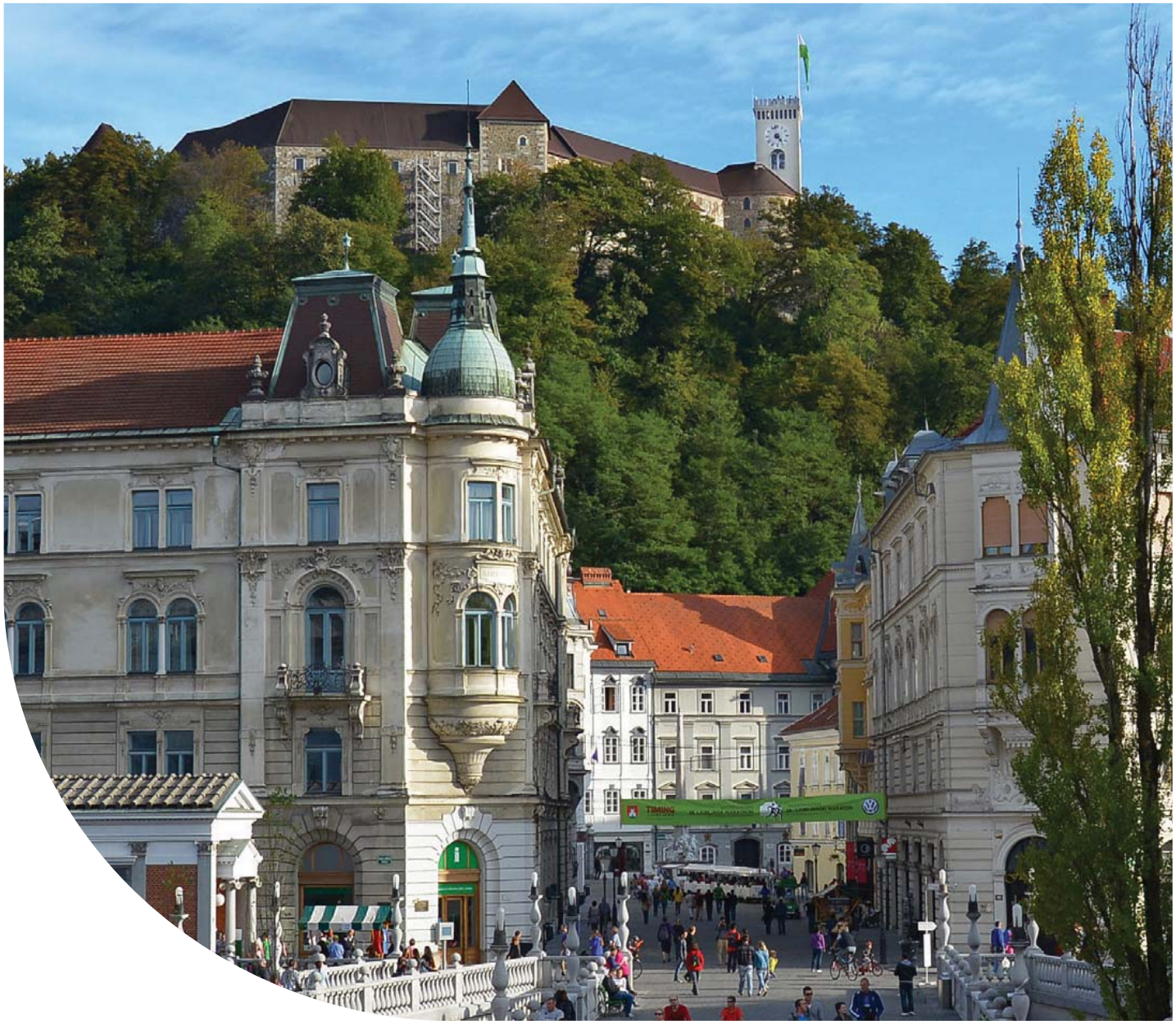
CITY STREET 4

STREETS FOR 2030:
PROPOSING STREETS FOR INTEGRATED, AND UNIVERSAL MOBILITY

UNIVERSITY OF LJUBLJANA, FACULTY OF ARCHITECTURE and
URBAN PLANNING INSTITUTE OF THE REPUBLIC OF SLOVENIA in collaboration with
NOTRE DAME UNIVERSITY-LOUAIZE, RAMEZ G. CHAGOURY FACULTY
OF ARCHITECTURE, ART AND DESIGN and
AESOP Thematic group Public spaces and urban cultures



STREETS FOR 2030:
PROPOSING STREETS FOR INTEGRATED AND UNIVERSAL MOBILITY

BOOK OF PROCEEDINGS

ORGANISERS

Notre Dame University-Louaize

Univerza v Ljubljani

Urbanistični Inštitut Republike Slovenije

COLLABORATING UNIVERSITIES & INSTITUTIONS

Chongqing University

De Montfort University

DUPPS - TSPAS

Edifici a Consumo Zero

Ljubljana Tourism

Vilnius Gediminas Technical University
Faculty of Architecture

Aristotle University of Thessaloniki

Slovenian Chamber for Architecture and Spatial Planning

ROUNDTABLES COLLABORATORS

ADVISORY BOARD, SCIENTIFIC AND ORGANIZING COMMITTEE

ADVISORY BOARD

University of Ljubljana, Faculty of Architecture:
assoc. prof. DR. MATEJ BLENKUŠ, dean
assoc. prof. DR. ALENKA FIKFAK
Urban Planning Institute of the Republic of Slovenia:
DR. IGOR BIZJAK, director
assist. prof. DR. MATEJ NIKŠIČ
Notre Dame University-Louaize, Ramez G. Chagoury Faculty of Architecture, Art and Design:
prof. DR. JEAN-PIERRE EL ASMAR
assoc. prof. DR. CHRISTINE MADY

SCIENTIFIC COMMITTEE

Dr. Jean-Pierre El Asmar, Notre Dame University-Louaize, Ramez G. Chagoury Faculty of Architecture, Arts and Design, Lebanon
Dr. Laurie Abi Habib, University of Balamand, Faculty of Health Sciences, Lebanon
Dr. Hebatallah Aboulfadel, Alexandria University, Egypt
Dr. Alessandro Armando, Politechnico Di Torino, Department of Architecture and Design, Italy
Ms. Dina Baroud, Notre Dame University-Louaize, Ramez G. Chagoury, Faculty of Architecture, Arts and Design, Lebanon
Dr. Lola Beyrouthi, Notre Dame University-Louaize, Ramez G. Chagoury, Faculty of Architecture, Arts and Design, Lebanon
Dr. Igor Bizjak, Urban Planning Institute of the Republic of Slovenia, Slovenia
Dr. Maria Bou Zeid, Notre Dame University-Louaize, Faculty of Humanities, Lebanon
Dr. Uģis Bratuškins, Riga Technical University, Faculty of Architecture, Latvia
Dr. Charis Christodoulou, School of Architecture, Aristotle University of Thessaloniki, Greece
Dr. Massimo Crotti, Politechnico Di Torino, Department of Architecture and Design, Italy
Dr. Ilka Čerpes, University of Ljubljana, Faculty of Architecture, Slovenia
Jernej Červek, Ministry of Environment and Spatial Planning of Republic of Slovenia, Slovenia
Dr. Gregor Čok, University of Ljubljana, Faculty of Architecture, Slovenia
Dr. Dalia Dijokienė, Vilnius Gediminas Technical University, Faculty of Architecture, Lithuania
Dr. Vladan Đokić, University of Belgrade, Faculty of Architecture, Serbia
Dr. Alenka Fikfak, University of Ljubljana, Faculty of Architecture, Slovenia
Dr. Polona Filipič, University of Ljubljana, Faculty of Architecture, Slovenia
Dr. Branislav Folić, University of Kosovska Mitrovica, Serbia
Dr. Angeliki Fotiadou, Research Associate, Aristotle University of Thessaloniki, School of Architecture, Greece
Dr. Damjana Gantar, Urban Planning Institute of the Republic of Slovenia, Slovenia
Dr. Ilaria Garofolo, University of Trieste, Department of Engineering and Architecture, Italy
Mr. Janez P. Grom, University of Ljubljana, Faculty of Architecture, Slovenia
Dr. Guitta Hourani, Notre Dame University-Louaize, Faculty of Law and Political Science, Lebanon
Dr. Liljana Jankovič Grobelšek, City Municipality of Ljubljana, Slovenia
Dr. Dima Jawad, Notre Dame University-Louaize, Faculty of Engineering, Lebanon
Dr. Matevž Juvančič, University of Ljubljana, Faculty of Architecture, Slovenia
Dr. Ioannis Kiousopoulos, University of West Attica (UNIWA), Greece
Dr. Miha Konjar, University of Ljubljana, Faculty of Architecture, Slovenia
Dr. Saja Kosanović, University of Kosovska Mitrovica, Serbia

Dr. Višnja Kukoč, University of Split, Faculty of Civil Engineering, Architecture and Geodesy, Split, Croatia
Dr. Domen Kušar, University of Ljubljana, Faculty of Architecture, Slovenia
Ph.D., P.E. Francesco Paolo Lamacchia, Zero Energy Building Network, Italy
Dr. Peter Lipar, University of Ljubljana, Faculty of Civil and Geodetic Engineering, Slovenia
Dr. Christine Mady, Notre Dame University-Louaize, Ramez G. Chagoury, Faculty of Architecture, Arts and Design, Department of Architecture, Lebanon
Mr. Sebastiano Marconcini, Politecnico Di Milano, Department of Architecture, Built Environment and Construction Engineering, Italy
Dr. Sabina Mujkič, Urban Planning Institute of the Republic of Slovenia, Slovenia
Dr. Ognen Marina, Ss. Cyril and Methodius University in Skopje, Faculty of Architecture, Republic of North Macedonia
Dr. Charbel Maskineh, Lebanese University (Iba2), Beirut, Lebanon
Dr. John Mcmillan, Ulster University, Belfast School of Art, Faculty of Arts, Humanities and Social Sciences, Northern Ireland, Uk
Dr. Habib Melki, Notre Dame University-Louaize, Ramez G. Chagoury, Faculty of Architecture, Arts and Design, Lebanon
Dr. Luka Mladenovič, Urban Planning Institute of the Republic of Slovenia, Slovenia
Dr. Ian Montgomery, Ulster University, Global Engagement, Northern Ireland, Uk
Dr. Simon G. Moussalli, Advisor in Planning and Architecture, Lebanon
Dr. Gašper Mrak, University of Ljubljana, Faculty of Civil and Geodetic Engineering, Slovenia
Dr. Eglė Navickienė, Vilnius Gediminas Technical University, Faculty of Architecture, Lithuania
Dr. Florian Nepravishta, Polytechnic University of Tirana, Faculty of Architecture and Urbanism, Albania
Dr. Matej Nikšič, Urban Planning Institute of the Republic of Slovenia, Slovenia
Dr. Nevena Novaković, University of Banja Luka, Faculty of Architecture, Civil Engineering and Geodesy, Bosnia and Hercegovina
Dr. Tomaž Novljan, University of Ljubljana, Faculty of Architecture, Slovenia
Dr. Svetlana Perović, University of Montenegro, Faculty of Architecture in Podgorica, Montenegro
Dr. Lea Petrović Krajnik, University of Zagreb, Faculty of Architecture, Croatia
Dr. Svetislav G. Popović, University of Montenegro, Faculty of Architecture in Podgorica, Montenegro
Dr. Antoni Remesar, University of Barcelona, Polis Research Centre, Spain
Ir. C., Ceren Sezer, Tu Delft, The Netherlands
Dr. Paola Somma, Freelancer, Venice, Italy
Dr. Luca Staricco, Politechnico Di Torino, Interuniversity Department of Regional and Urban Studies and Planning, Italy
Dr. Mojca Šašek Divjak, Town and Spatial Planning Association of Slovenia, Slovenia
Dr. Ahmad Taki, De Montfort University, Leicester School of Architecture, UK
Dr. Ir. F.D., Franklin Van Der Hoven, Tu Delft, Faculty of Architecture and the Built Environment, the Netherlands
Dr. Špela Verovšek, University of Ljubljana, Faculty of Architecture, Slovenia
Dr. Tijana Vujićić, University of Banja Luka, Faculty of Architecture, Civil Engineering and Geodesy, Bosnia and Hercegovina
Dr. Alma Zavodnik Lamovšek, University of Ljubljana, Faculty of Civil and Geodetic Engineering, Slovenia
Dr. Martina Zbašnik Senegačnik, University of Ljubljana, Faculty of Architecture, Slovenia
Dr. Tadeja Zupančič, University of Ljubljana, Faculty of Architecture, Slovenia
Dr. Vita Žlender, Urban Planning Institute of The Republic of Slovenia, Slovenia
Mr. Manfred Wacker, University of Stuttgart, Institute for Road and Transport Science, Germany

Dr. Miao Xu, Chongqing University, Department of Architecture, China
Mr. Donagh Horgan, University of Strathclyde, Institute for Future Cities, Scotland
Dr. Tomaž Pipan, University of Ljubljana, Biotechnical faculty, Slovenia
Mr. Donagh Horgan, University of Strathclyde, Institute for Future Cities, Scotland
Dr. Manja Kitek Kuzman, University of Ljubljana, Biotechnical Faculty, Slovenia

ORGANIZING COMMITTEE

DR. IGOR BIZJAK, UIRS
assoc. prof. DR. ALENKA FIKFAK, UL FA
NINA GORŠIČ, UIRS
assist. JANEZ P. GROM, UL FA
assoc. prof. DR. CHRISTINE MADY, NDU RC FAAD
DR. LUKA MLADENOVIČ, UI RS
assist. DR. GAŠPER MRAK, UL FGG
assist. prof. DR. MATEJ NIKŠIČ, UIRS
MARKO LAZIĆ, UL FA
KRISTIJAN LAVTIŽAR, UL FA
ALEŠ ŠVIGELJ, UL FA
Msc. INA ŠUKLJE ERJAVEC, UIRS

CONTACT

assist. prof. DR. MATEJ NIKŠIČ
Urban Planning Institute of
the Republic of Slovenia
Trnovski pristan 2,
SI - 1000 Ljubljana, Slovenia
matej.niksic@uirs.si

assoc. prof. DR. ALENKA FIKFAK
University of Ljubljana
Faculty of Architecture
Zoisova 12,
SI - 1000 Ljubljana, Slovenia
alenka.fikfak@fa.uni-lj.si

IMPRESSUM

STREETS FOR 2030: PROPOSING STREETS FOR INTEGRATED AND UNIVERSAL MOBILITY, Ljubljana, 23.-24. September 2020

BOOK OF PROCEEDINGS

EDITORS

assoc. prof. DR. ALENKA FIKFAK, UL FA
assist. prof. DR. MATEJ NIKŠIČ, UIRS
assoc. prof. DR. CHRISTINE MADY, NDU RC FAAD
DR. IGOR BIZJAK, UIRS
assoc. prof. DR. MATEJ BLENKUŠ, UL FA

DESIGN

assist. DR. GAŠPER MRAK, UL FGG

PUBLISHERS

University of Ljubljana, Faculty of Architecture, Ljubljana, Slovenia;
Urban Planning Institute of the Republic of Slovenia, Ljubljana, Slovenia;

Ljubljana, September 2020
The book is available at: https://cs4.uirs.si/portals/cs4/posters/CS4_2020_BOP.pdf

ISBN 978-961-6390-58-3 (pdf)

All abstracts and as well as full papers were blind peer reviewed by two international scholars.

Fikfak, A., Nikšič, M., Mady, C., Bizjak, I. & Blenkuš, M. (Eds.). (2020). *Streets for 2030: Proposing Streets for Integrated, and Universal Mobility*. Book of proceedings. Ljubljana, 23.-24. 9. 2020. University of Ljubljana, Faculty of Architecture, Urban Planning Institute of the Republic of Slovenia.

Kataložni zapis o publikaciji (CIP) pripravili v Narodni in univerzitetni knjižnici v Ljubljani
COBISS.SI-ID=32867843
ISBN 978-961-6390-58-3 (pdf)

INTRODUCTION

Dear Participants,

Welcome to the City Street4 (CS4) Conference! In 2020 this conference examines mobility in various aspects: the users, modes of mobility, and the streets facilitating but also affecting it. A current and imminent need for revisiting streets stems from the COVID-19 pandemic, which has imposed new requirements for encounter, co-presence and mobility in public spaces, among them streets. This conference is entitled:

STREETS FOR 2030: PROPOSING STREETS FOR INTEGRATED AND UNVIERSAL MOBILITY

The conference theme outlines global mobility challenges in relation to parameters of various transactions, communication modes and human flows. The status of streets is put under the spotlight to address scholars with multiple questions referring to society, climate change, the environment, technical and technological aspects, safety, urban health and quality of life implications. This international and interdisciplinary conference seeks to engage participants in discussions of everyday living and explore it from various backgrounds and considerations, with the purpose of forwarding knowledge on addressing streets to respond to current needs.

Choosing Ljubljana as the location for CS4 was intentional, as this city strives towards universal and integrated mobility. Mobility in Ljubljana is underpinned by serious endeavours from urban planners and academicians supporting professional practices and local authorities in providing a city for all. Also, the strong collaboration between the institutions: Ramez G. Chagoury Faculty of Architecture, Arts and Design at Notre Dame University-Louaize, and the Faculty of Architecture at the University of Ljubljana, along with the Urban Planning Institute of the Republic of Slovenia, emphasises the attention given to the public realm, particularly streets. This conference in Ljubljana provides a nexus across geographic areas linking academicians, practitioners from various disciplines and all those concerned with the future of streets. The richness of the contributions from which participants will learn is included within the nine conference tracks, the five keynote speakers from different backgrounds, the two roundtables related to the Association of the European Schools of Planning (AESOP) Thematic Group on Public Space and Urban Cultures, as well as the other conference activities. The tracks have contributions from 43 papers

and two posters, which cover countries in Europe, Asia, and Latin America, and explore global issues on streets and mobility. Each track focuses on different aspects related to the year 2030 ranging from the users, to diverse urban development, and implications for traffic congestion, transport systems with a focus on public transport, the role of streets as dividers or connectors, green mobility and resilience, pedestrians, walkability, culture and activism.

Under Track 1: 'Integrated and Universal Mobility: Whose Streets?' the contributions are concerned with street design for all amidst privatisation; the integration of ecological concerns; health concerns, accessibility and increased mobility in public spaces; the introduction of e-scooters and new technologies with their anticipated impact on public spaces; supporting social inclusion and different user groups including students through mobility; the impact of temporary changes leading to inclusion in public space. In Track 2: 'Dense, Diverse and Designed Urban Development' contributions address the emphasis of historic city parts through mobility; accessibility and urban design; walkability in mega projects. These topics are addressed through case studies from different cities. In Track 3: 'Mitigating Traffic Congestion with Urban Development' contributions examine current case studies related to globalisation, and impact on streets; street dynamics as manifested through programs; changing patterns in building uses and impact on transport. In Track 4: 'Travel Time and Efficiency of Transport Systems' the exploration of sustainable urban mobility measures, digitalisation of traffic, autonomous vehicles, joint development of transit corridors in various contexts provides lessons learned for streets. Within Track 5: 'Public-Transport-Oriented Cities for All' multimodal corridors, green spaces, alternative mobility and public health, and transit-oriented development provide analyses of advantages and disadvantages of public transport that could inform different urban contexts. Track 6: 'Borders in Street Life: Dividing or Protecting?' comprises papers exploring the role of material and immaterial divides including fences, music, and art in streets. Track 7: 'Green Mobility in a Way to Climate Resilient Streets' highlights directions for improving streets at various scales and considerations for pollution, low carbon emissions, seismic hazards. The papers provide examples at city scale and others at a university campus scale. Track 8: 'Pedestrian Friendly Cities to Support Climate Change' considers temporary strategies, integrated mobility, walkability as explained through several case studies. Track 9: 'Perspectives on Sustainable Mobility: Culture of Everyday Activism' presents the theme from the eyes of the users and their cultural milieus: students, riders of informal mobility psychological impact and human experience in public

spaces; digitalisation to enhance the identity of historic public spaces; streetscape transformations with the innovative interventions to street design and social aspects, beyond engineering; and social innovation to enhance urban mobility. And finally, Track 10: 'Street Lighting – Supporting Sustainable Urban Development' addresses the questions of nocturnal cityscapes and presents the role of light in managing the architectonic, social and environmental dimensions of built environments.

We wish you a successful conference in which this platform triggers new 'convivialities' among participants, through the scholarly exchange of thoughts, participatory debates, and inspirations for new and adaptive approaches to further inhabit, manage, and sustain mobility in city streets for 2030.

Assoc. Prof. DR. CHRISTINE MADY
Notre Dame University-Louaize, Ramez G. Chagoury Faculty of Architecture, Art and Design:

CONTENTS

KEYNOTE SPEAKERS

BERNARD KHOURY

LUKA MLADENOVIČ

LUKA SKANSI

DARKO RADOVIĆ

DAVISI BOONTHARM

BERNARD KHOURY

Bernard Khoury studied architecture at the Rhode Island school of Design (BFA 1990 / B.Arch 1991). He received Masters in Architectural Studies from Harvard University (M.Arch 1993). In 2001, he was awarded by the municipality of Rome the honorable mention of the Borromini Prize given to architects under forty years of age. In 2004, he was awarded the Architecture + Award. He was a visiting professor at the Ecole Polytechnique Fédérale de Lausanne, L'Ecole Spéciale d'Architecture in Paris and the American University of Beirut. He has lectured and exhibited his work in over one-hundred-twenty prestigious academic institutions in Europe and the U.S. including a solo show of his work given by the International Forum for Contemporary Architecture at the Aedes gallery in Berlin (2003) and numerous group shows including YOUprison at the Fondazione Sandretto Re Rebaudengo in Turin (2008) and Spazio at the opening show of the MAXXI museum in Rome (2010). He was the co-curator and architect of the Kingdom of Bahrain's national pavilion at the Venice Biennale's 14th International Architecture Exhibition in 2014. His work has been extensively published by the professional press. Khoury started an independent practice in 1993. Over the past twenty years, his office has developed an international reputation and a significant diverse portfolio of projects both locally and in over fifteen countries abroad.

KEYNOTE SPEECH: TOXIC GROUNDS.

As a practitioner, I have been drawn to problematic territories. Most of the grounds I have operated on were either highly sensitive zones, cities undergoing convalescence or regions in which the state and its institutions have failed to regulate or control the growth of the urban tissue. Beirut is a striking example that I often call "a wonderful catastrophe", a city that, over the last few decades, witnessed a rapid and chaotic development. In the absence of federating and consensual political projects, our neighborhoods are shaped by individualistic and distinct gestures that do not compose with each other. These are often driven by defensive postures that are the result of the inability to predict the future of the surrounding context and the danger of what can be coming right around the corner. In such conditions, you have to be extremely alert. Engaging in any kind of speculation or assertive stance over the future settings of a project could be lethal. We have taken that risk in many of our schemes that I would describe as voluntarily masochistic and sometimes suicidal propositions. There is no comfort zone on the unstable grounds where the most fundamental rules of urban planning don't apply. This is the result of the total bankruptcy, the incompetence and the corruption of our state institutions. In such conditions, architecture has to be a political act. What could be at the outset an ordinary program can take on a whole other dimension. When the state does not build parks, memorials, museums, opera houses, social housing… The most ordinary programs such as a residential development, a night club, a corporate office tower or a commercial building have to be considered as

projects that can hold a political charge. These private undertakings, which initially do not bear any heavy social or political accountability, can be the grounds for another kind of radicalism. This is where architecture should take on another kind of political responsibility, in formulating a history that is nonconsensual and not necessarily affirmative. I did not choose my battle fields. I chose to take action on distressed grounds where meaningful and generous efforts are much more needed. In a nation that failed to structure its grounds around consensual political symbols that would inscribe its history on its territory.

DR. LUKA SKANSI

Luka Skansi is an architectural historian, associate professor at Politecnico di Milano. He holds a Master of Science in Architecture from IUAV (Venice), and a doctoral degree from the School for Advanced Studies in Venice. His research interests include Italian Architecture and Engineering of the 20th century, Russian and Soviet Architecture, the Architecture in Socialist Jugoslavija. Recently he curated the exhibition Streets and Neighbourhoods, on Slovenian architect and Harvard Scholar Vladimir Braco Mušič (MAO Ljubljana, 2016) and participated to the 2014 Venice Biennale (section "MondoItalia") with the installation The Remnants of a Miracle. As a member of the curatorial staff of the exhibition Toward a Concrete Utopia. Architecture in Yugoslavia, 1948-1980, held at MoMA – the Museum of Modern Art in New York in 2018, he completed a research on the structural architecture of the 1960s and 1970s in Yugoslavia. He was a visiting scholar at the CCA (Canadian Centre for Architecture, Montreal) and a visiting professor at Ca Foscari University in Venice and the Faculty of Architecture in Belgrade and Ljubljana.

As a member of Datalab Rijeka, he participated in a collective research called Fiume Fantastika: Phenomena of the City: a central exhibition of the Sweet&Salt programme flagship, realized within the Rijeka 2020 – European Capital of Culture project. Based on recent research by DeltaLab – Centre for Urban Transition, Architecture and Urbanism at the University of Rijeka, the exhibition follows the last hundred and fifty years of Rijeka's urban history, during which the city experienced radical growth and became a global transport and industrial centre.

KEYNOTE SPEECH: FIUME FANTASTIKA. MONUMENTS OF A CITY OF FIVE CAPITALS.

Fiume - Rijeka - Reka - Sankt Veit am Flukt: four toponyms that during the 19th and 20th centuries signified the main seaport of the eastern Adriatic coast. In just a few decades, Rijeka developed from a small and geopolitically insignificant coastal town (1870) to the fifth largest port in the Mediterranean (1910), after

Marseilles, Genoa, Venice, and Trieste. She was a city that suffered a contested and divided condition after WWI, between the Kingdom of Jugoslavia and Italy (1919-41), and that experienced a second rapid process of growth after WWII as the main commercial and shipyard port of Socialist Yugoslavia (1945-91).

Every political entity that ruled the city (the Habsburg Monarchy, the Austro-Hungarian Empire, Fascist Italy, the Kingdom of Yugoslavia, Socialist Yugoslavia, the Republic of Croatia) left indelible and incredible marks, both material and immaterial, that today still characterize the image and spirit of Rijeka: dialects, cuisine, infrastructure, urbanism, architecture, monuments.

The relationship between Rijeka and its monuments – monumental public sculptures that commemorate important events and figures from the past – has always been problematic and conflictual. In the affirmation and legitimation of the various political entities that followed the collapse of the Austro-Hungarian monarchy, monuments in Rijeka were subject to cyclical erasure, manipulation, and exhumation due to their prominent symbolic significance. This fragmentary and at times illegible legacy stands in contrast to the city's other material heritage, primarily architecture (whether civil, industrial, or private), whose languages, dimensions, and typologies in a much more evident and integral way reflect the historical, political, and ethnic stratification that characterized this city, at least from the mid-19th century onwards.

The lecture will explore – through specific case-studies – the memorialization practices of different political entities, and the fate of memory in the city today, in the period of the lowest rate of ethnic diversity in 150 years of Rijeka's history.

DR. DARKO RADOVIĆ

Professor of Architecture and Urban Design at Keio University, Tokyo, and co-founder of co+re platform for strategic thinking making and living better cities Darko has taught, researched and practised architecture and urbanism in Europe, Australia and Asia. At Keio, he heads co+labo radović, research laboratory which focuses at the concepts of urbanity and sustainable development across scales, in contexts which expose difference and offer encounters with the Other. He has published in English, Serbo-Croatian, Catalan, Japanese, Korean, Italian and Thai languages.

KEYNOTE SPEECH: WHEN WE THINK ABOUT STREETS, WE ARE ALWAYS THINKING ABOUT SOMETHING ELSE

The title of this presentation paraphrases an argument, most likely formulated by Felix Guattari, that “when we think about cities, we are always thinking about

something else." I use it to point out how streets encapsulate many of the key aspects of what the urban is all about, its ultimate complexity. Properly conceived, (re)produced and (well) lived, the streets are indicators of healthy urbanity. Such statement sounds agreeable, apart from that indeterminate qualifier – "properly" – from which numerous legitimate questions arise. For instance, what do we think when we say – street? When we gather at international conferences and utter that word – to what degree does what we meant corresponds with Dutch expectations from their straat; Bosnian, Croat, Serbian, Slovenian or Russian from ulica or улица; Italian from strada; Spanish from calle, Catalan carrer; Vietnamese đường phố, Thai ถนน, Japanese 通り, Chinese 街, Arabs شارع, Israeli גאַס, or Turks from an, again fairly internationalised – sokak? To what degree does what sociologists assume when saying "street" resonates with what a traffic engineer, an ethnographer, an urbanist, politician or a resident who has, perhaps, grown up in that particular space may think – and feel?

The examples in this presentation are mainly from Tokyo, where I frame my research to include subjectivity of lived space, my own vécu. Attempts at conciliation of my personal, external and increasingly internalised views create conflicting perspectives, hint at the variety of possibilities and degrees of entry. As Jullien puts it, when exploring cultures and thought of the Other "only crossing thresholds and 'entering'" might be possible. Thus Japanese, along many other non-Western languages, has no words for "public". Neither the transcribed paburiku, nor indigenous kōkyo encapsulate the true meaning. That indicates an absence, or at least (to me) a very unusual situation with the concept of public – the cornerstone of my cultural, professional and academic frameworks. How to think streets without the idea of public?! How to admit that, as Jullien puts it mercilessly again, "other cultures have shown hardly any interest" in many of our key concepts?!

In this talk, my aim is to be polemological and to both, in de Certeau's tradition, help "force theory to recognise its own limits", and demand humility from common expert practices of solutionism. In that, I favour local criteria of excellence (as in the old environmentalist adage, critically associated with global awareness), as expressions of (also controversially untranslatable) – the right to the city.

DR. DAVISI BOONTHARM

Professor of Architecture and Urban Design at Meiji University, Tokyo. Davisi's international academic career stretches from France via Thailand, Singapore, Australia to Japan. Her interest in urban research includes subjective method and artistic approach in requalification, while her creative work expresses passion for cities. She published a number of books and research papers; she also exhibits her artwork internationally. Davisi is a member of the council board of City Space

Architecture, participating in research and action of public space. With Darko Radović she co-founded co+re, platform for strategic thinking, making and living better cities, organizing workshops, talks and exhibitions in Asia and Europe.

KEYNOTE SPEECH: CAPTURING THE CAPTIVATING STREETS

Street is an intricate subject at the core of urbanity. Street represents the character of the city and plays an important role in determining the quality of urban environment. I am interested in the notion of street as place, set within the context of my own cultural background and other familiar cities of East and Southeast Asia, which are in constant flux. The aim of this presentation is to explore creative methods other than those conventional in urban investigation, in particular artistic way to capturing, analysing, representing and interpreting the character and meaning of streets, with an aim to reach beyond the tangible data, and recognize their capacity to captivate. Three projects in three cities will be discussed.

1) Singapore: A tale of two streets, as an attempt to understand Singapore's urbanism through comparative mapping of Orchard Road and Haji Lane. Both streets communicate image of the city state as global, with strong sense of locality. By layering and delayering information that could relate to urban intensity, we eventually establish a rich visual essay capable to communicate such qualities.

2) Tokyo: "A street with no name" tests an artistic approach which seeks ways to communicate personal insights and sensibilities triggered by subtle qualities of lived experience, aiming to complement traditional depictions of place in urban research. Through my sketch&script method that engages bodily acts of drawing and writing, drawings help detect and they depict personal attachment to a particular street as a living place.

3) Bangkok: Mapping lived experiences of soi is the project that explores mapping of spatial narratives of residents living in my neighbourhood soi (local appellation of inner streets), located in a unique superblock of Bangkok. By referring to Lefebvre's trialectics and exploring those spaces as conceived, perceived and lived, I discuss the complexity of socio-spatial production of the neighbourhood and the soi which transformed from water-based settlements to land-based city by mapping the narratives of my family members and their attachment to the place.

The concluding part of presentation with focus at ultimate cultural quality of Bangkok, is endangered system of khlongs, canals which over the centuries functioned as liquid streets. This presentation will focus on current co+re efforts to help Bangkok reclaim and revive this complex urban type.

DR. LUKA MLADENOVIČ

Researcher and project manager at Urban Planning Institute of the Republic of Slovenia. Works in the fields of sustainable mobility and urban planning. He graduated from the Faculty of Architecture in Ljubljana and then in Urban Design at University College London, the Bartlett. Doctorate conducted at Faculty of Architecture in Ljubljana on the topic of sustainable planning and development of high-density urban areas. He has 15 years' experience working with Slovenian municipalities on their Cycling strategies, Sustainable Urban Mobility Plans and in the National SUMP Platform. He is a certified BYPAD auditor and a member of advisory board of European Cycle Friendly Employer Certification Scheme.

Keynote Speech: PUBLIC TRANSPORT AND OUR CITIES

Public transport is considered the cornerstone of mobility of a sustainable city. But the contemporary public transport system goes beyond traditional forms such as train or bus. It involves all sorts of new modes, some private and other shared, such as bike sharing, scooters, skateboards, rollers, electric bikes, ride sharing and many more.

Within the presentation we will take a closer look into important stages which shaped the system into today's state and influences public transport had on urban planning and design, with a special focus on Central European cities, which are mostly small and medium-sized, so changes might take some more time or develop a bit different, than in metropolises which we usually observe.

We will be focusing on three important stages, in which public transport had a direct influence on how urban environment is designed and built. First, the relationship of public transport and urban development in the period before the fast growth of motorization. Neighbourhoods of that period were originally planned as self-sufficient towns, allocated along important public transport corridors, which allowed daily commuting of its residents. This concept is today known as Transit Oriented Development.

Second part of s speech will focus on the post 2000 development with rise of shared and micromobility. We will look at what influence these new trends have on public space and urban development, challenges related to that and what approaches cities use to manage them.

Last part will discuss the effects of the COVID-19 crisis to public transport, mobility in cities and effects it has on planning and managing urban environment. As always, the crisis is a time of reflection, reconsideration of previous approaches and a possibility for change.

CONFERENCE ROUNDTABLES

ROUNDTABLE 1: PUBLIC SPACES - KNOWLEDGE TRANSITION BETWEEN RESEARCH, POLICY AND PRACTICE

Date: 23 September 2020 Time: 3:30 PM – 5:00 PM CEST (Central European Summer Time)

Moderators:

Matej Nikšič,
Urban Planning Institute of the Republic of Slovenia, Ljubljana

Ceren Sezer,
RWTH Aachen University, Aachen

Participants:

- *dr. Patricia Aelbrecht, Geography and Planning School, Cardiff University*
- *Cecilia Andersson, UN Habitat, Global Public Space Programme*
- *Enzhe Dusaeva, Tamga Institute of urban studies, Kazan*
- *Zeynep Gunay, ISOCARP Board, Director of Young Planning Professionals Programme*
- *Alenka Korenjak, prostoRož, Ljubljana, Slovenia*
- *Tadej Žaucer, Ministry of infrastructure of the Republic of Slovenia, Sustainable Mobility and Transport Policy Division*

Public space has received an increasing attention in urban research, policy, and practice. This is evident in the growing academic literature on the themes related to public space, including accessibility, healthy living, inclusiveness, democracy, urban justice, self-organization, social movements among others. The 2016 UN Habitat Conference, Habitat III, adopted The New Urban Agenda, which focused on public space as a promoter of 'inclusive, connected, safe and accessible' cities (UN Habitat, 2016). NGOs worldwide have developed a placemaking approach to improve public spaces, which has been adopted in many cities. Neighbourhood organizations, local interest groups, cultural minorities, or politically oriented pressure groups manifested their needs and interests and reclaimed public spaces specifically in the context of profit-oriented urban developments. This complexity requires transdisciplinary methods to analyse and conceptualise public spaces to be able to engage knowledge, approaches and theories of public spaces from various perspectives to inform and influence policy-making and practice in different contexts.

This roundtable aims to promote a vivid discussion between the speakers and participants from academia, international institutions, practitioners and governments on the challenges and opportunities of knowledge transition between public space research, policy and practice.

The CS⁴ Roundtables are organized jointly with AESOP Thematic Group Public Spaces and Urban Cultures within series of 2020-2022 events (https://www.aesop-planning.eu/blogs/en_GB/urban-cultures-and-public-spaces).

ROUNDTABLE 2: MOVING AROUND OUR CITIES IN THE TIMES OF EPIDEMICS – THE CHANGED DEMAND FOR PUBLIC SPACES

Date: 24 September 2020 Time: 3:30 PM – 5:00 PM CEST (Central European Summer Time)

Moderators:

Alenka Fikfak,
University of Ljubljana, Faculty of Architecture

Christine Mady,
Notre Dame University-Louaize, Beirut

Participants:

- *Jose Chong, UN Habitat, United Nations Human Settlements Programme*
- *Marko Peterlin, Institute for Spatial Policies, Ljubljana, Slovenia*
- *Janez Černe, Deputy Mayor of The City Municipality of Kranj, Slovenia*
- *Stefano Ragazzo, AMAT -Agency of the Mobility, Envrionment and Territory of Milan Municipality, Italy*

The recent Covid-19 pandemic crisis have affected mobility, social practices and other forms of life that are part of public spaces in our cities. While the public transport usage is decreasing, some other forms of mobility such as walking and cycling are gaining popularity. At the same time new social distancing measurements are challenging the design and management of the open public spaces. On one hand public spaces must stay the places of the social exchanges and democratic practices, on the other hand the epidemiologic measures demand the changed behavioural patterns and practices in open public spaces. Can this be an opportunity for re-conceptualising public spaces as we know them and turn them into more democratic and sustainable places?

This roundtable focuses on the following questions: Which technical solutions can contribute to a responsible usage of open public spaces during the epidemics so that the transportation, socialisation and other normative functions of streets can be

kept while the public health standards not endangered? Which interdisciplinary approaches are needed to address the issue in a holistic way at the crossroad of health, IT, urban planning, social and other sciences and disciplines to allow streets and other public spaces stay alive during the epidemics? How can individuals, communities and local authorities equally engage in circumscribing epidemics and mitigating their impact on the everyday lives of commuters, cyclists, pedestrians and other users of city streets? How can data be shared in epidemics situations and the transmittal of viruses controlled in streets and public transport?

The CS[4] Roundtables are organized jointly with AESOP Thematic Group Public Spaces and Urban Cultures within series of 2020-2022 events (https://www.aesop-planning.eu/blogs/en_GB/urban-cultures-and-public-spaces).

TRACK 1: INTEGRATED AND UNIVERSAL MOBILITY: WHOSE STREETS?

Track Chairs:

Matej Nikšič,
Urban Planning Institute of the Republic of Slovenia, Ljubljana, Slovenia and

Paola Somma,
Freelancer, Venice, Italy

Around the world, "the street" is the object of design competitions, academic courses, and concrete transformative operations. Most of these exercises propose scenarios that focus on the needs and requests of specific categories and groups of citizens and intentionally select the public for which the streets are intended. As a result, integration and universality become synonymous of all modes of transportation or, in the best case, of all ages and abilities.

The track focuses on how the dominant narrative is translated into concrete action and addresses a series of questions: Who can use the street? For what purpose? Under what conditions? With what entitlement and responsibility? In other words, whom the street belongs? Are the owners the ones who own the properties that front it? The ones who use the ground floor for a variety of economic activities? The city council that regulates its modes of use and design standards? The citizens in general? The international investors?

These questions are relevant both from a theoretical point of view and for their arising operative implications as they prompt us to turn the attention from unpopulated blueprints to the actual spatial practices that are changing our cities. Different disciplinary approaches are contributing to the track, provided they highlight the contradiction between the catchy slogans that advertise "streets for all" and the extreme categorization of the citizens that are addressed to, and engage with, proposing alternative and less unequal modes of using the public space.

Keywords: The Street, Users, Public spaces, Whom the street belongs, "Streets for all"

FROM EVERYONE'S TO NO-ONE'S STREETS – AND BACK?: APPROACHES TO PUBLIC SPACE DESIGN AMID PRIVATISATION PROCESSES

Matej Nikšič,
Assist. Prof., PhD, Urban Planning Institute of the Republic of Slovenia, Trnovski pristan 2, 1000 Ljubljana, Slovenia, matej.niksic@uirs.si

ABSTRACT

The character of the residential streets of the (post)socialist comprehensively planned neighbourhoods is changing under the shifting socio-economic paradigms and lifestyles. The paper presents the case study of Litostroj complex in Ljubljana to describe the changes in the life of residential streets in the last 70 years. It highlights the constraints that hinder the ability of residential streets to serve different needs of the users nowadays and sets an appeal for the decision makers and stakeholders to act and bring residential streets back to local communities.

Keywords: Residential Streets, Users, Modernist urban planning, Post-socialist city, Changing character of streets

INTRODUCTION

The impact of the quality of residential streets on the quality of urban life started to increasingly trigger professionals' minds in 1980s when the critique of the modernist planning was is rise. Practitioners and researchers started to address the issue of the characteristics of good residential streets. Jan Gehl, who has not yet been considered as one of the gurus of urban design back then, claimed in 1980s already that "Lively residential streets are those where the people meet easily and enjoy leisure and chores outdoors" (1980, p. 51). It seemed that the residential streets were rediscovered as the urban spaces that were always there but somehow forgotten or not given proper attention during the decades of modernist urban planning.

Different authors in 1980s and in 1990s started to address the potentials of residential streets within the (sub)urban renaissance endeavours (Homburger et al, 1989, Appleyard 1981, Southworth and Ben-Joseph, 1995, Moudon, 1987, Brindle, 1991, Kjemtrup and Herrstedet, 1992). Those were the times of the fast motorisation of the western society as well as the progressive decline of the industrial city. The scholars and practitioners were thus addressing the worsened safety situation on the residential streets filled with motorised traffic, the needs of

the street users in the post-industrial context, the issues of disappearing children-play in the streets, and the early ideas of the shared space instead of the segregation of the pedestrians and vehicles were introduced.

Even if the general context was alike all across the cities of the (post-)industrialised western world and some common solutions were proposed globally, different cities also developed their very own approaches to redesign the residential streets in accordance with their unique socio-economic and cultural contexts. Many authors were pointing out that the street life is a direct reflection of social and cultural assets of a community which must be considered when "redressing" the streets (Hester, 1984, Holland et al, 2007, Crowhurst-Lennard and Lennard, 1987, Cattell et al, 2008, Whyte, 1980, Mehta, 2007 and 2009, Polus, 1985).

This paper will put light on the changing character of residential streets which were conceptualised in the distinctive times of fast industrialisation of Ljubljana after WWII, when large housing estates were constructed to accommodate the new working class. The historical review will reflect the evolving life of the residential streets in one of the city's distinctive residential areas - Litostroj. The paper is based on the review of the historical documents related to the construction of the industrial complex and accompanying housing estate, and the interviews with some remaining residents that settled into the neighbourhood in their childhood. The interviews were part of the study done for the preparation of the urban regeneration strategy for the neighbourhood commissioned by the City of Ljubljana (Nikšič et al, 2013). In the concluding part the paper discusses the factors that crucially affect the quality of residential streets in the specific socio-economic circumstances of a post-socialist and neo-liberal city.

LITOSTROJ NEIGHBOURHOOD AND ITS KOROTAN COLONY IN LJUBLJANA

The city of Ljubljana has historically been the functional, administrative, cultural and political center of Slovenia (Korošec, 1991). In the period after the second world war it was developed as one of the main industrial centres of then existing federal state of Yugoslavia. The establishment of many working places attracted large numbers of new residents to the city, coming from all over the country. The city grew with new, comprehensively planned housing estates (Mihelič et al, 2014), which can be interpreted as "goal towards which the social environment under the self-management system was oriented" (Zbašnik-Senegačnik and Fikfak, 2006).

One of the new housing estates was constructed 3 kilometres north-western from the historic city as a part of a newly developing heavy machinery industrial complex Litostroj. The factory was one of the largest industrial estates of the ex-Yugoslavia and was built in the middle of the agricultural lands (Nikšič et al, 2013) where until 1940s only few family houses of so-called colony Korotan with few individual houses existed. The construction of Litostroj complex changed the character of a wider area of Korotan colony to a great extent – in a short period of

few years the rural landscapes were turned into the industrial urban environments with the accompanying housing areas.

At the peak of its production Litostroj employed more than 3.500 workers (Seme, 1977). The production halls were built north-eastern from Gorenjska railway, while south-western to the railway the housing estate for Litostroj workers was formed. Besides the industrial and housing zone, there was also the third part of the Litostroj complex – so called educational and recreational zone which was positioned western from the industrial zone and northern to the original Korotan colony.

The three zones of Litostroj complex were planned comprehensively as a new city quarter and were inter-connected by the new main urban artery – *Litostrojska cesta* avenue, which became the central and most representative linear public open space of this part of the city (Nikšič et al, 2013) (see Figure 1). Its main characteristics were the wide green stripes planted with trees, which were running along both sides of the avenue, and the distinctive streetlamps made of reinforced concrete (Figure 4).

The whole Litostroj complex was organized in accordance with the modernist urban planning paradigm and notable architects and planners of the times took part in its conception (Mihelič et al, 2013). Besides the clear zoning (industrial, living and educational & recreational zone) the layout has been characterized by the big amount of open green spaces in each zone - the industrial halls were separated by green patches to provide space for workers' recreation during work-breaks, while the blocks of flats in the housing zone were positioned in rather large distances from each other to form the abundance of green open spaces in-between (see Figure 2). The largest green area was provided in the educational and recreational zone where Litostroj technical school was built in a form of a modernist building on pillars in the middle of a large park. Additional greenery was grown spontaneously in the strip of land along the railways as well as western to the complex, where the wooden barracks for the construction workers of the complex were temporary constructed and then after (once the construction works were finished), not demolished as initially planned.

The large development initiated by Litostroj influenced once isolated Korotan area a lot – from eastern side Litostrojska cesta avenue formed its new border and prominent access at the same time, while the land to the north was urbanized in 1947 by the construction of Litostroj school and surrounding park, and a decade later by a number of terraced houses constructed by the housing cooperative Proleter (besides the collective blocks of flats, Litostroj was encouraging the construction of terraced houses too as part of it's own housing policy to provide more and diversified housing for its workers) (see Figure 3). A distinctive, however not planned area of Korotan colony became also the construction-workers' barracks area, which amid the unsuccessful demolitions spontaneously turned into a shanty-town-like part of the neighborhood.

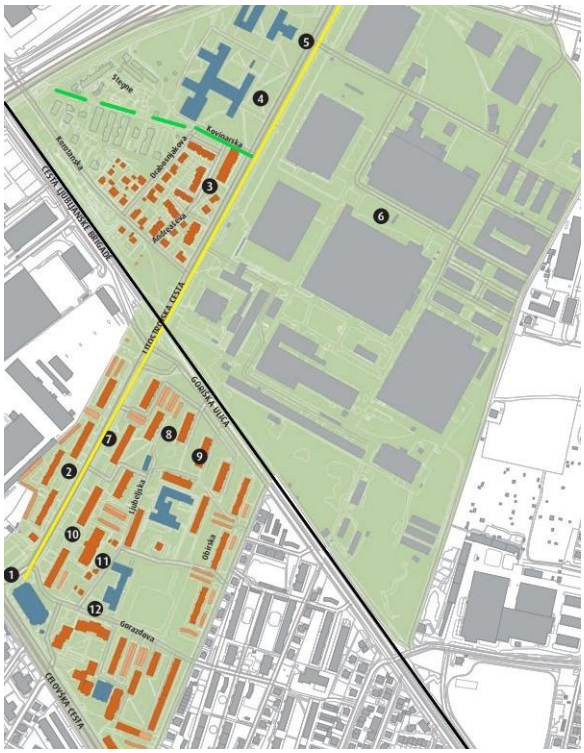


Figure 1: Map of Litostroj complex: 6 – industrial zone, 4&5 – educational&recreational zone with Korotan colony (3), housing zone to the south (1-2, 7-11). Litostroj avenue is marked with yellow line, Kovinarska street with green line (dashed continuation into barracks area), Gorenjska railway with black line (source: Mihelič et al, 2013)

Figure 2: The modernistic urban planning layout of the housing estate of Litostroj complex with abundant open spaces between the blocks of flats – marked with 1-2 & 7-11 on Figure 1 (source: Arhitekt, 1951, No. 1).

Figure 3: Terraced houses of Proleter housing cooperative at Andreaševa street (source: Mihelič et al, 2013)

Figure 4: Litostroj avenue, the main connection of the whole Litostroj complex (source: Nikšič et al, 2013)

NO-ONE'S AND EVERYONE'S PUBLIC SPACES OF SOCIALIST NEIGHBOURHOOD

Based on the expropriation of the initial farmland-owners the whole area was turned into the ownership of Litostroj from the very beginning of the existence of the complex (Fonda, internet source). Litostroj was a state-owned socialist enterprise, thus all the open spaces of the new urban area were freely accessible to everyone with few exceptions (some plots next to the industrial halls were the restricted zone due to the safety reasons, and the plots of the initial Korotan single houses and of the Proleter housing cooperative terraced houses were in private ownership). Besides Litostroj another public entity owned few open spaces, i.e. the City of Ljubljana, which owned some of the local roads.

Such ownership structure in combination with the modernistic urban planning layout (blocks of flats freely standing in the greenery) made the public spaces in the whole Litostroj area easily and freely accessible to everyone, which offered lots of recreational and socializing opportunities to the residents. In their childhood memories the remaining initial residents of the neighbourhood (UIRS, 2012) recall that they were playing all over the place, not only on the green patches around the blocks of flats and in the school park, but also on the roads and streets which were back then rarely used by the motorized traffic. Some interviewees also remember that in the early years of the neighbourhood some open spaces were used as allotment gardens, while the plots in-front of the residential buildings were spontaneously arranged as flower beds.

Case Study: Kovinarska ulica (Kovinarska Street)

Kovinarska ulica is a residential street in the northern part of Litostroj area and is nowadays part of the extended Korotan colony. The street is directly connected to Litostroj avenue at its eastern end and runs westwards to it. The southern edge of the street was aligned with 9 terraced houses while the northern edge was opened into the park surrounding Litostroj school with the connection to the open landscapes outside the city towards the north. It was constructed when the housing cooperative Proleter developed row-houses for Litostroj workers in 1950s and was designed as a residential street with two parallel tracks (northern and southern) which were separated with a 14-meter wide green strip inbetween. The green strip was originally not given any distinctive purpose but had a rather representative role. It gave the street an outstanding character compared to other streets in the area and through time started to serve as the unofficial front-garden of terraced houses – the house owners were taking care of it. The street had also an unofficial continuation towards the west into the shunty-town-like area of Litostroj-construction workers' wooden barracks.

Two other residential streets were constructed at the same time next to Kovinarska and ran perpendicular to it - Andreaševa and Drabošnjakova streets. The initial residents remember how the three residential streets were a spontaneous linear playground of their childhood in early years of the neighbourhood (UIRS, 2012). In their memories they recall that, similarly as in the whole Litostroj complex, there were very few motorised vehicles on these streets and different activities took place there: residents used the street space for walking to their daily errands such as work in the nearby Litostroj and daily supply shops, and to school. They were also regularly socialising on the street in the afternoons. Some residents even occasionally used the street space as an extension of their little front-yards when doing some out-door works. The initial local community was rather closely connected in social terms as residents shared the feeling of belonging to the same organisation (all families got the right to own the house in the area due to the fact that at least someone in the household was Litostroj worker) (Fonda, internet source), but also because many young families with children of similar ages moved into the houses and had similar daily concerns and interests.

The initial residents also recall the times when the terraced houses' back garden had not been fenced yet – these allowed children to played all around the houses, using the back gardens as playing fields no matter of the ownership. However, this has changed once the terraced houses owners decided to separate their own plots from the rest of the open space in the neighbourhood to avoid unwelcomed visitors to their vegetable gardens. Once the gardens were fenced, the socialising and playing function of the residential streets became even more important - some residents remember that especially the corners of the three residential streets gained the importance and became spontaneous meeting spaces where youth spent a lot of spare time together. Thus, fencing the gardens was the first bigger change in the life of the area that had major consequences on the dynamics of street life in the area as due to inaccessibility of back gardens they became the central open public space.

Another big change happened in mid 1970s when a large block with 90 flats was added at the intersection of Kovinarska and Andreaševa street (Nikšič et al, 2013). The number of households suddenly tripled and new people who came to the neighbourhood represented the majority of residents. 1970s were also the times when the cars became more accessible to the average Slovenian family and more street space got occupied by the parked cars in the neighbourhoods (Koblar, 2016). Additionally, the first generation of children of initial residents grew up into late adolescents and did not necessarily spend their spare time on the local streets anymore. All these changes made Kovinarska street less occupied with social activities while the parked vehicles were becoming more prevalent feature in the street space.

The arrival of new residents in mid 1970s also caused some tensions between initial and new residents who earlier established and abode some un-written rules of conduct in the open spaces. Besides the bigger amount of traffic in the area caused

by the newcomers, the initial residents were also not happy about the increased amount of litter on the streets. Moreover, the new residents had some new demands – as they did not have enough parking lots within their own plot, they wanted to construct their garages in the green strip of Kovinarska street - the area was "empty" and seemed not to be dedicated to any special purpose therefor the newcomers, who did not have the strong feeling of belonging to Litostroj's legacy, found it suitable to fulfil their rising parking needs. The initial residents who were (with a silent approval of Litostroy management) taking care of this green area in front of their own terraced houses opposed this idea as they always perceived the area as a part of the open space of their street. At the end they managed to convince the management of Litostroj, which owned the plot, that the area is an indivisible part of Kovinarska street and must stay an open green space. There is no written evidence about the arguments that convinced the Litostroj management to keep the green strip of Kovinarska street unbuilt - the initial residents guess (UIRS, 2012) that the regular usage by initial Litostroj residence (mainly children for spare time activities) convinced the decision makers to leave the street layout intact. Thus the green strip of Kovinarska street remained a no-ones and everyone's open space throughout the existence of Litostroj. It kept to be taken care of by terraced houses owners and stayed unfenced, thus in theory accessible to anyone, even if the terraced houses owners appropriated it through their maintenance activities.

OWNERSHIP CHANGES FROM 1990S ONWARDS AND THE CONSEQUENCES FOR THE OPEN PUBLIC SPACES

In 1990s major socio-economic changes took place in Slovenia. They were characterized by the end of socialist planned economy period and introduction of the privatized market economy (Ferfila, 2010). These processes brought slow but steady changes to the public open spaces in all Slovenian cities too, and Ljubljana and its Litostroj neighbourhood were not any exceptions.

These changes were gradual and strongly related to the privatization tendencies that started with the new housing law in 1990s that offered the purchasing of the social housing units to the renters who were inhabiting them (Sendi, 1995). In the same period also the privatization of some other properties that were previously in the public ownership started. 1990s were also the times of the economic hardship in Slovenia due to the re-orientation of the economy from the Yugoslav planned-economy model to the market-oriented model integrated into the wider European markets. In such circumstances many enterprises could not compete anymore and got bankrupted which caused the rising unemployment (Kajzer, 1996).

Litostroj was not an exception – in early 1990s it went to administration (Pipan, 1998). In the bankruptcy proceedings all the properties of the company were made part of the bankruptcy estate, including the properties and plots that the company owned. To make the situation more complicated at the same time the de-nationalisation processes started and the original owners of the lands that were

nationalsed after WWII were eligible to claim their land ownership back (Sendi, 1995).

In these process parts of the open public spaces of Litostroj neighbourhood were put on sale and were sold by the best bidder. This meant that parts of the street network, green areas and other open public spaces were offered to literally anyone who had the purchasing interest, even if only in speculative terms (not having real interest in owning and managing the concrete plot but rather sell it further at a higher price). The residents would usually not take part in such purchases, mainly due to their unawareness that the "public" open spaces of their neighbourhood were on sale (UIRS, 2012). Once they have got aware of the process the first buyers would already increase the land prices and would only sell the plots at higher prices, which many of the ex-workers of the bankrupted company could not afford.

The city authorities at that point did not attempt to protect the public interest by buying the important parts of the public spaces network from Litostroj, among other reasons also due to the fact that the big amount of public spaces would cause more maintenance costs to the city (Litostroj was not a unique case, there are very many similar cases all around the City). By doing so the City avoided the maintenance costs and thus passed the responsibility and costs to the new owners. It is important to note that the City however was investing into public spaces in the same period, but primarily into the (re)development and upgrading of the city's most central open public spaces in the historic city centre which is a of great interest to tourism sector (Nikšič, 2017).

The ownership changes took the residents of Litostroj neighbourhood by surprise as they were unaware that open public spaces were made part of the bankruptcy estate of Litostroj and on sale. They have got aware of the situation only once the new private owners started to develop various ideas on rearranging or developing the plots. The new plot owners saw the purchasing of the open spaces as an investment with the clear goal to capitalize the land in different ways (e.g. by selling it further for higher price, building it up with new properties, or fencing the plots and turning them into the payable parking places).

Along with the privatization process and the decreased City's interest for the suburban open public spaces, another process accelerated in 1990s and continued into the new millennium - the motorization. The average number of private cars per household in Ljubljana rose rapidly and grew 1.5 times in a decade from 1990 to 2000 (SURS, web source). As the parking facilities in Litostroj neighbourhood were not designed for such great amount of cars, the open public spaces started to spontaneously turn into the open-air parking lots. The process firstly started along the local streets which became filled-in with the side-parking. Similarly the open spaces in-front of the entrances to the buildings were under the pressure. In the next phase some green patches started to turn into the "provisional" parking spaces too.

In some cases the new owners who bought the plots from Litostroj's bankruptcy estate even managed to turn them into the restricted-access payable parking spaces.

The accelerating privatization of open spaces and the absence of City's urban design, management and investment policies for suburban areas caused other modifications of public spaces too. Some new owners for example decided to cut all the trees on their plots - according to their explanations to avoid the autumnal maintenance works when deciduous trees loose leaves, but in some cases with a clear intention to prepare the plots to be turned into the parking surfaces. In some places the privatised ground-floor flats were turned into the services (e.g. shops, bars) and started to use the street space as the extended space for these business (e.g. open-air beer gardens).

THE NOWADAYS REALITY OF KOVINARSKA STREET

These processes were reflected at Kovinarska street too. It turned out that only the southern track of the street was in the ownership of the City, while the northern track and the green stripe in-between were sold to a new owner who managed to gain the right-to-build. Moreover the whole area of the nearby wooden barracks was privatized too and the new owner fenced it, demolished the wooden barracks, cut all extensive greenery and turned the area of 7.5 acres into a large parking lot for the heavy trucks, as a transitory land use until the new housing estate with about 850 flats would be built there. As the area is part of the public-drinking-water protected zone, the new parking facility attracted lots of wider public attention too, including the press coverage and investigations (Rožman, 2019) which found out that the new ownership of the lands is unclear at best as it is related to a post-box in the UK.

Due to the fenced large parking lot the western extension of Kovinarska street became inaccessible for general public. Additionally the motorization rate of the nearby households grew even further meaning that all sidewalks were turned into the informal parking spaces. That made the unoccupied space of the street limited to a narrow passage-through. Some residents started to park their cars even within the green strip in the middle of the street which was an unprecedented act not seen ever before. The constant entering and exiting of heavy trucks made the northern track of the street a completely motorised-traffic-serving surface with no space for safe use by any other user even if it is the entrance area to Litostroj park (see Figures 5-7). Moreover the new owner managed to get the City's approval to build -up the green strip of Kovinarska street with new terraced houses.

All these changes largely influenced the overall social life of Kovinarska street. The initial residents who put lots of effort to keep the open spaces intact (not built up or turned into the parking lots), were unsuccessful in their endeavours and the feeling of devotion to destiny started to develop (UIRS, 2012). Some residents even gave up their decades long voluntary maintenance of the middle green strip which started to be overgrown with bushes, as well as became the rat breeding place due

to the City's garbage disposal point that was placed there. The conviviality of the street as it was known to the initial residents became a matter of a memory and the far distant past.

Figures 5-7: Residential streets in socialist-constructed part of Korotan colony nowadays, on an average mid-week day (source: the author)

CONCLUSIONS

The case of Litostroj neighbourhood in general and Kovinarska street in Korotan colony in particular offers insights into the constraints that influence the ability of residential streets to serve different needs of the street users through time:

- The ownership of open urban spaces has a profound impact on who will (not) be able to use the open space and under which conditions. Therefor the privatisation of historically publicly accessible open spaces can have the devastating effects for the social life of streets if the planning system does not provide and require compliance with the basic quality standards. The privatisation-related fencing can have devastating consequences for social capacity of streets if there are no alternative good spaces offered for the residents to meet and spend time together (the case of shut down of western extension of Kovinarska street for the needs of trucks parking lot). The fencing policy must therefor be a well thought aspect of any regeneration strategies.

- The modernist planning neighbourhood layouts of (post-)socialist cities with relatively large amount of open spaces are being under big pressure in contemporary neo-liberal paradigm amid privatisation and monetarisation processes (new construction, parking lots etc). The local communities need to be empowered to fight back such processes and show that the true value of open spaces remains in their social and environmental capacities.

- The dynamics of demographic structure of the local community is directly reflected in street life of residential streets – the socialist neighbourhoods that age at once will more likely see the drop of socialising and other user-generated activities through time, therefore the regeneration plans must be comprehensive and prepared in interdisciplinary teems with public space strategies and participatory approaches in the core

- The ever more present motorisation in suburban residential streets keeps having the devastating influence on social life in street space. Due to the weak policies it remains one of the main obstacles for the development of the residential street concept, where the car-owner will not be the king anymore but simply one of the users of street space. As the post-corona revival of the car shows that the car will obviously not go anywhere for a while without a daring public policy in the field, the communities and practitioners must find new, might be "guerrilla tactics" to address the problem.

In the context of the post-socialist suburbia, which dropped low on urban agendas from once highly considered part of the city by socialist regime to the kind of the forgotten urban territory under the post-socialist governance, the case of Litostroj shows that the users that can in fact use the streets change through times in accordance with the power they possess. The conditions and rules of street-usage are dictated by the ones who manage to gain the most power in various forms: either through historically acquired rights of usage, ownership or rule of the performed fact, while the absence of any regulation excuses them of any responsibility to share the space with other users on the bases of equality and equity. These are fertile grounds for the external actors, such as profit-oriented investors from elsewhere, to enter the local scene and use their financial powers to set their own rules of play no matter how harmful they might be for life of local public spaces.

As local communities most often get aware of these processes at a (too) late stage, the quality of streets is decreasing and once every-one's streets are turning into no-one's streets in social terms. Reversing the process will demand the full and sincere investment of will, energy, and resources of cities' decision makers too – they finally must act in public interest in the suburban areas too and stop leaving them to the grace and mercy of the all-mighty forces of the self-regulated market. Only then may the Gehl's bright vision (1980) of residential streets become the case of post-socialist suburbia too - and the residential streets there lively places where the people easily meet and enjoy their leisure time.

REFERENCES

Appleyard, D. (1981). *Livable Streets*. Berkeley: University of California.

Brindle, R. E. (1991). Traffic calming in Australia. *Australian Road research 21*(2), pp. 37-53.

Cattell, V., Dines, N., Gesler, W., Curtis, S. (2008). Mingling, observing, and lingering: everyday public spaces and their implications for well-being and social relations. *Health & Place*, 14, pp. 544–561.

Crowhurst-Lennard, S., Lennard, H. (1987). *Livable cities —people and places: social and design principals for the future of the city*. New York: Center for Urban Well-being.

Ferfila, B. (2010) *Slovenia's Transition: From Medieval Roots to the European Union.* Plymouth: Lexington Books.

Fonda, R. (internet source). Litostrojska leta mojega očeta – Litostroj years of my father. *Accessed on August 29th 2020 at http://rfondablog.blogspot.com/2017/01/litostrojska-leta-mojega-oceta.html.*

Gehl, J. (1980). The Residential Street Environment. *Built Environment*: Architects, Space and People, *6*(1), pp 51-61.

Hester, R. (1984). *Planning neighborhood space with people*, 2nd ed. New York: Van Nostrand-Reinhold.

Holland, C., Clark, A., Katz, J., Peace, S. (2007). Social interactions in urban public places. Bristol: Policy Press.

Homburger, W., Deakin, E., Bosselmann, P. (1989). *Residential street design and traffic control.* Washington DC: Prentice Hall.

Kajzer, A. (1996). *Trg dela in brezposelnost v Sloveniji = Labor market and unemployment in Slovenia*. PhD thesis. Maribor: Faculty of economics and business.

Kjemtrup, K., Herrstedt, Lene (1992). Speed management and traffic calming in Europe: A historical view. *Accident Analysis and Prevention, 24*(1), pp. 57-66.

Koblar, S. (2016). Prometna obremenjenost cest v Ljubljani = Traffic loads of Ljubljana roads. *Urbani izziv*, No. 6, pp. 140-144.

Korošec, B. (1991). *Ljubljana skozi stoletja=Ljubljana through centuries.* Ljubljana: MK.

Mehta, V. (2007). Lively streets: determining environmental characteristics to support social behavior. *Journal of Planning Education and Research, 27*(2), pp. 165–187.

Mehta, V. (2009). Look closely and you will see, listen carefully and you will hear: urban design and social interaction on streets. *Journal of Urban Design*, *14*(1), pp. 29–64.

Mihelič, B., Nikšič, M., Goršič, N., Mujkić, S., Tominc B. (2013). *Dragocena urbanistična dediščina: Litostrojsko naselje = Valuable Urbanistic Heritage: Litostroj Neighbourhood.* Ljubljana: City of Ljubljana, Department of Urban Planning.

Mihelič, B., Koželj, J., Gajšek, M. (2014). *Ljubljana: Portrait of a city.* Ljubljana: City of Ljubljana.

Moudon, V. A. (ed.) (1987). *Public streets for public use.* New York: Van Nostrand.

Nikšič, M., Goršič, N., Mihelič, B., Mujkić, S., Tominc, B. (2013). *Litostrojsko naselje : smernice za vzdrževanje in prenovo karakterističnih območji mesta Ljubljane / Litostroj Neighbourhood: Maintainance and Renovation Guidelines of Distinctive Quarters of Ljubljana*. Lubljana: Urbanistični inštitut Republike Slovenije.

Nikšič, M. (2017) Is a walkable place a just place? Urban justice issues of walkable environments on the case of Ljubljana. Built Environment, Alexandrine Press, *42*(4), pp. 214-235.

Pipan, G. (1998). Sodišče je preložilo narok za stečaj koncerna Litostroj = The court adjourned the hearing for the bankruptcy of the Litostroj concern. *Delo*, 27.2.1998.

Polus, A. (1985). *Evaluation of the characteristics of shared streets*. Haifa: Transportation Research Institute.

Rožman, A. (2019) Korotansko naselje: Dve družini izgubili streho nad glavo = Korotan neighbourhood: Two familes lost their roof over their heads. *Dnevnik*, daily press, 25.9.2019.

Seme, M. (1977) *Titovi zavodi Litostroj = Litostroj plant of Tito*. Ljubljana: TZ Litostroj.

Sendi, R. (1995) Housing reform and housing conflict: The privatization and denationalization of public housing in the Republic of Slovenia in practice. *International journal of urban and regional research*, *19*(3), pp. 435-446.

Southworth, M., Ben-Joseph, E. (1995). Street standards and suburbia. *Journal of the American Planning Association 61*(1), pp. 65-81.

SURS, web source: *Republic of Slovenia Statistical Office SiStat Portal:* Accessed on August 14th 2020 at *https://pxweb.stat.si/SiStat/en*

UIRS (2012). *Litostrojsko naselje – pogovori s prvotnimi prebivalci: neobjavljena gradiva zbrana za potrebe naloge Dragocena urbanistična dediščina = Litostroj neighbourhood – conversations with the original inhabitants: unpublished materials collected for the needs of the project Valuable urbanistic heritage.* Ljubljana: Urban Planning Institute of the Republic of Slovenia.

Zbašnik-Senegačnik, M., Fikfak, A. (2006). Urban, architectural, technological and economic turning points in the construction of apartment buildings in Slovenia = urbanističke, arhitektonske, tehnološke i ekonomske prekretnice u izgradnji višestambenih zgrada u Sloveniji. *Prostor,* 14 - 1, pp. 77-86.

Whyte, W.H. (1980). *The social life of small urban spaces*. Washington, DC: The Conservation Foundation.

RETHINKING PUBLIC SPACES: ACCESSIBILITY FOR ALL AS A DRIVER TO INTEGRATE MOBILITY, HEALTH AND ECOLOGICAL ISSUES

Elena Marchigiani[1]
Assoc. Prof., University of Trieste, via Alfonso Valerio 6/1, emarchigiani@units.it

Ilaria Garofolo
Professor, University of Trieste, via Alfonso Valerio 6/1, ilaria.garofolo@dia.units.it

Barbara Chiarelli
PhD student, University of Trieste, Via Alfonso Valerio 6/1, barbara.chiarelli@phd.units.it

ABSTRACT

The ageing of European urban population, the increase of social and economic inequalities, and the demand for maintenance of public spaces and welfare equipment foster deeper reflection on the material assets supporting citizens' health and autonomous mobility. Recognising the largest number of people the capability to actively contribute to their own well-being is also a matter of spatial organisation of cities. In this view, taking accessibility for all *as a right of citizenship sets the reflection on sensorial/cognitive/motor (stable or temporary) disabilities within a broader frame, covering many fields of EU and UN Urban Agendas. Today, these issues become even more strategic in the light of post COVID-19 quarantine measures, stressing the importance of re-equipping urban spaces to make them usable to the largest extent of urban populations. The research* PROACTIVE CITY, *in progress at the University of Trieste (IT), offers inputs to this debate. In order to test and disseminate good practices, since 2019 its core step has been the identification of pilot contexts in the Italian region Friuli Venezia Giulia. Trieste and Grado were chosen as the locations of design workshops organised with the local Municipalities and the main associations of people with disabilities. Both workshops clearly showed the need to design without barriers from the very beginning, and to adopt this as an ordinary approach in any urban transformation. By taking the perspective of the most fragile people, the key issue is turning the conflicts among different mobility modes/capabilities into an opportunity to try out innovative design solutions and planning tools, addressed to integrate slow mobility with a framework of green/health/sports equipment.*

Keywords: Inclusion, Mobility, Proactive cities.

[1] Corresponding author. As the result of shared research and intense discussion, the final version of paragraphs is to be attributed as follows: to all three authors (first and fourth); to Barbara Chiarelli (second); to Elena Marchigiani (third and fifth).

INTRODUCTION

Since 2019, the interdisciplinary group *Trieste Inclusion & Accessibility Lab* (TRIAL), led by the Department of Engineering and Architecture of the University of Trieste (DIA), has been working at the research *PROACTIVE CITY. The City as a Gym for Active Design*[2]. Going beyond the simple removal or mitigation of the impacts of physical barriers, this *action and by design research* focuses on the interpretation of cities as gyms: places where the configuration of public spaces, the location of services, of green areas and sports equipment are part of strategies aimed at reactivating people's capabilities to move independently, mainly by walking and cycling.

Focusing the attention on the enabling potential of urban space is taken as a key move to overcome the sectorial nature of solutions that are often still designed for specific categories of users and types of disabilities. The hypothesis is that the physical configuration of places plays an important role in stimulating active behaviours (Sen, 1987; Kaufmann, 2011). If the link between *healthy places* and *healthy people* is recognised as inseparable (Commission on Social Determinants of Health, 2008), disability should not be interpreted as the condition of single individuals, but as the outcome of the daily interaction with a living environment which is more or less able to enhance motor, sensory, cognitive capabilities, that – in a stable or permanent way – change for everyone, in the different phases of their existence.

In this frame, accessibility comes to the fore as a strategic and cross-cutting issue of the *2030 Urban Agenda*, and as a perspective from which many fields covered by the *Sustainable Development Goals* and by the most recent addresses for a *European Green Deal* are to be co-ordinately tackled: social justice and mobility/motility; health and inclusion; universal, people-centred and inclusive design; sustainable and nature-based solutions (United Nations, 2016a, b; European Commission, 2019).

The paper is based on research developed on case studies in the Italian region Friuli Venezia Giulia, through the organisation of workshops involving students and professors from the courses of Architecture and Engineering at the University of Trieste, and addressed to provide design criteria and suggestions for specific sites and larger urban contexts. Starting from these results, the aim is to offer a broader reflection on *accessibility for all* as the outcome of a proactive and inclusive design approach (Bencini, Garofolo, Arenghi, 2018) to the refurbishment of public spaces and equipment, based on strong integration of a variety of planning tools, strategies and scales of urban regeneration. PROACTIVE CITY is still in progress. The paper ends with open conclusions on further research steps, and on the relevance that the design of urban spaces plays in fostering soft, inclusive and healthy mobility in the view of post COVID-19 pandemic quarantine measures.

[2] TRIAL is coordinated by Ilaria Garofolo, with Elena Marchigiani and Barbara Chiarelli.

THE RENEWAL OF SANT'ANTONIO SQUARE IN TRIESTE

The first case study was offered by the re-design of Sant'Antonio Square, promoted by the Municipality of Trieste as the latest step of a long-standing regeneration process of the city historical centre that was started in the 90's. A participatory design experience was developed in spring 2019, by experts from TRIAL[3], in collaboration with members of *Progettiamo Trieste* (a local association of young activists). The general aim was to raise – among a wider public – the awareness of the issues of accessibility for all in public spaces, by defining and testing ways to listen to vulnerable groups' requests since the very first phases of the design process.

In this perspective, a one-week workshop was organised; during the training, students from the University of Trieste had the opportunity to discuss with the administration technical staff, the architect Maurizio Bradaschia in charge of the preliminary plan of the square, and different stakeholders[4]. The main objective was to assess – in a shared way by students and expert designers, elderly persons and persons with motor and visual disabilities – which of the four proposals defined by the architect[5] could best meet a series of requirements identified as fundamental. The participatory process was supported by the use of decision-making tools, to help match and evaluate different solutions, and improve the quality of the final project. Specifically, a listening process was activated, starting from on-site mapping and the filling in of qualitative questionnaires, that had already been tested by TRIAL and the Municipality of Trieste to map urban itineraries according to their degrees of usability by the most fragile city users[6]. Firstly, *accessibility*, *safety*, *environmental quality*, *usability* and *reachability* were identified as the main requirements. Then, in order to choose among the project proposals, a general grid was defined, linking the types of stakeholders to more detailed design criteria (Table 1). By adopting a multi-criteria assessment model, each participant was asked which requirement weighed more, with the aim to recognise the design alternative that could offer the highest level of accessibility, in relation to the preferences of the majority of stakeholders. This approach helped understand that the importance given to the issues related to spatial accessibility varies according to the stakeholders' needs and capabilities. For example, for the elderly, the most important requirement was safety; for the visually impaired, accessibility, usability and safety were equally fundamental; for physically disabled persons, not only the accessibility of the space but also its reachability was defined as a priority. In the end, a software elaborated all the answers by equally considering the different points of view.

[3] Barbara Chiarelli, Ghazaleh Afshary, Silvia Grion.

[4] Representatives of the Regional Board of disabled people's associations, of the Italian Blind Persons' Union, and of Pro Senectute association.

[5] The proposals were published by the Municipality on: http://piattaforma-partecipativa.online.trieste.it/santantonio/progetto-di-fattibilita-tecnica-ed-economica.

[6] The reference is to the Accessibility Laboratory (LaBAc), developed between 2011 and 2016 by the Province of Trieste (Garofolo, Chiarelli, Grion, 2018; Garofolo, Marchigiani, 2019).

Table 1: Trieste. The multi-criteria assessment grid (University of Trieste)

Stakeholders	Requirements	Criteria	
Physically disabled Visually impaired Elders Experts	Accessibility	Elements readability	Path inclination
		Path continuity	Sound aspects
		Path width	
	Safety	Discontinuity detectability	Materials invariability
		Obstacles readability	Sound aspects
		Surfaces uniformity	
	Environmental quality	Perception	Illumination
		Well-being	Microclimate
	Usability	Ergonomics	Reflexivity
		Material properties	
	Reachability	Public transport proximity	Availability of dedicated car parks

The final outcome was the choice of one proposal (number 4) that, however, showed some critical issues. A second listening phase was therefore developed, in order to allow the participants to suggest measures to overcome the identified problems and review the project during its further steps. In addition to the results of the workshop, the administration also considered feedback from citizens, through the answers to a questionnaire that was published on the project web platform[7]. The set of collected suggestions prompted the Municipality technical staff to ask the architect for a new version of the project, considering the needs expressed by citizens during the overall listening process. The administration is currently working on that version, in order to develop the final design phase.

This experience clearly demonstrated that *participation counts*. Knowing the needs of citizens allows designers to better calibrate their choices and to reach solutions that are better tailored to people's requests. The challenge is not only to consider those design and quantitative criteria on accessibility that are formally dictated by the law, but also to give voice to performance and qualitative requests that are expressed by the real users of public space.

GRADO ACCESSIBLE FOR ALL

Grado was the place of a second design workshop, held in summer 2019[8]. The choice was motivated by the complexity and dynamism of this small city, and by the interest to further question the interactions between planning and design issues dealing with accessibility. Grado is an important regional seaside tourist destination, with an intense seasonal change of habits and population (8,000 inhabitants in winter, 80,000 in summer). The local administration is implementing

[7] See: http://piattaforma-partecipativa.online.trieste.it.

[8] The workshop was coordinated by Elena Marchigiani, and tutored by Sara Basso, Barbara Chiarelli, Ilaria Garofolo and Valentina Crupi from the University of Trieste.

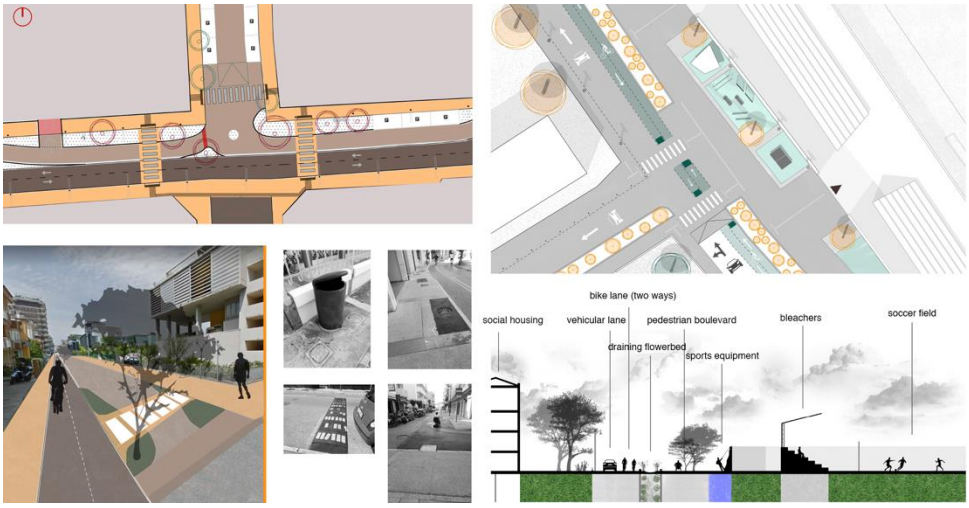
innovative projects for public spaces, with a specific attention to green networks, walkability and cycling. The two most relevant planning initiatives concern a plan for the removal of architectural barriers (PEBA)[9], and a plan for sustainable urban mobility; however, further work is needed towards their integration into general and extensive urban strategies.

The workshop approach was, again, based on direct practice of the city. For two weeks professors and students walked across urban spaces, met technicians from the Municipality and the Region, and took part into surveys with disabled people's associations. A core activity was the organisation of training seminars on accessible cities, given by experts engaged in national planning and design experiences, and aimed at providing inputs both to the administration, and to professionals and citizens. Meanwhile, design work focused on proposals for *healthy and green infrastructures*: itineraries connecting the most residential parts of the city to the parks and pedestrian areas at the back of the beach. The challenge was to imagine Grado as a small capital of active life, where everyone can move safely, all year long. As a city where collective spaces and equipment work in an integrated manner, offering to the largest number of people the opportunity to perform outdoor activities; where tourism can become a lever to develop economies, but also to upgrade the quality of everyday life.

The selection of the streets and paths to refurbish was oriented by considerations on a larger, urban scale. Projects took the *public facilities* already available in the residential area – schools, parks, sports equipment, healthcare facilities for the elderly – *as keystones of the new urban route* and of the whole system of soft mobility. On a more detailed scale, the proposals focused on *opening up the fences of public buildings and plots* and on redrawing their intermediate spaces with the streets, in order to multiply and offer their services to a larger variety of users. The solutions consisted in the design of *flexible collective spaces*, where casual encounters and interactions can take place; where inclusive playgrounds and equipment for outdoor activities are not conceived as intrusive furniture, but as an integral part of multitasking, changing in time and inter-linked urban spaces, inviting to freely act in the city. In all the projects, green materials and strategies for making urban soil more permeable and resilient to climate change were among the main ingredients, showing how *accessibility, health and environmental issues can be jointly addressed* in ordinary interventions on public spaces. Wherever possible, the students' solutions converged on the increase of pedestrian areas and of lanes specifically dedicated to bikes (separation of walking and cycling was recognised as necessary and welcome by all the users), combined with the reorganisation of parking facilities and public transport services. In line with the

[9] In Italy PEBAs were established by the law no. 41/1986; they concern all existing public buildings, and should have been adopted within one year of the enactment of the law. In 1992 another national law (no. 104) added the obligation to integrate them with provisions referring to accessibility to open spaces. However, the compulsory nature of these instruments was nullified by the lack of sanction measures, and the Municipalities that have approved a PEBA are still very few.

EU Road Safety Policy Framework 2021-2030 and the advice provided by the European Transport Safety Council (2020), when the co-presence of different mobility modes in the same space could not be avoided, the proposal was to design *30 km/h streets*: public spaces that are meant to protect the most vulnerable road users, by hosting cars in reduced vehicular areas, adding chicanes and trees to articulate the street section and force to reduce speed. A common ingredient to all the interventions was, however, the creation of a *continuous system of pedestrian crossing platforms and pavements*, where the choice of *surface materials* and the location of *street furniture* could help orientation and avoid obstacles, not only to persons with motor and sensory disabilities, but to anyone (let's think about the difficulties in carrying a baby stroller!) (Figures 1, 2).



Figures 1, 2: Grado. On the left, 30 km/h streets; on the right, spaces in-between sports equipment and the street (University of Trieste)

The workshop strengthened the awareness that *inclusive design is not synonymous with special or sectorial*. The challenge is to design without barriers from the very beginning, taking the perspective of the most fragile persons to conceive spaces that are walkable by everyone, and trying to negotiate in advance the conflicts among different persons and ways/capabilities to move (pedestrians vs. cyclists, motor vs. visual or cognitive abilities). Indeed, one of the workshop outcomes was the awareness that the main obstacles to proactive cities are not to be found in the lack of detailed technical solutions (that, in fact, urban planning, regulations and design have already developed to a large extent), but in the difficulty in combining them as average and interconnected components of a different (and multiscale) way to transform our cities into people-centred and environmentally sustainable habitats.

INPUTS FROM DESIGN EXPERIENCE

The research activities and spatial solutions developed in Trieste and Grado provided general methodological inputs on *accessibility for all* planning and design. More than the mere application of building and planning standards and regulations, a first group of inputs refers to the pivotal role recognised both to the direct analysis of the spatial contexts (and of their constraints against soft and autonomous mobility), and to the listening of the actual needs of those who everyday practice them. The perceived usability of a place goes well beyond the absence of single sensory and architectural barriers. It refers, instead, to an articulated set of physical and behavioural variables, whose impacts differ according to the types of disability, and that deeply influence the propensity to freely move across urban space. When we design public spaces, we should design for everyone, to guarantee the access to public services and equipment while considering individuals' different functioning. Talking about *Universal Design* means providing high quality urban spaces, whereas the combination of the issues of soft mobility and accessibility for all prompts to reconceive the *material configuration of a city as a welfare service itself*. A service that both plays a strategic prevention and therapeutic role in promoting healthier conditions (for the urban environment and for its inhabitants), and helps fight against the exclusion of growing numbers of at-risk urban populations (persons with disabilities, living in institutionalised settings, with limited language proficiency, who are transportation disadvantaged for social and economic reasons, as well as the children, the elderly, etc.) (DIAUD/CBM, 2016).

In this view, participatory surveys and mapping help understand and negotiate the often-conflicting effects of disenabling spaces, and search for more inclusive solutions. In Italy as well as all over Europe, since many years, the adoption of participatory approaches in design (and, specifically, in placemaking processes and projects for *inclusive public spaces*[10]) has been recognised as fundamental and highly recommended. However, when these approaches are not given as compulsory by national and regional laws, they are often ignored. This in spite of the evident value that the understanding of the end users' needs can add to designers' creativity and to the effectiveness of their projects. In Italian legislation, what comes closest to the concept of participation in design – that is the *Public Debate* – is formally required only for the adoption of large-scale infrastructural and architectural works of social relevance. In addition, public debate can also be activated for other types and scales of interventions, but only if requested by a sufficient number of citizens (*Codice dei contratti pubblici*, Legislative Decree no. 50, 18 April 2016). This situation highlights the importance of raising awareness on the right to participate in decision-making processes. The activities carried out by the University in the frame of the so-called *public engagement third mission*

[10] An important role has been played by EU projects and initiatives. Among the others, URBACT; see https://urbact.eu/how-participatory-placemaking-can-help-urbact-local-groups-develop-urban-actions-public-spaces-our

(establishment and strengthening of collaboration with local contexts and stakeholders) precisely go in this direction. The dissemination and sharing of good practices as well as the organisation of curricular and/or continuous training programs – such as those accompanying the experiences that we have developed so far – feed innovation processes, providing skills to all the involved actors: the students (as future experts); the territorial administrations in charge of urban policies; and the civil society, whose voice can be strengthened through a better knowledge on possible solutions for urban accessibility.

Trying to match and co-ordinately address a variety of conflicting issues (prioritisation of traffic flows and parking, safety and comfort of pedestrian and cycling mobility, needs of persons with different disabilities) concretely shows to be a *wicked problem* (Rittel, Webber, 1973). A problem that has many reverberations on spatial justice (Sorkin, 1999) which, however, are still largely underestimated by urban policies. A further group of inputs concerns the importance of harmonising the variety of planning tools, building procedures and regulations that more or less directly deal with soft mobility and accessibility, but are often managed by local administrations in a sectorial way. Relying the improvement of accessibility on the implementation of single thematic tools (i.e. PEBAs) shows evident limits. In fact, the mapping of the physical obstacles to people's movement – although extensive, accurate and sided with the costs necessary to their removal – tends to reduce the complex theme of accessibility to a punctual and remedial approach. On the contrary, its assumption as a *structural component of ordinary and general town plans* can more effectively build a reference vision, able to coordinate the timing and contents of the many programmes and public/private interventions that materially affect the usability of collective spaces (i.e. traffic, mobility and parking plans, public works, permissions for commercial occupation, etc.). When talking about healthy and active cities, no less important is the need to overcome the persistent misalignments between planning instruments on the one hand, housing, social and healthcare programs meant to rule the *territorialised organisation of welfare services* on the other. This further highlights the importance to foster a radical change in the routines that still guide local administrations, in order to break the persistence of a *silos thinking approach*, and to strengthen the coordination among urban policies, disciplines and actors involved in urban transformations.

OPEN CONCLUSIONS

PROACTIVE CITY is still underway, and new operational fields have recently opened up thanks to an agreement signed by the Universities of Trieste and Udine with the Region Friuli Venezia Giulia. The request is to provide support to enacting the regional law no. 1/2018, *General Principles and Implementation Provisions on Accessibility*. By taking the perspective of Universal Design, the aim is to develop a laboratory for the innovation of public policies, where the Region and the local administrations work together to rethink the contents of planning tools (starting

from PEBAs, but fostering their integration into general urban plans, public works and private interventions). Planning guidelines, a georeferenced web portal providing a regional database on accessibility to main public facilities, its further implementation through the surveys made by the Municipalities on the basis of methodological addresses and ICT tools, the organisation of participatory and training activities: these are the main results of a process where administrative staff, researches, professionals and civil society will be actively engaged. In more general terms, starting from the results of previous research by design activities developed by PROACTIVE CITY, the assumption of the lens of accessibility is meant to help reformulate planning/building standards and spatial solutions, in order to overcome a purely quantitative and functional conception, and to introduce new performance and qualitative criteria to implement conditions of sustainable and inclusive mobility connecting public spaces and equipment[11].

Today, putting accessibility for all at the core of technical and political debate becomes even more strategic and urgent in the view of post COVID-19 quarantine measures, stressing the importance of re-furbishing urban spaces to make them walkable and usable to the largest extent of urban populations. During the first phase, lockdown and social/physical distancing have mainly affected the most fragile persons (the disabled, the elderly, children), preventing or making even more difficult the autonomous access to fundamental services and open spaces. Now, the starting of a new phase prompts more careful reflection on how to reorganise both welfare facilities (mainly healthcare and education), and the accessibility to those public spaces that can offer the opportunity to safely reactivate social and healthy practices (mainly parks and streets). If in many cities all over the world the realisation of pop-up bike lanes and pedestrian areas are being assumed as a solution to a limited use of public transport, adapting spaces and material connections according to accessible for all criteria cannot be postponed. The risk is – again – not to consider the importance that urban spatial setting plays in the definition of health and equity conditions, and to miss the opportunity to take pandemic as the driver of significant urban welfare and policies reforms. Our choice can, therefore, place itself between two extreme scenarios: on the one hand, the worsening of spatial/social/functional disparities by providing only sectorial, targeted and temporary solutions; on the other, the opening up of a new phase for sanitary and governance assets in the cities (as it has somehow already happened after nineteenth epidemics) (Pineda, Corburn, 2020). Even stronger is, however, the responsibility of university and research in providing technical and cultural inputs, and in the promotion of actions aimed at raising awareness of the issues of inclusion and the enhancement of diversity.

[11] See the regional Planning guidelines on: http://www.regione.fvg.it/rafvg/export/sites/default/RAFVG/infrastrutture-lavori-pubblici/FOGLIA1/allegati/14072020_linee_guida_PEBA.pdf.

REFERENCES

Bencini, M.L., Garofolo, I., Arenghi, A. (2018). *Implementing Universal Design and the ICF in Higher Education: Towards a Model That Achieves Quality Higher Education for All*. In: G. Craddock et al. (eds.), *Transforming Our World Through Design, Diversity and Education*. 464-472. IOS Press.

Commission on Social Determinants of Health (2008). *Closing the Gap in a Generation: Health Equity Through Action on the Social Determinants of Health*. Retrieved from https://www.who.int/social_determinants/thecommission/finalreport/en

DIAUD/ CBM (2016). *The Inclusion Imperative: Towards Disability-Inclusive and Accessible Urban Development – Key Recommendations for an Inclusive Urban Agenda*. Retrieved from https://www.susana.org/en/knowledge-hub/resources-and-publications/library/details/3080

European Commission (2019). *The European Green Deal*. Retrieved from https://ec.europa.eu/info/strategy/priorities-2019-2024/european-green-deal_en

European Transport Safety Council (2020, January). *How Safe is Walking and Cycling in Europe?* Retrieved from https://etsc.eu/how-safe-is-walking-and-cycling-in-europe-pin-flash-38

Garofolo, I., Chiarelli, B., Grion, S. (2018). *Percorsi inclusivi e partecipati per la fruibilità degli spazi urbani: il caso studio LabAc*. In: F. Angelucci (ed.), *Smartness e Healthiness per la transizione verso la resilienza. Orizzonti di ricerca interdisciplinare sulla città e il territorio*. 307-324. Franco Angeli.

Garofolo, I., Marchigiani, E. (2019). *Accessibility and the City. A Trieste, dispositivi e pratiche progettuali per attenuare le vulnerabilità sociali*. In: Aa.Vv., *Atti della XXI Conferenza Nazionale SIU. Confini, movimenti, luoghi. Politiche e progetti per città e territori in transizione*. 91-98. Planum Publisher.

Kaufmann, V. (2011). *Rethinking the City*. EPFL Press.

Pineda, V.S., Corburn, J. (2020). Disability, Urban Health Equity, and the Coronavirus Pandemic: Promoting Cities for All. *Journal of Urban Health*, 23 April. 1-6. https://doi.org/10.1007/s11524-020-00437-7

Rittel, H.W., Webber, M.M. (1973). Dilemmas in a General Theory of Planning. *Policy Science*, *4*(2). 155-169.

Sen, A. (1987). *Commodities and Capabilities*. Oxford University Press.

Sorkin, M. (1999). *Introduction: Traffic in Democracy*. In: J. Copjec, M. Sorkin (eds.), *Giving Ground: the Politics of Propinquity*. 1-18. Verso.

United Nations. (2016a). *The Sustainable Development Agenda 2030*. Retrieved from https://sustainabledevelopment.un.org/post2015/transformingourworld

United Nations. (2016b). *Good Practices of Accessible Urban Development*. Retrieved from https://www.un.org/disabilities/documents/desa/good_practices_in_accessible_urban_development_october2016.pdf

E-SCOOTERS IN URBAN AREAS – A VIABLE INNOVATION OR SOURCE OF NEW CONFLICT POTENTIAL?

Raphael David Saalmann[1]
MSc, BSc, University of Graz, A-8010 Graz, Heinrichstraße 36, raphael.saalmann@edu.uni-graz.at

Wolfgang Fischer
Dr. Mag., University of Graz, A-8010 Graz, Heinrichstraße 36, wolfgang.fischer@uni-graz.at

Sabrina Reinbacher
MSc, BSc, BSc, University of Graz, A-8010 Graz, Heinrichstraße 36,
sabrina.reinbacher@uni-graz.at

ABSTRACT

Electric scooters (e-scooters) have appeared in many cities since 2017. As a kind of micro-mobility, they are used by nearly all segments of society, even though they do not have clear use-cases or benefits. This paper shows the potential of the current market, Austrian laws for electric scooter usage and the specific characteristics of Vienna as the major competitive market for shared devices in Austria. Present conflicts and processes are illustrated and analyzed with structured and semi-structured interviews. The findings show that complex processes of market maturation are still ongoing, which result in a great deal of structural modifications and restrictions. These could turn dockless sharing into a highly regulated system. An integration into existing urban mobility options has not occurred yet, and proper concepts for its implementation are missing.

Keywords: e-scooter, e-mobility, micro-mobility, free-floating, sharing economy

INTRODUCTION

In the last few decades, human mobility behavior has changed fundamentally. Urbanization and a rising number of people with demand for mobility caused not only the private transport sector to increase in size dramatically, but also to reach capacity of public (local) transport. For that reason, cities tend to develop forms of sustainable transportation that defuse this situation. Confined urban spaces are cut out to be used by forms of micro-mobility. Micro-mobility is based on easy to handle means of transportation for people of all ages that appear to be cheap. Furthermore, they adopt the concept of a sharing economy (sustainable use of products by sharing instead of owning them).

[1] Corresponding author

A relatively new form is the use of e-scooters both privately and rented. This market segment is growing substantially, but lacking experience. Therefore, it is to question whether e-scooters will develop into being a useful form of urban mobility in the future or a potential source of new conflicts.

This paper investigates the potential and value added by e-scooters in urban mobility development, and outlines strengths and weaknesses of their use and supply with a focus on Vienna. Vienna, being the capital, is the biggest city of Austria with a population number of about 1.9 million and is continuously rising (2019). The city is characterized by a high life quality and a great number of tourist attractions which made it one of the most visited cities of Europe. At the same time conflicts were identified and analyzed. As especially rental forms dominate the urban image and seem to be an interesting extension of the sharing economy, e-scooter rental companies are being focused on. During the investigations, a mixed-method approach was used. Expert interviews based on guiding questions, semi-structured interviews of e-scooter rental companies, users and other traffic participants, as well as field tests, were performed.

CURRENT SITUATION AND DEVELOPMENT IN AUSTRIA

E-scooters reach a medium range of 25 km and can therefore be declared as short distance vehicles. The devices reach a maximum speed of 25 km/h and a maximum engine power of 600 Watts. Charging lengths vary between four and seven hours, depending on brand and model. They are not to be confused with e-mopeds (German: E-Scooters). Differences are listed in the following Table 1.

Table 1: Comparison of E-Roller and E-Scooters in Austria (own illustration, adopted from BMDW 2019, Klima- und Energiefonds 2019 & ÖAMTC 2019)

(English term)	E-Roller (e-scooter)	E-Scooter (e-moped)
traffic legislation	bicycle	moped (motor vehicle)
authorized to be operated on public streets	only when there is no bike lane	yes
driving license	no	yes
maximum speed	25 km/h	45 km/h
maximum engine power	600 W	600 W - 4 kW
requirement to wear a helmet	no	yes
compulsory registration and insurance	no	yes
age limit	12 years (younger children need to be accompanied by a person older than 16, or have a bicycle license)	15 years
alcohol limit (permille)	0,8	0,5
federal grant	no	up to 350 Euros

In Austria, there is no compulsory registration and insurance, which contributed to an easy market entrance for e-scooters. Legally, since 2019 e-scooters are treated like bicycles in Austria (30./31. StVO Novelle). First e-scooter rental companies already established in 2018 in Vienna, being the only Austrian city at the time that started to treat e-scooters like bicycles. In Austria, there were eleven rental companies (December 2019), not all of them operating in Vienna. Current implementations are characterized by using a free-floating system, i.e. e-scooters can be parked/picked up anywhere within predefined areas (see Figure 1).

In contrast to private use, which is allowed from an age of 12 years on, the use of rental e-scooters meets further requirements. First, users must be at least 18 years old. Second, users need to have a smartphone with internet access and GPS enabled, and they need to download an individual app provided by the rental company. Lastly, payment is usually only possible by debit card or online payment using services like PayPal.

As e-scooters are treated like bicycles, it is obligatory to use bike lanes. The use of sidewalks and pedestrian areas (between 6 a.m. and 10 p.m.) is not allowed. Also, driving "in public green spaces and other areas that are important for the urban image" is prohibited (Magistrat der Stadt Wien, MA 65, 2019). Due to being handled like bicycles, there is no statistical differentiation possible, and in further consequence, there is no precise information about e-scooter usage. In 2019 there was a limit of 1500 e-scooters per rental company in Vienna. That led to a maximum number of 10500 devices. They are not equally distributed in all urban districts (the focus lies on inner city areas), which leads, among other issues, to a low acceptance by users (Pichler 2019). Other problems are recklessness, illegal parking and conflicts with bicyclists and pedestrians. Further regulations were planned for the beginning of 2020 (ORF 2019a).

RESULTS

Supply Side

Data from suppliers was collected using an online survey. It included open questions especially concerning challenges, the latest findings about the current business in Vienna and the evaluation of the future potential of e-scooters. Only two out of seven suppliers in Vienna (LIME and TIER) responded, resulting in a limited point of view and comparison.

Both emphasize that urban space is limited, and the number of people and vehicles is increasing while emissions must be reduced. Protection of the environment and life quality are important factors too. Therefore, sustainable and attractive new forms of mobility become necessary. In general, they see a higher urban potential and call for a higher number of e-scooters allowed.

Profitability must go along with sustainability, also including a high life expectancy of their devices. However, the current competitive market and profitability in general are challenging. Different weather conditions are causing problems as well.

Concerning costs, there is a basic charge of 1 or 2 Euros (depending on the number of trips) and additional 20 Cents per minute. This is, relative to ticket prices of public transport, quite high. Suppliers hence emphasize that e-scooters are not alternatives to public transport, but an additional form of individual mobility. In comparison, buying a low-price e-scooter for private use costs about 500 Euros. By an average use of 10 km on five days a week a purchase pays of within three months (based on a relatively high assumed constant driving speed of 20 km/h).

There is also potential in collecting and using the generated GPS data. Consequently, the supply could be adapted to public interests, user behavior and therefore organized more efficiently.

Figure 1: E-Scooters offered by rental companies in Vienna (photo: Raphael Saalmann 2019)

Demand Side

On the demand side, five random users (using rented and private devices) in the first district of Vienna were individually and situationally questioned. They were asked about their motivation to use e-scooters, their general opinion about e-scooters and experiences in usage as well as upcoming challenges and possible suggestions for improvements. They mentioned advantages concerning commute time, ease of handling, and the ability to take them along in other means of (public) transport. However, they also complained about the lack of comfort and inconvenient locking. Besides, e-scooters do not have blinkers. Unlike riding a bike, giving a hand signal while driving one-handed is dangerous and impractical.

Driving at night feels uncomfortable too. Users ask for expanded riding paths in order to be safely separated from cars. Nevertheless, also misbehavior by users, like two people driving on one scooter, can be observed.

In a separate self-test, we experienced that a certain speed is necessary to activate the e-motor. As other users already noted, driving on streets, or making a turn, considering traffic and traffic rules turned out to be difficult. Another disadvantage concerning the individual comfort is a missing basket or luggage rack.

Third Parties

Similar questions were used during interviews with several third parties, as for instance Mobilitätsagentur Wien (Vienna Mobility Agency), working at the interface between population, city administration, suppliers and policy and serving as place to go for advice or criticism concerning mobility. Frequent complaints about incorrect parking of e-scooters reach them. Also, there seems to be usage insecurity. They further told about upcoming infrastructural challenges and limits, as well as needing to gain more experience. Overall, they support active forms of mobility and see e-scooters as a means of connection to public transport and rents, and as part of a sharing-strategy. Dealings between all participants are described as well-organized and in a good condition. However, they doubt whether e-scooters effectively reduce car traffic.

Other traffic participants (N=9) like pedestrians, cyclists and car drivers have differing opinions. Some react sympathetic, others complain about recklessness and the violation of traffic rules by e-scooter users, vandalism and incorrect parking, especially on footpaths. The national lobby of cyclists aims at boosting non-motorized traffic and enhancing the traffic situation for cyclists. They accentuate that the infrastructure for bikes must be extended urgently in Austrian cities and that pedestrians should not have to share their space with vehicles like e-scooters (Radlobby Österreich 2019). Another important interest group are blind people who participate in traffic as pedestrians. In an e-mail interview with Blinden- und Sehbehindertenverband Wien, Niederösterreich und Burgenland (BSV-WNB) was stated that e-scooters, just as bicycles, are hard to notice by (partially) blind people. The problem is that e-scooters, as already noticed by the national lobby of cyclists, are frequently driven and parked on footpaths causing higher potential risks, disregarding the needs of the blind.

Another interview partner was the Austrian Institute of Technology (AIT) who works on a project called e-WALK, where potential impacts of daily use of e-vehicles on pedestrians are investigated. They focus on how they can effectively perform as a shuttle to other means of mobility and public transport. E-scooters might be used by all age groups and different social classes. Surveys show that that e-scooters are used predominantly for short distances, instead of using public means of transportation. This, however, results in a rising pressure on the bicycle infrastructure. AIT also calls on more public awareness and underlines the lack of knowledge about proper behavior rules.

Lastly, suppliers of public transport are included in the discussion around e-scooter regulations, especially when it comes to transportation of e-scooters in public vehicles. At the moment, Wiener Linien (Vienna's public transport operator) count e-scooters as hand luggage. Its transportation is free, but they must be folded. The ÖBB (Austrian Federal Railways) specify a maximum size of 90 cm x 60 cm x 40 cm (ÖBB 2019). The lacking possibility to safely arrange them might be another (critical) issue.

FURTHER ISSUES

Environment

There are a few different factors regarding e-scooters that cause concerns about effects on the environment. One of them is the short life span and high attrition, also due to vandalism, which demands the use of more resilient materials. Also, they cause relatively high CO_2-emissions per kilometer (regarding the whole value chain: materials, production, transport, and disposal over two years of use) (Hollingsworth et al. 2019).

Another problem deals with collecting rented e-scooters when they are parked incorrectly or when it is necessary to charge them. This often happens with the use of fossil-fueled powered vehicles, which does not fit the spirit of sustainability. Instead, exchangeable batteries could be installed so that charging is not necessary anymore. The new batteries could then be exchanged on site. However, frequent charging must be reduced, and it is debatable how batteries should be disposed and recycled (ORF 2019b).

Accidents

In Austrian statistics, there is no differentiation between accidents of (e-)bicycles or e-scooters. There is a rising number of accidents, injured people and traffic deaths in that category. Unfortunately, it is not possible to find out whether a rising number of e-scooters contributes to that number. Hence, clear statements of strengths and weaknesses of e-scooters cannot be discussed. Conflicts and accidents might be ascribed to driving on pathways and the fact that only about 2 % (users of rental vehicles) to 10 % (private users) are wearing a helmet (KFV 2019).

INTERPRETATION OF THE RESULTS

Despite the limited respondence both on supply and demand side, in combination with the opinions of several third parties some general insights of e-scooter usage can be generated and interpreted.

In Austria, the legal basis for e-scooter usage seems to be quite liberal. The e-scooter market, especially in Vienna, shows a tendency to grow, and a consolidation is to be expected (however, some have already given up or withdrawn from the market due to pandemic reasons in early 2020). In general, it is assumed that there is a high acceptancy of e-scooters given a high market competition and a high density of rental devices in the inner-city parts of Vienna. Further, it is said that renting an e-scooter may serve as an opportunity to test them in order to decide on a private purchase. From a user´s point of view, the high number of suppliers may at first seem beneficial, but requires an individual app, account, payment service etc. for each as there is no cooperation between suppliers yet. Advantageous is for sure a missing compulsory insurance, which leads to less costs and sanctions, at least for users.

E-scooter rental systems have the character of a sharing economy based on free-floating, where it is allowed to park the e-scooters within a defined area, without determining explicit parking zones. However, first regulations concerning restricted parking zones and speed limits have been discussed and implemented. Fixed parking spaces would counteract the system of free-floating. Moreover, there is a lack of theft-proof equipment for parking. Another point to mention is that dangers and risks of the use of e-scooters are underestimated. For that reason, far more public awareness must be generated.

CONCLUSIONS

E-scooters are a controversial topic. Are they a viable innovation or a source of new conflict potential? The market for e-scooter rents developed since 2017, so it is a very young and dynamical field, yet improvable. For now, legislation is structured quite simply. Problematic is the lack of missing data concerning accidents or traffic offence caused by e-scooters, as they are not classified separately.

Criticism by users is mainly about technical features. There is also a call for better infrastructure, since there is an expected overuse of bike lanes. This might lead to their expansion or even the need for newly built constructions, as sharing existing paths is not an optimal solution. Challenges are also about greater awareness and sticking to traffic rules, also caused by a lack of sensitization about e-scooters and their use in daily traffic. It is questionable whether e-scooters lead to a reduction of motorized vehicles. They are rather an addition to the existing mobility supply. Parking restrictions must be avoided to ensure the system of free-floating.

In conclusion, more adaptations must be made to enhance the use of e-scooters and the situation for other traffic participants. Nevertheless, as part of being a trend, e-scooters contribute to the ongoing debate about multimodal mobility and distribution of certain traffic and living spaces not only in Vienna but also in other cities of comparable size and setting.

REFERENCES

BMDW (Bundesministerium für Digitalisierung und Wirtschaftsstandort). (2019, October 10). *Elektro-Scooter, Quads & Co. Ministerien-übergreifende Informationswebsite.* Retrieved from https://www.oesterreich.gv.at/themen/freizeit_und_strassen-verkehr/Elektro-Scooter,-Quads-und-Co.html

Hollingsworth, J., Copeland, B. & Johnson, J. X. (2019, November 11*). Are e-scooters polluters? The environmental impacts of shared dockless electric scooters.* Retrieved from https://iopscience.iop.org/article/10.1088/1748-9326/ab2da8/pdf

Klima- und Energiefonds (2019). *Leitfaden Elektro-Zweiräder, Elektro-Fahrräder sowie Transporträder. Jahresprogramm 2019.*

KFV (Kuratorium für Verkehrssicherheit). (2019, December 16). *E-Scooter: Neue KFV-Analyse zeigt hohe Unfallzahlen und großen Aufklärungsbedarf.* Retrieved from https://www.kfv.at/escooter2019/

Magistrat der Stadt Wien, MA 65 (2019). *Verordnung des Magistrats der Stadt Wien, mit der die Verordnung des Magistrats der Stadt Wien betreffend stationslose Mietfahrräder, Amtsblatt der Stadt Wien Nr. 26/2018, geändert wird. Amtsblatt der Stadt Wien Nr. 26/2019.*

ORF (Österreichischer Rundfunk). (2019a, November 25). *„Konstruktives" Treffen zu E-Scootern.* Retrieved from https://wien.orf.at/stories/3018715/

ORF (Österreichischer Rundfunk). (2019b, December 08). *E-Scooter-Entsorgung oft problematisch. Beitrag.* Retrieved from https://wien.orf.at/stories/3023412/

ÖAMTC (Österreichischer Automobil-, Motorrad und Touringclub). (2019, November 14). *Kleinfahrzeuge & Trendsportgeräte im Straßenverkehr.* Retrieved from https://www.oeamtc.at/thema/kindersicherheit/kleinfahrzeuge-im-strassenverkehr/

ÖBB (ÖBB-Personenverkehr AG). (2019, December 16). *Handbuch für Reisen mit den ÖBB in Österreich. Tarifbestimmungen mit den Allgemeinen Geschäftsbedingungen. A.4., Mitführen von Gepäck, Gegenständen und Tieren.* Retrieved from https://www.oebb.at/static/tarife/de/handbuch_fuer_reisen_mit_der_oebb_in_oesterreich/index.html

Radlobby Österreich. (2019, November 14). *E-Scooter: rechtlich wie Fahrräder benutzbar.* Retrieved from https://www.radlobby.at/e-scooter

Saalmann, R. D. (2020). *E-Roller im urbanen Raum – eine praktikable Innovation oder Quelle eines neuen Konfliktpotenzials?* Masterarbeit, Institut für Geographie und Raumforschung, Karl-Franzens-Universität Graz.

CITY TRANSPORT AND SOCIAL INCLUSION, A CASE STUDY OF STUDENT DORMITORIES' COMMUNITY IN LJUBLJANA

Zala Bokal
Msc student of Urban planning, Faculty of Architecture, University of Ljubljana, Zoisova ulica 12, 1000 Ljubljana, zala.bokal@gmail.com

ABSTRACT

Transport related social exclusion the process by which people are prevented from participating in the economic, political and social life due to insufficient mobility. Substantial research is therefore important to understand the causes, factors and outcomes regarding travel practices and social inclusion in local communities.

The following study is aiming to note, observe and disclose the use of transport systems and services by the students, inhabiting specified six student dormitories in Ljubljana and to investigate its relation and impacts on investigated students' notion of being socially included in the city.

The three main questions that this research is seeking to answer are: 1) What city public transport options are available to the students inhabiting selected student dormitories in Ljubljana? 2) What are the characteristics of the transport services use of surveyed groups of students? 3) What relations could be detected observing the notion of personal social inclusion and their use of city transport among investigated groups and what could be their explanations and interpretation?

Relations and impact on student's notion of social inclusion is evaluated through survey results comparison between different dorm sites resident's groups.

Transport and other city policies, improving social inclusion and thus support the social sustainability goal.

Keywords: Ljubljana, Social inclusion, Student community transport use, Student dormitories, Transport-related social inclusion

INTRODUCTION

Transport-related social inclusion

Social Inclusion refers to people's ability to participate adequately in society, including education, employment, public services, social and recreational activities. Social exclusion refers to constraints to adequate participation. Many

factors can affect social inclusion. Ignorance, poverty, language barriers, racism and classism can limit people's ability to participate in some activities. (Litman, T., 2003).

Although social exclusion involves many issues in which transport dimension is peripheral (Kamruzzaman, et al., 2016), transport is crucial in enabling people to reach essential opportunities and desired goods, services, activities, destinations as well as social networks (Kenyon et al., 2002) and relationships (Stanley and Stanley, 2017). Thus, the accessibility of transport is an important factor of social inclusion. On the contrary, problems with transport provision, location of services and therefore insufficient mobility in a society and environment built around the assumption of high mobility (Kenyon et al., 2002), can reinforce social exclusion (Social Exclusion Unit, 2003).

Assuming that a just society ensures participation in society to its entire members and is therefore an inclusive society, mobility-related exclusion is the process by which people are prevented from participating in the activities of economic, political and social life of the community because of reduced accessibility to opportunities (Kenyon et al., 2002). Of that importance, it is even highlighted by various transport researchers to establish the "mobility rights" and "accessibility rights" of citizen to combat social exclusion (Kamruzzaman et al, 2016).

Researching the transport-related social inclusion

When Kamruzzaman, et al. (2016) reviewed the effectiveness of investigating social inclusion using various quantitative measures of transport disadvantage, four groups of criteria were identified as related to the issues of 1) spatial (e.g., urban accessibility, and public transport accessibility), 2) temporal (e.g., public transport availability, and facility opening hours), 3) social attributes of travel and 4) activity participation (e.g., personal mobility, and disability).

Broad research in European urban contexts is focused on transport issues and urban accessibility as a key factor of transport-related social inclusion (e.g. Pérez-DelHoyo, R., et al., 2017), its effectiveness and enhancement using Information and Communication Technology – ICT, e.g. L. Martins et al. (2020), approaching the design of a public transport route-planner in order to promote social inclusion and Ricci et al. (2016) transport policies research, that is as well exposing that the proliferation of ICTs requires the consideration of social inclusion as not limited to physical participation only. Another pool of research is investigating how urban design and traffic arrangements are affecting social relations in urban spheres thus affecting social inclusion; e.g. Sauter & Huettenmoser (2008), connecting liveability of streets and social inclusion.

Likewise, in a locational context of Slovenia's capital city Ljubljana, Gabrovec & Razpotnik Visković (2018) researched the accessibility of public passenger transport as a condition for social inclusion of secondary-school students or in

another study conducted by Tomšič & Rugelj (2016), the use of urban passenger transport is disclosed as an important factor in the social inclusion of older people was investigated.

Both mentioned works are researching the travel related social deprivation of a specific focus group operating in a specified area. This is a prerequisite to a meaningful research contribution that can support the development of quantification and analysis of the social impacts. Those are to be considered in transport policies planning as efforts to address transport-related social exclusion, that are mostly implemented at the local level (Litman, T., 2003). The transport related social-inclusion issue is indeed multidimensional, dynamic and highly relational (Ricci M., et al. 2016). As Litman, T. (2003) argue that not everybody in each category faces severe social exclusion under all circumstances, posing an assumption that transport needs tend to be relative, depending on communities' level of accessibility and social expectations. Furthermore, the impacts and benefits of transportation systems are often unevenly distributed across regions and population groups Pteg. (2010).

Hence, to identify the transport disadvantaged as well as their variation in needs, in order to minimise transport-related social exclusion, an important requirement is to use the analysis of disaggregated data (Kamruzzaman et al., 2016) of specified sites and focus population groups.

Students and a risk of travel-deprivation social exclusion

Students are considered as a population group recognized to possibly be at risk of facing travel deprivation. As Urban Institute Student Transportation Working Group (2017) argues, student transportation may also affect a student's health and well-being and has an impact on attendance and overall academic performance. Additionally, student transportation can have a substantial effect on the quality of a student's education and the composition of their peer group. Finally, transportation options as well allow for participation in enriching before- and after-school activities such as study clubs, sports and outdoor activities, that can make a significant difference to pupils' attainment, attitude to school and attendance. Participation in social, cultural and leisure activities is very important to people's quality of life and can play a major part in building cohesive communities. (The Social Exclusion Unit, 2003).

Since the opportunities to access the above mentioned is shown to be of special large importance for students living in rural areas (Gabrovec & Razpotnik Visković, 2018), where travel deprivation could be a critical factor of being at risk of social exclusion, it certainly is applying to students living in urban areas as well. One of the reasons could be that students are presumably the category with low rate of private car access, that is according to Stanley & Stanley (2017) in communities, that have become increasingly car-dependent, factor of risk for transport related social exclusion.

Transport-related social inclusion and student community in Ljubljana

As stated in Sustainable Urban Strategy of the city of Ljubljana, social inclusion is on the list of priority work axes and it is important to understand how the city transport practices can affect it and thus support the goals of the EU 2020 Strategy.

In the city government guidelines, promotion of social inclusion is found as a multilateral goal represented by measures of different sectors - e.g. responding to the needs of vulnerable social groups, strengthening youth work programs, setting up an organizational environment for housing and other cooperatives for different purposes (new housing construction, renovation of residential neighbourhoods etc.), implementation of green public infrastructure, development of sustainable and smart city-oriented electronic services, elimination of built barriers in the living environment, response to the issue of temporary accommodation and refugee issues etc. (LJ ZATE, 2018). Obvious and crucial factor for operability of such programs is their accessibility, including potential participants ability of physical engagement.

Sustainable urban strategy of Ljubljana synthesizes individual development emphases, so that the implementation of a measure of individual strategy can mean the implementation of a measure in another, e.g. the implementation of transport policy could have a positive effect on measures related to the field of environmental protection as well as on the social security strategy (e.g. enabling social inclusion through universal accessibility and a diversified public passenger transport system, including at regional level). In this regard of transport related social inclusion, the implementation of the City's Transport Policy is recognized as crucial at the local community level.

Ljubljana represents a national urban hub of concentrated University and other higher education institutions' life. Assumed the size of its' academic community (only University of Ljubljana is represented by 3 art academies, 23 faculties, libraries, and an Innovation-Development Institute), the latest generates a high percentage of trips within the city. Students living in dormitories are presumably as well users of city transport services. Public Institute Residence Hall Ljubljana is managing city dormitories with the capacity to accommodate 7500 beneficiaries all together. They encompass 35 compound units on 10 different locations within the city. In respect to the fact that each dormitory site is uniquely incorporated in city transport schemes, there is a question that can be posed; how do the transport access situations affect the transport use behaviour of selected student population and furthermore, in what manner could that affect their social inclusion?

Considering above stated, the aim of the following study is to investigate student's perception of their own social inclusion as it is relating to their use of transport.

Thus, the goal is to note, observe and disclose the use of transport systems and services as the city government implementations, by the students, inhabiting specified student dormitories in Ljubljana and to investigate its relation and impacts on investigated students' notion of being socially included in the city.

Therefore, the three main questions that this research is seeking the answers to are: 1) What city public transport options are available to the students inhabiting selected student dormitories in Ljubljana? 2) What are the characteristics of the transport services use of surveyed groups of students? 3) If and which connections could be detected when observing the notion of personal social inclusion among investigated groups of students in relation to their use of city transport and what could be their possible explanations and interpretation?

The research is aiming to bring new cognitions supported by empirical results, contributing to the understanding of transport impact on perception of social inclusion in the City of Ljubljana. Considering transport as a factor supporting the city social sustainability goal, research of this matter is useful to mind when implementing new and adapting the existing range of city transport policies and programs.

RESEARCH METHODOLOGY

Researching the transport-related impacts on social inclusion

Sauter & Huettenmoser, 2008 recognized three impact dimensions of measuring the social inclusion in public life: 1) Structural dimension that deals with accessibility and usability of the space and the corresponding perception of the residents, 2) Interactive dimension that is considering neighbourhood relations, activities in public space and the possibilities for participation in local decision making and 3) Subjective dimension of social inclusion, where the personal satisfaction and contentment with the living arrangements and the personal feeling of being socially included are measured. The relations between the dimensions may be complex and contradictory.

In the conducted research, measures of three listed dimensions are taking place; structural is represented by defining the transport opportunities and through the investigation of student's traveling activities. Interactive dimension is considered as the research survey is related to the student's participation in public space activities and the subjective dimension is an investigation of corresponding perception of inclusion among students themselves.

Study area, method and model of the analysis

The research is descriptive, comparative and explanatory. It compromises of four steps as follows: 1) Basic analysing of selected student dormitories in Ljubljana (capacity, location etc.), 2) Defining the range of city transport options, spatial investigation and mapping of the public transport infrastructure and facilities availability, 3) Providing quantitative data on selected groups of students regarding their transport use and their notion of social inclusion via conducted survey and 4) analysing obtained data, disclosing the survey results and interpreting the findings.

The qualitative and quantitative represented data needed to perform first research step is obtained through academic literature, information provisions of City Municipality of Ljubljana sources, platforms of city transport services providers and personal observations on site visits.

All investigated dormitories are situated in urban environment in maximum 2 km radius from the city centre - Prešeren Square that is recognized as a symbolic centre of social city life and is for the purposes of this research considered as a reference point to measure the distance of an individual dormitory to the city centre.

Next, maps of city public transport systems are analysed to define the range of relevant city transport options and locate the public transport infrastructure and facilities available for students. Radiuses from focal points of investigated dormitories are defined, to measure proximity-based accessibility and frequencies of the transport services (e.g. number of bus lines routes per specific bus stop).

The first measurement of public transport accessibility is defined as the proximity of one dwelling - student dormitory unit to the nearest bus stop or public bicycle station within a threshold travel time. The travel time was estimated as walking minutes based on pedestrians' distance.

As part of the next research step, student dormitory communities were asked to take part in a survey to support the following analyses. For the survey purpose, the study sample is population of residents inhabiting six dormitories: 1] Rožna dolina, 2] Rimska apartments, 3] Ilirska, 4] Akademski Kolegij, 5] Litostroj and 6] Kardeljeva ploščad. *In following text, dormitories are referred to with consecutive numbers n] of that order. This method is allowing to draw a representative sample from an interconnected group and in such manner, surveyed groups are presumably to an extent largely comparable in terms of some characteristics composition as same age range group, temporarily or permanent residence in dormitory and student status. Furthermore, considering particularities of investigated dormitories, comparative analysis is enabled.

The questionnaire is structured out of four focus parts – the first sought some personal characteristics (e.g. Gender, age) of the surveyed population, the second

its transport use characteristics (choices of transport means detected issues), third investigated personal assessment of social inclusion among students' community (using numeral indicators 0-5; the higher the rate, the higher the personal notion of inclusion) and the last part of the questionnaire asked the respondents about their perception on travel related social inclusion and related aspects affecting their engagement in social and variant activities.

The online questionnaire was distributed by the means of social media (private dorm groups on Facebook platform) in April and May 2020 in two separate periods of altogether three weeks. Participation was voluntary and anonymous. The survey covered a total of 369 respondents. Depending on each surveyed group - dormitory, the response rate ranged from 10.05 the lowest to 65.21 the highest.

The average age of the respondents is 22.3, (19 the youngest, 28 the oldest). 31% respondents identified as Male and 69% as female.

Table 1: Student dormitories characteristics, surveyed groups, their population, sample size

Student Dormitory	Capacity [n]	Respondents [n]	Response rate [%]
1] Rožna dolina	808	75	10.05
2] Rimska apartments	23	15	65.21
3] Ilirska	294	73	28.23
4] Akademski kolegij	205	53	31.00
5] Litostroj	406	89	24.38
6] Kardeljeva ploščad	735	77	11.83

Data source: The Student Hall of Residence in Ljubljana website

In the last research step, a comprehensive set of obtained data on students' use and viewpoints on the city transport systems is taken into account to evaluate relations and impact on their notion of social inclusion, through survey results analysis and comparison between resident groups of individual dormitories.

RESULTS – FINDINGS AND DISCUSSION

1) What city public transport options are available for the surveyed groups?

Table 2: Identifying the availability transport systems per selected student dormitory

Dormitory n]	1	2	3	4	5	6
A. minimum walking distance from the reference center [m]	1900	700	650 m	1500	4100	3400
Travel distance to closest city public bus station [m/min]	210/2.5	52/0,6	50/0,5	250/3	2002.4	400/5
Bus stations and lines numerus [ns(nl)] in 200 m radius	2(3)	3(20)	1(2)	2(12)	1(4)	2 (4)

Walking distance to the closest BicikeLJ station [m]	210	120	30	250	210	350
Walking distance to the referenced city centre point [m]	600	700	650	1500	4100	3000

Data source: Measurements on the data base retrieved from BicikeLJ website (Map of stations on the platform), Ljubljanski potniški promet d.o.o. website (document: Map of the Bus Routes and P + R)

2) What are the characteristics of the transport services use of surveyed groups?

Identifying transport behaviour of surveyed student population is involving an investigation of the transport means choice and use frequency.

Only 5% of students stated that they rarely walk to the city destinations, for all of others, it is a regular practice. Asked about the choice of transport means, the most used transport mode among all the respondents is a city bus, proceeded by a personal bicycle, that is closely followed by public bike BicikeLJ. Generally, the surveyed population very rarely use a personal car (31% of survey participants is owning a personal vehicle) - approximately half of students inhabiting each individual student dormitory declared that they never use a personal car, but this share is varying between dormitories; none of students living in dorms 2],3],4] is reporting of its use as often or regularly, while the biggest share of daily car users is among those inhabiting dorm 5] (18%). This difference could be to some extend explained by the fact that dorms 2], 3] and 4] sites are in the central city part and dorm 5] is in that respect the most distant dorm, with least frequent public transportation links. When it comes to the use of personal bicycle, the customs of students from separate dorms tend to vary a lot; circa half of students of dormitories 1] (52%), 2] (50%), and 4] (50%) is using their bikes often or on daily basis. Again, a pattern emerges, that the use of personal bikes is higher among students living in the central city parts. An exception is dorm 3, where the beforementioned share of daily personal bike users is 15%. On the contrary, ¾ of students living in dorm 6] stated that they never use a personal bicycle, making the dorm 6] community the one of lowest personal bicycle use rate. Data shows that 14% of all asked students use the city public bikes (BicikeLJ) often and 6% on daily basis. In this research, BicikeLJ is found to be very popular among students of dorm 3] (that could be in correspondence to the lower use of private bikes). Other dorms in central city locations (1],2],4]), have significantly low percentages of use (up to maximum 10%) - in dorms 5] And 6], circa three times more respondents are choosing BicikeLJ often/on daily basis. The use of city electric scooter, relatively new public transport mode implementation, was reported by 1% of all asked students as seldom (dorm 4]) and 1% stated that they choose it regularly (dorm 3]).

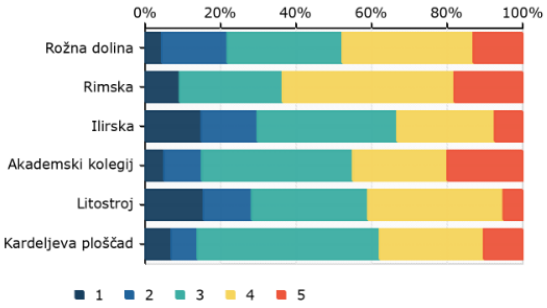
3) Use of city transport services relating to students' social inclusion?

Relating the concept of travel-related social inclusion, surveyed group of students was asked to assess and disclose notions of their own social inclusion, how is the city transport meeting their mobility needs and how is it affecting their inclusion. Besides, subsection investigated how students perceive city transport availability supporting their activities and participation in public space.

When asked to assess their own social inclusion (on the 0-5 scale), most students (35%) opt for the medium rate (3), 33% rating it higher and percentage of 13% choosing lower rates. 9% of the respondents feel totally social included and the opposite, the same percentage (9%) do not feel included at all. The average social inclusion assessment score on the proposed range is 3,89.

Results vary between individual student dorms. There is no significant correlation detected between the proximity of a student dormitory to the referenced city centre and the reported assessment rate of social inclusion notion, though the share of students that feel absolutely socially included is higher among those dormitory communities that are located closer to the centre. However, there is a significant correlation (0.66) detected between the rate of social inclusion notion and the bus station and lines numerus in 100 m distance from student dorm. The higher the number of stations and bus lines, the higher the self-assessed inclusion rate.

Table 3: Self-assessment of social inclusion of selected dorms communities on 1 – 5 scale (1- I do not feel socially included at all, 5 – I feel completely socially included)



Regarding the city transport meeting their mobility needs, 4% of all students are describing their transport options as very poor, 12% as poor, more than half (56%) finds them to be sufficient and for 28% the city transport is completely satisfactory. Anticipated, disaggregated data investigation discloses significant correlation (0.71) between the bus lines numerus and respondent's satisfaction of the availability of city transport options. In addition, when observing the respondents' assessments of transport and their notion of social inclusion, significant correlation (0.65) between those two is found; the lower assessment rate of city transport generally means lower rate of personal self-assessed inclusion – none of the

students that are reporting of themselves as not feeling socially included at all are assessing the city transport as adequate to meet their needs and on the other side, among students that feel absolutely socially included, no one is finding city transport as poor or inadequate.

Researching students' perception on the transport services in Ljubljana as impacting their social inclusion in the city, 8% of asked students does not find transport aspect important or see the correlation respectively and 27% thinks it has a minor impact. However, viewpoint of 43% of the students is that transport related matters have a strong impact and of 18% that they massively effect their inclusion.

Generally, students are recognizing the availability of transport options as a factor that is affecting their academic goals achievements (learning success, attendance at lectures, additional education). 35% of them strongly agree with stated, 45 partially and 16% do not agree with stated.

Moreover, more than half (shares varying from 56-70%/dormitory) are reporting that transport-related problems have at least once in the past disabled them from choosing or performing desired student part time work.

When asked if it is applicable to them that the optimized accessibility of city transport means and services thus better mobility would enhance their social life and possibly widen their social circle, the answers show that more than half of respondents don't think so or find it less likely to happen. Others think that it is very likely (shares varying 15%-24%/dormitory) and minority (5-7%/dormitory) is stating that better transport would certainly enhance their social life. Dorm 5] is an exception at this point since 29% of its' residents are of that opinion. The possible explanation of that exception could be sought in the facts that student dormitories 1], 2], 3], 4] and 6] are either located in central city areas of higher transport connectivity and/or compromised of clustered blocks and in-habiting students facilities. That does possibly provide more opportunities to engage in social activities in terms of shorter travel distances.

In regard to the participation in public space activities, students were asked if they think that the optimized city transport services thus better mobility would increase their engagement and participation in several cultural events in activities or if it would enable them to engage in more sports activities (trainings, fitness, etc.). Results are comparable to the social life aspect; 13% (cultural activities), respectively 15% (sports) do not think so, 33% respectively 32% find it is less likely, around the same share – 34% very likely and for circa one-fifth better transport would definitely have a positive impact of increasing their engagement in cultural and sports activities.

The homogeny of results is again dissolving between the dorms and that could be attributed to specific dormitory sites (e.g. offer of sports and cultural programmes and facilities in individual student dormitory or compound, proximity of urban

cultural and sports infrastructure, as only two of the two assumed factors. That said, adequate transport access is indeed corelated with students' participation in academic and public life, but survey results shows that other factors, referring to a specific dormitory site, have to be taken into consideration.

CONCLUSIONS AND RECOMMENDATIONS

The work is helping to identify some characteristics of the transport behaviour of surveyed focus group of student communities in-habiting six selected student dorms in Ljubljana.

Transport use habits are found to vary among residents of individual student dormitories, which is anticipated since the analysis of student dormitories and city transport infrastructure helps to understand different disparate characteristics of the investigated sites.

City transport practices, especially availability of sufficient public transport infrastructure (e.g. bus stops, routs), seems to play a role in how the students are perceiving them as social included in the city of Ljubljana. Self-assessed social inclusion of participants in the survey is not found to be in influenced by the individual student dorm location and therefore proximity to referenced city centre, but it is rather related to the transport services availability. The personal contentment with city transport accessibility in as well related to their higher social inclusion assessment, as it increases the potential for social integration.

A part of surveyed students is finding the city transport meeting their mobility needs an important factor in enabling them to participate in public space activities such as sports and cultural events and majority is recognizing it essential for reaching their academic goals.

Disclosing the results, is important to have in mind the relativity moment of social inclusion, its' complex and contradictory dimensions and the various factors affecting it. The scope of conducted research is limited (e.g. survey is not covering disabled or of any form physical impaired students).

However, leading base findings are recognizing transport as one of the key factors and therefore the study is confirming the results of previous work related to the matter, but they also arising new questions. A need of site-specific research is implied. As the research of (micro) urban environments, it would be meaningful to conduct future research, tackling the transport related social inclusion on municipality and regional levels. Orienting to comprehensive research could support transport and other (e.g. land use) implementing policies, improving social inclusion and finally, support the social sustainability goal.

REFERENCES

A. L. Martins et al. (2020). Design of a Route-Planner for Urban Public Transport, Promoting Social Inclusion. *INTSYS 2019, LNICST 310*, pp. 3–17, 2020.

Boisjoly, G., Yengoh, G. T. (2017). Opening the door to social equity: local and participatory approaches to transportation planning in Montreal. *Eur. Transp. Res. Rev*. (2017) 9: 432.

City Municipality of Ljubljana. (2018). *LJUBLJANA ZATE.* Publication.

Dejan, A. (2015). *Predlog merjenja družbenih učinkov na primeru projekta Ljubljana – pametno mesto.* University of Ljubljana, School of Economics and Business. Master thesis.

Gabrovec, M., Razpotnik Visković., N. (2018). Dostopnost do javnega potniškega prometa kot pogoj za socialno vključenost dijakov. *Geografski vestnik* 90-2, 2018, 109–120.

Ignaccolo, M., et al. (2016). PUBLIC TRANSPORT ACCESSIBILITY AND SOCIAL EXCLUSION: MAKING THE CONNECTIONS. Conference paper for *International Conference on Traffc and Transport Engineering* – Belgrade, November 24-25, 2016.

Kenyon, S., et al., (2002). J. Transport and social exclusion: Investigating the possibility of promoting inclusion through virtual mobility. *J. Transp. Geogr*. 2002, 10, 207–219.

Kamruzzaman, Md., et al. (2016). Measures of Transport-Related Social Exclusion: A Critical Review of the Literature. *Sustainability* (2016), 8, 696.

Litman, T. (2003). Social Inclusion as a transport planning issue in Canada. Contribution to the FIA Foundation G7 Comparison Paper, presented at the *European Transport Conference* held in Strassbourg in June, 2003.

Lukić A. et al. (2011). Planning a More Humane City: Student Expectations Concerning Bicycle Use and Transportation in Zagreb. *HRVATSKI GEOGRAFSKI GLASNIK* 73/1, 111 – 132 (2011.).

Mazzulla, G. (2009). An activity-based system of models for student mobility simulation. *Eur. Transp. Res. Rev*. (2009) 1: 163–174.

MOL Working group for preparation of TUS-StrMOL. (2015). *Trajnostna urbana strategija MOL 2014-2020*.

Pérez-DelHoyo, R., et al. (2017). Improving urban accessibility: A methodology for urban dynamics analysis in smart, sustainable and inclusive cities. *International Journal of Sustainable Development and Planning*, Vol. 12, No. 3 (2017), 357–367.

Perko, M. (2014). *Pametno mesto*. Faculty of Computer and Information Science. Bachelor thesis.

Pteg. (2010). *Transport & Social Inclusion: Have we made the connections in our cities*? Retrieved from http://www.pteg.net/Publications/Reports/Reports.htm

Ricci, M., et al. (2016). Transport policy and social inclusion. *Social Inclusion*, 2016, Volume 4, Issue 3, Pages X-X.

Romanowska, A., et al. (2019). A Study of Transport Behaviour of Academic Communities. *Sustainability* (2019), 11, 3519.

Sauter, D., Huettenmoser, M. (2008). Liveable streets and social inclusion. *URBAN DESIGN International* (2008), 13, 67–79.

Stanley, J., Stanley, J. (2017). The Importance of Transport for Social Inclusion. Issue "Regional and Urban Mobility: Contribution to Social Inclusion". *Social Inclusion*, 2017, Volume 5, Issue 4, Pages 108–115.

Sun et al. (2018). Gated university campus and its implications for socio-spatial inequality: Evidence from students' accessibility to local public transport. *Habitat International*, 80, 11–27.

The Social Exclusion Unit. (2003*). Making the Connections: Final Report on Transport and Social Exclusion.* Report by the Social Exclusion, publication (2003).

Tomšič, M., Rugelj, D. (2016). *Varna uporaba mestnega potniškega prometa kot pomemben dejavnik socialne vključenosti starih ljudi. Družine s številnimi izzivi: soustvarjanje pomoči v skupnosti.* Monography. Ljubljana, 2016.

University of Ljubljana. (2020, March 25*). University in numbers.* Retrieved from https://www.uni-lj.si/university/university_in_numbers/

Urban Institute Student Transportation Working Group. (2017*). Student Transportation and Educational Access.* Publication of the Urban Institute.

THE "POP-UP PIAZZA"-PROJECT: HOW TEMPORARY CHANGES IN PUBLIC SPACE MIGHT HELP OPENING STREETS FOR EVERYONE

Sara Bafaro[1]
BSc, University of Graz, Department of Geography and Regional Science, Heinrichstraße 36, A-8010 Graz, sara.bafaro@uni-graz.at

Sabine Oberrauter
BSc, Austrian Mobility Research FGM-AMOR, Schönaugasse 8a, A-8010 Graz, oberrauter@fgm.at

ABSTRACT

Initiating a turnaround in the city planning process – especially in the transport policy – towards sustainable mobility, there are several approaches. Some of them stand out in terms of finding solutions, that are rapidly realizable, easily accessible, and cost-efficient. The connection to awareness-raising aspects and the better perception of the space will further contribute to a higher level of citizen satisfaction with subsequent permanent implementation.

The project framework, therefore, includes temporary testing with the so-called "StreetFormators" before cost-intensive reallocations or investments are made. The conception of the "StreetFormators" is still going on and will be ready in late spring 2020. The prototypes will be used in 2 situations. Within a context that requiring permits (street festivals, play streets, etc.) and on their own. The big advantage of using bikes is that they can legally be parked on parking lots and do not have a size limit. The prototype has an integrated toy box and that triggers the creative mindset of children and offers older people a place to sit and opportunities for social participation. A key objective of the concept is to have the potential of bringing together different age groups.

Furthermore, the "Digital Citizen Tool" supports the transformation by providing citizens with the information they need. It allows people to have a look, where and how in their neighbourhood a temporary transformation of public space (parklets, play streets, street festival etc.) could take place. In a second step, there is the possibility to apply directly for a permit for the temporary change. The platform also provides a cartographic potential map and further information to create a link between citizens and decision-makers.

All these details combined help to implement the concept of temporary try-outs, especially from a bottom-up perspective.

[1] Corresponding author

Keywords: Tactical urbanism, pop-up techniques, sustainable transport policy, streets for everyone, sustainable urban development

INTRODUCTION

Public streets originally had various functions: They were spaces that enabled the connectivity of traffic but also formed part of the social interactions between citizens in public space (Furchtlehner & Lička, 2019: 73). As the focus has removed almost fully from the social aspect towards the transit usage, it has become vital to reintroduce the balanced use of both functions again.

"Pop-Up Piazza" wants to change this circumstance and intends a suitable and sustainable use of public space, making it accessible to people again. There is a consensus that the most inefficient use of public space is private car parking. Another issue is the fact, that changing the build environment is extremely cost-intensive and takes a lot of time. Implementing flexible forms of transforming public spaces might be a first step towards more active forms of mobility.

In this paper, possible effects of temporary changes of public streets will be highlighted. The change in mobility habits, the engagement of citizens in bottom-up participation processes and the opening of public space for active and creative forms of social interaction provide opportunities to develop a higher social and environmental impact on urban neighbourhoods.

THE PROJECT FRAMEWORK

The Pop-up Piazza is particularly interested in the temporary redesign of streets and squares and create seasonal or one-day public spaces where people encounter and interact. The project idea is based on an action-oriented planning approach. This means that in case of a concrete requirement for modification, transformations are no longer planned, permitted, and implemented traditionally, but a feedback loop[2] is interposed. That insert makes it possible to try out different options within the frame of "Living Labs" in order to achieve the highest possible output for all participants.

The aim is to develop tools that can make this approach feasible within the current legal framework of the study area, make public spaces more human and child-friendly but also lower the barriers that block a change in the mobility turnaround. The focus is therefor on creating efficient tools for the planning and execution of temporary transformations through the engagement of citizens in bottom-up participation processes. For this purpose, the following Prototypes will be developed:

[2] Idea - prototype - test - evaluation and assess the modified situation - adaptation if needed - etc.

- The physical prototypes, called "**StreetFormators**", will be used in two situations: In a context requiring permissions (street festivals, play streets, etc.) and on their own and without supervision. The great advantage of bicycles, respectively cargo bikes, is that they can be parked legally on parking spaces and have no other specific size restrictions. The prototypes have, for example, an integrated toy box that promotes children's creativity, or a place to sit, rest and for social participation.
- The "**Digital Citizen Tool**" supports citizens with the information and prevailing conditions to participate in a temporary transformation or even to become active themselves. It enables people to take a look at where and how a temporary transformation of public space could take place in their neighbourhood. Specifically, the subject areas of play streets, residential streets and school streets are dealt with. All possible locations are shown on a potential map where people can place their own ideas directly and interact with one another and decision-makers. In this connection, the usability aspect, regarding the simplicity of the app and the reachability of stakeholders and other interested citizens, is an important thing to consider (Stollnberger et al., 2018: 60f). All in all, this prototype supports the digitalization of participation processes, also providing legal information.

Both prototypes are linked to each other and must be seen equally as *the* core part of the project and its upcoming interventions in public space.

A special focus of the ongoing remarks will be on the city of Graz since the support and possibilities for temporary interventions in public space are more limited than in Vienna. While the Viennese administration is trying to strengthen neighbourhoods with different digital services and supporting parklets even financially (Furchtlehner & Lička, 2019: 80), there is no reference about any kind of temporary public space interventions in the urban development concept of Graz. So, the ongoing initiatives in Vienna can be seen as an inspiration for a bottom-up movement by empowered citizens in Graz. At least, there must be a change in urban development goals in Graz to guarantee a good quality of live to its citizens.

In total, around 30 interventions are planned with the support of both tools. The project also focuses on the evaluation and validation of the implementations in the real-world laboratory situation.

Mobility customs and spatial sharing in Graz (AT)

To gain space for sustainable forms of using the streets, there must be a change in the mobility habits of the citizens. Modal splits visualize the mobility customs of people in a certain area. In 2018, the individual motorized traffic represented around 41,6 % (ZIS+P, 2019: 6). The other modes of transport have a roughly equal share of 20% (see Table 1). One goal until 2030 is to change the mobility customs significantly towards an active and sustainable form of movement.

Table 1: Modal split of Graz 2018 (data: ZIS+P)

	Modal Split (in %)
Pedestrian	19,3
Cyclist	19,3
Public transport	19,8
Motorized vehicle	41,6

The change of mobility customs is certainly one main aspect to consider. Another issue is the spatial distribution of stationary traffic. To show, how different the use of public space can turn out: One average car can be parked on 12 square meters – or around seven bikes (Radlobby, 2020). So, the efficiency of public space usage should lead to an intensified construction of bike infrastructure. But the figures in Graz (Table 2) illustrate other realities.

Table 2: Spatial distribution of stationary traffic (data: FGM 2016 based on data from the City of Graz (parking space department and street office and Holding Graz)

	Land requirement (in %)
Bicycle parking facilities	2
Pedestrian areas	3
Areas for public transport	3
Car parking space	92

There is a significant mismatch between the different categories of land requirement of stationary traffic. The largest part of the infrastructure is claimed by parked motorized vehicles. Only around 8 % are left for other forms of mobility. One objective is to gradually reclaim public space for more active forms of mobility and social interactions.

The clue of "StreetFormators"

The prototype for the transformation of a car parking space allows a mobile possibility to replace cars in public places. Unlike parklets[3], parking a bike is allowed without any form of application and permit. Provided to the public, it offers additional space where people can meet, have a chat, have a break during working hours, or just sit down and watch the proceedings going on in their neighbourhood.

If one calculates the number of people who can make use of the newly gained area of an average parking space, StreetFormators could provide space for approx. 16 people. These people could talk to each other without force, while the five people in the car are "fixed" on their seats and could only talk to themselves. Moreover, a car cannot expand and the communication to the outside is "naturally" limited since it is a self-contained space.

[3] A parklet can be described as a temporary structural extension of the sidewalk into the parking lane. A parklet often provides benches, urban greenery, etc.

Table 3: Comparison of cars and "StreetFormators" regarding the land occupation of and the communication potential within a standard parking space on public streets (data: Knoflacher 1993 and RVS 03.04.12)[4]

	Potential land requirement of the vehicles (per sqm)	Number of people (per vehicle)	Communication potential within one parking space (per sqm)
StreetFormator as mobile parklet	~ 6 [5]	1 to 10 [6]	0,2-2,7
Car (medium-sized vehicle)	12 [7]	1 to 5 [8]	0,2-0,4

The communication potential is an important point regarding the social aspect (see Table 3). While a car provides a low space share for an undisturbed communication between people, "StreetFormators" extend this communication area significantly and offer far more potential for social interactions than a car. Even if cars were fully occupied, the social impact and interaction with other people would be far from being the same as with the "StreetFormators". To sum it up, it offers far more potential in terms of the general quality of life and the attractiveness of public realm than a parked car.

Another significant difference is the circumstance that a car is usually privately owned and occupies public space, while "StreetFormators" make public space temporarily accessible to people. They are also used during "street openings" and traffic-calmed areas such as residential streets. In this case, especially children will benefit from the improved space available, since the "StreetFormator" provides various games, creative and multifunctional elements.

THE CHANCES OF TEMPORARY TRANSFORMING PUBLIC SPACES

There are many benefits by temporary transforming public streets into traffic-calmed spaces. A reduction in traffic volume not only has positive effects on noise and air pollution, but the try-out implementation will further support a safer environment for socially vulnerable groups (the elderly, disabled citizens, children) and offer increased opportunities for social interactions. Moreover, the process of temporary transforming the street has the potential of connecting neighbours. This is an important aspect in bigger cities, given the fact that people often live anonymously and rarely know their next-door neighbour.

[4] Underlying calculation (data: Knoflacher 1993. 0,95 sqm / person)
StreetFormator: min. communication potential: 2 pers. / 12 sqm, max. communication potential: 10 pers. / 5,5 sqm plus additional 6 pers. / 6,5 sqm
Car: min. communication 2 pers / 12 sqm, max. communication 5 pers. / 12 sqm
[5] Base area: 5,5 sqm + 0,5 sqm "other required space"
[6] Data: EU Project Metamorphosis
[7] Average parking space size according to RVS 03.04.12; base area (~10,2 sqm) + "door opening space" (~ 1,8 sqm)
[8] Average car fits a max. of 5 people

Additionally, there is also great potential that temporary implementations can be used to try out various options. Quite often, top-down measures are taken to change the urban landscape - with the risk that people might not be satisfied with the outcome. With temporary transformations, one can deal on a 1:1 scale with a wide variety of urban planning issues. The previously mentioned community-based approach with the bottom-up participation process is a viable tool for urban regeneration and enables appropriate long-term solution by including citizens in the planning and decision-making processes.

The social aspect

It is important to consider that the existence of public space does not necessarily mean that it is always equally accessible to everyone. In fact, public is easily mistaken for accessible, suitable, appropriate, or fitting for all residents. It is therefore important to focus on shared spaces and vibrant ground floors. They are the basis for creating social networks in the neighbourhood and lead to casual and accidental encounters between residents, which enables social inclusiveness (Shokoohi, 2019: 111).

The pop-up piazza project generates opportunities to reinterpret the function of public spaces within the framework of a street closure and raises awareness for the perception of public space as a space of communication and social participation. In theory, a temporary street closure provides more space for the implementation of the “StreetFormators” and for social activities of citizens (see Figure 1). In this case, citizens benefit from the fact that it is legal to walk beyond the sidewalk and make use of the improved space available (empty parking spaces or the carriageway).

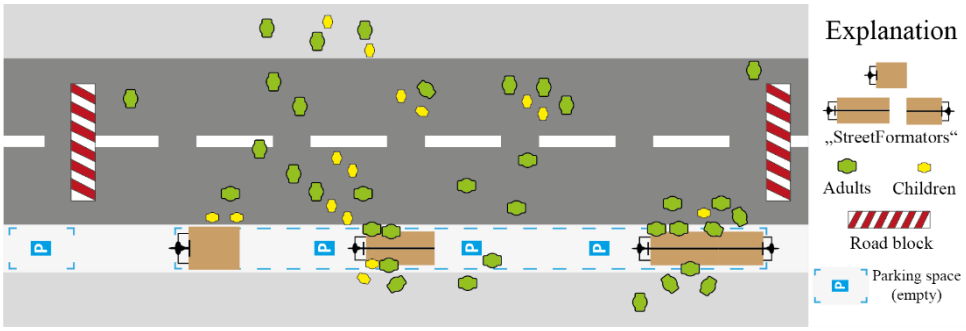


Figure 1: Possible street closure and implementation of the “StreetFormators” (Graph: Sara Bafaro)

One of the two prototypes configured to retain several toy modules for children (arts and crafts, ball games, street chalk etc.). During temporary street closures, free play for children is possible while their parents chat with other neighbours.

This type of intervention provides an opportunity to try out a car-free setting for selected streets usually used by motorised traffic.

Reclaiming public space and increasing safety

Another possibility is to use one prototype as a "mobile parklet". Parklets are transformed former parking spaces, which typically are built with a platform as extension of the sidewalk without the obligation to consume anything (San Francisco Planning Department, 2013: 1). Since parklets require a permit, the "StreetFormator" offers a simple alternative to temporary reclaim smaller parts of streets. In addition to revitalising the neighbourhood and serving as a meeting point, the "StreetFormator" offers a seating area that is especially helpful for the elderly.

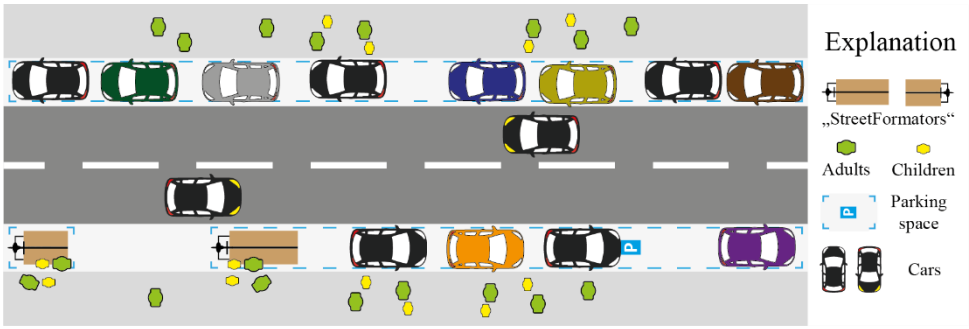


Figure 2: "StreetFormators" as mobile parklets in everyday life (Graph: Sara Bafaro)

The idea of attracting interested citizens, the local economy or other interest groups as hosts for the StreetFormators (e. g. maintenance, reporting vandalism) also promotes (institutional) neighbourly help and helps to lower the inhibition threshold for active use. The intention of bringing together different stakeholders is to show how easy little changes can be implemented in public space.

Focusing on temporary street closures, there is also an increased safety for children, elderly or disabled people due to the increased "freedom of movement" for everyone on the street. In addition, the presence of many people reinforces the general feeling of security. This enhances the quality of public spaces and attracts even more people (Pacheco, 2015).

CONCLUSION

To sum up the previous threads, there are some aspects to highlight. First: Making the active forms of mobility more attractive to citizens leads to reduced traffic flow and less "space consumption" due to private car parking in public space. The

second facet is linked to the interactions between people. Mobile parklets provide an equally good opportunity as stationary parklets for people to interact and get to know each other (better). Besides, children enjoy the reclaimed freedom on the streets, which fosters their creativity and (mental) health.

The third issue regards the engagement of people in the participation processes. Integrating citizens in the transformation process can strengthen their confidence in decision makers and encourage them to change their own environment too. Decision makers have also the opportunity to test a car-free setting and to look at the feedback given to the new situation. This can make a lasting contribution to awareness raising and improved perception of space.

Disclaimer: The Pop-up Piazza project is a national research project within the programme “Mobility of the future” that is funded by the Austrian Research Promotion Agency (FFG) and the Federal Ministry of the Republic of Austria for Climate Action, Environment, Energy, Mobility, Innovation and Technology (BMK).

REFERENCES

Furchtlehner, J., Lička, L. (2019). Back on the Street: Vienna, Copenhagen, Munich, and Rotterdam in focus. *Journal of Landscape Architecture 2019*, Vol. 14 (1), 72-83.

Pacheco, P. (2015). *How “Eyes on the Street” Contribute to Public Safety.* Retrieved from https://thecityfix.com/blog/how-eyes-on-the-street-contribute-public-safety-nossa-cidade-priscila-pacheco-kichler/

Radlobby (2020). *Fahrradparken*. Retrieved from https://www.radlobby.at/fahrradparken

San Francisco Planning Department (2013). *San Francisco Parklet Manual*. Retrieved from https://www.lgc.org/wordpress/docs/events/first_thursday_dinners/ftd_2013_Parklet_Manual-may.pdf

Shokoohi, R. (2019). *Our City. Countering exclusion in public space*. Stipo.

Stollnberger, R., Gebetsroither-Geringer, E., Peters-Anders, J. (2018). “Interactive spatial web-applications as new means of support for urban decision-making processes"; Presentation: 3rd International Conference on Smart Data and Smart Cities, Delft, The Netherlands; 04.10.2018 - 05.10.2018; *ISPRS Annals of the Photogrammetry, Remote Sensing and Spatial Information Sciences*, Vol. IV-4/W7, 59-66.

ZIS+P (2019). *Mobilitätsverhalten der Grazer Wohnbevölkerung 2018*. Retrieved from https://www.graz.at/cms/dokumente/10192604_8032890/85f01d38/Mobilitätserhebung%20Graz_Wohnbevölkerung%202018.pdf

T2

TRACK 2: DENSE, DIVERSE AND DESIGNED URBAN DEVELOPMENT

Track Chairs:

Branislav Folić
University of Kosovska Mitrovica, Kosovska Mitrovica, Serbia and

Saja Kosanović
University of Kosovska Mitrovica, Kosovska Mitrovica, Serbia

The physical component of a developed city system is changing more slowly than the ecological and social ones. This is evidenced by the appearance of many cities of the world at the end of the 20th century, namely busy city streets, large air pollution due to the over-use of cars, high levels of traffic noise, usurpation of the open parking spaces, etc. Initiated transformation of this negative picture is considered a complex and long-lasting process as well as the integral segment of sustainable urban development. Track 2 contributions identify concrete challenges and present corresponding solutions regarding:

- *Urban policy for mobility infrastructure (re)development;*
- *Sustainable mobility solutions for dense urban areas;*
- *(Re)design of the urban space along transport corridors;*
- *Spatial, social and ecological interrelations between pedestrian, singular and group (public) mobility corridors in urban environment;*
- *Car-free cities;*
- *Alternative mobility viewed from the perspective of social and health sciences;*
- *Design of slow-mobility streets;*
- *Open urban spaces as sustainable mobility nodes;*
- *Integration of sustainable mobility schemes into new urban development projects.*

Keywords: Sustainable mobility, Urban morphology, Urban planning and design, Multidisciplinary approach

SUSTAINABLE TRANSFORMATION OF HISTORIC TRANSPORT CORRIDOR IN THE CITY OF BELGRADE, SERBIA

Branislav Folić[1]
Assist. Prof., PhD, University of Priština, Faculty of Technical Sciences – Department of Architecture, 7 Kneza Miloša St., 38220 Kosovska Mitrovica, Serbia, branislav.folic@pr.ac.rs

Milena Vukmirović
Assist. Prof., PhD, University of Belgrade – Faculty of Forestry Department of Landscape Architecture and Horticulture - Chair of Planning and Design, 1 Kneza Višeslava St., 11000 Belgrade, Serbia, milena.vukmirovic@sfb.bg.ac.rs

Saja Kosanović
Assoc. Prof., PhD, University of Priština, Faculty of Technical Sciences – Department of Architecture, 7 Kneza Miloša St., 38220 Kosovska Mitrovica, Serbia, saja.kosanovic@pr.ac.rs

Milena Ivanović
PhD student, University of Belgrade - Faculty of Architecture, 73/II Bulevar kralja Aleksandra, 11000 Belgrade, Serbia, milena.ivanovic.arch@gmail.com

ABSTRACT

The relocation of Belgrade's main railway terminal and the mainline for freight trains, which used to run parallel to the riverbank, opened an opportunity for the development of sustainable urban mobility zone and its integration into specific nature-based solution. Based on historical facts and the current status of the old railway corridor positioned in the central zone of the City of Belgrade, the aim of this paper is to elaborate suitability of a linear park concept for selected area and to explain one proposal for its sustainable transformation into a multifunctional contemporary urban space. In contrast to previous historical transport line, the proposed green corridor is intended to connect the city and the riverbanks in functional, ecological and visual terms. Furthermore, developed solution represents a response to some of the city's existing problems, and a contribution to safeguarding the opulent heritage in historical urban core.

Keywords: sustainable urban mobility, green infrastructure, linear park, multifunctionality, regeneration.

INTRODUCTION

The City of Belgrade was founded at the place that today is known as Kalemegdan. Kalemegdan lies on the confluence of two rivers, the Sava and the Danube. Over time, the city has been expanding from Kalemegdan towards inland, thus creating

[1] Corresponding author

new urban areas such as Gornji (Upper) Dorćol and Donji (Lower) Dorćol. At the end of the 19th century, the transport corridor known as the Slaughterhouse Railway was built around Kalemegdan and Dorćol (Figure 1). It aimed to connect industrial area on the Danube bank with the main railway station i.e. the railway bridge across the Sava river. Along this route, especially within the zone of today's Concrete Hall, many shops and storages were built. Later on, the station at the Slaughterhouses (today known as Danube station) was enlarged with additional tracks. Prior to construction of the Pančevo Bridge in 1935 and the extension of the route across the Danube, the gorge had been a 'dead end'. In the interwar period, with the spontaneous development of the industrial zone along the rivers, the railway grew into an industrial railway that served the Danube Industrial Zone (Vukmirović & Nikolić, 2020). As a result, heavy rail traffic has occurred in the area that, according to the General Plan from 1923, was planned to be the largest sports and recreation zone (Figure 2).

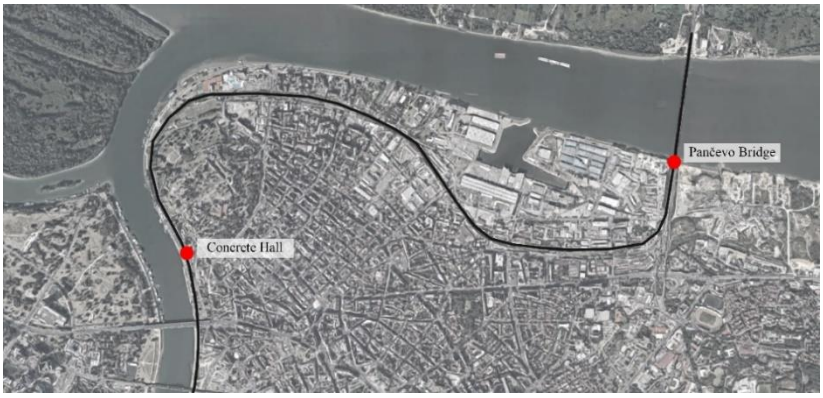


Figure 1: Old railway line from the Concrete Hall to the Pančevo Bridge

Figure 2: A section of historical railway line in Lower Dorćol: Current state

The railway route stopped operating in 2018, when Belgrade's main railway terminal and the mainline for freight trains were relocated. This has open up ways for finding the new mobility solutions. Simultaneously, the redevelopment of the old railway route has been seen as an opportunity to respond to some existing urban problems in this part of the city, including the lack of greenery, high risk from river flooding, occurrence of the urban heat island effect, bad air quality, lack of good-quality leisure space, etc.

MULTIFUNCTIONAL LINEAR SPACES AS A RESPONSE TO LOCAL CONDITIONS

In densely built urban areas, and especially in central zones, green infrastructure is a common problematic issue. To increase the presence of greenery and improve the quality of life, ultimately, voids needed to be found. In post-industrial cities, these void spaces are likely a "by-product of a plethora of cultural processes and needs", e.g. disused railways, pipelines, post-industrial waterfronts, rivers, etc. (Kullmann, 2011).

In recent theory and practice, adaptive reuse of linear infrastructural spaces is most commonly referred to as the design of linear parks. According to Kullmann (2011), thin parks located on infrastructural-type, linear sites need to be calibrated as programmatic sequences of experience – whether variably visual, tactile, or event based. Such is the case with the adaptive reuse of abandoned rail infrastructure and its transformation into the High Line New York park that later inspired many worldwide projects and proposals. Copying of the High Line New York concept to other places, however, is not always successful due to numerous local specificities, so when planning linear parks on the foundations of the old traffic infrastructure, it is necessary to consider keeping, i.e. reintroducing suitable modes of transport (Ascher & Uffer, 2015). In the Vauxall Missing Link Park in London, different mobility routes were successfully brought together by forming a buffer between pedestrian/cyclist/vehicular traffic.

Adaptive reuse of linear landscapes is of broad cross-disciplinary relevance (Kullmann, 2011). By integrating new cultural, ecological, developmental, agricultural, and recreational values (Faggi, at al., 2017) into existing urban structure, some urban problems, and at least those found in physical proximity to a line subjected to transformation, should be taken into consideration. For example, linear parks could mitigate local urban heat island effect, improve health and well-being, and strengthen the resilience to floods (Giannakis, et al., 2016). At the same time, they should be designed to take advantage of local conditions (Santos, at al., 2012). Tanghe River Park in Qinhuangdao, China, even introduces encompassed natural habitats into educational use and allows its visitors to experience local nature.

TRANSFORMATION OF OLD BELGRADE RAILWAY: PLANS AND ACTIONS

Although the Belgrade Master Plan from 1972 intended to bring Belgrade back to its rivers and thus foresaw the removal of railway line in the central urban zone and the relocation of the central railway station, this topic has only recently begun to be discussed more seriously. In late 2018, the Belgrade Land Development Public Agency initiated a Detailed Regulation Plan for 4,600 m-long section of the old railway line extending from the Concrete Hall to the Pančevo Bridge (Figure 1), based on the Decision of the City of Belgrade Assembly from September 2018. The Urban Planning Institute of Belgrade has been engaged in drafting the plan. In April 2019, the media (Mučibabić, 2019) announced that the architectural studio 'Diller Scofidio and Renfra' was invited to submit a project proposal for the transformation of the subject area into a park. Eventually, the fee for hiring the world-renowned team turned out to be extremely high, which resulted in a need for a different approach.

Standard planning procedure was subsequently amended and harmonized with the international scientific project CLEVER Cities (Vukmirović & Nikolić, 2020), whose main topic is the co-creation in city planning by utilizing live lab approaches and nature-inspired solutions. In this manner, the team working on the project, along with the group from the Urban Planning Institute, devised a plan development methodology that was expected to involve all relevant stakeholders. As a result, the Urban Innovation Partnership has been set up, uniting around 50 members from more than 35 local and national public and private sector institutions, scholarly community, and common society.

The initial co-working phase on the project CLEVER Cities has resulted in defined vision of the Linear Park 2025, an attractive, self-sustaining, multifunctional, eco-technological, artistic, educational and research demonstration ground that promotes healthy living, community, cosmopolitanism through national culture, nature protection and youth empowerment (Belgrade Urban Living Lab, 2020). The call for design solutions for the Linear Park in Belgrade was closed on 28/01/2020 and 28 proposals were submitted.

THE LINKPARK CONCEPT

The LinkPark design concept is among ten selected solutions for the transformation of the area along historic railway into a linear park. The guiding idea of the LinkPark 4-member team was to establish a direct spatial, socio-cultural and natural-ecological connection between the Sava and the Danube rivers and their banks, and the city. This implied a radical shift in notion of the subject spatial line that in the past was treated as a firm spatial edge, i.e. a boundary. Therefore, the concept of transformation is based on the need to generate a strong spatial identity, establish continuity of space, connect river banks, integrate rivers with the city core, and provide spatial contents to be used throughout the day, in all seasons and

by all citizens. On the other hand, the key design elements were derived from the main characteristics of the context: river– authentic natural habitats – old railway line – city centre.

In spatial terms, special attention was paid to the issue of accessibility and the integration of park into a public space network. Accordingly, the accessibility of space has been achieved by introducing longitudinal and transverse linear strokes. Longitudinal paths are aimed at establishing a connection between the Sava and the Danube banks, while at the same time enabling the creation of five thematic routes.

Predominantly pedestrian transverse connections represent an extension of existing street routes, thus allowing for the direct access to the Danube quay. (Figure 3)

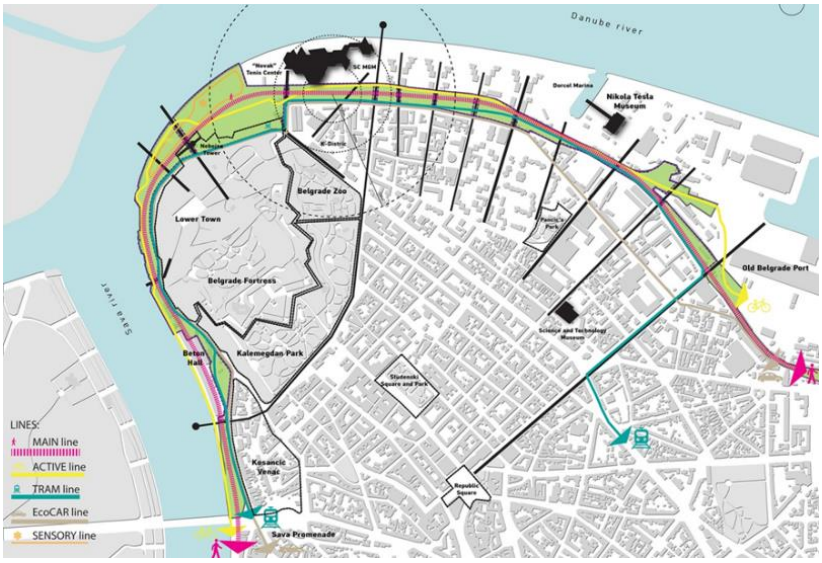


Figure 3: LINKPark thematic routes - MAIN, ACTIVE, TRAM, EcoCAR and SENSORY lines. Authors: Vukmirović, at al., 2020

From the perspective of landscape architecture, the concept is based on mimicry of wetlands of the alluvial plain of the Danube (Vukmirović, at al., 2020).

In terms of ecology, LinkPark offers significant strengthening of green infrastructure with all its benefits, as well as the introduction of various modalities of sustainable urban mobility (Figure 4). Defined longitudinal routes so include walking as a primary modality (MAIN line); cycling and micro-mobility (ACTIVE line); tram transport (circular TRAM line); and the use of environmentally-friendly (zero-emission) vehicles exclusively (EcoCAR line consisted of two lanes with green interspace). Finally, proposed water transport aims to establish a direct connection with other parts of Belgrade (Figure 5).

Figure 4: LINKPark image. Authors: Vukmirović, at al., 2020

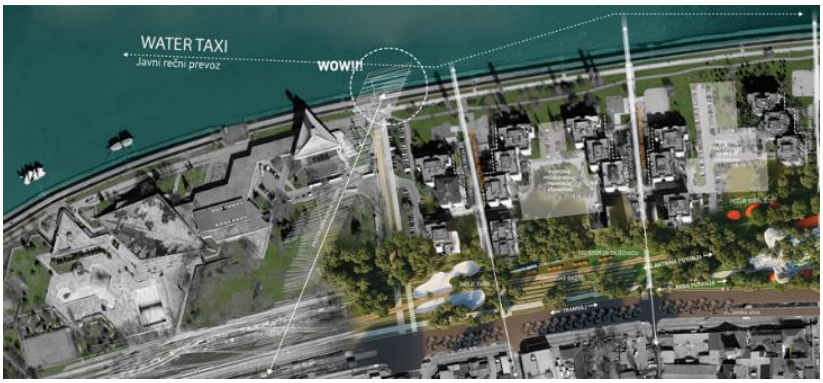


Figure 5: LinkPark proposal for a new water taxi station. Authors: Vukmirović, at al., 2020

CONCLUSIONS

The City of Belgrade has recognized the location of abandoned rail traffic as a creative opportunity to develop new green corridor. In that way, Belgrade has finally begun to transform the abandoned zone into contemporary city centre amenity, changing back this area to its original purpose, and using the inherited advantages and weaknesses of the space.

LinkPark proposal fully opens the riverbanks of old Belgrade to the users. Next to different modalities of sustainable mobility, the concept envisages nature-based solution that has the potential to connect isolated remnant habitat patches and provide ecosystem service in the city (Zhang, at al., 2019). The concept could also be understood as an impetus for gradual green transformation of the whole central urban zone, and the city in general, aimed at improving its sustainability- and resilience-related capacities.

Keeping in mind general developmental tendency of Belgrade central area that is to decrease the intensity of motor vehicle traffic, and the necessity to apply new ways of sustainable mobility, a more holistic approach could in future include the consideration of time-related quality of space, e.g. the chrono-urbanism (Gwiazdzinski, 2015; Moreno, 2019). In that case, the transformed infrastructural corridor presented in this paper could also be considered an integral part of future development of "interconnected network of pathways and relationships" (Mehaffy & Salingaros, 2013).

ACKNOWLEDGEMENTS

The authors acknowledge the Erasmus+ Capacity building in Higher Education project 'Strengthening the Master Curricula in Water Resources Management for the Western Balkans HEIs and Stakeholders – SWARM' (597888-EPP-1-2018-1-RS-EPPKA2-CBHE-JP).

REFERENCES

Ascher, K., Uffer, S. (2015). The High Line Effect. *Global interchanges: Resurgence of the Skyscraper City*. Conference proceeding, CTBUH 2015: New York.

Belgrade Urban Living Lab (2020, January 6). *Poziv za mlade arhitekte*. Retrieved from: http://bellab.rs/poziv/

Faggi, A., Vidal, C. Z., Gusteler, F. (2017, January 18). *Linear parks: the importance of a balanced, cross-disciplinary design*. The Nature of Cities (online platform). Retrieved from: https://www.thenatureofcities.com/2017/01/18/linear-parks-importance-balanced-cross-disciplinary-design/

Giannakis, E., Bruggeman, A., Poulou, D., Zoumides, C., Eliades, M. (2016). Linear parks along urban rivers: Perceptions of thermal comfort and climate change adaptation in Cyprus. *Sustainability*, 8(10), 1023.

Gwiazdzinski, L. (2015). Introduction. The Urban Night: a Space Time for Innovation and Sustainable Development. *Articulo-Journal of Urban Research, (11).*

Kullmann, K. (2011). Thin Parks / Thick Edges. Towards a linear park typology for (post)infrastructural sites. *Journal of Landscape Architecture*, *6*(2), 70-81.

Mehaffy, M., Salingaros N.A. (2013, March 22). *What does Resilience have to do with architecture?* Retreived from: https://www.metropolismag.com/architecture/resilience-architecture/

Moreno, C. (2019). *The 15 minutes-city: for a new chrono-urbanism!* Retrieved from: http://www.moreno-web.net/the-15-minutes-city-for-a-new-chrono-urbanism-pr-carlos-moreno/

Mučibabić, D. (2019, April 10). *Novi park od Beton hale do Pančevačkog mosta.* Retrieved from: http://www.politika.rs/sr/clanak/427093/Novi-park-od-Beton-hale-do-Pancevackog-mosta

Santos, P., Marques, G.F., Souza, V.B.F.S. (2012). Analysis of the Contribution of Linear Parks in Urban Flood Control. In *World Environmental and Water Resources Congress 2012: Crossing Boundaries, May 20-24, 2012 | Albuquerque, New Mexico, United States*, 235-248.

Vukmirović, M., Nikolić, M. (2020). *Findings on Industrial Heritage Preservation on eleven sites placed along the Sava and Danube waterfront*. Belgrade: Unpublished work.

Vukmirović, M., Vujović, I., Radić, B., Ćopić, A. (2020, January 28). LinkPark. *Winning proposal for the urban-architectural competitiotn for Linear park in Belgrade*. Belgrade.

Zhang, Z., Meerow, S., Newell, J.P., Lindquist, M. (2019). Enhancing landscape connectivity through multifunctional green infrastructure corridor modeling and design. *Urban Forestry & Urban Greening*, 38, 305-317.

FROM URBAN POROSITY DECODING TO MATERIAL URBANITY

Sérgio Proenca
Assist. Prof., PhD, Universidade de Lisboa, Lisbon School of Architecture, CIAUD, formaurbis LAB,
Rua Sá Nogueira - Pólo Universitário - Alto da Ajuda, 1349-063 Lisboa,
sergioproenca@edu.ulisboa.pt

ABSTRACT

The linear axis of Rua da Palma and Avenida Almirante Reis is the structuring element of a complex urban territory characterized by a permanent urban dynamic, compacity and overlapping of functions. This axis has a strong legibility in the city of Lisbon, configuring the longest straight line of the urban layout, one of the main radial axes of transportation of the city. Almirante Reis shows a wide diversity of building periods and uses, standing out the commercial function, clearly derived from the good accessibilities provided by the valley street, the avenue and the subway system. Although this part of the city recently underwent processes of abandonment and physical decadence of the built fabric, nowadays is going through a period of transformation linked to the renovation and re-use of the city.

The relation between people movement and the private space permeability to public and collective uses echoes the 1748 Giambattista Nolli plan of Rome that uses the same representation for public spaces and singular buildings private spaces of public use, revealing as streets and squares extend in the church ground floors or in the palace's atriums and courtyards. The same entanglement and continuity between public and private spaces is part of Walter Benjamin and Asja Lacis description of the city of Naples as a porous city (Benjamin and Lacis, 1925), where public and private life overlap in space. Paradoxically, this impermanence of uses is supported by the lasting and legible form of built spaces, referring to the city as a the physical place of human exchanges.

Therefore, we may establish the hypothesis that it is the friction caused by human movement in the edges of the urban space that originates sedimentation of urban life in these porous spaces.

The paper addresses the morphological decoding of the longest avenue of Lisbon by delayering and recombination of specific urban systems and strata. This interpretative delayering of the avenue reveals formal relations between public and private spaces and mobility systems that would otherwise remain veiled, revealing urban porosity as essential to the "material urbanity" (Sòla-Morales, 2010) of Avenida Almirante Reis.

Keywords: Urban morphology, Delayering, Urban Porosity, Lisbon.

INTRODUCTION

The paper addresses the morphological characterization of the Almirante Reis Avenue, based on the interpretation and design process developed in the context of design studio classes (*Laboratório de Projecto IV* and *Laboratório de Projecto V*) of the fourth year Integrated Master in Architecture with specialization in Urbanism at the Lisbon School of Architecture, University of Lisbon.

The development of the design studio work in this academical year implies that the project is developed in a complex urban area. Therefore, in the academical year 2019-2020, coordinated by Sérgio Proença and tutored by Ana Amado, the choice fell on one of the most important valleys of the city of Lisbon that clearly stands out by supporting the longest straight line of the city urban layout, which corresponds to the axis Rua da Palma/Avenida Almirante Reis. (Figure 1)

Figure 1: Rua da Palma and Avenida Almirante Reis axis in the urban layout of Lisboa (*formaurbis LAB* archive)

The valley that is structured by the axis Rua da Palma/Avenida Almirante Reis, constitutes a complex urban territory of the consolidated and diverse urban fabric of the city of Lisbon. Resulting of the sedimentation, overlapping and juxtaposition of strata in the course of time, this urban territory is characterized by a constant

dynamic, nonetheless keeping its identity in the context of the city. During the last decades voted to processes of abandonment, it is nowadays a stage for the renovation and reuse of its fabric, constituting a privileged context for the development of the design studio assignments.

Pedagogically, the exercise considers urban form reading and interpretation as the first act of project, acknowledging in the existing urban fabric a specific theme to ground the conceptual approach that directs the definition of an urban strategy and consequent development of a specific project that physically materializes the program and aims previously defined.

Robert Bresson once said that "Créer n'est pas déformer ou inventer des personnes et des choses. C'est nouer entre des personnes et des choses qui existent et telles qu'elles existent, des rapports nouveaux" (Chateau, 2012, p.27). A possible inference from this quote for the actions of the architect is that, whatever is the reality we are addressing and transforming, there is the need to know it very well – it is not possible to create lasting relations without a thorough knowledge of the parts.

THE ANTECEDENT TERRITORY: THE VALLEY AND THE PATH

The interpretative reading of the valley bottom urban system, framed by the hills of Santana, to west, and Penha, to the east, allowed to reveal, other than the straight axis of Rua da Palma and Avenida Almirante Reis, other evidences. The clearest of these is the matrix route that roughly follows the valley line and pre-exists the opening of the avenue in a territory that has kept its rural character until late XIX century.

The sinuous path that follows the valley stream and gradually sedimented in a series of sequent streets – Rua do Benformoso / Rua dos Anjos / Rua de Arroios / Estrada de Sacavém – with widenings in crossings and divergences to other routes or near exceptional elements of the built fabric, such as churches and convents, was the first structuring element of the valley bottom. This linear urban element extended northwards from the São Vicente da Mouraria gate of the Fernandine wall, one of the main gates of the medieval wall of Lisbon. It was on the outside of the wall, following this linear path, the faubourg in the sequence of the Moorish quarter developed, concentrating the built fabric that became less compact as it spread north. (Fernandes, 2014).

This faubourg consisted in a ribbon of urban life, singular linear presence structured by the valley path in a territory occupied by farms, vegetable gardens and orchards, as it is acknowledged from the official cartography of mid-XIX century and even after the opening of the avenue in early XX century.

THE AVENUE: MORPHOLOGICAL INTERPRETATION

The interpretative reading of a complex urban element such as the urban axis composed by Rua da Palma and Avenida Almirante Reis – the Avenue – requires a decomposed approach that enables to simplify the formal complexity and allows to decode composition rules (Gandelsonas, 1991) of this urban element. Moreover, the recombination of specific layers allows to render evident existent relations between layout and topography, public and private spaces or the mobility system and the collective functions that inhabit the Avenue ground floors.

Layout and topography

Valley bottoms, when compared with the surrounding hillsides, are less steep, therefore consisting in natural corridors suited for the establishment of paths (Caniggia e Maffei, 2001 [1979]). The need to keep them free for the water flow underline their vocation as mobility corridors. The continuous use in time of these paths and the gradual consolidation their built margins led to the definition of valley streets. These valley streets are usually sinuous linear urban elements that structure the surrounding urban fabrics, which proceeded their settlement. In Lisbon, a city built on a topography where hills and valleys alternate, is common to find street layouts that mimic or double valley lines (Proença, 2014) (Figure 2).

The intrinsic good accessibility of valley streets stimulates the settlement of commercial functions and the resulting intensification of urban life underlines the structuring role of these linear elements. The expansion of the city or the need to improve traffic conditions sometimes gave origin to the duplication, by juxtaposition or overlapping, of the sinuous ancestral route by a new, wider and more regular street layout (Proença, 2015). The urban system composed by the sinuous sequence of Rua do Benformoso, Rua dos Anjos, Rua do Regueirão dos Anjos, Rua de Arroios, Rua Alves Torgo e Rua Quirino da Fonseca and its duplication by the regular layout of Rua da Palma and Avenida Almirante Reis is a paradigmatic example of the valley bottom urban system in the city of Lisbon.

Although the straight layout of the Avenue, between Praça do Martim Moniz (southern limit) and Praça Francisco Sá Carneiro (northern limit) has a continuous width of 25 meters, this apparent uniformity may be questioned when observed in the context of the urban layout of the valley of Arroios. The urban layout is the result of the overlapping of morphologic strata with different organization principles, although sharing the common matrix of the valley line. Thus, we can acknowledge the sinuous linear urban element, adjusted to the topographic conditions of the valley topographic configuration, and the overlapping operated by an orthogonal matrix urban layout structured by Rua da Palma and Avenida Almirante Reis and seven transversal streets, articulated with regularizations and adjustments of pre-existent spaces (Figure 3).

In addition to these linear elements, singular public spaces stand out – some of them pre-existent and integrated in the new urban layout, other composed regarding the Avenue, doting exceptions along the layout – from the south to the north: Praça Martim Moniz; Anjos church churchyard; Praça do Chile; Alameda Dom Afonso Henriques; Praceta João do Rio; and finally Praça Francisco Sá Carneiro (Fernandes, 2014).

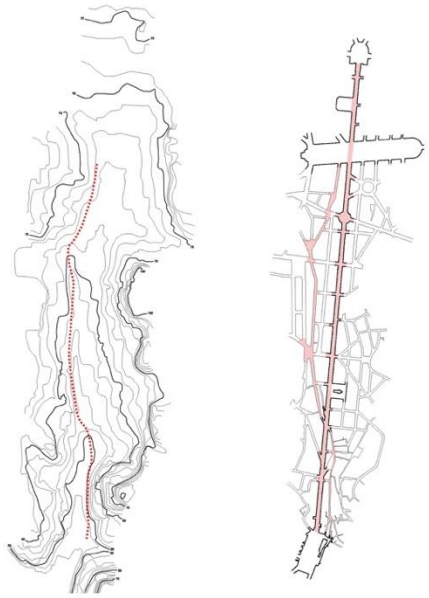


Figure 2: Structuring elements of the valley bottom urban system. Topography and valley line vs. valley street and the Avenue urban layout (Proença, 2014)

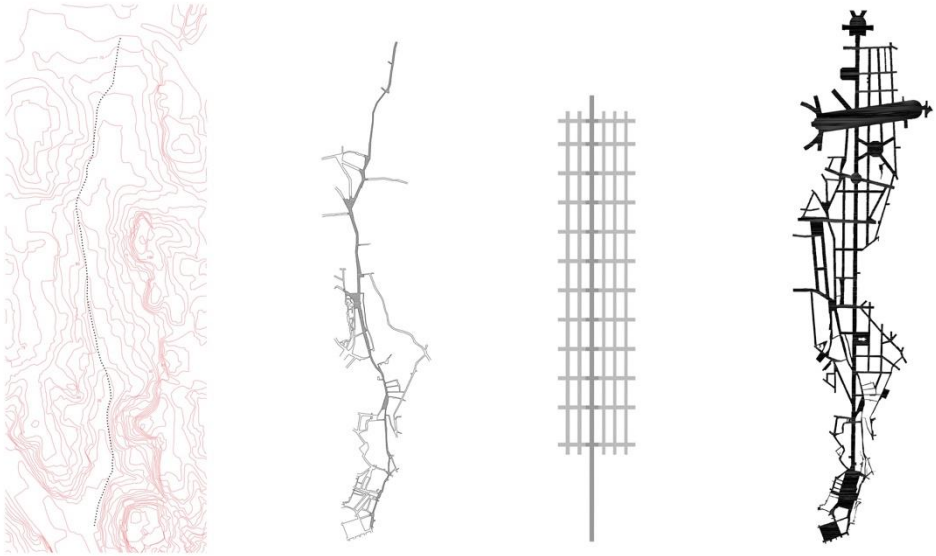


Figure 3: Generative effect of the valley in the Almirante Reis layout (Fernandes, 2014)

The public space [layout, partition and tree plantation]

The urban layout of the Avenue has a continuous width of 25 meters, only varying in the exceptional urban moments described above. Nevertheless, in the course of time and depending on its construction period and transformation, this regular width had different partitions, which answered specific needs and wills.

Initially designed with sidewalks, carriageways and a central pedestrian platform with a double alignment of trees, similarly to other Avenues that were built in Lisbon during the same period and the Parisian boulevards that consisted in its model. (Figure 4) Although, the Parisian boulevards and avenues were wider – 40 meters for the most important and structuring avenues; 36 or 30 meters for main avenues; and 30 meters for avenues that were opened overlapping pre-existent dense urban fabrics (Gourdon; Werquin; Demangeon, 2000). The proportion between pedestrian and automobile space was more balanced than it is today.

Figure 4: Initial type section partition of the Avenue, already with the introduction of trams (Eduardo Portugal, 1938). Arquivo Fotográfico Municipal: PT/AMLSB/POR/021056

In the 1930's, the Avenue was equipped with public transportation that run on tracks, which generated the non-exclusive appropriation of one of the lanes of the carriageways in each direction, similarly to other Lisbon avenues in the same period. Answering the same purpose, the expansion of the Avenue northwards of the ancient ring road that defined the edge of the city, where today exists Praça do Chile, contemplated the double circulation of trams in the central space. This option compromised the extension of the central forested pedestrian platform in benefit of the new mobility system in the northern part of the Avenue (Figure 5).

Figure 5: Avenue partition without central platform (Judah Benoliel, ant. 1952). Arquivo Fotográfico Municipal: PT/AMLSB/CMLSBAH/PCSP/004/JBN/004543

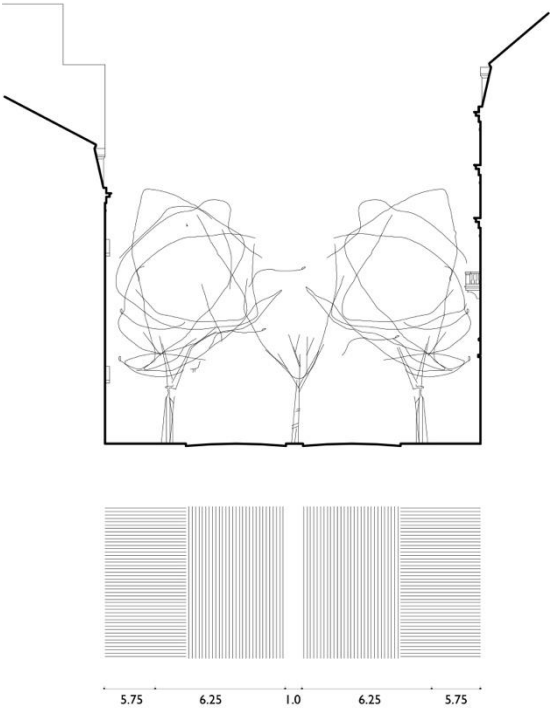


Figure 6: Contemporary Almirante Reis partition type section with diagram of pedestrian vs. automobile space (Proença, 2014)

The subway construction introduced six stations in the three kilometres long Avenue and originated reformulations on the Avenue partition. Nowadays the section partition is mostly constant (Figure 6) with central roadways divided by a narrow separator, which nevertheless enables the existence of a rarefied tree alignment, and lateral sidewalks, approximately six meters wide, with irregular tree alignments between Martim Moniz and Alameda and without trees north of Alameda. In the course of Lisbon recent transition to soft mobility and as a result of a tactical urbanism action, the south-north central lane was converted in two cycle lanes. Nevertheless, along the course of the Avenue, sidewalks remain cropped by parking spaces, dotted with subway entrances and erratic urban furniture that disturb pedestrian circulation.

The private space [plot structure and built fabric]

Regarding the private space, the plot structure is helpful to acknowledge production processes and development phases. The irregular plot structure and the diversity in the alignment of the plot division that exists between Martim Moniz and Rua Maria Andrade reveals the land divisions that pre-exist the regularization and opening of Rua da Palma and the southern part of Avenida Almirante Reis. North of Rua Maria Andrade the alignment of the plot division is perpendicular to the direction of the avenue and the width of the plots seems to be defined according to a composition matrix multiple of 10, 12 or 15 meters (Figure 7).

The building replacement that occurred along the second half of the XX century gave origin, in some cases, to plot joining, promoting longer façade buildings which contributed to a transformation of the image of the Avenue.

Regarding the built fabric height, essential for the definition of the street cross section, the diversity that exists in the Avenue seems to generate from the generic legislation that framed each building construction period (Proença, 2014) (Figure 7).

Thus, for a street width of 25 meters, up to the approval of the *Regulamento Geral da Construção Urbana* (Urban Building General Regulation) – December 6th, 1930 – the maximum allowed height was 20 meters. On a common collective housing building of the period, this height would correspond to six floors, adding up the use of the space under the roof as long as the roof structure remain unchanged.

After the approval of the *Regulamento Geral da Construção Urbana*, the maximum allowed height for streets wider than 10 meters changed to 21 meters. This height could reach 25 meters in corner buildings, underlining the role of the corner in the urban image of the city. The same regulation allowed the existence of overhangs with a certain presence in the façade composition, which would characterize the Avenue buildings character along the decades of 1930 and 1940.

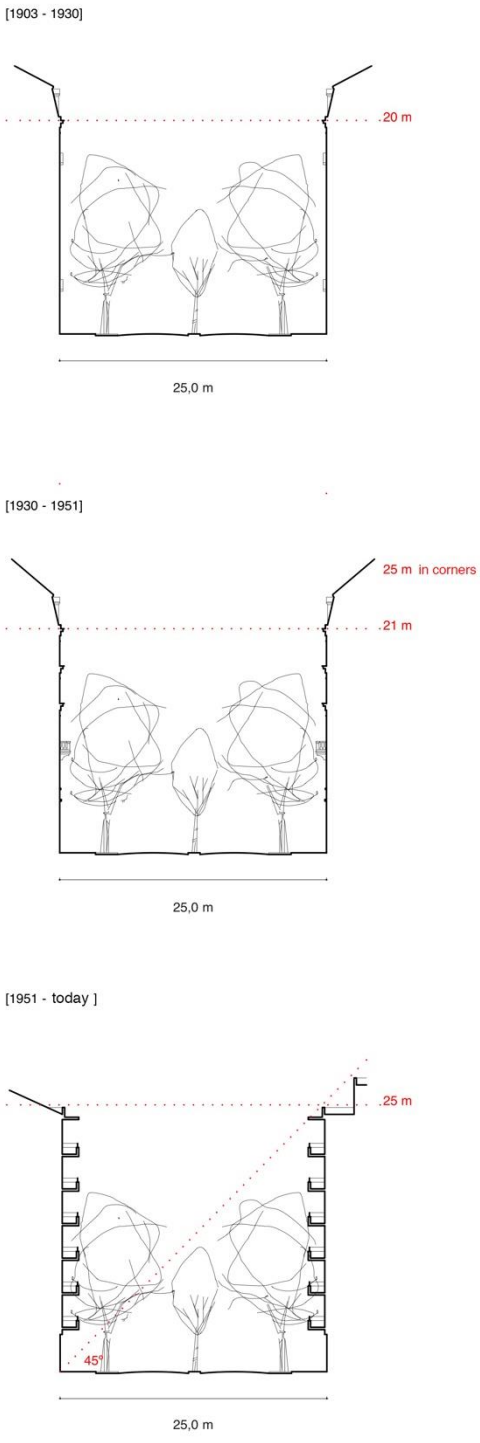


Figure 7: Graphic representation of building height regulations evolution (Proença, 2014)

From 1951 onwards, with the approval of the *Regulamento Geral das Edificações* Urbanas (Urban Edifications General Regulation),the buildings maximum height was defined by a 45º line drawn from the intersection of the facing building with the ground. In the case of the Avenue, this implied that the maximum height of the façade would correspond to 25 meters, admitting setbacks in the proportion of 1:1.

Nowadays, most Avenue buildings have six floors above ground, although occurrences range from one to 13 floors, concentrating the lower buildings in the southern part of the avenue, corresponding to non-residential buildings prior to 1919 (Santos; Soares; Ramalhete; Vicente, 2017).

Beyond the generic regulations that conditioned the height of the façade in each period, traffic flow difficulties in the Avenue, acknowledged at least since the 1930's, and the relative narrowness of the section for the service level demanded in this axis, generated a specific regulation for Avenida Almirante Reis new buildings. In November 18th, 1950, a municipal disposition obliged that the ground floors of all new building receded 3,75 meters generating a continuous gallery at street sidewalk level. When buildings on both sides of the avenue were demolished and new buildings replaced them, the Avenue width at ground level would expand from 25 to 32,5 meters, a considerable extension that would, in time, allow a redesign in the partition of the section (Figure 8).

Figure 8: Receded ground floor bulding with gallery (Armando Serôdio, 1962). Arquivo Fotográfico Municipal: PT/AMLSB/CMLSBAH/PCSP/004/SER/005244.

This disposition is visible in 49 buildings with receded ground floor, mainly built in the third quarter of the XX century (Ramalhete, 2019). Given the fact that almost all buildings have commercial uses in the ground floor, the main purpose to design galleries with the same depth as the recede would be the progressive construction of a continuous shopping gallery that supports the pedestrian circulation, freeing space in the Avenue for the expansion of the roadways and automobile parking.

The outcome isn't as intense as it has been imagined. Nevertheless, between the Anjos churchyard and Praça do Chile, it's possible to find sequential buildings with these galleries and in some points receded ground floors on both sides of the Avenue.

Mobility and commercial vocation

According to the urban and functional survey that was made in 2015, in the scope of the research project Atlas Almirante Reis, the 255 buildings that margin the Rua da Palma and Avenida Almirante Reis axis are:

"mainly residential (90%), with an average of eight residential fractions and three non-residential fractions per building. However, only 11 of the 255 buildings (...) have exclusively residential use. (...) on the other hand, 26 buildings have no residential units (...) hotels, commercial or office areas." (Santos; Soares; Ramalhete; Vicente, 2017)

Nowadays, Almirante Reis consists in a local linear centrality that glues both hillsides of the valley social life and cumulatively is an important mobility radial axis of Lisbon that connects to the traditional city centre. The importance of mobility for the occurrence of commerce is relatively clear. Commercial uses in ground floors are more intense near intersections with other main arteries and by subway stations entrances – commerce even exists in some underground access platforms. The existence of itinerant commerce next to subway entrances – as in the case of Arroios station – confirms the importance of accessibility to generate and sediment this urban function (Figure 9).

Traditionally dedicated to medium and low standard trade – consequence of the extension of the western Baixa area commerce – despite the diversity, retail, restaurants and cafes stand out. Currently, the specialization that existed in previous decades in which most of the commercial establishments on the avenue were dedicated to the sale of furniture and household appliances is less evident (Santos; Soares; Ramalhete; Vicente, 2017).

In recent years, commerce diversification resultant from immigration contributed to the cross-cultural enrichment and its coexistence with the neighbourhood spirit, especially along Rua da Palma and the beginning of Avenida Almirante Reis, extending from Martim Moniz and Rua do Benformoso.

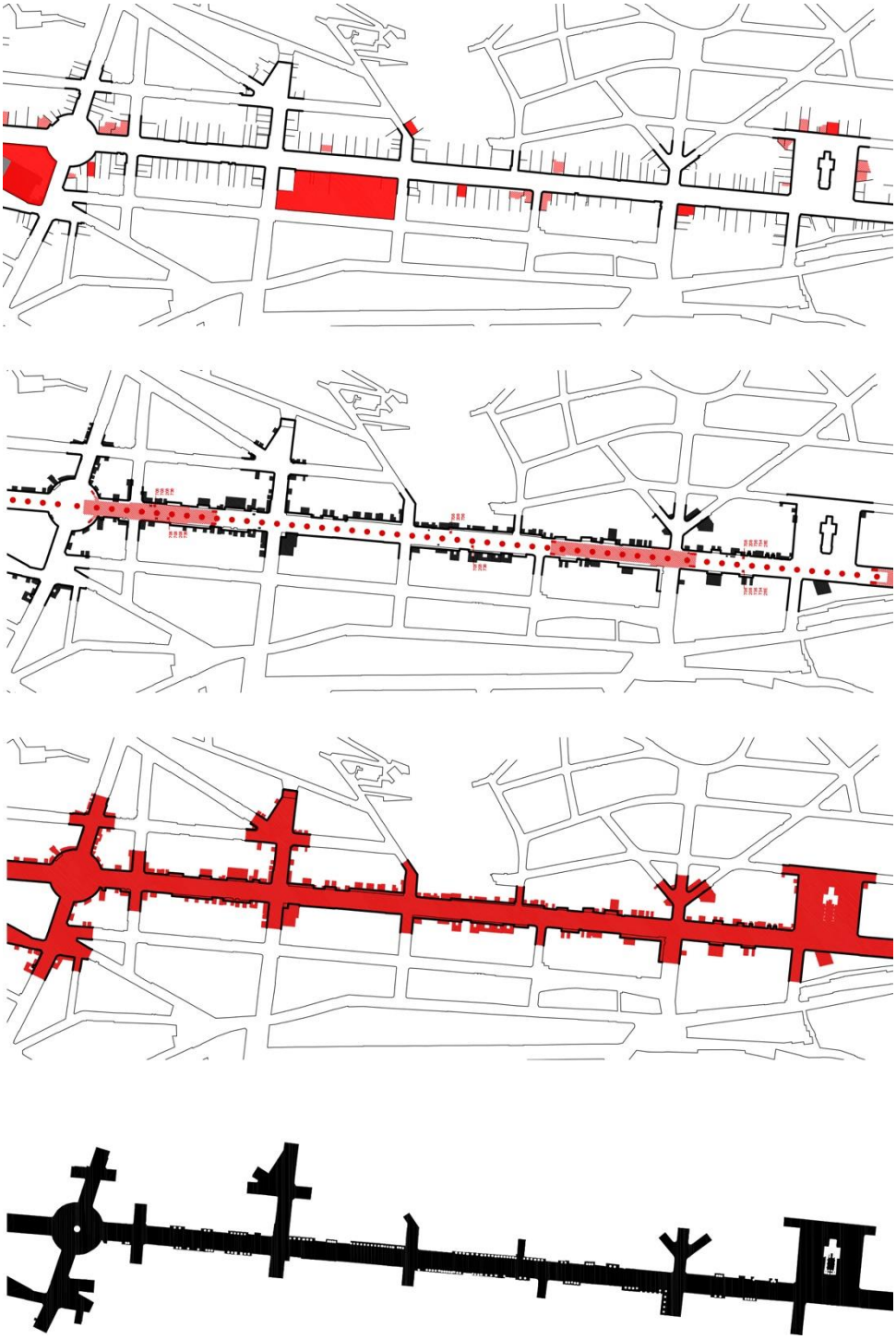


Figure 9: Almirante Reis Urban DeCODE, Anjos – Arroios extract (from the top): plots vs. vacant spaces; transports vs. commerce; collective use; Nolli plan (4th year Master in Architecture + Urbanism, Lisbon School of Architecture, Universidade de Lisboa, 2019/2020)

A porous Avenue

A representation of the avenue that highlights the continuity between public and private spaces of collective use, similarly to the 1748 Giambattista Nolli representation of Rome, allows to acknowledge veiled continuities. (Figure 9) The entanglement between public and private space as a value of urbanity is the key to understand the description of Naples as a porous city: *As porous as this stone is the architecture. Building and action interpenetrate in the courtyards, arcades, and stairways. (...) Porosity is the inexhaustible law of the life of this city, reappearing everywhere. A grain of Sunday is hidden in each weekday, and how much weekday in this Sunday! (...) Just as the living room reappears on the street, with chairs, hearth, and altar, so, only much more loudly, the street migrates into the living room.* (Benjamin; Lacis, 1925)

The ground floors porosity that exists in commercial uses and public facilities allow an expanded reading of the use of the avenue space (Figures 9, 10, 11). These spaces where public and private uses overlap are the spaces where urban life fixates and sediments.

However, despite the existence of this porosity between the public space and the private space that takes place in a first strip of the built fronts, there is a relative impermeability between the avenue and the streets that run parallel to it – mainly to the north from the intersection with Rua de Angola, block fronts with more than 170 linear meters are common and the urban block front from Convento de Arroios to Alameda reaches about 300 meters.

On the other hand, the subway line that accompanies the Avenue and surfaces at the station's accesses contribute to another type of porosity. A porosity that allows transporting more or less distant realities directly to the avenue space and enhances uses and appropriations with a metropolitan radius of influence.

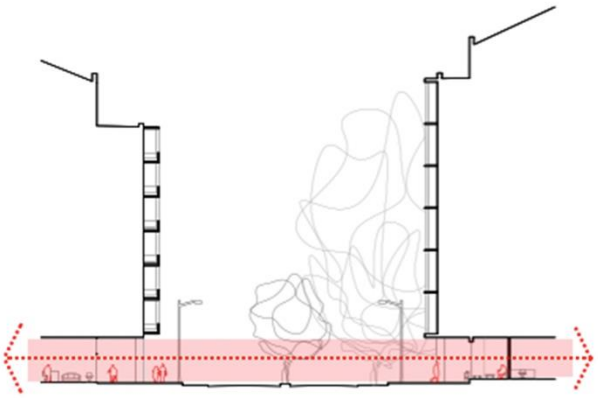


Figure 10: Public space expansion through the ground floor galleries and commercial spaces. (4th year Master in Architecture + Urbanism, Lisbon School of Architecture, Universidade de Lisboa, 2019/2020)

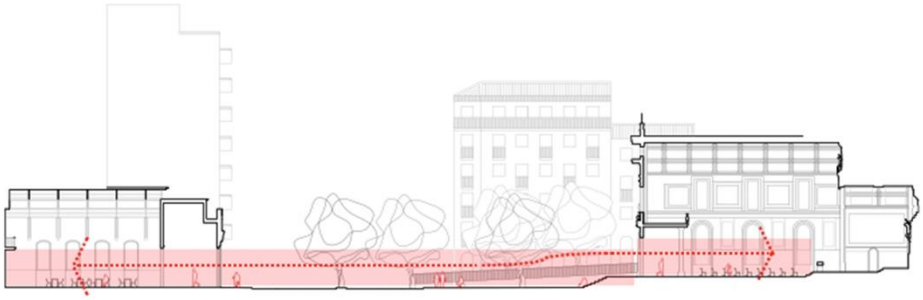


Figure 11: Public space expansion through the ground floor of singular buildings. (4th year Master in Architecture + Urbanism, Lisbon School of Architecture, Universidade de Lisboa, 2019/2020)

CONCLUSION

The essential need to understand the territory of the city prior to transformation is very well expressed in the words of Bernard Huet: "La Ville est donc à lire en premier lieu comme une archive, non pas pour en retracer l'histoire, mais simplement pour comprendre ce que l'on transforme et surtout pour ne pas faire d'erreurs sur la manière dont on opère, afin de ne pas provoquer une rupture qui ne serait pas inscrite dans les gènes que toute ville me semble posséder" (Huet, 1998). In synthesis, the usefulness of reading the territory is to inscribe the transformation and evolution of the city in continuity with its identity matrix. Therefore, we tried to unveil the character of this anthropic landscape that was obtained by gradual mimetic transformation in continuity with its supporting territory.

Morphological decoding of the Avenue allowed to reveal the formal nature of the Avenue and the lead role of urban porosity in the definition of its character. The territorial interpretation at the base of this morphological description consists in the first step of a methodological approach to achieve the "material urbanity" that Manuel de Sòla-Morales irreprehensible defined: "the ability of urban material to express civic, aesthetic, functional and social meanings" (Sòla-Morales, 2010).

REFERENCES

Benjamin, W. and Lacis, A. (1925 [1978]). "Naples" in *Reflections. Essays, Aphorisms, Autobiographical Writings*, Helen and Kurt Wolf Book, New York and London, Harcourt Brace Jovanovich.

Caniggia, G., Maffei, G. L. (2001 [1979]). *Architectural Composition and Building Typology – Interpreting Basic Building*, Firenze: Alinea Editrice.

Chateau, D. (2012). *La subjectivité au cinéma: Représentations filmiques du subjectif*, Rennes, Presses universitaires de Rennes.

Gandelsonas, M. (1991). *The Urban Text*, Cambridge, Chicago Institute for Architecture and Urbanism Book / MIT Press.

Huet, B. (1998). "Une génétique urbaine" in *Urbanisme*, n.º 303, nov.-dec. pp. 56-59.

Fernandes, S. P. (2014). *Génese e Forma dos Traçados das cidades portuguesas. Morfologia, tipologia e sedimentação*, PhD Thesis in Urbanism (unpublished), Lisboa: Faculdade de Arquitectura, Universidade de Lisboa.

Proença, S. B. (2014). A diversidade da Rua na cidade de Lisboa. Morfologia e Morfogénese, PhD Thesis in Urbanism (unpublished), Lisboa: Faculdade de Arquitectura, Universidade de Lisboa.

Proença, S. B. (2015). "Valley lines and mobility infrastructures in Lisbon. A timeless morphological bond" in Urbanistica Informazioni, 263 s.i., IX 9° INU Study Day Green and Blue Infrastructures, Virtual, Cultural and Social Networks. Roma: INU Edizioni, 2015. pp. 24-26.

Ramalhete, F. (2019). *Atlas Almirante Reis. Leituras sobre uma avenida*, lecture at the Lisbon School of Architecture, Universidade de Lisboa, Lisboa, october 14th.

Santos, T., Soares, N., Ramalhete, F. & Vicente, R. (2017), "Avenida Almirante Reis: diagnóstico urbano" *in Estudo Prévio*. 11.

Sòla-Morales, M. (2010). "The Impossible Project of Public Space" *in In Favour of Public Space, Ten Years of the European Prize for Urban Public Space 2000-2010,* exhibition catalogue, Barcelona, CCCB / Editorial Actar.

ROADS IN INTROVERTED MEGAPROJECTS FROM DUBAI TO LEBANON, A WALKABILITY ANALYSIS: URBAN DESIGN OR ENGINEERING APPROACH

Oula Aoun
Assist. Prof., NDU, oula.aoun@ndu.edu.lb

ABSTRACT

Roads are the core element of cities' urban fabric. Innovative approaches of roads design are critical to the liveability of neighbourhoods and cities. Interestingly, roads design is differently approached by two distinct tracks: urban design and highway engineering. While the first targets the quality of the built environment and is pedestrian-centric, the second, more automobile-centric, deals with the technical transportation needs (Southworth, 2005; Hebbert, 2005).

The design and characteristics of roads differ in relation to their scale and their location within the city, and requires therefore different analysis and approaches.

One particular case is roads within urban megaprojects. Urban megaprojects are becoming a key strategy in the context of cities' competition, and are often designed and perceived as self-sufficient introverted entities, or 'cities within cities' (Aoun, 2016).

Roads are often the raison d'être of megaprojects. Although megaprojects are introverted, they are linked to the rest of the city through main arterials. Roads are also a key element in the success or failure of megaprojects, as they constitute the main determinant in the projects inner dynamics from one side, and their connectivity to the city from the other side. However, despite many similarities not all urban megaprojects have the same characteristics, and they differ in terms of scale, landuse, density, topography and urban pattern, hence significantly influencing the quality and role of roads.

This paper aims at analysing the status, role and characteristics of roads in two different megaprojects: Dubai Marina in Dubai, and Beit Misk in Beirut. The two projects vary in terms of context, scale and functions. We analyse to what extent the roads are designed following an urban design or engineering approach. We do so through a walkability analysis, basing our methodology on Southworth's attributes in evaluating walkability (Southworth, 2005). From these attributes, this study will mobilize mainly urban pattern and connectivity.

Keywords: Roads, Walkability, Roads Engineering, Urban design, Dubai, Beirut

INTRODUCTION

For several decades, the road was engineered to serve the automobile needs. In parallel to that, pedestrian movement was considered as recreational activity rather than legitimate transport (Wigan, 1994). In the last two decades a major change is taking place; accommodating pedestrians and bicycle is becoming a growing challenge that is seriously considered at all scales.

Roads are a key component in the urban fabric; they constitute the linkage and connectivity layer of built environments. When well-designed, roads constitute the setting for everyday activities and provide an image and a sense of community and belonging (Jacobs, 1961; Pacione, 1990; Adkins et al., 2012). Walking is linked to many health benefits; several studies have linked walking to longevity and quality of life (Hakim et al., 1998; Strawbridge et al., 1996; Leveille et al., 1999). Before the automobile era, all streets were mainly designed to fit to pedestrians and slow moving vehicles of that time. As a result the urban fabric had to be dense and city centers accommodated a variety of functions close to each other in a pattern that makes them accessible to pedestrians in a relatively short time. Even the industrial cities of the 19th century provided walkability since workers didn't have cars (Southworth, 2005). Cities lost their walkability progressively with Modernism and with the emergent use of cars. Streets gave priority to cars and lost their pedestrian scale, and progressively the pattern of the urban fabrics made it difficult or even impossible to pedestrians to move freely.

Two approaches in roads design: the urban design and the highway engineering

Urban design and transportation have often followed distinct tracks in understanding the role of the road and designing it. Urban design focuses on the experiential qualities of the built environment, mainly at a local scale, while transportation planning focuses on the efficiency of roads, particularly accommodating an abstract function of serving the motorist, at the city scale.

From the beginning of the twentieth century, the discipline of roads design had two distinct branches: the professionals who are specialized in the technical transportation matters, and the professionals who are specialized in the place-based design. The first category consists of engineers who's designing factors include capacity, volume and flows, while the second category is mainly urban designers and landscape architects who are interested in the form, the use, the dynamics, the users perception of a place and the quality of the built environment at a local scale (Southworth, 2005). In the engineers' approach, roads are designed to accommodate the flow of vehicles, while pedestrians are considered as a slowing down factor mainly at street crossings (Ramsey, 1990).

A main difference between the two approaches is the availability of data related to concrete variables in the engineering approach, while in urban design it has been

difficult to map and measure the variables at stake, the way it can be done in transportation research: the quality of an environment, the place character, the pedestrian and bikers' behaviors are not easily measurable.

Highway engineering is more automobile centric, and deals with the technical transportation needs. It uses concrete metrics to measure effectiveness of roads; these performance measures are crucial for decision-making.

What is walkability?

A walkable urban fabric provides access to a variety of everyday places to users of varied ages, without interruption or unsafe modes of transportation. Literature on walkability highlights the importance of walkability quality rather than walkability duration (Ewing & Cervero, 2010; Adkins et al., 2012). Walkable roads must have therefore an attractive and engaging character, offer a variety of visual experiences and have a high recreational value.

Walkability is defined as the extent to which the built environment supports and encourage walking by providing comfort and safety to pedestrians, connecting people with varied destinations with a reasonable amount of time and effort, and offering visual interest in journeys throughout the network.

WALKABILITY IN MEGAPROJECTS

Urban megaprojects are becoming a key strategy in the context of cities' competition, and are often designed and perceived as self-sufficient introverted entities, or 'cities within cities' (Aoun, 2016). Urban megaprojects are at the core of cities' re-imaging and marketing. Their large scale and functional complexity provide them a significant cognitive power that puts them at the center of current strategies of metropolization in many cities around the world. Clearly, exceptional size is a major criterion in the definition, followed by the mixed-use and the 'integrated' aspects of such projects. Some authors focus on the complexity side of the projects' contents and contexts (Orueta & Fainstein, 2008; Premius et al., 2008), others on their linkage to globalization where the projects transcend local conditions and adhere to universal codes (Marshall, 2003), while yet others highlight the inherent risk within these projects (Flyvbjerg et al., 2002). The success of megaprojects depends on many factors; one of these factors is the urban design and pattern. Attractiveness and liveable built environment are key contributors to the image of a successful megaprojects.

Roads are often the raison d'être of megaprojects. Although megaprojects are introverted, they are linked to the rest of the city through main arterials. Roads are also a key element in the success or failure of megaprojects, as they constitute the main determinant in the projects inner dynamics from one side, and their connectivity to the city from the other side. A growing concern in designing roads

in megaprojects is to provide a walkable urban pattern. It is often related to sustainability, the sense of community and to pleasant open spaces.

METHODOLOGY

Measuring walkability is not an easy task, and research on that topic is relatively limited. There is a significant amount of researches in the medicine domain correlating walkability and physical activity to health benefits (Saelens & Handy, 2008; Sundquist et. al, 2011). For some scholars, walkability is not a "one size fits all' but vary by trip purpose and socio-economic characteristics of residents (Manaugh, & El-Geneidy, 2011). Therefore, walkability to this approach that differentiates users' desires and capabilities is defined as a "match" between residents expectations for types of destinations, their willingness to walk and the quality of the path (Ibid). In the literature, measuring the factors that define livable streets seems to be a difficult task; In general there are two types of indicators: the physical characteristics and the users behaviors and preferences (Harvey & Aultman-Hall, 2016). Walkability is also analysed under different scales: the macro-scale characteristics such as destination proximity, density and connectivity, and the micro-scale characteristics such as safety, quality and context. Harvey & Aultman-Hall have even mobilized three different scales: the *Macroscale*, where the characteristics are accessibility and mobility, translated into variables such as density, diversity and networks design, the *Mesoscale* with enclosure and human scale as characteristics; variables are mainly building geometry and tree canopy. The third scale is the *Microscale* of which characteristics are human scale, complexity, imageability, transparency and coherence. These characteristics can be interpreted through a palette of variables ranging from road layout, building materials, path quality, and landscapes to vegetation, urban arts, building identifiers and others.

To Alfonzo (2005), there is a hierarchy of walking where basic needs - such as user's ability and place's accessibility- influence the walking decision more than micro-scale elements can do. For other scholars as well, the micro-scale characteristics such as safety, comfort and pleasurability are minor elements in influencing travel behavior (Cervero & Kockelman, 1997).

In a significant number of studies the most used attributes are connectivity, land use and variety of experiences at the ground floor level, including therefore elements from both micro and macro scales. Southworth suggests six attributes that a walkable network must have: connectivity of path network, linkage with other modes of transportation, fine grained and varied land use patterns, safety from traffic and crime, quality of path and path context including street design, visual interest and other values.

In this research we will mobilize two characteristics relating to the macro-scale: connectivity and land use pattern.

Connectivity is determined by the extent to which an urban fabric provides continuous, safe and interconnected pedestrian paths. Measuring connectivity could be done through the size of blocks, the amount of path choice and intersections, and the absence of barriers.

Land use pattern has to provide accessible uses to serve daily needs. This encompasses shops, grocery stores, day care centers, cafes and others, all in a walkable distance of a maximum 20 minutes. A walkable neighborhood with a varied and mixed land use has to have eventually a fine grained pattern.

The case studies are Dubai Marina in Dubai and Beit Misk in Lebanon. The two projects were selected given their similar promoted image as attractive cities within cities offering a luxury built environment. Another common aspect is the same developer Emaar properties based in Dubai, mobilizing the same logic in real estate development, the same knowhow and mobile exportable professional expertise. As megaprojects both projects are considered as gated communities providing a unique sense of place, high levels of safety and quality of urban realm. On the other hand the two projects are different at many levels: Dubai Marina is one of the most dense development of the world; it was planned to have a number of the highest towers in the world. It is built on a flat empty area in the desert, in a zone with very fast dynamics that transformed desert areas of Dubai into a new city center. The project is connected to a complex transportation network encompassing buses, metro, tram and marine transportation. Beit Misk is a low to medium density project, built at the heart of pine forests with 250-meter difference in altitude from the lowest to the highest point in the project. Density and topography are main elements in shaping the urban pattern and the road network design.

WALKABILITY ANALYSIS

Dubai Marina

Dubai Marina is one of the first urban megaprojects in Dubai. It covers 3,000,000 m2 and includes more than 300 towers. The artificial 3.5 km canal with a 7 km pedestrian promenade is at the core of the plan design. The project includes residential towers, the Marina Mall, a Yacht Club, and 'Jumeirah Beach Residence', a sub-project built in only one phase. 'The Walk' – a cornice promenade within the project – is deemed to be one of the best public spaces in Dubai. The project boasts several world records and spectacle elements such as the highest residential tower, the largest man-made marina, and the 'Tallest Block', consisting of a block of high towers reaching 350 meters.

Dubai Marina is considered to be 'one of the first and largest waterfront developments in the region'. It was planned to be the core and the catalyst for the development of the Jumeirah region at the end of the 20th century, when the major development of the city was occurring around the old center and along Sheikh Zayed Road. With its towers, luxurious residences and retail facilities, mixed use

spaces and ‘public’ promenade, Dubai Marina is now considered the new center of Dubai.

Beit Misk

Beit Misk is a megaproject in Metn region in Lebanon. It is promoted as a new village, offering a mix of uses dominated by residential functions, even if the project’s circulated image is a mix of residences, retail, recreational areas and clubs. The project is planned over 655,000 m2. Owned by Lebanese stakeholders, the developer is Emaar Lebanon, part of Emaar International Development, a subsidiary of the Dubai-based Emaar. Beit Misk is one of the largest gated communities in Lebanon. One of its main characteristics is its location in the mountain at the heart of pine forests, offering an open view to the sea. The location also is considered as offering a nice and moderate climate.

Figure 1: Dubai Marina, photo: Daniel Cheong Photography
Figure 2: Beit Misk, photo: Beit Misk official brochure

Connectivity Analysis

As defined in the methodology, connectivity can be measured through three indices: the size of blocks, the amount of path choice and intersections, and the absence of barriers. In Both projects, and given their status as introverted megaprojects highly similar to gated communities in terms of presence of private security and the management of common and public spaces by one assigned entity, barriers doesn’t exist in the projects without the control of this managing and controlling entity. The only barriers that may exist are only those that delimitate works areas, as both project are not totally built.

As for the size of block, it evokes two different situations in the two projects: in Dubai Marina the blocks size is the direct result of the urban design of the master plan. The general composition can be simply seen as clusters around a longitudinal central Marina. In these clusters the blocks size changes significantly. It is for example more than 300 meters in the block hosting Marina Mall, while it is only around 40 meters in less iconic clusters. In Beit Misk, the design of the master plan is shaped by the steep topography and as a consequence the road network doesn’t present blocks the way urban fabrics are conventionally divided. The roads follow a linear grid with a sequence of curves that adapt to the topography.

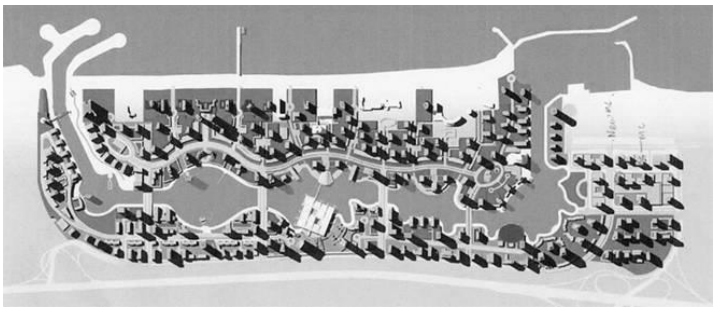


Figure 3: Master plan of Dubai Marina (Source: www.Skyscrapercity.com)

Figure 4: Master plan of Beit Misk, photo: Beit Misk official brochure

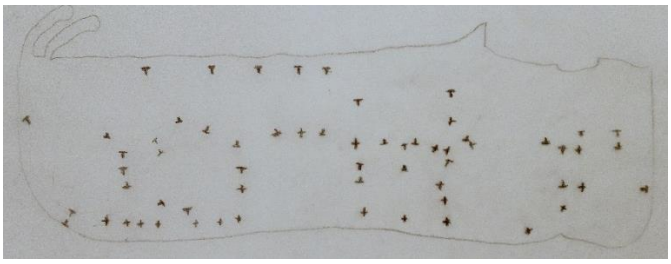


Figure 5: Number of intersections in Dubai Marina; Author

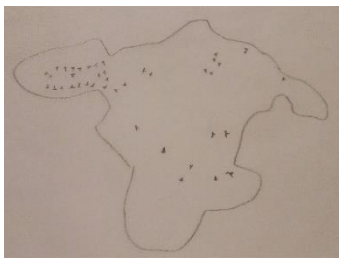


Figure 6: Number of intersections in Beit Misk; Author

This can be seen in the intersections mapping (Figures 5 and 6) where the number of intersections at Beit Misk is significantly low. At the eastern side of Beit Misk a cluster is designed to be similar to a 'traditional town'. In this cluster the number of intersections is significantly high. In the case of Dubai Marina, the number of intersection depends also on the general layout of the various clusters. In some the number of intersection is high, as a result of small size blocks and in others where the blocks accommodate large buildings, the number of intersections is small.

Land Use Pattern Analysis

The correlation between the land use pattern and walkability can be understood as the presence of everyday activities and the location of these activities within walking distances from residences. In Dubai Marina the majority of ground floors are for non-residential functions, mainly ranging from commercial, retail to restaurants and cafes. However some blocks are more mixed than others, and some ground floors are used for car parking. In the highly mixed blocks the walkability is clearly more important. Interestingly the everyday walkability where users are residents can be seen in less iconic clusters. On the other hand, the clusters where the high iconic towers are built, the ground floor is mainly used for cafes and restaurants, and therefore the users are mainly tourists. In Dubai Marina the availability of everyday functions is not the factor affecting walkability; the project's layout being composed of large clusters, moving from one to the other can take more than 20 minutes or what is almost equivalent to one kilometer and a half, despite the presence of the central pedestrian promenade surrounding the marina borders. Given the large scale of the project, the 'largest Marina's promenade' can't be easily walkable by all categories of users.

In Beit Misk the residential function is dominant, hence groceries and everyday functions are very rare. Residents do not have various destinations to go to. The 'traditional town' cluster is not central in the project's composition and therefore not easily accessible for the project's residents. However it is worth to consider the walkability of the roads for the purpose of walking per se, as physical activity that doesn't need a specific destination. The pleasant natural environment and low traffic encourages walking in internal roads.

CONCLUSION

This paper has tried to analyse walkability in two different megaprojects, one in Dubai and one in Lebanon. Megaprojects are specific developments that have characteristics that make them different from city parts, such as the introverted aspect, the particular urban morphology and design, and the private management of common and public spaces. The analysis has mobilised two indices: connectivity and land use pattern. It has shown that several factors influence walkability, mainly the topography, the form of the road network and the Master Plan's layout that generates particularly lots with specific size, composition and connections. It has shown also that the diversity and even distribution of everyday activities are key in defining destinations for users and therefore in encouraging walkability.

REFERENCES

Adkins, A., Dill, J., Luhr, G., Neal, M. (2012). Unpacking Walkability: Testing the Influence of Urban Design Features on Perceptions of Walking Environment Attractiveness. *Journal of Urban Design, 17*(4), 499-510. https://doi.org/10.1080/13574809.2012.706365

Alfonzo, M. A. (2005). To walk or not to walk? The hierarchy of walking needs. *Environment and Behavior, 37*(6), 808–836.

Aoun, O. (2016). *Urban Megaprojects-based Approach in Urban Planning: From Isolated Objects to Shaping the City*. PHD Thesis. Université de Liège. Belgium.

Cervero, R. & Kockelman, K. (1997). Travel demand and the 3Ds: density, diversity, and design. *Transportation Research Part D: Transport and Environment*, *2*(3), 199–219.

Ewing, R., Cervero, R. (2010). Travel and the built environment: a meta-analysis. *Journal of the American Planning Association, 76*(3), 265–294.

Flyvbjerg, B., Bruzelius, N., Rothengatter, W. (2002) *Megaprojects and risk: making decisions in an uncertain world*. Cambridge: University Press.

Hakim, A. A., Petrovitch, H., Burchfiel, C. M., Ross, G. W., Rodriguez, B. L., White, L. R., Yano, K., Curb, J. D. & Abbott, R. D. (1998). Effects of walking on mortality among nonsmoking retired men. *New England Journal of Medicine*, *338*(2), 94–99.

Hebbert, M. (2005). Engineering, Urbanism and the Struggle for Street Design. *Journal of Urban Design, 10*(1), 39-59.

Jacobs, J. (1961). *The death and life of great American cities*. New York: Random House.

Leveille, S. G., Guralnik, J. M., Ferrucci, L., Langlois, J. A. (1999). Aging successfully until death in old age: opportunities for increasing active life expectancy. *American Journal of Epidemiology, 149*(7), 654.

Manaugh, K., El-Geneidy, A. (2011). Validating walkability indices: How do different households respond to the walkability of their neighborhood? *Transportation Research Part D*, 309-315.

Marshall, R. (2003) *Emerging Urbanity, Global Urban Projects in the Asia Pacific Rim*. London and New York: Spon Press.

Orueta, F., Fainstein, S. (2008). The new mega-projects: Genesis and impact. *International Journal of Urban and Reginal Research, 32*(4), 759-767.

Pacione, M. (1990). Urban liveability: A review. *Urban Geography*, 11, 1–30.

Priemus, H., Flyvbjerg, B., Van Wee, B. (Eds.) (2008). *Decision-Making on Mega-Projects: Cost-benefit analysis planning and innovation, Transport economics, management and policy*. Cheltenham/Northampton Edward Elgar.

Saelens, B. E., Handy, S. L. (2008) Built environment correlates of walking: a review. *Medicine and Science in Sports and Exercise*, *40*(7 Suppl), S550–S566.

Sowthworth, M., (2005). Designing the Walkable City. *Journal of Urban Planning And Development*, *131*(4). 246-257.

Strawbridge, W. J., Cohen, R. D., Shema, S. J., Kaplan, G. A. (1996). Successful aging: predictors and associated activities. *American Journal of Epidemiology*, *144*(2), 135–141.

Sundquist, K., Eriksson, U., Kawakami, N., Skog, L., Ohlsson, H., Arvidsson, D. (2011). Neighborhood walkability, physical activity, and walking behavior: The Swedish Neighborhood and Physical Activity (SNAP) study. *Social Science & Medicine, 72*(8), 1266-1273. https://doi.org/10.1016/j.socscimed.2011.03.004

ROLE OF ACCESSIBILITY IN A SUSTAINABLE TOWN AS APPLIED TO MURSKA SOBOTA

Jernej Červek
univ. dipl. ing. arh., Ministry of Environment and Spatial Planning of Republic of Slovenia, Dunajska cesta 48, Ljubljana, jernej.cervek@gmail.com

ABSTRACT

"Murska Sobota 2050 is a town through which we daily travel by bike or walk on foot" (TUS, 2016: 9). This is a vision that will have a decisive impact on urban planning, primarily through urban recycling, in order to achieve a good and safe access to spheres of daily activities. The present paper analyses different areas, ranging from scientific data and historical overview in the context of the town to regulation promoting better urban accessibility. Numerous scientific contributions on sustainability and urbanism deal with the subject of the compact city, urban densification and mobility. In the context of sustainable urban forms, densification, activity deployment and mobility are closely related. Their interconnection points towards better accessibility and creation of quality open living spaces. Stronger emphasis on more accessible public passenger transport – along with walking and cycling in the urban streets – diminishes dependence on car use in urban areas. Parallel historical overview indicates that the street as a space of urban traffic is being restored to the people and is once more becoming an urban open public space, suitable for socialising. Simulation of Vision Murska Sobota 2050 on the location of one of town's multi-apartment neighbourhoods points out to changes already in place and to those still to be implemented.

Keywords: Mobility, Traffic, Transport, Walkability, Accessibility

INTRODUCTION

The present paper examines different aspects of the terms traffic, mobility and transport in the case of the town of Murska Sobota. As pointed out by Čerpes (2013: 57), "in discussions on urban sustainable development and planning, the term "traffic" is increasingly displaced by "mobility" and "transport". She explains that "traffic" should be understood as a synonym for "technical aspects of planning and dimensioning of infrastructure". Instead of traffic – in the sense of planning new roads, parking spaces and other associated paved trafficked areas –, the emphasis has moved to urban planning and activity deployment in areas accessible to people. According to her, the goal of these activities is to enable "access to as wide a range of services for as many as possible, under equal conditions and with the least

possible consumption of fossil energy products and the lowest possible environmental pollution".

Urban mobility means re-directing transport towards cycling and walking in combination with public passenger transport, all of which enable the population to reach their desired destinations. Urban accessibility or, rather, daily travel habits of residents, is defined by the five characteristics of built environment (the so-called five Ds):

- Density (of population, dwelling units, employment),
- Diversity (of uses, building typologies, population),
- Design (walking and bicycle-friendly streets, dense and interconnected street network),
- Destination Accessibility (e.g., a 30-min access to workplace reduces the number of vehicle journeys by 20 %),
- Distance to Transit (up to 6-min of walking or 650 m walking radius) (Čerpes 2013: 58).

One of the main documents for the provision of accessibility is Transport Oriented Development (TOD): "The TOD Standard stands for the rights of all to access the city: to walk and cycle safely, to easily and affordably reach the most distant destination through rapid and frequent transit, and to live a good life free of dependence on cars. It stands for access to opportunity, education, services, and all the resources available via no- or low-cost mobility options" (TOD Standard, 2017: 4).

In the context of accessibility, there is an increased focus on walking or walkability. Walkability means "attractiveness of a space for walking; a certain area characterized by the ability to walk through easily, without unnecessary detours or excessive effort. The concept of walkability consists of several components, including presence of pedestrian areas, such as pavements and foot paths, spatial permeability and connection density, low traffic velocity and crossing safety, visual attractiveness of the space, feeling of safety, frequency of use of the path, density of nearby activities, population density in the area, short distances between travel sources and destinations" (IPOP, 2020).

In order to verify the scenario of the "Regional Green Capital", a test case of the densely populated Lendavska Street neighbourhood in Murska Sobota has been made. We tested the density ratio of the neighbourhood vs. that of the town and the accessibility of the neighbourhood to key activities in the town. Analysis of the test case indicates that in order to achieve the goals from Vision 2050 an urban recycling of a wider area is needed, with the emphasis on safer and more attractive footpaths and cycling lanes and by incorporating green elements. Urban planning for better accessibility for cyclists and pedestrians can reduce traffic load and thereby transform streets from trafficked areas into quality open urban areas.

MURSKA SOBOTA 2050: THE GREEN CAPITAL OF POMURJE

The Sustainable Urban Strategy of the City Municipality of Murska Sobota, adopted by the municipality in 2016, includes a vision of development by the year 2050 (TUS MS, 2016: 9). This strategic vision provides for Murska Sobota as the green capital, and administrative and economic centre of the region of Pomurje. Vision 2050 emphasises environmentally friendly technology, sustainable food supply from the town hinterland, and sustainable building and reurbanisation of the town centre. The town is to become a healthy environment of active and lively neighbourhoods, providing a meeting point for the needs of all generations (TUS MS, 2016: 9).

TUS MS with its vision and goals will influence sustainable urban planning development and therefore require necessary interventions into the urban fabric with the emphasis on mobility, especially of pedestrians and cyclists, together with associated infrastructure (cycling lanes and footpaths, benches, bicycle stops, bicycle self-service stations), and the reduction of the share of road transport (cars and transit traffic) through better public passenger transport, completion of the town bypass and Park & Ride systems" (TUS MS, 2016: 88).

In order to achieve mobility goals, it is necessary to perform an analysis of the existing town conditions that has to provide answers to three key questions:

- Are there any goals that have already been achieved in the town?
- Where are the locations of needed interventions?
- Which parts of the town cannot achieve required goals on their own and therefore have to be considered comprehensively, in the context of the town as a whole?

METHODOLOGY

The present article is based on a qualitative survey of relevant literature and regulations on the subject of urban, density and traffic planning in recent years, as applied to the town of Murska Sobota. The paper attempts to address the issue of replacing traffic planning with mobility, a change which in connection with urban density and deployment of activities can significantly alter the image of the street. Such changes may lead to reduced dependence on cars and increase in walkability and cycling, street greening, citizen cooperation, even to improved public health.

THE TOWN OF MURSKA SOBOTA

Murska Sobota has the status of a city municipality (more on the terminological conundrum later) and is the administrative centre of the Mura Statistical Region (Pomurje). Murska Sobota was only granted formal urban status in 1952 in the former Yugoslavia (Hari, cited. in Merica, 2016), and then again in 2000 in the newly established Republic of Slovenia (Uradni list RS, 2000). Territorial surface

of the town is 14.5 km² and according to the latest data has 11,113 inhabitants (SURS, 2019), ranking as only 16th in Slovenia. Geographically, the town is situated in the northeastern part of Slovenia and is an "urban centre at the intersection of four states – Slovenia, Austria, Hungary and Croatia" (TUS, 2016: 23).

Murska Sobota, a former village centre, gradually only acquired its urban image by the end of the 19th c., influenced by the contemporary Vas County Regulations on Buildings and Hygiene, adopted in 1879 in Budapest, since Murska Sobota was then part of the Hungarian part of the Dual Monarchy, specifically Vas County (slv. Železna županija). Regulations were applicable until the 1930s. One of the outstanding parts of the Regulations concerns street planning, requiring that new streets should only be laid out in straight lines and be at least 20 m wide, while both sides of each street should be flanked by 1 m wide pavement for pedestrians (trotoar) and lined with trees all along its length. Urban status was defined by article 28, prescribing the building of walls: "In municipalities with urban status, buildings could only be constructed of stone or fired bricks." Since "even in the 1920s houses in Murska Sobota were still being built of compressed earth and with wooden frameworks, this information allows us to assume that Murska Sobota during the last era of Hungarian rule lacked urban status" (Brumen, 1995: 35).

According to Hari (as cited in Merica, 2016), proper *urban development of Murska Sobota began with architect France Novak in the 1930s. Novak, who became M. Sobota's first contractual architect, later, in 1938, for several months worked in Le Corbusier's studio in Paris, a fact that influenced urban planning development of M. Sobota. Murska Sobota is, indeed, the only town that was completely designed in the spirit of the CIAM methods and on the basis of the principles of functionalist urbanism that were elsewhere broadly implemented only in the 1950s. In his urban plan for Murska Sobota Novak resorted to zoning; he defined four obligatory zones that cover east- and southward spread of the town, nowadays still visible in spatial orientation. According to his plans, the town would cover c. 200 ha and have max. 6000 inhabitants, i.e. 33 inhabitants per ha. His calculations thus envisioned 330 m² of town area per inhabitant. Future growth of the town should reach a maximum of 12,000 inhabitants and thus 165 m² per inhabitant. At the time of Novak's death in 1959, Murska Sobota had c. 6000 inhabitants, while nowadays the population has reached 12,000. In his plans for the transport network, Novak took into account the existing street network, while the transit connection was diverted to the south of the town (the southern bypass was only built in 2019 and the western one is still under construction). The main streets were designed with wide pavements, divided from the road surface by a broad green* caesura *(as laid down by the Athens Charter).*

Further development of the town in the 1960s followed Novak's urban plan with zoning. However, since the 1970s, the town has primarily been developing piecemeal, through individual urban parts such as the densely populated residential area in the north and the new industrial zone, or the urban planning competition for

the town centre and similar unconnected spatial interventions, all of which paid no regard to the broader urban context.

TUS MS and Vision 2050 thus represent an attempt to re-emphasize a comprehensive urban design for the town of Murska Sobota.

TEST CASE: LENDAVSKA STREET NEIGHBOURHOOD

Lendavska Street 15 (Lendavska neighbourhood) is part of the densely populated northeastern part of the town. The neighbourhood was built in the early 1980s and is located next to one of the four approaches to the town, between the town centre on the southwestern part and the industrial zone on the eastern and northern part of the town.

The location of the Lendavska Street residential neighbourhood was dictated by the broader renovation of the northern part of the town at the time (when the roadside buildings, characteristic for the 19th c., were demolished). Furthermore, the location provided for good accessibility (short distances) to the town centre with social activities on the one hand and to the industrial zone with jobs on the other. During the transition to capitalism, most of the industry collapsed, with the result of still visible brownfield sites. The surrounding area consists of large unfinished building sites, abandoned buildings and individual spatial interventions, at odds with coordinated urban planning. Instead of considering a comprehensive solution for the broader northern part of the town, the municipal administration favoured further sprawl of building sites towards the north where a large commercial zone was developed. After the service activities (shops, supermarkets, schools) moved from the town centre to its outskirts, the planned accessibility inside the town was partially destroyed. Lendavska neighbourhood with its wider surrounding area is currently classified as a derelict brownfield site (Koželj, 2016). The area lacks green elements, while most of the open built surfaces serve as parking spaces, which are, nevertheless, too small in number (if prescribed standards were taken into account).

The test case will attempt to verify Vision of Murska Sobota by 2050 as a green town where one can walk or cycle and which is trying to re-establish the broad green corridors, intended for the town inhabitants. Considering the interconnection of density and mobility between the residential complex and the rest of the town, we will apply the latest findings on the subject of urban density and accessibility. The test case should answer the following questions: does this particular neighbourhood correspond to the requirements listed in the scenario of Vision of Murska Sobota by 2050 and are further urban planning measures needed, such as “recycling urban planning”.

URBAN TYPOLOGY AND DENSITY

Vision of Murska Sobota by 2050 predicts that the town will become the green capital, and administrative and economic centre of the region of Pomurje. In order to achieve this goal, we have comparatively used the European methodological manual on territorial typologies, developed by Eurostat (Eurostat, 2018), in order to determine the settlement typology of Murska Sobota with an estimated density, which will be important for further work. The methodology in question provides three main territorial typologies that can, on the most basic level, be divided into three different groups, encompassing grid typologies, local typologies and regional typologies. All of these are tightly interconnected, since they are all based on the same basic building blocks, i.e. "classifying population grid cells to different cluster types and then aggregating this information either by LAU or by region to produce statistics for a wide variety of different typologies" (Eurostat, 2018: 4).

Table 1: Classification of Murska Sobota according to Eurostat methodology (Eurostat, 2018)

Territorial typologies	
Local typologies based on statistics for local administrative units (LAUs)	**Regional typologies** statistics that are grouped according to the classification of territorial units for statistics (NUTS)
Slovenia – municipality : **City Municipality of Murska Sobota**	

Cluster types (*based on 1 km² grid cells*)		
Urban centre	**Urban clusters**	**Rural grid cells**
High-density clusters:	Moderate-density clusters:	Grid cells of 1 km² outside of urban centres and urban clusters
a cluster of contiguous grid cells of 1 km² with a density of at least 1500 inhabitants per km² and a minimum population of 50,000 after gap-filling	a cluster of contiguous grid cells of 1 km² with a density of at least 300 inhabitants per km² and a minimum population of 5000	
	Murska Sobota	

Local typologies (LAU)		
Urban areas		**Rural areas**
Cities	**Towns and suburbs**	
Densely populated areas	Intermediate density areas	Thinly populated areas
where at least 50 % of the population lives in one or more urban centres	where less than 50 % of the population lives in an urban centre, but at least 50 % of the population lives in an urban cluster	where more than 50 % of the population lives in rural grid cells
	Murska Sobota	

According to Eurostat methodology and publicly available data (Table 1), Murska Sobota ranks among smaller settlements (Towns). Towns are defined as having a density of at least 300 inhabitants per grid cell (1 km²) and an overall population of at least 5000 inhabitants. According to the scenario of Vision 2050, the urban settlement may grow into a larger settlement (City), characterised by at least 1500 inhabitants per grid cell and a population of at least 50,000.

At this point, a short explanation is necessary. We have just defined Murska Sobota as a "town" and yet, due to several reasons, the official name of the municipality in question is City Municipality of Murska Sobota. There are 11 such municipalities in Slovenia, with Murska Sobota being the second smallest in terms of population. If Eurostat criteria were applied to the urban centres of these municipalities, only two of them (Ljubljana and Maribor) would qualify as "cities".

URBAN MOBILITY

Transport & IKT communications is the one of the four main areas of TUS MS that places special emphasis on accessibility (using different means of transport in order to access different services) and sustainable mobility (footpaths, cycling lanes, urban passenger transport, P&R, etc.). In order to meet the requirements of TUS MS and Vision 2050, it will be necessary to preliminarily assess the traffic categories, establish the newest trends and orientations for each of those categories, and analyse their role in meeting the required objectives.

Five main categories may be identified in the context of urban transport: transit transport, passenger car transport, public passenger transport, cycle transport and pedestrians (walkability). In order to establish the quality of urban walkable accessibility in connection with public passenger transport and cycling, we have used the guidelines on length of journey and walking time from several documents (TUS MS, TOD Standards, and Decree on Spatial order of Slovenia).

TUS MS provides recommended lengths of accessibility for three selected categories:

- walkability up to 1000 m
- cycling max. 3 to 5 km
- public passenger transport 0 to x km

Article 23 of the Decree on Spatial order of Slovenia among other rules on settlement planning requires:
- development of a unified network of cycling lanes,
- development of a unified network of footpaths with the provision of a 5 min walkable accessibility from residential areas, mixed areas, special areas and areas of social infrastructure to public passenger transport stations,
- development of an efficient network of public passenger transport.

Table 2: Criteria for urban accessibility assessment (source: author)

Accessibility	Walkability		Cycling
	10 min (500 m)	20 min (1 km)	5 min (1.3 km)
Education *(kindergarten, primary school, high school)*	✓ / X	✓ / X	✓ / X
Health *(hospital, health centre, health clinic, pharmacy)*	✓ / X	✓ / X	✓ / X
Services *(shop, market, bank, post office, administrative services)*	✓ / X	✓ / X	✓ / X
Green and recreational spaces *(park, sports ground, children's playground, sports hall)*	✓ / X	✓ / X	✓ / X
Public passenger transport *(urban passenger transport, bus station, train station)*	✓ / X	✓ / X	✓ / X

Walkability for pedestrians has been assessed on the basis of TOD standards stating accessibility of 10- and 20-min walks at an average speed of 3 km/h. At such a speed, it would take 10 min for a pedestrian to reach a linear distance of 500 m and 20 min to reach a linear distance of 1 km. For cyclists, we have used the guidelines in "Bicycle-friendly infrastructure" (in: Ministrstvo za infrastrukturo, 2017: 10), according to which the average speed of cyclists in urban area is 16 km/h. At such a speed, a 5-min cycling would enable a cyclist to reach a linear distance of 1.3 km (Table 2).

ANALYSIS OF THE LENDAVSKA STREET NEIGHBOURHOOD

Lendavska Street neighbourhood is composed of 12 multi-apartment towers and a ground floor supermarket, joined into two forms of construction: closed (grid pattern) construction and open (linear pattern) construction (Figure 1).

Figure 1: Representation of Lendavska Street neighbourhood showing types of construction and green spaces (figure: author)

The closed or grid pattern construction type building is defined as a block that opens into the central courtyard with disjointed corners. The courtyard is surrounded by 10- or 11-storey multi-apartment buildings on the eastern, northern and western sides, while on the southern side there is a ground level building with a supermarket. The central space is intended for open green and built spaces with a small children's playground. On the western side, there is an open or linear pattern construction type building, defined as a lamellate block. The building has 11 storeys and three separate entrances.

The multi-apartment buildings are composed of 318 apartments and a public ground floor with several different facilities (supermarket, catering establishment, business offices, kindergarten and health clinic). The neighbourhood perimeter is paved and serves as a parking area for c. 120 cars (c. 1 parking space per 3 apartments).

The entire neighbourhood area measures 12,149 m² (1.2 ha or 0.012 km²), with 45 % covered by built surfaces. Green spaces represent 14 % of the area, while the rest of the paved surfaces (41 %) are intended for transport. A linear row of tries divides the neighbourhood from the main thoroughfare.

Official neighbourhood population data is lacking, therefore we have used a formula for calculation of apartment density which "defines the number of apartments per hectare (ap./ha)". Mladenovič (2011: 6) writes that "based on the number of apartments per hectare and by taking into account the average household size we can simply reach an estimate of the number of inhabitants per hectare or per square km". Based on the SURS data for 2019, the average household in the City Municipality of Murska Sobota numbers 2.2 members. Using available data, we may estimate that Lendavska Street neighbourhood is very densely populated, with c. 583 inhabitants (58,300 per km²) in a smaller town (767.1 inhabitants per km²), since the population density of the neighbourhood is c. 76 times larger than the average number for the town as a whole.

Mozas (as cited in Mladenovič, 2011: 22) writes that, according to the "building density scale, areas with more than 300 apartments per hectare are considered to be very densely populated urban areas, requiring new approaches to living in high buildings", and adds that it is necessary to verify the "organisation of mobility inside the area and in connection with its surroundings" (in Mladenovič 2011: 9). Such a high density requires provision of a certain quality of living, above all by establishing sufficient green and recreational spaces in the narrower area of accessibility.

In relation to Lendavska neighbourhood, we have verified the following criteria from the table concerning accessibility to selected categories: education, health, services, green and recreational spaces, and public passenger transport (Figure 1).

Figure 2: Representation of pedestrian (500 m and 1 km) and cyclist accessibility (1.3 km) (source: author)

Table 3: Verification of accesibility criteria on Lendavska Street neighbourhood (source: author)

Accessibility		Walkability		Cycling
		10 min (500 m)	20 min (1 km)	5 min (1.3 km)
Education	*Kindergarten*	✓	✓	✓
	Primary school		✓	✓
	High school			✓
Health	*Hospital**			
	Health centre	✓	✓	✓
	Health clinic	✓	✓	✓
	Pharmacy	✓	✓	✓
Services	*Supermarket*	✓	✓	✓
	Market place	✓	✓	✓
	Bank	✓	✓	✓
	Postal office	✓	✓	✓
	Administrative services	✓	✓	✓
Green and recreational spaces	*Park*	✓	✓	✓
	Sports ground		✓	✓
	Children's playground	✓	✓	✓
	Sports hall		✓	✓
Public passenger transport	*Urban passenger transport**	✓	✓	✓
	Bus station		✓	✓
	Train station		✓	✓

** General Hospital Murska Sobota is located outside of town and is accessible by local/urban passenger transport. The local passenger transport station is located next to the main road at the outskirts of the neighbourhood (10 m distance from the chosen point).*

On average, an individual resident of Lendavska neighbourhood can thus within a 10-min walking distance access the majority of five selected categories and within a 20-min walking distance reach the other facilities: the primary school, sports and recreational areas, bus and train station. A resident on a bicycle can in 5 min reach all of the selected categories (Table 3).

CONCLUSIONS

The town of Murska Sobota is a smaller Slovenian urban settlement, with its design still reflecting the original urban plan of architect Novak from the 1930s and with a good accessibility to day-to-day facilities. Nevertheless, the town has been subject to many unsuccessful interventions, such as the migration of social and service activities to the town outskirts, leaving behind an empty town centre. All of this is reflected in the travel behaviour of the town residents, mainly directed towards the town outskirts and not the town itself.

The accessibility analysis of Lendavska neighbourhood demonstrates a need for comprehensive treatment and town planning in order to achieve the goals of Vision 2050. The town administration has responded to the urban spread and associated dispersal of different activities by setting up urban public passenger transport system and cycling networks. The town's cycling infrastructure is linked to the existing pedestrian corridors (pavements), now shared by pedestrians and cyclists. In order to improve urban accessibility, it would be profitable to glance back at the history of the town, when it was in many ways planned on a more human scale, and take visionary steps towards the urban future.

One question that remains is what is to be done with numerous personal vehicles that are cluttering urban open spaces, such as streets, squares, large parking spaces and other paved surfaces. Cars still play an important role as status symbols; therefore a dialogue between decision makers, experts and residents is needed. Higher and better accessibility levels to different facilities and activities could diminish dependence on car use. Streets and squares should be turned into user-friendly open built and green spaces, dedicated to public socialising. In that respect, further dialogue between the town administration and residents on future approaches to the implementation of Vision Murska Sobota by 2050 is needed.

REFERENCES

Brumen, B. (1995). *Na robu zgodovine in spomina – urbana kultura Murske Sobote med letoma 1919 in 1941*. Murska Sobota: Pomurska založba.

Čerpes, I. (2013). Z javnim prevozom uravnan razvoj mest. *Arhitektov bilten*, 197–198, 56-60.

Eurostat. (2018). *Methodological manual on territorial typologies – 2018 edition.* Luxembourg. Retrieved from: https://ec.europa.eu/eurostat/web/products-manuals-and-guidelines/-/KS-GQ-18-008 (accessed 7 Jan 2020).

IPOP. (2020). *Izrazje*. Retrieved from: https://ipop.si/urejanje-prostora/izrazje/ (accessed 16. Dec 2019).

Institute for Transportation & Development Policies (2017*). New York: Institute for Transportation and Development Policy.* Retrieved from: www.itdp.org (accessed 20. Apr 2020).

Koželj, J., Filipič, P., Hočevar, P., Strle, K., Kušar, K., Lavtižar, K., Gracar, M., Cafuta, O. (2016). *Merila in kriteriji za določitev degradiranih urbanih območij (DUO2).* Ljubljana: Ministrstvo za okolje in prostor.

Merica, T. (2016). *Strukturiranost mestnega središča Murske Sobote v uporabnikovi miselni sliki.* Senior thesis. Ljubljana: Univerza v Ljubljani, Biotehniška fakulteta, Oddelek za krajinsko arhitekturo.

Ministrstvo za infrastrukturo. (2017). *Kolesarjem prijazna infrastruktura: Smernice za umeščanje kolesarske infrastrukture v urbanih območjih.* Ljubljana.

Mladenovič, L. (2011). *Kriteriji za trajnostno načrtovanje in gradnjo območij z visoko gostoto poselitve.* PhD. thesis. Ljubljana: Univerza v Ljubljani, Fakulteta za arhitekturo.

Statistični urad Republike Slovenije. (2020, Februar, 21). Available at: https://www.stat.si/

Trajnostna urbana strategija Mestne občine Murska Sobota. (2020, Februar, 21). Retrieved from: https://www.murska-sobota.si/sites/default/files/datoteke/Trajnostna%20urbana%20strategija%20Mestne%20ob%C4%8Dine%20Murska%20Sobota.pdf

STRIATED AND *SMOOTH* IDENTITIES: MAPPING TRIPOLI'S VARYING POLITICAL INTENSITIES

Dina Nashar Baroud
Assist. Prof., Notre Dame University, Louaize, Lebanon, dbaroud@ndu.edu.lb

ABSTRACT

Karami Square is one of the significant central squares in Tripoli, Lebanon. In recent decades, the square has manifested the city's changing political identity, where the spatial relationship that the square's centre has with its surroundings was diverse, resembling varying political statements. These variant spatial relations are weaved and narrated between the area's urban physical definition and the imaginative places that people construct (through events and protests) as they build political meanings around the place (according to De Certeau). This work questions whether it is possible to more clearly formulate such a narration, and, if so, then what the concepts could be for diagrammatically mapping (spiral cyclic diagram) such spaces that are real, imaginative and meaningful (between the centre and its surrounding). And how could such mapping help in understanding the mobile political identity of a city? To approach such questions, this work refers to Deleuze and Guattari's notions of striated and smooth spaces, and proposes that urban spaces that narrate the changing (political) identities are partly defined, striated real, physical spaces and partly unstable, smooth, imaginative spaces. Accordingly, to diagram such spaces is to resolve concepts that can visualize and represent the striated and the smooth. In such an attempt, the paper aims to formulate fields of intensities that are one form of visualizing the urban space dynamics of the variant political identities: fields, intensities and experiences (political identities). Methodologically, parameters are derived from Deleuze and Guattari's principles (points, lines, vectors, intervals and nomadism), as well as allocating spatial interventions (tents,) and digital tools (AutoCAD or similar) are deployed to map these narrations and formulate the fields of intensity of the city's vibrant political identities.

Keywords: striated and smooth spaces, spiral diagram, Tripoli, intensities

INTRODUCTION

One of the basic challenges in reading any urban dimensions is how to draw on the complexity of the urban context that is being tackled. This complexity is inherent in urban dynamics and reflects the spatio-temporal reality, or what can also be termed "dynamic complexity" (Verraest and Keunen, 2012). Accordingly, this reality is built on dynamics that oscillate between what is physical, imagined,

appropriated, perceived and provisioned (Stockmans and Buscher, 2017). So how does it become possible, then, to narrate and interpret such diverse aspects, as well as their distinct spatial and temporal patterns, where what is physical has its own spatial and temporal pattern and logic that is differently conceived and perceived from what is imagined and provisioned in the city? How, for instance, can urban identities, including political ones, be stated where these are the agglomeration of spatial experiences, memories, places and spaces, as well as strategies and tactics? How can these, as they change across time and history, be represented, mapped and interpreted?

Narration can bring together all the elements of such complexity, as narration can deploy and weave exuberant space-time scenarios that might reflect the diversity of the reading of urban political identities (Dai *et al.*, 2018). In this sense, the political identities can be investigated within the interventions, experiences and patterns of the political activities that take place in urban contexts (Gadinger *et al*., 2019). But one questions how to deploy narration in understanding the spatiality and temporality of such scenarios. To delve into this question, this paper aims to conceptualize a diagrammatic mapping that might illustrate the "dynamic complexity" of narrations that tell stories about changes in the political identities of a particular urban context (Gadinger *et al.*, 2019). This diagram aims to map the space-time components of the narrations, or what will also be referred to as territories. It proposes that what defines these political territories spatially and temporally are the intrinsic characteristics of what Gilles Deleuze and Flèx Guattari refer to as *striated* and *smooth* spaces (1987). The work further suggests a cycle– specifically a spiralling cyclic form – can diagrammatically map the territories across the variant space and time aspects of urban political identities and narrations. The spiral, in this sense, can reflect the political narration's space and time qualities, such as fragmentation, continuity and rhythms. In such an attempt, the paper traces the political identities by drawing territories as well as mobility and intensities (Rossolatos, 2018) in spaces that are striated and smooth.

Taking the case study of Abdul Halim Karami Square in Tripoli, Lebanon, the paper examines the political activities between the square's centre and the surrounding spaces and constructions. Methodologically, the work refers first to a basic literature review in order to establish the theoretical frame and the main propositions of the work (De Certeau, 1984; Deleuze and Guattari, 1987). Second, it builds on interventions taken from Karami Square. However, due to limitations, the work refers to only one level or element being studied, namely tents that have been installed at various political activities and events. The paper attempts to map the tents in the spiral diagram that is conceptually verified. AutoCAD is used as a tool for drawing. The overall interpretation of the diagram aims to reveal the potential indicators of the intensities and mobility of the political activities, hence its changing identity.

THE CYCLIC NARRATION: CIRCUMSTANCES AT KARAMI SQUARE

On 17 October 2019, Lebanon underwent an unprecedented national revolution, which transformed and reshaped its main public spaces into spaces of protest. The revolution was due to outrage against the country's (political) corruption and deteriorating economic, social and environmental conditions. Among the many public spaces that witnessed ongoing gatherings, Abdul Halim Karami Square in Tripoli was one of the most active in the country. For several consecutive weeks, thousands of protestors met at the square on a daily basis (mainly in the evening), expressing their protests through various activities and events. The site of Karami Square changed, then, to become a public space of political manifestation, marking not only a statement but also the city's political identity.

Yet this was not the first time that the square had become a site of political activities drawing the city's identity. For decades, Karami Square has been a place for events, protests and activities that keep on narrating, each time in different forms, the changing political affiliation and identity of the city. The square, which marks one of the main entrances to the city, is circular in form, with a roundabout. Originally the square had at its centre a huge statue of Abdul Halim Karami (one of the independence politicians). Yet in 1976, at the beginning of the civil war, the statue was bombed and broken into pieces. Several years after this, a large "Allah" (God) calligraphic sign was installed, beneath which, and on a separate board, the following statement was written: *Tripoli Castle of Muslims* (author's translation).

The square is surrounded by both low and high mixed-use buildings. Further, it stands almost 100 metres away from the city's Serail (the general security government building) and court house. With the proximity of these buildings, and having a vast space around the centre, cornered by an unfinished construction that can be utilized for visual political statements, Karami Square resembles an urban space that constantly houses political events, outrage, protests and even celebrations. Examples include the bombing of the Karami statue (1976); the 14th March uprising after the assassination of the prime minister, Rafic El Hariri (2005); Islamist protests against the long government detention of Islamist radicalists (ongoing for the last few years); and the latest 17th October revolution against the country's recession (2019).

Yet each of these instances have projected a distinct political identity and moments of tension. Through this, Karami Square is an example by which "[t]he active shaping and reshaping of the urban public landscape is an important political mechanism in the … struggle for control and representation" (Stockmans and Buscher, 2017). The (re)shaping of political spaces, as many would agree, is articulated by experiences. These experiences are not definite, but follow "the notion that we do not only see the world from a rational, logic-scientific viewpoint, but also from a spontaneously narrative one" (Verraest and Keunen, 2012). Accordingly, the reshaping is the subject of a sharp physical definition of the

political public spaces and representations, as well as the narrations of these places and moments.

Michel De Certeau suggests how this works: "narrated history creates a fictional space. It moves away from the 'real' – or rather it pretends to escape present circumstances: 'once upon a time there was …'" (De Certeau, 1984), deviating these circumstances from their actual time/space frames into the fictional time/space of the narration. De Certeau continues that the narration's circumstances are restructured in a new logic and identity – that of the fictional space – where time and space follow new interrelationships of compactness and extension:

> *It recalls still more the mathematic theme of an identity correspondence between a circle and its centre. But here extension means duration, and concentration means an instant. By means of this substitution of time for space, the correspondence moment of the unending experiences (the circle) with the punctual moment of their recapitulation (the centre) could be regarded as the theoretical model of the occasion. (De Certeau, 1984)*

This mathematical restructuring is a formulation of the fictional circumstances. This formulation is defined by the centre, which is the inevitable moment of the narration (the place, the hit, the actual event) and the circle (the experience, the imagined place, the individuals). Further, this formulation is constant and flexible, relying on the one hand on the persisting actual spaces of the centre-circle, which articulate the geometry of the narration, and, on the other hand, on the "unending experiences" between both the centre and the circle's unending limits – hence the flexibility and tension between the centre and the circle.

The interpretation of any political identity (as in the case of Karami Square) can be resolved, in one instance, by this mathematical spatial narration. Sepcifically, to diagrammatically map the interrelations between the physical and the experienced – the circle and its centre – might visually represent how political events at a particular place manifest, through their location, perspectives, vision, and mobility disseminations. However, to proceed with the mapping, the circle-centre is reconsidered.

THE SPIRAL: MAPPING THE STRIATED AND SMOOTH SPACES

De Certeau's circle-centre (1984) potentially lacks a detailed representation and systematization of the full experience and temporal dimensions of any narration. The compactness of any narration within the circle limits the expression of the open, unending reshaping of the circumstances. An alternative form for interpreting and mapping urban spatial narration could be cyclical and/or spiral.

The cyclic model can be flexible. Unlike the linear model, it allows the mapping of various spaces and temporalities or various rhythms and patterns of events: those that resemble the complexity of any circumstances including the ongoing experiences and the non-linear temporality of the events (Chirobocea, 2017).

Bruno Latour suggests what temporality (and space) can be if conceived in a cyclic/spiral way, where "[e]lements that appear remote if we follow the spiral may turn to be quite nearby if we compare loops" (Latour, 1993). Hence, the spiral constructs a physical existing entity, with its looping line and its open, negative space – that which stretches between its loops. Through this, the spiral is susceptible to mapping along its line what is determined, and in its open space what is vibrant and indefinite. Consequently, the spiral can map what Deleuze and Guattari (1987) refer to as *striated* and *smooth* spaces. These spaces have intrinsic characteristics that reflect the space-time circumstances of narration and the reshaping process of any urban context, as people try to manifest their identity in such spaces. But what are these spaces? And how can they be associated with the spiral's components?

To Deleuze and Guattari (1987), the striated space is a determined territory that is defined by metric lines that join points. The smooth space, on the other hand, is rather a territory that is constantly being defined by lines or vectors that are not metric but directional (Deleuze and Guattari, 1987). Their directionality means that these lines are in constant *flight*, de-territorizing the territory and constructing a vibrant and indefinite territory (Fişek, 2018). Deleuze and Guattari write: "In striated space, one closes off a surface and 'allocates' it according to determined intervals, assigned breaks; in the smooth, one 'distributes' oneself in an open space, accordingly to frequencies and in the source of one's crossing." (Deleuze and Guattari, 1987)

In such spaces, the circumstances and experiences of narration are as follows: the striated space – the spiral's looping line – can represent the narration's realistic context; the smooth space – the spiral's open, negative space in between the loops – can represent the unending experiences and de-territorization/reshaping of the story, specifically evidences (interventions during political activities). To test whether this can be demonstrated, this paper proceeds as follows: 1) illustrate a diagram showing the spiral with its striated and smooth space; 2) allocate certain interventions realized during political events at Karami Square; and 3) suggest and discuss what indicators can be derived from the diagram to establish grounds for changing political spatial interventions.

Mapping the striated space

To construct the diagram, a spiral is drawn, mapping both space and time. To map space, the centre of the spiral should be the centre of Karami Square. The buildings and surrounding spaces are then allocated around the centre, as in the real situation

and planning. The buildings are represented as dots of different scales, indicating the distinct footprints of the represented buildings (small dots for small-footprint buildings, medium for medium-footprint and large for large buildings). To project the temporal aspect of the narration (the time of the political events to be mapped), the buildings/spaces are diverted and arrayed along the loops; the past events are indicated at the centre of the spiral and the latest events at the outermost loop of the spiral (so that history is delineated from the centre outside, with the centre being the oldest and the ending of the spiral the newest). Consequently, buildings and spaces that were the locations of past events are diverted to the closest loop to the centre, while those buildings and spaces that were the sites of recent events are diverted to the outermost loops.

By allocating and directing the buildings/spaces in relation to the spiral's centre and its loops, the physical and temporal mapping of the events are represented as striated spaces defined by both their actual physical and temporal dimensions and by the spiral's striated elements (centre and loops). The construction of this element and the element that follows – the smooth space – refers to and relies initially on Deleuze and Guattari's (1987) striated and smooth spaces. Consequently, the allocation and mapping of the context of Karami Square is, on the one hand, a striated allocation following "determined intervals" defined by points and lines between points (as Deleuze and Guattari would have put it).

Mapping the smooth space

The mapping indicates the intervention (as imagined) of the events' smooth space (narration of individual experiences). As discussed above, this is delineated within the negative space between the loops. According to Deleuze and Guattari (1987), the smooth space is rather a *distribution* of experiences. Consequently, to concretize that spatial distribution, a grid is resolved around each building and space. The purpose of defining the grid within these vectors is to establish the territories of the smooth space. Further, the grid establishes a neutral ground, if not a mesh that can inhabit diversity and flexibility within its premises (Morton, 2013); the lines of the mesh and the negative space can be the ground on which the mapping of the individual experiences and interventions can be projected.

Among the many alternatives that can be selected to map experiences, what is suggested is to map the "placeness" of the experiences: the interventions. However, due to word-count limitation and the exceptional outdoor measures due to the COVID-19 lockdown, this work examines only tents as one possibility for diagrammatically demonstrating the spatial and temporal interpretation of Karami Square.

To reflect this in the diagram, tents are drawn as small squares in the grid of the smooth space of the spiral. Tents are distributed, as in the real context, with respect to the space/buildings around which the event is taking place. It is important to note

at this point that this representation of the tents does not, however, show the actual spatial mapping of the tents, but rather their variable intervals and directional relations with the constructions and spaces on site, as well as the intensity and flow of the events, as discussed below.

To exemplify, two events are considered: the first is the ongoing protests of the Islamists, and the second is the 17th October protest. In this demonstration, curved vectors are further added, which join the tents' array and the spectrum of the trajectories of each tent. Further, the curved vectors shape the fields of the diagrammed events (Figure 1). Mapping these fields of intensities is an attempt to suggest indicators of how to interpret changes of political identities in the square.

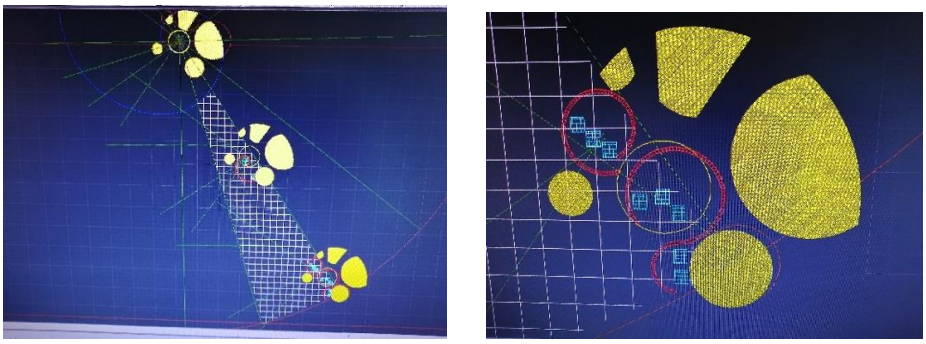


Figure 1: Spiral Diagrams

CONCLUSIONS

What is suggested at the moment is that the diagram could indicate political intensities and their flow. By analysing and comparing the spatial distribution of tents across the loops, what could be defined are indicators that can characterize the political fields of intensities at the location. Essentially, these indicators and characteristics can be subject to "rhythmanalysis" (Brighenti and Kärrhol, 2018), or the question of continuity and discontinuity between the striated elements in the diagram and the smooth distribution (of tents) in between the spiral loops. The diagram can indicates the historic projection across the loops (to map the changing political rate), the tension and proximity between the striated and the smooth experiences and the distribution of events and imagination (to map the intensity of struggle and protest between demonstrators and authorities), the changing pattern and flow between both spaces and across time (to map the persistence and strategies of the political activities), the scale of the presence of the interventions/tents (to map the tactics of interventions and the imagination, provision and prospects of the activists), and finally, the temporal flux that exists between the centre and its surroundings. The task that lies ahead would be, then, to formally develop a more elaborate spiral diagram that can encompass diverse and more complex layers and levels of the spatial and temporal political situations and,

materialistically, to develop what could provide evidence for the spatial interrelation between the striated and the smooth spaces.

REFERENCES

Brighenti, A. M. and Kärrholm, M. (2018). Beyond rhythmanalysis: towards a territoriology of rhythms and melodies in everyday spatial activities. *City, Territory and Architecture 5*(4).

Chirobocea, O. (2017). Perspectives on the relation between history and fiction. *Philologica Jassyensia*, *2*(26), 191–202.

Dai, T., Zhuang, T., Yan, J. and Zhang, T. (2018). From landscape to mindscape: spatial narration of touristic Amsterdam. *Sustainability*, 10 (2623).

De Certeau, M. (1984). *The Practice of Everyday Life*. University of California Press.

Deleuze, G. and Guattari F. (1987). *A Thousand Plateaus: Capitalism and Schizophrenia*. Continuum.

Fişek, E. (2018). Palimpsests of violence: urban dispossession and political theatre in Istanbul. *Comparative Drama*, *52*(3), 349–371.

Gadinger, F., Ochoa, C. S. and Yildiz, T. (2019). Resistance or thuggery? Political narratives of urban riots. *Narrative Culture*, *6*(1), 88–111.

Latour, B. (1993). *We Have Never Been Modern*. Harvard University Press.

Morton, T. (2013). *Hyperobjects: Philosophy and Ecology after the End of the World*. University of Minneapolis Press.

Rossolatos, G. (2018). Post-place branding as nomadic experiencing. *Place Branding and Public Diplomacy*, 14, 285–304.

Stockmans, J. and Buscher, K. (2017). A spatial reading of urban political-religious conflict: contested urban landscapes in Addis Ababa, Ethiopia. *Journal of Modern African Studies*, *55*(1), 79–104.

Verraest, S. and Keunen, B. (2012). Introduction to new work on landscape and its narration. *CLCWeb: Comparative Literature and Culture*, *14*(3).

THE EVOLUTION OF THE SHARED SPACE

Mia Crnič
univ. dipl. inž. arh., Faculty of Architecture, University of Ljubljana, mia.crnic@gmail.com

ABSTRACT

This article will address the topic of shared space, which is an approach to designing open space arrangements within urban centres. It is characterized by blending pedestrian, cyclist, and motorized traffic. All users can move freely within the Shared space, since the space can be moved arbitrarily and is not divided into individual lanes. In addition to the indivisibility of space into individual lanes, the main features of the Shared space are the arrangement of the space into one level and its non-signalization. Shared space should be based on the equal use of space, where the main mode of communication for all users is eye contact.

Shared space as a form of public open space regulation has experienced tremendous growth over the last decade and is increasingly being introduced as a way of regulating city centres. Yet, the concept of shared space is not new. This article will summarize the historical overview of when and how shared space came into use, what influenced its creation, who were its originators, etc.

This article shows that the way public space is regulated by shared space principles has already been known and used even before the greatest developments that have spurred the emergence of urbanism that we know today

Keywords: Shared space, public open spaces, historical evolution, traffic

INTRODUCTION

"Shared space" has been an increasingly more popular approach to designing city centres and it deals with the problem of infrastructural connectedness of the city on one hand, and the creation of an open public space on another. Shared space conceptually blends the traffic and the street (shared space = traffic + street), where it can be used as a spatial cluster by pedestrians, cyclists, and bikers.

The main characteristic of shared space is its non-segregation into lanes, creating a space where all types of users are gathered on the same surface. This approach aims to ensure the flexibility of the space, free crossing, and the attainment of its primary goal: to create an equal space for everyone.

Shared space extracts and clears the space. It designs a space where the emphasis lies on the city and the pedestrians, not the traffic. Such an approach allows creation of safe urban public and housing space (Grey and Sindall, 2012).

The removal of traffic signalling is the source of its alternative name: "naked streets" (Gillies, 2009).

Besides technical characteristics of the street profile organization (non-segregation into lanes, single level for walking or driving surfaces, no traffic signalling), the shared space is characterized by its sociological and psychological influence. Its "nakedness" conditions the necessity of "communication" based on eye contact among the users. It is meant to enhance the attention between the users and visual interaction among pedestrians, cyclists, and drivers, thereby affecting the provision of safety in the space.

Besides the aforementioned social interaction, shared space could contribute to the sustainability of urban centres, reduce traffic jams, and strengthen the content in the space.

On one hand, shared space represents an element in the urban structure connecting places and being often understood as a traffic-engineering system. However, besides traffic supply, it is also a form and a type of a public open space, a space for life in the streets as it generates activities happening in it or next to it.

In order to understand the actual role of the shared space in the development of public and traffic spaces of modern cities, it is important to look back at a time when the idea of a common traffic space first emerged and critically evaluate the development of the phenomenon as well as its influence on the development of the cities.

THEORETICAL BASIS FOR THE EMERGENCE OF THE SHARED SPACE

From the end of the 19th century, there were no special methods of traffic planning, since there was no need for it due to the way in which cities were organized. Cities were typically designed as compact central structures with a radial segregation. The hierarchy of city districts would fall from the centre towards the outskirts and was entirely connected by equivalent concentric traffic (linking) routes.

At the turn of the 20th century, the boost of scientific research and design has projected and influenced the continuity of the development of science, technology, energy, industry, traffic, trade, and society. The process of development continued even after the two world wars, when the economic development strengthened even further. Consequently, industrialization saw a steep rise (Tepina, 1996).

This was an era that led to large shifts in the area of architecture and urban planning, as well as planning of traffic spaces.

With industrialization and development, the turn of the century brought along the transformation of the city. The emergence of the modern city was presented in the fundamental works of the time, which simultaneously outlined the guidelines for the planning of the city: Ebenezer Howard (Garden Cities of To-morrow, 1898), Soria y Mara (Linear City, 1882), Tony Garnier (An Industrial City, 1904), and Camilo Sitte (The Art of Building Cities, 1889). The compact design of a city with a single consolidated centre began to fall apart. The centre either became fragmented into several smaller units or began to stretch and expand within the entire urban design. An image of a new urban structure emerged, comprising of a large number of smaller centres - urban units - which had to be attached to the infrastructural arteries. The system of connections, which enabled connectivity and accessibility of individual units and thus facilitated the city to function as a whole, gained a new important function; ultimately, it even began to help create the city.

The foundations of modern urban planning were built in the early 1920s (1914). Urban planning became more scientific (Van Eastern-Fluck & Van Lohuizen Fundation id, 2014).

In 1928, the first CIAM conference was held in Berlin. It pointed out principle issues regarding the quality of living (social, educational, and cultural issues). The congress advocated for building an industry, which was beginning to transform from traditional to modern and highly-developed, organizing urban living (residential and mass construction, work, recreation, and traffic), and adopting non-intrusive monumental architecture (Van Eastern-Fluck & Van Lohuizen Fundation id, 2014).

With these terms, they tried to teach people how to live again (Matysek-Imielińska, 2020).

One of the most important and key events affecting the development of urban planning and architecture in Europe was the fourth CIAM congress held in Athens in 1933. The architects of CIAM created images of a functional city which responded, like “an organism”, to all changes brought upon by the industrial revolution at the end of the 19th century (Van Eastern-Fluck & Van Lohuizen Fundation id, 2014).

The congress set guidelines for planning: residential areas should always react to natural conditions and circumstances and provide the planting of greenery in the neighbourhoods. Choices for the location of the industry and its impact should be made in an informed manner. Transport connectivity should be enhanced, separation of traffic categories should and traffic bans in the residential areas should be adopted. Assisted living areas with a collective consciousness should be established. Among other things, many advocated to situate smaller and lighter

industrial installations, which would not have a negative impact on health and living environment, within the residential areas like shops and the craft industry. This was the outline of the guidelines for a modern functional city, which has been deeply rooted into urban planning even to this day. The fourth CIAM congress introduced city zoning, where individual zones are segregated based on their functions. With this approach, the city became clearer, more manageable, legible, and segregated based on specific uses (Van Eastern-Fluck & Van Lohuizen Fundation id, 2014).

The system of original solutions and projects for connectivity and city zoning faced first criticism in the 1950s as the two world wars helped both define and destroy European cities. The renovation of cities was necessary, leading to new spatial approaches and projects. In 1953, the ninth CIAM congress was held. There, a group of architects operating under the name of "Team 10" made an appearance (Van Eastern-Fluck & Van Lohuizen Fundation id, 2014). While they still advocated for the segregation of the city into four basic program zones, the emphasis was put on the connectivity of the existing life of the people within the existing houses, streets, areas, and the city itself. Team 10 reinforced their position at the tenth CIAM congress in 1956. They advocated for community, spatial zones, social interactions, and connections. Consequently, the development of the city began to expand into the public sphere. The criticism reached international levels, becoming impossible to ignore. The role of city segregation into individual functions began to diminish. The idea of the importance of the city's cultural identity started to rise to the top of the agenda, as well as the role of open public spaces which were lost during wartime (Van Eastern-Fluck & Van Lohuizen Fundation id, 2014).

The policy of traffic segregation was most clearly and firmly supported by a committee chaired by Colin Buchanan. His ideas on segregation were published in a report called Traffic in Towns in 1963 (Hamilton-Baillie, 2008). He claimed that in the areas of increasing traffic, traffic should be separated from public spaces, exercise spaces, and spaces for social interactions. This policy was backed by the United Kingdom's then Ministry of Transport. "Segregation should be the keynote of modern road design," was Buchanan's final report in 1966 (Roads in Urban Areas). What emerged was an urban landscape of underpasses and overpasses, obstacles (e.g. speed bumps, bends, etc.) and signalling systems, which served as the main ingredients for a modern city (Hamilton-Baillie, 2008).

A few years later, it became clear that the division of space into individual lanes was not an appropriate method to provide safety and lower the number of traffic accidents, also in addition to not enabling the city to "live". By prioritizing the design of the space to accommodate cars, other aspects of city living began to decline. Freund and Martin (van der Hoek, 2011) stated that the modern urban landscape, which favours the car by segregating the space, consequently hinders the development of the urban landscape and impedes the movement of people. The criticism did not only touch upon the segregation of space for people and motor

traffic, but also the segregation within neighbourhoods and their component parts as well as the impact on social and economic environment. Individuality and autonomy of vehicles proved to be problematic, as traffic transformed the open public space (especially in cities). As stated by Urry (2006), the result of segregation into individual traffic lanes lead to the individualization of the community, making the interactions between people increasingly scarce (van der Hoek, 2011).

The interest in the potential of integrating traffic in the public open space started to emerge on local, national, and international levels with a concern to improve the state of the streets and the "street landscape". It has touched upon several interconnected topics, e.g. environmental issues in regards to emissions, pollution, noise, etc. It also touched upon the impact on economic activity, traffic flow of pedestrians, cyclists, motor traffic, and, consequently, the emergence of traffic jams. The interest even reached impact beyond economic activity, such as general population health, mental health, obesity, public safety, quality of life, and cohesive community (Hamilton-Baillie, 2008).

A step away from the modern design of cities would thus lead or promote a sustainable development of cities, where topical spatial questions were put to the forefront. This movement would go hand in hand with the approach of modern urban planning, where sustainable goals are not only environmental but also stand for the sustainable development of the social and economic environment. Jabareen (2006) draws attention to parameters which affect the development of a sustainable urban form, including compactness, sustainable transport, density, and diversity. All these elements are related to the impact of cars on the city. A compact city would thus have short connections for daily migrations within the city. This would encourage more active models of transport. Short distances in the city structure would enable the use of cycle transport and pedestrian traffic, thus making people feel safer (van der Hoek, 2011).

The latter criticism of the modern city design led to the emergence of new concepts of applicability and segregation of space between diverse users.

The application of traffic into the open public space began developing at the end of the 1960s and the beginning of the 1970s based on Buchanan's ecological zones. German and Dutch architects saw Buchanan as a spatial pioneer because of his way of traffic calming and urban development policies. De Boer applied those ideas in the project called Delfta, whereit emerged with the so called "woonerf" (Gharehbaglou, Khajeh-Saeed, 2018).

"Woonerf" realizes two important facts: first, it enables optimal opportunity for space users while prioritizing pedestrians, cyclists, and public transport, and second, it revives traditional urban spaces as well as residential areas. The latter provides and meets the criteria of "woonerf" having to be safe and accessible to all

users (including seniors, children, and the disabled). It suggests a sense of belonging (Gharehbaglou, Khajeh-Saeed, 2018).

At the end of the 1970s, a Dutch traffic engineer Hans Monderman began developing the "woonerf" concept and applying it in non-residential areas of urban and rural settlements in the Netherlands, which marks the beginning of the "shared space."

TRAFFIC SPACE MANAGEMENT SINCE THE END OF THE 19. CENTURY

The turn from the 19th to the 20th century was marked by the development of science and technology. It was also a time when two key developmental phenomena emerged: concrete and automobiles. Both were the result of interactive components of scientific research and industrial revolution. Thus, concrete revolutionized the development of architecture, whereas the automobile revolutionized the development of urban planning. Both emerged more or less simultaneously. The beginning of the petrol engine development dates back to 1885, when Daimler developed the first liquid petroleum vehicle. The mass use of concrete as building material began in 1875 (concrete as building material was invented by John Aspin in 1824). Reinforced concrete was invented between 1867 and 1870, when it was patented by Joseph Monier, whereas the boost in the use of reinforced concrete began in 1885 (Tepina, 1996).

Concrete enabled the construction of larger building volumes, overcoming wider ranges, reaching greater heights, and the possibility of bearing greater loads. It facilitated mass production of building materials and prefabricated construction technology (among others the applicability for paving and road surfaces). All of this affected the development of architecture, experimenting, the emergence of new building types, etc. On the other hand, the rise of the automobile has made remarkable shifts in urban planning or functioning and organization of the cities. Travelling larger distances became easier, and the cities began to connect with the outskirts, villages, and other cities, which affected regional connectedness and development. The emergence of the automobile had a much larger impact on the system of urban planning than that of the railway before it (Tepina, 1996).

The establishment of the road network and its hierarchic, yet adjustable structure (reaching all from a distant highway to a definitive system of residential streets), created a diffusion of urban structure beyond compare (Hauck, Kleinekort, 2010).

The development of the entire utility infrastructure (electricity network, telecommunication systems, etc.), which is placed separately from the road system, contributed to additional segregation of space (Hauck, Kleinekort, 2010).

The first signalised pedestrian crossing was placed in London in 1868, at George and Bridge Street crossing next to the Parliament. In 1905, Eugene Henard

published his proposal on the organization of the traffic roundabout in Paris (Place de l'Opera), where the traffic system was organized by underpasses and lanes segregated between pedestrians and (still used in the day) carriages (Hamilton-Baillie, 2008).

In the beginning of the 20th century, first CIAM conferences were held as a response to new situations and space requirements, since the city as it was before the industrial revolution was no longer capable of meeting new needs. Architects were searching for new spatial solutions, ways of complementing the old with the new, ways of designing and placing new structures, and ultimately ways of connecting all built structures.

This saw the rise of various exhibitions, catalogues, and competitions, which were either looking for or exhibiting new spatial solutions for the cities.

One of the first and most important exhibitions of urban planning was held in Dresden in 1903. The catalogue was edited by Robert Wuttke. The exhibition was directed towards a technological modernisation of the cities and represented a catalogue of characteristics of the modern city life – the infrastructural network (electricity, plumbing, sewerage, garbage, etc.), the supervision of construction works, housing, public arts, fire stations, educational institutions, public transport, etc. (Van Eastern-Fluck & Van Lohuizen Fundation id, 2014)

In 1910, a big exhibition in connection with a design contest (1911) which examined Dusseldorf was held in Berlin. Along with the exhibition, a catalogue edited by Werner Hegermann was published. The first part of the catalogue showed the development of Berlin, which was presented in various ways as an example of chaotic growth of an industrial city. The development of the modern city within the historical design was more or less a pioneering attempt. The result of the first part of the catalogue shows that year 1910 saw the beginning of urban planning in Berlin. An important part of the catalogue was its second part. There, Hegermann dealt with the issues of traffic and city reconstruction. Modern railway transport has already influenced the transformation of the traditional image of cities in the 1910s as compact and dense. London, as well as Berlin, were extremely decentralized. The motor problems in city centres (Paris) presented additional difficulties. An answer to the latter issue was toorganize public passenger transport within cities (e.g. Eugene Henard, traffic solution in Paris, demonstrated by a series of publications between 1903 and 1909) (Van Eastern-Fluck & Van Lohuizen Fundation id, 2014).

In 1925, Van Eesteren won the international competition Unter den Linden in Berlin. The proposed solution set high-rise office towers in the historical city. Hermann took quite a critical view towards the suggested solution. He also emphasized the problem of growth in traffic which could arise due to new buildings, since the creation of the urban design did not tackle this problem (Van Eastern-Fluck & Van Lohuizen Fundation id, 2014).

In 1926, a new competition on traffic arrangement of cities was held in Paris. More urban planners took part in the competition, including Van Eesteren and colleagues. Pineau showed a new approach to solving issues caused by a sudden growth in motor traffic. Pineau attempted to solve it by overlapping networks: the existing historical network of Paris was overlapped with the traffic network. The concept originated from attractive drawings by Van Eesteren that showed an image of Paris in the future. Ultimately, the result of overlapping, or the merger, was not the solution for this problem. After the competition, Van Eesteren kept working on solving the issues with traffic. This time, he merged the theoretical model of modern office towers with the traffic or traffic roads and adjusted everything to the existing historical network. This showed that solving emerging issues does not lie in pretty pictures (which show only the illustrative image of the city), but in an integrated and well-thought-out spatial organization of the city and urban life (Van Eastern-Fluck & Van Lohuizen Fundation id, 2014).

In 1930, Le Corbusier introduced a project called Villa Radieuse, which shows an example of possibilities of combining modern technology with the house and traffic. At the same time, the project reflected Le Corbusier's belief that the existing cities do not work properly (are chaotic) and do not respond to the change of the times and development. In his opinion, cities were in dire need of restructuring in terms of being able to respond to the mobilization and function along with it (Van Eastern-Fluck & Van Lohuizen Fundation id, 2014).

The introduction of city zoning into individual zones began to expose issues in regards to their interconnectivity and supply. Le Corbusier found the answer to the mode of connectivity and city zoning in the way it was connected. He believed that a city could live only if it was clearly marked in a plane or the axis and the majority of traffic ran on this axis. He saw bends and curves as dangerous obstacles paralyzing the city (Van Eastern-Fluck & Van Lohuizen Fundation id, 2014).

After the 1933 CIAM conference in Athens, several new approaches, where car traffic is separated from pedestrians and cyclists, have emerged.

Examples of projects exploring the options of space segregation[1] based on different users:

- Frank Lloyd Wright, The Living City, 1958.
- Le Corbusier, Vertical garden city, 1945.
- Hans Schauroun, 1945 and 1948. (Hauck, Kleinekort, 2010)
- Luis Kahn, 1956-1957.
- Le Corbusier, hospital in Venice.
- Edvard Ravnikar, Ferantov vrt (the Ferant Garden), 1975.

[1] *The principle idea of space segregation is explained below.*

All projects share an even more radical segregation of space. In addition to the horizontal segregation of space based on users, the space began to be segregated vertically as well.

However, the period after World War II began revealing first signs of weaknesses of segregating traffic into individual lanes and the emergence of car traffic in the area of public surfaces: it cut up the space.

The pioneers of merging traffic lanes and implementing the approach of "the car as a guest in a given space" were Joost Vahl and others, their beginnings set in the Netherlands. First examples of new spatial solutions began emerging within residential areas with an aim to lower the impact of traffic on the quality of the social space and the creation of a safe space suitable for children. Vahl and colleagues removed obstacles, curb stones, and road signs, or replaced them with more attractively designed ones, etc. The maximum vehicle speed was adjusted to the speed of the pedestrian (30 km/h), giving the pedestrian an absolute priority. The road thus became a part of the public open space, furnished with urban equipment, plantings, and playgrounds for children. In 1976, the Dutch government recognized and formalized the "woonerf" concept approach, which designed a road with slow traffic (Hamilton-Baillie, 2008).

If the basic thesis was that cities were losing life, "woonerf" became a public open space acting as a "living courtyard", enhancing safety, social interaction, and improving the quality of living (Gharehbaglou, Khajeh-Saeed, 2018).

The "woonerf" concept caught on well in the Netherlands and other parts of Europe. In the 1990s, the United Kingdom government began to promote test projects of the "woonerf", which developed into the "Home Zones" pilot project. The image of streets should thus work as an external room of the cities through which cars drive slowly, being mindful of the urban equipment and people (Gilles, 2009).

The beginning of the shared space is marked by Monderman's project in the village of Oudehaske in the Netherlands (mid-1980s) where he applied the characteristics of the "woonerf" into a rural and programmically mixed space. The main road to Oudehaske before the introduction of the shared space was represented by fast driving cars, rendering the pedestrian helpless when crossing a space. Monderman avoided the approach of installing elements or signalling systems, which would slow down the traffic. He experimented with a simple urban and landscape design, which emphasized the history and context of the village. He removed all common street elements (road signs, traffic lights, speed bumps, etc.). With this approach, he managed to reduce the speed of the traffic by 40% (Gilles, 2009).

DISCUSSION AND CONCLUSION

A survey of the development of the city traffic space shows its gradual transformation. From the history of the already existing, merged, uniform public space that was typical for cities before the industrial revolution, to its opposite in the time of modernism, when car traffic forced all other users out of the public space, back to a mutual, uniform public space, where there is no hierarchy of users based on their means of transport. The modern shared space becomes a space without rules and labels thoroughly determining mandatory behaviour of the users.

Shared space strips the space completely: it excludes segregation to individual lanes and signalling, and merges the space into a unified gesture. It erases everything, even whatever was produced by development. It can be understood as a return to a time before the industrial revolution. In a way, shared space shows what public spaces looked like in the times of first civilizations.

As mentioned in the introduction, the industrial revolution had an overall impact on the development of various fields, which meant an overall transformation of city structures (cities and population density, linking the existing city structures with new ones, linking the city with the outskirts, etc.), reflected also in the changes to the traffic space. It became characterised by cars and other types of motor traffic that was caused by the technological development. An increasing number of vehicles (as well as higher speed) dictated several considerations on the new organization of road profiles, which would enable connectivity (transport of goods and people) on one side while providing safety and hierarchy between different types of users on the other.

In late 19th and early 20th century, the organization of the traffic space began to clearly define segregation into lanes and regulation of crossing intersections or road profiles. The segregation into lanes enabled the establishment of rules, such as who can use individual lanes and under what conditions and ways can individual lanes be used (direction of movement, speed of movement, crossing points, etc.). The pedestrian, the most vulnerable user, was assigned space at the edge of the street, which enabled safety and contact with the buildings' ground floors, while the inner lanes became an area of faster flows intended for motorised traffic.

Connectivity and safety of users increased by segregating the lanes. Yet, the motorised traffic flows have created a considerable border inside the space. A reciprocal cross-linking (as well as crossing), especially by the pedestrians, was enabled only at specific crossings. It was difficult to develop activities in and alongside the street space.

An answer to the problem of how to successfully merge cross-linking/crossing (of pedestrians and cyclists) and the longitudinal connectivity of the lanes (especially faster flows) was found in the emergence of new spatial concepts, which began to segregate the space even further based on the type of users and their main

characteristics (first half of the 20th century). This saw the development of concepts, which, in addition to segregating into lanes horizontally, segregated space vertically as well.

With vertical segregation, the space began to segregate in detail. Most projects of this type segregated the space in two levels. Generally, the lower level was intended for flows reaching higher speed whose main goal was exclusively to pass through the city (from point A to point B) – connectivity. The flows were still segregated into individual lanes, because it was the only way to establish a system of rules and other criteria based on the use of space. The second (higher) level was intended for pedestrians and cyclists, who reach lower speed when crossing a space, and for whom, besides connectivity, an important element is also settling in the space. Thus, this level was designed uniformly, without segregation into individual lanes, which enabled a wide variety of use of the open space, the flexibility of crossing and settling, the development of activities in the outdoors, and finally, it was a space that was safe to use.

The second half of the 20th century saw a shift. New concepts of "reunification" of all users into a uniform space were beginning to appear; a space, which was not segregated could enable the crossing of space in all directions (including laterally), and was supposed to offer flexibility of use. First such concepts were used only in residential neighbourhoods ("woonerf"). On the other hand, the shared space began to be applied in all city districts regardless of its programming design – with an aim to have the car traffic become permitted in the space of pedestrians and cyclists. Cars would be a guest in the space, its speed of movement would be harmonised with the speed of the pedestrians.

The survey of the development of the shared space as a type of a public and, at the same time, traffic, space through the evolution of cities confirms the fact that the type of the city and the type of the traffic space are inseparably connected. They developed side by side and interdependently. There are parallels showing that one type of the city structure is connected with the corresponding type of the traffic space. The compact city with one single centre, which was well-established before the industrial revolution, designs simple and generally equal traffic spaces whose only function is that of connectivity. The more the city structure begins to break, the more the traffic space breaks and segregates (e.g. vertical segregation of traffic flows at the time of the emergence of the vertical city). Increasingly more exposed sustainability goals have always called for a change in the organization of the traffic space. The city begins to become more compact, enabling shorter inner connections, spaces inside facilities begin to merge and enable flexibility in the use. The set objectives of a sustainable city have begun to reflect in the traffic space as well. Merging and flexibility of spaces within facilities has translated to exterior spaces. With an objective to make the space equal, easily passable, and solving problems related to the increase of traffic in cities, the traffic space became uniform and not segregated into lanes. What emerged was the "shared space", a space with no rules, or the naked street.

Although the shared space is more or less a spatial solution which should, besides solving cross-connectivity of the space and its flexibility, also solve the problem of traffic congestion in the city centres, reduce traffic jams, and enable the spread of activities from the ground floors of buildings outside, it is also a social phenomenon. If the public space reflects society, then the shared space shows just that. It aims to establish and organize an equal space fair to all. This makes us question whether the shared space is a public space which really provides safety and equality for everyone moving within it, or is there perhaps an unwritten hierarchy where the rules of behaviour are dictated by the most powerful and the strongest ones.

By excluding rules, it works contradictory to its aims. The space becomes merely seemingly equal. The individuality of an individual takes precedence over the entire society. The stripping away of the rules creates a feeling of danger. Constant mutual surveillance, behaviour, and reactions among the users prevent or hinder various interactions. When using a space, the leading thought is who dominates the space and how the weakest link (in this case the pedestrian) uses the space. One of the biggest issues of the shared space is the usability of the space by vulnerable groups (physically handicapped people, blind and partially sighted people, seniors, children, etc.), who use/cross it with more difficulty, or are even exempt from being able to use the space entirely. The latter proves that the space is neither equal nor equally accessible to everyone under the same conditions.

If the introduction determined that the emergence of the shared space is the result of technological development, it is also shows that it is a reflection of all changes that began to emerge in the social context.

Finally, “shared space” can be understood as an urban experiment which combines two completely different activities into one space: connectivity and settling. As an experiment, it is based on various spatial, social, psychological, economic, economical, and other areas, and it needs to be addressed in an interdisciplinary way in order to provide quality guidelines for the development of a type of a space that could enable the achievement of the primary goals – development of an equal space, where two extremes successfully come together: connectivity and settling.

The latter certainly raises a question on what should “shared space” should mean or look like. Should it mean an equal space for different users while adhering to all technological and social shifts? Does such a space even exist? Is that still a “shared space”?

REFERENCES

Alexander, C., Ishikawa, S., Silverstein, M. et al. (1982). *A pattern language: towns, buildings, construction.* New York: Oxford University Press.

Collarte, N. (2012). *The Woonerf Concept: "Rethinking a Residential Street in Somerville".* Retrieved from https://nacto.org/docs/usdg/woonerf_concept_collarte.pdf (accessed on 5 April 2020).

Costa, P. B., Morais Neto, G. C., Bertolde, A. I. (2016). *Urban mobility indexes: a brief review of the literature.* Retrieved from https://www.researchgate.net/publication/317420405_Urban_Mobility_Indexes_A_Brief_Review_of_the_Literature (accessed on 3 April 2020).

Edquist, J, Corben, B. (2012). *Potential application of Shared Space principles in urban road design: effects on safety and amenity.* Retrieved from http://citeseerx.ist.psu.edu/viewdoc/download?doi=10.1.1.681.7211&rep=rep1&type=pdf (accessed on 1 April 2020).

Es, E. van, et al. (2014). *Atlas of the functional city: CIAM 4 and comparative urban analysis.* Zürich: Bussum, Thoth.

Farini de Orleans-Borbón, E. (2011). *Time and cities.* Pozuelo de Alarcón: Universidad Francisco de Vitoria, Facultad de Arquitectura.

Fikfak, A., Zavodnik, A. (1997). Mesto Cyberspace: Nove dimenzije urbanosti nasprotje ali nadaljevanje informacijske avtoceste? *Urbani izziv*, št. 30/31, str. 19-26+110-114. URN:NBN:SI:doc-F6GJHYUE. Retrieved from https://www.dlib.si/details/URN:NBN:SI:doc-F6GJHYUE (accessed on 5 April 2020).

Gausa, M, et al. (2003). *The Metapolis dictionary of advanced architecture: city, technology and society in the information age.* Barcelona: Actar.

Gharehbaglou, M., Khajeh-Saeed, F. (2018). Woonerf; A Study of Urban Landscape Components on Living Streets. *Journal of MANZAR*, 10 (43): 40-49. Retrieved from http://www.manzar-sj.com/article_68625_en.html (accessed on 5 April 2020)

Grey, T., Siddall, E. (2012). *Shared Space, Shared Surfaces and Home Zones from a Universal Design Approach for the Urban Environment in Ireland*. Retrieved from http://universaldesign.ie/Built-Environment/Shared-Space/ (accessed on 5 April 2020).

Hamilton-Baillie, B. (2008). *Shared Space: Reconciling People, Places and Traffic.* Retrieved from https://www.jstor.org/stable/23289804?seq=1 (accessed on 5 April 2020)

Hamilton-Baillie, B. (2010). *Shared Space and Street Design: Emerging best practice for reconciling people, places and traffic.* Retrieved from https://www.jstor.org/stable/23289804?seq=1 (accessed on 5 April 2020).

Hauck, T., Keller, R., Kleinekort, V. (2011). *Infrastructural urbanism: addressing the in-between.* Berlin: DOM.

Hoek, H.R. van der (2011). *Why Shared Space? An Exploration of the Motivations for Shared Space Development in Nine European Cities.* Retrieved from https://dspace.library.uu.nl/handle/1874/206210 (accessed on 5 April 2020).

Holmes, L. (2015). *Accidents by Design:TheHolmes Report on "shared space" in the United Kingdom.* Retrieved from http://chrisholmes.co.uk/wp-content/uploads/2015/07/Holmes-Report-on-Shared-Space-.pdf (accessed on 5 April 2020).

Jayakody, R. R., Keraminiyage, K., Alston, M., & Dias, N. (2018). Design factors for a successful Shared Space Street (SSS) design. *International Journal of Strategic Property Management*, 22(4), 278-289. https://doi.org/10.3846/ijspm.2018.3685

Joyce, M. (2012). *Shared Space in Urban Environments.* Retrieved from https://www.transportationgroup.nz/wp-content/uploads/Shared-Space-Guidance-Note.pdf (accessed on 5 April 2020).

Kaparias, I., G.H. Bell, M., Miri, A., Mount, B. (2012). *Analysing the perceptions of pedestrians and drivers to shared space.* Retrieved from https://www.sciencedirect.com/science/article/abs/pii/S1369847812000149 (accessed on 3 April 2020).

Karndacharuk, A., Wilson, D., Tse, M. (2011). *Shared Space Performance Evaluation: Quantitative Analysis of Pre-Implementation Data.* Retrieved from https://www.researchgate.net/publication/278675209_Shared_space_performance_evaluation_Quantitative_analysis_of_pre-implementation_data (accessed on 1 April 2020)

Krier, R. (1979). *Urban space.* London: Academy Editions.

Lotfata, A. (2019). *Shared Space Creation from Intersubjective Temporality.* Retrieved from https://www.researchgate.net/publication/330542001_Shared_Space_Creation_from_Intersubjective_Temporality (accessed on 5 April 2020).

Methorst, R., Gerlach, J., Boenke, D., Leven, L., (2007). *Shared Space: Safe or Dangerous? A contribution to objectification of a popular design philosophy.* Retrieved from http://www.pedbikeinfo.org/cms/downloads/Shared%20Space%20-%20eng.pdf (accessed on 5 April 2020).

Nalmpantisa, D., Lampoua, S., Naniopoulos, A. (2017). *The concept of woonerf zone applied in university campuses: the case of the campus of the Aristotle University of Thessaloniki.* Retrieved from https://www.sciencedirect.com/science/article/pii/S2352146517303526 (accessed on 1 April 2020).

Nello-Deakin, S. (2019). *Is there such a thing as a 'fair' distribution of road space?* Retrieved from https://www.tandfonline.com/doi/full/10.1080/13574809.2019.1592664?src=recsys (accessed on 18 May 2020).

Nikolaeva, A., Nello-Deakin, S. (2019). *Exploring velotopian urban imaginaries: where Le Corbusier meets Constant.* Retrieved from https://www.tandfonline.com/doi/full/10.1080/17450101.2019.1694300?scroll=top&needAccess=true (accessed on 18 May 2020).

Rinke, N., Schiermeyer, C., Pascucci, F., Berkhahn, V., Friedrich, B. (2017). *A multi-layer social force approach to model interactions in shared spaces using collision prediction.* Retrieved from https://www.sciencedirect.com/science/article/pii/S2352146517304350 (accessed on 3 April 2020).

Siláči, I., Vitková, L. (2017). *Public Spaces as the Reflection of Society and its Culture.* Retrieved from https://www.researchgate.net/publication/320846655_Public_Spaces_as_the_Reflection_of_Society_and_its_Culture (accessed on 12 November 2019).

Van Audenhove, F., Korniichuk, O., Dauby, L., Pourbaix, J. (2014). *The Future of Urban Mobility 2.0: Imperatives to shape extended mobility ecosystems of tomorrow.* Retrieved from https://www.uitp.org/sites/default/files/members/140124%20Arthur%20D.%20Little%20%26%20UITP_Future%20of%20Urban%20Mobility%202%200_Full%20study.pdf (accessed on 3 April 2020).

TRACK 3: MITIGATING TRAFFIC CONGESTION WITH URBAN DEVELOPMENT

Track Chairs:

Ilka Čerpes,
University of Ljubljana, Faculty of Architecture, Ljubljana, Slovenia and

Mia Crnič,
University of Ljubljana, Faculty of Architecture, Ljubljana, Slovenia

The fact that the sustainable mobility policy is the right way to reduce the harmful effects of motorized traffic on the environment has become a widely accepted fact. Less explored and considered are more detailed meaningful measures to achieve the goals and the consequences of their implementation for the development of urban environments. In the light of the experience of many European cities, the well-known measures for implementing a sustainable mobility policy are measures to reduce daily migration to urban centres and measures to introduce economically efficient public transport in the areas of highly dispersed settlements, which stay rather vague. The creative contributions on this topic with an emphasized interdisciplinary approach are presented within track 3. At the level of discussion on the consequences of sustainable mobility policies for the development of urban forms they open up new issues and examples of innovative solutions in both urban centres and the wider space. The particularly interest is in: the effects of digitization on planning and design of transport infrastructure (How will it be re-formed in the new circumstances?); the impact of the deployment of built structures along transport corridors to reduce the differences between urban and rural living environments (How and where to create new centralities? Where and what is the limit of the urban centres?); the impact of densification of built structures on the quality of life (What are the characteristics of the compact city? How dense is too dense? Are the new typologies of dwellings being developed and what are they?).

Keywords: Mobility & Urbanization Policies, Urban patterns, Mobility modes, Centrality, Densities

THE IMPACT OF GLOBALIZATION ON LJUBLJANA STREETS

Ilka Čerpes
Assist. Prof., PhD, University of Ljubljana, Faculty of Architecture, Zoisova cesta 12, Ljubljana, ilka.cerpes@fa.uni-lj.si

ABSTRACT

Streets are basic building blocks of the city and a carrier of urbanity. Throughout history, streets have borne various functions and forms but have always retained their essential attribute as a linear space for communication between people, between people and things, and between things themselves. In the 20th century, street space was occupied by motor vehicles, significantly reducing their multi-functionality. This phenomenon was accompanied by a significant deterioration of the living conditions, leaving the streets abandoned and no longer a carrier of public life. Presently, they are subject to physical decay, with traditional activities – such as trading – moving elsewhere.

While the described processes take place in the same way in all types of streets, the question remains, whether they are more common in certain types than in others, and how is the quality of the street space connected to economic and political changes in the age of globalization. In the case of the city of Ljubljana, we conducted a photo-analysis of different types of streets and compared the activities taking place in them and their physical state. We found that the intensity and variety of activities, as well as the physical condition of each street, primarily depends on its location – the distance from the city centre and its importance in the hierarchy of connections between the city and the region. The closer a street section is to the city centre, and the more important the role of the street is in the network of transnational transport connections, the more active and physically preserved the public space is. We also found a very clear connection between the quality of a street and the economic system which drives the development in a certain time period – the more liberal and market-oriented the system, the less human oriented and vibrant the street space.

Keywords: globalization, street, Ljubljana

INTRODUCTION

The current period is characterized by the development of the world market, with profound consequences for culture, identity, and lifestyles. Globalization of economic operations is accompanied by waves of cultural transformation, a process which significantly affects the very urban fabric.

Architecture is a thought carved in stone, wrote Victor Hugo in his famous novel *Notre-Dame de Paris*, published in Paris in 1831: "'There exists in this era, for thoughts written in stone, a privilege absolutely comparable to our current freedom of the press. It is the freedom of architecture', he wrote in praise of its construction" (Cuttle, 2018).

Current debates on the role of streets and urban roads in the development of a sustainable city raise an interesting question, namely how the turbulent events of half-past history were embedded in the image of streets and arterial roads in cities that experienced a radical break with the past due to the globalization processes (Schneider-Sliwa, 2006). Specifically, some of them jumped literally overnight from a totally static model of a socialist planned economy directly into a model of a global liberal market economy.

Case study background

With the disintegration of socialist Yugoslavia in 1990, Ljubljana became the capital of the independent Republic of Slovenia. Its formation as the capital of the young state coincided with the collapse of the bloc world order and accelerated processes of globalization, thus, in a relatively short time, experiencing dramatic political, social and economic changes: transition to a market economy and introduction of the multi-party system (1990) as well as integration into the European common market (accession to the European Union in 2004 and to Schengen in 2007). We are specifically interested whether the described processes are written into the physical structure of Ljubljana's streets and which factors significantly affect the density of activity and the quality of public space.

METHOD

Ljubljana has an important geostrategic position of European significance. Its location at the intersection of the Alpine and Mediterranean worlds has since antiquity led to its development as an important transport hub. The city grew along major arterial roads that spread in a star-like shape from its centre in all directions. The characteristic star-like shape and leading role of the main arterial roads in the development of urban form have been preserved to the present day.

We performed a photo-analysis of different types of major arterial roads and high streets in two sections each: the first section was performed at the intersection of the high street and the inner city ring bounding the compact historic city centre (radius 500–700 m, measured from the geometric centre of the city). The second section was made at the intersection of the arterial roads with the outer city highway ring, which has since 2006 been defined as the boundary of a compact city (radius 3,000–4,000 m, measured from the geometric centre of the city). The 1986 city plan envisioned these points of intersection as a new type of vibrant high street space.

Based on photos from the Google Street View app, we recorded and evaluated the image of the streets and arterials.

Evaluation criteria

In general, a high street is identified by four characteristics: connectivity, adaptability, mix, sociality and intensity. The quality of space is defined by four categories: flexibility; healthy environment (noise and air pollution levels); recognizable, green, and comfortable social space; an appropriate criterion for walking and performing activities. The worst high streets are dirty and poorly maintained, dominated by traffic, insecure; activities are in decay or lacking; improvement is superficial and cheap; they are inaccessible and uncomfortable, inhuman, ugly and unremarkable (Carmona et al., 2017).

Figure 1: Ljubljana figure ground plan with marked observation points

RESEARCH

A common characteristic of all main arterials and high streets is the division into northern entrances (Dunajska, Celovška, Šmartinska), which lie on a very suitable solid geological base for construction, and southern entrances (Barjanska, Tržaška, Dolenjska), which run along the edge of low bearing marshy soils of the former tectonic lake (Ljubljansko barje). Due to the natural conditions, the northern entrances are more intensively built up. The interest rate for investments there is high. The high streets and arterials in the southern, marshier-ground part of the city are less developed in terms of built structure and placement of private or public investments.

To the north – Dunajska cesta

Dunajska cesta ("Vienna Road") runs along the axis and in the direction of the former Roman road between the Pannonian Plain and the Adriatic Sea. It connects Ljubljana with the economically developed hinterland – Maribor, the second largest Slovenian city, and further with Vienna. Towards the south, it ends in the narrowest city centre, where its name changes to Slovenska cesta ("Slovenian Road") on the Roman Cardo Maximus axis. After the removal of the walls around the medieval core, Slovenska cesta (respectively, Dunajska cesta) became the carrier of urban development. Along it, the most important public and business buildings from all periods of the city's history are located.

Section 1 – intersection with the inner city ring

This is a designed high street space with limited access for cars. Car speed is limited to 30 km/h, and public transport predominates. The width of the street space allows adjustments to accommodate different activities. The ground floors of the buildings are filled with a variety of service programmes, which are safe and well accessible to pedestrians. The recognizability of the space is distinct. It is surrounded by quality modernist architecture with regionally rooted details of inventive Slovenian architecture from the post-WW2 socialist era. A significant change since 1990 was the restoration of pavement and diminishing of car traffic. Environmental pollution with noise and gas emissions is moderate.

Section 2 – intersection with the outer city ring

The modernistic concept of dense and high building pattern along the main arterial has been preserved, but most of the public space is occupied by cars with a speed limit of 60 km/h. As a result, environmental pollution with noise and gas emissions is high. The space is dangerous, unattractive, and uncomfortable for pedestrians. On the left side is the building of the World Trade Centre, built in the socialist era in postmodern style. This is the only building with a ground floor designed as a space for socializing and mixed programmes, accessible to people. The remaining

buildings were built after 1990. The visibility of the building volumes is rather good, but they are designed without additional effort to create a specific architecture. We are dealing with an uncritical transfer of "international" style of serial office buildings from abroad. The programme on the ground floor is mostly business with limited access to the public (banks, representative offices, insurance companies, hotels, etc.).

To the northwest – Celovška cesta

Celovška cesta ("Klagenfurt road") connects the city centre with Alpine regions and further with Salzburg and Munich. Along it, all the way to the Austrian border, well-developed urban centres in the form of conurbations are located. This part of Slovenia is an important tourist destination. Celovška cesta is also the main connection to the central state airport. The area along the arterial is mainly composed of large residential neighbourhoods and an abandoned extensive turbine factory complex, dating to the post-war socialist construction of the city.

Section 1 – intersection with the inner city ring

Here the high street is converting to arterial. Compact building line along the street is blurring and no longer readable. Car areas with narrow sidewalks predominate. The speed limit is 50 km/h. Security and readability of the space is poor. Postmodern renovations have contributed to the loss of the elegant silhouette of the glass modernist high-rise dominant volume of the hotel. The only highlighted public entrance of the former public library from the socialist era is closed. The building has been refurbished for business purposes. Street-accessible service on the ground floors is lacking, as well. The buildings are dominated by an introverted programme (hotel, casino, meeting room), without entrances from the street. Noise and air pollution are high. Post-1990 changes have worsened the quality of public space.

Section 2 – intersection with the outer city ring

The arterial is a wide road with a car speed limit of 60 km/h. The ground floors of the buildings are below the road level and are not connected to it. Negotiating a six-lane crossing poses a serious risk to pedestrians and cyclists. The area is recognizable only by dense traffic signalization. Noise and air pollution are very high. The only change since 1990 has been the widening of the crossing due to connection to the outer highway ring (European transport corridor Nos. 5 and 10).

To the northeast – Šmartinska cesta

Šmartinska cesta ("Šmartno Road") runs through a former logistics and industrial area, since 1990 transformed into the biggest shopping centre in Slovenia. It runs to the outer city ring and has no function in the regional road network. It is lined

with abandoned pre- and post-WW2 industrial complexes. Since 1990, a large shopping centre has been developing at the crossroads of Šmartinska and the outer city ring. Development is based exclusively on the interest of private investors.

Section 1 – intersection with the inner city ring

Northeastern arterial is connected to the inner city ring through an underpass under the railway line, part of the European Mediterranean corridor Madrid–Budapest. Due to the narrowness, car traffic is congested and occupies the entire space between the buildings. There is no pedestrian space, so people avoid the place. As a result, both diverse service programmes on the ground floors and the physical building structure of former high street are disappearing. The public space is unsafe, recognizable only by the decaying pre-WW2 battery factory. Noise and air pollution are very intense.

Section 2 – intersection with the outer city ring

This arterial performs the function of quick access to the regional commercial centre BTC for cars and transport vehicles. Pedestrian walkways are narrow and uncomfortable. The space is recognizable by high business and commercial buildings with low-quality architecture and good car accessibility. It is a typical example of a globalized consumer model of urban development. It is based on the depletion of existing public infrastructure. Noise and air pollution are high, whereas the safety of cyclists and pedestrians is very poor.

To the southwest – Tržaška cesta

Tržaška cesta (“Trieste Road”) runs along the route of the ancient Roman road in the direction of the Adriatic Sea. To this day, it has retained the character of an important transport connection with the northern Adriatic ports (Koper and Trieste). Since it runs beside the edge of the wetland of Ljubljansko barje, there are no tall buildings along it, and the interest of investors is lower due to more expensive construction in comparison to the northern arterials and high streets. Due to the parallel highway built before 1990, it lost the importance for transport, which further accelerated the deterioration of buildings and services. No major city programmes are located next to it, so the public space is either undeveloped or non-existent.

Section 1 – intersection with the inner city ring

The historically built fabric forms a closed building line along the route of the ancient Roman southern entrance in the direction of the narrowest centre of the city. The inner city ring, built after WW2, does not follow the historical pattern. The former high street human scale has replaced the car scale. The space is recognizable for its preserved historical structures and partly preserved high street

character. The ground floors of the buildings are lively, busy with services for the local population, and well accessible from the street. Vehicle speed is limited to 40 km/h. Greenery improves air quality and reduces noise pollution. In part, a comfortable and safe pedestrian area is provided.

Section 2 – intersection with the outer road ring

The four-lane arterial space is designed as a distinctly car-friendly space that is uncomfortable, unattractive, and unsafe for pedestrians. The speed limit is 60 km/h. The street fringe is occupied by extensive parking lots, the buildings are set into the interior remote from the street and are not perceptible as part of the arterial. The space is unrecognizable; people find it difficult to navigate. The space is dangerous because there are no buildings with programmes close to the street. Noise and air pollution are high.

To the south – Barjanska cesta

Barjanska cesta ("Marshes Road") is the most recent arterial, which connects the city centre with the southern outer highway ring. Built after 1990, it follows the axis of the Roman Cardo Maximus. Barjanska was only partially implemented in the socialist-era planned four-lane profile and doesn't follow in full the prevailing paradigm of the automobile city of the time. Closer to the city centre, the historical profile of the two-lane street accompanied by early modernist villas and palaces, which were originally planned for demolition, has been preserved. Like Šmartinska cesta, this arterial lacks a direct connection to the regional road network but ends at the outer ring of the city. It runs along the marshy terrain of Ljubljansko barje, location of only relatively recent city expansion. Therefore, the plots along the arterial are mostly left undeveloped. Closer to the city centre, several important public buildings, university buildings, schools, and residential neighbourhoods from the socialist – as well as post-1990 globalization – period are located next to it.

Section 1 – intersection with the inner city ring

The place is recognizable by aligned buildings from the beginning of the 20th century. It is one of the few intersections of the arterial with the inner city ring where the width of the road has been adapted to the historic built structure. Vehicle speed is limited to 40 km/h. Pedestrian corridors are well designed, safe, and surrounded by greenery. Access to the buildings is connected to the street space through front gardens, which provide privacy and noise protection for the residential villas on the one side and the school on the other side of the street.

Section 2 – intersection with the outer road ring

The southern end of Barjanska cesta is only a functional connection between the city centre and the highway. Pedestrian movement has been not planned, so there are no service or residential programmes. The place is recognizable by large billboards and beautiful views towards Ljubljansko barje.

To the southeast – Dolenjska cesta

The southeastern arterial is directed towards the historic entrance of the medieval core. During socialism, it was reconstructed into a wider two-lane road connecting Ljubljana with the main Yugoslav cities in the Balkans (Zagreb, Belgrade). Very heavy traffic flowed through it. In the 1970s it was widened into a four-lane arterial with multi-level crossing after the American model of automotive city. With the disintegration of Yugoslavia, the arterial lost its significance. In addition, it runs between the marshy terrain of Ljubljansko barje and the steep slope along its northern edge. The built structure and programmes on the ground floor are deteriorating due to unfavourable location conditions and the loss of the function of an important regional connection.

Section 1 – intersection with the inner city ring

The place is recognizable by the multi-level crossing above the historic level of the urban ground floor with no access from the street. The main function of the arterial here is the efficient delivery of car traffic. Cars are moving at a speed of 50 km/h. The sidewalks are narrow and uncomfortable. The place is dangerous, polluted with traffic signalization, noise, and gas emissions. Despite its walking distance to the old city centre (550 m), it is not used by pedestrians and cyclists. They avoid the place and, unless absolutely necessary, do not use it.

Section 2 – intersection with the outer city ring

A two-lane road with narrow pedestrian corridors ends at the outer city ring in the form of a typical motor road surrounded by meadows. Billboards and car-care services line the edge. The space is unrecognizable, unsafe for pedestrians, and overloaded with excessive noise and air pollution. With the exception of minor roadway reconstructions, the condition of the arterial area has remained unchanged since the time of its post-WW2 construction.

CONCLUSION

The analysis of Ljubljana arterials and high streets has shown them to be well-designed as multifunctional and active public space only in the narrowest city centre, bounded by the inner city ring (radius 500–700 meters from geometric centre on the city). It is organized to human scale. Cars are subject to speed limits

and other regulations which ensure pedestrian priority. Already at the intersections of high streets with the inner city ring, the high streets are transformed into degraded mono-functional traffic corridors for motor vehicles moving at a speed of at least 60 km/h. These areas are recognizable by aggressive traffic signalization and poor local identity. The living conditions (polluted air, risk of accidents, noise) are significantly deteriorated. The arterial corridors have been abandoned and are no longer a carrier of public life. They are physically decaying, and traditional activities, such as trade, have moved elsewhere (to the city outskirts, online, etc.).

Generally, we can conclude that the intensity and variety of activities of each street, as well as its physical condition, mostly depend on its location – the distance from the city centre and its importance in the hierarchy of connections between the city and the region. The more economically developed the part of the city around the street is, the more active and physically preserved is the street. The development level of the region toward which the street is heading has significant impact on the street quality. We also found a very clear connection between the quality of street space and the economic system which drives the development in certain time periods. The more liberal and market oriented the system is, the less human scale oriented and vibrant is the street space.

As expected, the results showed that the street sequences closer to the historic city centre are better preserved and livelier than more distant sequences at intersections with the outer city ring. The latter were built after 1990 and support the goals of a liberal market economy. Following first the model of the German concept from the 1960s (i.e. *autogerechte Stadt*) and later the model of the American car city, the implemented solutions mostly, or even exclusively, enable fast and efficient transport of goods and passengers. After joining the European Union in 2004, Ljubljana arterials became part of the network of European transport corridors, which further emphasized their transport function. As a result of Slovenia's integration into the European and global space, intensive strengthening of road transport connections is detrimental to the image of their adjoining public space. Local programmes and social life have been replaced by parking lots. Once carefully designed socialist-era city skyline along the Dunajska and Celovška cesta has been blurred by the addition of an anonymous low-quality designed architecture of smaller foreign investors with introverted programmes and with very limited connections to the public space. Dolenjska and Tržaška cesta, due to difficult construction conditions less attractive to investors, have remained unchanged since pre-urbanization period. They maintain the rural appearance of the built structure which is deteriorating physically and programmatically, owing to the lack of interest in investing in renovation due to the adverse effects of intensive traffic. The city ground floor along arterials outside the centre is largely unattractive and useless for walking or socializing. Ljubljana arterial area outside the city centre is a traffic area for vehicles, preventing any development of a quality urban way of life.

In order to develop a comprehensive strategy for the renovation of arterial and high street network as a whole, it is entirely necessary to create a set of specific tools for their renovation and revitalization. Such tools should be based on a typology of streets as defined by the distance from the city centre and their importance in the hierarchy of connections between the city and the region.

Figure 2: Intersection of the arterials with the inner city ring (left) and outer city ring (right)

REFERENCES

Carmona, M., Gabrieli, T., Hickman R., Laopoulou, T., Livingstone, N. (2017). Street appeal: The value of street. *Progress in Planning*, Vol. 126, Nov. 2018, pp. 1–51. Retrieved from https://www.sciencedirect.com/science/article/pii/S0305900617300636 (12 Feb. 2020).

Cuttle, J. (2018). *How the French Author Victor Hugo Saved Notre Dame.* Retrieved from https://theculturetrip.com/europe/france/paris/articles/how-the-french-author-victor-hugo-saved-notre-dame/ (19 Apr. 2020).

Figure 1: SCHWARZPLAN.EU. Retrieved from https://schwarzplan.eu/ (3 Mar. 2020).

Figure 2: Google Maps. Retrieved from https://www.google.com/maps/place/Ljubljana/@46.0660318,14.3920158,11z/data=!3m1!4b1!4m5!3m4!1s0x476531f5969886d1:0x400f81c823fec20!8m2!3d46.0569465!4d14.5057515 (20.4. 2020).

Schneider-Sliwa, R. (2006). *Cities in Transition Globalization, Political Change and Urban Development, GeoJournal Library 83*. Springer, Netherland. Retrieved from https://link.springer.com/book/10.1007/1-4020-3867-4 (15 Jun. 2020).

DYNAMIC STREETS AND CITY PROGRAMS

Višnja Kukoč[1]
Assist. Prof., PhD, University of Split, Faculty of Civil Engineering, Architecture and Geodesy
visnja.kukoc@gmail.com

Mirza Džananović
Assist. Prof., PhD, University of Zenica, Faculty of Philosophy
mirzadzanan_89@hotmail.com

Marko Borota
MA, Independent designer
borota.marko@gmail.com

Jelena Borota
M. Arch, GISplan
jelenaborota@yandex.com

Mariana Bucat
M. Arch, Arhitektonski Kolektiv
mariana.bucat@gmail.com

ABSTRACT

Streets are the primary urban element and the primary public good. The word street has a broad meaning. Regarding programs we differ a primary street with city programs, a business street with a variety of businesses, a housing street with housing programs and a combination of all three. Regarding purposes we differ streets to pedestrians and streets to automobiles.

In this paper we present the research of the two primary business/housing pedestrian streets in two different cities.

The first street is Maršala Tita Street in Zenica, in BiH, formed gradually and largely in a spontaneous manner, located in the city centre. The second street is Ruđera Boškovića Street in Split/Split 3, in Croatia, carefully planned and built at once, located in the centre of the third city rayon.

Maršala Tita Street encompasses city and housing programs, businesses, the University of Zenica Campus, the market, the old centre and the Jalijas' Bridge. Ruđera Boškovića Street encompasses city and housing programs, businesses, the University of Split Campus, a bus hub and a department store. In the vicinity of both streets there are primary and secondary schools.

[1] *Corresponding author*

The two streets have been created at different times, in different cultures, but within the same social system – Yugoslav self-governing socialism. They are comparable regarding their almost identical purposes and similar programs. Additionally, both streets haven't been refurbished or exposed to tourism and yet they are dynamic and active.

We planned to simultaneously count of passers-by at different times of the day and of the month, listing street programs, and compare the outcome. Restriction of movement that occurred due to the pandemic caused by COVID -19 prevented us to carry out the research to the end. Results, of only a third of the planned survey suggest to be indicative and we present them as preliminary.

Keywords: City program, pedestrian street, public good, residents, pedestrians

INTRODUCTION

Streets are the primary urban element and the primary public good. The word *street* has a broad meaning. In regard to programs we differ a primary street with city programs, a business street with a variety of businesses, a housing street with housing programs and a combination of all three. In regard to purposes we differ streets to pedestrians and streets to automobiles.

"Think of a city and what comes to mind? Its streets. If a city's streets look interesting, the city looks interesting; if they look dull, the city looks dull", Jacobs (1992).

Until recently the streets in the city centres in Europe and elsewhere were full of people, but mostly tourists. To meet the growing tourism needs programs and purposes of those streets have been changing. Coffee bars, restaurants and souvenir shops were all over while programs that serve residents have been disappearing, and residents as well. City centres have become monotonous. Outside the tourist season they are deserted.

Having in mind that city programs are meant for residents we consider how those programs influence dynamism of streets, not exposed to tourism. Our research reviews the two streets that serve residents on different schedules and in the place for different purposes.

"The diversity, of whatever kind, that is generated by cities rests on the fact that in cites so many people are so close together, and among them contain so my different tastes, skills, needs, supplies and bees in their bonnets" Jacobs (1992).

We planned to simultaneously count of passers-by at different times of the day and of the month, listing programs of the streets, and compare the outcome obtained in the two listed streets. *Restriction of movement that occurred due to the pandemic caused* by COVID -19 prevented us to carry out the research to the end. R*esults,*

of only a third of the planned survey suggest to be *indicative* and we present them as preliminary.

The intensive literature review did not result in finding relevant research, criteria or norms that could be used in our survey for the comparison. Researchers today are preoccupied with *reclaiming city streets for people, shared space and pedestrian safety, pedestrianisation as a great necessity* and alike, although already in 1960s it was obvious: "The onslaught of cars and the pressure of that industry, that is, the lobbies for cars have made the crumb the main object, the parking lot an obsession, the traffic the primary goal, the destroyers of every social and urban life. The day is approaching when the rights and powers of the car will have to be limited, not without difficulties and damage" Lefebvre (1974).

Relevant insight of the topic similar to ours we find in the book of Jan Gehl and Lars Gemzøe *Public spaces Public Life Copenhagen* first published in 1996. Chapters *Residents in the city centre*, and *Students in the city centre* especially justify our research. "Residents contribute to the vitality of the city at all times of the day and night, going about their daily tasks (...) No single factor has more influence on the vitality of city centres than the presence of universities and students in the area" Gehl, Gamzøe (2004).

In this paper we deal with Maršala Tita Street in Zenica, in BiH and Ruđera Boškovića Street in Split/Split 3, in Croatia. The two streets have been created at different times, in different cultures, but within the same social system – Yugoslav self-governing socialism[2]. City of Zenica has a population of 110,000 inhabitants. City of Split has 180,000 inhabitants, while the rayon of Split 3 has 40, 000.

MARŠALA TITA STREET

Maršala Tita Street in Zenica, in BiH, is formed gradually and largely in a spontaneous manner. It stretches through the historic centre of the city, in the area of the old Ottoman Bazaar. Buildings built in different periods, from the Ottoman to the Modern as well as the city programs have a long history on this street. They appear to have happened by accident or in the development of a city over time.

Master plans created from 1955 to 1983 have directed the development of modern Zenica (1955 by Juraj Neidhart, 1966 by Ivan Taubman and Jelena Civrić, 1983 by Mugdim Čukle). "MaršalaTita Street was reconstructed in 1968. For further activities, it was necessary to create a new urban solution for the city centre,

[2] Socialism in the Socialist Federal Republic of Yugoslavia (SFRY) was characterized by a one-party system, social ownership (instead of state ownership proclaimed in the USSR and other countries of the Eastern bloc) and social or "socialist" self-government. This system was decentralized (six federal units called Socialist Republic) and respected some elements of a market economy.

namely, its southern part around the Ottoman Bazaar. Famous Slovenian architect Edvard Ravnikar performed this work “Džananović (2017).

Figure 1: Maršala Tita Street with all programs and services (Orto-photo: GISplan archive)

Maršala Tita Street, primary business/housing[3] pedestrian street, connects the University of Zenica Campus with 5,500 students, the main city market, the old centre and the Jalijas' Bridge leading across the Bosna River to parks and recreational areas. In its vicinity there are administrative centre of Zenica and Zenica – Doboj Canton, elementary and secondary school, kindergarten and other city programs.

During the day but also in the evening, especially in the summer period, when it becomes a promenade, Maršala Tita Street plays important role in the social life of city of Zenica.

Due to general conditions in the state of B&H and in Zenica – Doboj Canton not so many tourist arrive to Zenica. "Tourism and catering in Zenica-Doboj Canton have so far been at a very low level, although significant resources exist" Official pages of the Assembly and the Government of Zenica - Doboj Canton, B&H (2020).

RUĐERA BOŠKOVIĆA STREET

Ruđera Boškovića Street in Split/Split 3, in Croatia, is carefully planned and built at once. It is located in the centre of the third city rayon[4]. Programs of Ruđera Boškovića Street were systematically designated through the program for the urban tender, with participation of the then wider public, and performed through a series of strategic and implementation plans. The buildings built on this street belong to the Modern period. The overall activities took place from 1970 to 1979.

"The street was conceived as one of the two main mixed use, commercial and residential pedestrian streets of the third city rayon of 50,000 inhabitants. It is placed in line of the cardo of Diocletian's Palace and runs north – south. The street was to serve inhabitants for their daily and occasional needs. Under the entire street there is a garage with 1,050 parking places", Kukoč (2013). Although at a very attractive location, several large commercial state-owned spaces have not been in use for decades.

Ruđera Boškovića Street connects the University of Split Campus with 20,000 students, a bus hub and a commercial centre. Several city and county agencies have their premises on this street. A primary school, two secondary schools and a hospital are nearby, and a little further is the sea and beaches.

[3] Old čaršija houses with commercial space on the ground floor and residential on the first floor.
[4] Rayon is a term used in urban planning from the 1950s to the beginning of the 21st century in Yugoslavia, in SSSR and Eastern Bloc countries. Each rayon is divided into local communities that make up the smallest organizational city units. In addition to housing, each local community has appropriate facilities and about 6,000 to 10,000 inhabitants. Each rayon has a rayon centre with appropriate facilities and 30,000 to 40,000 inhabitants.

Figure 2: Ruđera Boškovića Street with all programs and services (Orto-photo: GISplan archive)

The architects first and foremost respected the tenant and the pedestrian, by allowing him to move along the real street, which in the modern settlements was forgotten.

"With new values, in the new context of ideas about the place of our time, the street returns to us without losing any of its good traditional properties, and therefore brings new ones", Mušič (1970).

Given the old town with Diocletian's Palace, tourists do not come to Split 3 or Ruđera Boškovića Street, as yet.

THESES

Dynamic streets are those streets that by diversity and mixture of uses, with more than one city program, serve people living or working in the immediate vicinity or within a walking distance. In other words, diversity and mixture of uses are exemplified in a street that attracts people of different tastes, skills, needs and ideas.

METHOD

1. The method used is the systematic counting of pedestrians, at the strategic point on Maršala Tita Street in Zenica, and on Ruđera Boškovića Street in Split/Split 3, on 5 March, 2020, from 12:30 to 1:30 AM and from 3:30 to 4:30 PM, at a temperature of 20° degrees in Zenica and 14° degrees in Split. The counting was performed on a week day, on Thursday.
2. By touring the terrain, along each street individually, all spaces and programs were listed.
3. The collected data are presented graphically using Orto-photo of Maršala Tita Street and Ruđera Boškovića Street.
4. Brief analysis of preliminary results is conducted.

PEDESTRIAN TRAFFIC ON THE STREETS

"*People come where people are*, is a common saying in Scandinavia. People are spontaneously inspired and attracted by activity and the presence of other people" Gehl, Gemzøe (2004).

Counting of passers-by was conducted on 5 March 2020, in two terms on both streets: between 12:30 and 1: 30 AM and between 3:30 and 4:30 PM. The first term was chosen in regard to the time when children are coming back or going to schools. The second term was chosen in regard to when residents are leaving offices or coming back from work.

On Maršala Tita Street in Zenica, on sunny day, at 20°, first count gave total of 2,685 pedestrians. They were mostly of student age and retirees.

The second count, under the same conditions, gave total of 1,955, mostly middle and old age people in the direction of the market, while in the direction of the University campus were mostly young people.

Figure 3: The first count of pedestrians on Maršala Tita Street (Orto-photo: GISplan archive)

Figure 4: The first count of pedestrians on Maršala Tita Street (Orto-photo: GISplan archive)

On Ruđera Boškovića Street in Split, on partly cloudy and somewhat windy day, at 14°, the first count gave total of 816 pedestrians. They were mostly of student and school age and retirees.

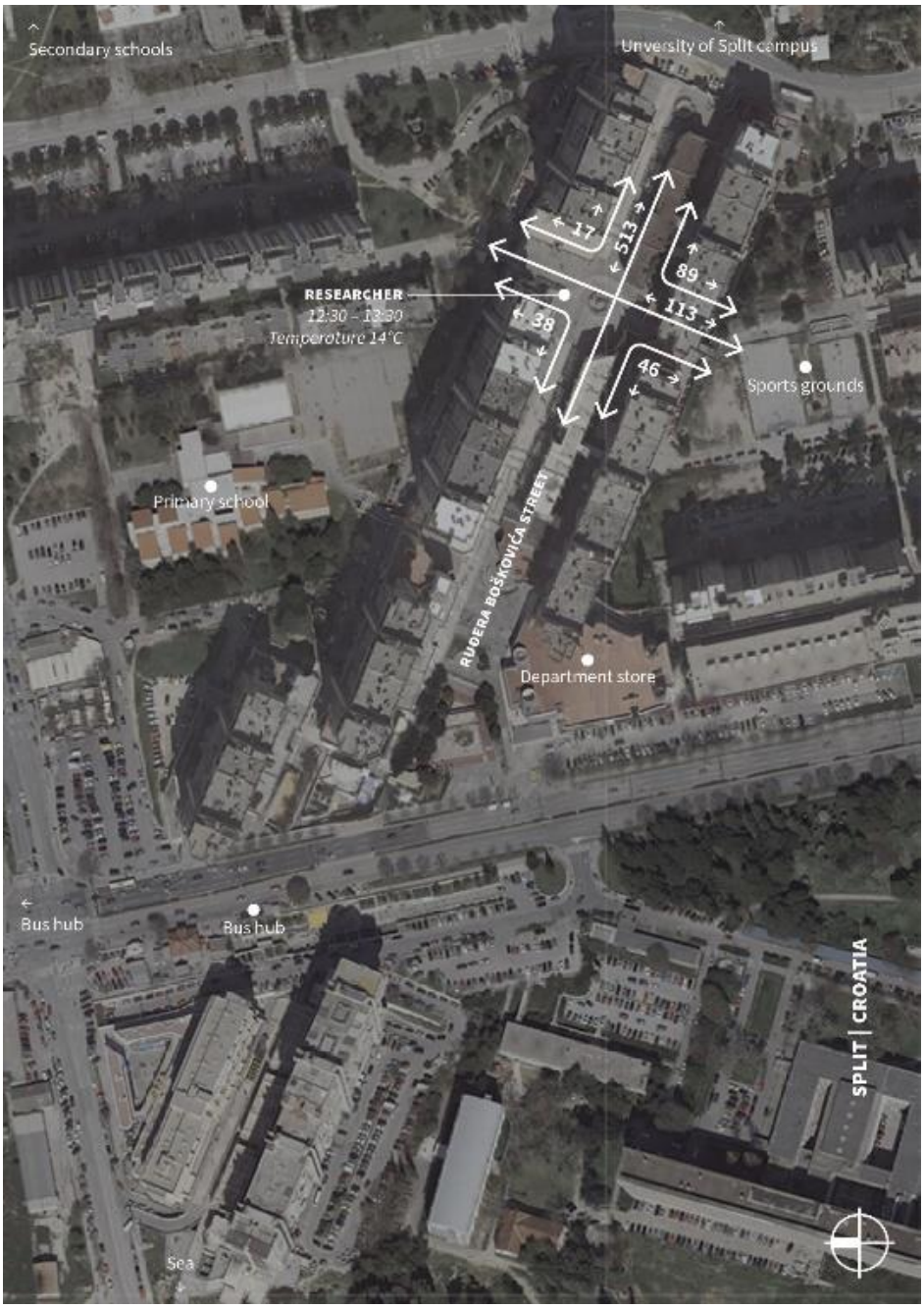


Figure 5: The first count of pedestrians on Ruđera Boškovića Street (Orto-photo: GISplan archive)

The second count, under the same conditions, gave total of 754 pedestrians. One third of them were elementary school children and the rest residents of all ages.

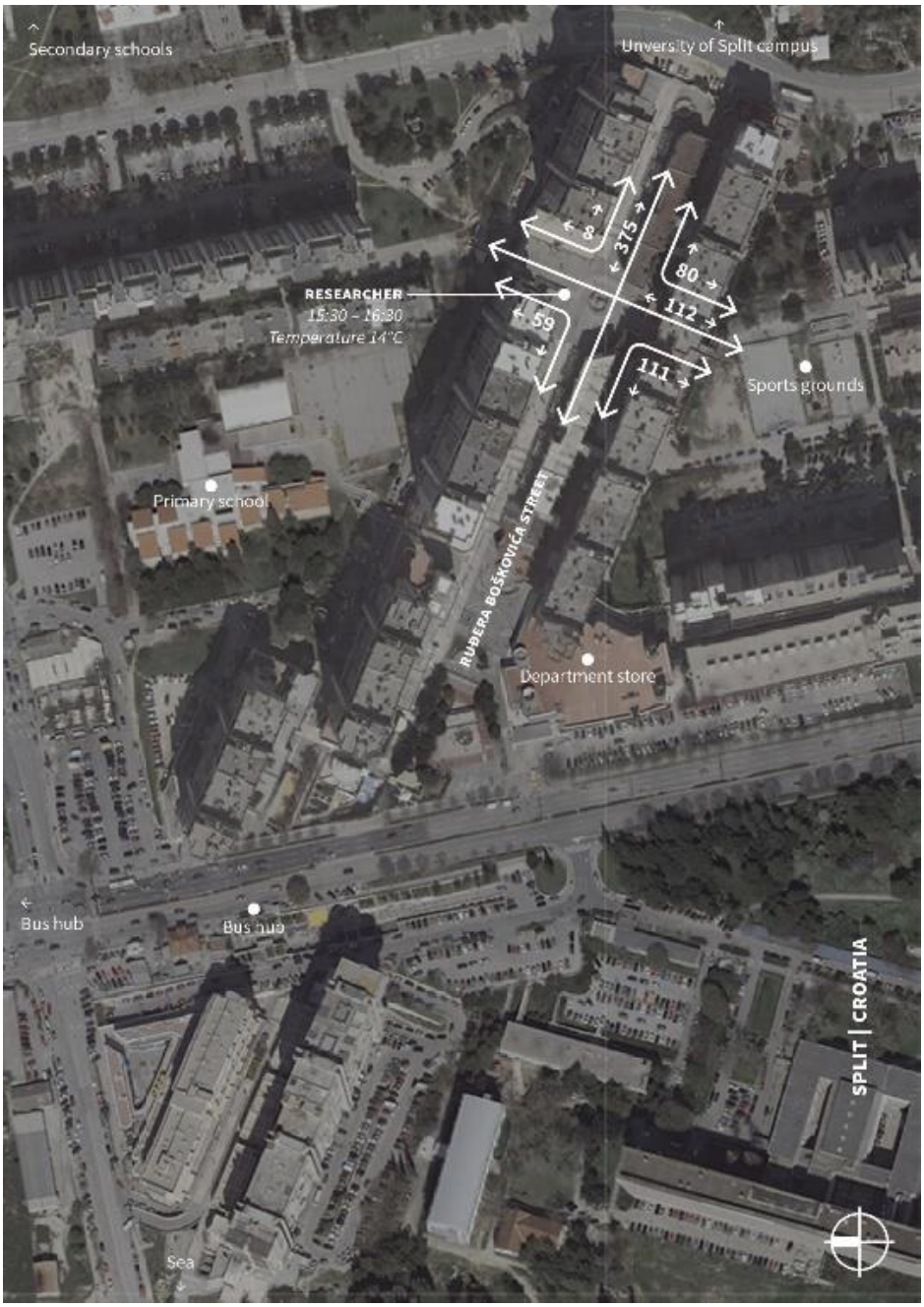


Figure 6: The second count of pedestrians on Ruđera Boškovića Street (Orto-photo: GISplan archive)

"The city's 14.000 students play a decisive role in keeping the city centre attractive, particularly in the winter half of the year, when the city has a special need for contributions to its level of activity and vitality" Gehl, Gemzøe (2004).

CONCLUSIONS

Diversity and mixture of uses are preconditions of dynamic streets. This includes both, the dense concentration in the case of people who are there because of residence and those who are there because of city programs, on the very street or in the vicinity.

Restriction of movement that occurred due to the pandemic caused by COVID - 19 prevented us to carry out the research to the end. Results, *of only a third of the planned survey, s*uggest to be *indicative* and we presented them as preliminary.

City programs and dynamic streets are interrelated. In the past the big survey of Jan Gehl and Lars Gemzøe presented in the book *Public spaces Public Life Copenhagen* confirm our opinion. Additionally, now, that tourism has largely waned and globalization is coming to an end city programs are even more important. "As economies reopen, activity will recover, but don't expect a quick return to a carefree world of unfettered movement and free trade (...) Wave goodbye to the greatest era of globalisation—and worry about what is going to take its place". No matter what changes are ahead of us children will always attend school, just as students will attend college, people will take a bus on a city or intercity lines, buy fresh food at a market, attend city agencies. Their presence on Maršala Tita Street in Zenica and Ruđera Boškovića Street in Split provide liveliness and thus a basis for economic activity.

"Whereas other city centres might feature specific user groups (…) public life in Copenhagen city centre is highly diverse. There are people from all age groups, income groups and educational backgrounds (...) There are residents, students, customers and visitors. People live, work, shop and enjoy themselves in the city" Gehl, Gemzøe (2004).

REFLECTIONS AND RECOMMENDATIONS

The actual contribution to the set thesis would be fully realized through the continuation of research in the following months. Maršala Tita Street in Zenica, in BiH and Ruđera Boškovića Street in Split/Split 3, in Croatia, are both vital to city life. To describe their qualities and special features will give an overview of their strengths and uniqueness to everyone concerned with urban development – users, owners, merchants and politicians.

REFERENCES

Džananović, M. (2017). *Grad u dimnjacima – urbanizacija Zenice od 1945. do 1990. godine (City in chimneys - urbanization of Zenica from 1945 to 1990)*. Udruženje za zaštitu intelektualnih i kulturnih vrijednosti Zjenica.

Gehl, J., Gemzøe, L. (2004). (First published in 1996) *Public Spaces Public Life – Copenhagen*. The Danish Architectural Press & The Royal Danish Academy of Fine Arts. School of Architecture Publishers.

Jacobs, J. (1992). (First published in 1961) *The Death and Life of Great American Cities.* Vintage Books.

Kukoč, V. (2013). *Metoda za načrtovanje javnih mestnih prostorov v obdobju tranzicije na primeru Split III (Method of Planning of Urban Public Places in Times of Transition as Exemplified by Split III).* Theses, University of Ljubljana.

Lefebvre, H. (1974). (First published in 1970) *Urbana revolucija (The original title: La révolution urbaine)*. Nolit.

Mušič, V. B. (1970). Urban Design and Development of the Split 3 Project. *SINTEZA – journal of art culture.* Double issue 18 & 19.

Official pages of the Assembly and the Government of Zenica - Doboj Canton, B&H. (2020, June 9). *Trade, tourism and catering*. Retrieved from https://zdk.ba/press/item/2965-trgovina-turizam-i-ugostiteljstvo

The Economist (2020, May 14). *Has covid – 19 killed globalisation?* Retrieved from https://www.economist.com/leaders/2020/05/14/has-covid-19-killed-globalisation

DECENTRALIZATION OF WORKPLACES AS A FACTOR OF THE REDUCING URBAN TRANSPORT SYSTEM

Gregor Čok[1]
Assist. Prof., PhD, University of Ljubljana, Faculty of Civil and Geodetic Engineering,
gregor.cok@fgg.uni-lj.si

Samo Drobne
Assist. Prof., PhD, University of Ljubljana, Faculty of Civil and Geodetic Engineering,
samo.drobne@fgg.uni-lj.si

Gašper Mrak
Assist., PhD, University of Ljubljana, Faculty of Civil and Geodetic Engineering,
gasper.mrak@fgg.uni-lj.si

Mojca Foški
Sen. Lect., PhD, University of Ljubljana, Faculty of Civil and Geodetic Engineering,
mojca.foski@fgg.uni-lj.si

Alma Zavodnik Lamovšek
Assist. Prof., PhD, University of Ljubljana, Faculty of Civil and Geodetic Engineering,
alma.zavodnik@fgg.uni-lj.si

Abstract

The urban transport system today faces the challenges of the negative impact of transport on health and the environment and its spatial limitations in terms of sharing with other actors. Traffic regulation can be achieved through partial measures or through strategic planning of activities in space. In recent decades, Slovenia has experienced an intensive centralisation of workplaces, especially in the large urban centers, which promotes daily commuting on a large scale and the resulting strain on both the wider transport network and the urban street network. The article presents an analysis of the current situation in the field of spatial distribution of workplaces and business entities in Slovenia, with a focus on the Osrednjeslovenska statistical region. Using a comparative research method, we have defined their scope and distribution in space on the basis of publicly available data. We found a significant concentration in the area of the Ljubljana Urban Municipality, which is consequently confronted with traffic congestion and the search for solutions to cope with the situation. The impact of transport on the urban environment would be easier to manage at the level of a coordinated location of activities in the area and towards the objectives of sustainable development.

Key words: urban transport system, jobs, commuting, business entities, decentralization

[1] *Corresponding author*

INTRODUCTION

The urban transport system is one of the basic structural elements of urban space. In addition to bypasses, access roads and other city streets, the system also forms intersections and contiguous street spaces which, together with the content and architectural scenery of the surrounding buildings, contribute to the identity of the structural morphology of each city and its quality of living (Jacobs, 1961; Rudofsky, 1969; Loafland, 1998; Gehl, 2010). In its chronological development, it has undergone various transformations of its programmatic and shape physiognomy over the decades.

The most important transformations of the conventional urban transport system were experienced by the motorisation of transport at the beginning of the 20th century (Clark, 1958). In addition to road surfaces, new uses such as parking lots, bus stops, charging stations, signaling systems and other elements of transport infrastructure were created, further restricting pedestrian traffic and causing various negative impacts on health and the environment. Less than a century later, the urban transport system faces the challenge of regulating the existing situation (Furchtlehner and Lička, 2019). On the one hand, it is a complete overload of the system and the search for effective solutions; on the other hand, we are witnessing the phenomenon of empty streets, which is a consequence of general social mobility or modern living and working culture. As an alternative to the traditional city streets with a public program, modern commercial and shopping streets are being developed, located in the newly emerging urban centers of cities and other settlements (Mehta, 2009). At the same time, the process of reducing and eliminating car traffic is being carried out in individual areas, especially in urban centers, in order to bring this area closer to a wider range of users.

In Slovenia, too, we are confronted with two opposing processes in the current planning of the urban transport system. In the field of renovation of historic streets we follow the trends of sustainable design (Pignar, 2015) and give priority to “street life and events on the street", tourism and trade. At the same time, we want to meet the growing demand for urban bypasses, access roads and other streets in the city, which are increasingly congested with increasing (mainly personal) traffic. The biggest congestion on the roads usually occurs in the morning and afternoon rush hours when people drive to and from work, and in the afternoons in larger shopping centers, due to the concentration of workplaces and various services in the cities. Especially in the area of Ljubljana, the capital of Slovenia and also one of the three national centers of international importance (SPRS, 2004), there are many business, administrative, educational and other functions that promote extensive daily commuting from the hinterland. 80,600 employed persons come to the Osrednjeslovenska statistical region every day, and only 19,700 leave it (Regions in figures, 2018).

Thus, despite the construction of the motorway network and the continuous improvement of urban transport systems, we are still confronted with congestion

in transport infrastructure, particularly at the level of regional centers (MzI, 2018), which is reflected in increased traffic flows and the resulting negative environmental impact on the structural, symbolic and quality of life of cities. In this context, the question arises whether the current centralisation (Miklavčič (ed.), 2016, Nared et al., 2016), which represents a deviation from the strategic orientations of spatial (SPRS, 2004) and sustainable development (ESDP, 1999), is also or primarily due to the lack of control of individual spatial processes?

Although the direct effects of the described situation are usually first seen on the transport infrastructure, the problem is much more complex and needs to be addressed on a broader scale. The article therefore draws attention to the situation that, according to statistical and other publicly available data (SORS, 2019, AJPES, 2020), shows the increasing centralisation of jobs in the major employment centers, which consequently leads to an increase in daily commuting. We will therefore show the spatial distribution of jobs and business units in Slovenia, focusing on Ljubljana and the Osrednjeslovenska statistical region.

METHODS AND DATA

The survey was carried out on the basis of publicly accessible (SORS, 2019) and other public databases (AJPES 2019) processed with the corresponding software tool (ArcGIS). In a first step, an analysis of the number of workplaces in Slovenian municipalities in the period 2005-2018 (SORS, 2019) was carried out. The trend of increase and decrease of the number of workplaces was divided into six (6) classes according to the Jenks method (the method finds the places with the highest concentration of the examined elements). In a second step, the size and distribution of business entities in the space were checked using a database of all registered business entities in Slovenia (AJPES, 2019). We then compared the results obtained descriptively.

In a third step, an even more detailed analysis of business entities in the Osrednjeslovenska statistical region was carried out and distributed according to the sector of activity (Čok et al., 2020) and according to distribution in the Ljubljana Urban Municipality (hereinafter referred to as MOL), suburban municipalities (all municipalities directly bordering the city of Ljubljana) and in the other municipalities in the Osrednjeslovenska statistical region. The scope and distribution of business entities with regard to the detailed land use in MOL (OPN MOL ID, 2010) was also reviewed.

RESULTS

Data on the change in the number of workplaces between 2005 and 2018 show that the picture has changed significantly over this period (Figure 1). There is no doubt that there is a strong trend of workplaces growth in some large urban centers along the motorway junction and especially in MOL, which shows strong workplaces

growth (up to 26% of all workplaces in the country) and in most municipalities of the Osrednjeslovenska statistical region. The results undoubtedly show a high concentration of business entities and the centralisation of many activities, including in the public sector (Nared et al., 2016) and the resulting increase in daily commuting to Ljubljana.

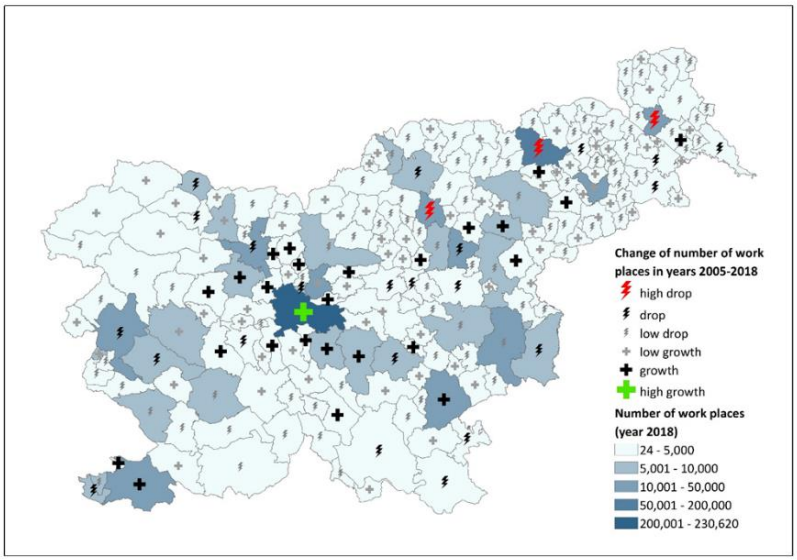


Figure 1: Number of workplaces by municipality in 2018 and the trend of change in the number of workplaces in the period 2005-2018 by municipality in Slovenia

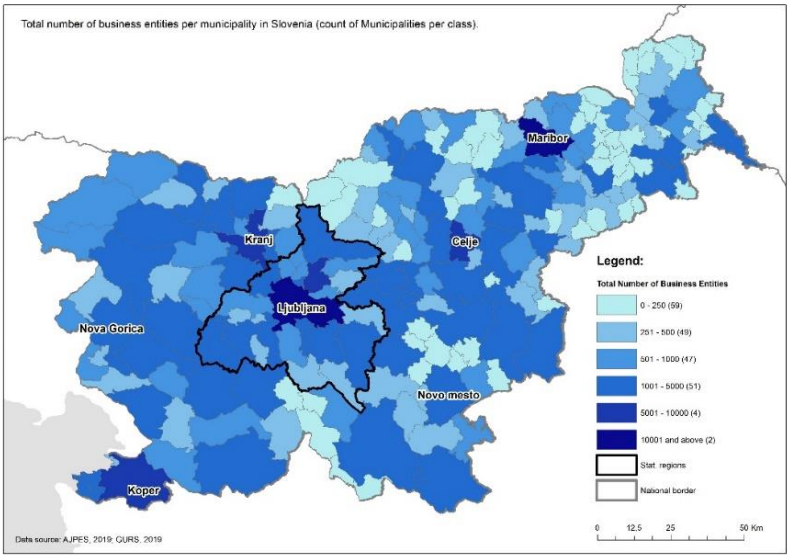


Figure 2: Spatial distribution of business entities in Slovenia, situation in 2019 according to their number in the municipality (the number of municipalities in each class is given in brackets)

Regardless of the trend of increasing or decreasing of workplaces, in 2019 the highest concentration of business entities (Figure 2) was also recorded in the urban municipalities of Ljubljana and Maribor, followed by the municipalities of Koper, Kranj and Celje.

The Osrednjeslovenska statistical region also stands out the most among the statistical regions. It is home to 85,359 or 33.2% of all business entities in the country, which together provide 293,647 workplaces and employ 53.5% of the working population (SORS, 2019). In terms of activities, the tertiary and quaternary sectors dominate in the Osrednjeslovenska statistical region, accounting for up to 91.8% of all business entities (Table 1).

Table 1: Number and share of business entities by sectors of activity in the Osrednjeslovenska statistical region

Sector of activity	Slovenia		Osrednjeslovenska statistical region	
	No. of business entities	Share (%)	No. of business entities	Share (%)
A - primary	2732	1,1	363	0,4
B - secondary	26.611	10,4	6671	7,8
C - tertiary	180.465	70,2	63.374	74,2
D - quaternary	47.224	18,4	14.951	17,6
Total	**257.032**	**100,0**	**85.359**	**100,0**

Compared with the data for the whole of Slovenia, in the Osrednjeslovenska statistical region 25% of all business entities are located in the secondary sector, even 35% in the tertiary sector and 31% in the quaternary sector. These data also indicate a strong concentration of business entities and workplaces in the Osrednjeslovenska statistical region, so we were also interested in a more detailed distribution of business entities within the region. It shows a significant concentration within the MOL (Table 2), where 65.8% of all business entities in the region are present, in the suburban municipalities (municipalities directly bordering to the MOL) this proportion is already much lower (21%), and in all other municipalities in the Osrednjeslovenska statistical region there are only 12.9% of business entities.

Table 2: Distribution of business entities by municipalities in the Osrednjeslovenska statistical region

Osrednjeslovenska statistical region	No. of business entities	Share (%)
MOL	55.920	65,5
Suburban municipalities	18.441	21,6
Other municipalities in region	10.998	12,9
Total	**85.359**	**100,0**

Surprisingly, the majority of business entities are located in residential areas (55.3% in the Osrednjeslovenska statistical region and 31.6% in the MOL). This is followed by the areas of central (community, commerce and business activities) and industrial activities. It is interesting that business entities in these areas also belong to all four sectors of activity. The tertiary sector is strongly dominant (at the level of the whole of Slovenia there are up to 70.2% of tertiary activities in residential areas (Čok et al., 2020). As it can be assumed that a large part of these activities is also carried out in the form of work at home, their influence on traffic flows is reflected in the overall urban transport system (Figure 3).

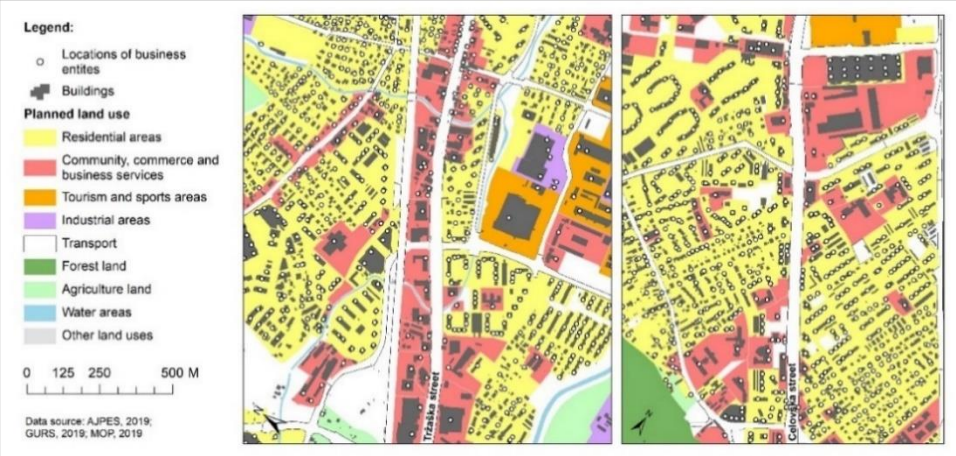


Figure 3: Example of the location of business entities in residential areas and in areas of central activities (commnity, commerc and business activities) in the case of Tržaška ulica (left figure) and Celovška ulica (right figure) in the city of Ljubljana

The consequences are naturally reflected in the general congestion of the main access roads (e.g. Celovška and Tržaška Streets) as well as the network of junctions and other city streets (access for business customers, supply of raw materials, waste disposal, etc.). This phenomenon has not yet been systematically studied in Slovenia (Čok and Furman, 2019), but we can say with great certainty that work at home on such a large scale continues to put a strain on the urban transport system and the associated street space.

CONCLUSIONS

The analysis of the distribution of workplaces and business entities in Slovenia, particularly in the Osrednjeslovenska statistical region, confirmed that we have long been confronted with the problem of concentration and, above all, centralisation in MOL. We have also shown that the business entities are belong to different categories of detailed land use at the city level. In this sense we are also dealing with a loosely controlled phenomenon of work at home, which causes additional traffic congestion and other negative impact on the urban environment.

We also note that the spatial situation certainly shows a deviation from the strategic orientations of a polycentric and balanced spatial development (SPRS, 2004), but also an insufficient implementation of the current spatial legislation (ZPNačrt, 2007 and ZUreP-2, 2017) and control of spatial processes.

All this has a direct impact on the dominance of car traffic in the urban transport system, including the interconnected junction and street system, often to be regulated by intervention measures and ad hoc projects. These are curative measures with the aim of rehabilitating existing problems that could be solved more successfully and rationally. In fact, for all the above-mentioned issues, the appropriate measures exist within the framework of existing strategic development documents (SPRS, 2004; PRS, 2004; SRS 2030, 2016, etc.) and spatial legislation (ZPNačrt, 2007 and ZUreP-2, 2017) with their implementation instruments. We can therefore conclude that despite the principles of sustainable development and the accepted direction of polycentric spatial development, Slovenia still has a clear centralisation of business entities and workplaces in MOL (and the Osrednjeslovenska statistical region), which raises two fundamental questions: Are we able to regulate current trends in spatial development and do we want harmonious spatial development?

ACKNOWLEDGEMENT

The authors acknowledge the financial support from the Slovenian Research Agency for co-financing of the research programme Geoinformation Infrastructure and Sustainable Spatial Development of Slovenia (P2-0227).

REFERENCES

AJPES (2019). *Baza poslovnih subjektov*. Ljubljana, Agencija Republike Slovenije za javnopravne evidence in storitve. Retrieved from //www.ajpes.si/fipo/default.asp

Clark, C. (1958). Transport: Maker and Breaker of Cities, *The Town Planning Review*. *28*(4), 237-250.

Černič Mali, B., Marot, N. (2019). *Izzivi zagotavljanja storitev splošnega pomena za starejše v težje dostopnih podeželskih območjih: primer Idrijsko-Cerkljanskega*. Bovec, Slovenski regionalni dnevi 2019.

Čok, G., Furman Oman, M. (2019). Delo na domu kot prostorski pojav : arhitekturni in urbanistični vidik regulacije dela na domu. *Igra ustvarjalnosti (IU)/Creativity Game (CG)–Theory and Practice of Spatial Planning*, 7, 38-45.

Čok, G., Mrak, G., Zavodnik Lamovšek, A. (2020). Analiza prostorne distribucije poslovnih subjekata u Sloveniji. *Prostor : znanstveni časopis za arhitekturu i urbanizam*. 28, 1 (59), 76-87.

ESDP (1999). *European Spatial Development Perspective: Towards Balanced and Sustainable Development of the Territory of the European Union*. Luxembourg, Committee on Spatial Development. European Commission.

Furchtlehner, J., Lička, L. (2019). Back on the Street: Vienna, Copenhagen, Munich, and Rotterdam in focus. *Journal of Landscape Architecture*, *14*(1), 72-83.

Gehl, J. (2010). *Cities for people*. Washington, Covelo, London. Island press.

Jacobs, J. (1961). *The Death and Life of Great American Cities*. New York, Vintage Books.

Mehta, V. (2009). Look Closely and You Will See, Listen Carefully and You Will Hear: Urban Design and Social Interaction on Streets. *Journal of Urban Design*, *14*(1), 29-64.

Miklavčič, T. (ed). (2016). *Poročilo o prostorskem razvoju*. Ljubljana, MOP.

MzI (2018): *Pobuda za državno prostorsko načrtovanje za ureditev ljubljanskega avtocestnega obroča in vpadnih cest ter predlog dopolnjujočih ukrepov reševanja prometne problematike.* Ministrstvo za infrastrukturo. *Ljubljana,* PNZ svetovanje projektiranje d.o.o., LUZ d.d.

Nared, J., Bole, D., Breg Valjavec, M., Ciglič, R., Černič Istenič, M., Goluža, M., Kozina, J., Lapuh, L., Razpotnik Visković, N., Repolusk, P., Rus, P., Tiran, J. (2016). *Policentrično omrežje središč in dostopnost prebivalstva do storitev splošnega in splošnega gospodarskega pomena*. Končno poročilo. Ljubljana. ZRC SAZU.

OPN MOL ID (2010). *Odlok o občinskem prostorskem načrtu Mestne občine Ljubljana – izvedbeni del*, Ur. L. RS, št. 78/10, 10/11 - DPN, 22/11 - popr., 43/11 - ZKZ-C, 53/12 - obv. razl., 9/13, 23/13 - popr., 72/13 - DPN, 71/14 - popr., 92/14 - DPN, 17/15 - DPN, 50/15 - DPN, 88/15 - DPN, 95/15, 38/16 - avtentična razlaga, 63/16, 12/17 - popr., 12/18 - DPN in 42/18.

Pignar, U. (2015). *Kreativno preoblikovanje uličnih prostorov. Primer začasne ureditve Koroške ceste v Mariboru.* Projektna naloga univerzitetnega študijskega programa arhitektura 1. stopnja. Maribor, Univerza v Mariboru, Fakulteta za gradbeništvo, prometno inženirstvo in arhitekturo.

PRS (2004). *Uredba o prostorskem redu Slovenije*. Ljubljana, Ur. l. RS 122/04.

Regions in figures (2018). *Statistical portrait of slovenianm regions.* Ljubljana, Statistical Office of RS. Retrieved from: Retrieved from: https://pxweb.stat.si/

Rudofsky, B. (1969). *Streets for People.* New York, Doubleday.

SPRS (2004). *Odlok o strategiji prostorskega razvoja Slovenije*, Ur. L. RS 76/04. Ljubljana. MOP.

SRS 2030 (2017). *Strategija razvoja Slovenije*. Ljubljana., Vlada RS

SIRS (2019): *Si-stat: demografsko in delovno področje*. Ljubljana, Statistical Office of RS. Retrieved from: https://pxweb.stat.si/SiStat

ZPNačrt (2007). *Zakon o prostorskem načrtovanju*. Ljubljana, Ur. L. RS, št. 33/07.

ZUreP-2 (2017). *Zakon o urejanju prostora*. Ljubljana Ur. l. RS št. 61/2017.

PROMOTING ACCESSIBILITY IN THE URBAN PLANNING SYSTEM: FADP IN TARANTO SMART CITY PLANNING

Alessandro Massaro[1]
MSc in Urban Regeneration, University of Parma, a.massaro.a@gmail.com

Francesco Rotondo
Università Politecnica delle Marche, f.rotondo@univpm.it

ABSTRACT

This paper aims to investigate the role of sustainable urban mobility in the strategy of the new urban design development of the city of Taranto. Following Agenda 2030, the municipal urban planning system is finding a definitive shape, under the regular exercise of the new Masterplan. Therefore, we investigate the role of sustainable urban mobility in the process that brings to the Masterplan. In this urban planning process, we analyze the FADP (Free-Accessibility Design Plan), its genealogy process, and its development. The FADP is one of the first applied tools of the Urban Sustainable Mobility Plan (SUMP), and regards the entire downtown, which is made by three different parts, due to the particular geographical context and to the different shapes of the urban neighborhoods. The present search explains the methodology used to study this area, based on GIS analysis supporting the decision system. So, the different moments of acquiring data, collecting measures, and involving residents become the topics of the speech, in their innovative methodology GIS-based. Finally, the search epitomizes the role of FADP to enhance urban open space quality and attractivity of places.

Keywords: Planning, Mobility, Accessibility

INTRODUCTION

The articulation of Objective 11 of the 2030 UN Agenda, highlights the need to enhance and adapt urban transport and public spaces to allow weaker users accessibility and security, with a view to a progressive decrease in vulnerability, greater inclusiveness, in a wider sense of sustainability. Reaching the targets of Objective 11 of the Agenda has become even more urgent in the pandemic phase in which the inability to use the entire capacity of local public transport to ensure adequate health safety measures, could lead to an increase in the use of cars by raising the level of pollution. The city of Taranto (the 16th most populous in Italy)

[1] Corresponding author. The paper is a shared work between the two authors even if it has to attributed the first three paragraphs and the last one to Francesco Rotondo and all the others to Alessandro Massaro.

has integrated the policies for sustainable mobility within the broader training path of the new Masterplan. So, this paper discuss the free accessibility design plan, starting from relationships with the general urban planning system, made by the Masterplan and the SUMP which have preceded it.

BUILDING THE MASTERPLAN AS A FRAMEWORK FOR URBAN MOBILITY

The city has to make a huge effort to get out of the planning impasse it has been in since 1978 (approval date of the current masterplan). The greatest difficulty of the process, precisely in terms of participation, is the mistrust accrued by the population with respect to the institutions and their plans and programs. Furthermore, there are evidently strong discrepancies between the urban planning tools in force and the real conformation of the settlements. This difficulty in planning that has characterized the city is probably also due to the presence of the large steelworks, accommodating and capable of ensuring easy employment and a safe model of economic development that does not require planning alternatives. All of this in a city covering an area of about 250 sq km with a population that since 1971 has decreased from 244,000 to 198,000 inhabitants (it is a shrinking city as revealed by Camarda, Rotondo, Selicato, 2015), of which today, even more worryingly, 30% are unemployed, well beyond the more diffused data (2-7%). In addition, the city, at present, has no relevance in the tourism market, neither regional nor national despite the enormous historical and cultural value of the Magna Graecia city (and not only) or of the Ionian tourist axis. For these reasons, the new municipal urban plan is mobilizing the plan resources on areas of urban regeneration in which to accompany and direct the private investors in the transformation processes, avoiding defining new property income (as traditionally the regulatory plans have always done in Italy) but focusing the scarce resources available on the areas to be redeveloped, generating new transformation rents for those operators who will undertake to implement the plan in these problem areas. No longer new soils with a land rent, but new areas of urban regeneration with a transformation income. This is how the new project areas of the municipal plan were identified. These become the territories of the experimentation of regeneration to be implemented. The new SUMP described in the next paragraph, has given sustainable transport solutions to support those regeneration processes.

SUSTAINABLE MOBILITY PLAN (SUMP) AND APPLIED TOOLS

In 2018 the municipality approved the Urban Plan for Sustainable Mobility. As a strategic tool, it does not introduce prescriptions, but addresses for the Masterplan, determining its urban planning choices. Among the proposed mobility policies, some outline new settlement arrangements for this complex city, such as the reuse of an abandoned Station (Nasisi near the Paolo VI district) or the identification and commissioning of the rapid transit bus, fast public transport lines (BRTs in coherence with a transit oriented development. Calthorpe, 1993; Wright, 2010; Wright, Hook, 2007) which will impose significant changes in the urban layout.

The Plan, built with the idea of an implementation in stages, aims to reduce the traffic crossing the old island and the historical quarters, making it expensive, up to arriving to make it completely pedestrian the aforementioned areas, today subject to severe congestion and degradation. Pedestrian and bicycle accessibility is the key concept of the plan.

FREE ACCESSIBILITY DESIGN PLAN (FADP)

Starting from the SUMP's addresses, the FADP weaves the concept of "accessibility" to the meaning of disability, enhancing it (Carra, Caselli, Ventura, & Zazzi, 2017), attempting to start the slow process of transforming discrimination into social resources. It wish began a process of changing public policies and design practices. Physical barriers in the environment are recognized as a discriminatory and powerful influence on people with reduced mobility. The progressive increase in the number of individuals with different abilities leads the consequent growth in life expectancy. In Italy, accessibility has become a fundamental design criterion for public buildings, with the Law 41/1986, which obliges public buildings to adopt plans for the removal of architectural barriers. It does not explicitly concern urban spaces, until 1992, with Law 104, which related the accessibility of buildings to urban spaces. So, now the design plan promote interventions to enlarge pedestrian flows, to allow the accessibility to the public spaces.

Roots of the idea

According to the European Agenda (Urban Agenda for the EU, 2016), the FADP focuses on accessibility (for disabled, elderly, young children, etc.) in the planning system (Massaro, Rotondo, 2019). Belonging the already described flows of the new Taranto's planning system, the FADP has thought on promoting "the equal rights of all persons with disabilities to live in the community, with choices equal to others" (Article 19 of the CRPD). In this way, the FADP develops its phases, trying to investigate the issues regarding the physical characteristics of the pedestrian network. The choice's management options refer more to three different zones of the city, belonging its downtown. The FADP, regarding the *Old City* an island linked by two bridges (the *Rounding Bridge*, and the *Stone Bridge*) to the other two parts of the Plan: *Modern Downtown* (Borgo) on the south, and *Naple's Door* (Porta Napoli) on the north. Entirely, the Plan will give solutions about an area of 2,11 sq km (28.341 inh., 2019), after an intense phase of participation, involving population, and disability in the mainstream of the Plan.

Methodology

This methodological approach explores the metric relief of the infrastructures and the construction of a GIS Network System, describing some proprieties about the analysis of pedestrian flows in an arc-node system on pedestrian paths. Directly connected with the relief, the multiplicity of constraints that affects the pathways

is put in evidence, most of all, for the Structural paths. In this way, it is possible to subdivide the planning zone in different micro zones by different indicators. The following steps build each micro zone. The network bases its analytic performance on the Municipality dataset, mapping the civic location of every inhabitant. Therefore, the network gives them a topographic settlement, the resident population has been subdivided and localized to the specific civic number, which involves different coordinates, as well as various reasons concerning the shape of the residential use of the urban space in the last years. The system represents the number of inhabitants (2018 Municipality census data) for each civic number, subdivided by sex, family components, and their evolution along the last ten years. Even more, the value GDP p.i. (Gross Domestic Product per Inhabitants, Regional data, 2006-2016) for the entire city in the last year has been subdivided by the addressed inhabitants at each civic number. The correlation between the evolution of the GDP p.i. for the entire city and the growth of the GDP p.i./Civic-Density, gives some different answers related to the shape of the balanced distribution of the residential value in the analyzed area. For first, it explains the difference between the economic evolution shape for the so different three (from north to south: Porta Napoli, Old City, Borgo) areas of the Plan, so close in the compact city. The union of residents and facilities in the area describes the set of all arcs of the analysis. Thus, when every link has an associated speed-max, derived from manuals (Sciences, 2000) of 5.5 km/h, it gives back a specific time of the journey. The study connects the different civic numbers with the various facilities, evaluating the weight of residential pedestrians on each arc beside the GIS network analysis, determining the most utilized paths of the analyzed area. Moreover, the FADP locates, describes, and analyzes the accessibility for the main public buildings of the area, collecting functions, and access indicators. One essential system of facilities regards to healthcare's buildings. The whole network of the healthcare centers (Hospitals, Pharmacies, Associations, etc.), acquires a critical role in the study of pedestrian flows, and the time-path just becomes a part of the safety equation. Another important system of facilities regards to education’s buildings. The various schools in the area enlarge the functioning of the plan to the children, and their security on the paths to reach their education.

The other crucial facilities added to the network to understand the main routes of the pedestrian flows are the Railway Station in the Porta Napoli district; the Cathedral, the University, and the City Hall in the Old City; the Museum (https://museotaranto.beniculturali.it/it/), the Province's Building, and the Fruit and Vegetable Market (*Mercato Fadini*) in the Borgo. The complex system of public spaces, gardens, and squares complete the evaluation of the pedestrian attractiveness. The functioning of the safety equation determines the danger along the paths, locating that, for evaluating different solutions, connecting the entrances of the various scheduled facilities, to the whole system of civic residential numbers. The danger is related to the elements that indicate protection of pedestrians: the height of the sidewalk on the roadway; the roads' speed max; protective elements as railings, or similar features; the presence of electronic bollards at intersections; the overall state of maintenance, measured on the different relief's evaluations.

Applying a different weight to the various indicators, it is possible to classify the location of the danger, obtained summarizing each value, and relating the result to the total amount of the pedestrian flows. Particular attention regards the crossroads, where the pedestrian paths intersect the vehicular flows. In fact, despite the dimension of the area, and the diversification of the three mentioned zones, there are few traffic lights. The safety in the intersections is often guaranteed just by old zebra crosswalks, notwithstanding the speed limit of 50 km/h on the whole area, standing the current Municipality's rules. The system adds an amount of time at every traffic light, regarding the time of the journey, measured by the proportional reduction of the pedestrian speed-max: the length of the crosswalk, its schedule of conditions, the dimension of the pedestrian flow, the shape of the relative sidewalks, and the typology of the vehicular circulation, determine the weight for that reduction for every intersection. Summarizing the data from the relief of the pedestrian paths, with the data deriving from the GIS network Analysis, it has been possible to evaluate the state of safety for the entire area. The network analysis matches the considerations about the pedestrian paths with the pedestrian's attitude in following convenience, economy, and comfort during their trips. Therefore, the state of safety depicts the localization of the danger for the whole area, underlining the main issues due to the most utilized paths. The network also gives a first evaluation of the level of service, directly linked to the convenience of the existing walkway system. The network analysis improves the comfort of the paths, using the Origin-Destination matrix to find the shortest one for each facility. The primary evidence at this stage follows the comparison with the maps of the UMPD, underpinning the similitude between the found paths, and the two lines of Bus Rapid Transport (BRT), a "supporting" network created by the UMPD for the urban transport. Naturally, the FADP focuses the analysis on the Structural Paths, a group of walkways distributed on the three parts of the investigation, underlining its proper functions. At this step, the calculations focus on accessibility, improve the perceived level of services underlining safety and security, comfort, and convenience. The feature of the sidewalks is skilled by the grade of separation from vehicular traffic, analyzing traffic control devices, and the functioning of the free-vehicular traffic areas. Moreover, in this part of the analysis, the location-allocation methodology of the GIS built network spots the actual bus-stop system and its relations with the neighborhood. It retains the previous accounts on the whole area, refining the pedestrian utilization along the structural paths. From literature about the topic, accessibility can be defined here as "the ability of people reaching possible benefits or locations within a system." (XU, 2014). The analysis of the pedestrian paths undergoes a wide range of measurements. So the sheets of the survey change, going deeply in the discovering of the physical features of the walkways, improving the amount of the indicators for the evaluation of their functioning. The calculations of the density, the frequency, and the rate of the pedestrian flows are useful to classify the level of service related to the bus-stops, so to the diverse functions. The shortest path to reach every key-point in the area shows another crucial feature of the city, over the UMPD, over the structural walkways, adequately related to the special meaning of the FADP. It is the case of what we can define as the "lifeline" of the city downtown.

RESULTS OF THE ANALYSIS

The interaction between the different made evaluations focuses on a measured scale of values. The whole group of issues along the structural paths are summarized and standardized, so deriving a corresponding number of adaptable design solutions, each one with its proper cost. An intervention action can be associated with each indicator found by crossing the data collected on the structural paths. Each intervention action brings with it a measured degree of priority. At the same time, the plan gives back a total value for the whole number of interventions, an absolute time, and the time-cost for each one. During the planning evolution, the results of the analysis, with possible design proposals for the most significant places (Figure 1), have been presented to the population to improve participation and discussing solutions.

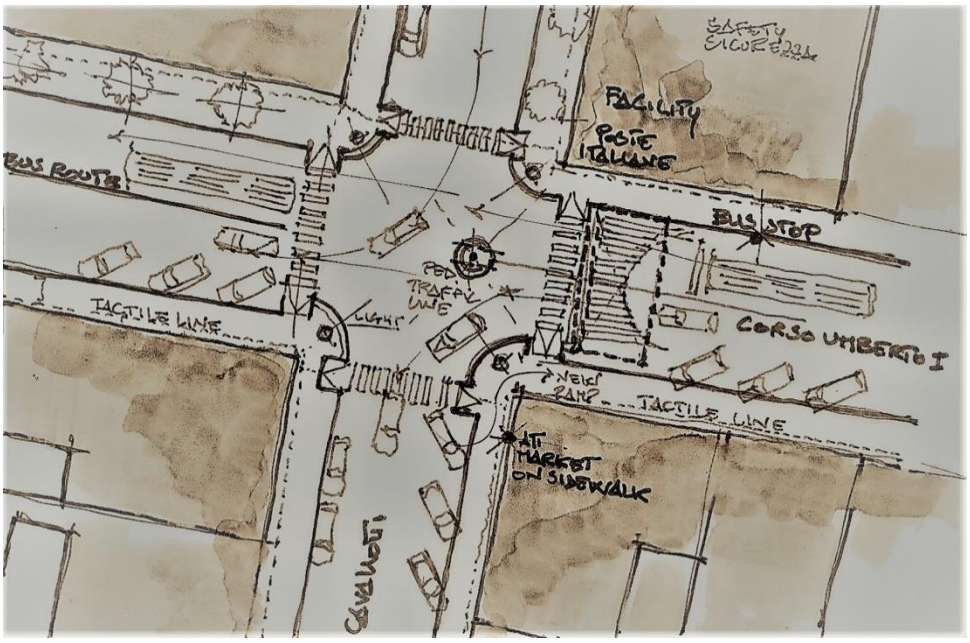


Figure 1: In-depth hypothesis for residential streets, concerning the safety of the intersection between via Umberto and via Cavallotti (Source: Authors' drawing)

CONCLUSIONS

The method proposed using a GIS Network System to model pedestrian flows and describing path's characteristics, it's not a new one. It uses tools like GIS and methods such as geostatistical analysis that are already well known in urban planning discipline, but we have verified in the case of Taranto, that this scientific approach can improve the ability to demonstrate the reasons and correctness of the choices made in terms of the priority of the proposed interventions and efficiency

of the overall accessibility system designed. The plan actions and the expected results are directly conveyable in the participation process to be continuously updated and monitored (City of Helsinky, 2005; Mitman, Ridgway, Chira-Chiavala, 2008). The plan acts as a tool for broader accessibility, reachable only through extensive sharing and constant monitoring. Moreover, the statistical evaluation through the analysis should be improved in the other parts of the cities. The plan focuses on the inhabitants, so it is useful to repair and give an impulse to the regeneration process. In this experience, sustainable urban mobility is a process where the FADP is a relevant tool to improve it together with urban planning development and transit oriented development, as we tried to describe in the case of Taranto.

REFERENCES

Calthorpe, P. (1993). *The Next American Metropolis: Ecology, Community, and the American Dream*. Princeton Architectural Press.

Camarda, D., Rotondo, F., & Selicato, F. (2015). Causes and processes of shrinkage in the old industrialized city of Taranto. *European Planning Studies*, 23, Issue 1, 126-146.

Carra, M., Caselli, B., Ventura, P., & Zazzi, M. (2017). Gis-Based Monitoring and Evaluation System as an Urban Planning Tool to Enhance the Quality of Pedestrian Mobility in Pezzagno, M., Tira, M. *Town and Infrastructure Planning for Safety and Urban Quality*, Taylor & Francis.

City of Helsinky. (2005, November 14). *Accessibility Plan*. Public Work Department. Retrieved from https://www.hel.fi/helsinkikaikille/en/

Massaro, A., Rotondo, F. (2020). *L'accessibilità urbana come forma di rigenerazione: un'esperienza a Taranto*. XXII Conferenza Nazionale Società Italiana degli Urbanisti - L'urbanistica Italiana di Fronte all'Agenda 2030 per lo Sviluppo Sostenibile. Bari: Società Italiana degli urbanisti (SIU). Retrieved from: http://www.planum.bedita.net/xxii-conferenza-siu-2019-pubblicazione-atti

Mitman, M., Ridgway, M., Chira-Chiavala, T. (2008, May). *A Technical Guide for Conducting pedestrian Safety Assessments for California Cities*. Retrieved from: https://safetrec.berkeley.edu/sites/default/files/psa_guidebook_2013.pdf

Sciences, National Institute of Buildings (2019, 07 18). *History Of Accessible Facility Design*. Retrieved from: https://www.wbdg.org/design-objectives/accessible/history-accessible-facility-design

Wright, L., & Hook, W. (2007). *Bus Rapid Transit Planning Guide*. Institute for Transportation & Development Policy.

Wright, L. (2010). Bus rapid Transit: a public transport renaissance. *Built Environment*, *35*(3), 307-316.

Xu, M. (2014), *A GIS-based pedestrian network model for assessment of spatial accessibility equity and improvement prioritization and its application to the Spokane public transit benefit area*, Washington State University Press.

URBAN MORPHOLOGY AND MOBILITY PATTERNS: MYTHS AND REAL-LIFE TRANSFORMATIONS OF A LARGE HOUSING ESTATE IN SOFIA

Milena Tasheva-Petrova [1]
Assoc. Prof., University of Architecture, Civil Engineering and Geodesy, Address: 1 Hr. Smirnenski Blvd., Sofia, Bulgaria, e-mail: tasheva_far_uacg@abv.bg

Elena Dimitrova
Assoc. Prof., University of Architecture, Civil Engineering and Geodesy, Address: 1 Hr. Smirnenski Blvd., Sofia, Bulgaria, e-mail: eldim2002@gmail.com

Angel Burov
Assist. Prof., University of Architecture, Civil Engineering and Geodesy, Address: 1 Hr. Smirnenski Blvd., Sofia, Bulgaria, e-mail: burov_far@uacg.bg

ABSTRACT

The paper discusses the long-term urban planning impacts on the urban morphology and mobility patterns in the large housing estates designed and built at the periphery of Sofia in the period 1960-1990 and undergoing continuous transformations under the changing political, demographic, sociocultural and economic conditions in the country since 1990s. Based on a casestudy-based approach developed within ongoing URBiNAT research project (HORIZON 2020), and applying a set of qualitative as well as quantitative methods, spatial analyses (territorial mapping, behavioural mapping, quality of life survey), and participatory activities (cultural mapping, photovoice and walkthrough), the research undertaken in Nadezhda district, Sofia, outlines major urban challenges of the present day and claims needed changes in the planning approaches for building a healthy and socially inclusive urban environment.

Keywords: urban morphology, mobility, large housing estates, post-socialist transformations, Sofia

INTRODUCTION

The large prefabricated housing estates (HEs) designed and built at the urban periphery of Sofia in the period 1960-1990 were aimed to support the national industrialization policy by following the then influential Modernist planning principles and providing good quality urban environment for large social groups. Under profoundly changing societal conditions in the next three decades the HEs

[1] *Corresponding author*

underwent numerous physical transformations. The present study was motivated by the interest to understand how and how far the urban model once chosen is capable to accommodate societal change. The findings of an ongoing international research project are discussed and needed changes in current planning approaches claimed necessary to adequately respond to the ongoing urban process.

THE LARGE HOUSING ESTATES OF SOFIA AS AN URBAN CHALLENGE AND OPPORTUNITY

Based on the social meta-narrative about directing social progress through planned urban change, the Modernist concept largely influenced urban planning in Europe and worldwide (Mumford, 2019). Modernist urban plans structured city life into functional zones linked by effective public transport. The promoted collective housing resulted in large housing estates (HEs) with standardized high-rise multifamily building units and highly permeable open public space with abundant greenery; motorized traffic was to be calmed down and walking prioritized in the estates.

The rapid industrialization of Bulgaria in early 1960s brought about an urgent demand for new urban housing. Large housing estates of prefabricated panel buildings were considered an optimal economic and social solution. The first prefab housing estates in Sofia for 15,000-20,000 inhabitants, with schools and kindergartens centrally located at a walking distance, were planned in 1960s. In mid-1970s, larger housing districts for up to 50,000 residents with planned healthcare and cultural facilities in the district centres were already under construction (Anastasov et al, 1968; Tashev, 1972); next large housing estates built in mid 1980s, sheltered up to 200,000 inhabitants each (Kiradzhiev, 2006). In 2011 nearly half of the housing stock in Sofia had been built between 1970 - 1990. Prefab housing estates sheltered about 575 000 inhabitants (47% of the city population) (NSI, 2011). The post-1990 transformations of the large housing estates, the result of a complex societal change, were motivated by market demand, enabled by the restitution and privatization of urban land, and facilitated by the lack of effective planning instruments. The social diversification of the inhabitants went alongside the establishment of privately owned services - from small groceries to big commercial chains. Housing densification due to infill private mid-rise developments and the post-restitution fragmentation of the inter-block public greenery was accompanied by a huge increase of privately owned cars, stimulated by changing lifestyles and the low reliability of public transport.

International research interest in the impact of Modernist urban planning on European cities in 20th century's second half outlined a number of general tendencies concerning the large housing estates in Europe and their peculiarities in the CEE region (Anderson et al, 2013; Brade et al, 2009; Tsenkova & Nedović-Budić, 2006). The urban dimensions of the transition period in Bulgaria were also discussed alongside emerging societal conflicts and challenges (Alexandrov,

2006). A deeper understanding for the long-term effects of the initial planning concept would be today useful to fully estimate the existing potential of inherited large housing estates to adequately address the needs and challenges of the present day, and the changes needed in urban planning and governance.

RESEARCH AIM AND METHODOLOGY

The current research stemmed from an on-going international research (URBiNAT project) with partner-cities from all over Europe, with a study area in Sofia covering a location with two neighbouring prefab housing estates, among others inherited from socialism (Figure 1). The construction of *Momkova mahala* HE started in 1962; most of the buildings were inhabited by 1970, and some - by mid-1980s. The spatial composition was built around a commercial centre, a kindergarten, and a school, linking two residential groups (Figure 2a). The original master plan of *Svoboda* HE envisaged 47 prefab panel blocks (Figure 2b). At present, *Momkova mahala* is part of Nadezhda 4 urban unit (with 22 900 inhabitants; *Svoboda* is with 16 500 inhabitants (NSI, 2011).

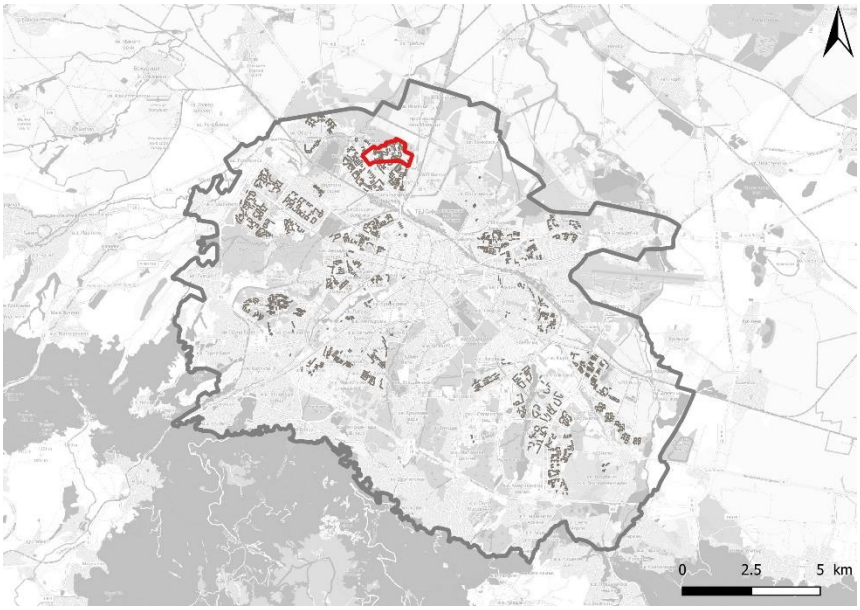


Figure 1: The location of the study area (in red) among other prefabricated housing estates in the city of Sofia (in black). Base: OpenStreetMap contributors

The study traced the changes in the urban morphology and the mobility patterns in the HEs from embracing the Modernist concept in the initial urban design, through their practical realization and functioning during the next 30 years, and the transformations resulting from the profound and continuing societal changes since 1990. Three research questions were addressed: (1)What was the long-term effect

of implementing the Modernist concept on today's urban form and process? (2) What was the capacity of the urban structure to accommodate changes resulting from new societal demands and inhabitants' lifestyles? (3) What planning approaches would today contribute to efficiently utilizing the adaptivity of the urban structures when facing new challenges in developing a socially inclusive and healthy urban environment?

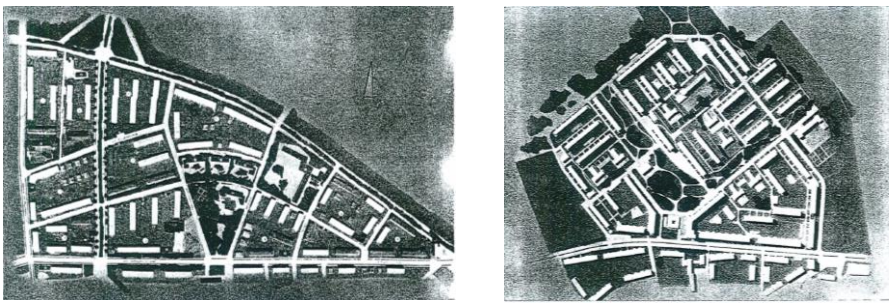


Figure 2: Urban design projects, 1960s: (a) Momkova mahala HE (today's Nadezhda 4); (b) Svoboda HE (source: adapted from Tashev, 1972)

The study of the functional and land-use dynamics and the related mobility patterns in the HEs started by a general socio-economic and functional analysis, followed by a comparative analysis of the planning tools developed and implemented – the urban plans from 1960 and post-2012. Based on desk research, territorial mapping and a comparative spatial study, diachronic analysis was conducted to identify spatial transformations of the major structural elements related to housing, open space, street pattern, and social services, retail, and leisure. The changes in land ownership were then related to accessibility, connectivity, and walkability. The state of the built environment was estimated through direct expert observations, further complemented by a "walk through" and a "photovoice" exercise, and 20 motivational interviews with local pupils. Behavioural mapping was conducted in 9 observation sites. The diversity of lifestyles and mobility patterns, as well as citizens' perceptions and attitude, were addressed through 10 in-depth semi-structured interviews, 3 focus groups with overall 20 participants, and a survey among 150 citizens on the quality of life in URBiNAT study area, all carried out in the period January - October 2019. The identified morphological transformations were related to mobility pattern changes and inhabitants' route preferences.

RESULTS AND DISCUSSION

The summarized research findings were related to four characteristics of the HES – the initial conceptual framework of the urban design, the practical realization of the projects up to 1990, the driving factors for change after 1990 and the resulting urban features currently observed (Table 1). The diachronic analysis covered plot ownership, buildings localization, and walking routes (Figure 3). The study results were then referred to the research questions.

Table 1: Urban dynamics in the housing estates, 1960s – 2020s

Urban aspects	*Modernist concept*	*Realization before 1990*	*Drivers for change post-1990*	*Resulting urban features*
Morphology				
Housing units	Meeting large-scale social needs; collective, free standing,	Prefabricated, standardized, State-built and later sold out to inhabitants	private investment pressure; delayed plan update; ineffective legal framework	Densification, changing scale; private initiatives in services
Open space	Abundant greenery, free access, contact with nature	Low maintenance budget, basic equipment, local initiatives	Land restitution, economic restructuring, high unemployment	Fragmented green system, insecurity, poor maintenance.
Social services	Walking distance to daily services	Schools & kindergartens	Insufficiency of public funding, privatization	Poor maintenance and decay.
Retail, leisure	The daily used at a walking distance	Scarce shops, basic goods provision	Privatization, market economy	Profit-oriented, contrasts in scale
Street pattern	Hierarchical network, calming down traffic inside	Narrow sidewalks, not well maintained, street greenery	Low municipal maintenance budget, increased parking pressure	Insufficient parking space, poor sidewalks, no lighting
Mobility				
Within the HEs	Walking relied upon and encouraged	Walkways never fully adapted to real-life flows	Increased diversity of paths and flows	Fragmentation of open space, barriers
Between the HEs	Walking, large green axes	Compromised green axes, few formal crossings	Increased car dependency	Few formal crossings, jaywalking
Between the HEs and the city	Mainly public transport	Difficult access mainly by bus and tram; few private cars	Low budget for public transport, fast growing car ownership	The city metro system in operation since 2012

(1) What was the long-term effect of implementing the Modernist concept on the continuing urban form and process? In both cases the initial urban design following the meta-narrative of Modernism set the long-term frame of collective housing. *Svoboda* plan was developed on greenfield; its rather rigid physical structure accomplished by 1970 was generally preserved after 1989 with only minor changes in the ground floors of the housing units to shelter small local businesses and provide needed everyday services. *Momkova mahala* plan envisaged 6-story blocks within a wide open green public space to the east, and a mix of existing and new low-rise houses to the west. The initial street design in both cases followed the concept of walking distances, 'calming down' car traffic

and small parking areas close to the buildings. The diachronic analysis outlined elements with major effect on further development: the street network, the residential buildings delineating the public open spaces, and the schools and kindergartens, located within the urban units. The green axes linking the HEs with the Northern park were the main elements not realized until 1990; that later compromised the main pedestrian access to the park and the sports area to the east and enabled future restitution and privatization. Most of the interviewed inhabitants highly appreciated the inter-block public open spaces with their abundant greenery; pupils, however, strongly disliked the poor maintenance of public space and the lack of free sports facilities in the neighbourhoods.

Figure 3: Diachronic spatial analysis, 1960-2020. Base: OpenStreetMap contributors; Pedestrian network: upgraded on Vision Sofia 2050 (2019)

(2) What is the capacity of the initial urban structure to accommodate changes brought by emerging new demands and lifestyles? Change was not envisaged in the initial urban concept, but after 1990 the urban structures were able to accommodate minor transformations within the existing buildings and some densification through the construction on the non-built plots initially designated for kindergartens and linear public greenery along the pedestrian paths. The fast-growing demand for parking places proved to be a major challenge difficult to cope with. New residential buildings, shops on the ground level, but also playgrounds and sports facilities appeared on restituted plots to meet new societal needs and market demand. A planned, yet not realized, local park in *Svoboda* was replaced by a large club football playground with paid access. New points of interest and

new barriers shaped the new daily routes of the inhabitants. Alternative informal paths - usually over municipal land, were trodden by and actively used in the large inter-block spaces, mainly connecting the entrances of the buildings to the public transport stops and the playgrounds located in the inter-block spaces. A much denser pedestrian network than the initially planned one responded to residents' diversified needs and search for walking convenience. An increase of pedestrian flows between the neighbouring housing estates was motivated by the diversity of services and personal motivations. Interviewed residents pointed out the poor condition of the natural and built environment as a major shortcoming. On-site observations outlined growing jaywalking and conflict points in crossing the streets with intensive traffic bordering the estates.

(3) What planning approaches would today contribute to efficiently utilizing the adaptivity of the urban structures when facing new challenges in developing a socially inclusive and healthy urban environment? The abundant public greenery, the network of schools and kindergartens within a walking distance in the quarters, and the 'porosity' and 'elasticity' of public urban space, enabling a continuous informal adaptation to emerging new needs and new mobility patterns, are today estimated by citizens and local authorities as the greatest potential chance for adaptability in future urban development. There is, however, a general perception that, if not properly managed, they also turn into a major shortcoming– a threat to safety and a prerequisite for crime, and face the risk of being privatized and built up, thus compromising the potential of the initial morphology. The confirmed self-identification of the young inhabitants with the place and the still existing culture of collective action previously encouraged, could be a good basis for encouraging proactive attitude to creatively changing public open space. The difficulties already faced in reaching community consensus had also made people appreciate the importance of a shared understanding on public space, and on the responsibilities for its use and management. The active urban planning system already made a serious effort to protect public space and public land ownership through the updated urban plans. Building a new planning culture based on mutual trust and embracing public participation would still need a long-term effort by all the actors involved. There were indicative messages coming from the on-site meetings – while the citizens claimed they were missing a clear guidance for action by the district administration, local authorities considered their communication with the inhabitants on public space a major challenge.

CONCLUSION

The Modernist planning concept was developed once with the promise to cure the evils of the capitalist city by setting a radically new urban system based on environmental and social justice. It largely failed in the long run, as its practical implementation promoted an approach hardly sensitive to urban complexity and dynamics, to the variety of inhabitants' needs and preferences, and to existing financial frames. The prefab housing estates in Bulgaria inherited from the period

of socialism responded to large-scale and urgent development needs with modest economic capacity; they, however, utilized considerable land and material resource and are still home to thousands of people in Sofia. The physical assets still preserved and highly valued by the inhabitants are the public open space and the abundant greenery. There is also an important cultural value outlined by the research – the inhabitants' self-identification with the place and their proactive attitude in the search for a better future there. If properly organized, that could be supportive to an urban policy aimed at a healthy and socially inclusive urban environment. Planning would need, however, to acknowledge the rights and values of all the inhabitants, to carefully study the diversity of life patterns and conflicts, and to build upon synergies.

REFERENCES

Alexandrov, A. (2006). *The transition period in urban planning.* Sofia Institute for Modernity, Sofia (in Bulgarian)

Andersen, H.T., E. Dimitrova, K. Schmeidler (2013). Urban Knowledge and Large Housing Estates in Europe. In Andersen, H. T., R. Atkinson (eds) *Production and use of Urban Knowledge. European experiences.* Springer, pp. 103-132.

Brade, I., G. Herfert, K. Wiest (2009). Recent trends and future prospects of socio-spatial differentiation in urban regions of Central and Eastern Europe: A lull before the storm? In *Cities*, Volume 26, Issue 5, pp. 233-244. https://doi.org/10.1016/j.cities.2009.05.001

Kiradzhiev, S. (2006). *Sofia 125 Years Capital 1879-2004 Chronicle* (in Bulgarian). Sofia: IK Gutenberg.

Anastasov, H. et al, (1968), *The Architectural Image of the Panel Residential Buildings*. Bulgarian Academy of Science (in Bulgarian).

Mumford, E. (2019). CIAM and Its Outcomes. Commentary. In *Urban Planning*, vol. 4, Issue 3, pp. 291–298. http://dx.doi.org/10.17645/up.v4i3.2383

NSI (National Statistical Institute, Republic of Bulgaria). *Census 2011*. Retrieved from: http://www.nsi.bg/census2011/pageen2.php?p2=179

Tashev, P. (1972). *Architecture and urban development of Sofia: Stages, achievements, problems"*. Technika State Publishing House, Sofia (in Bulgarian).

Tsenkova S., Nedović-Budić Z. (eds) (2006) *The Urban Mosaic of Post-Socialist Europe. Contributions to Economics.* Physica -Verlag HD

Horizon 2020. *URBiNAT Project*. Retrieved from: https://urbinat.eu/

Vision Sofia 2050. (2019). *Research on pedestrian connectivity on the territory of Sofia*. Retrieved from: https://vizia.sofia.bg/2019/02/21/pedestrian_network/"

TRACK 4: TRAVEL TIME AND EFFICIENCY OF TRANSPORT SYSTEMS

Track Chairs:

Simon Koblar,
Urban Planning Institute of the Republic of Slovenia, Ljubljana, Slovenia and

Manfred Wacker,
University of Stuttgart, Institute for Road and Transport Science, Germany

This track focuses on one of the main functions of roads - to provide transport. To ensure transport while disturbing adjacent land uses not more than really necessary is one of the most fostering tasks in urban road planning and design. Not only motorized vehicles in private transport, public transport, bicycles and pedestrians compete for the given road space, but also adjacent land uses ask for public space along the roads. Nowadays even new means of transport like e-scooters or mono wheels show up. The track highlights the quality of the physical throughput of a road by the perspective of the traveller (travel time) and the planning authority (efficiency of transport), finally leading to the question which capacity a road offers for the different means of transport. These items reflect the connection and feeder function of a road and are very often in conflict with the habitation function. Having this in mind the track addresses also the question of both urban network hierarchies as well as urban road classifications.

Keywords: Travel time, Efficiency, Capacity, Urban Network Hierarchy, Urban Road Classification

ASSESSING EFFECTS OF SUSTAINABLE URBAN MOBILITY MEASURES: CASE STUDY IN THE CITY MUNICIPALITY OF NOVO MESTO

Simon Koblar[1]
mag. geog., Urban Planning Institute of the Republic of Slovenia, Trnovski pristan 2, Ljubljana, Slovenia, simonk@uirs.si

Andrej Gulič
mag. urb. in prost. načrt., Urban Planning Institute of the Republic of Slovenia, Trnovski pristan 2, Ljubljana, Slovenia, andrejg@uirs.si

Sergeja Praper Gulič
univ. dipl. ing. agr., Urban Planning Institute of the Republic of Slovenia, Trnovski pristan 2, Ljubljana, Slovenia, sergejap@uirs.si

ABSTRACT

Mobility is one of the key areas where cities can improve quality of life for residents. Sustainable urban mobility plans (SUMP) have proven as an effective measure in achieving more sustainable urban mobility. In Slovenia 81 municipalities have already adopted SUMP. Most of them also implemented or are planning new infrastructure measures. However, effects of these measures are difficult to evaluate. In the paper we propose a new methodology for assessing effects of measures by calculating accessibility to key traffic generators. The key element is travel time calculation with OpenTripPlanner software and OpenStreetMap and public transport schedules as input data. This approach has been tested on a case study for the City Municipality of Novo mesto (Slovenia) that adopted SUMP in 2017 and implemented several measures since then. Accessibility for three situations is compared: before SUMP adoption (2017), in the beginning of the year 2020 and for a scenario with some additional sustainable mobility measures. Accessibility of the city centre by the residents with public transport, walking, cycling, rented bicycle and car is calculated and displayed on a map. The results show how different measures affect travel speed and number of residents that can access the city centre in a specified amount of time.

Keywords: SUMP, transport accessibility, Novo mesto, Slovenia, simulations

[1] *Corresponding author*

INTRODUCTION

Mobility is one of the key areas where cities can improve quality of life for residents (Schiller et al., 2010). Sustainable urban mobility plans (SUMP) are at the core of a holistic approach to traffic planning that is gaining more and more momentum also in Slovenia (Balant et al., 2018), where 81 municipalities have already adopted SUMP. There is a common consensus about the positive effects of SUMP, however quantitative measurements of implemented and planned infrastructure projects remain difficult. Common practice is to count pedestrians, cyclists and passengers in cars once a year at a specific location. Yet, this is a highly labour-intensive activity. Moreover, there are other factors affecting traffic flows which SUMP-s don't have a direct control, e.g. economic activity or employment rate.

Good infrastructure often plays a key part in attracting users of sustainable mobility modes. This can be explained with the sentence: "Build it and they will come", that has proven to be correct (Dale Bracewell, 2016). Therefore, we propose an alternative way of measuring the effects of new infrastructure, that can be used for implemented or planned infrastructure. We suggest measuring travel times to key locations in the city by sustainable mobility modes. This is done using open data for street network (OpenStreetMap, 2019) and an open source software for travel time calculation (OpenTripPlanner, 2019). Such choice allows easy scalability and usage in other case studies without the need to purchase expensive traffic modelling software and proprietary data sources.

The proposed approach has been tested on a case study for the City Municipality of Novo mesto (Slovenia) that adopted SUMP in 2017 and implemented several measures since then. Accessibility for three situations is compared: before SUMP adoption (2017), in the beginning of the year 2020 and for a scenario with some additional sustainable mobility measures.

METHODOLOGY

The assessment process includes four steps as shown in Figure 1. First, the study area, locations for which to assess accessibility, travel modes that we want to include and all variations that we want to consider need to be defined. Secondly, input data is prepared. OpenStreetMap (2019) has been used to build the road network in the next step. Data for Slovenia is generally detailed enough and can also exceed other publicly available sources (Koblar and Pajk Koblar, 2020), but for detailed modelling it is necessary to include all information about the road network (all bike paths, sidewalks, restrictions, speed limits, crosswalks etc.). OpenStreetMap is a community project, therefore improvements can be added directly into the database. In case of building scenario networks, all further modifications need to be done on a local copy of a database. A raw database can be downloaded (Geofabrik, 2019) and clipped on the study area with Osmosis

software (GitHub, 2020). Modifications of the local copy of OpenStreetMap can be done in JOSM software (JOSM, 2019). Public transport data need to be in a GTFS format (GTFS Static Overview, 2019). In Slovenia, data in this format is available for the train and intercity bus networks and for some city bus networks. If the data is not available in the right format, GTFS files can be generated from timetable data. There are also some free tools available for GTFS manipulation that would be needed if changes in public transport need to be modelled (Awesome transit, 2020).

Travel times are calculated in OpenTripPlanner software (2019) with OpenStreetMap as a data layer. Calls to the OpenTripPlaner can be performed with R studio as proposed by Young (2019). Generated isochrones are then imported in GIS software and joined with population data. The final step is to statistically analyse the result and assess the differences between scenarios.

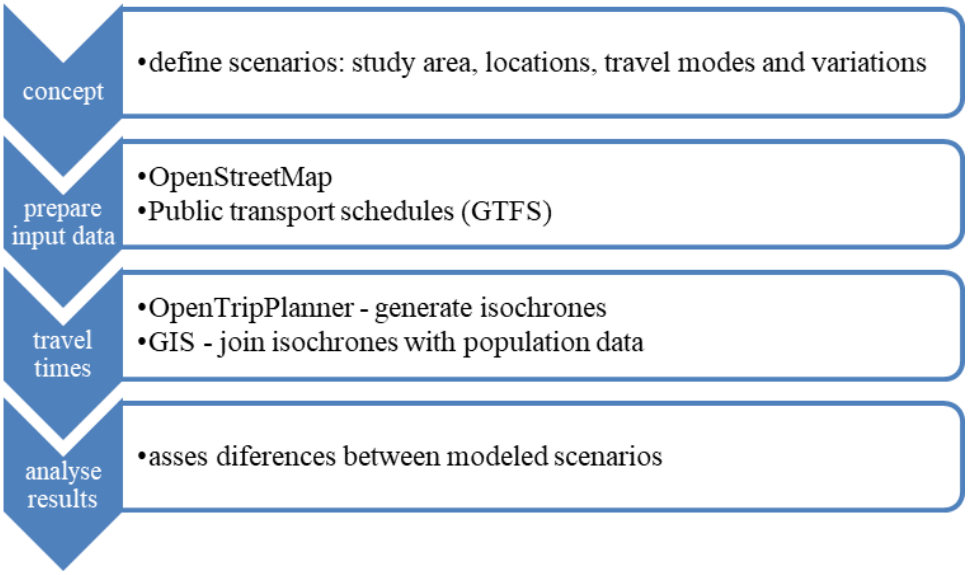


Figure 1: Assessment process

Case study for Novo mesto

The study area comprised the City Municipality of Novo mesto – population data (SURS STAGE, 2019) and all the statistics were performed for the municipality. OpenStreetMap, on the other hand, covered a slightly larger area, so that 30-minute isochrones for car and cycling would not be limited by the municipal border. Accessibility to Glavni trg in the city centre by walking, cycling and rented bicycle was analysed. Scenarios included the years 2017 and 2020 and the future network with a complete cycling network and new bridges over the Krka river. The analysis for public transport and car was done only for the current situation.

Before downloading data, the quality of OpenStreetMap data for Novo mesto was checked and missing information regarding the transport network added. The database now includes all relevant information for travel time modelling. The downloaded and clipped data for the year 2020 was further edited in JOSM software (JOSM, 2019) in the offline mode – therefore not affecting the official OpenStreetMap database. The network for the year 2017 was constructed by deleting the bike tracks that were built after 2017 and removing the bike sharing facilities and road closure for motorised traffic on the main square in the city centre. For the planned network, we predicted new bridges that are planned and a complete cycling network on all streets.

Travel time isochrones were generated with the OpenTripPlanner software (OpenTripPlanner, 2019) using default settings for generating isochrones, apart from the detail level that was set to 20 m from default 200 m. Calls to the OpenTripPlaner were done in R studio. Further analyses were performed in ArcGIS, where population grid data with 100 m resolution were spatially joined with isochrones. This part could have been done in open source QGIS software as well. The statistical analysis was performed in Excel.

RESULTS AND DISCUSSION

Figure 2 shows the area reachable by different sustainable mobility modes in 30 minutes from Glavni trg in Novo mesto for the year 2020. The results are not surprising, as the biggest area is reachable by bicycle followed by public transport, rented bicycle and walking.

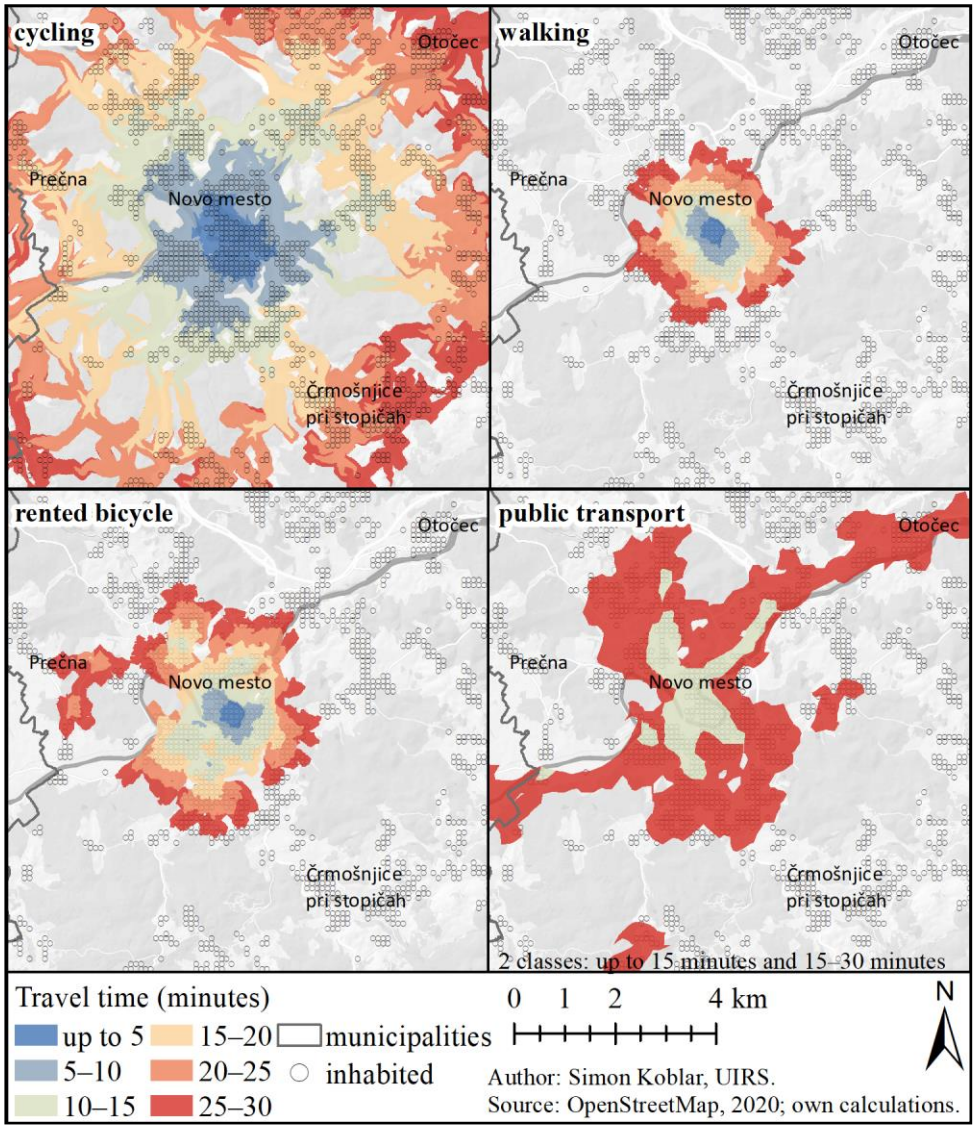


Figure 2: Accessibility to the city centre by sustainable mobility modes for the year 2020.

Detailed results can be seen in Table 1, that shows the percentage of residents of the City Municipality Novo mesto that can be reached from the city centre in 30 minutes and average travel times. Somewhat surprisingly, the percentage of residents accessed by walking and cycling has not changed between scenarios despite the new bridges included in the scenario. However, only one of the proposed bridges is near the city centre, that is close to the existing Kandija bridge, and has only minor effect on travel time to the city centre. Other bridges have bigger effect on accessibility to other locations (Koblar et al., 2019).

Table 1: Percentage of residents that can reach the city centre in 30 minutes and average travel time in minutes

	2017	2020	scenario
walking	44 % / 18,7 min.	44 % / 18,7 min.	44 % / 18,6 min.
cycling	86 % / 12,1 min.	86 % / 12,1 min.	86 % / 11,9 min.
rented bicycle	n.a. in 2017	53 % / 15,9 min.	53 % / 15,8 min.
public transport	Not modelled	65 % / n.a.	Not modelled
car	Not modelled	97 % / 15,3 min.	Not modelled

The Novo mesto city centre is well accessible with sustainable mobility modes. Bike sharing was introduced after 2017 and has now 15 stations with good spatial coverage. Personal car remains the fastest option despite the closure of Glavni trg for motorised traffic and therefore a need for around 5-minute walk from the surrounding parking lots.

CONCLUSIONS

The proposed approach of measuring accessibility has provided good quality results and can be a good additional measure when assessing effects of sustainable mobility measures. The case study for the City Municipality of Novo mesto showed that the proposed bridges will not significantly reduce travel time to the city centre. That does not mean that there will be no change in accessibility of other locations near the proposed bridges. Evaluation of more locations would provide a better overview of changes in accessibility. This approach could also be used to assess proposed locations for new developments based on the concept of traffic and spatial planning integration.

One of disadvantages of the used approach is the difficulty to properly model accessibility by bicycle. The new cycling infrastructure proposed in one of the scenarios did not have a big impact on accessibility, because it was assumed that cycling is possible on all streets where it is not strictly forbidden. In reality, the residents would not choose unsafe roads without cycling infrastructure for daily commuting. Therefore, in future work, more attention needs to be given to assessing safety factors. It is also important to note that there are further factors that are not included in the model, such as scenery, feeling of safety or fare price.

ACKNOWLEDGEMENTS

Most of the work presented was carried out during the development of UIRS accessibility atlas. The authors therefore thank for the financial support from the project ASTUS – Alpine Smart Transport and Urbanism Strategies, co-funded by the Interreg V B Alpine Space programme.

REFERENCES

Awesome transit (2020). Retrieved from https://github.com/CUTR-at-USF/awesome-transit (accessed 18. 5. 2020).

Balant, M., Plevnik, A., and Mladenovič, L. (2018). Razvoj nacionalnega programa za celostne prometne strategije v Sloveniji = Development of National SUMP Programme in Slovenia. In: Žnidarič, A., and Šemrov, D. (eds.): *Kongres o Cestah in Prometu*, pp. 1–7. Ljubljana, DRC - Družba za raziskave v cestni in prometni stroki Slovenije.

Bracewell, D. (2016). "BUILD IT AND THEY WILL COME": Convenient Routes Encourage More People to Cycle. Institute of Transportation Engineers. *ITE Journal*, *86*(9), p. 12.

Geofabrik. (2019). OpenStreetMap, Karlsruhe.

GitHub. (2020). Retrieved from https://github.com/openstreetmap/osmosis (accessed 14. 5. 2020).

GTFS Static Overview. (2019). Retrieved from https://developers.google.com/transit/gtfs (accessed 26. 2. 2020).

JOSM. (2019). Retrieved from https://josm.openstreetmap.de/ (accessed 5. 8. 2019).

Koblar, S., Gulič, A., and Praper, S. (2019). UIRS atlas dostopnosti. *Urbani izziv*, Posebna izdaja, (9), p. 126–131.

Koblar, S., and Pajk Koblar, V. (2020). Analiza prometne dostopnosti s podatki OpenStreetMap (in print). In: *GIS v Sloveniji 2020*.

OpenStreetMap. (2019). Retrieved from https://www.openstreetmap.org/about (accessed 5. 8. 2019).

OpenTripPlanner. (2019). Retrieved from https://www.opentripplanner.org/ (accessed 5. 8. 2019).

Schiller, P.L., Bruun, E.C., and Kenworthy, J.R. (2010). *An introduction to sustainable transportation: policy, planning and implementation*. London; Washington, Earthscan.

SURS STAGE. (2019). Retrieved from https://gis.stat.si/ (accessed 26. 8. 2019).

Young, M. (2019). *OpenTripPlanner - creating and querying your own multi-modal route planner*.

FUTURE SCENARIOS ON NEW MOBILITY AND THE DIGITALISATION OF TRAFFIC & ITS EFFECTS ON SPATIAL ISSUES IN RURAL AREAS

Lola Meyer [1]
Dipl.-Ing, Universität Kassel, Fachgebiet Architekturtheorie und Entwerfen, Universitätsplatz 9, 34127 Kassel, lola.meyer@uni-kassel.de

Philipp Oswalt
Professor, Universität Kassel, Fachgebiet Architekturtheorie und Entwerfen, Universitätsplatz 9, 34127 Kassel, oswalt@asl.uni-kassel.de

Stefan Rettich
Professor, Universität Kassel, Fachgebiet Städtebau, Gottschalkstraße 22, 34127 Kassel, rettich@asl.uni-kassel.de

ABSTRACT

The interdisciplinary project uses different future scenarios with a timeframe of 2050 to investigate which possible changes in mobility infrastructure and public spaces could occur due to the digitalisation of mobility, especially through autonomous driving. We focused on questions of accessibility and public services and possible impacts of residential and business development in rural areas. The project developed two divergent scenarios: one in which mobilized individual traffic increases significantly and dominates the traffic of the future and one where local public transport is strengthened and developed. In this scenario, an on-demand fleet of small, autonomous buses takes on a large part of the traffic load and combines with public rail transport to form the backbone of future mobility, which is supplemented by a well-developed and safe network of cycle paths. Furthermore, we identified the entry and exit points as well as the transfer points as crucial elements of a multimodal transport system. These mobility hubs have been defined and systematized in the research project.

The study area is northern Hesse, beginning above the city of Kassel, an area of about 700 square kilometres and approx. 100,000 inhabitants. We consider the project to be applied research and have therefore presented the work-in-progress not only to national experts in two workshops in May 2020, but have also discussed and developed it further in a March 2020 workshop with key local stakeholders.

This special process design offers the possibility of first implementation steps at an early stage – even though the time horizon of 2050 is still far away. However, to influence the future development of our mobility system and its associated urban developments, we must start early and proceed step by step.

[1] Corresponding author

Keywords: Future Scenarios, Mobility Change, Rural Areas, Digitalisation of Traffic

INTRODUCTION

The research project is funded by the state innovation program “Future Building” (Innovationsprogramm Zukunft Bau) by the “Federal Institute for Research on Building, Urban Affairs and Spatial Development”. The interdisciplinary research team from the University of Kassel comprises the departments of Architectural Theory and Design, Prof. P. Oswalt and Dipl.-Ing L. Meyer, the department of Regional Planning, Prof. F. Roost and M.Sc.E. Jeckel, and the department of Urban Development, Prof. S. Rettich and M.Sc.F. Böker.

RESEARCH QUESTIONS AND WORKING THESES

Basic assumption

If state and local governments do not resist, the digitisation process will have a significant impact on mobility development not only in cities, but also in rural areas. Regardless of the expansion and availability of 5G technologies, a growing number of autonomous private cars will begin spreading to rural areas around 2035. The digitalisation of transport will have a dynamic impact on the development of commercial and housing areas in rural regions (especially around bigger cites), and commuter linkages will increase. Therefore, we need the mobility change now – not only in big cities, but in the countryside as well. If we fail to strengthen public transport as soon as possible, we should expect- with the successive expansion of autonomous private cars – and an increase in motorized private transport and, as a result, a “cannibalization” of public transport.

Key questions

What effects will digitalisation have on traffic and development in the housing and business sector in the rural area of northern Hesse? Which measures must be initiated by the public sector in order to strengthen public transport and thus to provide public services of general interest in rural areas? Which stakeholders are particularly important? What effects can be expected on traffic and public spaces and which structural-spatial interventions must be enacted?

SCENARIOS 2050

From the above research questions and work theses, we developed two diverging scenarios:

Scenario A – Strong individualisation of traffic – growth of autonomous private cars (Figure 3)

Federal and state governments are leaving the digital turnaround to private market players – not unlike the issuance of 5G licenses. Control instruments are not being introduced and demands on market players are not being made. As a result, private cars are expected to increase at the expense of public transport. In this scenario, the public RegioTram (a special tram line that connects the countryside of northern Hesse to the city of Kassel used especially by commuters) would still be in use, but would be reduced to a minimum and would need to be subsidized even more than it is now. Public transport by bus in the area would have to be stopped completely due to the slump in demand and would be replaced by autonomous private cars. Complementary on-demand offers are conceivable and would be mediated on specific, private mobility platforms while replacing existing bus and taxi offers. The tariffs would be graded according to accessibility and route efficiency. Graduated tariffs would also prevail in the delivery service. This scenario would lead to a growth of urban sprawl and the urbanization of the rural landscapes – as well as more remote areas.

Expected effects from this scenario

(1) The modal split shifts significantly to the disadvantage of public transport. Public mobility offers come under considerable cost pressure, have higher deficits than before and are partially discontinued. (2) Transport performance, number of routes and travel distances increase significantly in the private car sector, with negative effects on climate change and CO2 emissions. (3) The public space remains dominated by the car. (4) With the increase in the number of private cars, parking space requirements also rise. (5) The attractiveness and use of bicycle mobility decreases. (6) Rail-bound public transport and its structural infrastructure (stops / train stations) must be maintained in spite of declining profitability. (7) Investments in the road network for the private cars increase.

Scenario B - Strong public transport (Figure 3)

Federal and state governments see the digitalisation of the traffic system as a great opportunity to initiate the sustainable growth of public services and as an important step towards mobility change. Looking ahead, public transport will be strengthened and expanded on its main axes, the RegioTram Line. In the area in and around Kassel, a public all-in-one mobility platform is gradually being developed, which includes both existing public transport as well as an on-demand public fleet of autonomous cars with ride pooling and private ride-sharing offers. It bundles the activities of all services under one public roof and thus supports intermodal mobility.

The digital infrastructure is accompanied by the analogue infrastructure of new "mobility hubs". These are transformed and expanded transfer stations with multifunctional purpose: mobility and social functions as well as site-specific secondary functions. The various modes of transport assemble here in one place. The hubs offer maximum service, transfer and residence comfort and become social hubs via affiliated secondary functions. To strengthen local transport and make the mobility hubs more accessible, the network of cycle routes would be improved and expanded. Additional push factors favouring the modal shift are used to contain the use of private cars.

Public measures are required for Scenario B

(1) Public all-in-one mobility platform

(2) Investments in the public transport sector (with the merging of public and private transport) and the cycling network

(3) Development of spatially differentiated hubs

Expansion of the range of mobility – fusion of public transport and individual mobility. The plan is to support the idea of carpooling by digitalising the idea of "Mitfahrerbänke", or carpooling benches. This is a system of special benches that have been in use in Germany since 2015. The bench, positioned by the side of the road, offers people without a car to "hitchhike" via the more formal system of the carpooling bench. They vary from region to region, but the basic concept is the same everywhere: if you sit on this bench, you are waiting for someone to stop and pick you up. Sometimes the bench has a sign that shows where you would like to go – so only cars willing to take you there will stop. Even though the concept is quite new, initial studies have shown that there are 76% more people willing to take someone with them than there are people using the bench – above all because they fear no one would be willing to stop (Blees, Becker, 2019). Our solution to the problem is to introduce the idea into the mobility platform. This way, bench users know when someone will use the route and can even (if it is a personalized system) see the person's name, ratings, feedback etc.

- The main module of Scenario B is the acquisition of an on-demand fleet of autonomous cars as feeder traffic and service of the area (further development of the public citizens' buses, which may continue to exist in parallel).

- As push factors: Parking management in Kassel and a toll system for the private cars on the main connecting roads.

The following effects are expected

(1) The expansion of fast, public mobility offers significantly increases the attractiveness of public transport. Supplemented by the offer of diversified hubs and improved cycle paths, intermodality can be experienced more effectively – the modal shift becomes possible. (2) Traffic performance, number of routes and passenger distances are falling in the private segment, despite the growing fleet of autonomous cars. (3) Housing and commercial development will dynamize and bundle itself in accordance with the principle of decentralized concentration in the vicinity of public transport routes. Placing the hubs at strategically important points can strengthen public services and public life (Figure 3). (4) By reducing the transport performance of private cars, the current cross-sections of streets and parking space requirements can be re-designed and re-regulated in favour of public transport and the public space. The spatial dominance of the car is pushed back. Since car sharing and carpooling reduce the number of cars and parking lots, the existing parking spaces can be added to the public space. Even though the amount of space in question is not currently known, an Austrian study assumes that with the maximum use of sharing offers (autonomous car sharing), the number of vehicles could decline by around 80% (even 90% for car sharing with ride pooling). Accordingly, enormous areas that were previously used for private cars, especially parking space areas, could free up.[2]

FURTHER RESEARCH

In order to achieve Scenario B – Strong public transport – with its positive effects on sustainable mobility as well as improved mobility for people in rural areas (especially elder people as well as students and the disabled), different steps must be taken and additional research must be done: (1) The hub idea must be specified and tested in the field; (2) We need more testing areas for the use of public fleets of autonomous on-demand cars;[3] (3) The idea of the "carpooling bench" must be further developed; (4) And, last but not least, the all-in-one mobility app must be a public service.[4] Furthermore, we need more push-measures to make private cars less attractive and to support the idea of mobility change.

CONCLUSION

If we fail to react, more cars will be on the streets and people will be on the road more often. Autonomous cars will revolutionize driving and make it even more popular and convenient to be in your own private car – reading emails, watching

[2] The research area is a small town in the Austrian country side with 15,000 inhabitants. *Klementschitz, R., Angerer, M., Bauernfeind, A Potenziale für den Einsatz gemeinschaftlich genutzter autonomer Fahrzeuge im ländlichen Raum*, 580.

[3] There are already several studies and research projects underway, for instance the project https://www.autonv.de in Eastern Germany.

[4] Cities like Helsinki are quite far along in this regard. See https://whimapp.com

films or sleeping while driving. This will lead to more urban sprawl and higher CO2-emissions. The alternative is that we start doing something. One option is the proposal to revolutionise public transport by the following measures: The existing concept of carpooling benches could undergo a significant increase through digitalisation; via an all-in-one mobility platform, a network of registered drivers and users could expand the mobility offers and successfully hybridize public and private transport, especially in rural areas. On the other hand, a public fleet of autonomous cars will fuse the benefits of public transport and private transport, offering more individualized and on-demand public transport.

Figure 1: Self-driving shuttle from the research project "autonomous driving public mobility in rural areas", at the TU Berlin. Photo: Arne Holst

Figure 2: Carpooling bench. Photo: Lola Meyer

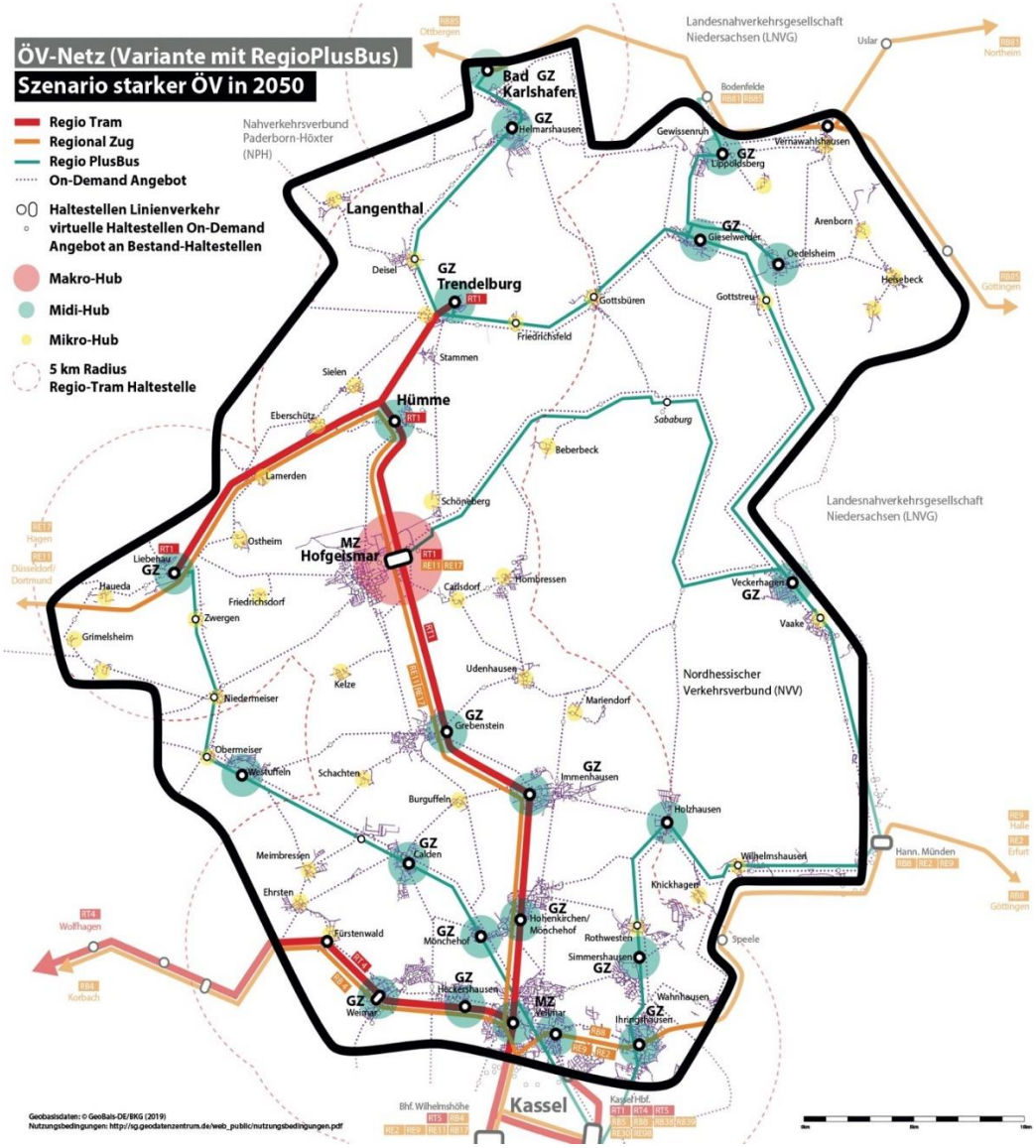


Figure 3: Research area Nothern Hesse. Concept Scenario B – Strong public transport – with its backbone of rail transport (red), autonomous driving shuttles (everywhere on the street system) and the plus-bus concept of fast buses that connect bigger distances (green). University of Kassel, BauMobil

REFERENCES

Blees, V., Becker, J. (2019*). Erfolgsfaktor Mitfahrbank?! Wissenschaftliche Untersuchung der Akzeptanz und des Nutzens von Mitfahrbänken*. Hochschule RheinMain Wiesbaden, Frankfurt University of Applied Sciences, 38.

Klementschitz, R., Angerer, M., Bauernfeind, A. (2019). *Potenziale für den Einsatz gemeinschaftlich genutzter autonomer Fahrzeuge im ländlichen*. RauUniversität für Bodenkultur Wien.

MaaS Global (2020). Retrieved from https://whimapp.com

Stern (2020). Retrieved from https://www.stern.de/neon/heimat/stadt-land/baden-wuerttemberg--sind-diese-mitfahrbaenke-das-neue-trampen--8002512.html

TU Berlin (2020). Retrieved from https://www.autonv.de in Eastern Germany

FUTURE OF URBAN MOBILITY IN LJUBLJANA

Gregor Boltič
MSc in Urban and Regional Planning, Heriot-Watt University, gregor.boltic@gmail.com

Miha Šetina[1]
BSc of Architecture and Urban Design, Fakulteta za Arhitekturo Ljubljana, mihaseto@gmail.com

ABSTRACT

Cars have been the main personal transportation mode for almost the past 100 years. A lot has changed in this field with the introduction of safety measures, fuel consumption standards, electricity to power the cars and in recent years automation. We could say that almost everything inside and outside the cars had changed since its beginning, only the driver remained. But this will change soon. With the introduction of digitalization and more and more systems which allow the computers to take over the control from humans, we will see the rise of autonomous vehicles in the near future. Especially public transport can benefit from the introduction of autonomy in driving, making it safer and more reliable as before.

Keywords: automation, autonomy, AV, mobility, digitalisation, urban strategy, transport mode, shared mobility

INTRODUCTION

Although there are numerous directions in which we could see autonomous vehicles (AVs in further reading) develop, this paper will focus on AVs that are not a direct substitution for personal cars. As such, AVs that are not in direct ownership by a household could also develop in several ways- as traditional public transport means, on demand mini buses, shuttle buses and driverless taxis being some of them.

It is arguable that the concept of autonomous vehicles is not even close to be fully utilised and researchers predict that AV's usage might mature in the mid-21st century, drawing on the experiences of introduction of electric vehicles and similar transitional trends in the past (Schoettle and Sivak, 2014). It seems that ensuring people's safety and technological challenges of AVs accompanied by public's perception of safety and trust in the technology have been the main topic of research in the past decade (Koopman and Wagner, 2017; Bagloee et al, 2016).

[1] *Corresonding author*

Because of this, and the fact that the scope of the conference is year 2030, we feel that this paper should focus on understanding what AVs can bring and pointing out what the city of Ljubljana can do to successfully undertake challenges and prepare for its future transport plans for the decades to come.

Since the capital city of Slovenia, Ljubljana has been emerging in the last decade as a green and modern central European city with focus on the development of greener personal transports, we would like to show in this report our vision for the future of the urban mobility in the city. We propose a plan based on the current traffic situation but introducing new proven ideas from abroad to make the transportation system safer, more modern, digital and most of all autonomous.

WHAT KIND OF FUTURE WILL AVS BRING?

Research by MIT (New York), ITF (Lisbon) and the VDV (Stuttgart) show that it would be possible to reduce the number of cars by 80% and still cater for people reaching their desired destinations. But it is of crucial importance to note that this could only happen if AVs are utilised as shared vehicles of different sizes, reinforcing a highly efficient public transport network, along with walking and cycling still being chosen as a means of transport by many (Policy Brief, 2016). The same paper reinforces this statement further by outlining that public transport remains the only reasonable solution, able to accommodate a maximum amount of trips by using as minimum space as possible and still be able to be time-efficient.

If the adoption of AVs is done correctly, we could see a drastic increase of shared mobility modes, eventually displacing private ownership. The concept of “using, not owning” might develop as a norm among urban populations, which will relieve pressure on roads and road space allocation. But if AVs become a mainstream mode of transport, what happens to walking and cycling? This issue is something that still needs to be properly researched and according to Madeer et al, 2017 there might be two possible future scenarios. One where active travel is done in almost perfect conditions- reduced exhaust emissions with much less traffic noise and car parking allocation alongside streets; and a second scenario, where walking and cycling are rather redundant since people can be picked-up within seconds and dropped-off at their exact desired location (Madeer, et al, 2017).

The other, less optimistic, but not unrealistic perspective of AVs changing the way people move and vehicles influencing urban mobility is presented by Yigitcanlar, 2017. He argues, that with the introduction of mainstreamed AVs, commutes will become easier, since driving won’t be seen as a specific task, so time might be utilised differently by people driving in AVs. This might lead in complete reappraisal of the time factor, since commuting wouldn’t be considered a big burden and a waste of time (Silberg et al, 2012). Easier commutes will consequently have “an impact on residential property prices, and might shift preferences from properties in urban centres to those in suburban areas”. This

might also have an impact on city centres being more densely populated, meaning that urban and suburban lifestyle might increasingly differentiate and become more distinct than they are at the moment (Yigitcanlar et al, 2017). People might favour living further out from the city centre, since land prices and rent in suburban areas tend to be cheaper than those in more central locations. Furthermore, families and anyone wanting to live in a greener environment would utilise this change and decide to move out, meaning that convenience of AVs could be a decisive factor when comparing trade-offs between location and daily mobility (Heinrichs, 2016). This scenario might be further supported with the prediction that fully automated transport operations might not be achieved in the foreseeable future, resulting in AVs not being able to form a new means of mobility and enhance existing public transport. This is also one of the reasons why authorities need to actively start preparing policy on AVs so that we don't miss the opportunity for fundamental change in urban mobility and end up with even more privately owned cars and all the associated negative effects on our cities and streets (Policy Brief, 2016). Some argue that the development of AVs will further increase VMT (vehicles miles travelled). That might be seen in a case of long distance overnight drives, where vehicles have sleeping compartments and are replacing similarly distanced train or airplane journeys. Another application of AVs is providing mobility services for elderly, people with disabilities or other mobility impaired members of society. This might lead to further increase VMT. This might happen due to unoccupied vehicles moving around the city, or driving on the outskirts to find cheaper and/or available parking places (Miller and Heard, 2016).

These changes will definitely have an impact on town planning and relationships between urban mobility and land use, yet this issue mostly remains untouched in contemporary research. Heinrichs, 2016 predicts three different scenarios on types of cities that might evolve with the introduction of AVs:

The regenerative and intelligent city: densely populated areas; resources are used in an effective, efficient and environmentally friendly way; buildings are energy neutral while power is gathered from renewable sources; intelligent management and technologies are integrated across all sectors; population cherishes quality of life and well-being, which is defined differently than economic well-being. Integrated multimodal mobility is the key, with public transport being a backbone of regenerative city, enhanced by walking, cycling and demand-oriented provision.

The hypermobile city: in this scenario, uninterrupted information, consumption and competition are the norm. Similarly to a regenerative city, the assumption is that society will no longer extensively use individual modes of transport, but the pressure on resources and environment will stay high. People will widely accept digitalisation, which will become an essential part of their everyday lives. Differences between urban centres and suburban areas will continue to increase, mobility demand will rise, mass and highly optimised taxi systems will replace standard public transport.

The endless city: new technology is not adopted to great extent, technological development is limited to specific areas/sectors, no major behavioral change, state does not have much power to steer development. Cities are sprawling, settlements are fragmented, mobility is still dominated by cars.

Drawing on the described models above, it would seem reasonable that Ljubljana pursues the model of regenerative city. As the city is already trying to be green, energy efficient and overall liveable it would be a logical aspiration for the future. Its current urban structure resembles the concept of transport oriented development model where high population densities are mostly concentrated around main transport corridors, while in between green wedges penetrate deep towards the town centre. In the future, public transport along with walking and cycling provision on these corridors must be reinforced, while the AVs must supplement the public transport, providing a good connection between main transport nodes/corridors and lower density areas.

WHAT CITIES SHOULD DO TO PREPARE FOR THE FUTURE

It is argued that despite all the planning and projecting the future, the planning profession has struggled through history to predict and prepare for new transportation technologies (Couclelis, 2005). Although private cars have been on the roads since the beginning of 20th century it is only in the past few decades that society realised that cars dominating city streets is not sustainable, nor convenient when it comes to urban mobility. That being said it is recognised that due to city planners' inability to predict the impact of a car, we left the urban environments to become transport engineering dominated spaces, where the main purpose of streets and roads is their vehicle throughput. With that in mind, planners might fail yet again to steer the emerging development of AVs, their regulation and desired impact they should have on cities. It might happen either in the form of misunderstanding this new technology or to see it as a solution to road congestion and climate change. Despite recent increase of research being done on AVs, it is still predominantly tied to the area of the technology itself, their regulation, safety and how they will affect road capacity (Guerra, 2015). One of the studies surveying how state and local officials are preparing on driverless vehicles showed that none of them were preparing for the impact of AVs on city planning in more than a cursory way (Brown et al, 2009).

Although it is becoming clear that the AVs will be a part of our daily lives, there is little known on how they will be utilised, which is mainly dependent on how their regulation will be set-up. As discussed before, they might be rolled out as part of the public transport fleet, or be a direct replacement of a personal car and if the current traffic rules and regulations will not fundamentally change, the latter scenario is much more likely to occur. If that is the case, it seems inevitable that public transport and active travel will lose their modal share, thus doing nothing and hoping for the best is not a smart game to play (Policy Brief, 2016). In the

scenario where AVs are rolled out as private vehicles or on-demand driverless taxis, it is believed that buildings and corresponding developments will need to adapt to this new pattern of traffic flow, meaning they will need to accommodate each site for door-to-door pick-ups and drop-offs (Yigitcanar et al, 2017).

But what if that is not the case? No doubt that planning authorities will be challenged to adopt this new door-to-door services, but with that in mind, they should build strong cases for continuing restrictions on private car traffic entering core city, only this time the simple environmental case won't be enough- assuming autonomous vehicles are powered by electricity or generally considered carbon neutral.

As AVs are expected to reduce the need for parking, especially in the urban cores, cities will be presented with an opportunity to rethink the allocation of freed-up space. City planners and decision makers must recognise this opportunity to turn former parking lots into social use, converting them to new parks, affordable housing or more high-value activities. This might be challenging, especially considering the high-value land prices in city cores, thus inviting more pressure from private developers who might be willing to invest in these locations. Other specific sites that will need to be transformed to different use are petrol stations- assuming AVs run on electricity and are charged overnight at their designated parking spaces (Yigitcanar et al, 2017). Petrol stations are usually positioned on quite good strategic locations, so once again the potential to redevelop these sites will be massive, as well as pressure on local authority by private investors trying to capitalise on the freed-up space on primer location.

Planning regulations and land supply are seen as the key instrument for assuring good balance between green field and brown field developments that will occur due to the changes AVs will bring. Cities need to consider how to apply these measures to maximise social and economic potential of this emerging new environment. As planners are mostly unprepared for the emergence of AVs, it is fundamental that cities become aware of the challenges and potential AVs bring and start to act immediately. They need to be smart and proactive with their decision-making if we all want to benefit from technological advancements that are about to come (Fraedrichs et al, 2019).

HOW OTHER CITIES ARE TESTING AVS

Sion, Switzerland

In the town of Sion, Switzerland, a shuttle bus with the capacity for 11 people is operating on a 1,5km circuit. Vehicles are fully automated without a steering wheel or brakes, although there is always a trained member of staff on board who can stop the vehicle in the case of emergency. Shuttle bus is travelling at the maximum speed of 20 km/h. It has been in operation since June 2016 and is transporting

people through pedestrianized and shared space areas in town. If the pilot project is to be successful, these shuttles will be introduced on other routes in the town. At the same time ETH Lausanne is working on a system to create demand-based service. This service will take into account flexible timetables, on-demand routes, door-to-door service and will be rolled out as an integral part of the public transport fleet (PostAuto, 2019).

Lyon, France

In Lyon, Keolis is operating a fleet of completely automated shuttle buses as well. Shuttle bus connects several businesses, entertainment and shopping areas. It has run along river Saone since September 2016 and transports around 18,300 passengers a year. It is predicted that by 2021, these and few new shuttles will be fully integrated in the public transport fleet of Lyon and will provide regular service throughout the day from Monday to Saturday. The average speed of these shuttles is 13-15km/h, while the general objective being to increase it to 20-25km/h in the near future. Service was designed with intermodality in mind, with shuttles stopping at the tram station that connects other districts of Lyon (Unlimited Mobility, Kelios, 2019).

Singapore

As of 2019, the whole western part of Singapore was designated as a trial site for AVs, covering more than 1,000km of roads as a response to calls for a more varied testing environment. AVs in Singapore are supposed to provide last-mile connectivity from and to the transport nodes, as well as serve as demand-based services. In January 2019, Singapore released national standards that will guide the development of vehicles. As of March 2019, Nanyang Technological University cooperating with Volvo Buses, started trailing 12 metre long autonomous bus, able to transport up to 80 passengers (Zdnet, 2019).

FUTURE VISION FOR THE TRANSPORT IN LJUBLJANA

Ljubljana is the capital city of Slovenia, a central European country. Ljubljana is situated in the middle of the country and is also the biggest city with around 250.000 inhabitants. Ljubljana's metropolitan region presents the biggest opportunity for employment since most of the people work inside the region. The city is surrounded by a highway ring which presents a border between the city and its suburbs. Currently there is a system of P+R(Park and ride) implemented, where people who commute to Ljubljana can leave their cars and continue the journey towards the city centre with a bus or on a bike.

Our vision follows the current trends in smart mobility and plays on the morphological characteristics of Slovenia's capital city. Ljubljana has two main

transport networks symbolized in two rings of streets that run around the city. The bigger one is the highway ring that stretches around the whole city and assures connections from one side of the city to the other. It connects travellers from all sides of Slovenia and also serves international passengers passing by the city. The inner city ring runs around the old city centre and connects the inner city while at the same time serves as the border between the city centre and the surrounding tissue. In the past decade the city's governance put a lot of effort into modernisation of the public transport with new, greener buses, Park + Ride centres and implication of bike share platform BicikeLJ, while at the same time closing the city centre for car traffic. Historically Ljubljana was the biggest city in Slovenia and at the same time the biggest employment market, which forces the daily migration of people from other cities and suburban outskirts of Ljubljana towards the city and its centre. Currently the most used mode of transport is still private cars, followed by public transport, mainly busses and trains to a smaller extent. The public transport network does not include the whole of Ljubljana and since it still relies on traffic in the streets also unreliable when it comes to travel times and punctuality. The current system works, but needs improvement and lacks the ability to adapt to the changes.

The switch to AV transport is also a big problem of the culture, especially in a country, a society where a car is seen as a status symbol. It's important to gain trust of the people and make them embrace the changes and new ways of travel. It's crucial to show them the benefits and let them try and experience the AV, since research shows that almost 40% of people don't trust the AV. The commercial centre BTC, one of the biggest shopping centres in Europe is progressively implementing the use of AV inside their zone. They already installed the 5G network, needed for the communication and real-time information with and between the vehicles. They plan to introduce AVs to cater the transport connections between the shopping malls. This eliminates the need to use the car, is much safer and includes children and youth without driver’s license, as well as older and disabled people in the transport. It is also very time efficient since it eliminates the time searching for the parking and delivers you in front of the desired destination. This exciting new addition to the transport network inside the centre, will not only show first steps into autonomous means of travel in Ljubljana, but also provide the people with a direct way to try and experience autonomous driving, giving them more trust in self-driving technologies. The main priority and at the same time benefit of autonomous driving is safety. The computer system operates the driving functions of the car and thus eliminates the human errors. The autonomous car can drop off kids at school and you in your office then go pick up groceries at the store, deliver them to your house and park in the charging station. It gives you more time to spend on other obligations rather than driving.

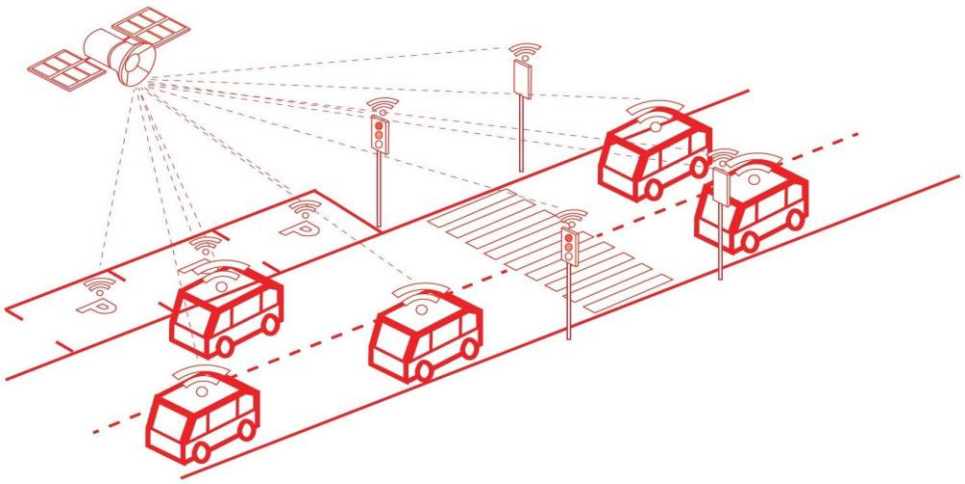


Figure 1: Interconnected grid of cars, traffic lights, parking lots and other vehicles and devices within the network

We propose a plan for digitalization and automation of the transport system in Ljubljana. The concept of two rings includes 3 different zones, which differ with use of transportation vehicles and the type of connections. First is the outside ring, the suburbs around Ljubljana where the long-haul AV buses are operational. They connect satellite cities and outskirts with the capital city and provide a better alternative to traditional bus routes. Since the autonomous buses are connected to the network, they allow for more punctual arrivals and departures and allow the passengers to check the availability and book the ticket online in advance. The smaller urbanised areas are served with autonomous mini buses which pick up the passengers on demand and can deviate a small margin of the main route. They operate more regularly and connect the smaller neighbourhoods to bus stations in cities. These smaller buses can if needed connect as a train and also serve the same route as bigger buses. The surrounding cities are connected with the Park + Ride terminals situated on the highway ring. There the passengers can either change to the city bus or select other means of public transport such as an electric scooter or a bicycle, which are all shared and rented. If there is a need for personal travel with a car, a system of car share is in place at the terminal.

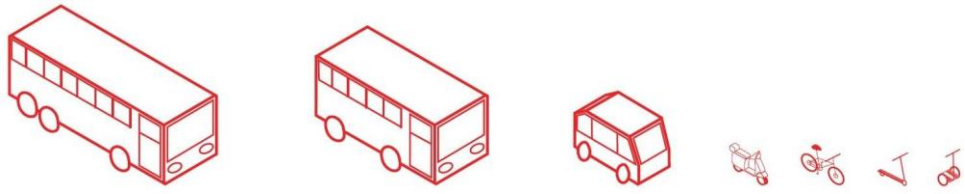


Figure 2: Different types of vehicles included in the strategy

Upon making a reservation online you can rent a personal autonomous vehicle, which can take you to your destination inside the highway ring. This vehicle can serve as a passenger car for up to 4 persons, or be suitable as a cargo vehicle to also transport goods. Since most of the passengers are travelling inwards towards the city, the autonomous city buses operate in the network similar to the already established one. The main addition is a circle route that connects the P+R Terminals. The Terminals still serve as a parking space for personal vehicles, providing them with power chargers, which get electricity from solar energy. As part of the transportation grid we also call for separate bus lanes on all major roads which would distress the traffic and make the service more efficient. The old city centre should be completely closed for all cars and other fossil fuel vehicles. The main mode of transport are bicycles, scooters and other electric or passenger propelled vehicles. Most of them should be provided as a shared experience on the same principle as BicikeLJ. The user buys a yearly, monthly or daily pass for a fixed price which should allow him to rent the vehicle and be able to drive with it around the city. The project BicikeLJ is a very good example on how a shared bicycle service can make more people use the bike instead of a car.

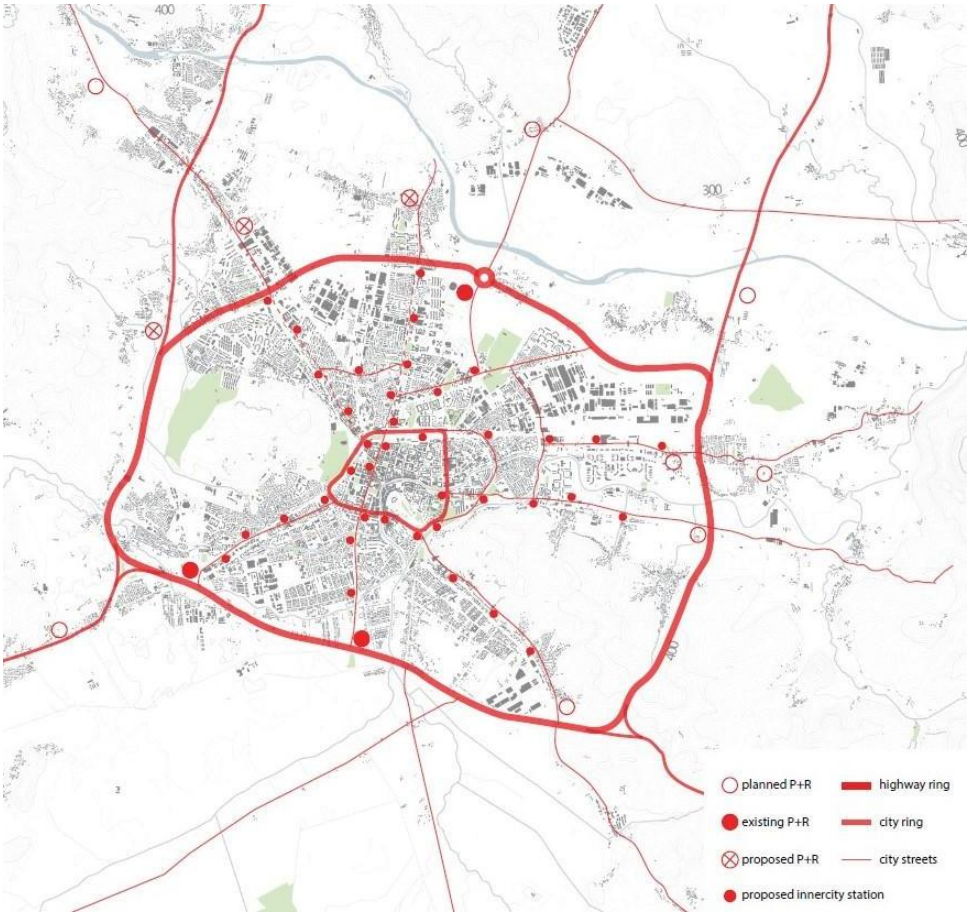


Figure 3: Vision for a network of stations and P+R Terminals

CONCLUSIONS

In addition to all the potentials and challenges, there might be another opportunity for the city of Ljubljana. That is to revitalise high density residential areas, struggling with ever increasing private car ownership and related challenges of car parking space. If city embraces the change in the right way and Ljubljana aspires to become a regenerative city as discussed before, there might be a big opportunity for high density residential areas such as Šiška or Bežigrad to use public space as envisioned in the first place- for parks and places where people can gather and socialize. Some of the petrol stations and P+R Terminals might be used as new community centers, parks or multimodal transport nodes.

REFERENCES

Bagloee, S.A., Tavana, M., Asadi, M. and Oliver, T. (2016). Autonomous vehicles: challenges, opportunities, and future implications for transportation policies. *Journal of modern transportation*, *24*(4), pp.284-303.

Brown, J.R., Morris, E.A. and Taylor, B.D. (2009). Planning for cars in cities: Planners, engineers, and freeways in the 20th century. *Journal of the American Planning Association*, *75*(2), pp.161-177.

Couclelis, H. (2005). "Where has the future gone?" Rethinking the role of integrated land-use models in spatial planning. *Environment and planning A*, *37*(8), pp.1353-1371.
Fraedrich, E., Heinrichs, D., Bahamonde-Birke, F.J. and Cyganski, R., 2019. Autonomous driving, the built environment and policy implications. *Transportation research part A: policy and practice*, *122*, pp.162-172.

Guerra, E. (2016). Planning for cars that drive themselves: Metropolitan planning organizations, regional transportation plans, and autonomous vehicles. *Journal of Planning Education and Research*, *36*(2), pp.210-224.

Koopman, P. and Wagner, M. (2017). Autonomous vehicle safety: An interdisciplinary challenge. *IEEE Intelligent Transportation Systems Magazine*, *9*(1), pp.90-96.

Meeder, M., Bosina, E., Weidmann, U. (2017, May). Autonomous vehicles: Pedestrian heaven or pedestrian hell. In *17th Swiss Transport Research Conference (STRC 2017)*. IVT, ETH Zurich.

Miller, S.A., Heard, B.R. (2016). The environmental impact of autonomous vehicles depends on adoption patterns.

Schoettle, B., Sivak, M. (2014). *A survey of public opinion about autonomous and self-driving vehicles in the US, the UK, and Australia*. University of Michigan, Ann Arbor, Transportation Research Institute.

Silberg, G., Wallace, R., Matuszak, G. (2012). Self-Driving Cars: The Next Revolution, KPMG and the Centre for Automotive Research.

Yigitcanlar, T., Currie, G., Kamruzzaman, M. (2017). Driverless vehicles could bring out the best–or worst–in our cities by transforming land use. *The Conversation*.

Retrieved on 18.2.2020, from: https://www.zdnet.com/article/singapore-expands-test-site-for-autonomous-vehicles.

Retrieved on 17.2.2020, from: https://www.postauto.ch/en/smartshuttle-projekt

Retrieved on 5.4.2020, from: https://www.keolis.com/en/our-services/transport-solutions/autonomous-shuttles

Retrieved on 4.4.2020, from: https://www.delo.si/mobilnost/avtonomna-vozila-v-javnem-potniskem-prometu-171714.html

Retrieved on 23.2.2020, from: https://varna-pot.si/2019/12/14/eden-kljucnih-deleznikov-vizije-nic-so-avtonomna-vozila/

Retrieved on 26.2.2020, from: https://www.delo.si/novice/slovenija/o-parkiriscih-p-r-parkiraj-in-se-odpelji-posebna-delovna-skupina.html

Retrieved on 15.3.2020, from: https://civitas.eu/measure/demand-responsive-services

T5

TRACK 5: PUBLIC-TRANSPORT-ORIENTED CITIES FOR ALL

Track Chairs:

Luka Mladenovič,
Urban Planning Institute of the Republic of Slovenia, Ljubljana, Slovenia and

Peter Lipar,
University of Ljubljana, Faculty of Civil and Geodetic Engineering, Ljubljana, Slovenia

Public transport is the cornerstone of mobility of a sustainable city. The contemporary public transport in cities goes beyond traditional forms such as train or bus. It involves ride sharing, car sharing, bike and scooter sharing etc. Applications help us plan the routes in real time. Some cities are also merging all public transport services in user packages within the MAAS services.

How will the extended understanding of public transport affect the built environment and the development of cities. How do cities adapt to these services? Are new typologies of public space needed to host the exchange between different transport modes? What elements of public transport should city administration add to planning? Are concepts like TOD a thing of a past or just gaining their real momentum? Are the new services accessible to everyone or exclusive to individual age or economic groups?

The approaches and experiences in this field vary among cities. Some cities have a clear vision of their future development and manage their mobility systems very strictly. Other ceased to plan and manage this area and leave the offer to the laws of the market. The track confronts different approaches, experiences and considerations on how to plan cities in future so that they work more efficiently with the support of public transport.

Keywords: Public Transport, Sharing Practices, Supportive E-applications, Comprehensive Planning, New Planning Categories

PUBLIC TRANSPORT ORIENTED CITIES

Luka Mladenovič,
Researcher, Urban Planning Institute of the Republic of Slovenia, e-mail luka.mladenovic@uirs.si

ABSTRACT

Public transport is considered the cornerstone of mobility of a sustainable city. But the contemporary public transport system goes beyond traditional forms such as train or bus. It involves ride sharing, bike sharing, personal micromobility and many more. Within the paper we are taking a closer look into important stages which shaped the system into today's state and influences it had on urban planning and design. We are focusing on three important stages. First, the relationship of public transport and urban development in the period before the fast growth of motorization, which lasted up to 80s. Second, the post 2000 development with rise of shared and micromobility. And third, the effects of the COVID-19 crisis. We observe all three stages trough changes in public transport system and effects they have on planning and managing urban environment.

Keywords: public transport, urban planning, shared mobility, micromobility,

INTRODUCTION

Transport is an important shaping element of city design and structure. Transport technology, available modes and residents' attitude towards them are influencing how people and services organize in space, but also how urban environment is designed and managed. Besides the parallels between the urban fabric complexity and the urban mobility systems, we can also find several parallels between approach and development of public transport system and general development of society, cohesion and accessibility to services, education and jobs.

Within this paper we are focusing on processes which are relevant for central European cities, witnessing changes in the way people live and behave we haven't seen for almost a century. What's specific for the observed cities is that they are mostly small and medium-sized, so changes might take some more time or develop a bit different, than in metropolises which we usually observe.

The central European cities followed the development steps which are similar to most historic European cities but were delayed in development in the last 70-100 years comparing to western European cities. In the last decade or two the gap started to narrow as a result of EU cohesion and research programs, which provided

resources for some cities to stimulate development of sustainable urban mobility elements, comparable to more developed countries. But the lack of available infrastructure, and specific attitude of residents towards different transport modes remain specific and similar between the cities in question.

Traditional public transport modes

Post war redevelopment of European cities introduced a new approach in planning, a residential neighbourhood. The concept was first described and applied on large scale as a part of Stockholm's development plan, but quickly transferred all around Europe, including Slovenia. Neighbourhoods were originally planned as mostly self-sufficient towns, sometimes also called by planners a 15-minute neighbourhood (Littman, 2020), allocated along important public transport corridors, which allowed daily commuting of its residents. Where rail was not considered as a viable option, tram or bus was an alternative. Such development patterns created communities that offered a high level of access for residents.

Looking into design of neighbourhoods of the period, we can clearly recognize the focus around one or two closest public transport stops, with direct pedestrian connections towards other parts of the development. And since car was not widely accessible up to early 80s in most central European countries, the main transport mode of residents of such areas was in fact public transport, in combination with cycling and walking.

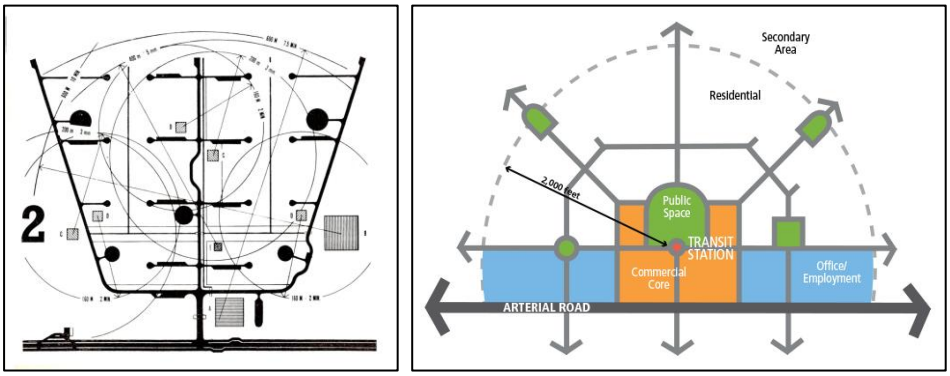


Figure 1: Residential neighbourhood layout from Ljubljan and TOD illustration by Peter Calthrope from 1993. Source: Novak, 1958 and Calthorpe, 1993

What we know now as a clear and defined concept of Transit Oriented Development is already included in layouts of those neighbourhoods (Figure 1). They are well connected, not only by public transport, but also walking and cycling, compact, dense and with well-planned mix uses (ITDP, 2017).

But all this changed with growth of motorization, which up to now never really ended. And with the increased availability of cars, interest in other transport modes decreased.

Neighbourhood started to reshape, adapting to the new spatial needs of its residents, changing parks to parking and leaving less and less of space for living and conditions for pedestrians and cyclists steadily deteriorated.

Since citizens were not attached to public transport lines, the urbanization also started to disperse, moving further and further into surrounding of cities, which still provide workplaces and often all other basic functions. Car-oriented planning caused that car accessibility increased significantly, while accessibility with other modes declined due to degraded walking conditions, reduced public transportation services, reduced transport network connectivity and sprawled development patterns (Littman, 2020). This created large disparities between motorists and non-drivers.

And for some time, it seemed that that the car won. Finally, after all these years, almost everyone who was able to drive, owned a car. All other modes in modal split represented less than a third of all trips made by car. Public transport was losing passengers and was because of that less and less viable to maintain, let alone further develop. Only passengers that remained were (are) those without a choice: students and elderly.

But the love story of man and his car is not so pure when carefully observed. Since costs of owning and maintaining a car are high, hybrid forms of ownership and public transport started to develop within the society. Ride sharing to work was a popular option between employees daily commuting on longer distances. First organized only between co-workers and friends, it took a dramatic increase with development of online tools for ridesharing, developed primarily for student population. Soon spatial needs for this phenomenon took shape in a form of large parking areas near motorway exits, where several commuters meet, leave their cars and continue the trip in one car.

Raise of alternative services

This informal and not-for-profit phenomenon was only a first step in further development of several alternative services which are available now. An important concept related to development of alternative services is so called shared mobility. Whether it is cars, bikes, scooters or any other mobility mode, the idea behind shared mobility is that any privately owned transport mode is not in use most of the day, so other users could benefit from making it available. By not owning a transport vehicle and user could avoid costs related to ownership and maintenance. Besides personal benefits of users, there are wider, space related benefits to consider as well. With shared mobility, demands related to space needed for

parking or storing the vehicles could be drastically reduces. According to data, a local car sharing facility can drastically reduce the need for second car ownership (Rodier, 2003), consequentially also influencing wider travel habits of residents.

First bike sharing schemes started appearing in early 2000s but were only short lived. Only with the 3rd generation bike sharing schemes became widely operational and financially viable. But since this generation of bike sharing requires physical (static) hiring stations and therefore larger investments in infrastructure, starting investment is only viable in larger cities with a certain density of users, which is present only in a few of the central European cities. But with further development of technology and arrival of 4th generation of bike sharing, the dock less schemes these services started to appear also in smaller cities.

The second concept shaping the city landscape is micromobility. Originally micromobility was walking and cycling, the two transport modes we use for the short trips or, in combination with public transport, sometimes event car, the last mile trips. But in recent years several other modes started to develop, such as folding bikes, scooters, rollers, skateboards, and most recently the electric scooters.

Development of small electric motors gave a boost to these modes. Things started changing fast what we call now Micromobility is becoming a key piece for sustainable urban mobility policies and planning.

But spatially the quick development is posing several challenges. The new micromobility modes are moving faster and less predictable than pedestrians. They are not motorized vehicles, so they are not allowed to use the road space. In most cases, where not regulated otherwise, the new modes share the existing public space with pedestrians and cyclist. This often results in conflicts between the users and quite often serious accidents. With shares of citizen which use micromobility modes, but also with growing shares of walking and cycling, a need for reallocation of available space and reorganization of traffic regimes is quite often needed to match the demand.

Several cities are considering ambitious traffic calming measures. For instance, Vienna made a decision to reduce all traffic limits to 30km/h with the only exception of buses and trams, which are allowed to travel 40 km/h. This has an important effect to other users, since reduced speeds of motorized traffic allows better mix with other users. The change is supported with wider reorganization of public space to support modal shift and improve quality of life in the city (Figure 2).

Figure 2: Public space redevelopment in Vienna, 2020

Additional challenges for cities regarding planning and management of public space and transport are related to combination of both approaches, when shared services of micromobility start to appear on city streets. These new operators are privately owned but trying to attract the city users to make a part of their daily trips with their services. By contrast, traditional public transport modes were mostly city or even state owned or at least managed. By offering a new service this new operators often attracted not only car users, but also previous passenger of public transport. Left alone, they pose the risk of a purely commercial approach to urban mobility, that dis-incentivizes (or cannibalizes on) trips that don't generate income, like walking.

Variety of new and existing services started to become complex and hard to manage. Different services and access to real time information related to them started to integrate, and a concept of MaaS (Mobility as a Service) was developed. This is a new transport concept that could change or disrupt current models of transport provision, particularly in urban areas. The concept claims to offer a personal mobility package based on lifestyle needs and delivered through an IT model (POLIS, 2017).

Figure 3: Mobility point concept design. Source: Sofia von Berg, 2014

The integration of services is physically realized in a form of mobility points, interchanges between different services available in the city. Placed in residential neighbourhoods, business or shopping centres, these points combine various mobility facilities such as bus stop, bike sharing, charging stations, but also drop-off places for taxis or personal delivery. What is interesting in this approach is that the city is trying to combine various service providers, private in public, under recognizable and united graphic image and in some cases also designed public space (Figure 3).

Designing the mobility points should become a part of creating high quality urban environment in line with city character, but also support development of the local identity.

Post COVID shutdown development

Recent changes in society, related to COVID-19 spread limitations and lockdowns made an important impact on public transport use as well. The lockdown sent several dangerous messages to general population, which could further decrease the use of public transport and shared mobility and give another boost to irresponsible car use.

Already before the crisis caused by COVID-19, we observed difficulties in public transport systems to secure resources of funding that would allow for the investments needed for the expansion and improvements of systems. The lack of financial inputs resulted in stagnation or decline of service quality contributing to a loss in users. During lockdown all public transport services were completely stopped, leaving the personal car as the only means of mid to long distance travel. Furthermore, when lockdown ended, health guidelines recommended people avoiding public transport if possible, even if no scientific support was available that existing measures to reduce risk failed to provide safe service.

With less traffic on the streets, personal car became even faster and competitively better than any other mode. Further on with social distancing, ride sharing became undesired. Several initiatives, which in the past made car use in city more acceptable, need a reconsideration in light of new situation.

Never has transport been so fragile and yet so vital, to maintain equal access to all essential services. With limited or no public transport service available vulnerable groups of residents often loose accessibility to even basic services.

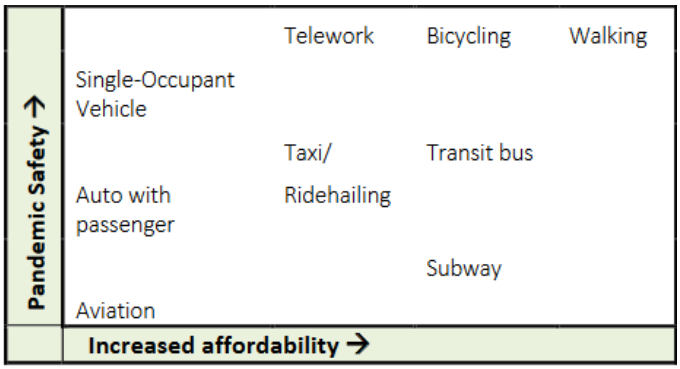


Figure 4: Pandemic safety and affordability by mode. Source: Littman, 2020

Again, some cities are taking initiatives to adapt to the new reality. As Littman (2020) shows, cycling and walking are still the two modes we should focus the most (Figure 4). Besides their high affordability and pandemic safety, both modes also positively influence personal immune system. Cities like Paris and Bogota started massive rearrangements of traffic to cycling lanes. By doing so, they hope to influence the able residents to access destinations actively, without a car but also without overloading the public transport system in order to keep it safe.

CONCLUSION

Considering the fast-changing society and current COVIS-19 crisis, cities are constantly looking for ways to adapt to the new situations. The recent buzz word is the 15-minute city, proposed by Paris Mayor Anne Hidalgo (Sisson, 2020). In her ambitious program, she seeks to ensure that Parisians will be able to meet all basic needs for work, shopping, health or culture within a 15-minute walk or bike ride. This has once again become important after the quarantine experience, which has sharpened our attention to our immediate surroundings and the services available close to where we live.

All the principles needed for this, all the tools and all the solutions for planning such cities, have been known for decades. Jane Jacobs, Jan Gel, authors of New Urbanism and others wrote about the importance of the local. To be fair, most of these principles are already included in our development documents and even layout of some urban developments. They were just forgotten in the last 30 years.

REFERENCES

Boulange, C., Gunn, L., Giles-Corti, B., Mavoa, S., Pettit, C., & Badland, H. (2017). *Examining associations between urban design attributes and transport mode choice for walking, cycling, public transport and private motor vehicle trips.* Journal of Transport & Health, 6, 155–166. doi:10.1016/j.jth.2017.07.007

Calthorpe, P. (1993). *The next American metropolis: Ecology, community, and the American dream.* New York: Princeton Architectural Press.

ITDP (2017) *TOD Standard*, 3rd ed. Institute for Transportation and Development Policy. New York.

Koohsari, M. J., Owen, N., Cole, R., Mavoa, S., Oka, K., Hanibuchi, T., & Sugiyama, T. (2017). *Built environmental factors and adults' travel behaviors: Role of street layout and local destinations.* Preventive Medicine, 96, 124–128. doi:10.1016/j.ypmed.2016.12.021

Littman, T. (2020). *Our World Accelerated: How 120 Years of Transportation Progress Affects Our Lives and Communities.* Victoria Transport Policy Institute.

Novak, V. (1958) *Stanbena zajednica. Ilustrovana revija za ekonomska I društvena pitanja.* Ljubljana: Gospodarsko razstavišče.

POLIS (2017) *Mobility as a Service: Implications for Urban and Regional Transport*. POLIS, Cities and Regions for Transport Innovation.

POLIS (2020) *Macro managing Micro mobility: Taking the long view on short trips. Discussion Paper.* POLIS, Cities and Regions for Transport Innovation.

Rodier, C. J., Shaheen, S. A. (2003). *Carsharing and carfree housing: Predicted travel, emission, and economic benefits : a case study of the Sacramento, California region.* Davis, Calif: Institute of Transportation Studies, University of California, Davis.

Sisson, P. (2020). How the '15-Minute City' Could Help Post-Pandemic Recovery. Bloomberg CityLab. Retrieved from: https://www.bloomberg.com/news/articles/2020-07-15/mayors-tout-the-15-minute-city-as-covid-recovery

FORMULATING MULTIMODAL CORRIDORS TOWARDS SUSTAINABLE MOBILITY IN A METROPOLITAN CITY

Stefanos Tsigdinos[1]
PhD Candidate, National Technical University of Athens, Iroon Politechneiou 9, Zographos, Greece, 15780, stef.tsigdinos@gmail.com

Thanos Vlastos
Professor, National Technical University of Athens, Iroon Politechneiou 9, Zographos, Greece, 15780, vlastos@survey.ntua.gr

ABSTRACT

The aim of this paper is to formulate multimodal corridors in a metropolitan city, pointing towards inclusive and sustainable mobility. The proposed method defines the corridors based on their network position, their connectivity, their urban characteristics, the existence of trunk bus lines or metropolitan cycling routes as well as their current classification. Moreover, the paper suggests general design methods referring to each of the corridors' category under the principles of sustainable mobility. The study area is the metropolitan region of Athens in Greece. The proposed method would bring about several benefits such as promotion of active modes and collective transportation, unification of the urban fabric, accessibility improvement, enhancement of urban vitality, etc. The aforementioned method constitutes a decision support planning tool which could be applied to other study areas with similar characteristics as well.

Keywords: Multimodal corridors, sustainable mobility, integrated urban and transport planning, urban arterials

INTRODUCTION

Cities dependent on vehicular movement and especially on private motor vehicles resulted in unattractive street environment, inaccessible public spaces, intense traffic congestion levels, road accidents, and severances to the urban fabric, as well as health hazards etc. (Nieuwenhuijsen and Khreis, 2016). These given circumstances undoubtedly demand a resilient planning perspective. Such a perspective is Sustainable Mobility (Banister, 2008) which focuses on the improvement of urban environment and particularly of the urban transport conditions. A fundamental step towards sustainable mobility is street functional classification (Huang et al., 2016), which organizes movement potentials for each

[1] Corresponding author

transport mode, thus developing a discrete road network management system (Stamatiadis et al., 2017). Classification systems that promote sustainable mobility should be multimodal and therefore limit the existing car dominance (McAndrews et al., 2017).

A crucial part of these alternative classification systems is urban corridors (mainly on arterial roads) which promote multimodal mobility, accommodating primarily the movement of sustainable modes (Curtis and Tiwari, 2008). Multimodal corridors are a key strategy in spatial policy in cities (Ruming, 2014) meaning a notable component for improving livability, as they integrate land use and transportation (Moore et al., 2007) and accessibility for all users (Williams and Seggerman, 2014), thus reducing social and spatial inequalities. Notable research has been carried out towards this direction (e.g. Jones et al., 2008), highlighting the necessity of reconceptualizing large urban streets (i.e. arterials) as places for walking, shopping, and socializing along with their car-movement function (Hess, 2009). The implementation of multimodal corridors is a difficult and complex task that demands flexible, robust and innovative solutions (McAndrews and Marshall, 2018). Although there are no fixed solutions, there are indeed some considerable projects that deal with the design of these corridors, composing valuable tools (e.g. FHWA, 2016; AC Transit, 2018). In this context, we strongly consider multimodal corridors as a notable solution for transforming the road system towards a sustainable future.

The current research is aimed at formulating multimodal corridors in a metropolitan city, for ensuring an inclusive mobility level and enhancing spatial and social equity. These corridors which have metropolitan or citywide range occur from a new integrated street classification. This classification system takes into consideration both urban and traffic dimensions and at the same time prioritizes sustainable transport modes. The proposed method is applied to the metropolitan area of Athens (AMA) and is line with the existing formal planning documents that prioritize the shift to sustainable mobility (Ministry of Environment and ORSA, 2011).

METHODOLOGICAL FRAMEWORK AND PROPOSED METHOD

The paper used a mixed approach in order to develop the proposed method. The part was the thorough examination of literature review regarding street classification and multimodal corridors planning (e.g. Cherry et al., 2006; Institute of Transportation Engineers, 2010), and the second was on-site observations in order to identify the existing situation and understand the needs of a metropolitan city. After taking into account the aforementioned parts in a combinatorial perspective, we developed a method, which consists of three main steps; a) the first step concerns the analysis of the existing situation (urban and transport features) aiming at the identification of potentials in the study area, b) the second step refers to the formulation of the multimodal corridors (utilizing the existing routes in order

to limit possible costs) and c) the final step defines the various design characteristics of the corridors. The steps are presented in the diagram below:

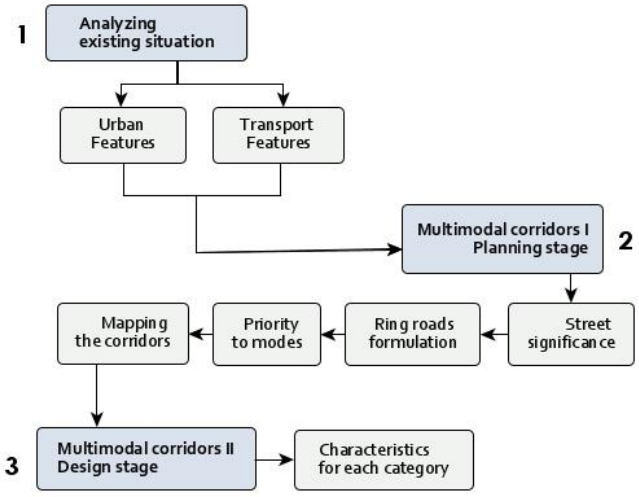


Figure 1: Flow chart of the proposed method for formulating multimodal corridors

The first step consists of two parts, with equal relationship with each other. The first one concerns i) the urban interest of the existing main road network (motorways and arterials), ii) the identification of the compact urban core and iii) the recognition of the major urban centers. The second one investigates features such as i) existing main road network, ii) major public transport routes (bus and tram), iii) metropolitan cycling routes and iv) total road width.

At next, we proceed to the formulation the multimodal corridors through constructing an alternative classification system. This classification is based on two dimensions; route significance and modes' priority. The first part includes the determination of the multimodal corridors and their significance. The criteria used are: a) connectivity (meaning, if the route connects central areas), b) multimodality indicator which is the following: *MMD= UrbanInt + MPT + MCR + TRW*, where UrbanInt is 1 (great interest) or 0 (low interest), MPT is 1 (existence of major public transport route) or 0 (absence), MCR is 1 (existence of metropolitan cycling route) or 0 (absence), TRW is 1 (road width higher than 25m) or (lower than 25m) and c) shortest path algorithm. More precisely, if a route (group of road segments with common name or shortest path between two points) connects metropolitan with intermunicipal centers (outside main urban core), then it is characterized as *metropolitan*. Otherwise, we apply the shortest path algorithm (nodes-intermunicipal centers within the main urban core, and edges the main road network segments), using the multimodality indicator as an inverse cost function. The routes that occur have *citywide* importance. All the rest that have been excluded, are not part of the multimodal corridors network. The second part defines

the ring roads of the city (*outer* and *inner*) by taking into account: a) significance and b) geometry. Specifically, the outer ring road protects the main urban core of the city, and is formulated by roads with metropolitan significance that do not belong to the multimodal corridors network. The inner ring road protects the historical and commercial metropolitan center and is composed by circumferential routes with metropolitan importance. The third part divides the road segments into two individual categories according to the mode they prioritize (*mixed* i.e. car and public transport and *sustainable modes* i.e. public transport, active modes, micromobility). The basic criterion used is the location. Precisely, if a route is encountered within the inner ring road zone, then it prioritizes sustainable modes, otherwise the route is characterized by a mixed priority condition. The final multimodal categories are: *a) metropolitan routes with mixed priority, b) metropolitan routes with sustainable modes priority, c) citywide routes with mixed priority, and d) citywide routes with sustainable modes priority*. At last, the fourth part includes the mapping and the illustration of the corridors, in order to reveal their spatial dimension.

The final step refers to the specification of corridors' characteristics, in order to bridge the gap between planning and implementation stage, and therefore completes the process of making multimodal corridors. Specifically, this step presents several indicative design features (e.g. suggested land uses, modes' infrastructure, etc.) for each corridor category. It should be mentioned that the selection of the appropriate design features was based on various sources (e.g. FHWA, 2016; AC Transit, 2018; Ministry of Environment, Regional Planning and Public Works, 2001), in order to achieve efficient and comprehensive results.

FORMULATION OF THE MULTIMODAL CORRIDORS: METHOD APPLIED

The method is applied to the main urban core of Metropolitan Athens (AMA), which constitutes the most significant component in Attica Region (population in 2011, approx. 3 million residents). The existing strategic network is car-oriented with car use reaching an average percentage of 53%, which in certain municipalities rises even up to 60-70% (Bakogiannis and Siti, 2014). As a result, this classification system permits the penetration of the main urban core by major arterials and undermines the vital role of sustainable modes. In addition, the current conditions lead to exclusion of pedestrians and vulnerable social groups. Furthermore, the main road network (10% of the entire) creates major movement barriers to the urban fabric. Consequently, the strategic network is incapable of encouraging sustainable multimodal corridors, thus requiring radical changes.

Multimodal corridors I: Planning stage

Taking into consideration the proposed method, we suggest several multimodal corridors via establishing a new strategic network hierarchy (Figure 2). This new

classification re-addresses the priority of transport modes, composing an entirely different strategic road network system.

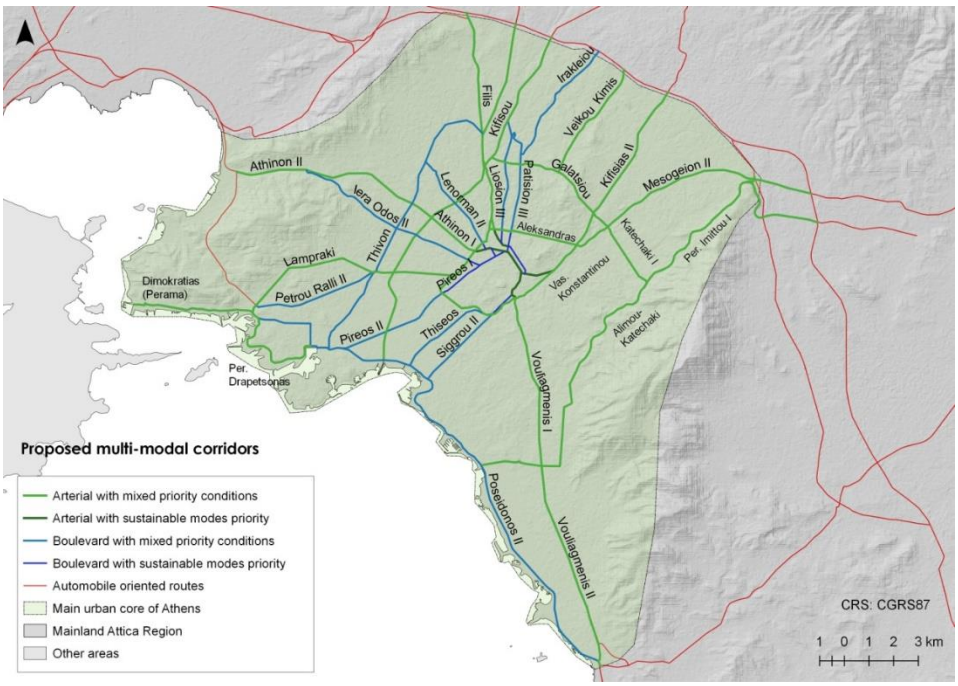


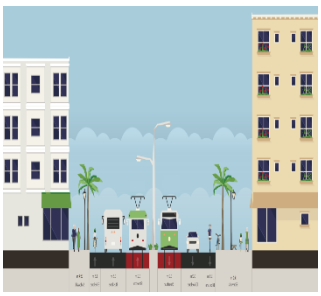
Figure 2: Proposed functional classification of road network

Each road segment was evaluated one by one according to our criteria, in order to identify its role in the multimodal network. The results are the following: 63% metropolitan and 37 % citywide. Focusing on each category separately, we should note the subsequent: a) concerning the metropolitan network, 96% combines private vehicles and sustainable modes, and the rest 4% prioritizes exclusively sustainable modes, and b) regarding the citywide network, 9,3% turns into sustainable modes and 90,7% is characterized by mixed-priority conditions. The overall length of the proposed multimodal corridors equals to 237,5 km (28,81% of the new strategic network), and its designation signifies that the existing car dominance has been reduced by 35,9%.This fact leads also to a radical reduction of central areas where mobility and access functions confront, decreasing these friction areas by 86%.

Multimodal corridors II: Design stage

In an attempt to bridge the gap between planning and implementation, we have developed a table including some desirable characteristics for each category. These characteristics refer to speed limit, car movement regulations (conventional, EVs or AVs), public transport, cycling and pedestrian infrastructure, land uses, streetscape features and parking management.

Table 1: Multimodal Corridors' categories

Categories	Desirable Characteristics
Metropolitan-mixed priority 	• Speed: up to 60-70km/h, • Car movement: Signalized junctions, 2 lanes for car circulation per direction (including EVs) • Autonomous vehicles: Separate lanes for safe circulation • Public transport: Tram or BRT (signal priority), • Cycling infrastructure: Separate (protected from cars), • Pedestrian infrastructure: Adequate or moderate (removal of obstacles, crosswalks, widening of sidewalks, curb ramps), • Land uses: Vehicle-oriented or pedestrian friendly, • Streetscape features: Greenery, benches • On-street parking: Restricted
Metropolitan-sustainable modes 	• Speed: up to 40-50km/h, • Car movement: Signalized junctions, 1-2 lanes for car circulation per direction (including EVs) • Autonomous vehicles: Mixed lanes due to low speed limits • Public transport: Tram or BRT (signal priority), • Cycling infrastructure: Separate or roadway, • Pedestrian infrastructure: Enhanced (removal of obstacles, more crosswalks, widening of sidewalks, curb ramps), • Land uses: Pedestrian friendly • Streetscape features: Greenery, benches, porches, parklets • On-street parking: Restricted
Citywide-mixed priority 	• Speed: up to 50-60km/h, (mainly 50km/h) • Car movement: Signalized junctions, 1-2 lanes for car circulation per direction (including EVs) • Autonomous vehicles: Separate lanes for safe circulation • Public transport: Streetcar or bus (high frequency), • Cycling infrastructure: Separate or roadway, • Pedestrian infrastructure: Moderate or enhanced (removal of obstacles, crosswalks, widening of sidewalks, curb ramps), • Land uses: Vehicle-oriented or pedestrian friendly, • Streetscape features: Greenery, benches, porches, parklets • On-street parking: Mainly restricted
Citywide-sustainable modes 	• Speed: up to 30-40km/h, (mainly 30km/h) • Car movement: Signalized or non-signalized junctions, 1 lane for car circulation per direction • Autonomous vehicles: Mixed lanes due to low speed limits • Public transport: Streetcar or bus (high frequency), • Cycling infrastructure: Separate or roadway, • Pedestrian infrastructure: Enhanced (removal of obstacles, more crosswalks, widening of sidewalks, curb ramps), • Land uses: pedestrian friendly • Streetscape features: Greenery, benches, porches, parklets • On-street parking: Mainly restricted

It is rather obvious that when shifting from mixed to sustainable, and from metropolitan to citywide, the proposed features are getting more human-oriented.

CONCLUSIONS

This paper introduces a methodological tool for formulating multimodal corridors in a metropolitan city. The suggested method as applied in Athens' Metropolitan Area will achieve a readable network of strategic corridors, will unify the urban fabric and is expected to reduce car dominance in arterial streets. Moreover, it will contribute to an acceptable accessibility level for all (vulnerable groups, households without a private vehicle, etc.). In addition, the method includes some desirable characteristics regarding the corridors, which somehow bridge the gap between planning and implementation.

The research has notable value, since it deals with the integration of multimodality in a car-oriented urban environment, thus enriching the existing literature which proposes the shift towards sustainable modes. The method that we address, could be used as a decision support tool, and could also be replicated to other cities with comparable characteristics; especially with radial-centric road network.

Multimodal corridors constitute a complex issue which cannot be fully analyzed in one single research. Another attempt could be the creation of a complete evaluation framework, in order to identify the quality of the suggested multimodal corridors and their dynamics. Also, it would be quite interesting to adopt a participatory planning approach, engaging residents and stakeholders, for enhancing the feasibility of the proposed strategy. Moreover, new criteria and tools could be integrated into the methodological process augmenting smartness and innovation. Undoubtedly, the elaboration of more scientific studies and projects about multimodality (planning or design level) can contribute greatly to the making of more sustainable and inclusive cities.

REFERENCES

AC Transit. (2018). *Multimodal Corridor Guidelines.* Alameda-Contra Costa Transit District (AC Transit).

Bakogiannis, E. & Siti, M. (2014). Athens in crisis, sustainable mobility and climate change. *Journal of Earth Science and Engineering*, 4, 352-360.

Banister, D. (2008). The sustainable mobility paradigm. *Transport Policy, 15*(2), 73-80.

Cherry, C., Deakin, E., Higgins, N., & Huey, S. (2006). Systems-level approach to sustainable urban arterial revitalization: Case study of San Pablo Avenue, San Francisco Bay Area, California. *Transportation Research Record, 1997*, 206-213.

Curtis, C., & Tiwari, R. (2008). Transitioning urban arterial roads to activity corridors. *Urban Design International, 13*, 105-120.

FHWA. (2016). *Achieving Multimodal Networks: Applying Design Flexibility and Reducing Conflicts.* Washington, DC: U.S Department of Transportation Federal Highway Administration.

Hess, P. (2009). Avenues or Arterials: The Struggle to Change Street Building Practices in Toronto, Canada. *Journal of Urban Design, 14*(1), 1-28.

Huang, L., Zhu, X., Ye, X., Guo, W., & Wang, J. (2016). Characterizing street hierarchies through network analysis and large-scale taxi traffic flow: a case study of Wuhan, China. *Environment and Planning B: Planning and Design, 43*(2), 276-296.

Institute of Transportation Engineers. (2010). *Designing Walkable Urban Thoroughfares: A Context Sensitive Analysis.* Washington, D.C.

Jones, P., Marshall, S., & Boujenko, N. (2008). Creating more people-friendly urban streets through 'link and place' street planning and design. *IATSS Research, 32(1)*, 14-25.

McAndrews, C., & Marshall, W. (2018). Livable Streets, Livable Arterials? Characteristics of Commercial Arterial Roads Associated With Neighborhood Livability. *Journal of the American Planning Association, 84*(1), 33-44.

McAndrews, C., Pollack, K., Berrigan, D., Dannenberg, A., & Christopher, E. (2017). Understanding and Improving Arterial Roads to Support Public Health and Transportation Goals. *American Journal of Public Health, 107*(8), 1278-1282.

Ministry of Environment & ORSA, 2011. *Athens Mediterranean Capital: Strategies and Priorities of the Attica Regional Plan 2021*. Athens.

Ministry of Environment, Regional Planning and Public Works. (2001). *Functional Classification of Road Network.* Athens: NAMA Consulting Engineers & Planners S.A.

Moore, T., Thorsnes, P., & Appleyard, B. (2007). *The Transportation/Land Use Connection* . Chicago: American Planning Association.

Nieuwenhuijsen, M., & Khreis, H. (2016). Car free cities: Pathway to healthy urban living. *Environment International, 94*, 251-262.

Ruming, K. (2014). Urban consolidation, strategic planning and community opposition in Sydney, Australia: Unpacking policy knowledge and public perceptions. *Land use policy, 39*, 254-265.

Stamatiadis, N., Kirk, A., Jasper, J., & Wright, S. (2017). Functional Classification System to Aid Contextual Design. *Transportation Research Record, 2638* , 18-25 .

Williams, K., & Seggerman, K. (2014). *Multimodal Transportation Best Practices and Model Element.* Tallahassee, FL : Florida Department of Transportation.

THE ROLE OF GREEN SPACE AND ALTERNATIVE TRANSPORTATION IN IMPROVING PUBLIC HEALTH

Jelena Marić[1]
Teach. Assist., Faculty of Architecture, University of Belgrade, e-mail jelena.maric1989@yahoo.com

Aleksanda Djukić
Assoc. Prof., Faculty of Architecture, University of Belgrade, e-mail: adjukic@afrodita.rcub.bg.ac.rs

Eva Vaništa Lazarević
Professor, Faculty of Architecture, University of Belgrade, e-mail: evavanistalazarevic@gmail.com

ABSTRACT

The shift of paradigms regarding public health from pathogenesis to salutogenesis (Antonovsky, 1979) is reflected in the famous definition of health given by the World Health Organization. Health is not simply identified through the absence of disease, but as a state of complete physical and mental well-being. The main issues that affect public health in the modern era are stress and a sedentary lifestyle. There is a growing body of research suggesting that exposure to natural characteristics of open green space can improve both physical and mental well-being (Ulrich et al., 1991). Additionally, environmental psychologists argue that green space design can influence public health and positive behaviour of people, such as social interaction, physical activity and the use of alternative transportation, pedestrian and biking.

The aim of this research is to identify how specific characteristics and urban design of green space can be beneficial to public health, as well as how the use of alternative transpiration solutions can increase positive health outcomes. In addition we will try to identify which areas in the urban city areas have the most healing potential for improving public health. The methodology is based on theoretical research and extensive literature review regarding the aforementioned topics, followed by expert observation of green space and people's behaviour in the riverfront area of New Belgrade.

Keywords: Green space, Alternative transportation, Public health and well-being, healing space, riverfront.

[1] *Corresponding author*

INTRODUCTION

The shift of paradigms regarding public health from pathogenesis to salutogenesis (Antonovsky, 1979) is reflected in the famous definition of health given by the World Health Organization (WHO). In the modern era and contemporary lifestyle, health is not simply identified through the absence of disease or trauma, but as a state of complete physical and mental well-being. Regarding international declarations and agendas, and Sustainable Development Goals (SDGs) physical environment is perceived as an important determinant of health (WHO 2016, 2017). In the city context, we have to considered areas that can be used for improving public health. Open green areas present urban hubs within a city that can be beneficial for all the users. In this paper we are going to analyze these benefits, i.e. how these natural settings can impact health and well-being, with natural and built characteristics, as well as alternative modes of transportation. Furthermore, we will try to identify the type of open green space in the city that can be considered as healing or restorative space.

BACKGROUND RESEARCH

Regarding the overall aim of this research in this section we are going to present critical and focused literature overview regarding role of open green space on public health and the significance of alternative transportation.

Positive - healing effects of open green space

There is a growing recognition for the role of open space, focusing on green infrastructure, such as forests, gardens and parks in overall physical and mental health and wellbeing. The healing and therapeutic effect of open green space has been a vocal point of several researchers and studies. In order to better understand this connection between space and health we have to consider various theories and theoretical concepts, which are dealing with the subject of the restorative environment, such as *Environmental Psychology* and similar concepts and *Psycho-Evolutionary theories*. *Environmental psychology* is a field acclaimed in the late 1960s as an interdisciplinary theory that focuses on the interrelation between people and their surroundings. It examines the way in which the natural and built environments shape human behaviour and affect people (Ulrich, 1984; Ulrich et al., 1991). Ulrich claims that green, natural space influences not only positive behaviour, but also outcomes in the form of better physical and mental health. The relation between natural settings and people is more clearly described in the *Psycho-evolutionary theory*. This theory claims that people are experiencing their surroundings through psycho-neuro-endocrine mechanisms that influence our senses. A large number of theorists argue that exposure to natural scenery and open space can promote recovery from stress, and overall health outcomes (Thake et al., 2017; Velarde, Fry, & Tveit, 2007, Ulrich et al., 1991). A range of authors from psychologists and sociologists to landscape architects and urban planners are

contemplating the role of nature and open space in public health and well-being. In the overall context, combining different theoretical and practical approaches, we can state that green open public spaces can influence well-being on different levels. Firstly, natural characteristics can contribute to physical and mental health. Restorative environments, natural views, ambient, colours and sounds can have a soothing and calming effect and influence stress reduction, which directly affects the heart rate and blood pressure (De Vries, 2010; Ulrich, 1984). Exposure to direct sunlight is believed to increase the vitamin D levels and regulate the sleeping hygiene and overall circadian rhythm (Farhud et al., 2018). Apart from natural qualities, built characteristics of open space can engage people in physical activity, sport and recreation as well as socialization and communication (Thake et al., 2017; Tyrväinen et al., 2014). These activities are strongly connected with positive behaviours that have restorative outcomes on people. Urban green spaces particularly offer health benefits for citizens in urban dense areas. WHO has released important publications in 2016 and 2017 (WHO, 2016; WHO, 2017) where they list and explain in detail all of the positive effects that open green space can have regarding human health, such as: Improved social capital; Enhanced physical activity; Optimized production of natural sounds exposure to sunlight and improved sleep; Reduced exposure to air pollution and reduction of the urban heat island effect; Enhanced pro-environmental behaviour; Reduction of pain and stress; Reduced cardiovascular disease and mortality; Alleviation of depression and anxiety and Reduction of aggressive behaviour.

Open green space offers a range of physical activities that directly influences peoples' health outcomes and overall level of public health. In that context, we are going to analyze the role of alternative transportation as means for physical activities in open green space.

ROLE OF ALTERNATIVE TRANSPORTATION IN IMPROVING PUBLIC HEALTH

Alternative transportation, or active transportation, as it is often referred to in literature present non-motorized transport modes including pedestrian walking, cycling, and different other variations. Regarding available literature on the subject we can summarise that alternative, or active modes of transportation can benefit public health directly and indirectly, by: (1) indirectly - reduced air pollution and better air quality and (2) directly - increased physical activity (WHO, 2008; Litman, 2013; Rissel et al., 2012). Tod Litman in the Annual Review of Public Health discusses major categories of public health impacts that tend to be significantly affected by transport policies and planning decisions. "Transportation policy and planning decisions can affect health in various ways. How people travel affects physical and mental health, including cancer, cardiovascular disease, vehicle crashes, and diabetes, four major causes of death" (Tod Litman, 2013). Important category of health outcomes that involves transportation is pollution emissions that comes from motor vehicle and can cause serious ecological damage, therefore influencing several health conditions as well as climate change (Mundorf et al., 2018). According to a recent WHO report, approximately 1.3 million premature

deaths worldwide are attributed to outdoor air pollution in 2009 (WHO, 2008). Another major topic of health and well-being impacts is related to the effects that transport-planning decisions have on physical activity, which is on the top of the "public health risk factors" list (Rissel et al., 2012). Alternative or active transportations modes provide an opportunity to increase frequent physical activity on the daily basis, which could help people stay more active and fit, thus improving the physical health and well-being (Rissel et al., 2012; WHO, 2000). In addition, active transportation modes can affect mental health by improving physical activity and supporting community cohesion and positive interactions among people in public space (Oja et al., 2011).

In this chapter we have gathered and presented data regarding health outcomes of open green space and alternative modes of transportation. In the city context we have areas that combine open green space characteristics and possibilities for active transportation. These areas are usually located in the riverfront, as it is the case with Belgrade, and in the next chapters we are going to briefly present one of the riverfronts in New Belgrade, from the aspects of public health benefits.

METHODOLOGY

The methodology is based on theoretical research and focused literature review regarding topics of public health and health determinants. In particular, we analyze the impact of open green space and alternative transportation on the health and well-being outcomes. The research includes primary and secondary resources, such as: theoretical research, studies, statements, publications and regulations. Next phase of this research is focused on the case study Area of New Belgrade. More precisely, the area of Sava riverfront in New Belgrade was selected, in order to analyze the elements of design and usage. Regarding methodology, firstly, the expert observation of natural and built characteristics was applied. In this regard, we tried to determine the elements of riverfront areas that could be connected with the healing characteristics of open green space that have been previously identified through the theoretical background research. Secondly, we analyzed people behaviour, regarding usage and means of transportation in the open green space – riverfront. This form of methodology is based on the concept of environmental design research, in specific environment (Markus, Cooper & Barns 1995,1999). This particular methodology is especially popular and applied in urbanism, architecture and design professions.

RESULTS - FINDINGS

With the presented theoretical background research we were able to identify how natural and urban design characteristics of open green space can be beneficial to public health, as well as how the use of alternative transportation solutions can increase positive health outcomes, including both physical and mental health. In the context of urban city areas most potential for improving public health can be

assigned to the waterfront areas. These areas represent part of city green infrastructure, with all the positive natural characteristics, as well as urban furniture for socialization and communication. In addition, these areas are very often used for alternative transportation such as pedestrian walking or cycling. In the next chapter we are going to briefly present expert observation of open green space and people's behaviour in the riverfront area of New Belgrade.

New Belgrade – Sava riverfront

In pre-industrial cities, waterfront areas were intensely used and thriving with people and activities. Also, during this period, a close relationship was between waterfront and cities. With industrial era, this relationship was interrupted due to some uses, such as huge ports, commercial, industry, warehouses and transportation. Through the evolution of technology, port activities moved to outside of the city, leaving areas of riverfront for sport and recreation - as a public open spaces with natural elements, pedestrian and bike lines and vistas towards water. With the increasing environmental awareness and as a consequence of the pressure for upgrade in a urban areas, waterfronts were rediscovered in the city. In this paper we are going to present the formal and functional characteristics of Sava riverfront in New Belgrade. Sava riverfront represents a public green landscape along the banks of the Sava River, in the coastal land. This area of “preserved” natural greenery, in addition to a significant role in improving the quality of the environment, due to the pronounced strip shape, represent the “green connections” of the system of green areas of Belgrade, thus achieving a significant ecological function. The Sava riverfront in New Belgrade is located alongside the river bay area as a part of New Belgrade mega blocks 70, 44 and 45. This area is developed as a linear park, divided into several segments, with greenery in form of regulated park areas and densely planted trees, providing shaded surfaces and spaces with direct sunlight. This type of landscape with natural settings and vistas of water has positive image for users and provides a restorative and calming effect. Another component of a healing environment is fresh air. Air quality is relatively high in this area due to tall trees and dense vegetation as well as distance from the main roads and traffic.

Figure 1-3: Natural greenery of the Sava riverfront; source: author

Built characteristics of Sava riverfront are in correlation with the aforementioned urban design of a healing or restorative environment. Although often neglected and outdated, selection of a garden-furniture and architectural elements of the square are adapted to the type of use. The complete area is equipped with urban furniture for communal use, as well as small shops, famous coffee places and restaurants on the river, popularly known as “splavovi”, variety of benches for small and large groups of people, communication and socialization. In addition, the area is adequately equipped for different types of physical activity, such as courts for different sports and open gym, as well as pedestrian and bike lines for active modes of transportation, throughout the whole area. The riverfront area offers variety of places that are proved to be beneficial for mental and physical health. Besides positive natural characteristics, there are places for peace and quiet as well as places for socialization, sport and recreation. People behaviour patterns are subjected to the aforementioned types of places in riverfront area. During months with warmer weather, users are sitting in a park, relaxing or walking the dog, playing with children, sitting in restaurants and coffees or doing sports. People are active and engaged in alternative transportation, of exercise in open gym areas.

Figure 4-6: People behaviour in Sava riverfront / active transportation; source: author

As seen in the figures, majority of users are engaged in active types of transportation, such as pedestrian walking or cycling. In that regard, the riverfront area is playing an important role in increased physical activity in the city and directly contributing to better outcomes regarding public health.

CONCLUSIONS

The aim of this paper was two-folded. In the first part of the paper – the background theoretical research, we defined characteristics of open public space that can be beneficial for physical and mental health and well-being. Based on presented research we can conclude that green open space can have healing and restorative components, that makes these areas crucial for public life and public health. Promoting sustainable and alternative transportation is an important objective not only for transportation planners, but also for public health researchers and policy-makers. Population health includes preventing disease, prolonging life, promoting health equity, as well as physical, mental, and social well-being. Sustainable transportation can improve population health, through individual transportation choices, activity patterns, walk ability, and increased exposure to green spaces (Munford et al., 2018). Secondary aim of the research referred to the case study research, we identified areas of open public space in a city that can combine all the aforementioned healing characteristics. Riverfront areas presented in this paper showed great potential for improving public health, due to their natural characteristics in combination with urban design that can support activities beneficial for mental and physical health. In order to improve the impact on public health in our cities we should promote and enhance overall usage of riverfront areas.

REFERENCES

Antonovsky, A. (1979). *Health, stress, and coping*. San Francisco: Jossey-Bass.Cooper

Ulrich, R. (1984). View through a window may influence recovery from surgery. *Science 224*(4647), 420. https://doi.org/10.1126/science.6143402

De Vries, S. (2010). Nearby nature and human health: Looking at the mechanisms and their implications. In: W. Thompson, P. Aspinall and S. Bell. (Eds.) *Innovative Approaches to Researching Landscape and Health.* Abingdon: Routledge.

Cooper Marcus, C. and Barnes, M. (1995*). Gardens in healthcare facilities: Uses, therapeutic benefits, and design recommendations.* Retrieved from https://www.healthdesign.org

Farhud D. ... [et. al.]. (2018). Circadian Rhythm, Lifestyle And Health: A Narrative Review. Iranian Journal of Public Health, 47(8): 1068–1076.

Grahn, P., & Stigsdotter, U. K. (2010). The relation between perceived sensory dimensions of urban green space and stress restoration. *Landscape and Urban Planning*, *95*(3–4), 264–275.

Hanzl, M. & Ledwon, S. (2017). *Analyses of human behaviour in public spaces.*

Hartig, T., & Staats, H. 2006. The need for psychological restoration as a determinant of environmental preferences. *Journal of Environmental Psychology*, 26, 215–226.

Kaplan, S. 1995. The restorative benefits of nature: Towards an integrative framework? *Journal of Environmental Psychology*, *15*(3), 169–182.

Litman, T. (2013). Transportation and Public Health. *Annual review of public health*. 34. https://doi.org/10.1146/annurev-publhealth-031912-114502

Mundorf, N., Redding, C. A., & Bao, S. (2018). Sustainable Transportation and Health. *International journal of environmental research and public health*, *15*(3), 542. https://doi.org/10.3390/ijerph15030542

Oja, P., Titze, S., Bauman A., et al. (2011). *Health benefits of cycling: a systematic review*, *Scandinavian Journal of Medicine and Science in Sports*, *21*(4), pp. 496–509, 2011.

Rissel, C, Curac, N., Greenaway M., and Bauman A. (2012). Physical activity associated with public transport use—a review and modelling of potential benefits. *International Journal of Environmental Research and Public Health*, *9*(7).

Stigsdotter, U. and Grahn, P. 2002. What Makes a Garden a Healing Garden*? Journal of Therapeutic Horticulture*, 13, 60-69.

Thake, C., Bambling, M., Edirippulige, S., & Marx, E. (2017). A psychoevolutionary approach to identifying preferred nature scenes with potential to provide restoration from stress. *HERD: Health Environments Research & Design Journal*, *10*(5). https://doi.org/10.1177/1937586717705085

Tyrväinen, L., Ojala, A., Korpela, K., Lanki, T., Tsunetsugu, Y., & Kagawa, T. (2014).The influence of urban green environments on stress relief measures: A feldexperiment. *Journal of Environmental Psychology*, 38, 1–9.

Ulrich, R. S., Simons, R. F., Losito, B. D., Fiorito, E., Miles, M., & Zelson, M. (1991). Stress recovery during exposure to natural and urban environment. *Journal of Environmental Psychology*, 11, 201-230.

Van den Berg, A.E., Maas, J., Verheij, R.A. (2010). Green space as a buffer between stressful life events and health., Groenewegen PP, *Soc Sci Med*, *70*(8):1203-10

Velarde, M. D., Fry, G., & Tveit, M. (2007). Health effects of viewing landscapes-Landscape types in environmental psychology. *Urban Forestry & Urban Greening*, 199–212. https://doi.org/10.1016/j.ufug.2007.07.001

WHO (2000). *Urban Planning, Environment and Health: From Evidence to Policy Action*. Meeting Report. Copenhagen, Denmark: WHO Regional Office for Europe.

WHO (2016). *Urban green spaces and health.* Copenhagen: WHO Regional Office for Europe.

WHO (2017). *Urban green space interventions and health.* Copenhagen: WHO Regional Office for Europe.

IS TRANSIT-ORIENTED DEVELOPMENT IN THE AFTERMATH FEASIBLE?

Dima Jawad[1]
Assoc. Prof., Department of Civil and Environmental Engineering, Notre Dame University - Louaize, Lebanon, djawad@ndu.edu.lb

Pamela Mouawad
Graduate Student, Department of Civil and Environmental Engineering, Notre Dame University - Louaize, Lebanon, pemouawad@ndu.edu.lb

Peter El Khoury
Civil Engineer, Department of Civil and Environmental Engineering, Notre Dame University - Louaize, Lebanon, ppkhoury01@ndu.edu.lb

ABSTRACT

The concept of transit-oriented development (TOD) has been gaining noticeable appreciation in cities that pursue urban and transport sustainability. This term was coined in the late 1980s when the alarming outcomes of vehicle-dependent planning started to materialize. TOD is characterized basically by mixed land use that fosters the use of transit services by minimalizing the walking distance to its service point. Thus, a transit station must be centred based on the neighbourhood typologies in order to encourage the largest number of people who live or work near the station to use transit as a transport mode. Setting this objective at the onset of planning a development can result in a TOD with varying successes. But when introducing transit into an already developed and car-based city, realizing a TOD can be quite challenging. The objective of this research is to investigate the feasibility of such an endeavour. The research is done while taking the city of Zouk-Mosbeh in Lebanon as a case study. Lebanon is planning to introduce its new mass transit system, the Bus Rapid Transit (BRT), where several alignments are proposed. The city of Zouk-Mosbeh is planned to house one of the 28 BRT stations along the northern corridor. Hence, this paper aims to study the adequacy of Zouk-Mosbeh city to be transformed into a transit-oriented city. In this research, the general TOD characteristics and objectives are first discussed as well as the neighbourhood typologies. Then, a method of how TOD concepts can be applied to an existing city is elaborated. TOD characteristics are compared with the city's existing characteristics; as a result, certain features are identified for necessary modifications, and new components are proposed. Finally, recommendations of priority-ranked interventions are developed that best satisfy the TOD required criteria along with general reflection on the process.

Keywords: Transit-Oriented Development, Alternative transport modes, city improvement

[1] *Corresponding author*

INTRODUCTION

With population growth in cities projected to rise to five billion people by 2030, efficient urban planning and management must become manifest to face urbanization challenges. Yet, most cities in developing countries lack basic urban infrastructure and it is predicted that, by 2030, 95% of the urban sprawl will occur in these developing countries. Also, it was estimated that, by the end of this year 2020, vehicle ownership would have increased by 32% and motor vehicle-kilometres by 40% (United Nations, SDGs, 2015). These numbers are alarming if we were achieve the targets of several indicators of the United Nations' sustainable development goals. Supporting the economic development and well-being must start through providing quality, sustainable and resilient infrastructure that provides affordable access for everyone to sustainable transport systems while improving road safety, specifically by broadening public transport systems that consider different people's needs particularly those with disabilities. (United Nations, 2015).

A concept that integrates efficient urban planning with transit is the concept of transit-oriented development (TOD). This concept has been gaining noticeable appreciation in cities that pursue urban and transport sustainability. The TOD term was coined in the late 1980s when the threatening outcomes of vehicle-dependent planning started to materialize. TOD is characterized basically by mixed landuse that fosters the use of transit services by minimalizing the walking distance to its service point. Thus, a transit station must be centred based on the neighbourhood typologies to encourage the largest number of people who live or work near the station to use transit as a transport mode. Setting this objective at the onset of planning a development can result in a TOD with varying successes. But when introducing a novel transit system into an already developed car-based city, realizing a TOD can be quite challenging. The objective of this research is to investigate the feasibility of such an endeavour. The research is done while taking the city of Zouk-Mosbeh in Lebanon as a case study. The paper aims to study the adequacy of Zouk-Mosbeh city to be transformed into a transit-oriented city. In this research, the general TOD characteristics and objectives are first discussed as well as the neighbourhood typologies. Then, a method of how TOD concepts can be evaluated in an existing city is elaborated. TOD characteristics are compared with the city's existing characteristics; as a result, improvement strategy is proposed. Finally, recommendations of interventions are established that best satisfy the TOD required criteria along with general reflection on the process.

LITERATURE REVIEW

Transit-Oriented Development Task Force at Maryland Department of Transportation defines TOD as "a place of relatively higher density that includes a mixture of residential, employment, shopping and civic uses and types located within an easy walk of a bus or rail transit centre". This concept has lately been

used in different places to solve transportation issues, to minimize travel distances, to reduce air pollution and congestion, to enhance transit ridership, walking and cycling, and to ensure a better quality of life (Kumar, Sekhar, & Parida, 2020). Nasri and Zhang characterize TODs by a reduced walking distance from residents' houses to a major station or to any other facility which aims to promote transit ridership by allowing access to more job centres, educational opportunities, and cultural facilities and to encourage pedestrian activities (Nasri & Zhang, 2014). To add up, TOD has lately been used to encourage Smart Growth strategies such as energizing areas, improving the economy, and enhancing the quality of life. They also introduce quantitative methodology taking into consideration three essential factors which are walkability and high density, walking distance to a transit station, and collaboration of mixed uses and transit.

Identifying TOD typologies is one main task to be able to characterize whether a certain city is transit-oriented or not or if it can be modified to become one. Two main approaches for differentiating TOD typologies exist in the literature (Higgins & Kanaroglou, 2016). The first approach is qualitative, and it consists of labelling typologies based on the geographic and functional characteristics of neighbourhoods. According to this approach, Calthrope (1993) defined two TOD types: urban TODs characterized by high density and small walking distance to transit, and neighbourhood TODs characterized by a lower density and a small distance to local or feeder bus lines. Other researchers went further and divided TOD into six types (Dittmar, Belzer, & Autler, 2004). The second approach, called the node-place approach is quantitative. It was first developed by Bertolini (1999). This approach converts data into an XY-diagram where the Y-axis is the node-index which describes the variety and frequency of transit supply and the X-axis is the place-index which describes the functional mix of the area near the station (Ibraeva, Silva, Antunes, & de Almeida Correia, 2020). Each station must be located on the diagram depending on the two indexes' performance and their location will show whether they are sustained or un-sustained. Another alternative approach for realizing TOD is the network governance approach proposed by Mu & de Jong (Mu & de Jong, 2016). Network governance means the mechanisms that aim to enhance the voluntary or forced alignment of goals and tasks of networked actors. In TOD planning, network governance positively influences planning and policy integration between urban transport and land use through progressive and cumulative stages.

Evaluating TOD started using the 3Ds: density, diversity, and design (Cervero & Kockelman, 1997), later researchers added new Ds to the list which are the distance to transit, destination accessibility, and demand management (Translink, 2012). So, the main typologies a city must have to be transit-oriented are walkable blocks and streets, the proximity of housing and shopping centres, accessible public spaces, and successful development around transit stations. Thus, residences, offices, open spaces, commercial buildings, and public uses must be all mixed in a walkable environment near stations (Ibraeva, Silva, Antunes, & de Almeida Correia, 2020). Two main areas can be distinguished in TOD. The primary area includes major

commercial and employment areas, including public space and a residential zone with a high to medium density. The secondary area surrounds the primary area and is located at around 1.6 km. It contains low-density housing, schools, park areas, and streets which ensure fast, and direct access to the primary area (Ibraeva, Silva, Antunes, & de Almeida Correia, 2020).

CASE STUDY BACKGROUND

The case study selected in this research is the city of Zouk Mosbeh in Lebanon. The main focus of planning in Lebanon before 1963 was on the capital Beirut when economic growth was considered important, and environmental impacts were marginalized (El Asmar, Ebohon, & Taki, Bottom-up approach to sustainable urban development in Lebanon: the case of Zouk Mosbeh, 2012). Later on, during the civil war between 1975 and 1990, certain regions in Lebanon suffered extensive infrastructure damage and building destruction which forced residents to relocate to safe regions. Zouk Mosbeh, located 15 kilometres north of Beirut, was one of those cities that became the home to many displaced people which lead to an exceptional unexpected urban growth as a result (El Asmar & Taki, Sustainable rehabilitation of the built environment in Lebanon, 2014). Rapid physical developments occurred in this area where it evolved from being a rural and industrial area to becoming a mixed-use urban city containing industrial, commercial, and residential buildings.

Regarding the transport sector in Lebanon, it is dominated mostly by private vehicles since the existing public transport is neither efficient nor regulated (Mikhael & Saadeh, 2015). The same research also found that investment in cars constitutes over 7.5% of the GDP including maintenance and other related costs (Mikhael & Saadeh, 2015). The public transport in Lebanon relies mainly on an informal fleet of shared taxis and microbuses. Also, according to studies by the World Bank Urban Transport Development Project in Lebanon, 75% of Lebanese households own a minimum of one car. This car-dependency practice leads to a high number of traffic accidents as well as all-day traffic congestion with an indirect cost that reaches two billion dollars annually (CDR, 2018).

Realizing the unsustainable transport sector with its high direct and indirect cost, the government of Lebanon is planning to introduce a country-wide new mass transit system, the Bus Rapid Transit (BRT), where several alignments are designed, the northern coastal corridor, the southern coastal corridor, the Beirut two inner loops, and the eastern corridor. The BRT system elements include: dedicated right of way, stations with off-board fare collection, level boarding platforms, and bus priority at intersections (CDR, 2018). Additionally, feeder buses will also be implemented to collect people from and to the BRT stations. The city of Zouk Mosbeh is planned to house two of the 28 BRT stations along the northern corridor.

EVALUATION METHODOLOGY

As discussed in the literature, different methods exist to evaluate whether cities are transit-oriented or not. Considering the current conditions and the scarcity of available data, the method used to evaluate the city of Zouk Mosbeh in terms of TOD potential is based on the 3Ds: density, diversity, and design.

Regarding the *density*, a city with low-density developments and poor integration of land uses is considered to be more automobile-dependent. Thus, a high-density area with mixed land-use and investments promotes the use of public transport because it is assumed that the existence of residential buildings near transport nodes and workplaces will motivate citizens to use transit (Ogra and Ndebele n.d.). Also, presumably, high-density cities are characterized by a low average trip distance to nodes that encourages more walking and cycling than private car usage.

As for *diversity*, what is referred to is the land-use diversity. It is agreed that a high mix of land-use indicates that a city is more suitable for TOD. The land use Diversity Index (LD) will be calculated using Simpson's diversity index which measures the distribution and the evenness of the individual land uses within the mix of land uses where the larger value of LD indicates a greater land-use mix in the area and 1 is the maximum possible diversity (Mohamad Zulkifli, et al. 2017).

The formula used to calculate this index is:

$$Land\ use\ diversity\ (LD) = 1 - [\sum_{i=1}^{n} IA_i] \text{ where } 0 \leq \text{LD} \leq 1$$

$$Individual\ Areas = IA_1, \dots\ IA_n = \frac{A_1^2}{A^2}, \frac{A_2^2}{A^2}, \dots\ \frac{A_n^2}{A^2}$$

Where A_i is the individual landuse area and A is the total area.

As for the *design*, a well-designed city is known for its land-use mix and its safe and easy accessibility. It also contains well-designed streets and intersections with continuous sidewalks and streetlights as well as amenities such as benches, parks, libraries. Also, bicycle lanes and pedestrian crossings must exist. All these elements are essential to assuring a good built environment, enable sustainable mobility for cities, and encourage transit ridership (Ogra & Ndebele).

In order to conduct the 3D evaluation, a detailed analysis of the area is needed. The analysis entails collecting information on cadastral maps, landuse, building density, zoning, and streets network. Moreover, the existing status of public transport is detailed and criticized. Then, the BRT project to be implemented in Lebanon is studied specifically in Zouk Mosbeh. The location of the BRT stations in this area is studied regarding the typologies of the surrounding buildings and the pedestrian travel time needed to arrive at the station either from work, home, or

any commercial centre. Also, these characteristics are further examined with respect to the feeder bus loops that must be implemented.

After evaluating in detail, the 3Ds for Zouk Mosbeh, conclusions are made whether this area is transit-oriented or not and how can different criteria be modified in order to make it transit-oriented.

RESULTS AND DISCUSSION

Analysis of Current Status

Zouk Mosbeh area is a condensed city with an area of 4.48 km^2 where around 45,000 people live in a mixed land-use. Figure 1 illustrates the map of Zouk Mosbeh where zoning designation is characterized as residential commercial, industrial, and future expansion.

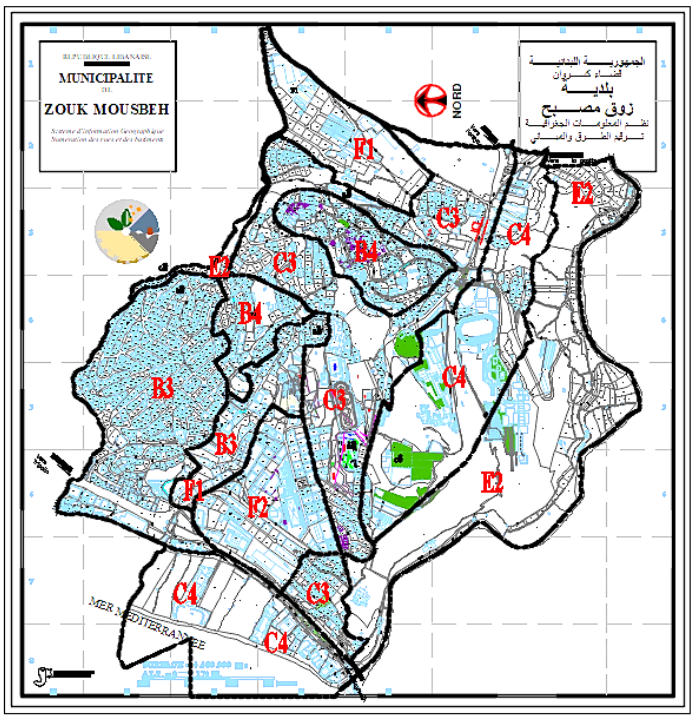


Figure 1: Zonning and Zouk Mosbeh area

The current landuse includes also educational, religious, and recreational zones. Under the educational landuse, is a major university in the region attracting more than 6,000 people between students, faculty, and staff. The existence of a university

is particularly important to the TOD context because of its high trip generation coupled with the growing likelihood of university students to rely on transit.

The transport sector in Zouk Mosbeh is no different from other areas in Lebanon with its high dependency on vehicular traffic and a large percentage of single-occupant vehicles using its streets. The street network is for the most parts well distributed with two main arterial roads crossing the city: the northern coastal highway and the Ajaltoun highway (west-east), other streets are either collectors or local roads. The public transport sector does not accommodate more than 5% of travellers with unreliable service and low levels of service. Currently, public transport relies mostly on shared minibuses or cars, mostly privately-owned. Only one route of government-operated public buses crosses Zouk Mosbeh along the northern coastal highway. Four main bus stops exist, two of them along the northern coastal highway (in each direction) and two of them along Ajaltoun highway. No public buses that may transport the traveller to other areas exist internally in this city, so people who wish to take the bus in this area have to either walk, cycle, carpool, or take a taxi to arrive at any nearby bus stop before reaching their destination. In this area, there are more than 15 taxi operators.

BRT project in Zouk Mosbeh

As mentioned earlier, the planned BRT project in Lebanon has one of its main alignment along the northern coastal corridor with Zouk Mosbeh housing two of its stations. In Figure 2 below, it can be seen that the proposed BRT stations in Zouk Mosbeh are located where two of the existing bus stops are located. In addition to the main BRT stations, minor bus stops are planned inside the city where feeder buses can pick people up and drop them off at the BRT stations.

The feeder bus system is proposed as a main component of the BRT project but detailed designs are yet to be finalized. To conduct a comprehensive evaluation of Zouk Mosbeh in terms of TOD potential, a preliminary feeder bus system is proposed. Several different factors were considered in bus stop placements along the feeder bus routes. The ridership potential is one important factor in determining an adequate location for stops and therefore, several bus stops were placed near the two most prominent trip generators in Zouk Mosbeh which are the highly active commercial areas along the main arterial road (Zouk Mosbeh – Aajaltoun Road) where retail shops, activity centres, banks, offices, restaurants, and supermarkets are located, in addition to the major trip generator Notre Dame University. Another considerable trip generator zone taken into consideration is the heavily populated residential zone in Zouk Mosbeh where an exclusive feeder bus loop was designed to provide transit service for that zone.

Figure 2: BRT stations from Beirut to Tabarja (CDR 2018)

The *Transit Capacity and Quality of Service Manual* (National Academies of Sciences, Engineering, & Medicine, 2013) suggest that 50% to 95% of transit passengers walk no further than 0.25 miles (400 meters) to reach a bus stop (equivalent to a 5-min walk). According to the manual, this walking distance is affected by the street connectivity, the grade of the street, the pedestrian crossing environment and a population factor that takes into account the number of elderly people among the population. Those factors directly affect the reliability and the willingness of the residents to use the transit system.

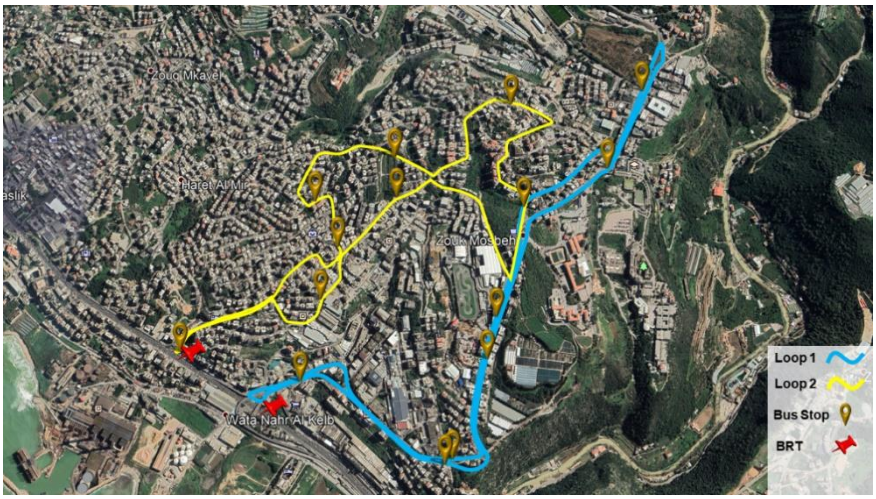


Figure 3: Proposed inner and outer feeder bus loop and bus stations

The bus stop placement was chosen in a manner to maximize coverage area while carefully taking into consideration the effects of the high number of stops on the speed of the bus facility and on the implementation costs. The layout of each bus stop was designed to conform to the on-site situation, including sidewalk presence and traffic flow. Traffic counts were made at peak hours on the main arterial road and on the inner roads where the bus stops were to be located, specifically the curb-side lane volume. Figure 3 illustrates the alignment of the two proposed feeder bus loops with 18 bus stops.

Analysis Results

Once all data are obtained, the 3D evaluation is done accordingly. The results shown in Table 1 indicate the density and land-use diversity at the two BRT stations and the 16 inner and outer feeder bus stations. For the density, it was calculated by adding both the population and the employment density in the area. It can be seen that two stations exist in a high-density area, twelve in a medium-density area, and the rest in a low-density area. This proves that Zouk Mosbeh satisfies the first criteria of the 3Ds.

Table 1: Density and diversity results for all stations in Zouk Mosbeh

Stations	Density (pers/km^2)	Scale	Diversity (LD)
OBS 3	45000	High density (above 30,000 pers/km^2)	0.47
OBS 8	30000		0.75
OBS 6	26211	Medium density (between 10,000 and 30,000 pers/km^2)	0.74
BRT 1 (St Charbel)	23184		0.95
IBS 4	22615		0.88
OBS 7	22000		0.76
OBS 2	18000		0.72
OBS 5	17857		0.73
OBS 1	15000		0.77
OBS 4	13435		0.89
IBS 5	12828		0.93
IBS 8	12000		0.64
IBS 7	11040		0.83
BRT 2 (Yasouh Malak)	10979		0.99
IBS 2	8432	Low density (less than 10,000 pers/km^2)	0.90
IBS 1	6474		0.95
IBS 3	6000		0.86
IBS 6	4500		0.89

For the diversity, as mentioned previously, the higher the LD, the more the land-use is mixed. In Shanghai, Mohamad Zulkifli et al. classified LD values in the Shanghai case study as follows: a value between 0.2 and 0.36 is classified as a low diversity area, between 0.37 and 0.53, medium diversity area, and higher than 0.53, a high diversity area (Mohamad Zulkifli, Kadar Hamsa, Noor, & Ibrahim, 2017). The LD was calculated for the areas around the bus stops in the city of Zouk Mosbeh. Almost all values are above 0.64 except for one value which is 0.47. At some locations, LD has a value above 0.9 getting closer to 1 which indicates that the Zouk Mosbeh area can be considered a mixed land-use area.

Regarding the design dimension, site investigation of Zouk Mosbeh streets was done to assess the existing situation with regards to the walkability dimension. The results found were worrisome. As the topography of the area varies between level and mountainous and elevation that varies between 37 m and 200 m above sea level, some roads have steep slopes which is a major factor when considering pedestrians' ease in walkability. However, as the area is subdivided to service area each containing a feeder bus station, the time for pedestrians to arrive at these stations is around 5 minutes where slopes encountered are for short distances. Another impediment to walkability is adequate sidewalks. Sidewalks are seldom found on local roads. When found, most of the sidewalks present are in poor condition and disrupt safe pedestrian movement. As for the streetlights, none can be found on the roads except on the main Zouk Mosbeh-Ajaltoun highway. There are no pedestrian crossings on any road and no signalized intersections. However, two streets underwent reconstruction recently and one was newly constructed. These are the only roads that have continuous sidewalks with almost level slopes and equipped with streetlights and trees ensuring a good environment for pedestrians. Hence, regarding the design, almost all the streets in this area need to be rehabilitated or reconstructed to be considered pedestrian-friendly, and these modifications include, as a minimum, constructing sidewalks, adding streetlights, pedestrian crossings, and greenery along the sidewalks. In certain streets, one limitation to sidewalks construction is the limited right-of-way due to proximity or encroachment of buildings on public space. When these conditions exist, further modifications can be implemented such as reducing allocated space for vehicular movement by converting streets to one direction if feasible and dedicating the gained space to sidewalks.

CONCLUSIONS

With the prospect of implementing the BRT project in Lebanon, cities housing the BRT stations must evaluate its current condition and prepare its transport infrastructure where needed if they seek to benefit from economic and social benefits that the BRT project will bring. This research studied the adequacy of the city of Zouk Mosbeh to maximize its benefits from the BRT project by preparing it to be a TOD. The study looked at three TOD aspects: density, diversity, and design. It was found out that Zouk Mosbeh can satisfy the density and the diversity

aspects taking into consideration introducing two feeder bus loops. Conversely, the study concluded that the design aspect needs major improvements. In specific, Zouk Mosbeh must rehabilitate its street in terms of walkability. Once the third aspect is dealt with, it will put Zouk Mosbeh on track towards becoming a successful TOD. The significance of this research is two dimensional: for existing cities in terms of how they can prepare to better capture the potential benefits of converting into a TOD, and for transit planners where locating stations can take into consideration an additional factor that is the potential of the area to be a TOD. This factor can bring about increased ridership and better system efficiency.

REFERENCES

CDR. (2018). *Environmental and social impact assessment (ESIA) for the bus rapid transit (BRT) system between Tabarja and Beirut and feeders buses services.* Beirut: ELARD.

Cervero, R., & Kockelman, K. (1997). Travel demand and the 3Ds: Density, diversity, and design. *Transportation Research part D: Transport and Environment, 2*(3), 199-219.

Cohen, S. (2018). *The Sustainable City.* EBSCO.

Dittmar, H., Belzer, D., & Autler, G. (2004). The New Transit Town. Best Practices in Transit-Oriented Development. In D. O. Hank, *An introduction to transit-oriented development* (pp. 1-17). Washington D.C.: Island Press.

Duncan, M. (2019). Would the replacement of park-and-ride facilities with transit-oriented development reduce vehicle kilometers traveled in an auto-oriented US region? *Transport policy*, 293-301.

El Asmar, J.-P., & Taki, A. H. (2014). Sustainable rehabilitation of the built environment in Lebanon. *Sustainable cities and society*, 22-38.

El Asmar, J.-P., Ebohon, J. O., & Taki, A. (2012). Bottom-up approach to sustainable urban development in Lebanon: the case of Zouk Mosbeh. *Sustainable Cities and Society*, 37-44.

Higgins, C. D., & Kanaroglou, P. S. (2016). A latent class method for classifying and evaluating the performance of station area transit-oriented development in the Toronto region. *Journal of transport geography*, 61-72.

Ibraeva, A., Silva, C., Antunes, A. P., & de Almeida Correia, G. H. (2020). Transit-oriented development: A review of research achievements and challenges. *Transportation Research Part A*, 110-130.

Kumar, P. P., Sekhar, C. R., & Parida, M. (2020). Identification of neighborhood typology for potential transitoriented development . *Transportation research part D*.

Mikhael, M., & Saadeh, L. (2015, June 13). *Transportation sector: Problems and solutions*. Retrieved from Blom invest bank: https://blog.blominvestbank.com/wp-content/uploads/2015/06/Transport-Sector-Problems-and-Solutions.pdf

Mohamad Zulkifli, S. N., Kadar Hamsa, A. A., Noor, N. M., & Ibrahim, M. (2017). Evaluation of land use density, diversity and ridership of Rail Based. *Transportation Research Procedia 25*, 5266-5281.

Mu, R., & de Jong, M. (2016). A network governance approach to transit-oriented development: Integrating urban transport and land-use policies in Urumqi, China. *Transport policy*, 55-63.

Nasri, A., & Zhang, L. (2014). The analysis of transit-oriented development (TOD) in Washington, D.C. and Baltimore metropolitan areas. *Transport policy*, 172-179.

National Academies of Sciences, Engineering, & Medicine. (2013). *Transit Capacity and Quality of Service Manual, Third Edition.* Washington D.C.: The National Academies Press.

Ogra, A., & Ndebele, R. (n.d.). The Role of 6Ds: Density, Diversity, Design, Destination, Distance and Demand Management in Transit-Oriented Development. *Neo-International Conference on Habitable Environments* (pp. 539-546). Johannesburg, South Africa: University of Johannesburg.

Salameh, T. (2020, March 9). Zouk Mosbeh municipality's engineer. (P. Mouawad, Interviewer).

Texas Transportation Institute, Texas A&M Research Foundation, Texas A&M University, & College Station, TX. (1996). *Guidelines for the Location and Design of Bus Stops.* Washington, D.C.: National Academy Press.

Translink. (2012, July). *Transit-Oriented Communities Design Guidelines.* Retrieved 2020, from Translink: https://www.translink.ca/~/media/documents/plans_and_projects/transit_oriented_communities/transit_oriented_communities_design_guidelines.ashx

United Nations. (2015). *Goal 11: Make cities inclusive, safe, resilient and sustainable*. Retrieved from Sustainable development goals: https://www.un.org/sustainabledevelopment/cities/

United Nations. (2015). *Goal 9: Build resilient infrastructure, promote sustainable industrialization and foster innovation.* Retrieved from Sustainable development goals: https://www.un.org/sustainabledevelopment/infrastructure-industrialization/

United Nations. (2015). *Sutainable Development Goals*. Retrieved from Sustainable development goals: https://www.un.org/sustainabledevelopment/

UNDERGROUND RAIL INFRASTRUCTURE AS A MULTIMODAL PASSENGER HUB – THE CASE OF THE LJUBLJANA PASSENGER CENTRE

Jaka Veber
Student, University of Ljubljana – Faculty of Architecture, veber.jaka@gmail.com

ABSTRACT

Potential benefits of underground rail infrastructure (currently at grade level) for the functioning of the future Ljubljana Passenger Centre (PCL) as a multimodal passenger hub are going to be examined through a review of literature on the topics of transit oriented design, community severance and transit interchanges.

Ideas of moving rail infrastructure passing through Ljubljana below grade appeared in the first half of the 20th century and persist to this day. The motivation for such plans lies in the perception that ground level railways present an obstacle for the development of the city and block the communication between urban areas adjacent to them. Such proposals however, could also help improve the public transport system of the city and its region. Of particular interest is the main train station, along with its surroundings, which is waiting to be redeveloped into a functioning passenger hub – the PCL, along with commercial, business and residential programs.

In an attempt to re-evaluate proposals for underground railways in Ljubljana, while focusing on the options these plans would create for shaping the built structure, the aim of this paper is to obtain guidelines for urban design which could facilitate the role of the PCL area as a public transportation hub.

Keywords: community severance, transit oriented design, mixed use, street system, transit interchange

INTRODUCTION

The area of the future Passenger Centre of Ljubljana (PCL), in Slovenia's capital, Ljubljana, consists of the city's main train station, along with large stretches of empty degraded land – some of which has been converted to temporary parking lots. Also, on the southern stretch of the area is the main bus station, which lacks basic facilities such as covered platforms, with buses stopping on an improvised parking strip. The redevelopment of the area is hoped to provide better conditions for passengers, and create an urban whole that will incorporate both stations, along

with commercial, business and residential programs. The exact definition of the area has varied through time. It also was not always refered to as “PCL”. In this paper however, we will think of the PCL as the area encircled by the following streets: Trg OF, Masarykova cesta, Šmartinska cesta, Vilharjeva cesta and Dunajska cesta. This roughly corresponds to the currently valid extent of the current urban development plan by Klanjšček et al. (2002; see also Klanjšček et al., 2007).

The PCL area also lies in the heart of a strategically important region. The main train station of Ljubljana is the only one in the country placed in the highest category of a classification based on ridership (Slovenske Železnice, 2020) by the Slovenian Railway Company “Slovenske Železnice” (SŽ), while Ljubljana itself is following the path of development as the country’s most important transport node (Pravno informacijski system, 2019). As stated by Gregorc and Krivec (2012), Ljubljana Urban Region (LUR) lies in central Slovenia, and in addition to a central role in the country, it also represents a strategic transport hub, due to its positioning at the intersection of V. and X. TEN *(Trans-European Transport Network)* corridors. Therefore, LUR is subject to international passenger traffic, freight and tourist flows, which are intertwined with cross-regional, regional and local traffic flows (ibid.).

The focus of this paper is a topic commonly appearing in discussions about the future PCL and development of the city in general. Namely, long persisting calls for the redevelopment of rail corridors within Ljubljana by moving them below grade – including the platforms of the new main train station. The history of such plans is presented in the special issue of the journal AB (Dešman, 2007). The primary motivation for such proposals is the perception that rail infrastructure in Ljubljana creates a major obstacle for the city’s development. In the case of the PCL area, railways disrupt the continuity of the urban form between the city centre south of the PCL, and the Bežigrad neighbourhood to its north.

Ideas of moving railways in Ljubljana below the current elevation appeared before the Second World War, initially as proposals for the railways to be put in an open trench, with only the building of the main train station being placed above the tracks. Since then, these ideas developed into visions for partially or fully covered tracks, with buildings – particularly in the PCL area – being built above them. In this paper, such plans are therefore referred to as “underground railways” since, in the more recent proposals of this kind, the PCL is featured with buildings largely covering the tracks – with examples by Vrhovec M. et al. (1994) and Kranjc et al. (2001; see also Rožič, 2007) – and the freeing of space above the tracks for urban development is often described as a major benefit of lowering the railways, particularly by Rožič (2007).

As evident from Dešman (2007) proposals for underground tracks have enjoyed support from the public and from professional circles, particularly among architects and urbanists, who also heavily promoted the idea. Despite this, such plans have

been often dismissed as unrealistic and other solutions chosen instead – such as the existing road underpasses under the railways, or the current urban development plan for the PCL with grade level railways by Klanjšček et al. (2002; see also Klanjšček et al., 2007). This was mainly due to high costs, but also due to a lack of support and cooperation from different stakeholders. Ambitions for the eventual realisation of the project have not disappeared however, with the current plan for the PCL technically permitting the eventual implementation of underground railways even after its completion, where buildings would be shaped according to ground level railways.

With the redevelopment of the PCL area according to current plans still awaiting realisation at the time of writing (June 2020), the prospect of an entirely new proposal for the PCL – possibly one that would consider underground railways as an integral part of its design, forming a built environment above the underground tracks – is a scenario still being given consideration, with a recent example in Kosec (2015).

The main intention of this paper however, is to understand how underground railways could open up additional options for designing the built environment of the PCL area in a way that could facilitate public transport (PT) use and help minimise transfer times between different modes. This kind of insight could help evaluate potential future proposals and add new arguments in favour of underground railways in Ljubljana. Along with acknowledging the importance of designing the PCL itself, the characteristics of the built environment in the broader region are important as well.

With the review of literature on the subjects of community severance, transit oriented design and transit interchanges, these topics are going to be linked to the aim of improving the functioning of the PCL as an efficient transit hub.

COMMUNITY SEVERANCE

The first topic that is going to be discussed is community severance, also known as the barrier effect, which is the effect of linear transport infrastructure (such as roads or railways) or road traffic levels or speeds as a physical or psychological barrier separating local communities (Anciaes et.al., 2014b). In the case of Ljubljana, the proposal of moving railways underground has been seen as a way to solve this issue – that is to connect parts of the city separated by railway based community severance.

Regarding potential negative effects of barriers on the PT system, only a few studies mention accessibility to workplaces (UK DOT, 1983; in: Anciaes et al., 2014a) and to public transport nodes such as rail stations or bus stops (Braddock, 1979; in: Anciaes et al., 2014a). Certain mentions of the issue are also made in the literature review on the topic of severance in Anciaes et al. (2014a), where it is

stated that "severance can also be an issue for road public or private transport, when local traffic is affected by bottlenecks at junctions with main roads", and that "the need to cross busy roads also reduces the efficiency of services that need to use the minor roads inside neighbourhoods, such as postal distribution, couriers, rubbish collection, public transport, police and emergency vehicles" (Héran, 2011 in: Anciaes et al. 2014a).

Regardless of whether plans for moving rail infrastructure below the surface are ever implemented or not, connecting the city should remain a goal when designing the PCL, since railway lines and stations have traditionally divided towns (Brian, 1997), in response to which many modern railway architects have designed the station as an urban link; the station as "bridge" is a common modern interpretation of the type (ibid.).

By implementing this design principle, the problem of severance could be solved to a certain degree in the PCL case as well (the currently planned redevelopment of the PCL uses this design principle) as in the case in many train stations globally, or by constructing additional underpasses and overpasses. However, as stated by Anciaes (2013); "it is assumed that infrastructure is a barrier to the movement of pedestrians even when these facilities are present, due to the intimidation effect of the infrastructure and traffic at high speeds". Although large rail stations are a special example due to having enclosed overpasses and underpasses, and often contain commercial activities (all of which may reduce the intimidation effect), this still would not diminish severance completely, due to factors such as changes in level.

By moving rail infrastructure underground however, a step beyond merely reducing severance (with bridges and underpasses) would be made, and planners could have the freedom to create a built city structure on the surface, potentially in a way which could help facilitate the use of PT options available in the PCL area.

PUBLIC TRANSPORT HUBS AND URBAN DESIGN

Hernandez and Monzon (2016) tried to identify key factors both from a functional and psychological perspective for defining an efficient transport interchange in the eyes of users. For this, they carried out a survey in three European transport interchanges – Ilford Railway Station (London, UK), Moncloa (Madrid, Spain) and Kamppi (Helsinki, Finland). The research considered interchanges not only "as nodes", but also "as places", concluding that "current urban transport interchanges can host other type of activities and act not only as transport nodes, but also as meeting places within cities" (ibid.). This already suggests a mixed use urban environment around transit interchanges, capable of attracting a large number of users, many of whom might arrive to the area by PT.

Also, transfers in a unimodal or multimodal trip are seen as inconvenient and, in order to improve the attractiveness of public transportation, they should be made simpler and shorter. Since a transfer implies extra travel time and/or travel costs while no distance is covered, the transfer itself has serious consequences for the transport services included in a multimodal trip (van Nes, 2002). Hernandez and Monzon (2016) even say that "the total effectiveness of the transportation network is determined by intermodal transfer facilities" and quote Iseki et al. (2009) who noted that; "the attractiveness of Public Transport can be substantially increased by reducing the burden of walking, waiting and transferring."

In the following chapters, characteristics of the built environment which have an effect on the usage of the PT system and the efficiency of transit interchanges, are going to be addressed.

Street layout, density and land use mix

A description of the relations between PT and land use is given by Chatman (2006 in: Renne, 2008); "sufficiently high amounts of shops and services increase both walking and transit use by making the walk to and from work, and the walk to and from the transit stop, both more visually interesting and a way to carry out occasional commercial trips during the middle of the day, after work or before work". Land-use mix (diversity) produces a more balanced demand for public transport over time (reducing differences between peak and off-peak periods) and in space (in terms of direction of flow) (Cervero, 2004 in: Guiterrez et. al., 2011).

Regarding urban design in the broader sense, the principle of Transit Oriented Design (TOD), aiming to facilitate PT use, describes desirable characteristics of the built environment in this regard with the so called 3D's – density, diversity and design. Cervero (2001) gives an explanation how the 3D's promote walk-and-ride access to PT stations; "Density does this mainly by bringing larger shares of residents within walking distances of rail stops. Diversity, reflecting the degree of land-use mixture, promotes walking by allowing pedestrians to efficiently consolidate trip ends – such as between a station, retail shop, and a residence, and without the need of a car – by bringing mixed activities closer together".

Renne (2008) compared three stations of the BART mass transit system in San Francisco, USA. He found that the station with the most passengers also had the most street intersections in the surrounding area, indicating that smaller block sizes with more linkages and intersections create greater pedestrian accessibility at the neighbourhood level (ibid.). Apart from the small urban blocks, the area around the station was also described as "Highly mixed – both vertical and horizontal" and as "the most TOD-like" (ibid.). Furthermore, this particular station also happens to be underground, which means no severance effects from rail infrastructure are present – the same condition that the redevelopment of railways in Ljubljana would create.

Regarding specific values for densities, Frank and Pivo (1994) showed – in a research addressing relations between mix use and density – that the relation between employment density and mode choice for single occupant vehicle (SOV) use, PT/transit use, and walking for work trips is nonlinear, as well as the relation between population density and mode choice for SOV use, transit use, and walking for shopping trips. This means that increasing densities in order to encourage PT use might not be cost effective unless certain thresholds are reached. For example, in the case of work trips, as stated by the authors (ibid.), significant modal shifts from SOV use to transit use and walking occur with between 20 and 75 employees per acre *(4942 and 18533 per square kilometre respectively)* and again with more than 125 employees per acre *(30888 per square kilometre)*. This analysis suggests that policies that encourage employment densities to increase from 75 to 125 employees per acre will have little effect on mode choice (ibid.). In the case of shopping trips and population densities, the threshold of 13 people per acre (3212 per square kilometre) was determined.

Urban form beyond the transport hub area

Schlossberg and Brown (2004), use street intersection density as one of the measures determining pedestrian accessibility in TOD areas around PT stations in Portland, Oregon, USA. With this, they demonstrate the need for small city blocks, similarly to Renne (2008) above. They also use the measure of pedestrian catchment area (PCA), which means that distances are calculated not as aerial distance, but instead through the street network. Furthermore, an important contribution of this research is that it also distinguishes between non-impedance and impedance based PCA. Impedance based measures are those where major roads with heavy traffic are treated not as streets along which people can walk, but instead as barriers that need to be crossed (in the context of this paper, referring to the chapter “Community severance”, these measures could also be defined as “severance based”). This makes a transit stop surrounded by busy streets less accessible.

This is important in the context of the PCL, firstly because it shows negative effects of severance on the accessibility of PT, and secondly – with addressing the severance of the street network – it is important since railways are not the only barrier in the PCL case. Currently, particularly the streets to the south of the PCL area present a strong barrier which divides it from the remaining part of the city centre (Figure 1). This implies that, even if we do choose to bury the railways, the PCL itself must not remain isolated from the rest of the city by surrounding roads, at least not to the same degree as today, primarily from the south. Furthermore, this research looks at measures within a quarter mile (402.34 metres) and a half mile radius (804.67 metres), suggesting a broader look is needed and a dense street layout with many intersections needs to be promoted in the surrounding areas as well. It should be noted, that Schlossberg and Brown (2004) were attempting to only define factors of pedestrian accessibility, and did not compare these results

with the actual number of users of each station. However, walking distance to transit facilities is an important factor contributing to transit ridership, because the farther away people are from transit facilities, the less likely it is they will use transit (Cervero, 2004 in: Guiterrez et. al., 2011).

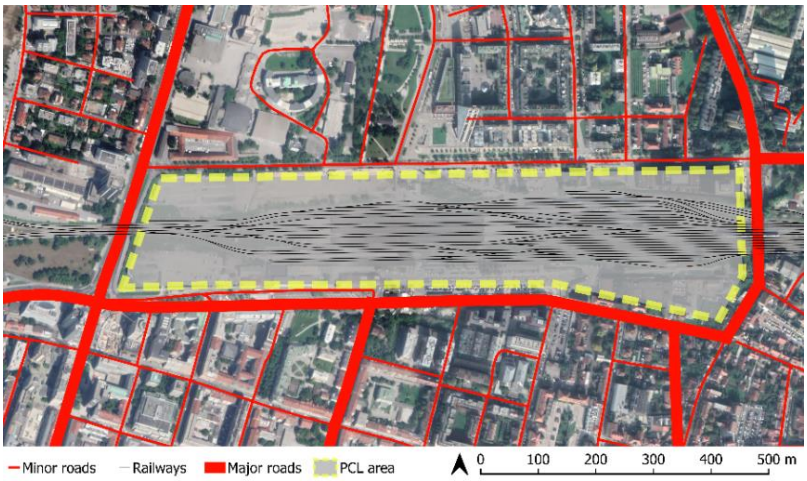


Figure 1: Surrounding street layout
The PCL area is divided from the city centre (towards the south) with major roads, making it less accessible. Source: Google Satellite Image

Another justification for looking beyond the limits of the PCL area comes from the research already mentioned in the previous section by Frank and Pivo, (1994). This time, characteristics of urban form at trip endings and origins were correlated with mode choice for different trip purposes (shop trips and work trips); "Transit usage and walking increase as density and land-use mix increase, whereas single occupant vehicle (SOV) usage declines. These findings suggest that observing the urban form at both trip ends provides a greater ability to predict travel choices than looking at trip ends separately. The findings also suggest that increasing the level of land-use mix at the trip origins and destinations is also related to a reduction in SOV travel and an increase in transit and walking" (ibid.).

The suggestion is that, in order to increase the number of total users of the PCL, it is not enough to encourage density and land use mix only inside the PCL area and its neighbouring areas. It should instead be done so also in other parts of the city and region, around PT stations with connections to the PCL. This essentially implies that a TOD – like environment should be promoted in the wider region as well in order to increase the number of passengers using the PCL and the PT system in general.

In practice, this can be imagined materialising in the form of corridors with higher densities along PT lines, similarly to the so called "Finger Plan" strategy of Copenhagen, Denmark, or the "Planetary Cluster Plan" of Stockholm, Sweden, both mentioned by Cervero (2009), who describes the benefits of the later;

"Stockholm planners have created jobs-housing balance along rail-served axial corridors. This in turn has produced directional-flow balances. During peak hours, 55 percent of commuters are typically traveling in one direction on trains and 45 percent are heading in the other direction". Regarding this, as Ljubljana has spread outwards from its historical core along the radial road system, it has a characteristic starlike shape (Š. Divjak, 2008). Furthermore, the radial roads run mostly parallel to the railroads. Hence, there already exists a foundation on which urban development supportive of PT use can be further encouraged.

Reducing transfer times

A model to determine ridership at Madrid metro stations through the characteristics of the station (type, number of lines, accessibility within the network, etc.) and of the areas they serve (population and employment characteristics, land-use mix, street density, presence of feeder modes, etc.) was developed by Guiterrez et al. (2011). Certain specifics were found in the case of intermodal stations, ie. those that overlap with other PT modes. Namely that "most of the riders at this type of station come from transport modes other than pedestrian. In fact, their demand varies widely depending mostly on the amount of passengers provided by the feeder modes" (ibid.).

At first, this seems to reduce the importance of underground railways by prioritising the integration of PT modes over the characteristics of the built structure (such as intersection density or land use mix). However, we can consider the benefits of subsurface railways for improving transfer times as well in the PCL example, by looking at the distance between the main train and bus stations and the bus stop "Bavarski Dvor", where most lines of the urban bus network meet. According to Koblar (2017), the distance from Bavarski Dvor to the main train station is more than 500 metres – resulting in a little more than 5-minute walk – while the distance to the majority of platforms of the rail station is about 850m (they are, except for two platforms, only accessible through an underpass under the railway, located away from the main building), which results in about a 10-minute walk. This makes transfers between the urban bus network and other modes long and impractical.

A better spatial integration of urban buses with other modes is therefore important, and in the PCL case, underground railways may present an opportunity to achieve this. With rails gone from the surface, we would be able to reorganise the street network and adapt it to the needs of connecting city bus lines with the PCL.

To demonstrate this, a simple hypothetical example of bringing PT modes closer to one another can be given (Figure 2); where currently there is an underpass of the major road Dunajska cesta under railways – in the case of the tracks being moved underground –transfers could be made much easier by placing a bus stop there,

thus reducing transfer times by bringing more urban bus lines closer to the main bus and train stations.

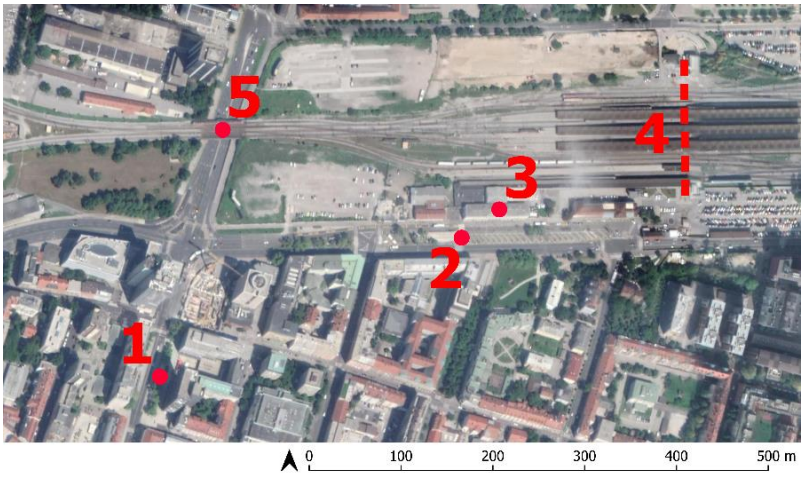


Figure 2: Locations of facilities
Locations by number: 1: Bavarski Dvor, 2: Building of the main bus station, 3: building of the main train station, 4: platforms of the main train station along with accessing underpass marked by a white dashed line, 5: Dunajska cesta railway underpass. Source: Google Satellite Image

CONCLUSIONS

Based on the analysed literature, it can be concluded that moving rail infrastructure underground would present advantages for establishing a dense, mixed use built environment with a dense street network, the benefits of which are evident in regard to the aim of facilitating PT use. This also fits well with calls for transit interchanges to act as meeting places within cities.

Yet, reviewed literature also shows the greater complexity of such passenger hubs, and the need to look beyond shaping the built environment of the PCL. Minimising transfer times is probably as important as creating an urban environment of high densities around transit interchanges. However, underground railways could make integrating PT modes in the PCL area much easier, while also opening more space for a densely populated environment with a mixed use and a dense street pattern. Along with the presence of many PT options, this would make it an attractive place to live and work.

Another benefit of sub surface railways from the perspective of public transit could also be in creating an opportunity, as well as a necessity, to answer long term strategic questions. This primarily concerns guiding urban development in areas outside the PCL as well, towards a dense mix use environment in order to encourage PT use.

To conclude, this paper attempted to provide a collection of views that could serve as a guide in the development of the PCL. This was done mainly from the perspective of public transportation while taking the plans for underground rail infrastructure into account. Questions and perspectives mentioned here should be further researched and debated in order to provide orientation for planners and decision makers.

ACKNOWLEDGEMENTS

I would like to thank Prof. Alenka Fikfak for her assistance and support. Her help in clearing up dilemmas whenever they arose, and her guidance regarding technical aspects were instrumental for finishing this paper. I would also like to thank anonymous reviewers for their helpful comments.

REFERENCES

Anciaes, P. R. (2013). Measuring community severance for transport policy and project appraisal. *Urban Transport XIX*.

Anciaes, P. R., Jones, P., & Mindell, J. S. (2014a). *Quantifying community severance – A literature review*. Street Mobility and Network Accessibility Series, Working Paper 02. November 2014. University College London. Retrieved from https://discovery.ucl.ac.uk/id/eprint/1461385/1/Mindell_ucl_streetmobility_paper02.pdf

Anciaes, P. R., Jones, P., & Mindell, J. S. (2014b). *The value of the barrier effect of roads and railways – A literature review*. Street Mobility and Network Accessibility Series, Working Paper 03. November 2014. University College London. Retrieved from https://discovery.ucl.ac.uk/id/eprint/1461386/1/Mindell_ucl_streetmobility_paper03.pdf

Braddock, M. (1979). *Evaluation of the severance effects of a proposed rapid transit corridor*. Paper presented at the 1979 Australian Transport Research Forum, Sydney, 18-20 April 1979. Retrieved from http://www.atrf.info/papers/1979/1979_Braddock.pdf

Cervero, R. (2001). Walk-and-ride: factors influencing pedestrian access to transit. *Journal of Public Transportation*, *3*(4), 1. https://doi.org/10.5038/2375-0901.3.4.1

Cervero, R. (2004). *Transit Oriented Development in America: Contemporary Practices, Impacts, and Policy Directions*. International Planning Symposium on Incentives, Regulations, and Plans – the Role of States and Nation-States in Smart Growth Planning. University of Maryland.

Cervero, R. (2009) Public transport and sustainable urbanism: global lessons, in: Curtis, C., Renne, J. and Bertolini, L. (eds.). *Transit-Oriented Development: Making It Happen*. Farnham, Surrey, England; Burlington, VT., USA: Ashgate. 23–35.

Chatman, D.G. (2006). *Transit-oriented development and household travel: a study of California cities (DRAFT)*. Los Angeles, CA: Institute of the Environment, Institute of Transportation Studies, Department of Urban Planning, School of Public Affairs.

Dešman, M. (2007). *Arhitektov Bilten (AB), 37*(173/174). Retrieved from http://www.ab-magazine.com/volumes/ab-173-174.pdf

Divjak, M. Š. (2008). Urban planning for the strategic spatial development of Ljubljana. *Urbani izziv*, *19*(1), 133-145. Retrieved from http://www.urbani-izziv.si/Portals/urbaniizziv/Clanki/2008/urbani-izziv-en-2008-19-01-002.pdf

Edwards, Brian. *The Modern Station.* E. & F.N. Spon, 1997.

Frank, L. D., & Pivo, G. (1994). Impacts of mixed use and density on utilization of three modes of travel: single-occupant vehicle, transit, and walking. *Transportation research record*, *1466*, 44-52.

Gregorc, C., & Krivec, D. (2012). Networking of Public Passenger Transport Modes, a Step Towards Sustainable Mobility in Ljubljana Urban Region. *Procedia - Social and Behavioral Sciences, 48*, 3009–3017. https://doi.org/10.1016/j.sbspro.2012.06.1268

Gutiérrez, J., Cardozo, O. D., & García-Palomares, J. C. (2011). Transit ridership forecasting at station level: an approach based on distance-decay weighted regression. *Journal of Transport Geography*, *19*(6), 1081-1092. https://doi.org/10.1016/j.jtrangeo.2011.05.004

Héran, F. (2011). *La Ville Morcelée. Effets de Coupure en Milieu Urbain [The fragmented city: Barrier effects in urban contexts]*. Collection Méthodes et Approches. Economica, Paris. [in French]

Hernandez, S., & Monzon, A. (2016). Key factors for defining an efficient urban transport interchange: Users' perceptions. *Cities, 50*, 158–167. https://doi.org/10.1016/j.cities.2015.09.009

Iseki, H., & Taylor, B.D. (2009). Not all transfers are created equal: Towards a framework relating transfer connectivity to travel behaviour. *Transport Reviews, 29*(6), 777–800. https://doi.org/10.1080/01441640902811304

Klanjšček, R., Vrhovec, A., Pavlin, K., & Lavrič, A. (2002). PCL [Urban development plan]. Retrieved September 11, 2020, from http://www.real-eng.si/

Klanjšček, R., Vrhovec, A., Pavlin, K., & Lavrič, A. (2007). *Zazidalni načrt potniški center Ljubljana, 2002-2006.* REAL Engineering d.o.o. In: Dešman, M., (2007). Novo tisočletje. *Arhitektov Bilten (AB)*, *37*(173/174), 39-41. Retrieved from http://www.ab-magazine.com/volumes/ab-173-174.pdf

Koblar, S. (2017). *Predlog alternativnega omrežja javnega potniškega prometa v Ljubljanski urbani regiji*. Master Thesis. Ljubljana, Filozofska fakulteta, Oddelek za geografijo.

Kosec, M. (2015, October 6). Emonika pod zemljo. *Outsider*. Retrieved June 26, 2020, from https://outsider.si/emonika-pod-zemljo/

Kranjc, M., Rožič, J., Glažar, T., Omerza, J., Ostan, A. S., Drašler, G., Zorko, I., Lukas, M., Lenarčič, L., Pavlin, N., Jovanovič, S., Vračko, S., Jaklič, T., & Rupar, B. (2001). *Mednarodni natečaj za območje Potniškega centra.* Odprti krog. In: Dešman, M., (2007). Novo tisočletje. *Arhitektov Bilten (AB)*, *37*(173/174), 39-41. Retrieved from http://www.ab-magazine.com/volumes/ab-173-174.pdf

Mackie, P. J., Jara-Dıaz, S., & Fowkes, A. S. (2001). The value of travel time savings in evaluation. Transportation Research Part E: *Logistics and Transportation Review, 37*(2-3), 91-106. https://doi.org/10.1016/S1366-5545(00)00013-2

Nes, R. van. (2002). *Design of multimodal transport networks: a hierarchical approach.* Delft, Netherlands: DUP Science.

Pravno informacijski sistem. (2019, December 30). *Odlok o strategiji prostorskega razvoja Slovenije (OdSPRS).* Retrieved from http://www.pisrs.si/Pis.web/pregledPredpisa?id=STRA12#

Renne, J. L. (2008). From transit-adjacent to transit-oriented development. *Local Environment, 14*(1), 1–15. https://doi.org/10.1080/13549830802522376

Rožič, J. (2007) Poglobitev. In: Dešman, M. (2007). *Arhitektov Bilten (AB), 37*(173/174), 54-59. Retrieved from http://www.ab-magazine.com/volumes/ab-173-174.pdf

Schlossberg, M., & Brown, N. (2004). Comparing transit-oriented development sites by walkability indicators. *Transportation research record, 1887*(1), 34-42. https://doi.org/10.3141/1887-05

Slovenske Železnice. (2020, May 13). *Buildings*. Retrieved from https://www.slo-zeleznice.si/en/infrastructure/public-rail-infrastructure/facilities

UK DoT (UK Department of Transport) (1983) *Manual of Environmental Appraisal*. Department of Transport; Assessments, Policy and Methods Division, London.

Vrhovec, M., Vrhovec, A., Zorko, I., Glažar, T., Fišer, E., & Gregorc, V. (1994). *Proučitev variantnih zasnov železniškega vozlišča in potniške postaje*. LUZ-Ljubljanski Urbanistični Zavod, Projektna skupina za proučitev variantnih zasnov železniškega vozlišča in potniške postaje Ljubljana. In: Vrhovec, A., (2007). Devetdeseta leta. *Arhitektov Bilten (AB), 37*(173/174), 37-38. Retrieved from http://www.ab-magazine.com/volumes/ab-173-174.pdf

T6

TRACK 6: BORDERS IN STREET LIFE: DIVIDING OR PROTECTING?

Track Chairs:

Domen Kušar,
University of Ljubljana, Faculty of Architecture, Ljubljana, Slovenia and

Luca Staricco,
Politechnico di Torino, Interuniversity Department
of Regional and Urban Studies and Planning, Italy

As Jane Jacobs preached, large-scale highways, parks, and big buildings can all divide communities, discouraging street life and sucking the life out of cities. Can street life connect people when trying to follow protecting regulations and rules, and ensuring safety in the living environment? Security is among the most valued values of modern man. Measures, in particular the construction of walls and fences, are accompanied by a man since the ancient times. Nowadays the walls are being erected all over the world to satisfy partial economic interests, prevent migration flows, and maintain religious, social and ethnic dominance in individual societies. The questions are arising on a balance between safety, symbolism, semiotics and creation of borders with the urban furniture on one hand and the open urban public spaces as places of socio-economic interactions in the widest sense. In the conditions where due to the safety & security regulations the urban communities are losing the public space for the meaningful social contacts, human interactions, exchanges and free mobility, the contributions to this track are addressing the issue of borders in open public space in theoretical and practical terms.

Keywords: Dividing communities, Security, Walls and Fences, Connecting, Public space

FENCES AS A MEANS OF DETERMINATION OF MOBILITY

Domen Kušar [1]
Assist. Prof., PhD, University of Ljubljana, Faculty of Architecture. Zoisova 12, Ljubljana
domen.kusar@fa.uni-lj.si

Blaž Komac
Research Advisor, PhD, ZRC SAZU Anton Melik Geographical Institute, Novi trg 2, Ljubljana
blaz.komac@zrc-sazu.si

ABSTRACT

Safety ranks among the most appreciated values nowadays. Safety in a residential environment is ensured by controlling the passage and by preventing visual access. Passage control arrangements, in particular the building of walls and fences, have been part of our lives ever since prehistoric times. Their design and layout reflect the societal, economic and social aspects, as well as the subjective perception of threats. Not long ago, in urban settings, in particular in the western world, fences were looked at as more or less symbolic elements of demarcation. Recently, however, perceived insafety results in building higher, less passable fences. In urban communities, this phenomenon leads to dwindling public spaces of social contact, mobility, interaction among people. However, along with interactions in society, people also need the opportunity to withdraw into privacy.

In the article we invent three new expressions which caracterised mobilities in relation to fences: physical, visual and audio mobility. In the following, we have defined these terms and presented them on examples of randomly selected cities around the world. By defining these three categories, the properties of mobility can also be used in the analysis of society. We have shown this in a small scale analyse. We anticipated that more open societies have higher mobility in all categories. The results demonstrate that, in the settings where people feel more threatened (e.g. in the environments more exposed to crime), the fences are higher and more efficient. This also depends on cultural basis. On the other hand, the environments less exposed to such problems feature fewer and lower fences. The article aims to present the role of fences in human mobility.

Keywords: fences, mobility, urban environment

[1] *Corresponding author*

INTRODUCTION

The Berlin Wall, a symbol of a divided world which cleaved Berlin for many years, fell on 9 November 1989. The eventual expansion of the EU broke down the barriers among member states, with Schengen seemingly a harbinger of a new chapter in history and an enhanced quality of human progress. However, the ongoing migrant crisis, its resulting safety issues and decreased trust in European institutions have renewed regionalisation and reintroduced the border controls. Elsewhere in the world, fences and border controls between the countries are, in fact, a permanent feature. Despite some negative connotations, they do ensure relative peace. It is therefore not surprising that the length of fenced and controlled borders has been steadily increasing (Vallet, David 2012).

Borders arise as a consequence of various factors. Natural and geographic borders (rivers, mountain ranges) impede passage due to their natural characteristics. Political borders are far more changeable since they arise as a result of social, economic and historical processes. Social conditions make these borders impermeable or even impassable. Historically, the safety of cities was ensured by appropriately high and defended walls. Once these walls were no longer needed and began to hinder the development of cities, they were demolished. The provision of safety was now pursued at a different, higher level—the level of state, and at a lower level—the level of neighbourhood or a particular plot of land.

The lower level is represented by the so-called gated communities. According to Altman (Polič, 1996: 26), there are various types of spaces, such as primary spaces (home, spaces that are inaccessible to others), secondary spaces (clubs, restaurants), and public spaces (parks, streets). By enclosing neighbourhoods, residents wish to have control over who enters their area while simultaneously ensuring that they live with people who are similar in terms of age, wealth, religion or language, or make sure that they are living in what they perceive to be a suitable environment (Low, 2003).

An even lower level of this type is represented by fences between plots. The positioning of these fences is in part historically determined (Komac, Kušar, 2017; Kušar, Komac, 2019). Nowadays plots are fenced in virtually all over the globe. Various studies (Habeck, Belolyubskaya, 2016) have shown that a bigger and more impassable fence does not necessarily mean fewer break-ins.

All space contains natural or artificial (political, structural) elements which direct and regulate mobility. They include features such as rivers, mountain ranges borders, long buildings, and fences... Mobility is enabled by allowing passage over, through or across these barriers.

Despite the similarities between various types of barriers, the present paper focuses on fences. These are a seemingly banal architectural, urbanistic element, which, however, exert a significant impact on mobility and environment. There are many

types of fences. Some of them, such as railings, are set up to prevent injuries caused by falls or impact. Other fences ensure people's comfort. These include acoustic fences, wind fences and also fences that provide privacy. Even though fences can belong to several categories at the same time, our attention will be given to urban fences intended to guarantee the privacy and direct mobility. As shown by Komac and Kušar (2017, 2019), there are different types of fences, depending on the material, height, transparency, appearance etc. The choice of type affects the image of the urban environment and may contribute to a balanced and orderly appearance. This is primarily the case in environments with a high degree of social awareness and individual responsibility, or in environments where fencing is regulated by law. However, large urban environments in less developed countries often exhibit disparate types of fencing, the appearance of which depends primarily on the investor.

The appearance of fences also depends on feelings of the perceived threat and the desire for privacy. The more threatened people feel, the more they invest in their safety. The most extreme example of such (threatened) society is the totalitarian system. In a totalitarian system, the government controls people, prescribes and proscribes what is allowed and sanctions any irregularities. On the other hand, this type of state provides a great degree of control and safety. Even though its citizens live in fear, they know what type of behaviour is allowed or enforced and what they are permitted to do in order to ensure their privacy. Totalitarian states are increasingly substituting conventional or physical fences with electrical systems of surveillance and restriction of movement (Ma, 2018). According to Graham (2011), capital and centres of power also want to control people in democratic societies. Urban areas are battlefields, where people want to fight against fences and control. However, in places with different safety provisions, where people feel safe, there is little need to separate between private and public spaces, since people rely on others to respect the imagined, "mental" barriers. Ensuring privacy is thus a dynamic process, in which individuals or groups control the possibility of contact among each other or with people from the outside, the ability to transfer material or information from one direction to the other and the freedom to choose who to associate with or where (Altman, 1977; Ittelson et al., 1974; Polič, 1996). The management of threats and protection of privacy thus entails a paradox: the more privacy space provides, the more it separates from the rest of the environment (Polič, 1996, 32).

The permeability of fences includes visual and technical permeability that influences mobility, is related to the societal attitudes and the culture of privacy. In cultures with high regard for privacy, fences tend to be taller, less permeable (especially visually) and less regulated. In open, liberal societies, we expect them to be fewer and lower, or at least visually permeable. In the article, we present a survey of the differences between fences depending on their location. It is to be expected that social and cultural differences will result in different types of fencing, which may act as a mental (subconscious) barrier as well as a physical barrier influencing mobility. We have included randomly selected locations from across

the world and highlighted the role of fences as regulators of mobility in relation to social and economic conditions.

METHODS

The study of influences exerted of fences has two parts. The first part defines mobility. Kušar and Komac (2019) proposed a new typology of fences. This typology which includes different properties like material, height, width, structure and colour is now upgraded with three different types of mobility.

One of the key features of living in an urban environment is mobility in the broadest sense of the term. It includes physical, as well as visual and acoustic mobility. As one of the most significant types of mobility, physical mobility can be defined as the capacity to physically move from point A to point B, either on foot or by various means of transport and by taking the shortest possible route without encountering obstacles. Visual mobility—in short, an "unobstructed view"—can be defined as the ability of a random passer-by who is walking, travelling by car or public transport, to have an unobstructed view of the surroundings. The third type of mobility comprises the ability to perceive ambient sound and to interact vocally with the environment. Restriction of mobility may be understood as being contrary to the idea of freedom. In Europe, freedom was first won by cities. This freedom represented a step towards the mobility of every individual, first the city dweller and eventually, the citizen. City streets and squares became public spaces freely accessible to everyone.

The second part – a comparison of fences was carried out with the aid of Google Street View (2009), which enabled a virtual inspection of fences in different parts of the world. Places of inspection were selected randomly and included Latin America (Cordoba in Argentina), Asia (Nakhon Sawan in Thailand), Africa (Kampala in Uganda), and Europe (Uppsala in Sweden). The selected cities are from countries that are diverse in terms of geography, culture, religion, wealth, and (in)equality. The study compared an area of one hectare in all the above-mentioned cities and categorised fences according to different types of mobility. The areas were randomly selected, the only precondition being that they are located in the urban part of the city, but not in its centre. City centres are on display as the most public parts of town, with less ostensible limitations of mobility. We used the predominant type of fences in each area in the study. The results were compared to some characteristics of the society which include social inequality, crime, wealth, and life satisfaction. The relevant data were collected online (Crime index by country 2019, Quality of life index by country, 2019, List of countries by income equality, 2019, World happiness report, 2020).

RESULTS

Fences and physical mobility

Physical mobility is defined as a person's capacity to physically pass a fence. The lowest level of a fence with a high degree of physical permeability is a "mental" barrier, which indicates separation but can be easily overcome by a pedestrian. These are usually low fences, low hedges, etc. This category also includes different land uses and land development. The next level includes barriers whose passing requires a greater effort. This is the category of medium physical mobility (Figure 1). It includes most fences which can be simply climbed over by a pedestrian. The final category includes fences resulting in low physical mobility, i.e. it is difficult or impossible to pass them. These fences are generally tall and may have additional in-built features to prevent passage, such as barbed wire, electric wires, and video and other types of surveillance.

Figure 1: Fences with medium physical and visual mobility and high acoustic mobility (Stara Gora, eastern Slovenia)

Fences and visual mobility

Visual mobility is defined in terms of the ability to look through or across a fence. Despite the availability of technical equipment which enables people to see across fences (telescopes, periscopes, drones), it is usually the person's height which determines which fences they can see over. The human visual field depends on the height of the viewer and the position of the head. The height of a person's eyes depends on their size. Low visual mobility is defined as the inability to look through or across the fence. This is especially pronounced with acoustic fences, which transform a thoroughfare into a forward-directed visual channel (Figure 2). Low or transparent fences provide a high degree of visual mobility, despite the barrier. The whole area thus visually becomes part of public space. Fences can direct visual mobility by channelling sight into a particular direction or towards a particular target.

Figure 2: A double-sided masonry fence obstructs the view of the gardens, while at the same time channelling sight forward (Kopačeva Street in Ljubljana, Central Slovenia)

Fences and acoustic mobility

The specifics of sound travel make fences less suitable for the acoustic obstruction of mobility. The reason for this is the difficulty of preventing sound travel in open spaces and even very tall or massive fence cannot fully prevent sound from travelling. Even though the acoustic fences, commonly found alongside roads, reduce the level of noise, they have to be very tall to do so. Generally speaking, fences cannot prevent or channel sound mobility; partial sound mobility can be achieved with tall and massive fences or walls and with fences made from special acoustic panels. High sound mobility means that people can engage in a normal conversation with each other. Because human communication contains a prominent non-verbal element, high acoustic mobility is characterised also by the ability of people to see each other. Medium acoustic mobility can be defined as the ability to communicate without being able to observe non-verbal communication.

The channelling of mobility in four cities

The analysis of four individual areas of urban development in the cities of Cordoba, Kampala, Nakhom Sawah, and Uppsala has shown the ubiquitous presence of fences. Fences in Sweden are generally low, usually made of metal or consisting of hedges. In the chosen example, buildings were mostly positioned in the middle of the plot. There are very few outbuildings (sheds) complementing the fence next to the property line. Physical mobility is managed on the mental level, people are aware of the existence of borders and respect them. Because the fences are low, there is a high degree of visual as well as acoustic mobility. In the case of Argentinian Cordoba, plots were mostly enclosed by fences which are mostly made of metal or masonry. The height of the fences usually exceeds 2 metres; the fences partly consist of buildings that stand on the property line. Fences thus limit physical mobility to a high degree or direct it to specific points. The choice of fence material also results in visual mobility being impeded or even made impossible. There is a medium degree of acoustic mobility since masonry walls are tall enough to obstruct non-verbal communication. Nakhon Sawah in Thailand demonstrates a high concentration of buildings in the selected area. Plots of land are enclosed by fences. The choice of building material varies, with people tending to use locally-sourced

materials. Fences vary in height; however, they are partially transparent and thus do not impede visual or acoustic mobility. Kampala in Uganda is an exception among the selected examples. In Kampala, fences are related to social status and wealth. Simple fences built by poorer residents are made of locally sourced materials, such as wood or dry-stacked bricks, and mainly demonstrate the desire to establish at least some sort of a "mental" barrier. On the other hand, the same neighbourhood also includes examples of high masonry walls, fortified by barbed wire or broken glass. Their owners discourage any type of communication across the fence, either physical or visual. Physical and visual mobility are therefore highly obstructed or even impossible.

The above examples of city fences show that mobility is the least obstructed in Sweden and Thailand, followed by Argentina and Uganda. The comparison of chosen social indexes (Table 1) shows that the happiness index is highest in Sweden, Argentina and Thailand are ranked in the middle, while Uganda has the lowest happiness index. The income inequality index demonstrates a large discrepancy between Sweden, on the one hand, and the other three countries on the other, since they are quite close in terms of inequality. Interestingly, Argentina has the highest rate of crime and Thailand the lowest rate. According to the quality of life index, Sweden has the highest quality of life, followed by Argentina and Thailand. Unfortunately, the quality of life data was unobtainable for Uganda.

Table 1: Socioeconomic conditions in selected countries, related to fence characteristics

City	Happiness index (world ranking)	Income inequality index (world ranking)	Crime index (world ranking)	Quality of life index (world ranking)	Fences and mobility		
					Physical	Visual	Acoustic
Cordoba (AR)	6.086 (47)	41.7 (52)	62.55 (17)	122.49 (48)	Medium	Medium	Medium
Kampala (UG)	4.189 (136)	39.5 (64)	53.27 (29)	No data	Low	Low	Medium
Nakhon Sawan (TH)	6.008 (52)	39.4 (66)	46.66 (49)	103.26 (61)	Medium	High	High
Uppsala (SE)	7.343 (7)	24.9 (140)	49.35 (38)	187.67 (14)	High	High	High

Because our research was limited to a single area of each selected city, which is too little to provide a comprehensive overview, we complemented our analysis by using Google Street View to examine more locations in selected countries. This has shown that other parts of the country exhibited similar characteristics in terms of fenced enclosures. Results have demonstrated an interesting interrelation between different types of mobility and social indexes. This confirms that the use of fences is more closely related to perceived feelings of safety rather than objective facts. Our findings furthermore indicate that in stable countries (with greater happiness scores), fences pose less barrier to all types of mobility.

CONCLUSION

In the Western world, mobility is considered an essential part of personal freedom. However, an individual's freedom is curtailed by the freedom of others. This is relatively unproblematic if people keep it in mind. Fences help this by directing different types of mobility.

They predominantly channel physical and visual mobility. Physical mobility directs the movement of people or prevents mobility to undesired directions. This can be achieved with tall impenetrable fences (such as, for instance, in Kampala). However, there are other ways of generating feelings of safety. The most significant contribution to safety is made by the state and society as a whole. Well-regulated countries with societies of responsible individuals achieve equivalent effects with low hedges or wooden fences (for instance, in Uppsala). In the absence of this, or due to other cultural and social reasons, the provision of safety and privacy appears to a lower level (neighbourhood, group of buildings or plot) where efficient fences are necessary.

Similar factors apply in case of visual mobility. In situations where privacy is highly valued as a societal norm, low fences—which do not obstruct visual mobility—serve their purpose just as efficiently as taller fences. Liberal and tolerant societies seem to be more successful at achieving this.

REFERENCES

Crime index by country 2019 (2020, February 10). Retrieved from https://www.numbeo.com/crime/rankings_by_country.jsp?title=2019

List of countries by income equality, 2019 (2020, February 10). Retrieved from: https://en.wikipedia.org/wiki/List_of_countries_by_income_equality

World happiness report, 2020 (2020, February 10). Retrieved from: https://en.wikipedia.org/wiki/World_Happiness_Report

Quality of Life Index by Country 2019 (2020, February 11). Retrieved from https://www.numbeo.com/quality-of-life/rankings_by_country.jsp?title=2019

Altman, I., Wohlwill, J.F. (1977). *Human Behavior and Environment*. Springer.

Google Earth Street View (2009). US Department of State Geographer.

Graham, S. (2011). The new military urbanism. *Nonkilling Geography*. Retreived from: http://nonkilling.org/pdf/NKgeo.pdf

Habeck, J. O., Belolyubskaya, G. (2016). Fences, private and public spaces, and traversability in a Siberian city 2016. *Cities*, 119-129.

Ittelson, W. H., Proshansky, H. M., Rivlin, L. G., Winkel G. H. (1974). *An introduction to environmental psychology.* Holt, Rinehart & Winston.

Komac, B., Kušar, D. (2017). Sledi ruralne dediščine v urbani pokrajini: obzidani vrtovi na primeru Bovškega. *Geografski vestnik 89-1*.

Kušar, D., Komac, B. (2019). Ograje v urbani podobi Slovenije. *Geografski vestnik. 91*.

Low, S. (2003). *Behind the gates: life, security and pursuit of happiness in fortress America*. Routledge.

Ma, A. (2018, October 29) *China has started ranking citizens with a creepy 'social credit' system.* Retreived from https://www.businessinsider.com/china-social-credit-system-punishments-and-rewards-explained-2018-4

Polič, M. (1996). *Ekološka psihologija*. Univerza v Ljubljani, Oddelek za psihologijo.

Vallet, E., David, C.-P. (2012). Introduction: The (re)building of the wall in international relations. *Journal of Borderland Studies 27(2).*

DIVIDED NEIGHBOURHOOD

Katarina Konda
Mag., Mestna občina Ljubljana, Poljanska cesta 28, katarina.konda@ljubljana.si

ABSTRACT

Large housing estates in Slovenia have been lately involved in land title registration procedures. The aim of this procedure is solving land ownership situation which has occurred, after the privatisation of a high proportion of the former public housing stock in the early 1990s. Former tenants became owners of their previous rental dwellings while the land was still owned by municipality or building companies which built neigbourhoods. This is lately being solved with land title registration procedures but for each residential building separately. When this procedure is finished the occupants get the right to perform actions on the land around their building. Very often their first action is setting up electric locks around their parking lots. Lately we also witness (more problematic) trend, which is closing the passages, which run through buildings and serve as part of a bigger communication network for the whole neighbourhood. Due to that strollers are forced to use longer detours, which are sometimes on streets, without pedestrian surfaces.

This paper deals with effects this actions have on quality of public space in the neighbourhoods, urban structure and social life. It also investigates the legal tools to prevent this sort of situation.

Keywords: neighbourhood, public space, permeability

INTRODUCTION

The large housing estates are important parts of cities all over Europe. A considerable part of the urban population live in these areas and they have often lived there for many years. Many of them do not have much choice in the urban housing market, because other parts of the market are too expensive or too unattractive (for example for families with children). This means that the large housing estates have an important function in the urban and even regional housing markets of most cities in Europe (Kempen et al., 2007).

The neighbourhood can be defined as a planned, functionally organised unit in the city or wider city area, designed for 2500 to 5000 residents, which includes all necessary infrastructure, daily care, schools and kindergartens, green spaces, public

space and public passenger network. Neighbourhood is also an area where people live and interact with one another and tend to have their own identity. Residents may have similar types of families, incomes, and education level. Neighbourhoods are usually planned by the state or with state support.

NEIGHBOURHOODS IN SLOVENIA

Neighbourhoods in Slovenia were mostly built after Second World War with the aim of providing housing to as many people as possible (Kepmen et al. 2007). The intensive construction of residential neighbourhoods in Slovenia is typical for the 1960s, 1970s and the first half of the 1980s, reaching its peak between 1975 and 1985. After 1985, the volume of residential construction in Slovenia began to decline (Rebernik, 2002).

Most of the neighbourhoods in Slovenia were carefully planned and provided technically sound and well-designed housing. Nevertheless, many of the estates now experience a multitude of problems as they were originally built for a society that has subsequently changed. As life-styles have changed the neighbourhoods now face new sorts of problems, which have not been present originally. Construction was carried out on the basis of the detailed spatial plans adopted on the basis of municipal spatial planning documents. After being built the neighbourhoods remained largely unregulated (in the means of ownership, management and regulation). Land is recorded partly as property of a former municipality, partly as property of a residential construction investor and sometimes as property of the original landowners. The causes of the disorderly situation are mainly in the then relation to social property and in the then legislation in the field of spatial planning and construction of buildings (Frelih, 2007, Bandelj 2016) and property law. Following the amendment of the Building Construction Act in 1984 (Uradni list SRS No. 34/1984), the construction investor only submitted a certificate of registration of the newly constructed building with the then municipal geodetic authority, and in most cases did not ex officio regulate the land registry. The land parcels of multi-dwelling buildings thus remained unregulated by land, and public areas in residential neighbourhoods, such as roads, paths, parking lots, greens and playgrounds, invested by municipalities or municipal funds also remained unregulated (Frelih, 2006, Bandelj 2016). After the abolition of the system of social property, the process of privatization and privatization of social housing and associated land in social property began. Already at the beginning of the process, due to unregulated real estate records, there were many difficulties in registering condominium property in the land register.

Procedures for entering condominium ownership in the land registry have not yet been completed, and the procedures[1] for determining the pertaining land have

[1] Act on the Acquisition of the Strata Title of a Part of a Building on the Proposal of the Owner and on Determining the Land Belonging Thereto was (Zakon o vzpostavitvi etažne lastnine na predlog

begun after 2008. Determination of the land belonging to the building may simply be suggested by the building owners. The court in non-litigious proceeding assesses which land belongs to apartment block. The problem is, that this decisions are not coordinated on the level of the whole neighbourhood. Each building is regarded as individual object and not so much as part of a master plan. Given the decisions made so far, it appears that a large portion of the land in residential neighbourhoods will eventually be allocated to condominium owners. According to current practice, it is also possible to predict what happens in most cases (or is it already happening) condominium owners restrict access to newly acquired land with a barrier, and often come up with ideas on how to increase parking lots, of course to the detriment of greens and trees.

ŠIŠENSKA NEIGHBOURHOOD - ŠS 6

Figure 1: Šišenska neighbourhood - ŠS-6 (photo: www. urbinfo.com)

Šišenska neighbourhood ŠS 6 (Figure 1) was built between 1966 and 1970 and is one of the first completed residential neighbourhoods in Ljubljana that was created in accordance with the 1965 General Urban Plan of Ljubljana (GUP). It was built for 10,000 people and carefully designed as a set of several smaller neighbourhoods. The urban planners (Janez Vovk, Aleš Šarec) planned a higher density along the city road where public transport was taking place, and a smaller density towards the interior of the neighbourhood. For this reason, the center of the

pridobitelja posameznega dela stavbe in o določanju pripadajočega zemljišča k stavbi (Uradni list RS, št. 45/08, 59/11 in 34/17 – ZVEtL-1)),

neighbourhood, surrounded by high blocks and high-rises, was envisaged along Celovška Road, and lower residential buildings towards the interior. The apartment blocks are set in vibrant lines, bays and horseshoes, with rich park greenery, playgrounds and gardens (Figure 2). Road traffic is limited to just a few side streets. In the green heart of the neighbourhood, there is a school, a kindergarten and a gym. Pedestrian trails were carefully planned so that the distance from the station to the school would not exceed 600 meters anywhere. Traffic was placed on the edge of the settlement and was strictly separated from pedestrians. Inside the neighbourhood, urban planners have introduced a pedestrianized street element in the greenery to connect major points in the settlement (Figure 3).

Figure 2: Bays with rich greenery (photo: Katarina Konda)

Figure 3: Pedestrianized street element in the greenery (photo: Katarina Konda)

Figure 4: ŠS6 neighbourhood (roads and streets as communal devices) (photo: Katarina Konda)

Horseshoe-shaped building blocks were designed with two-sided entrances tied to the driveway and parking spaces on one side (Figure 4), and on footpaths, greens, playgrounds, on the other side. Along with the parking lots, there were also planned greenery with trees that shade parking spaces (Figure 5), mitigate noise and have a beneficial effect on the microclimate of the environment. (Modernist Neighbourhoods of Ljubljana, 2015).

Figure 5: ŠS6 neighbourhood (two-sided entrances) (photo: Katarina Konda)

Unfortunately, the idea of a neighbourhood as a completed urban unit was not realized to the last detail, but nevertheless represents one of the best Slovenian examples, for which in 1969 the authors received the Prešeren Fund Award.

ŠIŠENSKA NEIGHBOURHOOD - ŠS 6 – RECENT CHALLENGES

In addition to the lack of parking spaces[2], uncoordinated[3] energy renovations and tendencies to build on green areas, one of the challenges ŠS 6 neighbourhood is

[2] The building plan is based on the standard "two parking spaces for three apartments or one garage for two apartments", the urban standard was 0.9 parking spaces per dwelling unit (Bandelj, 2016).

[3] Due to the fact that neighbourhoods were built in the 1960s, 1970s and 1980s, most of them require energy rehabilitation. Due to the fragmented ownership and poor economic position of the population, the opportunities for quality renovation are limited. Renovation of the blocks is therefore limited to only necessary structural and technical updates and energy rehabilitation (thermal insulation, window replacement and façade). The work is led by residential managers and artisans, mostly without

facing today is determination of the land belonging to the apartment buildings. Although ŠS6 was planned as a functionally and design complete unit, most of the interventions today take place without top-level coordination. The renovation of the buildings is carried out individually (facility by facility), as well as the determination of the associated land to the facilities. The area, which was designed as a whole, is now breaking into fragments. This can potentially have severe impact on the character of the neighbourhood and consequently quality of life.

The neighbourhood in which pedestrian paths were carefully planned so that the distance from the apartments to the school would nowhere exceed 600 meters, with footpaths planned separately from traffic areas, is today facing a change, which exceeds the problem of the rainbow coloured facades. The pedestrian paths, which were planned in greenery inside the courtyards of apartment blocks, are today already interrupted in the north part of the neighbourhood, where tall buildings predominate. These buildings have passages that were originally designed as open passages for all visitors (Figure 7), but are now almost everywhere closed with doors (from 23 passages only 3 remained open to this day). Because the passages are no longer open, pedestrians have to make long detours around blocks, walk on grass and through traffic area without sidewalks. Besides closed passages another obstacle (Figure 8) was added just recently. On the major path connecting ŠS 6 neighbourhood with new neighbourhood Celovški dvori, several iron fences were erected (Figure 9).

A neighborhood that was originally designed to be transient in all directions is today losing this quality.

Looking at ŠS 6 neighbourhood we can easily find four generators of diversity (by Jane Jacobs) that determine and contribute to the character of ŠS 6 neighbourhood. Mixed uses, variety in the built environment, high density and last but not the least permeability. One the stroll through the neighbourhood one can notice, that these conditions have positive effect on the social and economic vitality of ŠS 6 neighbourhood. Paths and streets are continuously connected in a network spread over the whole quarter. Parks and public buildings (school, kindergarten, grocery shop…) are included in the street network. Their presence increases the complexity of the network and the diversity of uses. So preserving this quality should be one of the major goals for this neighbourhood in the future.

architects, urban planners, sociologists and economists, who with their knowledge could contribute to better results. Dwellings are thus transformed into (energy-less wasteful) rainbow complexes with plastic windows with no added value (Trajekt, 2012).

Figure 7: ŠS6 neighbourhood – red dotted lines show pedestrian lines, blue arrows show the area where passages are still open, red signs show the area where passages are closed.

Figure 8: Closed passage ŠS6 neighbourhood (photo: Katarina Konda)

Figure 9: Iron fences on the sidewalk (photo: Katarina Konda)

CONCLUSION

Considering neighbourhoods of Slovenia (and ŠS 6), it seems as if we still live in the illusion that open space is an automatic good and that everybody is willing to share it. The old spatial plans (detailed building plans, development plans…) did not unambiguously define public areas and built public goods. They were made during the time of social property, when the separation between public and private was not clearly defined.

But sooner as we know, we could be facing fenced islands where there used to be common open areas. Neighbourhoods that were built as organised construction, are today facing a threat to disintegrate into separate unconnected fragments. If the unsuccessful maintenance of buildings was usually highlighted, recently determining the land belonging to the individual buildings has come to the fore. What connects all of the actions mentioned above is, that most of interventions are not spatially coordinated, neither at the neighbourhood level nor at the city level. Knowing that good functioning can never be fully prescribed by provisions and acts and that reality will always give birth to coincidences that will imply unforeseen solutions, we should start thinking of organising joint management at the neighbourhood level as the situation cannot be regulated only through spatial plans. More attention should be paid to a comprehensive treatment of spatial issues.

Law of Property Code obligations should also be implemented so that the passages are assigned with maintenance of rights of way[4] as they were already foreseen as public by the design of the detailed building plan.

Municipalities should be encouraged to actively participate aswell in land registry issues and also in spatial planning of this areas (for instance project offices).

REFERENCES

Frelih, J. (2006). *Problematika funkcionalnih zemljišč in vpisa stanovanj v zemljiško knjigo.* V: Zbornik referatov 17. posveta Poslovanje z nepremičninami. Ljubljana, Gospodarska zbornica Slovenije.

Frelih, J. (2007). *Problematika določanja gradbenih parcel k obstoječim večstanovanjskim stavbam.* V: Zbornik referatov 18. posveta Poslovanje z nepremičninami. Ljubljana, Gospodarska zbornica Slovenije.

Bandelj, S. (2016). *Določanje pripadajočih zemljišč v večstanovanjskih soseskah.* Diplomska naloga. Ljubljana, Univerza v Ljubljani, Fakulteta za gradbeništvo in geodezijo. (mentorica Lisec, A., somentorica Simoneti, M.):

[4] Already proposed in Background document Evidence of real estate record Municipality of Ljubljana, (LUZ d.d., 2011-2017)

Jacobs, J. (2009). *Umiranje in življenje velikih ameriških mest. Ljubljana*: Studia Humanitatis.

Kempen, R., Murie, A., Knorr-Siedow T. & Tosics, I. (2007). *Regeneracija velikih stanovanjskih sosesk v Evropi: Priročnik za boljšo prakso.* Ljubljana, Urbanistični inštitut Slovenije.

Rebernik, D. Ljubljana. (2002). Urbano-geografsko proučevanje blokovskih stanovanjskih sosesk kot element urbanističnega planiranja. *Dela*, 18.

Retrieved from: http://trajekt.org/2012/10/02/regeneracija-sosesk-stanje/

Retrieved from: http://www.mao.si/Upload/file/Modernisticne%20soseske%20v%20Ljubljani.pdf (Modernist Neighbourhoods of Ljubljana, 2015)

MUSIC ON THE STREETS: POSITIVE IMPRESSIONS

Lola Beyrouti
Assist. Prof., Notre Dame University – Louaize, lbeyrouthi@ndu.edu.lb

ABSTRACT

The idea of writing about music on the streets was triggered by the conviction that music can bring people together despite differences and conflicts. Efforts aiming at resolving issues and disagreements through music are practiced throughout the world, namely with the West-Eastern Divan Orchestra founded in 1999 by Daniel Barenboim and Edward Said as a workshop for Israeli, Palestinian and other Arab musicians; similarly, LeBAM, the Lebanese Band Association for the promotion of Music founded in 2008, at the initiative of MP Ghassan Moukheiber in partnership with the late Ghassan Tueini and Walid Gholmieh, as a community-based nation-wide band music program, to promote culture, diversity, development and citizenship.

The aim of this study is to find the type of music adapted to the prevailing culture to be adopted by most Lebanese, both musicians and non-musicians, to achieve a peaceful dialogue and understanding among the people. The title "Music on the streets: Positive impressions" is holding many considerations: the impact of the music in general, the issue of street and designing spaces for the music bands, the popular and the folkloric music with the Rahbanis, and the analysis of one of the songs that lead us to find the positive impressions.

Keywords: Streets, folkloric music, Rahbani.

GENERAL CONTEXT

Eighteen different religions, confessions, and sects are officially recognized in the Lebanese society according to a survey done in 2011 (Harris, 2012: 14). It is therefore very hard to have one style of music that is appealing to all citizens. This style, if it exits, must be meaningful without being challenging or defying. The liturgical music used for the rituals is diverse. Each of these repertoires is following a system of scales or modes that is particular to the location, the liturgy and the traditions. Therefore, this genre of music is not fit to unite the public. Furthermore, the language used for worship is not the same, which makes it even more difficult to consider using these songs as music to unify people. Moreover, their political views are contradictory as well as their national music that represents, each, one of the political parties. This multiplicity of sound identity makes it a problem as to have only one nation identity. A universal and Gestalt ISO, Identity Sound

(MacDonald, Kreutz, Mitchell, 2012: 48, 49) helps attributing one identity to the citizens. In this context, music should hold a message of understanding. Already the message conveyed through music is comparable to the rhetoric of a language as Elaine Sisman presents it in the music of rhetoric (Greer, 2000:169). A common space for all citizens is to be found as well, and the common understanding of a public location is the downtown streets of a city.

MUSIC AND THE ISSUE OF STREETS

"Street music unquestionably influences the city and vice-versa" (Bennett and Rogers, 2014) (Clua, 2020). Positive and negative musical expressions have been heard in Beirut city centre. The "Fête de la musique", music day, that the Lebanese celebrate in all parts of Lebanon including downtown Beirut is one of these positive expressions that is acclaimed by some of the citizens (Daily Star, June 23, 2018, p.16). Similarly, political groups have chosen the downtown Beirut area to play their revolutionary songs , despite suggesting negative impressions to other groups of people.

The Journal of Public Space (Nazzal, Chinder, 2018) certifies that in Lebanon, meeting places are not public; although we can consider the Beirut downtown as a public space gathering people from all parts of Lebanon. The Place de l'Etoile of Beirut with the buildings surrounding it, and the place outdoor by the movie theatres, are some spots usually chosen for concerts and musical activities (LeBAM, 2011, 2019). The acoustics there, are rather satisfactory providing the use of microphones. However, no acoustical studies and no permanent musical settings were conceived for this public space, thus the musicians, bands and orchestras are managing their sceneries alone. Moreover, the genres of music displayed in these places were attracting some but not all Lebanese each time.

According to Philip V. Bohlman, music expresses "the culture's past, traits of a language, and articulate religious belief… Music functioning in these ways is, of course, what we call folk music" (Nettl, Capwell, Wong, Turino, 1997, 202). The folk music made of souvenirs may find a common interest among Lebanese citizens.

RAHBANI'S SONGS AND OPERETTAS

In the second half of the 20th century the Rahbani brothers who were driven by "the struggle to define shape, and claim Lebanese identity" (Stone, 2008:1) started composing popular songs and operettas, that were innovative and that the Lebanese people adopted as folkloric music due to their symbols and aesthetics.

The Rahbani brothers, Assi (1923-1986), and Mansour (1925), then the Rahbani family, Assi's wife the Lebanese diva Fairuz (1933) and their son Ziad Rahbani (1956) monopolized the fame of Lebanese composers and singers during the whole

half of the century up till now. In 1957, an agreement with President Camille Chamoun showed them the way to Baalbeck Festival where they quickly became a foundation of the Festival called International, with their national operettas, creating some controversy (Stone, 2008: 3, 4).

The Rahbani brothers studied music and theatre and were composing music and lyrics. The first to compose operettas in Arabic, the Rahbanis are considered pioneers of this structure from the 1960. These works were elaborated musically, despite concentrating on daily life subjects socially and politically: a form that combines many of the Arabic forms in one work. (Mansour, 2009:18, 20,26,28,34). Their operetta "Sahret el Hub" Love Evening, is based on the mixture of these following forms: The scores were not published therefore a site is mentionned. https://www.youtube.com/watch?v=L01RivAmuhk&list=RDL01RivAmuhk&index=1 Fairuz, Wadih ElSafi, Nasri Chamseddine, Sahret el hub.

Zajal: Classical form. Lebanese dialect poetry, originally in Syriac (Aramaic language), semi-improvised, semi-sung. The Zajal includes (the *Errede*: Repetition of the refrains by a chanting chorus; the *maanna* made of 12 syllables, …).

Mawwal: Another Classical form of singing on a love subject with one singer and one instrument. The melodic line is not measured and is characterized by the poetic meter and rhythm.

Mouhawara: Dialogue explaining the story in singing.

Qasida: A form of singing poetry comprising 10, 25 or more versus, with an Arabic Classical meter and a uniform final rhyme.

Mixing different forms apply equally to their songs. Their hundreds of songs and more than 20 operetta production are counted folkloric works. Most of their works were composed for the famous singer, Fairuz.

FAIRUZ

Fairuz a prominent figure of folkloric, national and actuality music, has many songs in her repertory. Her voice holds a national message to Lebanese people in Lebanon and abroad. The rich harmonics abide by an expression conveyed by the Rahabni brothers' music. The symbol triggered by the tunes and her voice is not only a source of memories but a predilection of all parties of different ages composing the Lebanese society and relying on the folklore to show their belonging (Stone, 2008:3). Fairuz spent five years at the Conservatoire, voice training, and studying with different private instructors.

In the next paragraph a nearly canto metrics analysis will be performed on one of her songs.

THEORETICAL FRAMEWORK

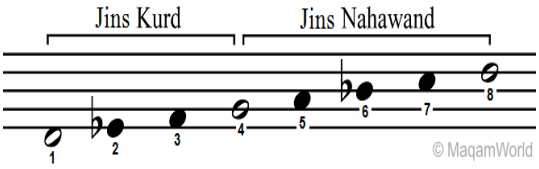
"Cantometrics is a system for rating a song performance in a series of qualitative judgments; one day it may be a way of using song as an indicator of social and psychological pattern in a culture." "Cantometrics takes into account the phenomena described by European music notation– melody, rhythm, harmony, interval size, etc.– however it also looks beyond these European basics at many other factors… the type and the degree of melodic, rhythmic, and vocal embellishment in a song performance; and the quality of the singing voice normally effected by the chosen singers in a culture" (Lomax, Averill, Cohen, 2003: ix, 250).

One of the songs will be selected from the Rahbani's repertoire. This song shows a sightseeing of a region in Lebanon. It is called *Layali El-Chimal.*

Through the process it is useful to display the musical language used in the song referring to Habib Hassan Touma's work (Touma, 2003: 29,30,31,53, 54, 55).

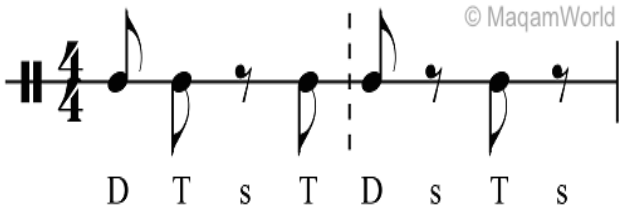
TEMPLATES OF RHYTHMS AND MODES

1. **The mode or maqam:**



Maqam Kurd

2. **The rhythm or ouasn**



Maqsoum

Figure 1: Templates of rhythms and modes

Touma explains that each maqam has a proper feeling, and he specifically relates to the maqam Saba which provokes sadness, pain and nostalgia. Regarding the rhythm, the maqsoum is said to create a romantic atmosphere

Case study

The song will be written in English letters, and then translated in English for the meaning. The actual analysis will consider the text of origin in Lebanese dialect and the metrics involved. This analysis will be better understood with a table that will illustrate exactly the parameters, their frequency and their meaning, finding a means of communication between these lyrics put in music and the Lebanese society.

The song "Layali *l chimal"* is an extract from the operetta Al Mahatta which means the station (Rahbani, 1973). Al Mahatta's main message is the solid faith of Warde(a girl) who is waiting at a train station, to see the train showing up wanting to materialize a dream or a desire to travel and adventure.

The title "*Layali El-Chimal el hazini"* evokes the sad nights of northern Lebanon. The melody confirms the title of the song. Whoever is living there, can identify the community surrounding him by hearing these sounds echoing exactly the blue words of the farewell and the darkness of the night. Aesthetically the "kurd" was used all along to suggest passion, dignity and nostalgia. The rhythm in use gives a romantic atmosphere and the daff (tambourine) without suggesting a dance rhythm, is adding a feeling of darkness and peace to these sad northern nights.

Lyrics:	**English Translation:**
Layali ilchimal elhazini	The sad nights of the north
Dalli izkirini izkrini	Stay remembering me, remembering me
O yis'al alaye habibi	And my love asks about me
Blayali elshmal elhazena	In the sad nights of the north
Ya habibi	My love
Ana asforat elsahat	I am the bird of the square
Ahli nadarouni	My family promised me
Lil shams o liltorkat	To the sun and the streets
Ya habibi	My love
Lasafar eltorkat	To traveling
Lsawtak yindahli ma'a elmasafat	To your voice calling me with the distance
O ydal yhakini elreeh elhazene	And it stays talking to me, the sad winds
Layali elshmal elhazena	The sad nights of the north
'Dili izkrini izkrini	Stay remembering me, remembering me
O yisaal alaye habibi	And my love asks about me
Blayali elshmal elhazena	In the sad nights of the north
Ya habibi	My love
o bhibak aa Tareek 'ghyab	and I love you on the road of absence
Bmada la bait ykhabena wala bab	With distance, a house can't hide us,
Khofi lil bab	nor can a door do so
Yitsakar shi mara bain elahbab	I fear that the door

O toll tbkini layali elshmal elhazene	Would close one day between the loved one And it would keep making me cry, the sad nights of north

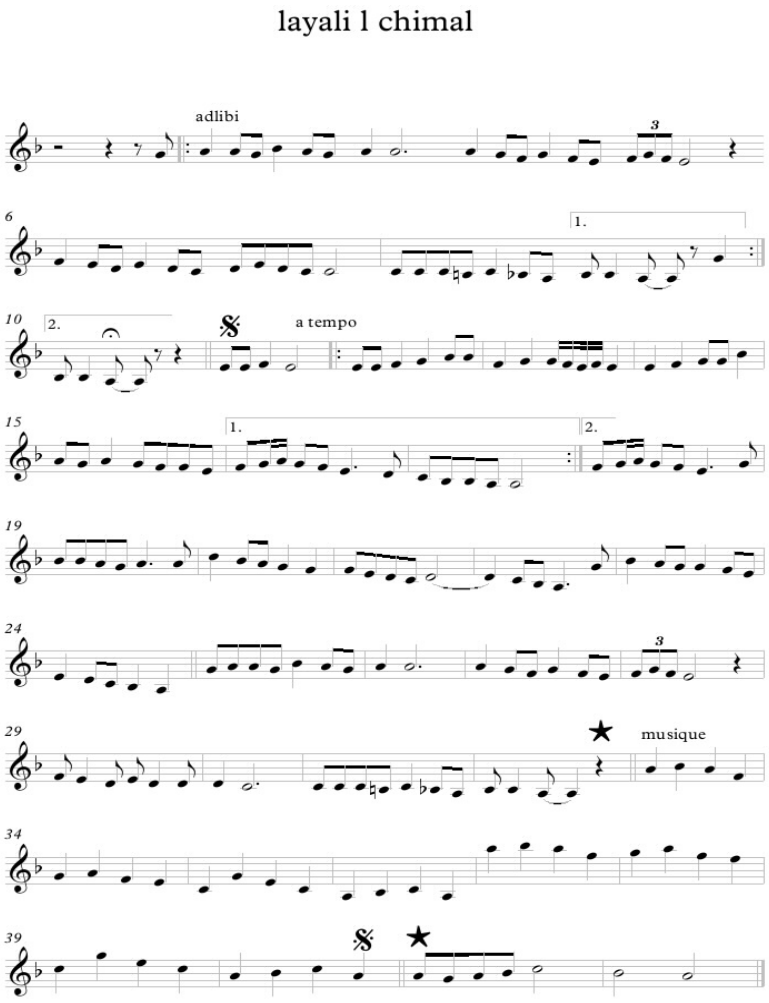


Figure 2: "Layali El-Chimal el hazini"

Table 1 description: The lowest key is A^2 "oshairan" and the highest is C^4 which confirms that Fairuz's voice vary between Alto and Mezzo-Soprano. The maqam kurd is situated on the 5th degree of the minor mode "D".

The minor "D" will be: D Eb F G A Bb C D
Its 5th degree is A: A Bb C D E F G A

The use of a minor mode is frequent with Rahbani's songs to avoid as much as possible the 3/4 tone interval of the Arabic music and to be able to perform orchestration on stable intervals. Maqsoum is translated by this formula: 4/4 1 & 2 & 3 & 4 &
D-T-----T-D-----T—

(Dum Tek ... Tek Dum ... Tek ...)

A free introduction or chorus is repeated till measure 11 then the rhythm starts at the 12th measure. An interlude is repeated an octave higher then back to the chorus before ending on measures 41 and 42 without rhythmic accompaniment. Aesthetically the "kurd" was used all along to suggest passion, dignity and nostalgia.

Table 1: The particularities of this song

Poetic analysis	A	BA/C/DA + coda	C instrumental
Origin	*Al-Mahatta*		
Melody	Melodic progression	Narration type of music where a tetratonic scale formula is repeated a semitone higher	An interlude kind of bridge
Interval size	A2 –C4		
Rhythm	Maqsoum		
Form ABACD	1-12 25-32 chorus A	1 versus: 12-24 Repeated after the chorus B 2nd versus D	Free melody between the 2 versus: 33-42 C
Ethnical content	The proclamation and echo of the northern mountains at night (Mawwal)	The village places and the vow	
Social structure	Waiting for the train and farewell on the roads		
Modality	Maqam Kurd D transposed in A		

RESULTS

After a detailed exposition of the methodological approach of songs analysis, some philological considerations clarified the results. The songs hold semiotics in the gestures of the music: ascending and descending, sad and strong, ethnicity and social structure, prelude, repetition and conclusion. With almost all their songs the language of harmony and orchestration is light. The mixture of genres in one song is frequent. Their use of sad modes on dance rhythms is their originality. They often recur to the Octoechos of the Syriac liturgical modes. They mix the dabke with other Lebanese folkloric genres. Based on this, one can clarify where would reside the understanding of linking Rahbani's music to the Lebanese society.

Already the Lebanese dialect used in the songs is a particularity of the Lebanese society. This dialect is their mother tongue and it sends directly the messages. Mostly all the Rahbani's songs are in a spoken language.

The aesthetics of the melody ascending, descending, repeated, in progression or in scales suggest the feelings, encouraged and hopeful or discouraged and sad. They avoid using the Daraboukka.

CONCLUSION

An outline on how music is active on the streets of Lebanon guided the statement of the hypothesis and determined a relationship between folk music and the society. Christopher Stone, throughout his work saw in the Rahbanis operettas and songs the advent of an elaborated folklore that was considered among the International manifestations in Baalbeck festivals (Stone, 2008). A relation was deliberately created between these musicians and the public due to their proficient use of music elements in a simple structure as an interpretation of their feelings and surroundings. A range of disciplines related to music helped figuring out the characteristics that a social and unifying music should have, namely the popular and folkloric music studies. Songs with words target groups of people with strong messaging. Like any musical instrument, the voice of Fairuz with its rich harmonics, works as impersonal means of communication in order to convey messages of peace.

REFERENCES

Bunt, L. (1994). *Music Therapy, An art beyond words.* N.Y.: Brunner Routledge.

De Benenzon, R.O. (2004*). La musicothérapie : La part oubliée de la personnalité.* Bruxelles : De Boeck & Larcier s.a.

Clua, A, Llorca-Bofí, J. & Psarra, S. (2020). Urban opportunities and conflicts around street musicians: the relationship between the configuration of public space and outdoor acoustics in Ciutat Vella, *Journal of Urban Design*. Barcelona. https://doi.org/10.1080/13574809.2019.1699398

Dudley, S. (2008). *Carnival Music in Trinidad. Experiencing music, Expressing culture.* NY: Oxford University Press.

Feder, G., MacIntyre, B. (2011*). Music Philology (monographs in Musicology).* Hillsdale, New York, USA: Pendragon Press.

Greer, D. (2000). *Musicology and Sister Disciplines.* NY: Oxford University Press.

Harris, W. (2012). *Lebanon: A History, 600 – 201*. N.Y.: Oxford University Press, Inc.

Lomax, A., Gage, A., Cohen, R. (2003*). Selected Writings, 1934-1997*. NY: Routledge.

Machin, D.A. (2010). Analyzing popular music: Image, sound and text. London: Sage publications Ltd.

MacDonald, R., Kreutz, G., Mitchell, L. (2012). *Music, health, and well-being.* NY: Oxford University Press Inc.

Mans, M. (2006). *Centering on African Practice in Musical Arts Education.* ZA: Pan-African Society of Musical Arts Education by African Minds.

Mansour, M. (2009). *The poetic map in Rahbani's song.* Damascus: Mamdouh Idwan Press.

Miller, K.H. (2010). S*egregating sound. Inventing folk and pop music in the age of Jim Crow*. NC: Duke University Press.

Sachs, O. (2007). *Musicophilia: Tales of music and the brain*. NY:Random House Inc.

Stone, C. (2008). *Popular culture and nationalism in Lebanon: The Fairouz and Rahbani nation.* NY: Routledge.

Shepherd, J., Devine, K. (2015). *The routledge reader on the sociology of music*. New York: Routledge, Taylor & Francis group.

Shepherd, J. & Wicke, P. (1997). *Music and cultural theory.* MA, USA: Blackwell Publishers Inc.

Touma, H.H. (2003). *The music of the Arabs.* New expanded edition. Oregon: Amadeus Press.

A-PLACE: LINKING PLACES THROUGH NETWORKED ARTISTIC PRACTICES

Leandro Madrazo[1]
Prof. Dr., School of Architecture La Salle, Ramon Llull University, Spain, leandro.madrazo@salle.url.edu

Maria Irene Aparicio
Assist. Prof., Faculty of Human and Social Sciences, Universidade Nova de Lisboa, Portugal, aparicio.irene@gmail.com

Burak Pak
Prof. Dr., Department of Architecture, KU Leuven, Belgium, burak.pak@kuleuven.be

Tadeja Zupančič
Prof. Dr., University of Ljubljana, Faculty of Architecture, Slovenia, tadeja.zupancic@fa.uni-lj.si

ABSTRACT

The purpose of A-Place "Linking places through networked artistic practices", a project co-funded by the Creative Europe programme (2019-2023) is to design and implement art-centred placemaking activities in six European cities –Barcelona, Bologna, Brussels, Lisbon, Ljubljana, and Nicosia– to connect meanings and experiences associated to places across cultural and geographic boundaries. Placemaking activities will be carried out with the participation of both local residents (from multiple cultural backgrounds) and transient population (refugees, tourists, business travellers, temporary workers), in collaboration with artists and educational staff participating in the project. In this paper, we outline the scope of the project, describe the first-year programme of activities, and discuss the methodology to be applied in their evaluation.

Keywords: placemaking, creative placemaking

INTRODUCTION

The re-appropriation of public spaces by their users, which defies the regulations set by professional planners and policy-makers, has been gaining ground in the last decades, to the extent that it has become part of newly "institutionalized" form of planning. A diversity of practices, including placemaking, creative placemaking, tactical urbanism, pop-up urbanism, performative urbanism and community art-based interventions, among others, coincide in the need to foster bonds between people and the spaces they live in, and to find ways to increase their sense of

[1] Corresponding author

belonging and advocate their right to the city: collaboration between professionals (artists, planners, sociologists) and non-professionals; promotion of interdisciplinary creative practices embedded in the social and built environments; and creation of exchanges between social groups from multiple origins and cultures.

PLACE AND PLACEMAKING

The idea of place conveys the existence of bonds between people and the environment they inhabit. For Sime (1986), "The term 'place', as opposed to space, implies a strong emotional tie, temporary or more longlasting, between a person and a particular physical location". A "sense of place" is inherent to human beings, as they are able to create bonds with the spaces they live in to make them the places of their existence. As Relph (1976) argued, places are "centres of meaning, or focuses of intention and purpose"; meanings and functions which are not the same for all cultural groups.

Place and placemaking are hardly distinguishable if we think of a place as a social construction process which involves multiple actors and audiences in diverse ways. The term "placemaking" has been used since the 1990s by the non-profit organization Project for Public Spaces based in New York. They define placemaking as "an overarching idea and a hands-on approach for improving a neighbourhood, city, or region, which inspires people to collectively reimagine and reinvent public spaces as the heart of every community" (Project for Public Spaces, 2007). Placemaking helps to unveil the potential embedded in the social fabric through the empowerment of community members. As such, it is part of a collaborative process to reinvent and reimagine everyday urban spaces, while promoting social and cultural identities and values.

Placemaking, as an action-oriented approach for community empowerment, can encompass a wide range of activities, from short-term interventions to long-term cooperative projects embracing multiple experts and disciplines. The purpose of placemaking is to create places "that benefit everyone - places that connect existing residents, instead of dividing, alienating, or displacing them, and places that enhance the existing character of a neighborhood, instead of erasing it" (Kahne, 2015). Place-based practices carried out with the participation of facilitators (artists, sociologists, architects) can help individuals to unveil the memories embedded in the living environment (Till, 2008).

In our global, multicultural societies, placemaking can become instrumental to reinforce the coexistence of diverse ethnic groups in neighbourhoods and cities thus giving rise to a superdiversity by which "individuals of diverse backgrounds may come together and form bonds based on a variety of identities or interests" (Foner et al., 2017). Superdiversity is a new condition of permanently increased, varied and fragmented pattern that can be detected in our cities. This term, coined

by Vertovec (2007), refers to a diversification of diversity which surpasses the conventional interpretations of interculturality (Meissner and Vertovec, 2014). The most evident challenge is a diversification of interests in society which gives rise to intercultural conflicts and makes it difficult for the urban design and planning practices to find a common ground to build upon. On the other hand, superdiversity creates distinct and novel forms of everyday life, which can also be creatively addressed.

CREATIVE PLACEMAKING

The term "creative placemaking" arose as a result of a programme of the National Endowment for the Arts in the United States "to integrate art and design in community planning and development, build shared spaces for arts engagement and creative expression, and increase local economic activity through arts and cultural activities" (Landesman, 2013). The aim was to help "public, private, non-profit, and community sectors" to develop strategies to "shape the physical and social character of a neighbourhood, town, city, or region around arts and cultural activities" (Markusen and Gadwa, 2010). Creative placemaking was part of a "creative economy" in which the "creative industries" would play a key role, together with the "creative citizens", in the making of "creative cities".

The addition of the adjective "creative" to placemaking gave rise to a new discursive practice, devised by government agencies, funders and other institutions (Zitcer, 2018). Within this "mode of production of the objects of knowledge", the artist becomes one more member of a partnership whose aim is "to develop projects that have a public impact", together with other placemakers (e.g. developers, citizens, local authorities). However, if "creatively planned", placemaking can bring about lively public spaces, preventing emptiness and isolation by enhancing the capacity to experience humanized and meaningful places.

Creative placemaking and urban planning can be related to each other in so far as the first provides solutions to the problems created (or not solved) by the second. Thus, Walker contends that "Placemaking really happens when people utilize recreational, social play and lingering spaces – and artists doing art – in ways that actually help solve a design problem" (Walker and Marsh, 2019). For Marsh, the function of creative placemaking is to repair or fix designs that people's use has proven them to be wrong: "Creative placemaking is an effort by artists to be part of this work of place fixing, and also part of undoing the social damage that these choices have caused for communities" (Walker and Marsh, 2019). Courage (2014) opposes the top-down "creative placemaking" with what she refers to as "social practice placemaking" which comprises "a cluster of co-produced, polylogic and relational creative practices" which are "temporary; low cost; quick to install and dismantle; informal; spontaneous; driven by community issues" and represent a "process with a focus on the relation between subject, object, and space". These tenets are also shared by the planning "tactics" that De Certeau (1998) opposed to

"strategies", both terms now embraced by "tactical urbanism" (Lydon et al., 2012). As Hou concluded, "Under the banners of tactical urbanism, creative placemaking, pop-up, and so on, improvised uses of urban spaces have become a method of urban design interventions and even development strategies", which are becoming increasingly accepted by institutional actors and adopted by companies as part of their marketing strategies (Harris and Nowicki, 2015).

Today, planning practitioners are challenging conventional practices developing new approaches which are more critical and process-driven (McKeown and Courage, 2019). Along this line, performative urbanism (Wolfrum and Brandis, 2015) aims at shifting the focus on perception and interpretation to "action, politics, design", in order to move urban planning and architecture beyond the limits of "objects and images". These alternative practices question existing power relations and offer alternative ways to bring together time, place and communities. In this sense, the concept of spatial practice can be extended to integrate social and political realms, which lead us to think of placemaking as a diverse form of civic-situated knowledge creation .in-and-through design which, as Miessen (2017) contended, lead us "to go beyond conventional physical construction and venture into the construction of realities—to not follow existing protocols, but to proactively generate them."

A COMPREHENSIVE PROGRAMME OF PLACEMAKING INTERVENTIONS

The purpose of A-Place (2020), a project co-financed by the Creative Europe programme (2019-2023), is to strengthen the bonds between people and places through creative placemaking practices. A number of interventions are planned for the first year of the project, in the cities where the partner organizations operate physically, as well as in digital spaces. The activities to carry out, actors involved and the objectives they pursue are next summarized.

- A Calm Place in Schaerbeek (Brussels) aims at enabling exchanges between students and residents in this superdiverse neighbourhood, with mixed cultures and ethnicities, and creatively exploring the potential of the strong presence of the student community. Integrating temporary interventions with the North Brabant Saint Lazare Renovation Contract, the placemaking activities –on-site events around a mobile installation (Mobile Hub) and learning activities involving students, artists, passers-by and residents (Learning Bubble)– will re-discover a green space next to Maison des Arts and transform it into a space for reflection and encounter. The interventions will help to visualize daily practices and activities and to facilitate socialisation between people of different origins and backgrounds, thus contributing to the rethinking and transformation of the urban space.

- A Confined Place is a programme of activities, open to those willing to express and share the experience of living in the period of confinement through the digital networks, using a variety of mixed techniques including texts and storytelling, drawings and photographs, audio-visual works and performances. The goal is to

create a sense of place derived from sharing a confinement across the globe, connecting people's experiences and contributing to community building in this exceptional period.

- A Hidden Place in Ljubljana focuses on the revitalization of an empty plot in the Bežigrajski Dvor district, a place without a collective memory or use. The placemaking intervention is carried out together with Trajna, a non-governmental organisation dedicated to promote community economies, creative research, workshops and eco-infrastructure design. We are inviting youth and adults (teachers from nearby schools, parents and child and young relatives, as well as other interested residents and passers-by) to approach the site, to inhabit it and to transform it into a place. This way, it will be possible to reveal the diversity of the ways through which a place can be "sensed" (perceived and felt) by different age groups within various learning environments (formal and informal).

- A Joint Place in Kaimakli (Nicosia) will be organized in conjunction with the "Pame Kaimakli" neighbourhood festival, whose aim is to use artistic and spatial practices to facilitate the interaction between the community, the artists and the public. Over the period of one week, representatives of partner organisations (architects, artists, students) will collaborate in the design and implementation of actions which address the current problems of the neighbourhood, using a variety of media (installations, performances, video and photography). This way, academics, artists and students will participate in a joint construction of a sense of place, together with the community.

- A Sound Place in Lisbon will involve the collaborative creation of a cultural soundscape of the Martim Moniz surroundings –one of the most multicultural neighbourhoods of Lisbon– by collecting residents' and non-residents' sonic perceptions and using them as materials for the creation of music pieces to be played in a live concert. The placemaking activities will include an installation of videos and photos representing the sounds of the neighbourhood. They will contribute to fostering social inclusion and dialogue between social groups, and will provide new insights for the ongoing rehabilitation plans in the area.

- A Visionary Place in Bologna will comprise workshops, talks and small events, which will be part of the Urban Visions festival. The programme will include a section to discuss the living conditions of migrants, refugees and displaced communities. The placemaking activities will concentrate on the Porto-Saragozza neighbourhood, in the south part of the city, near the well-known Arco del Meloncello. The goal is to increase the awareness of the need to integrate marginal groups in a joint construction of a sense of place and belonging.

- A Weaved Place in L'Hospitalet (Barcelona). The multiplicity of social groups with different origins, the marked differences between neighbourhoods, and the transport infrastructures (railways, highways) have given rise to a fragmented social and physical territory in this municipality, which is part of the metropolitan area of Barcelona. The purpose of the activities –workshops, public space interventions, photography exhibitions, video screening– is to involve students,

citizens, artists and architects in the search for a shared identity, by connecting these social and physical fragments.

The interventions, planned with the participation of local authorities, will bring new insights which will inform on-going rehabilitation plans. They will engage members of the various social groups to share the multiple meanings associated to places.

Altogether, the ultimate purpose of the interventions planned in the different cities and contexts is to create a network of multidisciplinary practices which help to overcome the idea of place understood as a limited space meaningful to a group or community.

EVALUATING THE IMPACT OF PLACEMAKING INTERVENTIONS

The evaluation of the impact of placemaking in public space remains an open challenge. Assessment tools –such as the one prepared by the Michigan State University Land Policy Institute (MSU, 2015)– can be used to analyse the kind of placemaking –strategic, tactical or creative– that better suits the needs of a community. The Project for Public Spaces (2017) suggests to carry out a continuous process of re-evaluation by comparing the answers obtained after the implementation of the actions with those collected in earlier phases. In the specific case of creative placemaking, it has been argued that the vagueness of the term does not help to assess the expected impacts. Thus, Zitcer (2018) claimed that "With the range of projects classified as creative placemaking, it can be hard to know what fits under the category—or what would fail to fit under its capacious umbrella". In addition, in creative placemaking is "almost certainly that results will diverge from initial intentions" (Markusen and Gadwa, 2019). To overcome these uncertainties, the various stakeholders involved in a creative placemaking action tend to pay attention to the objectives that suit their own agendas. But even so, it is difficult to define indicators to monitor impacts and to have access to the data to assess them (Markusen and Gadwa, 2019).

Moreover, intertwining artistic practices with community life can help to develop new forms of conviviality. But the assessment of a socio-physical transformation process is neither straightforward nor easy. The evaluation needs to be specifically "designed" for each placemaking action, taking into account each context. This also implies the consideration of the expectations of the various actors involved (e.g. artists, planners, citizens) and their shared goals and values. Placemaking impact assessment, therefore, is inextricably linked to the placemaking activity.

The impact assessment methodology we have outlined for the A-Place project will combine socio-ethnographic, phenomenologic and aesthetics theoretical frameworks to critically explain how placemaking enhances social participation and inclusiveness, and help to improve relations between community groups, by strengthening social cohesion. We will use specific impact indicators to describe

the dynamic process of transformation of indifferent spaces into engaging places, such as the enhancement of social interactions, the emergence of intercommunity discourses, and the increase in experiences of perceptions of places.

In order to acquire the data required for this assessment, we will use diverse methods and tools (e.g. interviews; sound capture; photography; video; notes, and sketches; press narratives; oral and written testimonies and the inhabitants' oral narratives). These data –collected, compared and collated in accordance with the specific methodology adopted for each placemaking activity– will help to evaluate issues such as:

a) The capacity to artistically express the sense of place with a particular media. The strength of expression can be taken as an evidence of the potential impact on different scales, targeted at actors with higher artistic sensitivity.

b) The potential of the performed action to transform physical and social space. Here we can identify, for example, rituals in particular places, potentially developed or disturbed by the actions, and changes in the understanding of multicultural realities in the local, regional and/or global socio-physical context.

c) The social impact of the placemaking actions, and its capacity to strengthen community ties. This capacity can be evidenced by the integration of the actions into everyday routines.

d) The communicative value of social media. Sometimes the impact of placemaking needs to be found far from where it took place, in the various social media platforms.

e) The originality of the action. A fresh inventive reinterpretation could be more influential than an alleged original work, which entails a potential fear of novelty. On the other hand, a total novelty may offer potential for greater long-term impact.

f) The capacity to integrate the dimension of time. Creative placemaking is an incremental process that is not limited to static spatial interventions or outcomes.

g) The capacity to transcend the disciplinary boundaries by bridging artistic practices and organisations with citizens and other actors such as academia, civic and governmental organizations.

CONCLUSIONS

Nowadays, there is a myriad of approaches aimed at encouraging the participation of people in the construction of a sense of place, by engaging multiple and diverse actors in a joint creative effort: placemaking, creative placemaking, community-based art, tactical urbanism, performative urbanism, do-it-yourself urbanism, etc. The activities planned in A-Place share the basic principles underlying these practices –enabling social cohesion, supporting inclusion and civic engagement– and they can adhere to a larger or greater extent to any of them depending on each particular intervention. Precisely, the creation of a network of overlapping and interrelated practices across disciplines, territories and cultures –rather than the adoption of an overarching theoretical framework– is what the project aims to achieve.

While the mere engagement of a diversity of actors –local authorities and policy-makers, residents and artists, students and faculty– in a joint placemaking intervention can be considered valuable in itself, it is necessary to design and deploy methods and tools to identify to which extent the shared objectives have been achieved. This evaluation process needs to be designed ad hoc for each placemaking activity, with the resources at hand, and their findings need to retrofit the next cycle of placemaking interventions, thus helping to feed a long-term process which goes beyond a concrete performative action.

ACKNOWLEDGEMENTS

The programme of placemaking activities has been elaborated by the A-Place partnership: School of Architecture La Salle, Spain (project coordinator), KU Leuven, Belgium; Alive Architecture, Belgium; Urban Gorillas, Cyprus; City Space Architecture, Italy; and Universidade Nova de Lisboa, Portugal; University of Ljubljana, Slovenia; prostoRož, Slovenia; and Screen Projects, Spain. A-Place is co-funded by the Creative Europe programme 2019-23, Project Agreement number 607457-CREA-1-2019-1-ES-CULT-COOP2.

REFERENCES

A-Place (2020). *Linking places through networked artistic practices*. Retrieved from http://www.a-place.eu/

Courage, C. (2014). *Placemaking as performative art*. Retrieved from https://www.academia.edu/8099324/placemaking_as_performative_art

De Certeau, M., Mayol, P. (1998). *The practice of everyday life: living and cooking*. (Volume 2). University of Minnesota Press.

Foner, N., Duyvendak, J. W., Kasinitz, P. (2017). Introduction: Super-diversity in everyday life. *Ethnic and Racial Studies*, 42:1, 1-16.

Harris, E., Nowicki, M. (2015). *Cult of the temporary: is the pop-up phenomenon good for cities?.* Retrieved from https://www.theguardian.com/cities/2015/jul/20/cult-temporary-pop-up-phenomenon-cities

Hou, J. (2020). Guerrilla urbanism: urban design and the practices of resistance. *Urban Design International*, 1-9.

Kahne, J. (2015). *Does Placemaking Cause Gentrification? It's Complicated*. Retrieved from https://www.pps.org/article/gentrification

Landesman, R. (2013). Foreword. In Michael Rushton (ed.), *Creative Communities: Art Works in Economic Development*, Brookings Institution Press.

Lydon, M., Bartman, D., Garcia, T., Preston, R., Woudstra, R. (2012). *Tactical urbanism short-term action long-term change* (Volume 2). The Street Plans Collaborative.

McKeown, A., Courage, C. (2019). Conclusion: Moving into the beyond–What's next for creative placemaking?. In Cara Courage and Anita McKeown (eds.), *Creative Placemaking. Research, Theory and Practice*. Routledge.

Markusen, A., Gadwa, A. (2010). *Creative Placemaking*. Retrieved from: https://www.arts.gov/sites/default/files/CreativePlacemaking-Paper.pdf

Markusen, A., Gadwa, A. (2019). Creative Placemaking. Reflections on a 21st-century American arts policy initiative. In Cara Courage and Anita McKeown (eds.), *Creative Placemaking Research, Theory and Practice*. Routledge.

Meissner, F., Vertovec, S. (2014). Comparing Super-Diversity. *Ethnic and Racial Studies* 38(4):541-555.

Miessen, M., (2017). *Crossbenching: towards a proactive mode of participation as a Critical Spatial Practice.* Doctoral thesis, Goldsmiths, University of London.

MSU (2015). Land Policy Institute. Placemaking Assessment Tool. Retrieved from: https://www.canr.msu.edu/landpolicy/uploads/files/Resources/Tools/MIplace_PartnershipInitiative/PlacemakingAssessmentTool_LPI_WCAG2.0_updated_041515.pdf

Project for Public Spaces (2007). *What Is Placemaking?.* Retrieved from https://www.pps.org/article/what-is-placemaking

Project for Public Spaces (2017). *The Placemaking Process*. Retrieved from: https://www.pps.org/article/5-steps-to-making-places

Relph, E. (1976). *Place and placelessness*. Pion.

Sime, J. D. (1986). Creating places or designing spaces? *Journal of Environmental Psychology*, *6*(1), 49-63.

Till, K. E. (2008). Artistic and activist memory-work: Approaching place-based practice. *Memory Studies*, *1*(1), 99-113.

Vertovec, S. (2007). Super-diversity and its implications. *Journal Ethnic and Racial Studies*, *30*, n. 6.

Walker, J., Marsh, S. (2019*). A conversation between a collaborating artist and curator Placemaking, socially engaged art, and deep investment in people.* In Cara Courage and Anita McKeown (eds.). *Creative Placemaking Research, Theory and Practice*. Routledge.

Wolfrum, S., Brandis, N. (2015). *Performative Urbanism Generating and Designing Urban Space.* Jovis Publishers.

Zitcer, A. (2018). Making Up Creative Placemaking. *Journal of Planning Education and Research*, 1–11.

DIGITAL BORDERS: EFFECT OF CONTEMPORARY AND FUTURE CONSUMERISM ON STREET LIFE

Oskar Cafuta
Master of Science, Prežihova ulica 12, 3000 Celje, oskar.cafuta@gmail.com

ABSTRACT

As the world speeds towards a future that is perceived as desirable, this paper looks into the future of street life as it is affected by consumer trends. In today's society, consuming has become an everyday preoccupation and expectation for most. Achieving a socially desirable image through consumption has become a driving force in modern society. However, consumer trends have experienced – and continue to experience – large shifts over the past decade. This, in turn, has also influenced the immense changes to the shape and use of our street space.

For decades, streets have been a place of gathering and transit, often revolving around consumerism. Looking into the decline of high street life on account of suburban shopping centres in past years, the latest culprit for extinction can be identified as ecommerce consumerism and social media. Technology and the digital era are transferring consumerism, as well as social interactions online. This is furthering public life eradication and replacing it with new types of consumerism. It is creating a digital border, one that we cannot see or acknowledge, yet it has vast effects on our society.

With a research through design method base, this paper looks into ecommerce and online consumer trends in Stockholm, Sweden and tries to understand the spatial and societal changes, limitations or borders this trend could bring to street life. I use the word 'border' in a very abstract sense. I am not referring to a border that physically prevents people from using the street (at least, not yet), but rather a border that limits the need to go out and thus prevents the use of city street space. The aim of the paper is not to find a solution for the future development of street life, but rather it seeks to expose and critique our mentality and planning principles in order to raise awareness of the issue.

Keywords: street life, e-commerce, consumerism, sustainable consumerism

INTRODUCTION

Cities have always been a place of culture, knowledge and exchange. In ancient Rome, exchange took place in forums, and in the 15th century the Grand Bazaar in Istanbul became one of the first covered places for exchange (National Geographic,

2018). Both of these examples show the beginnings of shopping centres in the cities. Later, until the mid 20th century, city streets represented a place where various functions came together as an integrated system of movement, of social and economic life (van der Werf et al., 2016). Shopping streets did not exist in the cities until the 19th century. They were places where living, working and trading took place in the same building for craftsmen who displayed their merchandise on the street in front of their homes. However, with the new transportation modes rising, cities started developing functions and modernising. For example, new, wide boulevards arose with separated traffic flows, pedestrian sidewalks were built, trees were planted, and shops and offices were built which transformed façades into attractive storefronts to display products. New shopping gallerias started to emerge which created enclosed spaces to walk through as well as providing a place to shop in luxury stores (van der Werf et al., 2016).

With the rise of the automotive industry, the urban fabric underwent major changes and cities began to be planned for traffic. The dynamic of city streets was altered on a fundamental level. Exchange places reached new dimensions and left the inner city. The mid 20th century meant the beginning of shopping centres as we know them today. The first ever enclosed shopping centre in Europe was opened in the north of Sweden – in a city called Luleå in 1955 (Nordic Council of Shopping Centers, 2017). The main reason for this shopping centre was not convenience in the sense of accessibility, since the shopping centre was central, but rather it was built in order to make shopping pleasant in the dark, cold Swedish winter months. Shopping centres started rising in the suburbs of all major cities and along highways for easier accessibility soon after. The design guide for them was a large complex with multiple retailers, good accessibility and lots of parking spaces. In the late 20th century entertainment programs infiltrated shopping centres via cinemas, arcades and bowling alleys. In the 1990s, shopping centres were the ultimate place for gathering and socialising in people's spare time. Food courts, restaurants, bowling alleys, movie theatres and more were enabling people to stay for a long time inside shopping malls, and transformed this strictly consumeristic space into space for leisure (Glennen, 2017).

In the late 1960s and early 1970s, French sociologist and philosopher Jean Baudrillard described shopping centres and malls as homogenized and enticingly organized, as something that constitutes a consuming community and is "the sublimate of all real life". According to Barry Smart, the difference between these landscapes of consumption then and today is firstly the sheer size and scale of physical objects as well as their global proliferation, secondly the rapid digitalization of their virtual equivalents, and thirdly the proliferation of digital communications media images and seductive signs of consumption in and through which social life is increasingly lived, experienced, and s(t)imulated (Smart, 2017).

CAR IS THE KING, CONVENIENCE IS THE QUEEN

Today, shopping centres are already marking a big decline in the US. While in Europe this shift is not so obvious yet, a slow decrease in newly built shopping centres is noted. In the past 15-20 years shopping centres have been increasingly replaced by an even more convenient alternative – clusters of shopping centres on the edges of major cities known as "shopping zones". Shopping zones differ from shopping centres in that they are usually much bigger and constructed with multiple shopping centres in one area. While shopping centres can still be in the city centre or its close proximity and can therefore be reached relatively quickly with public transportation, shopping zones are strictly directed to car-based shopping. Since they are more convenient than shopping centres, they have grown in recent years, whereas shopping centres' growth has slowed down and shops on city streets have marked a big decline in consumption and the liveliness of streets. Despite 90% of all retail sales in Sweden still taking place in physical stores, between 2005 and 2016 a 14% decline of stores in the city centre was marked. There was also a 1% decline of shopping centres but there was an 8% increase of shopping zones and a 7% increase of e-commerce sales. (Svensk Handel, 2018)

Currently, as a big convenience successor of shopping centres and shopping zones, e-commerce online shopping (Amazon, ebay, etc.) is rapidly rising. In the past few years, online shopping has become a very popular way of consuming. In the UK, where the e-commerce user base has become one of the largest in Europe (92% e-commerce user base compared to 45% Europe average), e-commerce users can now order clothes, appliances, books, services and meals online. Sweden on the other hand has the same 92% e-commerce user base, however unlike in the UK, Swedes cannot yet order everyday groceries. Additionally, big delivery services such as Amazon have not yet infiltrated the Swedish market which is resulting in a much lower e-commerce retail turnover. The UK had the third largest e-commerce market in 2015 (behind the US and China) and it produced 678 billion EUR of retail turnover whereas Sweden's turnover comes to only 7,6 billion EUR (Statista, 2017). While Svensk Handels' predictions for Sweden in 2025 are concerning, they are still relatively modest compared to the UK or the US. Online shopping is estimated to account for 22% - 33% of all retail in Sweden and the city centres would lose between 6.000 - 11.000 stores (Svensk Handel, 2018).

E-commerce is creating a variety of new issues ranging from killing shopping zones, centres and city street shops and leaving vast, empty buildings on the edges of the city, to losing connections to any kind of social life. Internet shopping is emptying shopping centres and shopping zones in the same way these spaces were emptying city centres. The cycle is running its course once again (Rushe, 2017). Which begs the question: why are there still so many shopping centres and zones being planned and built?

CONSEQUENCES

As the environmental crisis is progressively exposed and discussed, consumerism and its material-dependant society is increasingly criticised. However, the efforts to make a great change towards sustainability are being buried under the strong economic benefits of consumerism. In *The Consumer Society: Myths and Structures*, Baudrillard points out the irony of urban space "producing new examples of shortage: shortages of space and time, fresh air, greenery, water, silence. Certain goods, which were once free and abundantly available, are becoming luxuries accessible only to the privileged, while manufactured goods or services are offered on a mass scale" (Baudrillard 1998). There is a war between our planetary system and our economic system. As Naomi Klein neatly puts it, "What the climate needs to avoid collapse is a contraction in humanity's use of resources; what our economic model demands to avoid collapse is unfettered expansion. Only one of these sets of rules can be changed, and it's not the laws of nature" (Klein, 2014).

This new consumer society has created the need to express our social status through consumption and materialism. We dedicate our time and energy to earning money with which we will be able to consume. Ever since we were children, we have been told that when we grow up we will become lawyers, doctors, astronauts… we will become accepted in society as someone who is able to spend money – our worth is measured by how much we can consume. We are being bombarded with advertisements for things we do not even know we want and more often than not, do not even need. "Each monitor has become a substitute for a window, real life is inside, cyberspace has become the great outdoors" (Koolhaas, 2002).

Having eliminated "free time", a time when people can enjoy and relax without paying for it, the economy has tailored its offerings to make compensations for overworked. The leisure and tourism industry have flourished with their offers which compensate for our lack of free time with holiday breaks that promise to make up for time we spent working. Tons of dating apps help us find the love of our lives quickly since we now have no time to spend on dating. Walking, running and cycling in the city no longer feels safe or pleasant, so we drive to gyms where we run on treadmills or cycle. There is no longer time for cooking, so we order food from fast food restaurants, because we have to save time for work. Consumerist society has brought us to the stage where we spend the money that we earned by working too hard and too long on goods and services we can no longer provide for ourselves (Soper, 2013). "Shopping is branded as "retail therapy", but paradoxically, shopping mall culture is supposed to be a therapy for the very thing it is causing" (Soper, 2017).

Shopping is becoming more and more convenient with the goal of allowing people to consume as much as possible. Convenience has become one of the main factors when planning for consumerism. The effects of consumerism have therefore started not only affecting social and economic changes but also spatial changes. City

planning has become subordinate to consumerism. Large department stores are planned in order to accumulate several products with different quality and competing prices, so different consumers can find everything they need in one place. As a consequence, cities are losing public life in city centres as smaller stores cannot compete with big department stores, shopping zones and online shopping.

The environment is suffering as well. Sustainability, in consumerism has, up to now, mostly been portrayed in the form of sustainable products that are being sold in shopping centres and online. However, these products, despite being made with sustainable materials, have in reality often been shipped long distances from Asia or Africa to shopping centres where consumers, who over-shop and arrive with cars, buy them. Sustainability is trying to be met with measures that are nowhere near sufficient to make a difference. Sustainable planning and design is thus subordinate to sustainability in a very vague sense, a sustainability that is publicly accepted, encouraged and sells well. It is tailored for consumption. Much like a band aid will not heal a fracture, today's sustainability efforts will not fix the planet.

Recently we have been seeing a new trend, so called "experience" stores, suggesting a less material based future which will create more public life in the cities. Between 2013 and 2017, the UK marked a strong decrease of different "goods" stores such as clothing stores, sport and hobby equipment stores, phone stores, gift and cards stores, bookstores, footwear stores and charity shops. In total more than 3,800 stores closed across the UK (751 of which were clothing stores). However, a new trend was noticed which we could call "experience" stores (bakeries, tattoo shops, bookmakers, pubs and bars, cafes, takeaway stores, convenience stores and hair and beauty salons) that experienced growth of more than 2,800 stores across the UK in the same time period. Interestingly, the biggest increase was marked in hair and beauty services (more than 1,000 stores), as well as an 800% increase in tobacco and vaping stores (Holder, 2019). One such "novelty" is concept stores – showroom stores, a place where people could go and see the products but not buy them as they can only be ordered online.

This would seem to be a very desirable outcome as it encourages more cautious, sustainable consumption whilst creating lively city streets and other public spaces. The time spent "consuming" is time spent interacting, socializing and creating a vibrant public life. However, even if stores like that develop or replace the stores we know and have today, it does not necessarily mean it will be better for a sustainable future. It may increase public life, but these "experiences" have a dark, unsustainable background. Cafés like Starbucks or fast food chains like McDonalds are importing a lot of their goods from other countries as well as producing a lot of waste (Greenpeace Canada, Fiset, 2019). The majority of bars and restaurants also import their drinks and food from abroad. Furthermore, travelling is a big part of the "experience" industry and it is probably one of the biggest threats to a sustainable future (Holder, 2019). Finally, thinking that we are moving towards a less material-based society could be naïve. As we saw earlier, consumerism as we

know it is moving to the internet and our cities are faced with an unprecedented future.

DIGITALISED CONVENIENCE

"Our consuming interest is continually cultivated, our appetites stimulated, by the relentless generation of newly designed consumer objects whose signs now litter the multiple screens on and through which we live our smart-phoned, i-padded, internetted and digitalised lives." (Smart, 2017).

In order to better understand what future might hold, I have created an extreme, dystopian scenario based on statistics, news, current trends, case studies and theories, which are showing a possible outcome of a distant future and allows us to analyse it and critique it.

One such outcome is a scenario where e-commerce takes over and technology and convenience become the main pillars of consumerism. With the development of online shopping, production robots, delivery robots, delivery drones, holograms, AI, autonomous vehicles and other technological advances, we can imagine a world in which public space will become infrastructure for delivering goods. Products will get imported and distributed with drones or delivery robots and people will work and socialise from home via holograms. There will be occasional visits to shopping zones accessed only by cars (see Figure 1). Vibrant shopping zones will be the main socializing hotspot with shops, restaurants, bars, cinemas and bowling alleys, as well as indoors amusement parks and hotels. It would contain everything a modern person requires. It could even become a prime holiday destination where everything is interconnected and readily available – the perfect all-inclusive vacation.

Figure 1: Imaginary future scenario for shopping zones on the left and city streets on the right

I imagine a regular day-in-the-life of an average 30year old in such scenario consists of being woken up by your virtual assistant (Alexa or Siri, for example), followed by toast with avocado for breakfast prepared by a kitchen robot. After breakfast, you dress for work and move to your home desk where you sit and work until late afternoon. Your meetings and interactions with co-workers are strictly through online platforms and holograms. As you do not have time to cook, you order bio-organic meals from restaurants for lunch and dinner, and you order groceries for breakfast from delivery markets. You do not take longer than 30-minute breaks for lunch as you need to earn more to be able to afford a vacation in a shopping zone. After work you go to the in-building gym for a quick workout. After the gym you have a quick video call with your friends that you met in your online school. Before going to sleep, you surf through an online store and order new designer clothes so your friends can see you are doing well in your video calls. Finally, you check your dating app and make a couple of additional swipes in an attempt to find your true love. You work on Saturdays and on your free Sundays you take your car and leave the city to go to a park in the suburbs where you take a couple of photos for social media. On your way home you stop in the shopping centre to pick up some new shoes and meet with your match from the dating app. All this effort, of course, is not in vain, as you get to take time off twice a year and you can spend your vacations in shopping zones where you can see and buy anything you could possibly imagine.

Strong technological innovations are promising ultimate convenience at the cost of losing all the social interactions of city streets and not to even mention the social inequalities it would cause, which is too large a topic to unpack here and would deserve its own research project. Shopping zones will become horribly re-enacted cities, cities constructed with the sole purpose of creating a space for unlimited consumerism, a place where you forget about your real life and live in fantasy land with plenty of social media praise. Public space will become oversaturated with delivery infrastructure, our social life will become more dependent on materialism than ever before, and social media will determine our social status based on what we own.

CONCLUSION

"When you invent the ship, you also invent the shipwreck; when you invent the plane, you also invent the plane crash; and when you invent electricity, you invent electrocution…Every technology carries its own negativity, which is invited at the same time as technical progress" (Virilio, 1999).

Right now, it seems as though the only way we know how to achieve lively city streets is with increasing consumerism and offering inhabitants more central spaces to spend their money. Despite the recent increase in "experience" stores - stores which, for the most part seek to provide a social experience as well as a consumeristic one - the fact remains, that consuming is not declining but rather

steadily increasing. It is increasing in different forms and locations with different technologies which could obstruct street life and eventually eradicate it all together. As we have learned from Jane Jacobs, “the sidewalk must have users on it fairly continuously, both to add to the number of effective eyes on the street and to induce the people in buildings along the street to watch the sidewalks in sufficient numbers” (Jacobs, 1992), and failing to do so could result in a very unsafe and unpleasant environment (see Figure 2).

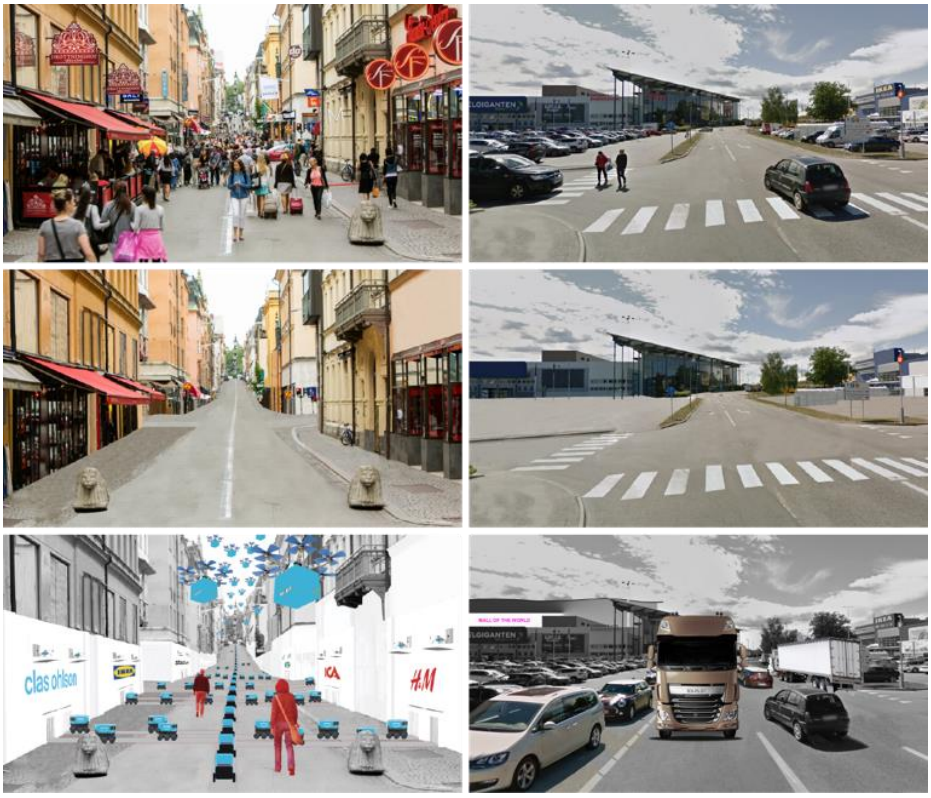


Figure 2: Consumerism effects on public spaces

Cities are developing in a relatively unpredictable way. They are largely affected by economic and societal trends; therefore, it is very hard to know what will happen next. City streets are, and have long been, strongly dependent on consumerism in one way or another. With new technology arising and the climate crisis worsening, it is time, to reconsider what the future street represents. It is not only the invention of technology that carries its own negativity. Future plans for the cities and our planet, no matter how suitable and beneficial they look, will always carry negative factors within them. It is up to us to find which will be the best compromise for the future of our cities and our planet.

REFERENCES

Baudrillard, J. (1998). *The Consumer Society: myths and structures.* London: Sage Publications Ltd.

Ecommerce Europe – infographics. (2015). Retrieved from: https://www.ecommerce-europe.eu/research/infographics/ [Accessed 2. 5. 2019].

Fiest, M. (2019). *Nestlé,* Tim Hortons top Greenpeace Canada's Plastic Polluter List for Second Year. Greenpeace Canada. Retrieved from: https://www.greenpeace.org/canada/en/press-release/26011/nestle-tim-hortons-top-greenpeace-canadas-plastic-polluter-list-for-second-year/ [Accessed 10. 4. 2020].

Glennen, C. (2017*). The rise and fall of the US mall*. World Finance. Retrieved from: https://www.worldfinance.com/markets/the-rise-and-fall-of-the-us-mall [Accessed 10. 4. 2020].

Holder, J. (2019). High street crisis deepens: 1 in 12 shops closed in five years. *The Guardian.* Retrieved from: https://www.theguardian.com/cities/ng-interactive/2019/jan/30/high-street-crisis-town-centres-lose-8-of-shops-in-five-years [Accessed 2. 5. 2019].

Jacobs, J. (1992). *The Death and Life of Great American Cities.* New York: Vintage Books.

Klein, N. (2014). *This Changes Everything: Capitalism vs. The Climate*. London: Allen Lane.

Koolhaas, R. (2002). *Junkspace*. Ltd. and Massachusetts Institute of Technology. October Magazine (No. 100), p.175-190.

National Geographic (2018). *Istanbul: Heritage and History.* Retrieved from: https://www.nationalgeographic.com/travel/destinations/asia/turkey/sponsor-content-istanbul-heritage-and-history/ [Accessed 2. 5. 2019].

Nordic Council of Shopping Centres. Basic facts. (2012/2013 facts). Retrieved from: https://web.archive.org/web/20170804053900/http://ncscnordic.org/basic-facts/ [Accessed 10. 4. 2020].

Report: European retail in 2018. (2018). *GfK study on key retail indicators: 2017 review and 2018 forecast.* Retrieved from: http://www.gfk-geomarketing.de/fileadmin/gfkgeomarketing/en/EN_European_Retail_Study_2018.pdf [Accessed 2. 5. 2019].

Report: European retail in 2019. (2019). *GfK study on key retail indicators: 2018 review and 2019 forecast.* Retrieved from: http://www.gfk-geomarketing.com/fileadmin/gfkgeomarketing/en/EN_European_Retail_Study_2019.pdf [Accessed 10. 4. 2020].

Retail Guide Sweden 2017/2018. (2017). *Invest Stockholm.* Retrieved from: https://www.investstockholm.com/globalassets/invest/reports/retail_guide_2017_stockholm2.pdf [Accessed 2. 5. 2019].

Richter, F. (2017). How Much Retail Space Is Too Much? *Statista*. Retrieved from: https://www.statista.com/chart/9454/retail-space-per-1000-people/ [Accessed 2. 5. 2019].

Rushe, D. (2017). Big, bold … and broken: is the US shopping mall in a fatal decline? *The Guardian*. Retrieved from: https://www.theguardian.com/us-news/2017/jul/22/mall-of-america-minnesota-retail-anniversary [Accessed 2. 5. 2019].

Smart, B. (2017). *Consuming Baudrillard: Introduction to the Revised Edition of the Consumer Society*. London: Sage Publications Ltd.

Soper, K. (2013). *Beyond Consumerism: Reflections on Gender Politics, Pleasure and Sustainable Consumption. Relational architectural ecologies: architecture, nature and subjectivity*. London; New York: Routledge, 2013. p. 127-138.

Soper, K. (2017). *A New Hedonism: A Post-Consumerism Vision*. The Next System Project publication. Retrieved from: https://thenextsystem.org/learn/stories/new-hedonism-post-consumerism-vision [Accessed 2. 5. 2019].

Statista. (2017). *Per capita retail sales area provision in Europe in 2017, by country (in square meters).* Retrieved from: https://www.statista.com/statistics/451485/sales-area-per-capita-in-europe-by-country/ [Accessed 2. 5. 2019].

Svensk Handel (2018). *Det stora detaljhandelsskiftet 2018.* Report. Available at: https://www.svenskhandel.se/globalassets/dokument/aktuellt-och-opinion/rapporter-och-foldrar/e-handelsrapporter/det-stora-detaljhandelsskiftet_2018-digital-version-08052018.pdf [Accessed 2. 5. 2019].

Van der Warf, J., Zweerink, K., Teeffelen, J. (2016). *History of the City Street and Plinth*. Retrieved from: https://thecityateyelevel.com/stories/history-of-the-city-street-and-plinth/ [Accessed 10. 4. 2020].

Virilio, P. (1999). *Politics of the Very Worst*. New York: Semiotext(e), p.89.

TRACK 7: GREEN MOBILITY IN A WAY TO CLIMATE RESILIENT STREETS

Track Chairs:

Kristijan Lavtižar,
University of Ljubljana, Faculty of Architecture, Ljubljana, Slovenia and

Jean-Pierre El Asmar,
Notre Dame University-Louaize, Ramez G. Chagoury Faculty of Architecture, Arts and Design, Lebanon

The track encompasses papers, presentations and discussions addressing green mobility on a way to climate resilient streets. Namely, climate change has become a relevant topic within various disciplines over the last decade. The manifestations of climate change are identified as a realistic threat to sustainable development in the built environment. In the context of climate resilience, common spaces in the built environment, including the streets, are gaining a new role and significance that need to be explored. Some of the main research issues addressed within the track are:

- *Climate-resilient streets, strategies and policies;*
- *Climate-resilient streets and urban sustainability;*
- *Structure, metabolism and functionality of climate-resilient streets;*
- *Addressing climate change-related risks in street (re)design;*
- *Streets and extreme weather events;*
- *Design and materialization of climate-resilient and sustainable streets.*

Keywords: Streets, Climate-change related risks, Uncertainty and Variability, Robustness, Adaptation, Sustainability-resilience nexus

ADAPTING TO THE URBAN MICROCLIMATE – STREET POLLUTION

Kristijan Lavtižar
mag. inž. arh. urb., University of Ljubljana Faculty of Architecture, Ljubljana,
kristijan.lavtizar@fa.uni-lj.si

ABSTRACT

The purpose of this article is to evaluate the issues surrounding the urban microclimate concerning the wind and street pollution. Urban climate remains one of the most important environmental criteria in urban planning, since it significantly affects an urban development and its placement in the space. As such, microclimate conditions on the street level are discussed in a literature review as to expose modern solutions in combating high levels of pollution in streets, to allow for better health of the city's residents and to improve comfort in using public space. Computational fluid dynamic simulation techniques are used to provide an insight into the complexities surrounding the wind modelling of the urban environment. The main idea is to address, how do different conditions of the street canyon affect the urban microclimate conditions in the street space. To conclude, the end goal of this article is to address the importance of understanding the microclimate for the purpose of sustainable development in the built environment.

Keywords: Urban climate, Wind Theory, Streets, Morphology, Robustness

INTRODUCTION

When planning a healthy urban intervention the planners are assessing a variety of spatial conditions. For example, one of the necessary assessments to make for the planner is the suitability of the specific location within the context of the city, its landscape, the connective possibilities with the existing urban tissue, the economic opportunities and so forth. Some of the lesser known criteria include the impact of the intervention on public health, which is especially present when dealing with new infrastructure project consisting of large paved patches of land which are capable of bringing in to the area a larger traffic load and with it a worsening of ecological and public health conditions. These might include higher noise levels, deteriorated surface drainage capabilities as well as worse microclimate conditions -correspondingly a greater heat island index and worse air pollution, matching a larger presence of motor vehicles. The following standards on public are usually not defined within the city legislation, but are more likely to be included in the national legislative guidelines and documents from various health agencies, including multinational organisations, such as the World health organisation. The

following chapter presents these guidelines of our current understanding of healthy urban conditions in a synthesized and clear arrangement.

NATURAL AND SOCIETAL ENVIRONMENTAL HEALTH FACTORS

The World Health Organization (WHO) has developed a set of 53 urban health indicators (HCI) to help evaluate the health of urban residents. This is the first systematic search for the collection of accurate data from European cities. The analysis offered an important insight into the availability of data and the feasibility of collecting such health indicator data, from which a set of 32 indicators with appropriate definitions were compiled. The analysis showed which data was the most useful in practical for a large-scale assessment. Healthy Cities interpretation by the WHO:

- A clean and safe physical environment.
- An ecosystem that is stable to sustainable in the long term.
- High level of participation in the control of the city's residents, with regard to decisions that affect life, health and well-being.
- Meeting basic needs (food, water, shelter, income, safety and work) for all people in the city.
- Access to a wide range of experiences and resources, with a wide range of contacts, interaction in communication
- Diversified, vital in an innovative economy
- Promoting connection with the past, cultural and biological heritage of urban dwellers and other groups in individuals
- Optimum level of adequate public health services in healthcare accessible to all.
- High health status (high level of positive treatment and low level of disease).

A set of indicators was used to leverage information that contributed to the definition of health, to formulate guidelines for the provision of health norms, and to help identify health problems. The cities have been encouraged in such a way, so that they begin a structured process of gathering information on the health of their population on which they can build upon collecting relevant data points for the development of the city's health profile, which can determine the municipal public health strategy. The WHO has raised questions about the importance of collecting quantitative in qualitative data, the number of indicators and the suitability of using indicators for fundamentally different cities. WHO has also identified four key characteristics, namely: outdoor and indoor air pollution, respiratory diseases and the air quality (Briggs & World Health Organization, 1999).

MICROCLIMATE OF STREET CANYONS

We perceive a multitude of microclimatic factors in the environment that can affect the human health and well-being. These can be, for example: air temperature, air quality, local winds and radiant temperature. Air quality is one of the determinants of the physical environment that accompanies us both externally and indoors. On average, a healthy adult, depending on constitution and physical activity, inhales 10 to 20 m3 of air per day, which is relatively high compared to the amount of daily fluid and food intake, which is why air quality is one of the important determinants of health (Levy, et al.., 1998). The atmosphere consists of a mixture of nitrogen (78%), oxygen (21%), carbon dioxide (0.03%), noble gases, water vapour (which is variable depending on the current amount of moisture in the air) and particulate matter (McKinley, et al.., 2011). Some of the particles and gases in the atmosphere are considered pollutants because their levels can have a detrimental effect on human health or the environment, called pollutants. The WHO lists the following as air pollutants: carbon monoxide (CO), particulate matter (PM10, PM2.5 and UFD), sulphur dioxide (SO2), sulphur dioxide (NO2), ozone (O3), and lead (Pb) (Briggs & World Health Organization, 1999).

Air pollutants are dominated by nitrogen and sulphur oxides, ozone, coarse, fine and ultrafine particles, carbon monoxide, metals and non-metals, and volatile organic compounds (Kukec, et al.., 2014). In addition to their effects on the respiratory and cardiovascular systems, they also affect the reproductive systems and nerves. They also have a negative effect on the flora and fauna and accelerate the degradation of materials in the environment and on buildings (Kukec, et al.., 2014). Air pollution poses the greatest environmental risk to human health in the European Union, according to the World Health Organization (WHO, 2016). Residents of urban areas, dominated by the street canyons, are particularly exposed to airborne pollutants. Particles, nitrogen dioxide and ground-level ozone are air pollutants with the greatest impact on health. Both aerosol particles and noise have been reported to adversely affect human health, for example, causing cardiovascular disease. This raised the question of the relationship between particulate matter and noise due to urban traffic (Franck, et al.., 2003). Another major contributor to urban pollution in urban environments is the combustion of biomass fuels, including wood, agricultural residues, animal manure, coal and charcoal in open fires or traditional furnaces. Such inefficient cooking and heating practices are still widely used in developing countries and release many air pollutants such as carbon monoxide, organic matter particles, free radicals and PM particles, especially PM2.5, which may be associated with health complications, including low birth weight infants, cardiovascular disease, tuberculosis, and other respiratory complications (Cincinelli & Martellini, 2017). The sources of pollution are far from localized considering the scale of the city, since the combustion of biomass fuels is popular among single households and those are spread throughout the city, wherever there are residential areas.

There are about 200 different pollutants in the atmosphere of the urban environment. We classify them in different ways and according to their molecular nature and their effect on the human body; we distinguish chemical, physical and biological pollutants. According to physio-chemical reactions, we divide them into primary and secondary pollutants. The former are released into the atmosphere directly from a specific source of pollution, while the latter are formed directly in the physio-chemical reactions of primary pollutants. Both short-term and long-term exposures to high concentrations of pollutants in the atmosphere are associated with a high risk of lung disease, blood circulation and some other organs."(Zaletel, et al.., 2016). Bioaerosol-borne organisms in the air also significantly affect air quality. These include viruses, bacteria, moulds and spores. Many of them cause infections, and their concentration affects the risk of diseases such as asthma, eye and respiratory irritations, skin inflammation, headaches, allergic reactions, bronchitis, etc. (Rejc, et al.., 2019).

Urban transport is the main source of pollutants in the air. It emits aerosol particles, gases, and presents the source of about 50% of the noise to which urban people are exposed. Transport is a growing problem, especially in the big cities and neighbourhoods of the world. It occurs as a localized phenomenon bound by the city streets and as such, the levels of the traffic-emitting pollution are localized as well. The traffic-related sources of pollution can be grouped in two categories. The first being ground traffic, consisting of bus, private car, taxi, a/o combi and motorcycle traffic. These are primarily occurring on the street level and in densely populated urban areas, they can saturate in street canyons. The second mode of transport is underground traffic, usually meaning public transport in from of a metro or subway. Ground-level traffic vehicles in urban areas are typically natural gas-fuelled, gasoline fuelled or diesel-fuelled. Combined, they produce emissions that contain aforementioned PM particles, CO, NO2 and SO2 (Han & Naeher, 2005).

Air pollution modelling

It is important to measure and evaluate the pollutant levels in urban streets in established and standardized monitoring programmes. A popular way of doing research in street pollution is by using *street level dispersion models* that allow for the study of traffic pollution, performing analyses of field campaign measurements, studying the efficiency of pollution abatement strategies, carrying out exposure assessments and also serve as reference in comparison to other models (Kakosimos, et al., 2010). One of the commonly applied models in air pollution research is the Operational Street Pollution Model (OSPM), is capable to include essential parameters and dependencies observed in field data including the influence of the traffic-produced turbulence. Kakosimos et al.. presented an overview of the applied models and gave a review to the OSPM, proving its usefulness in air pollution modelling.

Dispersion of pollutants originating from traffic is limited in its range and it is obvious that the actual geometry of the adjacent area plays an important role. The canopy layer is strongly affected by buildings and other obstacles, which may influence the local pollutant concentrations (see Figure 1). In such situations, it is essential to establish the influence of principal phenomena on the pollutants distribution and to assess their relative contributions (Jicha, et al., 2000).

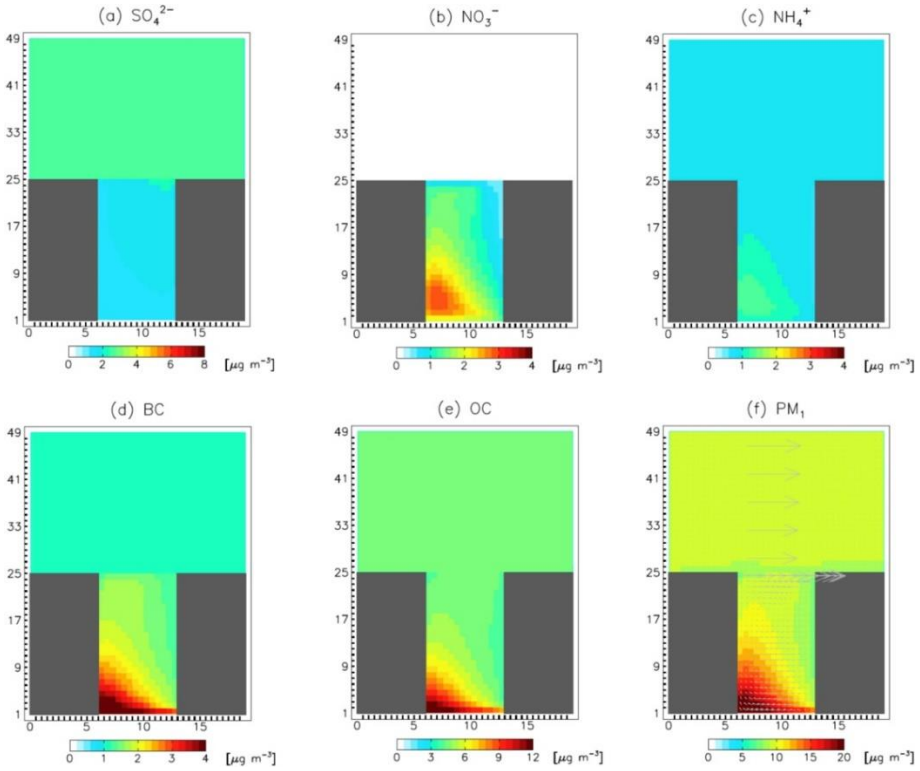


Figure 1: Distributions of the daily average concentrations of pollutants (Kim, et al., 2019)

Meteorological conditions play very significant role. It is mainly the speed and direction of the wind, solar irradiation of sidewalls and bottom of the canyon and thermal stratification of the atmosphere (Jicha, et al., 2000). Zhou and Levy studied the influence of urban street canyons on population exposure per unit emissions from motor vehicles. They considered the relative influence of street configuration, such as street canyons versus other line sources in open terrain, and its effect on personal exposure. Their points to the importance of controlling emissions in urban street canyons, and the need to study high-resolution near-source exposures for primary pollutants in urban settings (Zhou, et al., 2008). Research proves that with a variety of measures such as changing geometric properties of the street canyon a/o green areas, we also reduce the ambient air temperature by 3°C. Trees otherwise improve air quality by absorbing pollutants, but in narrow street canyons they also affect the flow conditions with their aerodynamic properties (Fink, 2013).

IMPROVING THE STREET AIR QUALITY

The effect of buildings and landscape arrangements on cross-ventilation

The airflow in street canyons and its effect on cross-ventilation is evaluated with computational fluid dynamic (CFD) models. Unfortunately, street canyon airflow is a difficult mathematical and computational task, since it depends on a number of factors. Nazarian and Kleissl found that the flow patterns in the canyon are significantly affected by the heating conditions (Nazarian and Kleissl, 2016). Thermal stratification in street canyon ventilation is one of those, as the street canyon experiences differential heating actuated by the heating of windward and leeward façade walls. Heating the windward wall was found to accelerate pollutant removals in square cavities, while it contributes to worsening of air quality in narrow cavities (Fellini, 2020). Yang, et al., conducted, that there is a significant effect of the window-opening percentage (WOP) in buildings on the amount of fresh air that enters the street canyon, because the airflow through windows disturbs the primary street vortex. The effect decreases with the increasing of the street width, which allows more air to enter from above the canyon (Yang, et al., 2016). The most important factor remains within the dimensioning of the street profile, or rather the height and width ratio of the street canyon. In addition, the larger the value of width/height ratio corresponds to smaller effect and air-filtration capabilities of street vegetation (Buccolieri, 2009).

Landscape mitigation in the urban environment

Fink (2013) measured CO2 content in a street canyon. The CO2 concentration decreased with the increase of ventilation and the distance between buildings. In contrast, the study found higher CO2 concentrations for strip tree lines. Due to the aerodynamic properties of the trees in the street canyon, they acted as a barrier, reducing the natural street ventilation. The research also showed higher CO2 concentrations at the windward façade than at the windward one, which was due to the advection of pollutants from the swirling air (Fink, 2013). Because of the aerodynamic properties, trees affect the spread of pollutants; however, this applies to narrow canyons with sources of pollutants. In these cases, an obvious aerodynamic effect predominates over the absorption effect and therefore trees have a negative impact on air quality. The same is true for city parks, green zones free of pollutant sources, where trees improve air quality.

Beckett, et al., discovered that trees of various ages and sizes removed significant quantities of air particles from the atmosphere at different locations in throughout the UK. The show showed to vary between tree species, by the fact that tree crowns with a rougher and greater surface performed the best at removing particulate matter from the atmosphere. Younger trees were also highly effective due to their greater relative foliage density (Beckett, 2000). Although some studies show, that the quantity of particle matter accumulation depends considerably between sites

and plant species (Przybysz, et al., 2014), and other show, that the net-improvement of air quality in some cities during the daytime of the vegetation in-leaf season is less than 1 percent. The percent of air quality improvement was measured at highest for particulate matter, ozone, and sulphur dioxide. Air quality improvement increased with increased percent tree cover and decreased with mixing-layer height. Conversely, cities with greater tree cover showed air quality improvements as high as 10 percent for some pollutants, specifically in reducing ozone (Nowak, et al., 2006). Paradoxically, some studies even show an increase in pollutant concentrations that overwhelms air-pollutant filtration of vegetation by reducing the street ventilation and trapping the air in roadside vegetation (Vos, et al., 2013). Tallis, et al.. (2011) recommend a strategies to combat this paradox. Moving planting trees as close as possible to the source of pollutants (the traffic) i.e. to the edge of the street or planting vegetation in the centreline of the street. This is because the pollutant removal by trees increases with pollutant concentration (Tallis, 2011).

CONCLUSIONS

Among all the listed environmental factors that affect public health, microclimate factors are crucial and a variable on which the design of the built environment has a significant impact. In addition, quantifiable and measurable are the easiest of all. Architecture and urbanism can thus become an important factor in improving health in new spatial arrangements, but only if spatial criteria are developed to meet indoor and outdoor air quality standards based on current research into the impact of microclimatic conditions on public health. The research findings offer the opportunity to upgrade existing street-space design criteria and guidelines. Contribution to the development of the profession is aimed at advancing the understanding of the impact of the environment on human health through interdisciplinary research and linking different professions.

The findings of the article suggest however, that improving guidance for spatial development and planning guidance through stricter quality of living criteria might be more difficult to implement in practice. The CFD modelling show just how complex the subject of air pollution modelling really is. The aforementioned research shows that simply densifying the street with greenery in every scenario of remodelling or planning a street profile might not be the correct approach in improving the air quality in streets and meeting environmental standards and reducing the negative effects of polluted street canyons on human health. The proper content of planning acts should be designed to provide the necessary guidance in planning healthy cities and in keeping with the latest scientific research and best practices. In accordance with the guidelines, the maximum values ought to be considered as an absolute ceiling data value when assessing existing building stock and creating new spatial regulations.

REFERENCES

Beckett P.K., Freer-Smith P., Taylor G. (2000). The capture of particulate pollution by treesat five contrasting urban sites. *Arboricultural Journal*, 24.

Briggs, D. J. & World Health Organization. (1999). *Environmental health indicators: framework and methodologies.* Geneva: World Health Organization.

Buccolieri, R., Gromke, C., Di Sabatino, S., & Ruck, B. (2009). Aerodynamic effects of trees on pollutant concentration in street canyons. *Science of the Total Environment*, *407*(19).

Cincinelli A., Martellini T. (2017). "Indoor air quality and health." *International Journal of Environmental Research and Public Health*. 1286.

Fellini, S., Ridolfi, L., & Salizzoni, P. (2020). Street canyon ventilation: combined effect of cross-section geometry and wall heating. *Quarterly Journal of the Royal Meteorological Society.*

Franck, U. et al. (2003). Indoor and Outdoor Fine Particles: Exposure and Possible Health Impact. *Journal of Aerosol Science*. 34.

Fink, R., (2013). *Vpliv mikroklimatskih razmer in kakovosti.* Ljubljana: Fakulteta za strojništvo, Univerza v Ljubljani.

Han, X., Naeher, L. P. (2006). A review of traffic-related air pollution exposure assessment studies in the developing world. *Environment international*, *32*(1).

Jicha, M., Pospisil, J., & Katolicky, J. (2000). Dispersion of pollutants in street canyon under traffic induced flow and turbulence. *Environmental monitoring and assessment*, *65*(1-2).

Kakosimos, K. E., Hertel, O., Ketzel, M., & Berkowicz, R. (2010). Operational Street Pollution Model (OSPM)–a review of performed application and validation studies, and future prospects. *Environmental Chemistry*, *7*(6).

Kukec, A. at el. (2014). Kakovost zunanjega zraka. *International Journal of Sanitary 4 Engineering Research*, 15.

Kim, M. J., Park, R. J., Kim, J. J., Park, S. H., Chang, L. S., Lee, D. G. & Choi, J. Y. (2019). Computational fluid dynamics simulation of reactive fine particulate matter in a street canyon. *Atmospheric environment*, 209.

Levy, M., Koeppen, B. & Stanton, B. (1998). *Berne and Levy Principles of Physiology*. 4th edition. St. Louis: Mosby Publishers.

Nazarian, N., Kleissi, J., 2016. Realistic solar heating in urban areas: air exchange and street-canyon ventilation. *Build. Environment*. 95.

Nowak, D.J., Crane, D.E., Stevens, J.C. (2006). Air pollution removal by urban trees andshrubs in the United States. *Urban Forestry & Urban Greenin*g, 4:115-123.

Przybysz, A., Sæbø, A., Hanslin, H. M., & Gawroński, S. W. (2014). Accumulation of particulate matter and trace elements on vegetation as affected by pollution level, rainfall and the passage of time. *Science of the Total Environment*, 481.

Tallis, M., Taylor, G., Sinnett, D. & Freer-Smith, P. (2011). Estimating the removal of atmospheric particulate pollution by the urban tree canopy of London, under current and future environments. *Landscape and Urban Planning*, *103*(2).

Vos, P.E.J., Maiheu, B., Vankerkom, J. & Janssen, S. (2013). Improving local air quality in cities:To tree on not to tree? *Environemntal Pollution.*

Zaletel, K. L., Eržen, I. & Kukec, A. (2016). *Zdravje in okolje – študijsko gradivo za EMŠ medicina*. Ljubljana (Mestna občina Ljubljana): Katedra za javno zdravje Medicinske fakultete.

Zhou, Y., & Levy, J. I. (2008). The impact of urban street canyons on population exposure to traffic-related primary pollutants. *Atmospheric Environment*, *42*(13).

World Health Organisation. (2006, December 10). *The Constitution of the World Health Organisation.* Retrieved from: https://www.who.int/governance/eb/who_constitution_en.pdf

World Health Organization. (2016). *Ambient air pollution: A global assessment of exposure and burden of disease*. Geneva: World Health Organization.

World Health Organization. (2017). *Evolution of WHO air quality guidelines:past, present and future*. Copenhagen: WHO Regional Office for Europe.

Yang, F., Gao, Y., Zhong, K., & Kang, Y. (2016). Impacts of cross-ventilation on the air quality in street canyons with different building arrangements. *Building and Environment*, 104.

ADVANCING LOW CARBON MOBILITY IN SLOVENIA: THE CASE OF THE CITY MUNICIPALITY OF NOVO MESTO

Andrej Gulič[1]
mag. urb. in prost. načrt., Urban Planning Institute of the Republic of Slovenia, Trnovski pristan 2, Ljubljana, Slovenia, andrejg@uirs.si

Sergeja Praper Gulič
univ. dipl. ing. agr., Urban Planning Institute of the Republic of Slovenia, Trnovski pristan 2, Ljubljana, Slovenia, sergejap@uirs.si

Simon Koblar
mag. geog., Urban Planning Institute of the Republic of Slovenia, Trnovski pristan 2, Ljubljana, Slovenia, simonk@uirs.si

ABSTRACT

In the paper, the trends, scenarios, strategy and actions for low carbon mobility and transport for the City Municipality of Novo mesto (Slovenia) are presented. In the introductory section, demographic and spatial trends and trends in transport and mobility comprised in the strategic documents and related resources of the municipality are introduced. These trends served as a basis for definition of key scenario elements and for preparing four low carbon scenarios. With an active involvement of local stakeholders, the most appropriate scenario was chosen and used as a starting point for elaboration of a low carbon mobility and transport strategy for the municipality. The content of the paper is based on activities carried out within the ASTUS project which ran in the Alpine Space Programme in the period 2017–2019. The project assisted local authorities in identifying and adopting local low CO_2 strategies and action plans to foster long term low CO_2 options.

Keywords: Low carbon mobility, spatial planning, Novo mesto, Slovenia

INTRODUCTION

The project ASTUS – Alpine Smart Transport and Urbanism Strategies aimed to help local authorities to identify and implement long term solutions in both mobility and spatial planning and to reduce the CO_2 impacts linked to daily trips in the Alps. The Alpine territories are very attractive for tourism, economic activities and housing. An increase in traffic volume and higher levels of CO_2 emissions are challenges of the future. The spreading of housing and car-dependent structures

[1] *Corresponding author*

often compels inhabitants to use their own car for daily trips. This has negative consequences from the environmental, economic, spatial and social perspective and contradicts the sustainable development of the Alpine Space (hereafter AS). A transnational approach, cross-sectoral competencies, skills and experiences are needed to improve the current situation and meet the objectives for the whole AS. Local low CO_2 strategies and action plans to foster long term low CO_2 options were elaborated and adopted by local authorities in the project's pilot areas. The main results of the ASTUS project were:

- a comparative, transnational typology of Alpine territories;
- transferable instruments and decision-making tools assessing the impacts of potential alternative mobility solutions for any Alpine region willing to improve its CO_2 footprint in the field of mobility;
- a transnational methodology for producing low CO_2 scenarios and local action plans;
- low CO_2 scenarios, strategies and action plans elaborated for territories acting as ASTUS project pilot areas;
- transnational conclusions report and recommendations for successful reduction of CO_2 emissions in the Alps.

In the paper, some of the results of pilot activities carried out in the City Municipality of Novo mesto (CMNM), one of the two pilot areas in Slovenia, are presented, more precisely the trends, scenarios, strategy and actions for low carbon mobility and transport.

TRENDS AND DRIVERS OF CHANGE

State of the art

The city of Novo mesto is the largest settlement and employment centre in the Southeast Slovenia Statistical Region. It is a functional centre that integrates administrative, health, educational, cultural and economic services of regional importance. According to the data of the Statistical Office of the Republic of Slovenia (SURS) the CMNM had 37,587 inhabitants (SiStat, 2020a) and 25,482 workplaces (SiStat, 2020b) in the year 2020. The number of people commuting into the municipality was 12.074 (SiStat, 2020b).

The city of Novo mesto is the only large compact settlement in the municipality. Between the city and the surrounding area there is no clear border. The suburbs are characterized by a scattered settlement pattern with marked rural elements. Decades of agricultural land conservation policy left their mark on the urban development pattern. Since the city of Novo mesto was surrounded by a belt of high-quality agricultural land no urban development allowing for organic growth

of the settlement area was possible. The current dispersed urban development pattern results in mobility problems related to the use of individual cars.

The characteristics of spatial development and recent land-use policies also influenced the modes of transport mobility. There is an ever-increasing trend in the level of motorization (583 in 2018) (SiStat, 2019), which affects that more and more journeys to work, to different supply, service and leisure destinations are carried out by individual motorized transport – 87 % and thus only 13 % by public transport in 2014 (Ministry of infrastructure, 2014). These trends result in reduced use of available public transport means, lowering efficiency of the public transport system and consequently increasing pressures for further unsustainable use of space.

The CMNM is actively responding and has already prepared various documents, which form the basis for the efforts to counteract unwanted developments. With reference to preparing scenarios within the ASTUS pilot activity the most important documents are: Development strategy 2030 (Bratkovič et al., 2018), Sustainable urban mobility plan (Balant et al., 2017) and Sustainable Urban Strategy (Grobler et al., 2015). Implementation of these development documents is an important driving force for changing inconvenient situations and trends.

Trends and driving forces

As mentioned in the introductory part of the paper, one of the main goals of the ASTUS project was to prepare low CO_2 scenarios, strategies and action plans for the pilot areas. The aim was to support the Alpine local authorities in defining and implementing relevant long-term solutions for a low CO_2 approach of mobility, combining transport and spatial planning solutions. The scenario-based approach is an open approach that considers multiple strategy options and takes multiple perspectives into account. It allows to develop mid- and long-term visions of what the future could look like. It helps to consider the range of plausible futures, to articulate preferred visions of the future, to develop strategies to attain the desired future and to find solutions to prevent the unwanted developments. In the ASTUS project, one purpose of the local low CO_2 scenario – strategy – action plan building process was also to produce transnational conclusions and recommendations that would capitalize on the decision-making processes of pilot sites while producing the scenarios, strategies and action plans.

As an introduction to the description of trends and driving forces definitions of the terms are explained:

- Trend – a general tendency or direction of development/change over time.
- Driving forces in the broader sense - factors that cause changes that affect the future.

- Driving forces in the narrow sense - factors that promote and stimulate certain aspects of demand for transport services such as driving frequencies, distance travelled and the total volume of passenger traffic.

In the following, the trends described in the strategic documents and related resources of the CMNM are described (the consulted documents and related resources are listed in the literature).

Demographic trends

- Population growth, especially in settlements located near the city of Novo mesto, and especially in the northern part of the municipality near the connections to the motorway.
- Without a strong increase in fertility, the decline in births will get stronger (558 inhabitants were born in 1995 and only 429 in 2018) (SiStat, 2020c).
- Decline of internal immigration into the municipality.
- Reduction in the number and share of the population with a lower level of education belonging to the elderly population and an increase in the number and share of the population with a higher and high level of education belonging to the younger population (361 inhabitants had 3rd cycle of higher education in 2011 and 589 in 2018) (SiStat, 2020d)
- Increase in the number and share of one-member and partly two-member families and a rapid reduction of the share of three- and more-member households (2,381 household with 4 household members in 2011 and 2,262 in 2018) (SiStat, 2020e).

Spatial trends

- Dispersal of settlements.
- The traditional settlement patterns are being dissolved with the suburban, especially atomized construction on the edges of the settlements and in the open space between settlements.
- Continued interweaving of rural and suburban features within settlements (OPN MONM, 2009).
- The trend of accelerated motorization continues.
- Changing habits of young people (in the year 2001 about 45 % of primary school pupils came to school actively (on foot or by bicycle) and only 31 % in the year 2016) (Plevnik et al., 2017).

Trends in transport and mobility

- Worsening conditions for long distance passenger public transport.
- Strengthening pressures on the environment from human activities.
- Downward trend in bus service supply.

- Increases in the number of alternative-fuel vehicles.

The following main *drivers of change* affecting spatial development and mobility have been identified:

- Decline in the competitiveness of the public transport services.
- Decrease in the number of public transport passengers (in 2012, the number of passengers in the urban passenger transport was 285,000, the estimate for 2015 is that their number decreased by 13 % (Balant et al., 2017).
- Continuing pressures for dispersed settlement development in the suburban areas.
- Increasing motorization rate (there were 520 passenger cars per 1.000 inhabitants in 2001 and 597 in 2018) (SiStat, 2019; SiStat, 2020a).
- Growing automobility.
- Increasing greenhouse gas emissions from transport.

By analysing the trends, a background was created that enabled Urban Planning Institute of the Republic of Slovenia (UIRS) and CMNM to identify the most important drivers of change affecting the pilot area. During preparation of the set of scenarios, the identified trends were considered and combined in different scenario versions.

SCENARIO BUILDING PROCESS

Elements of the low carbon scenarios

Considering the set of identified trends and drivers of change, key elements of the low carbon scenarios were identified (Gulič et al., 2019). There are four low carbon scenario elements: the current situation in the transport system, the motorway belt, the railway and bus networks. Possible variations are presented in Figure 1 below.

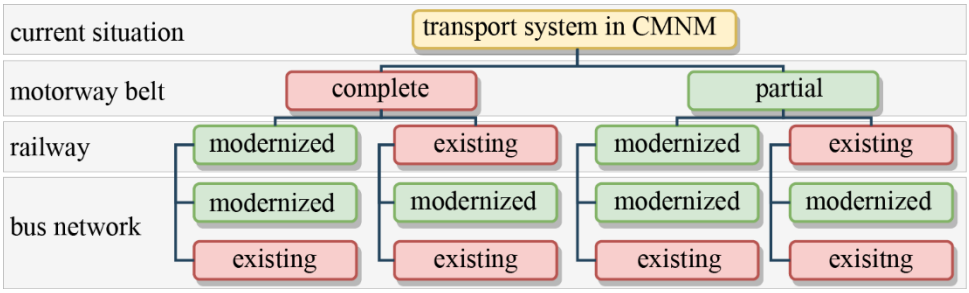


Figure 1: Elements of low carbon scenarios

Scenario elements have the following variations:

- Motorway belt:
  - Complete motorway belt: 3rd development axis – southern and western bypass.
  - Partial motorway belt: 3rd development axis – southern bypass.
- Railway:
  - Modernized network of (sub)urban transport by train, including new stations.
  - Existing network of (sub)urban transport by train, without new stations.
- Bus:
  - Modernized network of urban and suburban bus transport.
  - Existing network of urban and suburban bus transport.

Elements of the low carbon scenarios were identified for the territory encompassed by the CMNM urban plan with adjacent areas which are attractive for different types of land use (commercial, institutional, residential, recreational, industrial, mixed, transport). The time frame of the low carbon scenarios is the year 2030.

Low carbon scenarios

Four scenarios were produced in the scenario building process. In the following, their most important characteristics are briefly presented:

- Low carbon scenario 1. The scenario is based on construction of a complete motorway belt around the urban area of Novo mesto, modernization of the (sub)urban railway network which includes new railway stations and modernization of the urban and suburban bus networks.
- Low carbon scenario 2. The scenario is based on construction of a partial motorway belt around the urban area of Novo mesto, modernization of the (sub)urban railway network which includes new railway stations and modernization of the urban and suburban bus network.
- Low carbon scenario 3. The scenario is based on construction of a complete motorway belt around the urban area of Novo mesto, the existing (sub)urban railway network without construction of new railway stations and modernization of the urban and suburban bus network.
- Low carbon scenario 4. The scenario is based on construction of a partial motorway belt around the urban area of Novo mesto, the existing (sub)urban railway network without construction of new railway stations and modernization of the urban and suburban bus network.

Local stakeholders (representatives of the CMNM) chose Low carbon scenario 1 as the most appropriate one because it is to the highest possible degree aligned with the valid development documents of the municipality and, at the same time, best

reflects the long-term development interests in sustainable mobility and spatial development (Figure 2).

Based on a proposal from the local stakeholders, attributes were defined for the selected scenario, highlighting the substantive issues that are of importance for promoting sustainable mobility and spatial development in the municipality. These attributes are the rolling stock, a city well provisioned with economic public infrastructure, inhabitants in the well-provisioned city, extra-urban settlements, public passenger transport, the railway and public roads. Each attribute of the scenario was then described by the following features: components of the attribute, the current situation, the planned target situation in the valid development documents of the municipality and the desired target state.

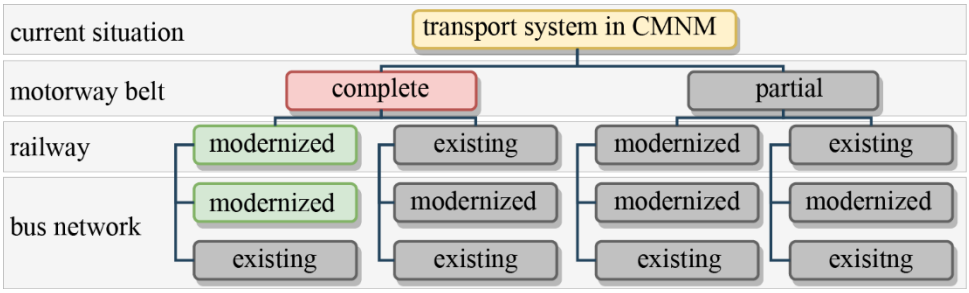


Figure 2: Low carbon scenario 1

STRATEGY FOR LOW CARBON MOBILITY AND TRANSPORT

The proposal for a strategy for low carbon mobility and transport in the CMNM was based on the selected low-carbon scenario 1. The representatives of the municipality actively participated in preparation of both the scenarios and the strategy. The proposed strategic objectives, activities, sub-activities and measures are closely related to the elements of the selected scenario and are - in terms of content - focused on attaining the desired target state. The measures are to the greatest extent possible related to the measures of the valid Integrated Transport Strategy of the City of Novo mesto (Balant et al., 2017).

The strategy document includes a general description of the strategy, presentation of strategic goals, actions and sub-actions, risk factors for their implementation and a detailed action plan until the year 2030. In the following, the general description of the strategy, strategic objectives and actions until the year 2030 are presented.

General strategy description

In the year 2030, green and healthy sustainable mobility is implemented in the City Municipality of Novo mesto. Passenger car and public transport vehicle fleets have been modernized, the equipping of the city with the current and new generation of

public economic infrastructure - especially within the area delimited by the city bypass - has been improved. The conditions for high quality living of the inhabitants in the well-provisioned city have been established, and at the same time important extra-urban settlements are attractive for the residence too. Public passenger transport is well developed and compliant with applicable social and technical standards. The city railway performs an important function as one of the backbones of public transport. Road infrastructure is up-to-date and upgraded, enabling quick and more environmentally friendly mobility. When designing and implementing spatial development and mobility, choices that contribute to reducing greenhouse gas emissions are preferred.

Strategic objectives

The strategy defines the following strategic objectives:

- Updated fleets of passenger cars and public transport vehicles.
- A well-provisioned city (with public economic infrastructure).
- High-quality living conditions have been established in the well-provisioned city.
- Important extra-urban settlements have been revived.
- Highly developed public passenger transport.
- Well-functioning urban rail passenger services.
- The existing road infrastructure has been updated and new infrastructure built.
- Monitoring of greenhouse gas emissions related to mobility and spatial development decisions has been set up.
- Urban public passenger transport has been digitalised.

Actions until the year 2030

For each strategic objective the actions were identified and assessed. This was done in close cooperation with the representatives of the CMNM and considering the valid municipal strategic documents. The actions are as follows:

- Passenger cars and public transport vehicles fleet modernization. In the year 2030 the degree of motorization will not exceed 600 passenger cars per 1,000 inhabitants and the average passenger cars age will be 7 years.
- Improving the public infrastructure by investing in public passenger transport and in public and private housing stock by equipping the areas intended for construction of multi-apartment buildings with infrastructure.
- Creating conditions for a high-quality life of inhabitants in the well-provisioned city. Increasing the number of new housing units in the city from the current average of 100 to 150 per year until the year 2030.

- Reviving the major extra-urban centres and encouraging moderate immigration to them.
- Promoting the development of public passenger transport.
- Development of urban rail passenger transport.
- Modernizing the existing and building new road infrastructure with a new outer bypass city ring.
- Development of sustainable mobility and spatial development aimed at reducing greenhouse gas emissions.
- Development of digitized urban public passenger transport.

Indicative time frames were set for gradual implementation of each action for the following time periods: 2020-2023, 2024-2026 and 2027-2030. For each action concrete measures were also prepared.

CONCLUSIONS

Taking part in the ASTUS project brought new insights and knowledge in the field of joint resolving of spatial development and transport mobility problems at the local level to the Slovenian pilot site City Municipality of Novo mesto. Furthermore, it contributed to an integration and upgrading of the existing development documents and to elaboration of a long-term low-carbon strategy and action plan. Local strategies and action plans were prepared also for the other pilot areas of the ASTUS project in Austria, France, Germany and Italy and served as a basis for transnational conclusions and recommendations developed for the level of the Alpine Space Programme area. The approach can be readily implemented in other areas facing similar transport mobility and spatial development problems.

ACKNOWLEDGEMENTS

The presented work was carried out within the project ASTUS - Alpine Smart Transport and Urbanism Strategies. The project was co-financed by the Interreg V B Alpine Space programme. The authors thank for the financial support.

REFERENCES

Balant, M., Mladenovič, L., and Plevnik, A. (2017). *Celostna prometna strategija Mestne občine Novo mesto: enostavne poti do živahnih središč*. Novo mesto, Mestna občina Novo mesto.

Bratkovič, F., Kovačič, S., Murn Kump, T., Jeraj, S., Pavlič, A., and Povše, J. (2018). *Strategija razvoja Mestne občine Novo mesto do leta 2030*. Mestna občina Novo mesto.

Grobler, B., Kump Murn, T., and Jerala, I. (eds.) (2015). *Trajnostna urbana strategija Novo mesto 2030*. Mestna občina Novo mesto.

Gulič, A., Praper Gulič, S., and Koblar, S. (2019). *Opis izbranega nizkoogljičnega scenarija trajnostne mobilnosti in prostorskega razvoja v Mestni občini Novo mesto*. Ljubljana, Urbanistični inštitut Republike Slovenije.

Odlok o občinskem prostorskem načrtu Mestne občine Novo mesto. Uradni list RS, No. 101/2009 from 10. 12. 2009.

Plevnik, A., Balant, M., and Mladenovič, L. (2017). Alarming changes in youth mobility: Primary school pupils in Novo Mesto. *Urbani izziv*, 28(2), pp. 149–158.

SiStat (2020a). *Population by sex, municipalities. Statistical Office of the Republic of Slovenia.* Retrieved from https://pxweb.stat.si/SiStatDb/pxweb/en/10_Dem_soc/10_Dem_soc__05_prebivalstvo__10_stevilo_preb__20_05C40_prebivalstvo_obcine/05C4002S.px/ (accessed 17. Jun. 2020).

SiStat (2020b). *Persons in employment (excluding farmers) by municipalities of residence, sex, year and municipality of workplace*. Retrieved from https://pxweb.stat.si/SiStatDb/pxweb/en/10_Dem_soc/10_Dem_soc__07_trg_dela__05_akt_preb_po_regis_virih__10_07234_delovne_migracije/0723405S.px/ (accessed 18. Jun. 2020).

SiStat (2020c). *Natural change of population, municipalities, Slovenia, annually*. Retrieved from https://pxweb.stat.si/SiStatDb/pxweb/en/10_Dem_soc/10_Dem_soc__05_prebivalstvo__25_selitveno_gibanje__05_05I10_naravno_gibanje/05I1002S.px/ (accessed 18. Jun. 2020).

SiStat (2020d). *Population aged 15 years or more by education and sex, municipalities, annually*. Retrieved from https://pxweb.stat.si/SiStatDb/pxweb/en/10_Dem_soc/10_Dem_soc__05_prebivalstvo__20_soc_ekon_preb__01_05G20_izobrazba/05G2014S.px/ (accessed 18. Jun. 2020).

SiStat (2020e). *Households by number of members, municipalities, Slovenia, multiannually*. Retrieved from https://pxweb.stat.si/SiStatDb/pxweb/en/10_Dem_soc/10_Dem_soc__05_prebivalstvo__17_Gospodinjstva__15_05F30_Gospodinjsva_OBC/05F3015S.px/ (accessed 18. Jun. 2020).

SiStat (2019). *Road vehicle at the end of the year (31.12.) by type of vehicle and municipality, Slovenia, annually*. Retrieved from https://pxweb.stat.si/SiStatDb/pxweb/en/20_Ekonomsko/20_Ekonomsko__22_transport__08_22221_reg_cestna_vozila/2222105S.px/ (accessed 18. Jun. 2020).

CONFIGURATION OF A CITY STREET NETWORK TO SUPPORT URBAN SEISMIC RESILIENCE

Katarina Rus[1]
University of Ljubljana, Ljubljana SI-1000, Slovenia, katarina.rus@fa.uni-lj.si

Vojko Kilar
Professor, University of Ljubljana, Ljubljana SI-1000, Slovenia, vojko.kilar@fa.uni-lj.si

David Koren
Assist. Prof., University of Ljubljana, Ljubljana SI-1000, Slovenia, david.koren@fa.uni-lj.si

ABSTRACT

Street space has a significant impact on the resilience of an urban system to earthquakes. Along with a city's open spaces it provides space for emergency evacuation and the long-term recovery of the affected urban system. This paper presents the results of our preliminary study on assessing the seismic resilience of the urban system with an emphasis on the city street network. The street network topology has been modelled as a mathematical graph with vertices (intersections and bridges) and edges (street segments). As test models, six topological variants of a simplified fictitious grid (five by five vertices) urban system have been selected. Their performance in terms of connectivity, accessibility and centrality has been evaluated applying measures and algorithms of the graph theory. Moreover, critical points in the system have been identified through centrality measures. The performance of the analysed urban systems and basic guidelines to improve their seismic resilience have been discussed. It has been shown that the graph theory measures used present a promising tool for the seismic resilience assessment of an urban system.

Keywords: Urban seismic resilience, Street network topology, Graph theory

INTRODUCTION

Cities are constantly exposed to many natural and human-made stressors depending on their geographical location and specific circumstances. Although generally the occurrence of earthquakes is much lower than extreme weather events, the consequences of an earthquake can be more catastrophic in terms of the death toll, as well as other victims and economic losses. In order to avoid the worst-case scenarios and limit the extent of the damage, more attention must be paid to increasing the resilience of urban systems. Urban resilience as a fundamental

[1] *Corresponding author*

property of sustainable cities is the capacity of a system to absorb disturbance and reorganize while undergoing change so as to still retain essentially the same identity (Folke et al., 2010). Therefore, a resilient urban system is a sustainable network of physical systems (buildings, infrastructure and open spaces) and a social community capable of managing extreme events. It is able to maintain its basic operation during a disaster and following it the original functionality is restored, while relationships and interactions between individual components (buildings, the street network, open spaces and the social community) (Rus et al., 2018; Koren et al., 2018; Koren and Rus, 2019) and their elements may also have changed. Four characteristics of resilient systems (4Rs) were recognized by Bruneau et al. (2003), namely robustness, redundancy, rapidity and resourcefulness which reflects in cities' flexibility and responsiveness to unexpected circumstances. Smart cities' intelligent technologies including decision support systems can also enhance flexibility and responsiveness, as cities can use real-time information to monitor urban functions and detect patterns and anomalies that will eventually allow them to become more sustainable and resilient (Angelidou et al., 2017). Thus, all three concepts of smart, sustainable and resilient cities are interdependent and important for citizens' well-being and cities' long-term functionality.

The street network as the backbone of an urban system has an important role in urban system resilience with an impact on the overall system functionality and development. It enables physical connections between individual elements as well as social interactions and information transfer within the system. Together with other technical infrastructures (water supply, sewage system, electricity network and telecommunications), it supports urban functions and their successful operation. When an earthquake strikes, streets serve as the location of immediate evacuation and should enable the smooth withdrawal of population from deprived areas as well as quick access of emergency services. Therefore, the focus of this study is on street network properties for seismic resilience enhancement in terms of street design and network topology. The emphasis is on the quantitative resilience assessment of a street network by applying different measures from graph theory.

STREET NETWORK PROPERTIES OF A SEISMICALLY RESILIENT CITY

Street design

Street space consists of various elements (streets, roads, cycling and walking paths, etc.) which form a common transportation infrastructure network. The design of these basic elements in terms of width, edge design, layout and orientation influences the system functionality both in normal and in crisis situations. The appropriate width of roads, streets or paths depends on the height of the adjacent buildings ('aspect ratio'), as well as the type and purpose of transportation infrastructure. The width of streets in a moderate density area is probably not

optimal in denser urban systems where the aspect ratio should be higher (Sharifi, 2019). If a building is damaged or even collapses in a catastrophic earthquake event, the adjacent streets would be disturbed or completely interrupted. To determine the degree of disturbance, the impact radius for each building adjacent to its street connection can be calculated, which depends on the building height and quantity of debris (Argyroudis et al., 2015; So et al., 2018; Domaneschi et al., 2018). Generally, wider streets provide safer and more successful evacuation after an earthquake. Together with open space, they can also serve as a place for temporary shelters in the proximity of the affected population's homes (Asadzadeh et al., 2017). Furthermore, wider streets can be easily transformed when needed and provide more space to integrate green infrastructure. On the other hand, wider streets require higher maintenance costs and do not provide the positive effects of the mutual shading of buildings. Narrow streets designed in human scale calm traffic and create intimate, semi-public spaces between private and public life.

The primary tasks of a street system to improve urban resilience are enabling smooth movement and accessibility to various urban functions. The latter is made possible by properly designed street edges which connect buildings and their programmes to streets by creating permeability and connectivity between indoor and outdoor spaces. Permeability of the edges can be achieved by traffic calming, shared street spaces, mixed use and adequate built density, pavements and active facades with large, open and transparent surfaces. However, building structures must be designed to be earthquake resistant. In addition to buildings, overpasses, underpasses and especially bridges with high occupancy levels may also be critical points in the event of an earthquake. Their failure would result in the greater loss of connectivity and accessibility for the entire urban system.

Street network topology

At the network level, the topology of transport infrastructure is important for urban resilience, which can be evaluated using graph theory. The road network can be translated into a mathematical graph constructed of points representing intersections and links between them representing individual road and street sections. The graph illustrates network topology in terms of relationships between individual elements, while real distances and capacities (width, travel time, speed limit, etc.) of streets and roads are captured by their attributes presented as weights. Measures and algorithms of graph theory allow us to evaluate the centrality, connectivity and accessibility of individual elements or the street network as a whole.

Centrality indicates the degree of importance of a particular point (vertex) or connection (edge) in a system which is measured by different indicators such as 'betweenness centrality' (how many shortest paths pass through a selected vertex or edge), 'closeness centrality' (the distance of selected vertex to every other vertices) and 'degree centrality' (how many edges are connected to a given vertex) (Sharifi, 2019; Barthélemy, 2011). In efficient systems, more important urban

functions (health care, schools, cultural, sports, commercial and service activities) are located in points with greater centrality, as these points are more accessible and well connected with other points in the system. However, vertices with high centrality are more vulnerable and require more attention to maintain their functioning, as their loss has a greater impact on the functionality of the whole urban system. A resilient system should be designed in such a way that potential interruptions in any nodes or connections do not cause significant system-wide accessibility losses (Sharifi, 2019). Therefore, an even distribution of centralities across the network that follows the power of law (i.e. a small number of vertices and edges with high centrality and a larger number with lower centrality value) seems to be the most sustainable and resilient for the system functionality in terms of efficiency and liveability.

Good system connectivity means redundant connections that provide alternative options in the event of the failure of individual elements. It can be measured using different indicators and algorithms of graph theory (Barthélemy, 2011; Koren and Rus, 2019; Zhang et al., 2015; Derrible and Kennedy, 2011). Measures for increasing connectivity include additional vertices and edges. When adding new nodes, it is important to consider increased maintenance costs and maintain the transparency and hierarchy of the street network. Accessibility indicates the distance of individual elements of the system to each other, which is also known as system performance. It can be measured as the shortest path between two points or as the average of all the shortest paths in the system. The global efficiency of the system (Latora and Marchiori, 2001) is defined on the basis of a characteristic path and assumes values of between 0 and 1. In a theoretically fully efficient system, where all paths between two points pass directly along the shortest possible line, global efficiency is assumed to be 1, while in real systems these values are much lower.

Some studies use the measure of global efficiency as the main criterion for system resilience (Cavallaro et al., 2014; Bozza et al., 2017a; Bozza et al., 2017b). They model the city as hybrid social-physical networks (HSPNs) which are a mathematical graph composed of vertices (objects and their inhabitants) and the (street) edges between them. Although these studies are a rare attempt of a network approach to the seismic resilience assessment of an urban system, they have some shortcomings and limitations. The measure of global efficiency evaluates the functionality of the system based on the relationships between the individual elements, but it does not take into account the overall health of the system in terms of the quantity and quality of these elements. Apart from global efficiency, some other measures and indicators for system connectivity, accessibility and centrality should be applied when assessing the overall resilience of the urban system.

A PRELIMINARY ANALYSIS OF THE STREET SYSTEM TOPOLOGY AND ITS IMPACT ON URBAN RESILIENCE

The purpose of this study was to test different measures and algorithms of graph theory in order to supplement the global efficiency measure for the seismic resilience assessment of an urban system. The impact of different network configurations and different earthquake scenarios was analysed using the Wolfram Mathematica program. The experimental study was conducted on six fictitious characteristic systems represented as non-weighted mathematical graphs (Figure 1) in order to identify a favourable street network configuration. All six selected systems are composed of 25 vertices with the same grid distribution and the same number of 32 bi-directional edges with different configurations. They reflect the characteristics of the perimetral, transversal and mesh network, combined with an orthogonal or diagonal configuration. For the purpose of this study, the assumptions have been made that all edges have the same capacity (same width and travel time) and a distance of l (for orthogonal links) or $\sqrt{2}$ (for diagonal links). It should be noted that in the case of a real street system, the analysis would require accurate measurements of the attributes based on the actual state of the street system and their consideration as weights in a mathematical graph.

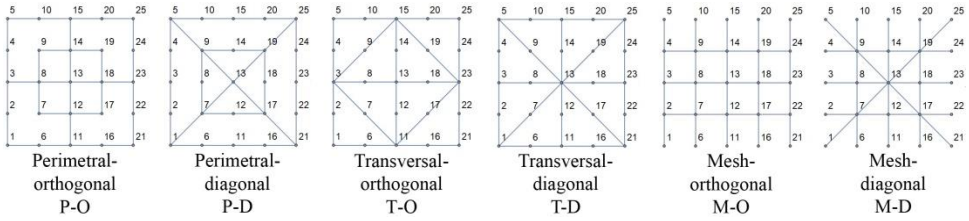


Figure 1: Six fictitious characteristic systems selected for analysis

Centrality measures

First, the importance of vertices and edges of the original graphs in terms of betweenness centrality was analysed in order to recognise critical points of the systems under investigation (Figure 2). The transversal-diagonal (T-D) graph proved to be the most centralised, with one high centrality vertex (172) and four associated edges with high betweenness centrality (106). Attention must be paid to strengthen and protect them in order to prevent greater damage to the whole network in the case of a catastrophic event. The mesh-diagonal (M-D) configuration also proved to have a central vertex with greater centrality (144), but in this case centrality is more evenly distributed following the power of law, while centralities of edges are low and uniformly distributed across the network (48-72). Therefore, in the case of an affected central vertex, other vertices and edges can effectively take over the load.

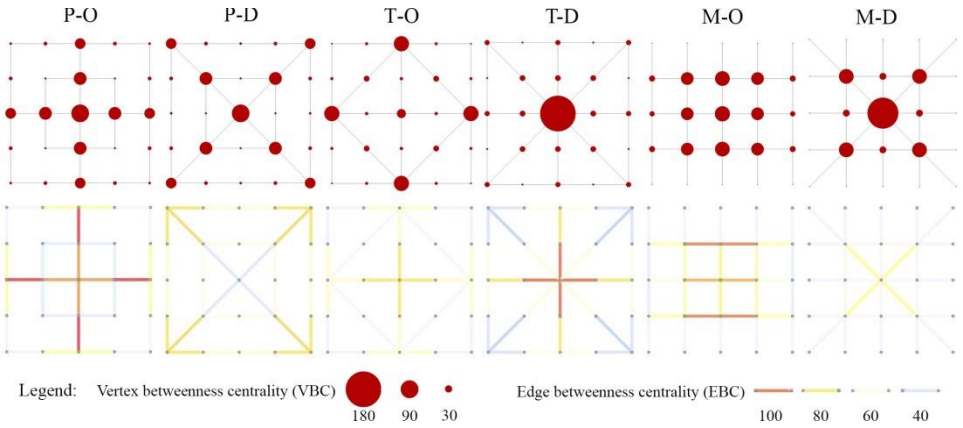


Figure 2: Analysis of betweenness centrality of vertices - VBC (above) and edges - EBC (below)

Connectivity and accessibility measures

Each of the above presented systems has been analysed using six different seismic scenarios with three different intensities (reflecting seismic intensity levels) (Table 1). At low intensity (I1) only one vertex (in the bottom left quadrant of symmetric graphs) appeared to be affected, while at medium intensity (I2) three vertices were removed. High intensity scenarios (I3) are I2 scenarios mirrored to the opposite quadrant so that five or six vertices are affected. In each scenario, different vertices and their adjacent edges were assumed to be seriously affected and therefore removed from the original graph. Scenarios were classified from the affected peripheral (p-o, p-d), through transversal (t-o, t-d) to central vertices (c-o, c-d) and divided on the orthogonal and diagonal position of these vertices (example of graph M-D in Table 1).

Table 1: Identities of affected vertices for each analysed seismic intensity (I1, I2 and I3) and scenario (S1 to S6)

	S1 (p-o)	S2 (p-d)	S3 (t-o)	S4 (t-d)	S5 (c-o)	S6 (c-d)
I1	1	2	3	7	8	13
I2	2, 3, 4	1, 2, 6	3, 8, 13	1, 7, 13	12, 13, 14	7, 13, 19
I3	2, 3, 4, 22, 23, 24	1, 2, 6, 20, 24, 25	3, 8, 13, 18, 22	1, 7, 13, 19, 25	8, 12, 13, 14, 18	7, 9, 13, 17, 19

Different indicators based on the graph theory were tested on the selected graphs for each scenario to examine their relevance for the seismic resilience assessment of the street network (Figure 3). Pre-disaster performance is also shown (S0) for comparison of the values of each indicator under observation and their changes. The higher the value on the y axis, the greater the performance of the analysed system. On the other hand, a significant drop between the initial state (S0) and each scenario indicates poor system resilience.

Table 2: Suggested supplementary measures and indicators for system resilience assessment

	Symbol	Description
Cyclomatic number	μ	Number of fundamental circuits in the network, where p is the number of sub-graphs ($\mu = e - v + p$).
Edges	e	The number of edges in a graph.
Vertices of main component	v	The largest number of vertices in one connected component of a graph.
Edge connectivity	λ	The size of the smallest edge cut, a set of edges whose removal renders graph disconnected.
Separate components	p	The number of separate components (sub-graphs) in a graph.
Vertices with degree 0	$d0$	The number of vertices with vertex degree 0 (no edge adjacent).
Vertices with degree 1	$d1$	The number of vertices with vertex degree 1 (one edge adjacent).

In the analysis, betweenness centrality for removed vertices (VBC) and edges (EBC) were evaluated and presented as a cumulative value (different colours represent values of different vertices or edges) on the graph. Moreover, global efficiency (GE) for different scenarios was calculated and supplemented by additional measures (Table 2) for a more comprehensive resilience assessment which requires multiple figures of merit (Koren et al., 2019). In order to get more comprehensive evaluation of system functionality, global efficiency measure should be combined with other indicators. It can be observed that generally all indicators follow a similar trend of rising or falling for different scenarios but with some exceptions. Usually, the greater the betweenness centrality of affected vertices and edges, the deeper the decrease in indicator values. It was observed that the measure of centrality might be related to system robustness as one of four resilience characteristics. Graphs with even distribution of centralities across the network (e.g. P-D) proved to be less vulnerable to disturbance of individual element while high-centrality arrangement (e.g. T-D) poses a risk for substantial losses of system efficiency in the case of affected high centrality element. However, the correlation is not always straightforward. As the global efficiency does not consider the overall health of the system (the quantity and quality of elements), in some cases it can even increase despite the affected network. The quantity and quality of elements (edges and vertices) present essential resources for successful system response and recovery after a disaster. Therefore, they are related to resilience characteristic of resourcefulness. The greatest drop in global efficiency was detected when the network decomposes on different separate components. Another important fact is the size of these components (number of vertices). Global efficiency was less affected if the remaining edges form a connected cycle around the deleted vertex. It reflects in the reduced number of vertices with degree 1 or 0 and the unchanged value of the cyclomatic number. It can be concluded that measures of connectivity including separate components, edge connectivity and cyclomatic number are related to redundancy of the system

as they reflect the availability of alternative connections. The fourth resilience characteristic of rapidity can be reflected in a speed of recovery of the affected system which should be studied in our further research.

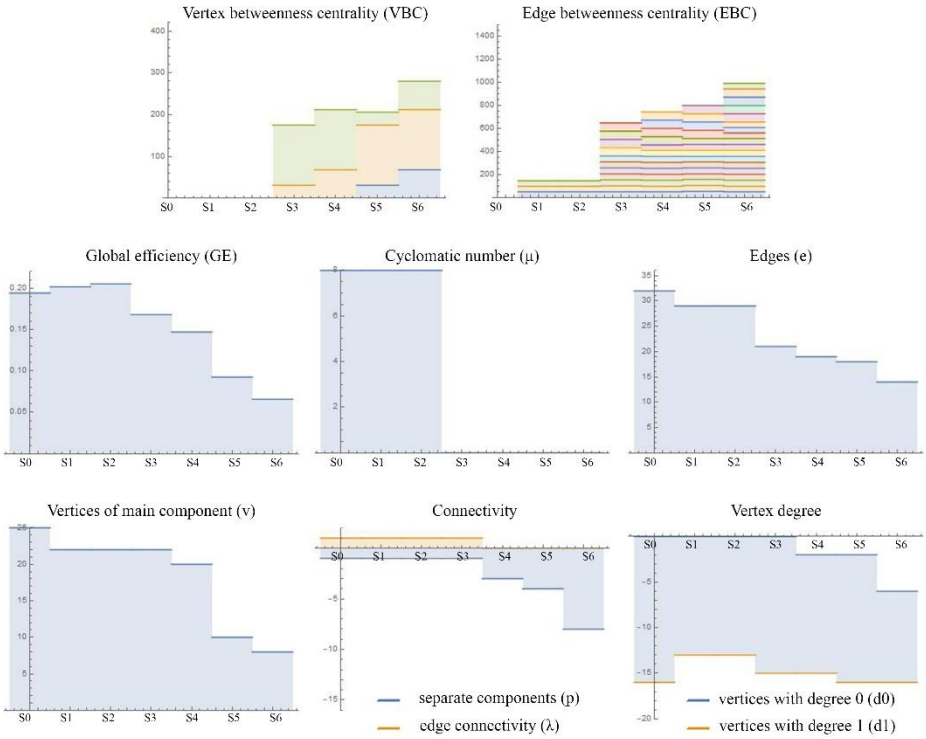


Figure 3: Graphs representing changes of measures and indicators for different seismic scenarios of M-D graph at medium intensity (I2) with a comparison of the initial pre-disaster value (S0).

Among all street network configurations, T-D proved to be the least resilient, which coincides with the highest centrality arrangement (see Figure 2). In the case of the affected peripheral vertices (S1 and S2), the M-D graph suffers a minimum loss of functionality. On the other hand, networks with an outer circumference (P-O, P-D, T-O) proved to be most resilient in the case of affected transversal connections (S3 and S4) or a system central part (S5 and S6).

Analysis of different seismic intensities

An analysis of the presented measures and indicators was performed on each selected characteristic graph. The greatest changes of functionality were recognised on the mesh-diagonal (M-D) graph. In the case of affected peripheral vertices (S1 and S2 scenarios), the M-D graph proved to be most successful in maintaining functionality among the selected systems. On the other hand, in the case of affected central vertices (S5 and S6 scenarios), it was the most affected one.

Therefore, a M-D street system was chosen for the further analysis of different seismic intensity (Figure 4).

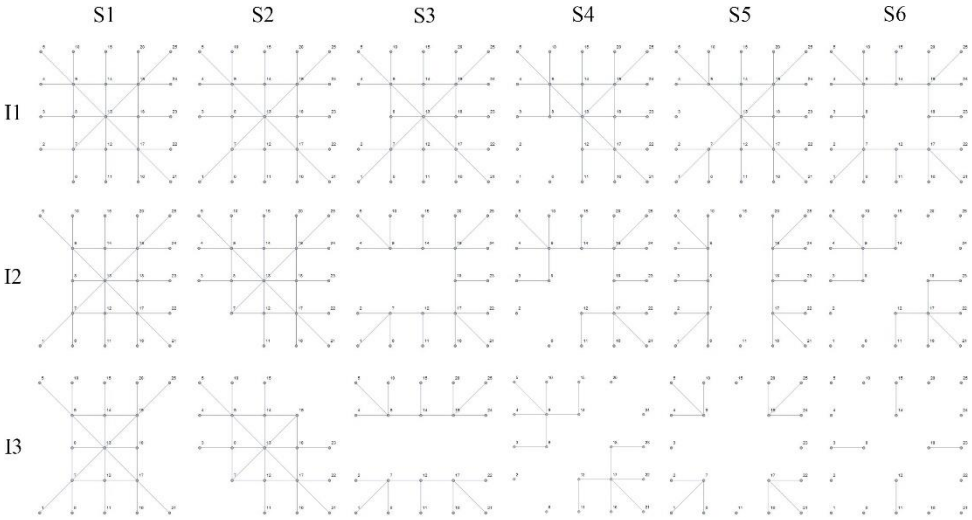


Figure 4: A graphically presented M-D street network affected at different seismic intensities and scenarios.

As can be seen from the obtained results shown in Figure 5, minor changes of global efficiency were observed at low seismic intensity (I1) and the worst scenarios was S4 with 4 separated components. Even though the central graph vertex and adjacent edges with the highest betweenness centrality were deleted in scenario S6, the global efficiency was higher than in scenarios S4 and S5. It is assumed that this is due to the maintained graph as a whole (one component) and fewer vertices with degree 1 or 0. As expected, there were more significant changes of efficiency at medium (I2) and high intensity (I3). A significant difference was noticeable between the graphs composed of separated components and those which remained connected as a whole. It should be noted that in some cases (S1 and S2), due to its computational definition, global efficiency increased in comparison with the initial graph, as the remaining vertices are better connected to each other. Therefore, in addition to global efficiency, supplemental measures are necessary for the proper and comprehensive evaluation of system functionality and thus resilience.

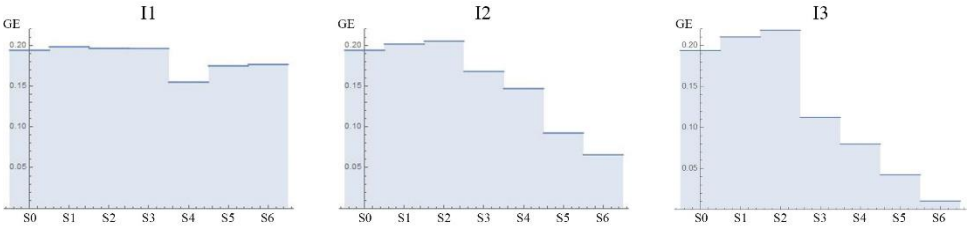


Figure 5: Changes in global efficiency for the M-D network at I1, I2 and I3 seismic intensity for different scenarios including pre-disaster performance (S0).

CONCLUSIONS

Street network topology influences the emergency response in the event of a seismic disaster. By applying graph theory tools on testing models (simplified fictitious 5x5 grid networks) we were able to compare different street configurations to select the most appropriate system topologies as well as determine the most harmful seismic scenarios. At this preliminary stage, only comparisons between different systems and different scenarios have be conducted. For proper resilience quantification, the capacity (width, travel time, speed limitation, etc.) of each individual street segment should be considered as weights in a graph model, which will be the next step in our future research. In this study, fictitious systems which try to illustrate real urban systems were selected for the analysis. However, for the practical purpose of the study, they were simplified with clear topologies and limited to only 25 vertices and 32 edges. There are no attributes considered in the study except the length of an individual link (limited to only 1 or $\sqrt{2}$ units). When assessing the system performance, measures of graph theory were selected according to the authors' choice. Some other algorithms and indicators for assessing system performance can be used, too. In further research, other urban components (buildings, open space and social community) with their attributes represented as weights will also be included in the analysis. Moreover, the presented tools should be tested on a real case study with a complex topology of multiple vertices and edges.

Despite before mentioned limitations, the study offers some important new findings about network approach to resilience assessment of a street system. In order to enable the efficient evacuation and enhance the system resilience, it is necessary to know the critical points in a street network. By applying a quantitative approach and graph theory, they can be measured by betweenness centrality which might be interpreted as a system's robustness. Loss of vertices with high betweenness centrality severely affects the performance of the whole network. Therefore, they are recognised as critical points in the system which need special attention.

A slight correlation between centralities of affected vertices or edges and loss of global efficiency was observed. Even though the measure of global efficiency

evaluates the relationship between individual system elements, it does not take into account their quantity and quality, which can reflect the system resourcefulness. Therefore, in some cases it can even increase despite the affected system. To perform a more comprehensive evaluation of urban performance, global efficiency should be supplemented by other measures and indicators. Beside the number of edges and vertices in the system, we recommend the assessment of cyclomatic number, number of separated components and vertices with one or zero connections to the others. The last three measures can be related to redundancy of the system, while the speed of system recovery reflects the rapidity, which should be studied in our further research.

As a monocentric urban configuration proved to be highly vulnerable, it is recommended to organise the system with more equally distributed centralities following a power of law distribution. Among different topologies of street networks, a mesh configuration with diagonal street connections (in the study marked as a M-D graph) and outer circumference (e.g. city bypass ring) was recognised as most resilient. Nevertheless, the resilience of individual urban systems depends on different seismic scenarios and the location of affected elements. Therefore, every city should be treated individually and assessed depending on its specific situation.

Moreover, it is also important to be aware of the possibility of other disasters and secondary hazards. In light of the current health crisis, which requires a consideration of physical distancing in street design the future research can be extended on the transformation of streets and user behaviours. However, individual system of specific urban component cannot be treated completely separately as it is deeply interdependent with other urban components. The new knowledge about transportation infrastructure offered by this study should be integrated into a holistic research on the resilience of urban system as a whole.

REFERENCES

Angelidou, M., Psaltoglou, A., Komninos, N., Kakderi, C., Tsarchopoulos, P. & Panori, A. (2017). Enhancing sustainable urban development through smart city applications. *Journal of Science and Technology Policy Management*, (9)2, 144-169.

Argyroudis, S., Selva, J., Gehl, P. & Pitilakis, K. (2015). Systemic seismic risk assessment of road networks considering interactions with the built environment. *Computer-Aided Civil and Infrastructure Engineering*, *30*(7), 524-540.

Asadzadeh, A., Kötter, T., Salehi, P. & Birkmann, J. (2017). Operationalizing a concept: The systematic review of composite indicator building for measuring community disaster resilience. *International Journal of Disaster Risk Reduction*, 25, 147-162.

Barthélemy, M. (2011). Spatial networks. *Physics Reports*, 499, 1-101.

Bozza, A., Asprone, D. & Manfredi, G. (2017a). A methodological framework assessing disaster resilience of city ecosystems to enhance resource use efficiency. *International Journal of Urban Sustainable Development*, *9*(2), 136-150.

Bozza, A., Asprone, D., Parisi, F. & Manfredi, G. (2017b). Alternative resilience indices for city ecosystems subjected to natural hazards. *Computer-Aided Civil and Infrastructure Engineering*, 32(7), 527-545.

Bruneau, M.; Chang, S.E.; Eguchi, R.T.; Lee, G.C.; O'Rourke, T.D.; Reinhorn, A.M.; Shinozuka, M.; Tierney, K.; Wallace, W.A.; von Winterfeldt, D. (2003). A Framework to Quantitatively Assess and Enhance the Seismic Resilience of Communities. *Earthquake Spectra*, 19, 733-752.

Cavallaro, M., Asprone, D., Latora, V., Manfredi, G. & Nicosia, V. (2014). Assessment of urban ecosystem resilience through hybrid social–physical complex networks. *Computer-Aided Civil and Infrastructure Engineering*, *29*(8), 608-625.

Derrible, S. & Kennedy, C. (2011). Applications of graph theory and network science to transit network design. *Transport Reviews*, *31*(4), 495-519.

Domaneschi, M., Scutiero, G., Marasco, Sebastiano., Cimellaro, G. P., Khalil, A. A., Pellecchia, C. & De Iuliis, E. (2018). A methodology to quantify debris generation after a seismic event. *In Proceedings of 16th European Conference on Earthquake Engineering*. Thessaloniki, Greece, 18-21 June 2018.

Folke, C., Carpenter, S.R., Walker, B., Scheffer, M., Chapin, T. and Rockström, J. (2010). Resilience thinking: integrating resilience, adaptability and transformability. *Ecology and Society*, 15(4), 20.

Koren, D., Kilar, V. & Rus, K. (2018). A conceptual framework for the seismic resilience assessment of complex urban systems. *In Proceedings of 16th European Conference on Earthquake Engineering*. Thessaloniki, Greece, 18-21 June 2018.

Koren, D. & Rus, K. (2019). The potential of open space for enhancing urban seismic resilience: A literature review. *Sustainability*, *11*(21), 5942.

Latora, V. & Marchiori, M. (2001). Efficient behavior of small-world networks. *Physical Review Letters*, 87(19), 198701.

Rus, K., Kilar, V. & Koren, D. (2018). Resilience assessment of complex urban systems to natural disasters: A new literature review. *International Journal of Disaster Risk Reduction*, 31, 311-330.

Sharifi, A. (2019). Resilient urban forms: A review of literature on streets and street networks. *Building and Environment*, 147, 171-187.

So, E., Baker, H. & Spence, R. (2018). Casualty estimation through assessment of volume loss and external debris spread in building collapse. *In Proceedings of 16th European Conference on Earthquake Engineering*. Thessaloniki, Greece, 18-21 June 2018.

Zhang, X., Miller-Hooks, E. & Denny, K. 2015. Assessing the role of network topology in transportation network. *Journal of Transport Geography*, 46, 35-45.

SUSTAINABLE TRANSPORT UNIVERSITY CAMPUS: STARTING AT THE GRASSROOTS

Dima Jawad[1]
Assoc. Prof., PhD, Department of Civil and Environmental Engineering, Notre Dame University - Louaize, Lebanon, djawad@ndu.edu.lb

Marie-Belle Boutros
Graduate Student, Department of Civil and Environmental Engineering, Notre Dame University - Louaize, Lebanon, mfboutros01@ndu.edu.lb

Marc Abi Khalil
B.E., Department of Civil and Environmental Engineering, Notre Dame University - Louaize, Lebanon, mcabikhalil@ndu.edu

Ralph Khadra
B.E., Department of Civil and Environmental Engineering, Notre Dame University - Louaize, Lebanon, rakhadra@ndu.edu.lb

Lilia Aboul Hosn
B.E., Department of Civil and Environmental Engineering, Notre Dame University - Louaize, Lebanon, lgaboulhossn@ndu.edu.lb

ABSTRACT

The link between climate change and transportation sector can no longer be overlooked. According to the Environmental Protection Agency, a typical passenger car emits about 4.6 metric tons of carbon dioxide per year (EPA, 2018). This result can be aggregated exponentially when society is a car-dependent one. Cities around the world are struggling to introduce innovative solutions that can combat this problem. More specifically, universities could play an important role on this behalf by converting their campuses into a sustainable transport campus. Universities have major governance within their institutions; they can implement changes in their policies and control them. This action will influence not only the internal community of each university, but it will be spread out to bigger communities. Furthermore, tackling this goal will also minimize the negative impacts of transport activities considering that universities are themselves generators of high levels of traffic. This paper presents the study done to convert a car-dependent university campus into a sustainable transport campus taking Notre Dame University in Lebanon as a case study. The approach followed in this study includes a literature review of best practices in sustainable transport, site physical assessment, investigation of exiting mobility options, survey, and evaluation of potential alternatives within the local (Lebanese) context. The study of the current

[1] *Corresponding author*

mobility situation at NDU is developed by taking into consideration three major dimensions: zero-emission mobility (pedestrian and bicycle circulation), vehicles and parking, and public transport. The assessment resulted in deriving a comprehensive strategy for the next seven years that includes a combination of physical improvements, installing new facilities, introducing new mobility programs, and developing targeted policies that lessen the car-dependency and promote sustainable transport practices.

Keywords: Sustainable Transport, university campuses, alternative mobility

INTRODUCTION

In the last three decades, sustainability has become a crucial objective in every sector. Researchers, planners, and policymakers are addressing this matter worldwide, particularly, sustainable transportation. The transport sector puts momentous pressures on the environment through the emissions of air pollutants, greenhouse gases, and noise pollution. Moreover, traffic congestion, inefficient land-use, and reduced physical activities also result from an unsustainable transport system (WHO Regional Office for Europe, 2017). Thus, any designated means of transportation that are safe and have low impacts on the environment can be assigned to be within the category of sustainable transportation (HORN & JANSSON, 2000). Since universities can be looked at as a minimization of the city, where students, staff, and faculty members from different backgrounds and beliefs work and cooperate (Azzali & Sabour, 2018,) campus planners are urged to promote sustainable mobility on campus. These planners face major challenges in designing good access and mobility within the university territory, without affecting the accessibility on the campus. Different solutions have been raised to release several constraints taking into consideration all campus users. These solutions tackle different concerns that affect not only the internal community of the university but also the surrounding neighborhoods (Poinsatte & Toor, 1999). The literature on this matter agrees that the elaboration of transport demand management (TDM) is among the least expensive and sustainable implementations in the long term. Additionally, evidence shows that better public transport (PT) facilities are associated with a reduced amount of carbon dioxide released in several countries around the globe (Buehler & Pucher, 2011). However, when university campuses are located in a country where PT services are inferior, single-occupant car-dependency is the norm, and urban planning is anchored to vehicular movement, planning a sustainable campus becomes a challenge. This study aims at finding the best strategies to transform such campus into a sustainable transport campus. The study takes Notre Dame University (NDU) main campus in Lebanon as a case study. This paper discerns the best practices of sustainable transport campuses. Then, the assessment of the current mobility at NDU is carried out through physical assessment and investigations with respect to best practices. Based on the results, the required modifications are suggested first and then weighed via a survey to a group of experts to elaborate on the final

recommendations. At the end, an optimization model is developed to identify the best strategy of implementation.

LITERATURE REVIEW

The academic literature on developing sustainable transport practices at university campuses started to surface in the last two decades. The majority of the available research presents the experience of a certain university towards this objective. The literature shows that assessments of the existing situation at campuses are typically achieved through a data collection using direct observations, walk-ins, couple with a survey. Earlier research in the year 2003 Balsas (2003) presented the results of the surveys done on eight bicycle and pedestrian-friendly campuses. In his study, the author highlighted the major role of colleges in encouraging and promoting sustainable ways of transportation through elaborating TDM strategies, organizing, planning facilities, promoting education, and adding enforcement. Yet, he emphasized that the opposition to the implementation of these findings cannot be underestimated. The adaptability of users to the new system will take time and it must be guided with the required awareness (Balsas, 2003). Later, several studies of campuses all over the world were done to elaborate more and more on this topic. Fund et al. conducted a study at the University of Kansas (KU) to understand the reason behind the preferences of KU students to take their vehicles to reach the campus instead of using sustainable forms as cycling, walking, or taking the bus. The findings revealed that distance, ease of use, time, and weather are the major incentives for the car-dependent campus. Additionally, the locations of the bus stop highly affect the ridership. His recommendation included improving the infrastructure, rewarding the participants, motivating the users were the effective paths to follow towards a sustainable campus. The authors mentioned the importance of launching awareness campaigns in their recommendations which is in line with Balsas's proposition (Fund et al., 2012). In a study in Spain (University of Cantabria) the authors suggested different scenarios and analyzed the responses to these scenarios. To get accurate results, maps and models were designed to allow the surveyors to understand the suggestions proposed. The study also considered the financial feasibility of the suggested plan (Dell' Olio et al., 2014). In 2015, a new component of sustainable transport was investigated by Rastogi et. al. The suitability of an electric vehicle strategy was carried at a university in India. Even though the components are different from the previously mentioned studies, but the methodology followed had a lot of similarities. Then, the results showed that the tendency of students to use the electric vehicle was 70% and this number depends on the benefits and rewards received while using electric vehicles. Again, rewards were also good incentives for the new suggestion (Rastogi & Doley, 2015). In the same year, Kaplan studied the challenges of walking and bicycling at Kent State University. The researcher started by identifying the current situation, collecting data by circulating a survey, and then analyzing the results. Therefore, the author identified the barriers and motivators to increase non-motorized transportation (Kaplan, 2015). Following the same interests of turning the

campuses into sustainable transport campuses, in 2018, a study elaborated on these challenges at the Eastern Mediterranean University. The results were tackling not only the physical infrastructure but also the management of the policies required (Dehghanmongabadi & Hoşkara, 2018). Another research study concluded that informing students regarding the environmental problems raising nowadays increases their tendency to adopt sustainable mobility and thus decreasing the car-dependency factor (Cattaneo et al., 2018). Moreover, the research at the University of Sao Carlos (Brazil) discerned the barriers, motivators, and strategies to encourage sustainable transportation on the campus. While the purpose is the same but a slight difference in the data collection is adopted. A special adaptive application was developed to collect data from all the students, staff, and faculty members. According to their study, owning a car was a major barrier to walking, cycling, and riding a bus; also, weather conditions and the need for additional stops on the road. Whereas the main reasons to prevent cycling depended on the risks of accidents and the absence of cycle paths on the campus. Finally, the main reasons to be a car-dependent member were the excessive travel time, the need for additional stops, and the weather conditions. Regarding the motivators, the benefits for health and the limited parking spots changes the behavior of members in the choice of a sustainable mode of transportation. Mainly, riding a bus had a major rating for the benefits of saving money and reducing air pollution (Stein & Rodrigues da Silva, 2018). At Qatar University, the barriers on the campus were identified to transform into a sustainable campus. The main constraints were the danger when crossing the roads, the absence of shadings, long trips distances, and the deficiency in the number of busses. Several recommendations were proposed; first, establish monitoring and reporting of the mobility inside the university. Second, the improvement of the road connectivity between buildings and the construction of effective pedestrians and bicycle pathways. Third, an improvement in the level of bus services is highly needed. Lastly, educating the members on the importance of the behavior change through awareness campaigns, specific programs, along with launching the incentives and rewards (Azzali & Sabour, 2018). In 2019, a study was performed at the University of Cantabria in Spain. In this study, the parking stalls availability were taken into consideration. Based on user preferences, an optimization model was developed to minimize the number of empty spaces in the parking and maximize the income per parking space. And finally, this work lead to the development of parking policies to promote sustainable mobility (Dell' Olio et al., 2019).

METHODOLOGY

The methodology followed in this research utilized multiple approaches. Based on the literature review, sustainable transport aspects that can be applied on campus are established as shown in Table 1. These aspects are developed such that it can contribute to achieving the objectives of sustainable transport of limiting the negative impacts of this sector on the environment, the society, and the economy. To achieve these objectives, one main heading surfaces that are to reduce the

number of fossil fuel vehicles on the streets. Three directions are discerned to do so: promote zero-emission mobility, improve PT services and shared transport, and manage your vehicular fleet. These aspects are further divided as either infrastructural provisions or policies. Once sustainable transport aspects are determined, the campus is assessed accordingly. Assessment of these aspects is done through the revision of existing maps, extensive site investigation, verifying codes, and standards compliance in addition to reviewing existing campus policies.

Table 1: Sustainable Transport Aspects

	Components	Infrastructure Provisions	Policies
Zero-Emission Mobility	Pedestrian Facilities	• Design Compliance • Continuity • Connectivity • Equipment (benches, shaded, lighting, handrails) • Special needs facilities	• Policies that protect the rights of special needs
	Cycling Facilities	• Cycling Lanes Design Compliance • Cycles Dedicated Parking	
Public & Shared Transport	Public Transport Service	• Availability • Frequency • Facilities (bus stops) • Comfort	
	University Shared Transport Service	• Availability • Frequency • Facilities (bus stops)	
	Car Pooling	• Applications that manage carpooling	• Policies that provide incentives to encourage carpooling
Private Vehicles & Parking	General Parking Facilities	• Design Compliance • Limit travel time (signage, operation design) • Safety of Pedestrians Safety and vehicles • Smart management	• Fees schemes/ incentives that decrease private vehicular usage
	Special Needs Parking Facilities	• Availability • Design Compliance	• Parking priority • Fees breaks
	Electric Vehicles	• Charging Stations	• Parking priority • Fees breaks that encourage usage
	Alternative Fuel Vehicles		• Parking priority • Fees breaks that encourage usage

The codes and standards include the International Building Code (IBC), AASHTO standards, Urban Land Institute (ULI), and the Lebanese Building Law. After the assessment is done, deficiencies are highlighted and several improvement recommendations are suggested. These recommendations were weighed using a Likert scale by a group of NDU experts through a survey that was circulated to them. These experts are chosen because of their good expertise in sustainability and familiarity with the local conditions and prevailing travel behavior.

CASE STUDY BACKGROUND

NDU is Lebanon's well-known non-profit Catholic institution of higher education. NDU has three campuses, North, Shouf, and the main campus in the small city of Zouk Mosbeh. During the fall semester of 2017, NDU had 652 faculty members and a total of 6255 students enrolled. On average, 30 students suffering from physical disabilities were registered (Office of Institutional Research and Assessment, 2017). The scope of this study covers the main campus which encompasses the buildings that house seven faculties, auditoriums, libraries, cafeterias, gym, sports courts, dormitories, laboratories, observatory, and nine different parking areas. Figure 1 shows the master plan of the university.

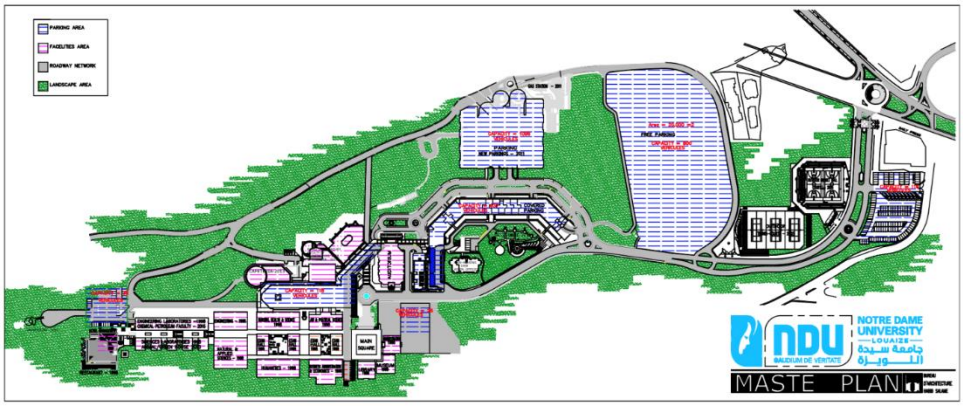


Figure 1: NDU main campus master plan

The total built-up area of the campus is 85,753 m^2. This divided into three parts: 36% of roads, pathways, and landscaped areas, 35% built-up areas, and 29% parking areas. The campus is located along the Zouk Mosbeh - Ajaltoun highway where the campus has a mountainous topography with a difference in elevation on campus reaching 65 meters.

NDU CAMPUS ASSESSMENT RESULTS

Zero-emission mobility

Zero-emission mobility covered pedestrian and cycling facilities. In terms of pedestrian facilities, the coexistence of pedestrian movement and vehicle movements is studied by taking into consideration pedestrian safety and comfort. The campus should provide means of egress which are continuous and unobstructed from any occupied portion of a building or structure to a public way. The critical components assessed were the pedestrians' main pathways at campus including stairways, ramps, hallways, and sidewalks. The following results were found. The stairways all over campus seem 100% compliable with the International Building Code (IBC) since they have the required egress width, riser heights, and tread depths. As for the ramps, 70% of them appear to comply with the code in terms of their width, slope, and handrail existence. Main hallways are the ones that are used frequently, and they are the main mean of circulation provided on the floor. Secondary hallways are less frequented paths that do not connect major components of the campus and they are not the only means of access to the floor. 33% (5 out of 15) of the main hallways and 39% (11 out of 28) of secondary hallways fulfill the IBC criteria. For example, two corridors 4 and 6 have the same design. Corridor 4 (C-4) is classified as a main corridor since it is the only means of access to the engineering department from the ground floor, while corridor 6 (C-6) links the business faculty and the main area in front of the bookshop and it is classified as secondary since it's not the only route of access for both areas from the ground floor. C-4 is a critical corridor since it serves a high pedestrian traffic flow with a low width of 120 cm and thus it leads to an all-day congested section of the corridor.

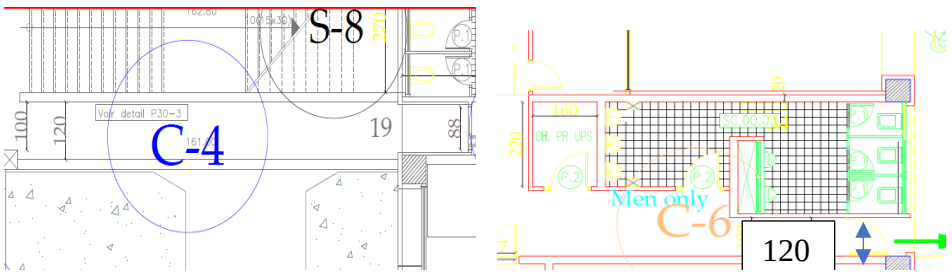


Figure 2: Maps of corridors 4 and 6

Comparing the sidewalks to AASHTO standards shows that 60% (3 out of 5) of them do not conform to the requirements. These results are shown in Table 2.

Table 2: NDU sidewalks width with respect to AASHTO specifications

	Width(cm)	Minimum Width(cm)	Best Practice Width(cm)
Sidewalk-1	295	120	240
Sidewalk -2	100	120	240
Sidewalk -3	100	120	240
Sidewalk -4	110	120	240
Sidewalk -5	174	120	240

Additionally, a major impediment to pedestrians at the NDU campus is sidewalk discontinuity. This discourages students and staff members from attempting to use walking as a main means of transportation to and from the campus as it creates a safety issue. Besides, the campus includes a lot of planted green areas that are aesthetically pleasing and create a nice environment for walking; however, the plantation is not well pruned which reduces pathway width. As regards the cycling facilities, none were existing on campus in any form.

Public transport

PT is a fundamental component of both the larger campus sustainability ideology and the efforts to minimize the negative impacts transportation has on our university and the surrounding environment. Since mass transit is a major player in reducing the number of vehicles entering the campus, PT was assessed in the context of the campus surroundings. The assessment looked at the following elements: the availability of PT, its frequency and travel time, the facilities, and the comfort level it provides. The results showed that PT services are inferior. Commuters come to campus from different directions where in most cases they need to make several connections using different forms of PT from buses to minivans, to shared taxis. Using PT can cause them an additional 30% up to 300% of travel time. The frequency varies depending on the time of the day and it is not reliable. All students using PT complained about the lack of comfort. On the other hand, using PT can be cheaper in terms of cost, depending on your destination. Currently, around 12% of NDU members use PT in some form. PT for special needs is nonexistent. As regards campus shared transport, the assessment indicated that such a system only exists between NDU campuses, however, its operation is limited to certain days and makes one trip per day only.

Vehicles & Parking

Several parking lots are scattered around the entire campus offering 2850 stalls. This number includes both free and paid parking lots and it is equivalent to 71,250 m^2 of area devoted to automobile movement and storage. The stalls number exceeds the requirement of the Lebanese building code or the Land Transport Authority standard which requires 1150 and 327 respectively. Parking geometric design was checked with respect to the Urban Land Institute (ULI) and the

Lebanese Building Code. The provided parking complies with the requirements in terms of design, however, the safety of pedestrians was not considered in the old parking lots. The available number of paid parking stalls is 1600 stalls. This supply is greater than the peak student demand of 1400 which encourages students to reach NDU by their vehicles. Also, this parking holds a large in-vehicle search time which tends to decrease the level of service of the parking. No smart parking management system was found to exist. Finally, the required parking fees are considered low which by their turn encourages their own-car usage. Thus, modifying the parking fee structure may discourage students from using their private cars.

Proposed Improvements

Based on the assessment and its analysis, fourteen improvement actions are suggested that took into consideration the existing conditions in the country regarding PT. These improvements are categorized as infrastructure provision or policy. At the infrastructure provisions 1) Rehabilitating NDU's parking spaces to provide safety for pedestrians, 2) Restructuring the roads, sidewalks and some hallways to provide efficient pedestrian movement, 3) Providing sidewalks furniture such as benches and lights, 4) Dedicating bike lanes at NDU roads and bike parking's spots. 5) Converting part of the free parking for recreational spaces: food trucks and landscaped areas. 6) Developing pedestrian and bikers' directional maps that extend to NDU's surrounding community. 7) Providing private NDU bus transport from the main bus station on the highway to NDU. 8) Using carpooling App and providing priority parking stalls to car-poolers along with reduced parking fees. 9) Installing electric vehicles charging stations to encourage the use of electric vehicles. 10) Ensuring 100% accessibility for special needs. At the policy level: 11) Providing the option of online courses or work-from-home especially during traffic peak hours. 12) Changing and increasing the on-campus parking fees. 13) Dedicating priority parking spaces for hybrid and electric vehicles. 14) Reducing parking fees for the owners of electrical and hybrid vehicles.

Once the list of improvement is established, planning its implementation for the next seven years was done using the optimization model. Out of the 14 recommendations stated, nine were identified by the model considering the yearly budget of $20,000. Increasing this budget can allow the implementation of additional recommendations such as restructuring the roads and sidewalks, assigning private NDU bus transport from the highway to NDU, and providing charging stations for electrical vehicles. Table 3 summarizes the actions and the best year to implement them.

Table 3: Suggested recommendations, their objective and the year to implement them

	Action	Objective
Year 2	1)Dedicating bike lanes at NDU roads and bike parking spots.	Encouraging the usage of bikes (especially by dorm's students).
Year 3	2) Redesigning NDU's parking spaces to provide safety for pedestrians.	Having safety and comfortable walks from parking.
	3) Developing pedestrian and bikers' directional maps that extend to NDU's surrounding community.	Encouraging people to walk and bike instead of using their cars.
	4) Encouraging the use of electric vehicles.	Reducing fuel consumption and pollution.
Year 4	5) Using carpooling App and providing priority parking stalls to carpoolers along with reduced parking fees.	Decreasing the number of cars reaching NDU's main campus.
	6) Reducing parking fees for the owners of electric vehicles.	Encouraging people to opt for an electric vehicle.
Year 5	7) Applying for online courses especially during traffic peak hours.	Decreasing the number of cars reaching NDU's main campus.
	8) Dedicating priority parking spaces for the owners of electric and hybrid vehicles.	Encouraging people to opt for an electric and hybrid vehicle.
Year 7	9) Providing sidewalks furniture such as benches.	Encouraging people to walk instead of using their cars.

CONCLUSIONS AND RECOMMENDATIONS

To conclude, the purpose of this study was the development of an optimum strategy that will be submitted to NDU's administration to implement to convert the campus into a sustainable transport campus. The study utilized different approaches to come up with its recommendation including site investigation of existing facilities and its operation, related codes and standard compliance checks, a limited survey, as well as an optimization model to find the optimum plan of action. It is concluded that improvement actions must not emphasize the PT for the near term considering the inferior level of PT in the country. On the other hand, focusing on walking, cycling, and carpooling can bring about noticeable positive impacts. Encouraging the usage of electric and hybrid cars is also recommended. Policies and TDM can be effective tools, especially when the direct budget is constrained. Fourteen improvement actions were proposed out of which nine can be implemented in the next seven years when the limited budget is available. These suggestions could be used by practitioners when designing campuses that pursue sustainable mobility on campus.

REFERENCES

Azzali, S., & Sabour, E. A. (2018). A framework for improving sustainable mobility in higher education campuses: The case study of Qatar University. *Case Studies on Transport Policy*, *6*(4), 603–612. https://doi.org/10.1016/j.cstp.2018.07.010

Balsas, C. J. L. (2003). Sustainable transportation planning on college campuses. *Transport Policy*, *10*(1), 35–49. https://doi.org/10.1016/S0967-070X(02)00028-8

Buehler, R., & Pucher, J. (2011). Sustainable transport in freiburg: Lessons from germany's environmental capital. *International Journal of Sustainable Transportation*, *5*(1), 43–70. https://doi.org/10.1080/15568311003650531

Cattaneo, M., Malighetti, P., Morlotti, C., & Paleari, S. (2018). Students' mobility attitudes and sustainable transport mode choice. *International Journal of Sustainability in Higher Education*, *19*(5), 942–962. https://doi.org/10.1108/IJSHE-08-2017-0134

Dehghanmongabadi, A., & Hoşkara, S. (2018). Challenges of promoting sustainable mobility on university campuses: The case of Eastern Mediterranean University. *Sustainability (Switzerland)*, *10*(12), 1–22. https://doi.org/10.3390/su10124842

Dell'Olio, L., Bordagaray, M., Barreda, R., & Ibeas, A. (2014). A methodology to promote sustainable mobility in college campuses. *Transportation Research Procedia*, *3*, 838–847. https://doi.org/10.1016/j.trpro.2014.10.061

Dell'Olio, L., Cordera, R., Ibeas, A., Barreda, R., Alonso, B., & Moura, J. L. (2019). A methodology based on parking policy to promote sustainable mobility in college campuses. *Transport Policy*, *80* (April 2018), 148–156. https://doi.org/10.1016/j.tranpol.2018.03.012

Fund, A., Hall, A., Gorby, C., Siegel, D., Wolf, E., Burdett, J., Gathunguri, M., & Project, C. S. (2012). *Sustainable Transportation at the University of Kansas*. 1–20.

Horn, B. E., & Jansson, A. H. (2000). Traffic Safety and Environment. *IATSS Research*, *24*(1), 21–29. https://doi.org/10.1016/s0386-1112(14)60014-5

John, A., Jakle, K. A. (2005). *Lots of parking*.

Kaplan, D. H. (2015). Transportation sustainability on a university campus. International Journal of Sustainability in Higher Education, 16(2), 173–186. https://doi.org/10.1108/IJSHE-03-2013-0023

CDR. *Environmental and social impact assessment (ESIA) for the bus rapid transit (BRT) system between Tabarja and Beirut and feeders buses services.* Beirut: ELARD, 2018.

Mohamad Zulkifli, Siti Nur Awanis, Abdul Azeez Kadar Hamsa, Norzailawati Mohd Noor, and Mansour Ibrahim. "Evaluation of land use density, diversity and ridership of Rail Based." Transportation Research Procedia 25, 2017: 5266-5281.

Ogra, A., and Robert N. *"The Role of 6Ds: Density, Diversity, Design, Destination, Distance and Demand Management in Transit-Oriented Development."* Neo-International Conference on Habitable Environments. Johannesburg, South Africa: University of Johannesburg, n.d. 539-546.

Poinsatte, F., & Toor, W. (1999). *Finding a New Way: Campus Transportation for the 21st Century*. Retrieved December, 83. http://scholar.google.com/scholar?hl=en&btnG=Search&q=intitle:FINDING+A+NEW+WAY+:+CAMPUS+TRANSPORTATION+FOR+THE+21ST+CENTURY#0

Rastogi, R., & Doley, G. (2015). *Sub Theme II – Policies and countermeasures for motorised and non-motorised transport*. *April*.

Stein, P. P., & Rodrigues da Silva, A. N. (2018). Barriers, motivators and strategies for sustainable mobility at the USP campus in São Carlos, Brazil. *Case Studies on Transport Policy*, *6*(3), 329–335. https://doi.org/10.1016/j.cstp.2017.11.007

WHO Regional Office for Europe. (2017). Cities. Transport, health and environment. In *European Environment and Health Process*. http://www.euro.who.int/__data/assets/pdf_file/0019/341128/Fact-Sheet-1-City-Transport-health-and-environment.pdf?ua=1

TRACK 8: PEDESTRIAN FRIENDLY CITIES TO SUPPORT CLIMATE CHANGE

Track Chairs:

Matevž Juvančič,
University of Ljubljana, Faculty of Architecture, Ljubljana, Slovenia and

Ognen Marina,
Ss. Cyril and Methodius University in Skopje, Faculty of Architecture, Skopje, Republic of North Macedonia

Walkability and pedestrianization have come to dominate our visions of ideal cities. We can agree on the main benefits of pedestrian friendly urban environments: lively streets, safe and less stressful places, exercise without exercising, providing livelihood for dense and mixed-use programme at eye level, vicinity of functions, more opportunities for social interactions, etc. These create the cities in which we would all like to live in. Based on predominantly individual perception, we sometimes forget the larger benefits and influences on sustainable way of life. Does being able to walk really reduce the need to use the car and commute? Every last inch of the city cannot be a pedestrian zone: what 'pedestrian friendly' really means and what appropriate levels do we envision? Is it about the access, enjoying walking or cycling, preferring the 'on foot' mode over the others or excluding the others? Does pedestrian friendly also mean carless society and car free streets? To which of the main pillars of sustainability do pedestrian friendly cities bring the most and which ones get usually overlooked?

Keywords: Walkability and Pedestrianization, Sustainable Way of Life, Meaning of 'Pedestrian Friendly', Encouraging Active Lifestyles by Urban Design

WALKABILITY THEMES AND PRINCIPLES EXAMINED ON LJUBLJANA CITY CENTRE AND JUŽNE FUŽINE NEIGHBOURHOOD

Matevž Juvančič[1]
Assist. Prof., PhD, University of Ljubljana, Faculty of architecture, Zoisova c. 12, 1000 Ljubljana, matevz.juvancic@fa.uni-lj.si

Kaja Žnidaršič
architect-urbanist, recent graduate of University of Ljubljana, Faculty of architecture, kaja.znidarsic@gmail.com

ABSTRACT

The contribution examines different approaches to- and definitions of- walkability, attempts to unify, link and translate them from abstract themes to more practical and implementable walkability principles. It continues with the assessment of two, very different districts of Ljubljana, city centre and newly planned, unbuilt, Južne Fužine residential neighbourhood. In both cases we analyse walkability themes through infrastructure provision and built context, pedestrian network, supported activities and establish key differences between them. The goal of comparison is not to declare which district is more walkable, but to identify the differences between them and compare walkability principles implementation and integration methods considering their spatial and socio-historical differences.

Keywords: walkability, Ljubljana, holistic approach, integration, urban design

INTRODUCTION

In the debates on the walkability and pedestrianization we often encounter principles and illustrative examples from retrofitted environments that predominantly show segments or partial implementations of those principles. Only rarely we come across an integrated, deliberate and explicit application of guidelines and principles in newly planned neighbourhoods. This is not trying to diminish the efforts of contemporary planners that intuitively incorporate (and had done so also in the past) aforementioned walkability and pedestrianization principles into the design of cities and neighbourhoods, but rather an example of how we can, not only deliberately design and facilitate the principles through the design of urban spaces, but also demonstrate, visualize and explain the benefits to different target groups. Rather than looking at individual places and designing them as independent interchangeable pieces we are arguing that the experience of

[1] Corresponding author

walking creates a continuous and unique spatial narrative which needs to be understood and designed as such. As users we are perceiving the environment on the experiential basis, through sequences, by moving through them. (This kind of experience is also a unifying and shared across the widest variety and number of users, regardless of their backgrounds and cultural affiliations.) Looking at individual places rather than an interlinked network of them, hinders incorporation of many decisive factors that accompany moving along a certain path, especially the experience of variety, intensity and density of activities, moments of saturation and moments of quieting down and contemplation, the much-needed rhythm and interchanging of characters by which we also remember places and the path itself. Whereas individual places can be well designed it is their interlinking and the design of the spaces between that define or at least majorly contribute to the wholesome user experience at the end. Rather than address the most interesting or (for the design and designer) most attractive places in a neighbourhood, we exemplified the approach by looking at the path, a walkable experience, through the whole neighbourhood or district and address all spaces that the path transits. Although we realize there is almost an infinite number of variation of paths the users will take and experience, we can, by careful selection of certain scenarios and envisioned paths better define, pace and integrate the principles of walkability and liveable open spaces into the design of future neighbourhoods.

While trying to observe and asses the two diametrically different places in Ljubljana (Slovenia), we came across different approaches and definitions of walkability, which we felt, needed to be unified, linked and translated from more abstract to more practical and implementable ones. Thus we first establish the walkability as a notion, look at it in more detail through key themes (Forsyth, 2015), expand on them and connect them with walkability principles of other researchers and publications. We also add our perspective and insight into the broad, popular and widely accepted notion of walkability.

CONCEPT OF WALKABILITY AND WALKABILITY PRINCIPLES

The term walkable has been present for a long time, probably in use since at least 18th century (Oxford English Dictionary), but the term walkability is more recent. It is a noun derived from adjective walkable. Walkability is a concept, more of an abstract notion, for which there is no official definition, but variety of understandings and explanations adapted to the context in which we are attempting to define this term. We start with the definition of Slovenian Institute for spatial policies ("Hodljivost - IPoP - Inštitut za politike prostora", 2020) where they defined walkability as a spatial attribute, the appeal of the space trough which pedestrians can move easily and uninterrupted. With this further more explained concept of walkability, urban planners are creating environment for pedestrians that is safe, functional, comfortable and interesting at the same time.

While the European cities, built long before cars, are inherently walk-friendly ("Why cities are bringing walking into focus", 2019), modernity and fast pace of cities' growth, population health issues, combined with sustainability efforts, forced a rethink of how we live and move in our towns and neighbourhoods. The concept thus emerged from the most car-reliant societies and started to permeate our way of thinking about urban environments even in more pedestrian attuned localities. It is increasingly becoming the measure of liveability and synonymous with good and successful design.

The concept of walkability covers a broad range and variety of different urban design concepts. Jeff Speck in his book Walkable City (2012) divides them into four main categories titled "The Useful Walk", "The Safe Walk", "The Comfortable Walk" and "The Interesting Walk". Every aforementioned component of walkability includes many subcategories, from which we would like to point out the most important, common and intelligible ones: traffic safety, security, mixed-use, space legibility, suitable distances, green system, diversity, spatial sequences and soft-edges. Even though Iderlina Mateo-Babiano (2015) managed to divide all of the six main pedestrian needs into a hierarchy (based on Maslow pyramid) and according to that ranked principles by their importance, we do not think that there is only one exact approach and only one correct sequence of principles and their application. We wold like to point out the fact that every space has its own needs and characteristics, so walkability principles and the way of their incorporation into specific environment have to be modified and adjusted to serve the needs of a chosen space. It is also important to understand that walkability principles are not isolated urban planning ideas, but with variety of other planning and designing principles intertwined methods for enhancing quality of public space and therefore public life. Walkability principles and the general concept of walkable cities and neighbourhoods are beneficial in many ways, on many different levels and have positive impact on environment, society and economy. Walkability plays a key role in providing vital, lively, healthy, and sustainable city. It promotes physical activity and thus has a positive impact on health and wellbeing of city's residents. Therefore walkability principles are not beneficial only in the discussed field of walkability, but are also very important for the whole concept of a city life, which is illustrated nicely by Speck's quote: "Get walkability right and much of the rest will follow."

Walkability is deemed essential by Sim (2019) as it is present in every single, built relationship, building where people live, work and move and can significantly contribute to sociability.

According to Gehl (2010), we consider walking as a prerequisite for lively city and majority of social interactions. Walkable city offers people an opportunity to walk and motivates them to choose walking over some of the less sustainable means of transport. Furthermore, walkability plays a huge role encouraging people to walk regardless of the walks purpose and motivates them to walk not only because they have to (goal-oriented walks), but also because they want to (walks for the sake of enjoyment and pleasure).

Accessibility and Walkability

Closely tied to the idea of walkability is the concept of accessibility. Even so, they are somewhat similar and in a way interdependent, they are not the same. The term accessibility relates to the idea of ability to access a particular service or activity and is measured with distance or time. While walkability focuses more on the sensorial experience of space. We can understand walkability as one of many components of the whole idea of accessibility and vice versa. There is also an overlap between walkability and pedestrian-oriented planning and places (Lo, 2009) that have been in use before the term walkable became the norm.

ACHIEVING HOLISTIC WALKABILITY

In todays' urban design and planning field, application of walkability principles differs not only by the selection of principles and ways of their implementation, but also whether they are implemented into individual, isolated environments or deliberately incorporated into the whole picture, a series of interconnected ambiences.

Holistic approach in planning and designing of walkable cities and neighbourhoods is becoming essential, as this is the only way urban designers can design open public space that are well connected and offer pedestrians unique, continuous and narrative spatial experience. The integrative approach is extensive and more demanding in nature, but also more effective in comparison to individual small-scale projects, which are often designed in isolation or with limited possibilities of linking to already established and built surrounding places.

While Forsythe (2015) takes holistic solution as one of the proxy definitions for defining better environments that generate investment, are more sustainable and are in generally better places to be in, we would like to take the integrative and holistic design approach further, arguing that it is not only a proxy indicator of walkability, an outcome, but rather a means to an end and a planning instrument towards better walkability outcomes. By planning of the walkability experiences in integrative fashion, as a series of interconnected and continuous places and flows, we can achieve better and more holistic results.

Our experience of urban environments as pedestrians is predominantly experiential. This is significant, because such an experience is common to all of us regardless of age, status and interests. It is based on our sensory apparatus and perception (also limited by it, e.g. vision: field of view), on our exploration by moving, relative scales and estimations rather than factual measurements, first person perspective and intuition. Cullen (1961) has summed it up with his notion of serial vision and also continued to establish the users relative positioning in regards to the places she moves through (outside, entering, being in the middle, leaving them, etc.). The design of such places has to adapt to these findings and is

by following them, in essence democratizing the experience to all users and user groups.

IDENTIFYING WALKABILITY PRINCIPLES

As introduced above, concept of walkability consists of many interconnected principles, which when implemented deliberately and consistently provide safe, useful, comfortable, interesting and therefore walkable network of open spaces. We can also understand and use those principles as criteria for measuring and comparing walkability of different places. It is predominantly qualitative rather than quantitative assessment. Based on those criteria, we can evaluate, as we did below, and compare different spaces to establish which ones are more walk-friendly.

Forsyth (2015) divided *key themes and dimensions of walkability* (from here on referred to as *walkability themes* or *key themes*) in three clusters: means (traversable, compact, safe, physically enchanting), outcomes (lively and sociable, sustainable transportation options, exercise including) and proxies (measureable, holistic solution). All of above-mentioned are interconnected; they all define walkability and walkable places, but not all of them are always present at the same time, at the same level and they also differ depending on the specific environment.

For the purpose of our case studies, we derived our *walkability principles* and their definitions from Forsyth's (2015) *themes and dimension*, modified them and combined them with already mentioned Speck's (2012) categories of walkability. By doing that, we broadened the scope and systematics of notions in order to cover as much aspects of walkability as possible. Some of the Forsyth's (2015) themes include more principles then others, while some of them are principles themselves. We will discuss her themes along with their definitions later on in the paper and compare them with *our* walkability principles. These were picked and formed out of Speck's Walkable city (2012) – *safe, useful, comfortable* and *interesting* and combined with other authors' contributions in the field.

Before we go into the comparison we would like to review and establish which principles fall into particular category:

- ***Safe*** environment for walking, according to walkability debates, Gehl (2010) and Speck (2012) is the one who provides both, traffic safety for pedestrians and feeling of security. This category includes principles for achieving traffic safety and principles for achieving sense of security. The first one is more of a technical principle, closely tied to traffic engineering, while the second one is more of a sociological theme, very well presented with Jacobs's (1961) *"eyes on the street"* concept of people presence.

- ***Useful*** environment considering pedestrians is compact and expresses the idea of destinations being close to each other in a range of a so-called walkable distance, which we can describe and measured both, with time and distance. In order to reduce distances and provide compactness of the city or neighbourhood we implement mixed-use principle. Proximity of everyday destinations plays a very important role in making city space functional and therefore useful. Furthermore, essential for usefulness of the space is legibility of the space, which we can understand as one of the walkability principles.

- ***Interesting*** environment for walking is diverse and enticing; it consists of many different architectural and open space design practices, is intriguing and offers many different activities. Principles that fall into a category titled interesting are diversity of both, physical space and activities, soft-edge principle of merging inner and outer space and space sequencing concept of multiple views.

- ***Comfortable*** environment for pedestrians is the one where pedestrians can walk about without meaningless interruptions. Where there are direct lines of walking, when perceived distance is shorter than the actual physical distance, where there is enough space for comfortable walk and the environment is overall traversable. Considering this category of walkability principles urban greenery is also very important, because it provides shade for pedestrians, which is especially important during summer time.

Key Themes and Dimensions interpreted and compared with walkability principles

In this chapter, we will look at each *key theme of walkability* (Forsyth, 2015), interpret it and offer suggestion for widening of some notions as well as renaming the others for clarity purposes or to introduce new, extended meaning.

We will look at the **means** first. According to Forsythe (2015) "**traversable** environments have the basic physical conditions to allow people to get from one place to another without major impediments, for example, relatively smooth paths." Traversable is walkability aspect, which falls into a category of comfort, amongst with urban greenery and many other design principles that make space appealing and comfortable to walk through. We suggest the term "***comfortable***", because it covers both, traversability as introduced by Forsyth and widens its meaning by adding assessment beyond mere utilitarian, including different groups and levels of comfortability of traversing.

For Forsyth (2015) **compact** places provide short distances to destinations for those who are walking for utility. The term compact covers the already introduced principle of proximity and short distances between everyday destinations. This

Forsyth's theme therefore falls in to the aforementioned category of usefulness of the space, but is concrete and suitable for the purpose of our case study. In comparison to our term useful, it does not cover the principle of legibility of the space, but covers the principle of mixed use. We kept the term "compact", which will in our case include both, proximity and mixed-use, but exclude legibility of the space, which we will discuss later on.

Forsyth (2015) states that **safe** spaces should be understood as: "[…] places being safe for walking – perceived and actual crime and perceived and actual traffic safety." The denoted meaning of "safe" is aligned with above definitions, which include walkability principles for achieving traffic safety and general feeling of security.

For Forsyth (2015) **physically-enticing** environments: "[…] have full pedestrian facilities such as sidewalks or paths, marked pedestrian crossings, appropriate lighting and street furniture, useful signage, and street trees. They may also include interesting architecture, pleasant views, and abundant services attractive to those who have other choices for getting around and getting exercise." Forsyth's definition of the term is very broad, it covers many different aspects of physical qualities of the space. It includes some themes, which could also fall into some of the above-mentioned themes. For example, sufficient lightning and pedestrian facilities are more suitable for category safe, trees on streets were already mentioned in category comfortable and service attractiveness and diversity is already considered in the compact category.
Many of those principles overlap, are interconnected and interdependent, so therefore we will not leave the mentioned ones out. Instead, we are substituting physically-enticing with "***interesting and functional***", which cater to Forsyth's definition and at the same time add some of the abovementioned principles – legibility of the space, variety of built and open space morphology, concept of space sequences and soft-edge principles.

One of the **outcomes** themes are **lively and sociable** places are pleasant, clean, and full of interesting people, according to Forsyth (2015). Also, Gehl (2010) emphasizes the importance of walking and describes it as one of the prerequisites for lively and sociable city. We agree with poetic definition, which denotes these characteristics well and is aligned with ours and common understanding of these notions in their broader socio-economic meaning.
When it comes to **sustainable transportation options** we suggest broader term ***sustainable*** (in general), that goes beyond Forsyth's (2015) transport focused understanding: "[…] to achieve both the environmental preservation and social equity components of sustainable urban form providing sustainable transportation options." Sustainable in general, additionally to sustainable transportation options, covers some additional outcomes, such as sustainable aspects of microclimate design and control, energy efficiency, sustainable design and maintenance practices, etc.

For Forsyth's (2015) health focused **exercise-inducing** where she sees benefits in: "[…] higher than average levels of walking either in total or for transportation or exercise," we suggest broader term "***inviting to move on foot***" that covers both, the idea of inducing exercise and the concept of choosing walking over some other, less sustainable, transportation options. This theme therefore covers a wide range of health benefits for space users and city residents, but also alludes to spaces that invite people to walk (and cycle) and encourage them to do so, not only for health benefits but also because it is more practical, less time consuming for short distances, provides more experiences and sensorial inputs, promises more social interaction, is less tedious and more fun than e.g. driving a car. Some of this qualities are already reflected through both above-mentioned outcomes – lively and sustainable, however we decided that "inviting to move on foot" is a defining quality or outcome that deserves to be singled out.

Table 1: *Key walkability themes* (Forsyth, 2015) paralleled and concretized into more operational terms of *walkability principles*

Key themes	*Walkability principles*
Means	
Comfortable	– traversable environment • physical conditions (smooth paths, same level paths, without obstacles and interruptions, enough space, wide paths, direct lines of walking) • psychological conditions (spatial sequences, avoiding tiring one-point perspective, vertical facade articulation) – presence of urban greenery (pleasant microclimate, provided shadow, visual appeal)
Compact	– proximity of destinations • mixed-use (offering different activities, different use facilities, closeness of different services, diversity of use) • short distances (high density, proximity of services) – accessibility (services are accessible, physical accessibility for different users)
Safe	– traffic safety (pedestrian infrastructure, crosswalks, speed reduction methods for motorized traffic, well-defined and designed traffic space) – feeling of security (presence of people, liveliness of the space, pleasant design of open spaces)

Interesting and Functional	– pedestrian facilities (paths are well connected, presence of pedestrian infrastructure, accessible services on foot) – overall physically enticing (presence of street furniture, sufficient lightning, pedestrian infrastructure mentioned above) – service attractiveness and diversity (similar to mixed-use concept) – legibility of the space (hierarchy of paths, intersections, nodes, landmarks) – diversity (of visual design and activities present) – space sequences (avoiding one-point perspective, serial vision concept) – soft-edge concept

Forsyth's (2015) **proxy definitions** are complex and as she states, draw together elements of prior themes. We agree with the complexity that **multidimensionality** and **holistic solutions** bring in the equation of walkability and are thus taking over the proposed definitions. However, due to their broadness and derivative nature of previous themes (notions), we abstain from measuring them in our case studies and rather use them for summary of before mentioned topics and principles. However, we also single out holistic solutions as a mean in an integrative approach, especially in the design of new districts and neighbourhoods, where the holistic integration into the initial design brings many benefits over later retrofits.

To conclude the interpretation, we agree with Forsyth's definitions to a wide extent, however we felt the need to broaden some of them, include additional aspects, which we deemed important and at some instances rename them in a more obvious fashion. To make the *themes* more operational for design and evaluation purposes, we also systematically translated and concretized them in Table 1 into more graspable *walkability principles*, especially in the *means* category, which we see as an urban designer's intervention and tools palette.

COMPARISON OF TWO CITY DISTRICTS

Methodology

We tested the proposed unified and modified walkability themes and principles on two case studies in Ljubljana (Slovenia). Slovenska cesta – Čopova ulica – Trubarjeva ulica sequence of spaces are located in the core city centre district and Južne Fužine neighbourhood, on the periphery of the city. We intentionally selected one that has already been built, is established and involves many layers from different time periods, and the other that is a proposal, the difference being that in the first case all walkability interventions are in a sense a retrofit, while in the planned one, the principles can be an integrative part of the holistic planning.

What we lose by potential speculation about the use and success of the one that has been in planning stage, we gain by its different predominant space use and built-in walkability principles for comparison purposes between two very different city districts.

We analysed walkability themes and principles in both cases and tried to identify whether they are present and in what way they are contributing to the walkability themes of the space. The goal was not to decide which district is more walkable, but to identify the differences between them and compare walkability principles implementation methods considering spatial differences.

As discussed in previous subchapter, we adjusted and expanded Forsyth's themes for the needs of the case study and we are still following Forsyth's methodology, adjusted accordingly (Figure 1). Forsyth's evaluation is based on identifying of the themes and their presence in the specific environments, with additional analysis of which principles for each theme are represented.

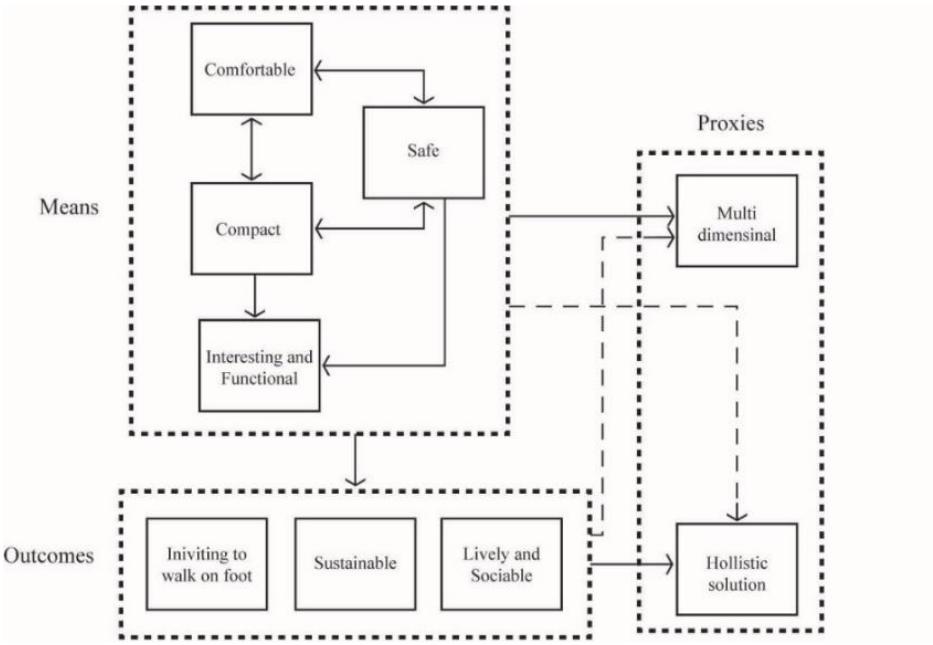


Figure 1: Linking modified *key themes* of walkability into an existing scheme (initially proposed by Forsyth, 2015 and modified by the authors of the paper)

Ljubljana City Centre

Slovenska cesta – Čopova ulica – Trubarjeva ulica sequence of streets

This is an example of existing built environment adaptation with walkability principles, which were implemented in numerous ways and result in many different aspects of city life, not just walkability. After the initial renewal projects, which were based on the concept of pedestrianization, streets became more attractive, traffic safety increased and the spaces became livelier. Even though pedestrianization was the initial and predominant walkability principle, municipal urban designers introduced and encouraged some other solutions, such as Slovenska cesta shared space (Figure 2).

Ljubljana city centre is a great example of how, with a long term vision, a combination of small-scale individual projects stretched through a longer period of time merge and become one whole. Even though initially many of those projects were isolated from each other, they linked up and came out well connected. All together resulting in a walkable, pedestrian-friendly environment. Many of those were planned all along, some of them resulted in on the spot adjustments. However, it is amazing how these individual projects achieve pleasant and continuous spatial narrative in existing environment (Figure 3).

Figure 2: Slovenska cesta – shared space concept, car free, public transportation zone only

Figure 3: Čopova ulica – pedestrian zone, mixed use, public ground floors

Južne Fužine Neighbourhood

Future residential neighbourhood layout and design

The main idea was to present a way of implementing walkability principles in the not yet built environment. In the diploma thesis from where the project is borrowed (Žnidaršič, 2020), we tried to set an example of how we can incorporate walkability principles in early phases of projects and how this approach affects the result in comparison to more common retrofitted urban renewals. The main objective or general goal is to outline the idea of deliberate implementation of walkability principles as guidelines for designing continuous walkable open space in neighbourhoods. In order to emphasize the importance of aforementioned holistic approach, continuity of walkability principles and open space network, we designed a sequence of open public space throughout the neighbourhood, that are all connected into one representative route – a continuous walkable open space consisting of several different spatial sequences.

We implemented principles of walkability after the morphological design of the neighbourhood was finished, which made it more difficult because of its orthogonal layout, which in consequence limited the possibilities of designing even more interesting spatial sequences. Regardless of that, we managed to design a walkable neighborhood through partial implementation of walkability principles. Every segment of the chosen path, which leads through the neighborhood was approached and designed in a different way (akin to the example in Figure 4); we applied many of the walkability principles in different order and form, depending on a specific segments' character, anticipated users and their needs, which at the end all connected into one whole.

Figure 4: Visualization of a representative ambient from Južne Fužine neighbourhood

COMPARISON AND RESULTS

The following table (Table 2) compares both areas, Ljubljana city centre and Južne Fužine neighbourhood. It strives to identify the differences and similarities in order to show the disparities in the design according to the context of the environment. The comparison is assessed and described in qualitative rather than quantitative fashion. Short descriptors help understand the reasoning behind the valorisation.

Table 2: Ljubljana city centre and Južne Fužine comparison - walkability themes according to interventions and design decisions in infrastructure, pedestrian network and supported activities

Interventions & design decisions (across) *Walkability principles (down)*	*Infrastructure provision & built context*	*Pedestrian network*	*Activities supported*
Means			
Comfortable *Ljubljana city centre*	Paths on the same level, enough space to move about, without meaningless interruptions, paths at crossings are lowered to the level of roads	Complete and well connected (pedestrianization) interesting change of sequences	Being able to move around on foot, activities accessible on foot
Comfortable *Južne Fužine*	Provided, paths on the same level, wide enough to move uninterrupted, road at crossings with the path is raised to the path level	Less interesting due to the predominant one-point perspective sequences, otherwise well connected	Activities centralised in the middle of the neighbourhood, longer walking distances
Compact *Ljubljana city centre*	Good accessibility, close distances, densely built part medieval, part building block urban tissue from interwar period	Well connected, provided intermodality to other destinations, resulting in proximity of activities of everyday use	Mixed-use resulting in compactness, being able to reach services and desired destinations on foot
Compact *Južne Fužine*	Bigger open spaces, higher buildings, high density but medium compactness, longer distances	Connected, multiple interwoven pedestrian networks (along the road network, within building block network, river path network)	Activities very centralised in the middle of the neighbourhood, longer distances

	Infrastructure provision & built context	*Pedestrian network*	*Activities supported*
Safe *Ljubljana city centre*	Pedestrian zones (very safe), physical separation of car and pedestrian traffic; shared space (less safe, less separation), human scale	Safe (continuous, pedestrian friendly)	Moving around on foot without fear of crime, presence of people, public ground floors, good lighting
Safe *Južne Fužine*	Very safe (sidewalks, pedestrians crossings raised, physical separation) shared space (less safe), pedestrians only zones (very safe)	Safe, continuous, partially car free	Able to move around safely, residential neighbourhood, plenty of public ground floors, well lit
Interesting and functional *Ljubljana city centre*	Functional (pedestrian infrastructure is provided, space is legible, non-repetitive, street furniture provided, signage, well maintained)	Interesting (diverse paving), functional (connected infrastructure)	Interesting and enticing (diversity, presence of soft-edge principle, service attractiveness, many different space sequences) for walking, lingering, strolling
Interesting and functional *Južne Fužine*	Street furnishing, pedestrian friendly crossings, multiuse paving, furniture for resting and relaxing, recreating, playing, gardening, etc.	Legible network, hierarchy of paths, various character of paths	Longer distances to reach shops, but many different interesting outdoor activities; walking to services, leisure and school activities, recreation
Outcomes			
Lively and sociable *Ljubljana city centre*	Provided (stated already above)	Complete (stated already above)	Offers many different activities (shopping, cultural activities, touristic activities, bars, restaurants), lively all day, also tourist focused
Lively and sociable *Južne Fužine*	Relatively provided, depend on the specific segment of the neighbourhood (stated already above)	Complete, activities intensify at nodes scattered across the neighbourhood, constant and everywhere	The amount of liveliness depends on the activities supported (livelier in the central space), very sociable where spaces are more intimate (small blocks), also depend on what time of the day, leisure activities, sports activities, spare time activities (e.g. urban gardening)

	Infrastructure provision & built context	*Pedestrian network*	*Activities supported*
Sustainable *Ljubljana city centre*	Could be better, lack of urban greenery, overcrowding; majority of users are visitors and do not reside in the area	Relatively complete (supports sustainable transportation, waste disposal and recycling, lacks sustainable spatial interventions), consuming oriented, heat island during summer	Human scale and proximity reduce car use (cars prohibited on surveyed streets), destinations can be reached on foot
Sustainable *Južne Fužine*	Provided, integrated into a design of a new neighbourhood; majority of users reside in the neighbourhood and commute to work	Urban greenery provided, sustainable paving materials, heat islands mostly avoided	Mixed use supports local shops, different recreational activities (gardening, sports), river space integrated;
Inviting to move on foot *Ljubljana city centre*	Provided (stated already above)	Complete, well connected	Present both, walking with a goal of reaching a specific destination and walking for relaxation, enjoyment, walks; spaces prioritize pedestrian and cyclist
Inviting to move on foot *Južne Fužine*	Provided (stated already above)	Complete, connected network of pedestrian paths	More recreational and relaxation walking, also some walking to destinations and reaching services; most spaces prioritize pedestrian and cyclist

	Infrastructure provision & built context	*Pedestrian network*	*Activities supported*
Proxies			
Multidimensional *Ljubljana city centre*	Provided safe, comfortable and functional pedestrian infrastructure	Network completed with additional dimensions, for example legibility and diversity of use	Inviting environment, mixed use, diversity, but could be more sustainable than it is
Multidimensional *Južne Fužine*	Provided safe and functional infrastructure for pedestrians	Network completed, offers many outdoor activities	Functional and inviting environment, recreational activities, sustainable

	Infrastructure provision & built context	*Pedestrian network*	*Activities supported*
Holistic solution *Ljubljana city centre*	Provided, positive effect on liveliness, mostly retrofitted and upgraded throughout numerous renewals during the years	Retrofitted to be such	Supports many different activities, promotes tourism, socializing, reduces negative effect of motorised traffic
Holistic solution *Južne Fužine*	Provided in combination with cycling infrastructure and speed management strategies; integrated into the initial design	Designed to be as such	Supports different activities, outdoor and recreational activities stand out; reduces the need of motorised traffic and encourages neighbourhood community building and socializing

Key differences

After the comparison we would like to highlight main differences between both districts. Our goal is once again, not to decide which environment is more walkable, because each of them has inherently different characteristics and different users, with different predominant space use. Instead, we would like to present and emphasize the contrasting points between them.

The major one has to be put aside first: Južne Fužine has been designed anew and has not yet been realized, thus having an advantage of optimistic assumptions about space use and user behaviour. Streets in centre of Ljubljana, have been recently refurbished, but have established a proven record of pedestrian friendly and good walkability solutions.

One of the key differences between them is comfort and its psychological aspect, where human-scale design and spatial sequences play a big role. It is obvious that city centre *'wins'* in this comparison, because of the complex morphology and layered historical sediments (Figure 5) – it has grown in more organic way, is more diverse, supports the idea of serial vision and with that makes it more comfortable to walk through (portrayed in Figure 6). While Južne Fužine neighbourhood is less pleasant, because of its orthogonal design and sometimes less interesting one point perspective.

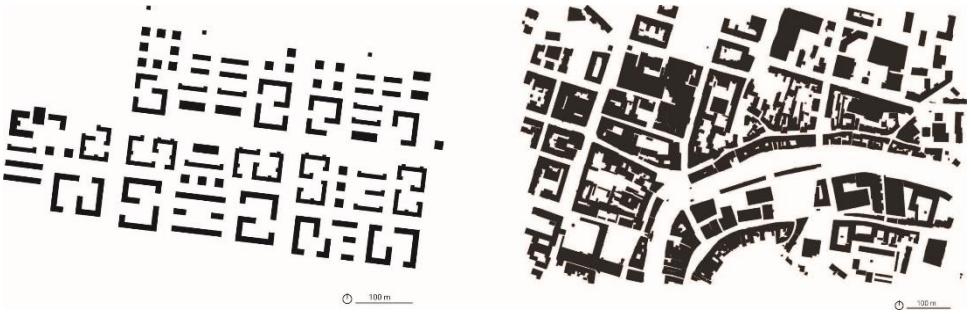


Figure 5: morphology comparison (Južne Fužine on the left, city centre on the right)

Figure 6: Trubarjeva ulica view (spatial sequences)

In addition, activities in the city centre and most of the important daily destinations users want to visit are closer to each other, while in Južne Fužine neighbourhood they are more centralised and require longer walking distances. “Dispersed compactness” of the city centre is better and more effective than the “centralised compactness” of the Južne Fužine neighbourhood. Which, once again, is reflected in the character and predisposition of the environment – prevailing use in the city centre is commercial, while in Južne Fužine neighbourhood it is residential.

The concept of interesting and therefore inviting is a little less dependent on the environments morphology and character – we can influence it through urban and architectural design. The key difference is, that city centre has many historical layers and can be in this aspect more interesting, but at the same time less flexible, while Južne Fužine neighbourhood is more flexible to change, in a way more open for some innovative interventions and therefore has more potential for growth in the interesting aspect. In conclusion both environment can be interesting and inviting, but in a different way.

Regarding the *outcomes*, we can say that city centre is livelier, to some extent even weather conditions independent, but Južne Fužine neighbourhood is more sociable, once again considering specific environments character and majority of users (in

the case of Fužine, we are also predicting behaviour rather than surveying it). In Južne Fužine, there is a big potential for people to meet, get to know each other and socialize, which builds a community and strengthens the feeling of belonging. While in city centre, the aspect of community building is less present, however sociability benefits still rank high. In contrast to Južne Fužine, city centre is lively throughout the whole day, on the other hand, we predict Južne Fužine residents will start to inhabit open spaces mostly in the afternoon, especially in good weather.

Sustainability in general can be better integrated in Južne Fužine, because it can be done deliberately and is integrated into the design of a proposed neighbourhood (e.g. solar energy, greenery and shading, avoidance of heat islands, sustainable energy management and low consumption, waste water and rain water management, etc.), while in the already built environment in the city centre it is more difficult to implement those principles, which can be only retrofitted in less ideal manner. The users of each districts also greatly differ. Majority of Ljubljana city centre users are visitors and do not reside in the area. The place has overcrowding tendencies, especially on summer days and numerous events, which bring negative consequences (litter, noise, reduced movement speed, etc.). In Južne Fužine, the majority of users will reside in the neighbourhood, however most of them will need to commute to work in other city districts. The positive aspects of belonging will result in better upkeep and sustainable practices of the users.

DISCUSSION AND CONCLUSION

The main goal of this contribution was to translate main walkability *themes* into more concrete and implementable *walkability principles*. They can be also understood as a palette of tools and interventions available to urban designers to achieve walkable, lively environments. With this idea of *themes* broadened into specific principles, we wanted to address the topic of walkability in general and deepen the understanding of its complexity, as well as Europeanise it. We estimate that we were successful in this endeavour.

As we already stated above, walkability principles are all connected, interdependent and in many different ways affect each other. Therefore, it was very challenging to divide them into groups because of the overlaps. Some of the *principles* fit into more than one *theme*, but for the sake of chosen methodology the grouping as done, was unavoidable. The challenges due this division and separation of *principles* became clearer later on (in Table 2 – comparison). When we started to describe each *theme* separately for a specific environment, some repetition occurred and we were not able to describe some of the principles without the support of others. Following the given methodology, the comparison lost some clarity and simplicity. The major character differences between both environments also added to the challenges. Some of the compared *themes* varied in their essence, because of the spatial context, and were therefore not the most comparable. For example, liveliness of the space in this case study does not solely reflect presence

of walkability principles, but is mainly derived from the spatial properties and character of the spaces themselves.

Therefore, we can conclude that the methodology in this case was not as effective as we initially anticipated it to be. If we had chosen different, contextually more similar and smaller locations to compare, it would be easier to make clearer comparison. Whit this methodology of qualitative comparison we could easily and effectively compare, for example, two different streets from the city centre or two different ambiences from the same neighbourhood. In those cases, we would be able to avoid stark contrasts which originate from very different environments observed. In addition, we would also be able to score walkability with rating scale (e.g. Likert scale), for example from 1 (not present) to 3 (present) and by that decide which of the localities are more walkable. For the reason of aforementioned baseline differences and the fact that one of the locations is a hypothetical one (not yet built), which would make it difficult to score objectively, we abstained from ascribing specific values to them.

With holistic and broadened approach we demonstrated that principles of walkability cannot be divided into categories and observed in isolation. As discussed above, the intertwinement even hinders unambiguous evaluation and leads us away from isolationist approach. The holistic aspects of the walkability – dealing with all of them at once – and its multidimensionality – intertwinement and co-dependency – are its integral parts, in design, implementation and evaluation.

REFERENCES

Cullen, G. (1961). The Concise Townscape.

Forsyth, Ann. (2015). What is a walkable place? The walkability debate in urban design. *Urban Design International* 20, no.4: 274-292.

Gehl, J. (1971). *Life Between buldings*. Washington D.C.: Island Press.

Gehl, J. (2010). *Cities for People*. Washington D.C.: Island Press.

Hodljivost - IPoP - Inštitut za politike prostora. (2020). Retrieved from https://ipop.si/urejanje-prostora/izrazje/hodljivost/ (25. July 2020).

Jacobs, J. (1961). The uses of sidewalks: safety. *The Death and Life of Great American Cities* (p. 29-55). New York: Random House.

Lo, R. H. (2009). *Walkability: what is it?*.

Mateo-Babiano, I. (2016). *Pedestrian's needs matter: Examining Manila's walking environment. Transport Policy*, 45, 107-115. Retrieved from https://www.sciencedirect.com/science/article/abs/pii/S0967070X15300561 (13. March 2020).

Paris Mayor Pledges a Greener '15-Minute City' - CityLab. (2020). Retrieved form https://www.citylab.com/environment/2020/02/paris-election-anne-hidalgo-city-planning-walks-stores-parks/606325/ (11. July 2020).

Sim, D. (2019). Soft City.

Speck, J. (2012). *Walkable City.* New York: North Point Press.

Why cities are bringing walking into focus. (2019). Retrieved from https://www.jll.pe/en/trends-and-insights/cities/why-cities-are-bringing-walking-into-focus (9. August 2020).

Žnidaršič, K. (2020). *Principi hodljivosti v urbanih soseskah: študija na primeru soseske Južne Fužine* (unpublished diploma thesis), University of Ljubljana, Faculty of architecture.

ANOTHER STREET IS POSSIBLE: EXPLORING FUTURE STREETSCAPES THROUGH TEMPORARY REDISTRIBUTION STRATEGIES

Steffan Robel
Dipl.-Ing., A24 Landschaft, Köpenicker Straße 154, 10997 Berlin, Germany,
post@a24-landschaft.de

ABSTRACT

Streets prevail public space. However, presently cars dominate our streets. A reimagining of the street's function is necessary to meet the needs, not just of motorists, but of everyone else as well. Future requirements of the street as a place for public life will ultimately reshape the spatial structure of our cities, which at present adhere a post-war paradigm of the car-friendly city. Today, various approaches to the reconfiguration of urban streetscapes are being tested through the reclamation of social space along our streets. Progressive cities demonstrate how the transformation of streets to squares and multimodal transit corridors can be successful. In Oslo and Berlin, urban pilot projects which are temporarily reorganising the use of streets have proven to be successful in illustrating possible scenarios and ultimately changing the mind-sets of urbanites before the street is permanently redesigned.

Keywords: Car-free city, mobility, participation, urban design, public space and life

INTRODUCTION

Streets – or more precisely the use of them – in most global cities are changing. As urban centres continue to demand increasingly more of their public and shared spaces, the conventional mono-functionality of thoroughfares and carparks is being questioned; the result of which is evident in streets being reclaimed for other uses than cars. Our mobility has shifted and become multi-modular. Societal trends such as urbanisation, densification and digitalisation have led to the increased use of public space, as well as a significance of physical, local areas. The concept of an urban street's function being centred primarily around the personal vehicle is being contested, and the paradigm of the car-friendly city is shifting. This is evident by the myriad modes of transport visible throughout the city – from ride sharing, to public transportation, cycling lanes and pedestrian zones – the potential of the city street as a space for everyday life continues to be rediscovered. How do we take up this current shift in mobility to formulate new narratives for urban space

which correspond to the contemporary urban mode of living? Where can we integrate public life into streets, creating an improved quality of living? Which strategies and urban design typologies can support pedestrian-friendly cities?

Changes to mobility and climate adaptation of cities must go hand in hand. Urban streets are dynamic spaces – as such, both their character and qualities can, and should, be reinvented for a wider range of uses, types, and functions. Though the consensus surrounding the necessity to reduce car dominance continues to grow, what to do with the street space is a matter of debate between many stakeholder groups. In Oslo and Berlin, the installation of temporary parklets has sparked a dialogue about what we may choose to prioritise in the configuration of our urban streets, by showcasing another kind of public space. This article explores the potential of temporary interventions to pick up on the current moment of change in mobility and reclaim the street as a hybrid living space of the city.

THE CAR-FRIENDLY CITY

How did the pre-motorised world look? What brought us to organising car-friendly cities? Street scenes of past ages depicted in art and photography show a much more varied and lively use of the streetscape before the car made its entry. This, however, was also accompanied by the lack of sanitary means of transportation. In *Children's Games* (1560), a painting by the Dutch Renaissance artist Pieter Bruegel, we see an interpretation of the streetscape in a very different light compared to that of today – that of a crucial open space of a city where all of urban life took place. Showcased in this image we see the inhabitants playing, eating, trading. However, it was not always romantic. A photograph of a street scene in New York in 1903 with children playing next to a decomposing horse (photographer anonymous) display the fact that streets were also unhygienic sources of infection. Cars were seen a rational and sanitary alternative to some 100,000 of horses occupying the streets at that time. This in-turn lead to the paradigm of the car-friendly city which has continued to persist for upwards of half a century.

The result is that today cars dominate the urban space of our cities. The present distribution of the street gives dramatic priority to cars: Berlin consists of 48% built-up areas, in contrast to a total of 18% green and open areas, but also of 11% streets, taking up ¼ of the unbuilt areas (excluding water). Furthermore, Berlin's streetscapes are mostly reserved for cars, whereas pedestrian and cycle lanes take up only 1/3 of the area, especially cycle lanes with only 3% of the entire street area having little physical space.

This urban configuration corresponds neither to current mobility behaviour nor to the renewed focus on health, wellbeing and quality of life in cities. Today, the urban dweller tends to value a pedestrian-oriented and bike-friendly city. New mobility technology like smart modal split apps, as well as car-sharing can help to

accelerate the process of regaining the streets for other purposes than driving a car. Although technology may not reduce traffic directly, it can address one crucial component of our cities' spatial composition, a component at the core discussions surrounding issues of urban space: the parking lot. 95% of all cars are stationary for the most part, only 5% are moving. What's more, each car requires 12.5 square metres of space (that of an average children's room) at any given time. In the future, automated driving could decrease the overall necessity of parking lots throughout the city. This phenomenon would provide the opportunity to reclaim vast amounts of otherwise unavailable space in our cities. For now, the question remains; what is to be done with the new spaces that will emerge out of the abolished parking lots?

OSLO: CAR-FREE CITY

The parklet is a pocket-sized temporary installation. They extend sidewalks and replace parking space with more space and amenities for people using the street – in-turn activating city life. Parklets are an important contribution to Oslo's car-free city life project, "Bilfritt Byliv", which phases out cars from the city centre and sets the framework for more city life. With a clear reduction of both the moving and the stationary traffic, the project has been generating new social and cultural activities in the streets since 2016 that could not have otherwise taken place in a city laden with cars. Acting as a test bed in the transition between today's Oslo and the future car-free city, parklets are facilitating a dialogue between the community and the municipality, before permanent changes are made to the streetscape.

Developed by Studio Oslo Landscape Architects and Vestre, Parklets 2.0's modular system allows for easy implementation, relocation and reuse (see Figure 1). It is an innovative concept which allows people to experience the qualities of a street with less cars, and how it may impact their daily life. Easy to customize, order and implement, Parklets 2.0 is being adopted by cities around the world as part of their transition to more people-friendly cities, including Trondheim, Berlin, Paris, Vancouver and New York.

Figure 1: Parklets in Nedre Slottgate in Oslo. Studio Oslo Landscape Architects (photo: Vestre and Nicolas Tourrenc)

BERLIN: PEDESTRIAN CITY

Berlin, as the first German city, has developed a Pedestrian Traffic Strategy to redesign street profiles and enhance pedestrian usage. The strategy aims to demonstrate the possible quality of a public space with less motor traffic along with raising public awareness of the fairness of an alternative street distribution. Pilot projects called "Begegnungszonen" ("meeting zones"), which is a concept originally coming from Switzerland, introduced urban spaces of high recreational quality, where user groups interact, pay attention to one another, and are able to walk safely and free of barriers. Two such pilot projects, in Maaßenstraße and Bergmannstraße, both lively streets with central neighbourhood functions, served as temporary test sites for the concept of "meeting zones".

On Maaßenstraße bollards were used to test space allocation. The road was drastically narrowed and deviated, while seating options were installed. After negative reactions to the test phase possibilities and shortcomings were discussed with the public. The result was a concept to restructure the street from one centered around motor traffic to one that emphasized the pedestrian experience and consisted of new uses for public life.

On Bergmannstraße an alternative approach was taken: parklets were introduced as a temporary method to reconfigure the street, transferring the concept from Oslo to Berlin. In order to showcase the positive effect of slowing traffic and increasing

accessibility of the street, the parklets replaced car parking to create small but multifunctional public spaces along the sidewalk (see Figure 2). The 15 modules extended the purpose of the street with various seating options for sitting higher, lower, in solitude, in groups, on benches, chairs or tribunes, with or without back rests or tables, turned to or away from the traffic lane. Inviting pedestrians to rest and enjoy the street life the parklets fundamentally changed the character of the street and created a new urban atmosphere. The interventions work to illustrate how less traffic could lead to more free space, and invite passers-by to re-appropriate the street, opening up the potential for co-production and shared use.

Figure 2: Parklet in Bergmannstraße in Berlin. A24 Landschaft (photo: Vestre and Nicolas Tourrenc)

The reception of the parklets was dubious: even if the use of the parklets could be observed, soon after the installation of the first modules neighbourhood pushback was evident through local media outlets such as the press, some installations even fell subject to acts of vandalism. As a response to the scepticism, and as an attempt to foster a face to face dialogue, a demographic cross-section of the local residents and neighbourhood representatives were invited to a series of workshops together with the senate, the district and the landscape architects to visualize the various possibilities for the Bergmannstraße streetscape. Subsequently, the discussion was brought back to the site, which saw the invitation of the broader public as well. The result was a series of radical co-produced concepts, all of them car-free or nearly car-free, leaving space for pedestrians, cyclists and greenery.

It was learned that, the problem was not to take away *some* of the parking lots as seen in other planning processes, but rather not taking *all* parking lots and cars away. This shows how the attitude towards motoring has changed within the last years.

CONCLUSIONS

Both in Oslo and Berlin, the test phases of the projects were integral to their success. Temporary, reversible interventions are useful to present alternative models of design and provoke debate. Contrary to the rigidness and formality of large-scale, permanent projects, temporary, small-scale architecture allows for experimental uses and scenarios, which are versatile and low-risk. These make ideal testing scenarios for unconventional solutions to urban challenges. The small-scale parklet interventions have produced extensive place-making changes. Their temporary use of space helped form the basis for a fruitful community involvement, ultimately making possible lasting large-scale projects more inclusive. The approach to develop new streetscapes though temporary designs in order to start a broad discussion with the public seems to be a promising way for the future transformation of our cities to green, sustainable and liveable places. In an ever-urbanising world, subject to the challenge of climate change and its associated issues, temporary designs offer an interactive test ground on how to inhabit cities in more sustainable ways. Interventions like the parklets have the potential to encourage new uses of public spaces, alter a site's identity, and reanimate the city.

Additionally, the reduction of parking spaces can transform mono-functional spaces into dynamic components of multi-functional cities. Adaptive and flexible urban design may inform the beginning of new urban structures with an array of typologies equipped for complex streetscapes for varible forms of movement and use. Hybrid streets provide an open urban stage, where different functions of mobility, meetings, consumption, physical exercise, political manifestation and ecology overlap. Another street is possible.

REFERENCES

Agentur für clevere Städte (ed.). (2020, May 4). *Wem gehört die Stadt? Der Flächen-Gerechtigkeits-Report. Mobilität und Flächengerechtigkeit. Eine Vermessung Berliner Straßen*. 2014. Retrieved from: https://www.clevere-staedte.de/files/tao/img/blog-news/dokumente/2014-08-05_Flaechen-Gerechtigkeits-Report.pdf

Huber-Erler, R., Topp, H. (2014). Ein ungeliebtes Erbe. Stadt und Auto. *Bauwelt* 24.

Rode, P., Hoffmann, C., Kandt, J., Smith, D. and Graff, A. (2015). *Toward New Urban Mobility: The case of London and Berlin*. Griffiths, P. (ed). LSE Cities/InnoZ. London School of Economics and Political Science: London

Senatsverwaltung für Umwelt, Verkehr und Klimaschutz. (2020, May 4). *Fußverkehrsstrategie*. Retrieved from https://www.berlin.de/senuvk/verkehr/politik_planung/fussgaenger/strategie/index.shtml

Senatsverwaltung für Stadtentwicklung und Wohnen. (2020, May 4). *Umweltatlas Berlin*. Retrieved from: http://www.stadtentwicklung.berlin.de/umwelt/umweltatlas/de601_06.htm

Sweco. (2020, May 4). *Bilfritt byliv. Mellomundersökelse 2017 – opsummering av observasjonsstudier*. 2017. Retrieved from https://www.oslo.kommune.no/getfile.php/13261937-1513590196/Tjenester%20og%20tilbud/Politikk%20og%20administrasjon/Slik%20bygger%20vi%20Oslo/Bilfritt%20byliv/Bilfritt%20byliv_mellomundersøkelse%202017_observasjoner_16.11.2017.pdf

NEW CENTRALITIES FOR INTEGRATED AND UNIVERSAL MOBILITY IN LATIN AMERICA

María Eugenia Martínez Mansilla[1]
PhD student in Architecture and Urbanism, UNB. DF-Brazil. me.martinez.mansilla@gmail.com

Marta Adriana Bustos Romero
Full Professor, Coordinator of LASUS (Sustainability Laboratory) of UNB. DF-Brazil.
romero@unb.br

ABSTRACT

The informality of urban consolidation processes in the Latin American context tends to be more progressive in transitional areas of the city and constitutes an obstacle to the accessibility and quality of open public space. However, innumerable efforts in several countries, demonstrate institutional, civil, or academic actions to face this problem, the fact is that occasionally they are approached in an isolated way. This paper aims to present a case study in the city of Tarija, Bolivia, which implemented the project of "widening sidewalks in the historical centre of the city", which promotes two fundamental changes in the urban context: a policy of sustainable urban mobility that prioritizes pedestrians and cyclists, and a plan to revalue the urban heart of the city where the cultural and heritage is preserved. The method consists in analysing that the contributions of the implemented project can be limited only to an infrastructure fact and not as part of a whole. The project can enhance and multiply its benefits from an integral mobility approach, a baseline to consolidate "new centralities" in which more than one hundred actions and/or complementary attributes are identified to justify the creation of new urban centres to improve the quality of life based on mobility and urban sustainability policies, considering that air quality and citizen perception are indicators of main reference. The result aims to define these urban cells in the city as model units, which will be constituted in the scenario to improve urban health, image and formality where local governments can make visible the multiple benefits of revaluing public space through micro-mobility, as part of a process of urban transformation in phases, continued and supported with research and which allows reconnecting the spaces to a true common sense and within a synergy between technique, governance and culture.

Keywords: Sustainable mobility, Open Public space, Urban Centralities, Sidewalks, Tarija.

[1] Corresponding author; Architect Urbanist from UAJMS of Tarija, Bolivia.

INTRODUCTION

It is clear that the concentration of urban population in cities, the expansion of geographically wider areas and the rapid growth of metropolises are among the most important transformations of human settlements (Martinez, 2020). Faced with this reality, cities must reinvent themselves and adapt to the indispensable requirements of urban health in order to face the end of the global health crisis, as well as to mitigate the negative effects of climate change, two great challenges. It is common that the problems and threats of the city, such as territorial dispersion, segmentation of uses, primacy of the private vehicle, destruction of neighbourhoods for the modernization of the city as a model of urban growth that is inefficient on a socio-environmental, economic and even symbolic level (Jacobs, 2001), predominant in the American and English context, evidence a claim to the right of the city, to an urban life of its own, to encounter and share. In other European cases, the strategy of transformation in the City Lounge programme and the treatment of the plinths as the most crucial part of the building at eye level, connecting the pedestrian flows to the urban area (Karssenberg, Laven, 2015) from the site, the road and the context according to Stipo[2] in Rotterdam or Amsterdam or the wonderful streets of Allan Jacobs (1995) or The walkable city in Stockholm (2010). In this reflection arises this question: how is the criticism of this problem in Latin America? The present work is oriented to make visible the urgent need to rethink a paradigm of urbanism that allows to revalue the urban centrality to reconnect with the city through sustainable mobility, where socioeconomic, spatial, formal, and even labour factors can highlight the multiple benefits that a process of transformation from the first urban cell, the centre, entails.

Although the object of this study focuses on highlighting how urban, functional and social problems are addressed mainly in the urban centres of Latin American cities from the street (as a punctual fact), it is also evident that it should not remain only there but should go towards an integrated mobility (as part of a process). The objective is to put in relevance the integrity of the solution proposals from the continuous reflection of real indicators sensitive to the citizen perception and emphasizing as focal point, the integral mobility. The qualitative methodology consists of evaluating how the project acts on a suggested frame of reference of thirteen criteria for new urban centres, articulated to three basic notions of management: technique, governance and culture. The case study was chosen because of the unique characteristics of an environment commonly adapted to the Latin American context, and the results suggest that the project should be approached in a comprehensive manner to achieve quality in urban space.

[2] www.stipo.nl

CONTEXT IN LATIN AMERICA

In a predominantly urban setting, there are processes of depopulation in almost all the centralities of Latin American cities. While the housing rate amounts to more than 10%, the depopulation of the centralities is around 3% (Carrión, 2011). The new city is moving from spaces of encounter to spaces of flow, mobility, interconnection, speed and a new approach to the networked city. However, three aspects have caused these structural changes, such as the demographic transition, the reform of the State and globalisation. In order to have an overview of the specific actions in terms of centralities, mobility and public space, studies of the countries of Brazil, Colombia, Mexico and Bolivia have been considered as case studies.

In Brazil, Barbosa (2016), referring specifically to the quality of walking or walkability and highlights three essential conditions: safety, attractiveness and comfort, in addition to valuing public transport and the physical quality of the roads to stimulate circulation in the city, considering that building and maintaining a roadway is not expensive, according to Mobilize Brazil[3], so that planning will be done on a human scale and for people. In other work in Sao Paolo, Oliveira (2005), presents the impact of the application of the Urban Centralities Program (Neighbourhood Centres), executed by the Municipal Urbanization Company, focused on the importance of the landscape project that highlights its environmental relevance. Although the region shows inequalities in the supply of public equipment, sanitation, infrastructure and areas for collective use that even affect the local climate, with degraded areas that give a sense of neglect and violence, urban neighbourhood environments are created in more deprived public areas. To build reference spaces for social coexistence, negotiating with the inhabitants the definition of use, schedules and activities, having as a priority the pedestrian. The author says that the projects bring an innate appropriation and highlights that these actions are of vital need for the future of the cities, those democratized spaces, that place of citizenship (in Brazil there is an important connotation due to the legacy of colonization and slavery). The urban landscape acquires an important symbolic value articulated to the city. The experimentation and appropriation of spaces and the care of trees was the tactic for public landscaping, promoted by a team of architects and agronomists. Due to the alternation of power, the program ceased to exist in 2005 and currently the municipality of Sao Paolo, as an urban management strategy, established 'centrality zones'[4] for those areas or subcentres of the neighbourhood that promote non-residential uses and landscape quality of public spaces.

For the Colombian case, Beuf (2016), analyses the figure of the centralities in the territorial models of the LUP[5], in which it passes from an urban vision of territorial

[3] Brazilian Portal for Sustainable Urban Mobility. http://www.mobilize.org.br/
[4] https://gestaourbana.prefeitura.sp.gov.br/zona-de-centralidade-zc/
[5] Land Use Plan

equity to the predominance of the principle of urban competitiveness. In the first POT (2000), the centralities had to present an equidistance in the different sectors, allowing the planning of a balanced and functional urban zone to facilitate access to urban services, it was necessary to improve mobility and adapt to the model of "cities within cities", creating new areas or urban pieces on a zonal scale with the execution of Structuring Operations (integral project in strategically delimited zones) that organize daily mobilities, reach connectivity with the city, construction of public spaces, recovery of wetlands and canalization of rivers, it was sought to promote accessibility and to root the sense of territorial equity. It was proposed to create 22 urban centralities located in the peripheries, for urban decentralization and to diminish the dependence on the metropolitan centre, complex spaces and places of interaction and identity that satisfy the needs of symbolic order of the citizens. With the change of mayor and the revision of the LUP, already by 2014, this network of urban centralities will become a network of cities, on a regional scale. The concept of 'integration centres' is adopted at international, national, regional and urban level, acquiring a sense of competitiveness, mainly to boost the economy and private investment. Throughout this urban construction, the centralities make sense in the framework of a global territorial model due to their social and economic character, where it is emphasized that citizen participation should not only act at a local level but also at a metropolitan level and in structuring terms.

In the Mexican case, Alvarado et al. (2017), evaluated the habitability conditions of public spaces in the historical centre of Toluca as a foundational and historical centrality due to its identity and vitality, with the elderly and people with motor disabilities through a methodological scheme that evidences that pedestrian accessibility, connectivity, safety and environmental noise are the main factors to be taken into account based on citizen perception and user surveys in these spaces, assuming that sustainability is fulfilled by ensuring basic habitability elements in public spaces, neighbourhoods and cities based on equity, cohesion and social inclusion. The study shows that only 82% of the streets are walkable, and that 90.3% of adults over 60 years of age perceive insecurity, in addition to noisy spaces, as inequity in access and free movement in a large part of the centre, making evident the need to evaluate the performance of the constitutive elements of public space. Likewise, Aguilar (2020), develops a study in the centre of Mexico City, from the sensory experience of a blind person in different journeys, emphasizing the sensitive aspects of the journey as the orientation, textures, smells and sounds. The author argues how the narratives of those pleasant places, the idea of secret places, are grouped into dimensions based on emotions and affects, sensory data, cognitive resources, travel strategies and environmental preferences. The relationship of the context with its stimuli, whether of a material or social order, justifies the importance of design in space, which must be inclusive even in saturated scenarios such as the city centre.

In Bolivia, the Country Report Habitat III, points out that the floating population is in transition, between urban and rural areas, since it maintains a mixed residence,

called “multilocality” (Antequera, 2011). In the city of Tarija, located in the south of the country, the project to widen sidewalks in the historic centre, which was initially misunderstood and is now required to promote active mobility, is presented later as a case study. In this review of the Latin American context through different scenarios and problems, it is common to note the concern and interest in establishing criteria for urban development and focusing on the central areas as favourable scenarios and great challenges to promote habitability in the environmental, symbolic, economic, social, formal and accessibility aspects.

WHY CENTRALITIES?

In any sense of centrality, the interaction between people and their activities is always present, and may be necessary, optional and social according to Gehl (2006), providing flows of relationships and accentuating the value of closeness. They are those spaces of socialization and encounter that help to create links between people and a feeling of social responsibility (Jacobs, 2001). Romero (2011), considers that the structure of a place is defined by its character and by the space, the character of a certain space contributes to the creation of an atmosphere of the place, a qualitative phenomenon that is not summarized only in the sum of its constitutive elements and the space organizes three-dimensionally the elements that guide the individual. It is in the urban centrality where the renovation project becomes more relevant in the context of a city (Beuf, 2011) and it is that conceived space that guides the action that forms a global project to understand its landscape dimension and lived dimension. As part of a process of transformation and living renewal that is shown in public space. As a result of conditions of good life, interventions that revolve around identity, coexistence and social practices even in the deep social inequalities that will be an individual and common search for small groups, while accessible to ensure the right to the city with greater recognition of the inhabitants as a reference point in the city, Garcia (2011), proposes to move from the right to the city to the right to happiness. According to Montejano (2015), urban centrality encompasses three dimensions: location of space (geographic); functions of social groups (social); goods and services produced or consumed (economic), closely associated with the concept of exchange between production and consumption processes. In itself it is considered a cluster in the city. The attributes of urban centralities are density as opposed to social segregation, dynamics due to land use and mixed occupation of services and commerce. Even Salat (2011), indicates that in the composition of natural spaces in the heart of the city and in the incursions of the natural environment in the urban context, the exterior becomes visible in the interior. The diversity of the urban landscape reflects the diversity of the landscapes in its surroundings.

CASE STUDY TARIJA – REAL SCENE

The municipality of Tarija is facing a serious environmental problem with air pollution due to the increase in the number of vehicles, a situation that is

suffocating the arteries of the city centre, which concentrates commercial, institutional and service activities and where associations and unions of urban transport currently operate and other vehicles circulate (taxis, individuals). Land use is also affected by the occupation of sidewalks with street commerce and parking lots in the streets that hinder the free movement of pedestrians (Figure 1, problems). Thanks to the promotion of international cooperation, Tarija became a node in the MoniCA Network (air quality monitoring) and obtained the first Municipal Air Quality Report for Tarija - Year 2014[6], the result of active sampling establishes concentration levels of PM10 (24-hour average), measured between January and December in two sites, Bolívar Park of 69.4 µg/m³ and Sucre Square of 65.2 µg/m³, which in both cases exceeds the annual limit value of 50 µg/m³ according to Law No. 1333 on the Environment. This implies that in both areas there is a moderate risk of chronic poisoning for the population. Similarly, the concentration level of NO2 exceeds the annual limit value. In the same year, a phase of sensitization begins to mitigate these environmental effects and a gradual modification of the road infrastructure. One year earlier, the first sidewalk widening was established around the Luis de Fuentes y Vargas Main Square and the following year a semi-pedestrian circuit was planned in the centre of the city of Tarija. The centre has an urban layout in the form of a checkerboard, typical colonial legacy and has track profiles between 8 to 12 mt. for a population of 268,400 inhabitants[7] that extends from north to south from the axis of the Guadalquivir River.

Sidewalk Widening Project

The widening of sidewalks, follows a policy of sustainable urban mobility and a plan to revalue the historic centre of the city, forms a circuit that articulates public spaces (Figure 2, semi-pedestrian circuit on monumental area), sites of collective interest, cultural, religious, tourist, squares (Palace of Justice) and consists of recovering the space of the vehicle parked on the road to redistribute it on the sidewalks, leaving 3mt. of road shared with the bicycle in the zone 30Km/h, area of controlled and restricted vehicular traffic to ensure road safety (Figure 2, shared road 3m). The project contemplates, the use of local materials, “laja” stone, worked in quarries of the city, very characteristic and traditional element in its use. It incorporates ramps for accessibility with lowered handkerchiefs and tactile tile at pedestrian crossings or zebras (Figure 1, work execution). It seeks to eliminate fixed obstacles, leaving the entire strip of traffic free for pedestrians, incorporates brackets on facades to free up the electric lighting poles, is complemented by the placement of aligned lights that are highlighted in perspective and medium sized flower trees (Figure 1, widening of sidewalks and lights). Considering that sidewalks are a fundamental form of urban infrastructure that facilitates walking, socializing, interacting and doing business, they should be provided on all urban

[6] http://snia.mmaya.gob.bo/web/modulos/PNGCA/#

[7] Projection 2020. Statistics National Institute - INE

streets and be accessible to all users (Global Street Design Guide), “ears” are left on the bicycle parking spaces, trying to get the private sector to invest in cycle-structures as part of their social responsibility to the city and as a result of citizen participation in the “Move by Bicycle” design competition. With neighbourhood presidents[8], the work of incorporating art and sculpture into green areas, exhibitions of objects (tangible) and stories (intangible) that keep the collective memory, is coordinated; a circuit has been designed for weekend bike rides accompanied by music with the traditional orchestra, a way of “living the city” and as a strategy of urban animation.

Figure 1: Problems. Work execution. Widening of sidewalks and lights. Photo: Own file

Socially this project was very criticized at the beginning, mainly by users of motorized which evidences the fact of strengthening the institutional role in local governments to socialize the scope of urban project planning to the population and institutions (water, electricity, hotel services, etc.), and to participate, discuss, plan with them. The most reluctant sector was that of urban transport and merchants of different items such as some owners, however, the collaboration of many others was highlighted. A strong threat to this type of urban intervention, is expressed in the malnourished culture of citizens and architecture to understand the spaces and their meanings, the psychology of habitat manifests in the built environment the way of life of people, so it is undeniable immediately resolve and curb the aggressive air pollution by the saturated vehicle traffic, visual pollution, occupation of the sidewalks by itinerant and informal trade that hinders free pedestrian traffic, the exposure of fruits and foodstuffs to the polluting gases of the vehicle fleet, generating an impact on people's health, to stop the deterioration of the architectural heritage, the hostile architecture thrown onto the public highway, the failure to comply with traffic regulations for loading and circulation in general, to rethink the working conditions available to people with different abilities in the collection of parking fees, the carelessness and indifferent sense of belonging to the city, the citizens must be empowered in the problems as well as in the solutions.

The pending works to complete this first phase and of immediate realization consists of the road-tourist signalling and in the medium term, the pedestrianization of streets, migrating the system of aerial to underground wiring, adequacy of the

[8] It is a representative of the neighbors (participatory and local democracy) to manage the provision of services, infrastructure, security to public entities.

system of pluvial drainage. The improvement of facades and the offer of new premises imprints a formal dynamic of the economy during the day and night. The actions set out in Table 1, are in themselves items of immediate application in the central areas, so that the area is valued, the urban landscape is improved and the conventional approach of seeing the sidewalks as spaces destined only for the passage of passers-by and access to buildings is changed, but as organs of public life.

Centrality Network

Although the project is planned within the framework of a municipal policy, it must act in a network and constitute centralities in all the residential areas of Tarija (Figure 2, urban centralities network), because the action of "widening" alone represents nothing more than an infrastructure work, the urban sidewalk itself is nothing, as an urban planner and reporter would say. For this reason, the approach proposed here of "new centralities" must be understood in a holistic way, integrating a whole and must be replicated in other areas of the city and articulated to a network of urban centralities for the access of all people, that is the city we want.

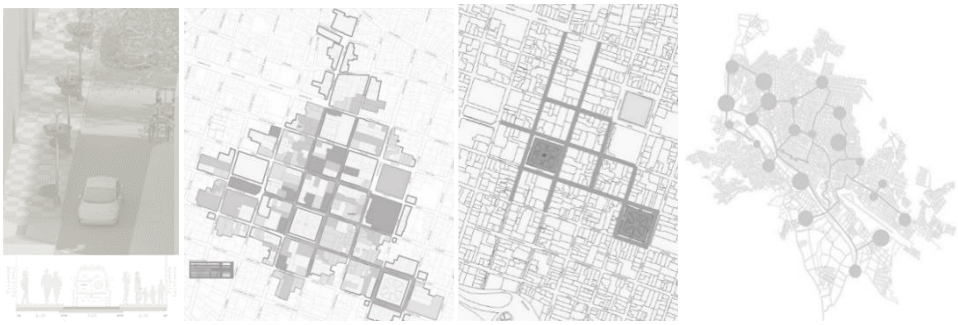


Figure 2: Shared road 3mt. Monumental heritage area. Semi-pedestrian circuit. Urban Centralities Network. Source: PMOT file, self-made

Citizen perception

Another relevant aspect is related to the citizen's perception and to evaluate that reality. Measuring the population's perception of different issues reflects the intention or the problem they are facing. It also serves as a basic indicator for planning new policies. Medeiros (2019), highlights the importance and need to include consultation with individuals in the different studies, since interventions in public spaces need to address their demands, desires and needs. In this case, three studies conducted in Tarija were considered.

The Citizen Perception Survey (CIEPLANE, 2019) reports that citizen insecurity (26.12%), after unemployment (47.16%), is the greatest problem facing the city.

In another study, on Environment and Pollution in the city of Tarija (CIE-UPDS, 2019), 48% of respondents believe that there is a high level of environmental pollution and perceive that the central area is one of the most polluted along the Guadalquivir River. The type of pollution that is of most concern is atmospheric pollution (77%) after the pollution of water sources. This study also shows that the most demanded institutional actions are the reforestation of trees, promoting the use of bicycles and fines to the most polluting vehicles. Finally, the study on Citizen Problems (CIE-UPDS, 2018), identifies that the main problem of the "neighbourhood" is the absence of parks and green areas (22.2%), followed by poor service of public transport (20.8%), and thirdly the lack of police presence (19.9%). With respect to the problems of the "city", it is identified that the main problem is the contamination of rivers and streams (35.6%), the second is unemployment (29.8%) and the third problem is insecurity/abuse (29.6%).

These results show that in the natural attributes, social and cultural aspects are superimposed because in the problems of the "neighbourhood", it is clearly identified that the first problem is linked to public space, the second to mobility and finally the third problem is related to the safety of people. The results of these studies justify the need to rethink spaces, places and their relationships with people. Gordon (2006), indicates that social interactions in space are linked to the city and are represented by its culture, architecture and design; this force of interaction between economy-demography-development, awakens interest. The main reflection is in deciphering the varied implications that predominate in the cities and that print this character, as the case of Mexico that considers the perception, the sensory of a vulnerable group with respect to the central space in the city.

NEW CENTRALITIES - IDEAL SETTINGS

In view of this context and according to the review of Management Practices and Urban Sustainability with emphasis on Sustainable Mobility and Transport in Curitiba (2013), Sustainable Cities: Social Urbanism and Public Management in Medellín (2013), Leadership for Urban Mobility Planning in Medellín – LUTP (2018) and other experiences gathered over several years in the municipal administration (2016), the following approach is proposed for urban centres that will be treated as an inseparable binomial between the historical centre and sustainable mobility, or expressed in another way in the following formula: centre + mobility = new centrality. Although there are different methods for measuring urban centres (spatial syntax), this paper relates the attributes of a municipal "policy" for sustainable mobility to a "plan" for the revaluation of the city's historical centre, grouped together in technical, governance and cultural criteria in order to address the public's perception. The elements of this formula suggest more than one hundred actions that promote this new centrality and can be articulated in other urban nuclei and work in networks for different uses and relations (Table 1, attributes of the new urban centrality).

Table 1: Attributes of the new urban centrality. Source: Self made

NEW CENTRALITY CENTRE + MOBILITY			
PLANIFICATION	Centralities network	Pedestrian /Bicycle Priority	PLANIFICATION
	Apple hearts	Phases to pedestrianize	
	Land use and occupation	Shared and complete streets	
	Articulate squares or green areas	Public bike and micro mobility/VMP	
	Hydrant networks	Integration of cycle path networks (transport, recreational, shared)	
	WIFI public space	Transportation Oriented Development – DOT	
	Information points	Integrated Public Transportation System	
CIVIC CULTURE	Tree/ Monument/ Bird Identification	Driver training	VIAL EDUCATION
	Architectural culture	Urban educators	
	Urban animation	EcoBici (bicycle school)	
	Citizen security/Social trust	Close traffic in downtown on Sundays	
	Cleaning	Traffic control	
INFRAESTRUCTURE	Improve lighting	Public transport stops	INFRAESTRUCTURE
	Public decoration/Street furniture (benches, posts)	Bike parking (public – private)	
	Improve facades	Vehicle parking	
	Underground telephone network	Traffic lights (intelligent monitoring)	
	Maintenance Attractors (museums, churches)	Illumination	
	Storm drainage networks	Stable, unobstructed surfaces	
	Newspaper kiosks	Horizontal marking of bike boxes	
DESIGN	Public space	Pompeiians	
	Urban image/Urban imaginary	Physical dividers / Area demarcation	
	Landscape architecture	Bollards / Use of local materials	
HERITAGE	Workshops schools	Wayfinding	
	Preserve heritage houses	Accessibility to attractors (market, library)	DESIGN
SOCIAL	Quality of life index	Tactical urbanism	
	Identity	Parklets / Terraces	
	Collective memory	Animated sidewalks	
	Coexistence	Urban art	
	Music on the streets	Universal accessibility (for all people)	ACCESIBILI
	Traditions/crafts cultural	Touch tile	
ECONOMIC	Capital gain	Street visibility	
	Night dynamics	30km/h zone	ROAD SAFETY
	Fairs and promotional activities	Vehicle restriction	
	Shops, book club, cultural centre	Safe intersections	
	Circuits (historical, gastronomic, religious)	Vertical / Horizontal signage	
TOURISM	Cataloguing urban landscape units	Regular vehicle ramps / Slopes	
	Freelance local tourism	Recreational bicycles	ECONOMIC
	Guided walks	Delivery / Services	
	Creative advertising	Tourist circuits	
	Illuminated night art	Bike maintenance (bicycle shops, stores)	
ENVIRONMENTAL	Green infrastructure	Urban trees / Landscape	
	Recover green areas	Less visual contamination	ENVIRONMENTAL
	Thermal comfort	Less air pollution	
	Native woodland, rain gardens, flower pots	Less noise pollution	
	Collective orchards	Less direct insolation	
	Carbon footprint calculator	Less wind speed	
	Clean air	Improves physical and mental health – Sensory experience	
GOBERNANZA	Incentives	Financing and execution of Mobility plan	GOBERNANZA
	New offer of micro-companies	Transportation to work plans	

Soil created/High-rise buildings	Access to bicycles (More bike for everyone)
Compensation certificates	Incentive to pedal and walk
Adequate burden sharing and benefits	Regulate informal service trade, transportation and Laws

In Tarija, more emphasis was given to those highlighted in the Table 1 (remark in blue), making evident a greater articulation of the set of attributes for a new centrality. Planning, governance and citizen culture, together with road education, constitute the basic platform for consolidating the guidelines of this urban model in a transparent, democratic and fair manner that guarantees active participation. In the aspect of design, a specialized technical criterion is vital, but, above all, sensitive in order to give a creative and coherent response to the urban space. The social, economic and environmental aspects guarantee the sustainability of this urban project. The infrastructure requires a serious and continuous commitment to ensure the equipment and elements constituting the public space. Heritage and tourism represent the opportunity to preserve what the past has coined in history as a cultural legacy and to innovate for the future. Finally, the aspect of accessibility and road safety are the key to always focus the priority on the urban space, the citizen. The influence of the urban environment on pedestrian mobility is evident, both the elements and the physical characteristics themselves will encourage or discourage pedestrian movement Valenzuela (2015), three key aspects of access to public transport, different centres and public space, ensuring social interaction. The relationship between man and space underlies the value and identity of the place (Romero, 2011). This approach also goes beyond public health by improving the conditions in which people can access public space. This set of actions is grouped into the following dimensions of sustainable urban management:

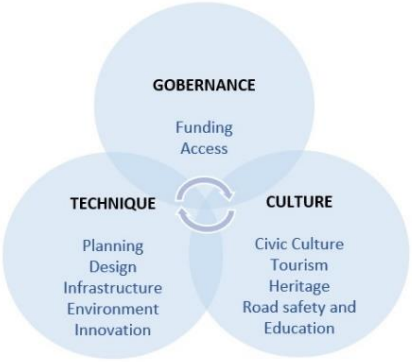


Figure 3: Sustainable Urban Management. Source: Self-made

Urban management has the challenge of guaranteeing the habitability of people, accessibility to services and spaces with equity and security. A synergy between technique, governance and culture. Here the importance of following the Colombian model, with a vision of integrity and corresponding to a global scale.

CONCLUSIONS

The creation of new urban centres to reconnect the city and guarantee its accessibility, ensures two key aspects in the city: integrating all people in a common scenario (in their relationships) and innovating new ways of working and living as citizens (in their transactions). All the attributes identified for a new centrality implemented in the city constitute the first action of social equity, because each place has its own centre. Revaluing space in the Latin American context should be the greatest effort that governments should make to guarantee the positive impacts on human development and social production of the habitat, as well as for the planning of public policies in the most sensitive areas of the city.

In both Sao Paolo and Bogotá, the studies carried out are linked to the revision of urban management strategies in the conception of urban centres, in both cases with actions in the periphery, highlighting more the environmental and landscape guidelines in Brazil and the competitive and economic in Colombia. The perception and sensory adoption of the problems, as in the case of Mexico and Toluca, reveal the importance of considering the person as the main object of study, in attention to their demands and needs. The ways of socializing the projects in previous consultation differ so much between the context of European or American countries with Latin America mainly to the informality of the processes of management and administration of the public thing, in that aspect we have much to learn.

In the Tarija case study, air quality indicators play a deterrent role in getting a transformation process off to a good start, but even the problem seems to be stagnating as a late event that could mitigate negative externalities. Throughout the city, new centralities will be established, which must be adapted to the characteristics of the place, although a single concept of centre is proposed, it is articulated in a network, but each centrality is different from the other because it acquires its own identity.

In the cases presented from the four Latin American countries, there are positive aspects that seek mechanisms to address the processes of urban development, however there are two common factors that must be carefully addressed, the “continuity and maintenance” of the projects is key to ensuring the impact and scope with which they were projected, as in the case of Sao Paolo worked on concepts of urban landscape throughout the city, especially in peripheral areas, a good experience that brought the population closer to the use of spaces, was only for memory. And the “integrity” of the proposals of intervention in the urban space since they are multiple factors and dimensions that must be addressed, nothing in urban management is unilateral, that is why it is proposed to adopt this construct of new centrality presented in this work, as a set of actions included in thirteen criteria that aims to empower citizens of their development, to the government capable of guaranteeing access and financing and the multidisciplinary technique to democratize information, this synergy will make us capable of facing with

resilience the great challenges to which we cities are now called mainly after the global health crisis, to guarantee the quality of the built environment (overview) and to integrate the pedestrian as the objective of urban quality.

Finally, developing new centralities in the city helps to organize the informality of urban consolidation, promotes and improves accessibility, interconnection is not a likely issue, it is an imperative need to collaborate with the health and welfare of citizens, so required and fundamental today for the post Covid-19 time and tomorrow for climate change.

REFERENCES

Alvarado, A. C., Adame M.S., Sánchez, N.R. (2017). Urban Habitability in public space, the case of the historic center of Toluca, State of Mexico. *Society and Environment*, (13), 129-169.

Antequera, N., Cielo, C. (2011). *Cities without bordesr. Multilocalidad in Bolivia.* CIDES.

Barbosa, V. (2016). *Avaliação da caminhabilidade no entorno de estações da linha 1 do metrô de Salvador*. Dissertação. Universidade Federal da Bahia.

Beuf, A. (2011). New centralities and access to the city on the outskirts of Bogotá. *Bulletin de l'Institut français d'études andines*. *40* (1), 147-178.

Beuf, A. (2016). The urban centres as conceived spaces: technical and ideological references of the territorial models of the land use plan (POT) of Bogota (Colombia)". *Notebooks of Geography: Revista Colombiana de Geografía*. *25* (2): 199-219.

CIEPLANE. Business Information and Strategic Planning Center (2020, May 10). *Barometer of citizen perception 2019*. Retrieved from http://cieplane.uajms.edu.bo/

CIE-UPDS. Statistical Research Center. (2019, March 25). *Study on citizen problems in the city of Tarija 2018*. Retrieved from https://www.elpaisonline.com/

CIE-UPDS. Statistical Research Center. (2019, November 11). *Study on environmental and pollution in the city of Tarija 2019*. Retrieved from https://www.elpaisonline.com/

Garcia, T., U. (2011). *The right to happiness. II Iberoamerican meeting of best urban practices.* 62-63. Un Habitat.

Gelh, J. (2006). *A humanização do espaço. A vida social entre os edifícios*. Reverté.

Gordon, D. L.A. (2006). *Planning Twentieth Century Capital Cities.* Routledge.

Jacobs, J. (2001). *Morte e Vida nas Grandes Cidades*. São Paulo: Martins Fontes. 4 Ed.

Karssenberg, H., Laven, J. (2015). *A Cidade ao Nível dos Olhos. Lições para os plinths*. EdiPucrs. Porto Alegre.

Martínez, M.M.E. (2020). *Evaluación de la alteración del paisaje natural por los asentamientos humanos en la comunidad de Lazareto, Departamento de Tarija.* Universidad Tecnológica Boliviana – UTB.

Medeiros, G.E. (2019). *Avaliação da importância da perspectiva do pedestre na análise da caminhabilidade: Aplicação de um modelo multicriterio*. Universidade Federal da Paraíba – UFPB.

Montejano-Escamilla, J. A. (2015). Is Mexico City Polycentric? New data and algorithms for the detection of urban centralities. *Economy, Society and Territory, Vol. XV*. 333-361.

Oliveira, S. M. (2005). Landscaping and urban centralities. *Landscape Environment*. N.20. 61-83.

Romero, M. (2011). *Architecture of the place: A bioclimatic vision of sustainability in Brasília.* Nova Técnica Editorial.

Salat, S. (2011). *Cities and forms: on sustainable urbanism.* CSTB Urban Morphology Laboratory: Hermann.

Valenzuela, L.M., Talavera, G.R. (2015). Pedestrian mobility environments: a review of approaches, factors and conditioning factors. *Institute of Urban and Territorial Studies. EURE, 41*(123), 5-27.

TOWARDS A WALKABLE CITY: A CASE STUDY OF ZOUK MOSBEH

Dima Jawad[1]
Associate Professor, PhD, Department of Civil and Environmental Engineering, Notre Dame University - Louaize, Lebanon, djawad@ndu.edu.lb

Maya El Chakhtoura
B.E., Department of Civil and Environmental Engineering, Notre Dame University - Louaize, Lebanon, mtchakhtoura@ndu.edu.lb

Julien Semaan
B.E., Department of Civil and Environmental Engineering, Notre Dame University - Louaize, Lebanon, jesemaan01@ndu.edu.lb

Nasri Khneisser
B.E., Department of Civil and Environmental Engineering, Notre Dame University - Louaize, Lebanon, nekhneisser@ndu.edu.lb

Paul Boulos
B.E., Department of Civil and Environmental Engineering, Notre Dame University - Louaize, Lebanon, paboulos@ndu.edu.lb

ABSTRACT

Cities all over the world are realizing the urgency to change their approaches for planning their streets. We can no more afford to design for car-based mobility solely; a practice that has proven to fail as a result of the traffic induction cycle resulting in more congested streets and less mobility. Not only it failed to secure mobility but also led to many disastrous outcomes from transport-induced air and noise pollution to increasing traffic accidents, equity issues, loss of urban space, and economic efficiency. The main challenge today is how to reverse this trend and redefine our objective to provide the necessary mobility using an integrated mode of transport that fosters low-emission alternative modes such as walking, cycling, or transit. This research presents an investigation if whether this trend can be reversed in the aftermath. The study takes the car-dependent city of Zouk Mosbeh in Lebanon as a case study. A small size town in Lebanon that has grown exponentially in the last two decades from a rural community to an agglomeration housing industrial, educational, commercial, and residential land uses in a chaotic manner while relying exclusively on vehicles for mobility. This growth is leading gradually to loss of economic efficiency as a city as well as deterioration of quality of life for its citizens. The study focuses on reintroducing walking as one of the alternative modes. This approach starts by identifying best practices for creating pedestrian-friendly environments, and then it moves into assessing the existing land use and infrastructure in Zouk Mosbeh with respect to these best practices.

[1] *Corresponding author*

After the assessment and analysis are done, a set of recommendations and guidelines are developed to guide the future planning and management of this city based on quantifiable impacts that take into account mobility measures.

Keywords: pedestrian-friendly, city assessment, alternative transport mode.

INTRODUCTION

As the automotive industry grew in size, the space allocated to cars grew with it whereas the pedestrian facilities shrunk. Cities all over the world are realizing the urgency to change their approaches for planning their streets. We can no more afford to design for car-based mobility solely; a practice that has proven to fail as a result of the traffic induction cycle resulting in more congested streets and less mobility. Not only it failed to secure mobility but also led to many disastrous outcomes from transport-induced air and noise pollution to increasing traffic accidents, equity issues, loss of urban space, and economic efficiency. The main challenge today is how to reverse this trend and redefine our objective to provide the necessary mobility using an integrated mode of transport that fosters low-emission alternative modes such as walking, cycling, or transit. This research presents an investigation if whether this trend can be reversed in the aftermath. The study is done by taking the city of Zouk Mosbeh in Lebanon as a case study. This city has become a hostile environment for pedestrians with severe vehicular congestion throughout the city's fast development. It currently lacks any initiatives for planning and designing a pedestrian-friendly city. The main objectives of this paper are to investigate if Zouk Mosbeh can become a pedestrian-friendly city by conducting a detailed investigation of the existing street condition and developing a set of appropriate recommendations and strategies towards transforming the city into a pedestrian-friendly one. The paper starts with the literature review section identifying best practices in planning for pedestrian-friendly cities, then outlines the methodology. After that, a discussion of the results and analyses are presented followed by the recommendation and conclusions.

LITERATURE REVIEW

Academic literature on the topic of walkability and pedestrian-friendly cities has focused mainly on three directions: defining these concepts, illustrating different approaches to assess their efficiency and impacts, and detecting peoples' perceptions under opposite conditions. Moudon, et al. (2006) presented theoretical and empirical insights on how to define walkable neighborhood from an operational point of view. They concluded that residential density, block size, presence of proximate grocery stores, restaurants, and retail facilities were strongly associated with higher pedestrian traffic; on the other hand, the presence of large office complexes and many educational facilities in a neighborhood had a deterrent impact on walking. Moreover, they found that the presence of parks was not associated with walking in the neighborhood. Most importantly the results showed

that food environments had a dominant role in defining walkable neighborhoods. (Moudon, et al., 2006)

Dannenberg (2017) presented an account of tools and practices for understanding and promoting walking and walkability. His objective was to identify methods for collecting and analyzing walking-related data. Although technology can play an important role in gathering data, the credibility of some data cannot always be taken for granted. For this reason, the research made use of five other research projects that contributed additionally to the data he analyzed (Dannenberg, 2017). Bödeker (2018) investigated the perception of walking and walkability in pre-set and self-defined neighborhoods in older adults using mental mapping. The researcher asked citizens to answer written surveys and participate in mental mapping interviews. The habitual durations of neighborhood walking and the total walking are the survey outcomes resulted from a self-reported physical activity, self-rated health, and sociodemographic characteristics. Interestingly, neighborhood delineations in this research are the mental mapping interview outcomes resulted from asking participants to sketch them on paper maps (Bödeker, 2018).

Among the literature that assessed cities in terms of walkability, Panagopoulos et al (2018) studied the usage and perception of pedestrian and cycling streets on resident's well-being in Kalamaria, Greece through 20 minutes of structured face-to-face interviews that were conducted with all the households of Kalamaria by using teams instead of sample units. Another study assessed pedestrian city-station routes for edge stations in Spanish small cities by analyzing and comparing pedestrian routes using the global impedance value of each route (Amparo Moyano, 2018). Another study assessed the conditions provided to pedestrians in two different cities with different urban morphologies: Qazvin located in Iran and Porto in Portugal. The assessment was performed through a multi-criteria model analysis to evaluate the pedestrian conditions. They concluded that their model can be a useful tool for planning more walkable and sustainable cities in urban areas (Jabbari, Pereira da fonseca, & Rodriguez Ramos, 2020).

Alternatively, the concept of complete streets was used to assess the conditions of various streets' in Riyadh – Saudi Arabia to examine the applicability of this concept. One of its main objectives is to reclaim streets to all users, especially in cities that have been characterized as auto-dependent for decades (Al- Mosaind, 2018).

METHODOLOGY

The existence of walkable streets has become one of the main goals for local authorities in various cities around the world. This aspect can be evaluated by the presence of elements that account for pedestrians and cyclists in a certain city. In this research, different criteria (elements) were identified based on the Complete Street guidelines (Al- Mosaind, 2018). The elements were divided into three

categories. The first covers the sidewalks, the second covers the pedestrian crossings on the vehicular right of way, and the third one the public surrounding environment. Table 1 lists the 19 elements identified to be on the checklist for evaluation in the case study. Following what was used in evaluating Winnipeg-Manitoba, a five-point rating system was established to study the current pedestrian-friendly conditions of Zouk Mosbeh and the physical quality of the surrounding environment (Galston, 2017). This technique is widely used by researchers and planners to determine a detailed score that enables engineers to identify which street design interventions are applicable in the area. Accompanying the checklist, is a rating system with a scale from 1 to 5, where a street would get a score of 1 if the element (under evaluation) was not observed in any section of the street, a score of 2 if the element was rarely observed, a score of 3 if the is element sometimes observed, a score of 4 if the element is observed most of the times, and finally a score of 5 if the element is always observed. The streets are assessed by using this scoring system that weighs the presence of the 19 design elements in each street. The optimum score that could have been obtained is 95.

Table 1: Evaluation Criteria

Sidewalks	Pedestrian Crossings	Public Surroundings
Presence of sidewalk	Presence of crosswalks	Active storefronts
Presence of sidewalk on both sides of the street	Refugee islands or median	Active doors & windows
Protected driveways	Crossing signage	Outdoor restaurants seating
Ramps	Pavement striping	Shared parking space
Landscape	Curb extensions	On-street parking spaces
Street lighting		Public spaces and squares
Protective bollards		
Sidewalk furniture		

CASE STUDY OF ZOUK MOSBEH

Background

Zouk Mosbeh is a city in Keserwan district, part of Mount Lebanon Governorate. It is located 12 km north of the capital Beirut with an altitude varying between sea-level and 170 m and a total surface area of 4,480,000 m^2. The topography of the city varies between level and rolling topography. The city was first established as an industrial region in 1950, and then it evolved into a city housing different land use from industrial to residential, commercial, and educational institutions. The topography of Zouk Mosbeh, the absence of public transportation systems, and the

infrastructural congestion in the city act as deterring factors against developing the city as a pedestrian-friendly city.

Lebanon's climate has a Mediterranean climate that is characterized by hot, dry summers and cool, moist winters. Temperatures in Zouk Mosbeh varies between 5°C in winter and 30°C in summer. Precipitation is irregular and varies considerably from the narrow and relatively moist coastal plain where Zouk Mosbeh is located to the dry conditions in the Anti-Lebanon mountain chain. (Verner, et al.).

Site Investigation Findings

In order to evaluate the streets of Zouk Mosbeh according to the established criteria in table 1, streets were divided into several sections based on their connectivity, the existing cross-sectional elements, the right-of-way width, and surrounding land use. As a result, 22 sections were identified. Each section was assessed through a detailed site investigation. The length of the sections ranges between 856 ft and 8,036 ft with a total length of 66,300 ft whereas the width ranges between 23 ft – 79 ft. The majority of these sections have some form of sidewalk with a width of around 3 ft. The slopes of the 22 sections were determined. These slopes varied between 0.9% (section 16) and 10.9% (section 6). It is recommended that pedestrian walkways have a maximum of 8%. Pedestrians can walk comfortably on a slope of up to 5%. Six out of the 22 sections exceed the maximum recommended slope. Even though the slope is an important factor for pedestrian comfort, this criterion is not included in the assessment per se as the slope is not a factor that can be improved.

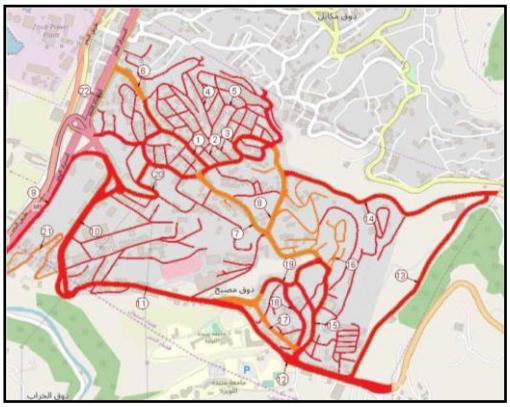
As a result of field investigation, street characteristics concerning the road right-of-way, sidewalk width range, number of lanes, and presence of median are recorded. In addition to that, the continuity of the sidewalks and their presence on both sides of the streets were rarely spotted. It was also identified that some sidewalks were built at the level of the roadway and thus occupied by vehicles as parking spaces. Landscaping was mainly done by planting trees inconsistently and not following standards in terms of the sidewalk zones and the required surface area for the roots. Consequently, the continuity of pedestrian pathways was interrupted and the surfacing material of the sidewalks was damaged. Basic traffic calming circles and roundabouts were marked at almost every intersection of the streets. However, some refugee islands were completely occupied by plants and thus making those impossible to serve the pedestrians while crossing the streets. It should also be noted that some Zouk Mosbeh streets have a combination of industrial and residential land uses.

Evaluation Results

After conducting the site investigation of the 22 streets, each street was assessed and rated. The attained scores are shown in Table 2. Out of 95 points, almost all the streets obtained a score of less than half the maximum. In addition, figure 1 shows the map of Zouk Mosbeh streets indicating the scores attained. The total absence of streets in yellow and green classification is clear, signifying that almost all the streets attained a scoring below average. This deficiency is mainly due to the absence of crossing signage, pavement striping, and crosswalks. Besides that, in most sections, there are no street lights, no bollards, and no benches. Some streets even lack the presence of sidewalks. According to the streets' public surroundings, the shortage in outdoor seating, shared parking space, and public spaces render the environment unappealing to pedestrians. Therefore, these streets are considered uninviting to pedestrians and they are oriented more towards vehicular circulations.

Table 2: Street scores

	Streets																				
Sidewalks	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22
presence of sidewalk	2	2	3	2	2	4	4	4	5	4	2	3	4	1	3	5	5	5	4	1	5	1
on both sides of the street	1	1	2	1	1	3	3	4	2	3	2	2	1	1	2	5	4	4	2	1	4	1
driveways	1	1	3	1	1	3	3	3	2	3	1	2	3	1	3	4	4	3	2	1	4	1
ramps	1	1	3	1	1	1	3	3	1	1	1	1	1	1	2	3	2	1	1	1	3	1
landscape	2	2	3	2	2	4	2	4	2	3	3	3	3	1	2	3	3	2	3	1	2	1
lightings	1	1	1	1	1	2	1	2	1	1	1	1	1	1	1	5	3	1	2	1	1	1
bollards	2	1	1	1	2	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
sidewalk furniture	2	2	2	2	2	2	2	2	2	1	2	2	2	2	2	2	2	2	2	1	2	2
Subtotal 1	12	11	18	11	12	20	19	23	16	17	13	15	16	9	16	28	24	19	17	8	22	9
Pedestrian Crossings																						
crosswalks	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
crossing signage	2	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	2	1	1	1	1	1
pavement striping	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
curb extensions	1	1	1	1	1	2	1	2	1	1	1	1	2	1	1	3	1	1	2	1	2	1
refugee islands or median	1	1	1	1	1	3	3	3	1	4	3	3	1	1	1	3	3	1	2	1	2	3
Subtotal 2	5	4	4	4	4	7	6	7	4	7	6	6	5	4	4	8	7	4	6	4	6	6
Public Surroundings																						
active storefronts	4	3	4	3	2	4	4	2	2	3	4	4	2	1	4	2	3	2	3	1	2	4
active doors & windows	4	3	4	3	3	3	4	3	2	2	4	3	1	1	4	2	2	3	3	1	3	3
outdoor seating	1	1	1	1	1	1	1	1	1	1	1	2	1	1	1	1	1	1	1	1	1	1
shared parking space	3	3	1	1	2	3	1	1	1	1	1	2	1	1	1	1	1	1	3	1	1	1
on-street parking spaces	5	5	5	5	5	5	5	4	3	2	4	3	3	2	4	4	4	4	4	3	4	5
public spaces	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
Subtotal 3	18	16	16	14	14	17	16	12	10	10	15	15	9	7	15	11	12	12	15	8	12	15
Total	35	31	38	29	30	44	41	42	30	34	34	36	30	20	35	47	43	35	38	20	40	30



Street score	Color indication
$score \leq 38$	Red
$38 < score \leq 57$	Orange
$57 < score \leq 76$	Yellow
$76 < score \leq 95$	Green

Figure 1: Thematic map of streets indicating scores

Recommendations

Since all the streets attained a score of less than half the maximum of 95, suggested improvements are developed to enhance the score so that this city can be considered pedestrian-friendly. The recommendations presented here are based on design guidelines that accounted in tandem for the land use of each street and its existing amenities.

Building complete streets and providing continuous pedestrian access were considered as main priorities towards changing Zouk Mosbeh into pedestrian-friendly. This is because the assessed streets either lack the existence of a functional sidewalk from the first place or contain gaps within their existing sidewalks. The scoring system, existing conditions for the right-of-way, and the prevailing land uses were taken into account while deciding upon which design interventions to be used based on ADA requirements (Planning and Designing for Pedestrians, 2002).

Accordingly, as general recommendations, streets should not be designed from centerline out. Sidewalks should be elevated to prevent vehicles from using them as parking spaces, free spaces should be allocated to design a shared parking place, appropriate refuge islands should be provided, and regions that have a slope exceeding 5% should have handrails on the sidewalk edges for safety. Also, streets should include street lights on the sidewalks, bollards for safety, crosswalks and pavement striping, and sidewalk amenities. In addition to that, each street is assigned a specific sidewalk width according to its landuse which is shown in Table 3.

Table 3: Sidewalk width distribution

Land use	Sidewalk width	Edge zone	Furnishing zone	Throughway zone	Frontage zone
Residential	11’6’’	6’’	6’	5’	0
Commercial/educational	13’	1’6’’	5’	5’	1’6’’
Industrial	6’	0	0	0	0

Some streets of Zouk Mosbeh are of a small restricted right of way which does aid in adding efficient sidewalks widths as required by the code guidelines. Thus, turning two-way streets into one-way could be the optimal solution. This implementation is recommended to be used for two different complete circulations ensuring proper continuity and accessibility. The delay in time resulting from this change in vehicular pathways is calculated and it ranges between 0 to 2 minutes.

Appropriate recommendations were developed for each of the 22 streets along with illustrative cross-sections. Figure 2 represents an example of the cross-sections provided comparing the current conditions and the recommended provisions for street 15. Due to the restricted right-of-way at certain streets like street 15, the recommended sidewalk width was decreased to 10’ and a vehicle-prohibited cyclic lane was added. In addition to that, vehicular circulation in certain areas in the city

was modified into a one-way direction. It is recommended to add an off-street shared parking space near that area since due to the narrow right-of-way, side-street parallel parking spaces were not implemented.

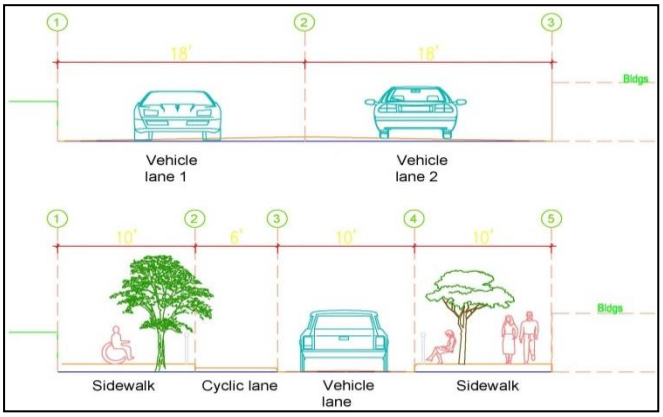


Figure 2: Recommendations for street 15

CONCLUSIONS

This paper presented the research done on how to tackle the following two objectives: investigating how to make Zouk Mosbeh a pedestrian-friendly city, and identifying an applicable set of recommendations and strategies. The first one was undertaken by accomplishing detailed site observations of the 22 streets according to a scoring system that considers the essential aspects of pedestrian-friendly cities. The second one was carried out by identifying appropriate recommendations for each street that took into account the existing right-of-way, land use, and the scoring system for each street.

As the Lebanese society is a highly car-dependent society in terms of mobility, rendering Zouk Mosbeh pedestrian-friendly is expected to face opposition from its residents in the short term. However, once they adapt to the city's modification, the opposing citizens will eventually enjoy the safer, environmental-friendly, and sustainable streets of Zouk Mosbeh. Pedestrian-friendly streets are proven to foster economic development locally more than vehicular streets, a much-needed aspect for Zouk Mosbeh, especially with looming economic recession in Lebanon.

REFERENCES

Planning and Designing for Pedestrians. (2002, June). Retrieved January 17, 2020, from https://www.sandag.org/uploads/publicationid/publicationid_713_3269.pdf

Al- Mosaind, M. (2018). Applying complete streets concept in Riyadh, Saudi Arabia: opportunities and challenges. *Urban, Planning and Transport Research*.

Amparo Moyano, J. R. (2018). Station avenue: high-speed rail's missing link. Assessing pedestrian city-station routes for edge stations in Spanish small cities. *Journal of Housing and the Built Environment*.

Bödeker, M. (2018). Walking and Walkability in Pre-Set and Self-Defined Neighborhoods: A Mental Mapping Study in Older Adults. *International Journal of Environmental Research and Public Health*, 1-12.

Bushell, M. A., Poole, B. W., Zegeer, C. V., & Rodriguez, D. A. (2013, October). *Costs for pedestrian and bicyclist infrastructure improvement.* Retrieved April 2020, from http://www.pedbikeinfo.org/cms/downloads/Countermeasure%20Costs_Report_Nov2013.pdf

Dannenberg, A. L. (2017). Special Issue Editorial: Tools and practices for understanding and promoting walking and walkability. *Journal of transport & health*, 1-4.

Edwards, K. (2016). Step It up! Action Institute for Increasing Walking and Walkability. *Journal of transport & health*, S12-S13.

Galston, R. (2017). *Places for People.* Retrieved January 29, 2020, from https://mspace.lib.umanitoba.ca/xmlui/bitstream/handle/1993/32572/Galston%20CP%20Practicum%20REVISED%2009122017.pdf?sequence=1&isAllowed=y

Jabbari, M., Pereira da Fonseca, F., & Rodriguez Ramos, R. A. (2020). Assessing the pedestrian network conditions in two cities: the cases of Qazvin and Porto. *Urban heritage along the silk roads, The Urban Book Series.*

Moudon, A., Lee, C., Cheadle, A., Garvin, C., Johnson, D., Schmid, T., et al. (2006). Operational Definitions of Walkable Neighborhood: Theoretical and Empirical Insights. *Journal of physical activity & health.*

Panagopoulos, T., Tampakis, S., Karanikola, P., Karipidou-Kanari, A., & Kantartzis, A. (2018). *The Usage and Perception of Pedestrian and Cycling Streets on Residents' Well-being in Kalamaria, Greece*.

Verner, D., Ashwill, M., Jens, C., Mcdonnell, M., Redwood, J., Jomaa, I., . . . Treguer, D. (n.d.). *DROUGHTS AND AGRICULTURE IN LEBANON CAUSES, CONSEQUENCES, AND RISK MANAGEMENT.* Retrieved from WorldBank.org: http://documents.worldbank.org/curated/en/892381538415122088/pdf/130405-WP-P160212-Lebanon-WEB.pdf

A Policy on Geometric Design of Highways and Streets. (2011). Washington, DC 20001: American Association of State Highway and Transportation Officials.

CONTRIBUTION OF PUBLIC SPACE TO SUSTAINABLE DEVELOPMENT: CASE STUDY VARAŽDIN

Lea Petrović Krajnik[1]
Ph.D., Architect, Associate professor, Department of Urban Planning, Spatial Planning and Landscape Architecture, University of Zagreb, Faculty of Architecture, Kačićeva 26, HR – 10000 Zagreb, lea.petrovic@arhitekt.unizg.hr

Damir Krajnik
Ph.D., Architect, Full professor, Department of Urban Planning, Spatial Planning and Landscape Architecture, University of Zagreb, Faculty of Architecture, Kačićeva 26, HR – 10000 Zagreb, damir.krajnik@arhitekt.unizg.hr

Tamara Lukić
mag.ing.arh., tamara.lukic.arh@gmail.com

ABSTRACT

Public spaces are one of the main constituent elements of the built environment, which functionally and visually contribute to the integration of urban tissue. They are significant places for social interaction that manifoldly improve the culture and quality of life and, if properly planned and designed, represent an important element of sustainable development.

In this work, public spaces are considered on two levels, as part of urban tissue and as specific microlocations. On the first level, the importance of public space is considered in the wider context of sustainable urban development investigating all its aspects. The emphasis is placed on the key role of the public space both for the city and for sustainability. The second level considers the public space planning and design of the specific microlocations in the centre of the city of Varaždin. The emphasis is placed on the consideration of the system of public places, their re-thinking and enhancing through soft measures.

Consideration of public spaces during city development shows their importance in case of different development dynamics, either expansion or transformation. Through research of urban public spaces in the context of sustainability, topics of mobility, vehichle, pedestrian and bicycle relations on certain microlocations which make a system of public areas in the centre of the city of Varaždin (streets, public squares, parks, common areas, etc.) are analysed.

The aim of this paper is to highlight the significance and importance of the public space in the built environment, considered from various aspects of sustainability,

[1] Corresponding author

with a special emphasis placed on the public spaces in the centre of the city of Varaždin.

Keywords: quality of life, system of public spaces, soft measures, sustainability, Varaždin

INTRODUCTION

Public spaces are one of the main constituent elements of the built environment, which functionally and visually contribute to the integration of urban tissue. They are significant places for social interaction that manifoldly improve the culture and quality of life.

Considered throughout history, public open spaces (streets, squares, parks and parks) have been of great importance for the city, and their functions have gradually changed. Until present time, these spaces have retained their basic functions, but due to the dynamics of the relations, their functions are gaining new hybrid dimensions. In a constantly changing world, where we are witnesses of constant change and we can say that these spaces are places of various events, from random to carefully planned cultural, social or political events.

Figure 1: Public spaces of the city centre of Varaždin as different event venues (source: Lukić, T., 2019)

Horvat (2002) studies and explains the development and role of public space, the square in society throughout history and its importance in nowadays cities. The square, with its traffic, stylistic, sociological and cultural elements, behaves like an organism. The slightest change in one of the elements causes a change in others. He points out that an important feature of public space in the city is that it must contain elements of complexity, strangeness, surprise and uncertainty.

In the 1980s, the negative effects of accelerated development prompted more intense reflections on sustainability and sustainable development on the global level, as evidenced by numerous documents on sustainability. The need for concrete action has prompted reflection at the local level, where actions conceived on sustainability principles result in small shifts and positive effects *in spe*. Public places, if properly planned and designed, represent an important element of sustainable development. Whether it is “hard” or “soft” measures applied in the design and / or improvement of public spaces, the effects have significant repercussions on all aspects of sustainability.

The use of landscape architecture in the planned transformation and / or expansion of urban areas plays an important role in establishing balanced and environmentally friendly relationships between built and unbuilt areas. The share of park-shaped space in a particular area indicates its importance for environmentally conscious planning and design. The spaces arranged in this way shape the image of the city and its recognizability and also contribute to the quality of life of the citizens. In addition to all the other roles that public spaces, with the emphasis on green spaces, play in urban areas, we would like to highlight their role in creating a healthy and sustainable living environment for citizens. This role is particularly important for European initiatives and documents that promote the sustainable development of cities and towns. (Petrović Krajnik, Obad Šćitaroci & Dundović, 2013; Petrović Krajnik, Križanić & Krajnik, 2019)

Architect Dora Francese (2016) points out that even though vegetation plays a fundamental role in urban regeneration, there is a habit of assigning green spaces only to those spaces of the city that have remained free from other uses, and often only as the answer to the mandatory planning standards. A more sensitive approach would be to consider green spaces as a design element that enhances the overall quality of urban life.

The creation of public spaces of urban sociability throughout history, especially on the site of former bastion fortifications, primarily meant providing new opportunities for "citizens” for a richer and more meaningful social life, but also contributed to the "transformation” of residents into "citizens". These new public spaces have become areas of social contacts concentration. The dismantling and transformation of bastion fortifications in European and Croatian cities resulted in some of the most important urban achievements of the 19th century, which regularly had the creation of public urban spaces and public buildings as urban social spaces as one of the primary roles. (Krajnik, Obad Šćitaroci & Šmit, 2008)

Consideration of public spaces during city development shows their great importance in case of different development dynamics, either expansion or transformation. The aim of this paper is to highlight the significance and importance of the public space in the built environment, considered from various aspects of sustainability, with a special emphasis placed on the public spaces in the centre of the city of Varaždin.

CITY OF VARAŽDIN IN THE CONTEXT OF SUSTAINABILITY

Throughout history, the city of Varaždin has been a significant political, cultural, economic and commercial centre of the northwestern part of continental Croatia. Particular importance in the urban structure of the city represents the fort, today's city historic urban centre, whose history dates to the 12th century when a manor house was founded on the site of today's Old Town. During the 12th and 13th centuries, a civic settlement developed as a suburb south of the aristocratic town, which received its first fortifications in the middle of the 15th century, and at the beginning of the 16th century the walls began to be erected. In the middle of the 16th century, Varaždin gained a significant geostrategic role, so the fortifications of the aristocratic and civic city were transformed in the spirit of Italian Renaissance fortification construction. The subsequent modernization of fortifications in Varaždin is the first example of the emergence of a bastion-type fortification in Croatia, which occurs simultaneously with the bastion fortification of Austrian cities such as Vienna, Graz and Klagenfurt. The modernized Varaždin fortress retained its shape and size until its demolition after 1807. The dismantling of Varaždin's fortifications at the beginning of the 19th century enabled the creation of public urban spaces on the site of former fortifications and buildings of predominantly public purpose, similar to examples of urban transformation in European cities such as Vienna, Riga, Wroclaw or Würzburg. (Krajnik, 2007; Krajnik & Šćitaroci, 2007; Žmegač, 2000)

The importance of the city centre of Varaždin in the context of sustainable development is evident in the plans and projects developed in the beginning of the 21st century. In 2008, the Institute of Tourism prepared the *Basis for the Strategy of Development and Sustainable Management of the Historic Core of the City of Varaždin*. The document is designed to propose, after the adoption of key spatial plans, in the Urban Development Plan of the historic core in particular, the next logical step in leading the process of revitalization of the historic core. The project is the basis for the venture of urban renewal and a key element in building the regional competitive position of Varaždin as a modern city with high quality of life. On the conceptual level, the possibilities and preconditions for turning the core into an attractive space for work, life and tourist visits are considered, ie: a) directing space development and restoration (of a part) of the historical core construction fund, and b) directing social and economic revitalization of the core. The document was drafted following the basic rules of strategic planning. It is divided into three main segments: a) Assessment, b) Sustainable Development

Strategy and c) Implementation, and critically examines the success factors of revitalization of the historic core, sets the vision of development, strategic determinants and implications for the use of space and considers key determinants of its implementation through organization of process management to the action plan of foreseeable necessary activities. The “Varaždin House” program was finally presented as a pilot project that illustrates the premises of the revitalization of the historic core on a micro level. (Institute for tourism, 2008)

Urban Development Plan of the historic core of the city of Varaždin (2006) covers an area of 56.6 hectares, which is characterized by 37 urban blocks with most of the buildings as immovable cultural heritage. The area is one of the most important Baroque-Rococo-Classicist historical architectural and urban units in Croatia, which is characterized by a wealth of various stylistic expressions. Significant urban elements of the historic core are green areas (public parks, gardens next to palaces or sacral complexes, protective greenery along major city roads and green islands along pedestrian streets and squares) and communication matrix formed by streets and squares that represents a recognizable urban identity. In addition to the streets that have retained their historical routes, the peculiarity of urban identity can be found in Varaždin squares, which are characterized by irregular shapes, peculiarities and spatial specifics. The goal of the urban arrangement of the centre is further development that meets the needs and functions of the modern city as an urban organism, whose most vital organ is the historical core. (City of Varaždin, 2019)

During the whole year the public spaces of the centre of Varaždin are places of social interaction where numerous events take place in various locations depending on the spatial specifics and the needs of the organizers. In that context, the Capuchin Square, which hosts the largest number of events especially stands out. Although some squares and parks have potential, they are not places of planned events, but are used on a daily basis and are places of "accidental” events that also play a significant role in the quality of life and the dynamics of city relations. (See Figure 1)

PUBLIC SPACE AS A PART OF URBAN TISSUE OF VARAŽDIN

The representation of the importance of public spaces in the urban tissue of the city of Varaždin is based on the part of the research for the doctoral dissertation *"Urban transformation of bastion fortifications”* (Krajnik, 2007) and further scientific researches as well as the master thesis *"Urban planning and architectural proposal for public spaces in Varaždin city centre”* (student: Tamara Lukić, mentor: Assoc. Prof. Lea Petrović Krajnik, PhD, 2019).

The historical transformation of the former fortifications in the beginning of the 19th century opened the possibility of design and arrangement of new public spaces. These newly designed places were located on the site of former bastion

fortifications and have a representative character and special significance in the urban fabric of the city. Morphological recognition of the space on the site of the former fortifications in the urban matrix at the beginning of the 21st century is mostly possible due to the existence of a circular street on the site of the former road around the fortress moat. The fact that four newly designed urban cassettes, on the site of the moat, have been preserved from construction, speaks of the recognition of the needs and possibilities of creating a quality public urban space on the junction of the city core and the suburbs. Banski and Capuchin Square were designed as extensions of *Via fossata ambiens* on its northeast and southwest corners, and the public city park Prater-Graberje on the west and the public city park Šetalište (today's Jagićevo šetalište) on the southern moat. (Krajnik, 2007; Krajnik & Obad Šćitaorici, 2007)

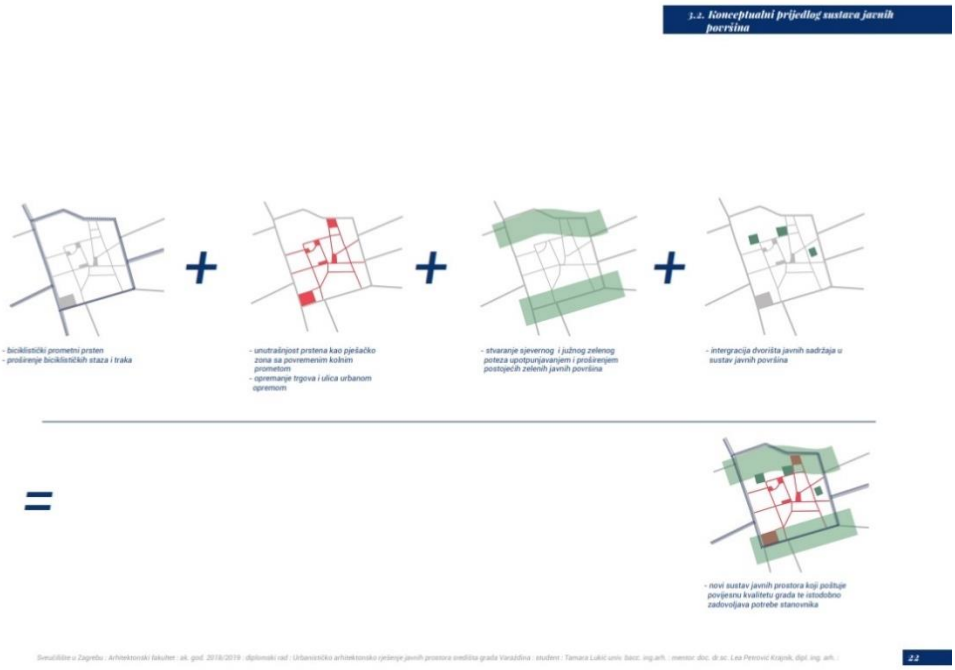


Figure 2: Conceptual proposal of the public space system (source: Lukić, 2019)

The analysis of the present situation of public spaces, construction and facilities surrounding them, traffic infrastructure, existing urban equipment and events that take place indicate the current state of public spaces in the city of Varaždin and their level of activity. From the existing spatial planning documentation, it is evident that the city centre is planned as a cultural, social and business centre of the city of Varaždin. Public spaces represent the potential for further development based on the principles of sustainability.

RE-THINKING AND ENHANCING OF THE SYSTEM OF PUBLIC SPACES IN THE VARAŽDIN CITY CENTRE

The analysis of the present situation of the centre of Varaždin pointed to the need of public spaces redefinition and planning interventions to create a better, more complete and diverse system of public spaces, in order to provide an environment for creating a quality atmosphere suitable for residents and visitors.

The proposal for a new system of public spaces of the urban centre respects the historical identity of the city and is designed to meet the needs of its residents. The proposal is based on 4 basic elements: 1) Creation of a bicycle traffic route around the centre and widening of bicycle paths and lanes; 2) The city core is designed as a pedestrian zone with occasional traffic. Streets and squares need additional urban equipment to allow additional activities throughout the year not only for visitors but also for city residents; 3) Creating a northern and southern green stretch by completing and expanding existing green public areas; 4) Integration of public facilities courtyards into the system of public areas. (see Figure 2)

Figure 3: Interventions in public spaces of the centre of Varaždin (source: Lukić, 2019)

Different interventions on 12 locations (3 squares, 6 streets and 3 courtyards) which are an integral part of the public space system had been proposed. Each of the locations has its own specifics, and by applying primarily “soft” measures, proposals seek to improve the public spaces in the city centre. Interventions include the following activities: creation of “new” squares in the urban fabric and the redistribution of square functions, design of a new pedestrian street, and equipment

of existing streets with urban furniture; introduction of “new” courtyards opened for public use into the system of existing courtyards; redefinition of the existing park on the north-east edge of the historic urban core; arrangement of a new children's playground in one of the public courtyards; arrangement of new bicycle paths and building new bicycle pavilions; the construction of a new underground public garage and the removal of parking lots is planned on the northern perimeter of the city centre; new traffic regulation of the in order to improve the quality of life of the inhabitants.

Figure 4: Microlocation – newly arranged public space on the northeast perimeter of the historical core (source: Lukić, 2019)

Special attention was given to the north-eastern edge of the former historical fortifications, which was recognized as a strong potential in the urban matrix and an area where the implementation of the largest number of interventions is required. The square and the park of Ban Josip Jelačić were designed as a space of dual character. In the context of traffic, the proposal envisages the relocation of the existing parking lot on the ground level of the square to the underground, where the construction of an underground garage on two floors is planned. It is planned to expand the vehicle-pedestrian zone and to create new pedestrian communications, respecting the historic routes. Along the north and south of the square, different facilities (florists, terraces and pavilions for rent) are planned to complement the existing facilities. The existing greenery has been preserved, effort was made to horticulturally enrich the existing park, and the square perimeter has been additionally *greened* with tree lines. In the north-western part of the park, arrangement of a children's playground, and the additional urban equipment

designed for the needs of the public space system of the centre of Varaždin was proposed.

Pavilions set up around the perimeter of the square use PV panels to produce electricity. Cooling of the space during the summer months is enabled by natural ventilation, while the canopy, the existing construction and the peripheral high vegetation serve as protection from the sun. During the winter, the glass wall of the pavilion allows the sunlight transfer and additional heating of the space.

CONCLUSIONS

Public spaces represent especially important elements in the development of urban fabric, whether it is about its expansion or transformation. They are one of the main constituent elements of the built environment, which functionally and visually contributes to the integration of urban tissue. In addition, they are places for social interactions that can significantly contribute to the culture and quality of life of residents.

Varaždin is one of the examples of Croatian cities in which historical transformation of the former bastion fortifications opened the possibility of design and arrangement of new public spaces. Newly designed public spaces are becoming part of the urban fabric and have multiple implications for the quality of life of residents. To this day, these spaces have retained their basic functions, but thanks to the dynamics of the relationship, their functions are gaining new hybrid dimensions.

In the spatial planning documentation from the beginning of the 21st century, the historical core of Varaždin is planned as the cultural, social and business centre of Varaždin, and public spaces represent the potential for further development based on the principles of sustainability.

Based on the comprehensive research and analysis of the elements that affect the public spaces of the city centre, a system of public spaces which represents a potential contribution to the aspects of sustainability at the local level has been planned. With the application of predominantly “soft” measures in the planning of public spaces and the design of elements of urban equipment based on the principles of sustainability, the newly renovated spaces acquire new features, and the entire system contributes to the quality of life not only for the inhabitants of the historic core but of the city of Varaždin as a whole.

REFERENCES

City of Varaždin. (2019). *Urbanistički plan uređenja povijesne jezgre / Urban development plan for the historic core*. Retrieved from https://varazdin.hr/urbanisticki-plan-uredenja-povijesne-jezgre/

Francese, D. (2016). *Technologies for Sustainable Urban Design and Bioregionalist Regeneration*. London and New York: Routledge.

Horvat, J. (2002). *Urbanistički parametri u projektiranju javnih gradskih prostora / Urban Designing Parameters in Organizing Public City Space*. (doctoral dissertation, mentor prof.dr.sc. Srečko Pegan). Zagreb: Faculty of Architecture, University of Zagreb.

Institute for tourism. (2008). *Podloga za strategiju razvoja i održivog upravljanja povijesnom jezgrom grada Varaždina / The basis for the strategy of development and sustainable management of the historic core of the city of Varaždin*. Retrieved from http://www.iztzg.hr/hr/institut/projekti/strucni/?projekt_id=69&tip=3&podrucje=5

Krajnik, D. (2007). *Urbanistička preobrazba bastionskih utvrđenja / Urban transformation of bastion fortifications* (doctoral dissertation, mentor: prof.dr.sc. Mladen Obad Šćitaroci). Zagreb: Faculty of Architecture, University of Zagreb.

Krajnik, D. & Obad Šćitaroci, M. (2007). Preobrazba bastionskih utvrđenja grada Varaždina / Conversion Process of Bastion Fortifications in Varaždin. *Prostor,* Vol. 15 No. 2(34), 180-193.

Krajnik, D., Obad Šćitaroci, M. & Šmit, K. (2008). Preobrazba gradskih utvrda u javne prostore urbane društvenosti / The Transformation of City Fortifications into Urban Public Spaces. *Društvena istraživanja*, Vol.17, No. 3 (95), 463-482.

Lukić, T. (2019). *Urbanističko arhitektonsko rješenje javnih prostora središta grada Varaždina / Urban planning and architectural proposal for public spaces in the Varaždin city centre* (master thesis, mentor doc.dr.sc. Lea Petrović Krajnik). Zagreb: Faculty of Architecture, University of Zagreb.

Petrović Krajnik, L., Obad Šćitaroci, M. & Dundović, B. (2013). Perivojna arhitektura projekta EXPO'98: Čimbenik preobrazbe istočnog obalnog područja Lisabona / Landscape Architecture of the EXPO'98 Project: Transformation Factor of the Eastern Coastal Zone of Lisbon. *Prostor,* Vol. 21, No. 1(45), 128-139.

Petrović Krajnik, L., Križanić, V. & Krajnik, D. (2019). Importance of green spaces in planning sustainable urban areas. *SMC - Sustainable Mediterranean Construction*, No 10, 40-46.

Žmegač, A. (2000). *Bastioni kontinentalne Hrvatske / Bastions of continental Croatia*. Zagreb: Golden marketing, Institut za povijest umjetnosti.

T9

TRACK 9: PERSPECTIVES ON SUSTAINABLE MOBILITY: CULTURE OF EVERYDAY ACTIVISM

Track Chairs:

Janez Grom,
University of Ljubljana, Faculty of Architecture, Ljubljana, Slovenia and

Christine Mady,
Notre Dame University-Louaize, Ramez G. Chagoury, Faculty of Architecture, Arts and Design, Department of Architecture, Lebanon

Mobility in this track is investigated through a relational perspective, considering the historical, social, economic, political and environmental characteristics of the context, and how they shape and are shaped by social practices. In particular, the role of mobility in contexts of instability is central in either mitigating or increasing discrepancies among the population. Also, social practices including everyday activism could contribute towards facilitating the mobility of various groups such as the disadvantaged, the impaired, the very young or the aging. Activists are essential in promoting different modes, specifically the non-motorized. Contributions to this track are from various disciplines and engage with the following questions: how is mobility justice sustained in the absence of public investment? How can activists guide investors in transportation away from the modification of basic mobility and towards a sustainable approach? What happens to everyday mobility in contexts of instability such as sudden population changes, natural or man-made disasters? How can actors engage in increasing accessibility and everyday mobility for different user groups? How can activists inform urban planners and policymakers in decisions related to mobility to and within urban contexts? What modalities by mobility activists contribute to sustaining spontaneous encounters and social interaction through mobility, enhancing the urban experience?

Keywords: Everyday Activism, Mobility, Mobility Studies, Relational Perspective

A ROAD OR A STREET? A CASE OF "VODNIKOVA" IN LJUBLJANA

Janez P. Grom[1]
Assist., University of Ljubljana, Faculty of Architecture, Janez.grom@fa.uni-lj.si

Matevž Frančič
Arch., ID:doma, matevzf@icloud.com

Alenka Fikfak
Assoc. Prof., PhD, University of Ljubljana, Faculty of Architecture, alenka.fikfak@fa.uni-lj.si

ABSTRACT

Urban spaces should reflect the quality of life, by continuing a dialogue with history, identity of places, including the built environment. Open public spaces are primarily catering to the various needs of people. The transformation from a traffic street to a street with outdoor activities can support the identity of the city and create or reinforce the local community. This paper presents the model of cooperation between students, inhabitants and experts to establish Vodnikova 'road back to a street' (RBS) through a learning process based on practical work and learning through experience. The project "Re-inventing the Vodnikova street" brought up an intense collaboration between the local people, who were not happy with a situation that was a result of the unplanned processes, a well-organized public initiative and students from the Faculty of Architecture in Ljubljana.

Keywords: local community, learning by doing, students, Vodnikova street

INTRODUCTION

Today's streets are an opportunity for a multifaceted vitality for the local communities and they must offer and create liveable places. Street-space represents more than 80 percent of all public space in cities and has the potential to foster business activity, serve as a front yard for residents, and provide a safe place for people to get around, whether on foot, by bicycle, car or transit (NACTO, 2013). Already in 1968 Sallman (in Madanipour, 2010) has defined that the "tension between the public and the private can be seen in the European medieval city, where the streets and open spaces of the city are gradually being threatened by the expanding houses and private spaces, to the extent that a minimum amount of space is left for passing through and for conducting trade and other essential functions". An appreciation of urban morphology is also important in relation to the preservation of the human scale within urban areas (Jacobs, 1961). In addition,

[1] Corresponding author

detailed attention to the local scale of urban form demonstrates the significance of interaction of street spaces, the street system and traffic and pedestrian accessibility and flows (Oliveira, 2016). Streets spaces are a mirror of the quality of life, by continuing a dialogue with history, identity of places, including the built environment, land and property questions, they are public spaces reflecting the needs of people. But, when asked about the built environment, the 'person in the street' would probably begin and end with comments on the visual manifestation of the architecture of specific buildings (Oliveira, 2016). "Reducing traffic with motor vehicles, care for the environment and economical use of resources" are well-known development goals. But we are still dealing mostly with discussions 'road vs. street' as we know that the motorized traffic represents a lifeblood to the functioning of a society, but actually prevents life to evolve where it flows.

On the other hand, "urban public open spaces are highly contested areas where different interests and desires meet, which is why they are an ideal arena for considering such questions" (Nikšič, Ragozino, Fikfak, 2018). The question of the democratization in the urban planning system was interpreted as setting new standards for an equal input of citizens in urban (re)development processes (Smith, 1999; Akkerman et al., 2004), where most transit and road systems were developed to facilitate suburb-to-city. But what does the 'street' stand for? Do we consider it as a space for people's interaction or is this just another example of 'shared spaces'? Does the social interaction happen as a result of shops, stores or houses along both sides of a road and are these the promotors of social interaction? The importance of "shared values of community members in relation to public urban spaces, including empathy, wellbeing, intimacy, sustainability, conviviality, mobility, accessibility, imagination, leisure, aesthetics, sensoriality, solidarity, and respect" were defined in the project Human city (2014; in: Nikšič, Ragozino, Fikfak, 2018). How can we help giving voice to the residents of a certain street in decision making processes in order to create inclusive social spaces?

CASE STUDY: VODNIKOVA STREET

The morphological structure, in relation to social space, can be pointed out as an essential element of human life-space functioning. According to the morphological studies (Lynch, 1960; Alexander, 1977; Carr et al., 1992; Mogutin, 2003; Carmona et al., 2010; Hinse, 2014; Makeover, 2014; Oliveira, 2016; Conzen, 2018; Maretto, 2018; Kropf, 2018) it is the built structure that creates the anchoring points of the stage 'of life' presented as spaces 'in-between'. As part of the morphological structure in urban systems the streets are reflecting the 'white', a 'no-place' structure in urbanity, a line or way to move from one point to the other. And certainly not an open space to stay in for a long term, to sit and observe the surrounding, to read a book, to talk with a friend etc. But as a part of the open space system they create a backbone to 'share values of community members', the stage for the life of the users. Whenever the balance between circulation and community

life or one or the other prevail, the whole system cannot offer a stable platform for user's quality of life. In the case of Vodnikova street this is more than apparent.

Vodnikova is a peasant street which was swallowed by the city. In the historical sense, Vodnik's path goes from the city center of Ljubljana to Kranj, along which the villages lined up: Lower and Upper Šiška, Dravlje, etc. (cadastral plan 1825 Unter and Oben Schisckha). In the first half of 20th century the city began do devour villages that were gaining an increasing number of suburban characteristics. After the WWII, Vodnikova became one of the backbones of the modernist typology of block buildings. On the street, different building typologies are intertwined and arranged in an organic way: the historical peasant homes in the core of the village of Upper Šiška, one-dwelling buildings of inter- and post-war period, as well as completely modern blocks of flats as part of the large residential neighbourhoods. Because the street grew organically, various spatial and functional accents were lined up along it: important cultural and historical sights ('Old' church, Gale Castle, Vodnik Homestead[2]), public buildings (schools, Petra Držaja hospital located in the castle garden of the former Jama Castle), market, bars, cultural and sports institutions and landscaping – architectural accents such as a two-row treeline next to the modernist neighbourhood of Šiška. At Koseška marketplace, the street is crossed by the PATH[3]. Amongst other things, there is also a side street with still functioning farms. In the proximity of Vodnikova street there are also the 'new' administrative centre and the former cinema building transformed into the centre of urban culture 'Kino Šiška'. In the immediate vicinity there are also health centre and the green hinterland of Šiška hill and Koseški pond, which have important leisure and recreational functions. A variety that is hardly paralleled in Ljubljana.

Until recently (2018), the Vodnikova Street was a typical suburban road, which was arranged according to the principles of road arrangement from the 70's and 80's of the 20th century, as the city axe's (term in contrast to the repertoire of urban morphology) where all the functionality was subject to car traffic requirements: at the expense of a too wide roadway in several spots there were neither cycle paths nor sidewalks for pedestrians. The speed that car drivers could develop was often significantly higher than allowed in settlements, and the street greenery was completely absent. The road was dangerous, noisy and uncomfortable; a feeling of a dangerous place was attached to it; therefore, the parents would very likely drive their children to a nearby schools, located less than 1km away).

[2] The Vodnik Homestead is the birthplace of the poet, priest, and publicist Valentin Vodnik (1758–1819). Nowadays Vodnik Homestead serves as a cultural centre - a house of reading, writing, and storytelling. It is managed by the Divja Misel Institute, which is also well-known for organizing the Library under Trees. The Homestead hosts regular book-themed events for adults and children and houses a gallery hosting thematic exhibitions. The programme of events is created in collaboration with partners in the fields of literature and music. (www.visitljulbjana.com)

[3] The Path of Remembrance and Comradeship (PATH) is a circular recreation ground in the city of Ljubljana, Slovenia. It is almost 33 km long and passes through the urbanised areas and the natural landscapes (Fikfak et al., 2019).

CREATIVITY AND EXPERIENCE: LEARNING IN/ FOR LOCAL COMMUNITY

"The formation of meaningful urban public space at a city level also has an important role in achieving a more socially cohesive city. The advantages of the city locations that are already present in users' mental images in a positive way can serve as starting points to extend the well-known and well-used public spaces into new city territories, thus not only contributing to a more recognized and better connected network of public space at a city level, but could also lead to new social interactions and economic activities in yet undiscovered city territories." (Nikšič and Butina, 2018, p. 881) The case of establishing the Vodnikova 'road back to a street' (RBS) type of communication is an example of innovative approach in connecting learning process with local community. The method used in RBS transformation process were: active inclusion of locals, students work, implementation of theory in practice, fieldwork, and several parallel community initiative activities. The conversion from a generic space characterised by the traffic dominance to a place for inhabitants, projecting their historic identity, was a situation where different experts and the public met in a constructive dialogue.

In the process of exploring the unknown problems we learn to think actively, by trial, and to solve various situations with creativity. In society, not just in school, this is a 'sensible risk' (Novak, 2004, p. 23), but many authors are convinced that only creative thinking guarantees our development within the 'society of knowledge'. Creativity is tightly connected to empirical methods of learning, where the involvement of an individual in the experience is the most important. The basic ingredient of empirical learning is without a doubt participants' communication, which includes conversation, thinking and acting; empirical learning is social learning, because it erases the boundaries between the performers and participants, they both search for the common solution of the problem (Marentič – Požarnik, 1987). For Maretič Požarnik (2002), spontaneous learning enables acquiring different types of knowledge. Central methods are: simulation, practice, group interaction, role-playing and movement of body. The form of spontaneous learning is closely connected with practical work, as a process of education, learning through 'experience'. But while it is clear within the academic circles that different tools and approaches are supporting the 'learning process', what does this mean for the local community?

The project "Re-inventing the Vodnikova street" brought up an intense collaboration between the public, i.e. the local people suffering a *de facto* situation (that was a result of unplanned solutions,) a well-organized public initiative and students of the Faculty of architecture of the University of Ljubljana, working together with different experts. Much more than a physical redesign of an urban road, the important goal was the transformation to a user-friendly street with adjacent spaces (the solution solving approach). The additional value of this specific project was the long-term learning effects that activities had onto the participants. The activities brought together the community members who felt being active players in the process and thus now form the part of the local

community that feels attached to the place and actively uses the places. Without the co-creation based on the 'user base' the places would probably remain voids and still be present just as 'well and nicely designed spaces'.

The challenge in setting up the collaboration was how to ensure an inclusive process for the rediscovering, rather than redesigning the street. The process of re-defining the identity of the street reflected its role of the backbone for the local community's life in open spaces. Therefor practicing the more inclusive pathways for provision of public space, inclusive and participatory social life was essential.

COMMUNITY ACTIVISM AND STUDENTS WORK

The initiative "Uredimo Vodnikovo" (*Arrange the Vodnik street*; founded in December 2015) is an open platform where a much broader view of the issues and arrangements is possible than offered by established design practices. It enables discussion and confrontation of different points of view: citizens – official site – students, etc. Solutions and proposals go beyond the usual planning frameworks and create new possibilities. The initiative "Uredimo Vodnikovo" started to function in 2015. There were several actions[4] all oriented mainly to promote local community life in relation to transform Vodnikova road back to a street.

Figure 1: Presenting to public the ideas being developed in a co-creation process is the key element of participatory and inclusive urban design processes (foto: Matevž Frančič)

[4] From 2015: the beginning of initiatives to redesign Vodnikova; the first contacts with the neighbourhood community (Fig. 1); written initiatives to Municipality of Ljubljana (MOL); the beginnings: first analyses of the situations and the first "wish list"; followed by Jane's walk 2016 – contact with the residents, learning about the problems, past experiments, wishes, … In the spring of 2016 students got involved in the story of Vodnikova road/street. This was followed by actions and initiatives, such as: Let's revive Vodnik's 2016 (on Mobility Day); round table 'What kind of Vodnikova street do we want?' 2016; Jane's walk 2017: in front of the city and behind the village; Garage sale; Street festival: More than a road to the city (on Mobility day); workshop with students of urbanism; action: Our little car, round table; Jane's walk: suggestions for arranging Vodnikova 2018, etc.

Vodnikova Street – Learning and Resolving Problems Together

In the annual semester of 2015/2016, urban planning students of the Faculty of Architecture, University of Ljubljana joined the "Re-inventing the Vodnikova street" activities. One of the issues was to address the problems of the street (Figure 2) and its open spaces through the format of the student workshop rather than through a common and generic client/designer contractual process. This format better responded to the needs and dynamics of the work already carried out by "Uredimo Vodnikovo" community initiative, as it offered an open platform for discussions.

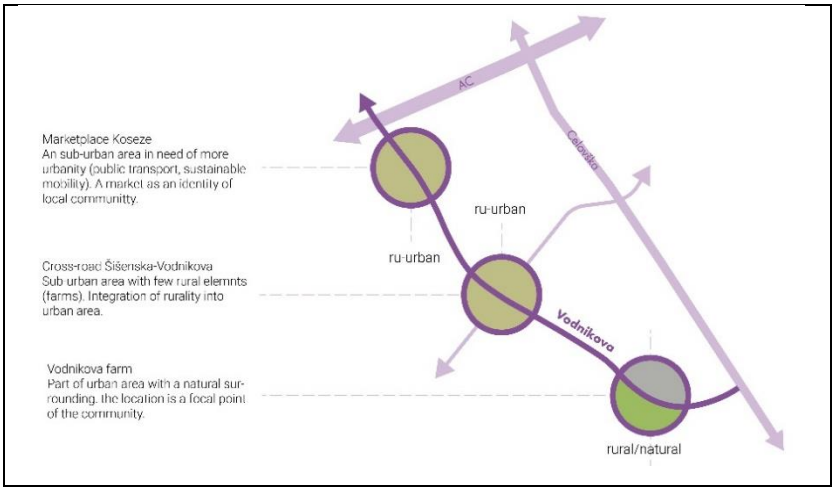


Figure 2: Vodnikova street with main location of students work (Grudina et al., 2017)

The process of inclusive urban design and problem solving is beneficial to all included. This statement is further confirmed when students of urban design studies come in contact with real life issues. Their energy, but mostly uncontaminated enthusiasm that has no boundaries in real life or pragmatically limited design approaches serves as a wonderful catalyst of fresh, inventive and innovative ideas. The process itself is an example of good and positivistic dialogues since the students have no political or economic agenda. With their fresh and not limited ideas they have offered well intentioned and sincere solutions. By entering this type of process anyone included feels the benefits of a workshop. It can be affirmed from Vodnikova experience that ex-cathedra teaching processes produce only a certain level of knowledge while the practical experience for the implementation of the gained knowledge is what is missing in the so-called classical teaching methods at the universities. The methods of teaching/learning through practice require much more energies from the teacher, but the positive benefits of this learning by doing processes more than justifies the invested energies. These processes prepare the student to real life situation and improve their communication skills with other participants of design processes.

The activities of the workshop were initiated by a series of presentation and lectures held by the Initiative representatives. The lectures were combined with 'on situ' activities such as location visit and by taking part of organized activities such as the Janes walk. All these ensured that the students were able to come in a direct contact with concerned experts already working on the issues of Vodnikova street and most importantly with inhabitants of the area, i.e. the end users. The 'getting to know each other' facilitated all the other steps taken towards a final design solution. Students were divided into working groups and produced a series of different conceptual ideas based on the previously carried out analytical work. All the stages of their design work went through a series of consultations with mentors from the faculty as well as external experts from the Initiative setting the guidelines. Each group was tasked to point out critical locations alongside the Vodnikova street. Each of these locations went through the same process of problem identification, analytical work, idea conceptualization and design drafting (Figure 3). After the work on a single micro location (3 of them) was completed, the groups had presentations at the faculty where mentors, both from the faculty and from the Initiative, were present to offer comments. When three selected micro locations were completed (Figure 4) in such manner, the final task of each individual group was to bring their ideas together in an integral proposal for the whole Vodnikova street. This resulted in as many final solutions as there were groups. The process of project division within each group meant that the solutions were well detailed, layered and they addressed specific issues along the street.

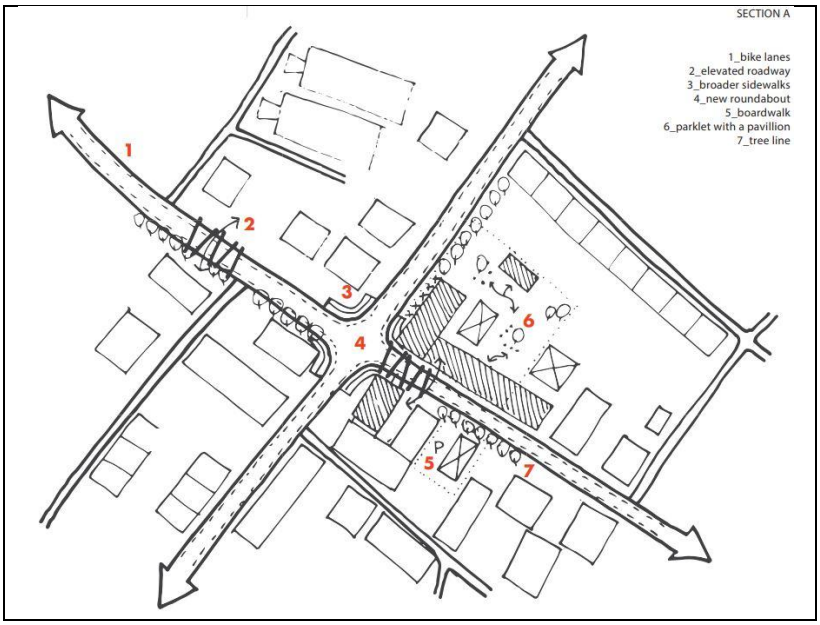


Figure 3: A conceptual draft by one of the student groups showing approaches to a re-design of the street – more space for bicycle line and more activities near the street to offer vitality and interactions (Lavtižar, Banovec, 2017)

Figure 4: Students work example - location Vodnikova homestead. Introduction of new walking path "gallery" (Todorovič, Krišto, 2017)

The organized final public exhibition of student work offered a platform for discussion between all interested parties. This ensured a consensual decision for the final product that served as a basis for the factual design decisions later on that were finally implemented in the space. Students gained experiences otherwise impossible to be gained in a standard academic environment.

During the process of work, we have used system of participation approaches, from: New Economics Foundation's Participation Works! 21 Techniques of Community Participation for the 21st Century (1998) and the Urban Design Group's Involving Local Communities in Urban Design (Billingham, Loew, 1998). These reports identified seventy-eight separate techniques, which were very useful in discussions between all participants in the process of thinking and learning; some most important that we want to point out are "involve all those affected, encourage local ownership of the process, plan your own process carefully, agree rules and boundaries, quality not quantity, involve all sections of the community, spend money, get value for money, accept different agendas, accept varied commitment, be honest, be transparent, have fun…"

CONCLUSIONS

Today, Vodnikova has been renovated, bicycle paths and pedestrian paths have been arranged, new pedestrian crossings have been provided, the area in front of Koseška marketplace and Vodnik's homestead has been redesigned in favour of pedestrians, and tree clusters have been planted along the street where space and other factors allow.

Figure 5: Today we are socialising on the street. You are welcome! (foto: Matevž Frančič)

After few years one may be thinking who has proposed the design ideas which were used for RBS transformation of Vodnikova street? Does it matter? The process on itself has had the benefits for all who took part. The result is a street, its life and its users.

REFERENCES

Alexander, C. (1977). *A pattern language: towns, buildings, construction*. New York: Oxford university Press.

Akkerman, T., Hajer, M. & Grin, J. (2004). The interactive state: Democratisation from above? *Political Studies, 52*(1), pp. 82-95. https://doi.org/10.1111/j.1467-9248.2004.00465.x

Billingham, J., Loew (eds.) (1998). Involving Local Communities in Urban Design, promoting a good practice. *Urban Design Quarterly.*

Carr, S., Francis, M., Rivlin, L.G., Stone, A.M., (1992). *Public Space.* Cambridge: Cambridge University Press.

Carmona, M., Heath, T., Oc, T., Tiesdell, S. (2010). *Public Places Urban Spaces*. Oxford, Burlington: Architectural Press, sec. Edition.

Conzen, M. R. G. (2018). *Notes on Urban Morphology: Its Nature and Development (1992–1999).* Teaching Urban Morphology, 51–64. Springer, Cham.

Hinse, T. (2014). *The Morphology of the Times: European Cities and their Historical Growth*. Berlin: DOM Publishers.

Fikfak, A., Konjar, M., Grom, J.P., Kosanović, S., Zbašnik-Senegačnik, M. (2019). Temperature Comfort, Recreation and Historical Features in Open Spaces; the Path of Remembrance and Comradeship (PATH) in Ljubljana, Slovenia. *Journal of Architectural Environment & Structural Engineering Research*, *2*(3), 7-14. https://doi.org/10.30564/jaeser.v2i3.1291

Grudina, P., Mijić, I. (2016). *Development of Vodnikova street.* Students work. Ljubljana: University of Ljubljana, Faculty of Architecture.

Jacobs, J. (1961). *The death and life of great American cities*. New York: Random House.

Kropf, K. (2018a). *The handbook of urban morphology*. Hoboken: John Wiley & Sons.

Lavtižar, K., Banovec, K. (2017). *Mobility on Vodnikova street.* Students work. Ljubljana: University of Ljubljana, Faculty of Architecture.

Lynch, K. (1960). *The image of the city.* (Vol. 11). Cambridge, Massachusetts, and London, England: M.I.T. Press.

Makeover, T. (2014). *Touching the city. Thoughts on urban scale.* West Sussex: Wiley.

Marentič - Požarnik, B. (1987). Nova pota izobraževanja učiteljev. Ljubljana: DZS.

Marentič - Požarnik, B., Peklaj, C. (2002). Preverjanje in ocenjevanje za uspešnejši študij (Prispevki k visokošolski didaktiki, 4). Ljubljana: Center za pedagoško izobraževanje Filozofske fakultete.

Maretto M. (2018). Teaching Urban Morphology in a Sustainable Perspective. In: Oliveira V. (eds). *Teaching Urban Morphology*, pp 243-264. The Urban Book Series. Springer, Cham. https://doi.org/10.1007/978-3-319-76126-8_14

Moughtin, C. (2003). *Urban Design: Street and Square.* Oxford, Burlington: Architectural Press.

National Association of City Transportation Officials (NACTO) (2013). *Urban street design guide.* Washington, Covelo, London: Island Press.

*New Economics Foundation's Participation Works! 21 Techniques of Community Participation for the 21st Century (*1998). London: New Economics Foundation.

Nikšič, M., Ragozino, S., Fikfak, A. (2018). Public spaces and local life : questioning the participatory approaches. *Urbani izziv*, 29, 3-8. https://doi.org/10.5379/urbani-izziv-*en*-2018-29-supplement-000

Nikšič, M., Butina Watson, G. (2018). Urban public open space in the mental image of users: The elements connecting urban public open spaces in a spatial network. *Journal of Urban Design*, *23*, pp. 859-882.

Novak, B. (2004). *Stili poučevanja učiteljev v funkciji učnih in mišljenjskih stilov učencev.* Ljubljana: Pedagoški inštitut.

Saalman, H. (1968). *Medieval Cities*. London: Studio Vista.

Smith, N. (2002). New globalism, New urbanism: Gentrification as global urban strategy. *Antipode – A radical journal of geography*, *34*(3), pp. 427-450.

Oliveira, V. (2016). *Urban Morphology. An Introduction to the Study of the Physical Form of Cities.* The Urban Book Series. Springer International Publishing AG Switzerland. https://doi.org/10.1007/978-3-319-32083-0

Todorović, A., Krišto, T. (2016). *Interventions on Vodnikova street*. Students work. Ljubljana: University of Ljubljana, Faculty of Architecture.

EXPERIENCING MOBILITY UNDER INSTABILITY: A PERSPECTIVE FROM BEIRUT'S INFORMAL BUS RIDERS

Christine Mady
Assoc. Prof., PhD, Notre Dame University-Louaize, P.O. Box 72 Zouk Mikael, Zouk Mosbeh, Lebanon, christine.mady@ndu.edu.lb

ABSTRACT

The geopolitical location of Lebanon allowed it over time to play a significant role regionally, with Beirut as its nexus. The Lebanese civil war between 1975 and 1989, with ongoing implications to present, rendered this country a potential laboratory for exploring various aspects of instability's effects on spatial practices, especially everyday mobility. The perspective of riders is considered. This article builds on Lefebvre's triad of space to investigate relationally the planned road network, the everyday experience of mobility by bus or car, and contextual specificities in Beirut. Building on participant observations by using the available informal bus system, and conducting interviews with the NGO Riders Rights (RR) who work on raising awareness on the current informal transport system, this research explores the riders' experience and its dissonance from the planned transport infrastructure in Beirut, with the disruptions it incurred due to instability. The interest in this exploration lies in identifying differentiated spatial experiences of Beirut by the private automobile or the shared transport system as well as various perceptions of the latter, and its operation under instability. This research could contribute towards alerting public transport policymakers to have a more nuanced understanding of the riders and awareness of the current experiences and their underpinnings in order to contribute to an integrated public transport system.

Keywords: Beirut, informal bus system, mobility, riders, spatial practices

INTRODUCTION

Observing streets in Beirut, one notices heavy traffic congestion with the dominance of private vehicles, the scarcity of pedestrians and public transport vehicles, amidst the presence of security measures such as checkpoints, concrete blocks and barbed wires. When spotted, public transport vehicles with red matriculation plates seem to move about haphazardly, struggling to escape heavy traffic congestion, even if by breaking rules. This vignette is the fruit of a history of intermittent instability and contextual traits. To explain this situation, I start by defining mobility as a practice and experience in reference to the mobility turn (Urry and Sheller, 2006), and further, informal mobility as broadly referred to in the literature (Cervero, 2000) and its riders are examined within unstable contexts.

Under instability, Lefebvre's (1991) triad of space serves to frame the relation between the planned spaces for mobility, spatial practices and embedded contextual meanings affecting mobility, to check whether it leads to riders' differentiated experiences. This is illustrated through participant observations that were conducted in August 2019 by riding along five bus lines: 6, 15, 24, 2 and 22 (Figure 1, see http://busmap.me/#downloads). The observation comprised taking photographs of locations where allowed, taking notes on the bus to depict actions as they emerged among driver, riders and understand how stops are signalled and changes announced. These lines were chosen due to their spatial distribution across Beirut, to experience their navigation and negotiation at terminals and across city boundaries, and learn about the generated encounters, norms and meanings for riders. In addition, interviews with Chadi Faraj (Faraj, 2018; 2019a; 2019b; Mady, 2018b), one of the Riders Rights NGO founders were conducted on 14 June 2018, 20 May and 8 August 2019 and served to gain insight on the informal mobility system and its riders.

Figure 1: The Bus Map (http://busmap.me/bmp-en-pocket.pdf)

INSTABILITY, INFORMAL MOBILITY AND CAR USERS

Mobility, whether by car or public transport, is a reflection of everyday urban life. It helps in generating context-specific experiences of 'socialities, affinities, knowledge', which one learns by practice and according to circumstances (Buhr, and McGarrigle, 2017, pp. 227-228). Mobility for riders of informal public transport differs from that of insular spatial practices of being in a car, dissociating themselves from the public (Farjalla et al., 2017) and choosing which mode to use and route to follow (Alaily-Matar, 2008; Blokland, 2017). Informal mobility's predominant traits include the absence of state endorsement, and response to market demand (Cervero, 2000; Cervero and Golub, 2007), though contextual considerations reveal further complexity. Automobile users perceive it as a nuisance or undesired reality, a safety and pollution threat (Cervero, 2000). Not participating in shared transport results in a 'public space so imputed with normative understandings of (in)appropriateness that they appear inaccessible to some.' (Blokland, 2017, p. 559) Informal mobility's vital role in providing spatial justice (Cervero, 2000: 9; Adams-Hutcheson et al., 2017; Sheller, 2018) is overlooked. It is perceived as serving a homogeneous, stereotyped user group rather than 'multiple identities of users' (Levy, 2013, p.49). There is a fuzziness in referring to the riders according to gender, race and income, and reducing them to those 'captive riders' (Chidiac, 2008, p. 45) who are forced to use informal mobility on socio-economic, and gender-based assumptions (Levy, 2013, p. 49; Samaha and Mohtar, 2016). Nevertheless, these 'normalized mobile subject[s]' (Sheller, 2014, p. 50) have accumulated knowledge of the routes, the operators, other passengers and their interrelations. The commuting experience generates a routine for the regular riders who learn the practices and codes on the bus but also have spontaneous encounters and interactions with others (Blokland and Schultze, 2017). Categorising and stereotyping riders, leads to marginalising their knowledge and ridership experiences, values and norms, and disabling them from contributing to the improvement of the informal system. Therefore, there is a need to understand their perspective on differentiated socio-spatial mobility experiences in order to address them. Mobility is a key factor in enabling social integration (Buhr, and McGarrigle, 2017, p. 228) and the production of mutual recognition that could increase tolerance, and support diversity within urban life (Blokland and Schultze, 2017). Though under instability, mobility cannot be taken for granted, as it is no longer an everyday practice equally available to all. This article builds on Lefebvre's (1991) triad of space to investigate relationally Beirut's planned road network as representations of space, the everyday experience of mobility under instability by bus or car as spatial practices, and contextual specificities in Beirut as representational spaces.

READING BEIRUT THROUGH THE SPACE TRIAD

In 1890, under Ottoman rule, Beirut had its first motorised public transport, a tramway with five lines covering the city north to south, and peripherally along the

waterfront (Hanssen, 1998). During the French mandate period, the focus shifted to the expansion of the road network serving trade, and forming suburban and peri-urban residential areas accommodating different religious, sectarian, ethnic and economic groups (Saliba, 1998). In 1943, the newly constituted Republic of Lebanon was marked by its free-market economy and consociational democracy (Salamey and Tabbar, 2008). This meant that state representation was divided among the various politico-sectarian groups with the intention of sharing power and ensuring equity among the multi-sectarian population (Camett, 2011). The reality of the situation was that 'authoritarian inner-state entities' (Salamey and Tabbar, 2008, p. 240) emerged with the patronage of politico-sectarian parties supporting their communities with a strong sense of communal belonging, rather than serving the public at large and having civic belonging (Roy, 2009; El Khazen, 2000). Nevertheless, various communities lived in cohesion until the war's outbreak. The new republic adopted 'western' trends in urban planning, and proceeded with the implementation of the inherited French schemes (Salam, 1998), prioritising road infrastructure and the automobile (Perry, 2000). In Beirut, this meant dismantling the tramway lines to expand the road network and introducing buses. Nevertheless, the favoured shared transport was by car, the 'service' or jitney, a more individualised means of trasnport. The service used the existing road infrastructure, had flexible itineraries and wide coverage, with routes radiating from the city centre towards all residential districts (Jouzzy and Nakkash, 1973). Since its inception, the service operation was linked to politico-sectarian groups (Jouzzy and Nakkash, 1973), which meant that its management by the municipality was difficult, a condition that was accepted and continues to present (Chidiac, 2008; Monroe, 2017).

The symbolic trigger for the war in 1975 was a shooting at a public bus crossing between east and west Beirut (Chidiac, 2008), a recurrent incident that led to an aversion towards the bus. Public transport stopped during the war, except for the service (Perry, 2000). The war annihilated the city centre (Tabet, 1996) and changed Beirut topologically: Damascus road became the demarcation line over 15 years, and segregated Beirut's population into predominantly Christian east and Muslim west (Khalaf, 2002). Urban spaces such as Martyrs Square north in the city centre (Khalaf, 2006), transportation terminals (Khalaf, 2002, p. 248), and the pine forest to the south (Mady, 2018a) became no-go areas. Beirut developed into a polycentric city, with insular neighbourhoods servicing its severed east and west parts with limited commute across them (Grenberg, 2002; CDR, 1995). Urban mobility was physically and mentally restricted by the prevailing boundaries of militia territories in a fragmented city (Nucho, 2016). The civil war ended in 1989 under the Taif Agreement, yet Lebanon and Beirut witnessed perpetual conflicts and instabilities manifesting themselves in different episodes continuing to present. Emerging from its devastation, a weak state and the reinforced role of politico-sectarian communities, resulted in people's mistrust in the neglected public sector, a laissez-faire attitude, and the predominance of the neoliberal market trends privileging private urban development interests over the public good. Reconstruction focused on the city centre within a public-private partnership by

the real estate company Solidere. This project disregarded the expanding and densifying suburbs and the mobility needs of the economically disadvantaged living in them or further outside Beirut (Bou Akar, 2018), despite the absence of public transport (Perry, 2000). Priority was given to reconnecting war-time disrupted streets, and the construction of tunnels and bridges, which both connect and divide (Nucho, 2016). Mobility was shaped by place of residence vis-à-vis everyday social practices and car ownership (Perry, 2000). The city is still unequally accessible to everyone and at any time, for instance to residents in suburban areas, which follow a ripple effect from the divide and consequent instabilities generating new divisions (Borell, 2008; Deeb and Harb, 2013; Fawaz et al., 2009; Bou Akar, 2012).

In 1996, the Office for Railway and Shared Transport (OCFTC) implemented a plan for reinstating a limited number of state public buses, operating on 22 routes without dedicated lanes amidst traffic congestion and with bus stops that were soon after vandalised. OCFTC buses did not have terminals, with the disappearance of the hub at Martyrs Square, and were served instead by city edge terminals (Chidiac, 2008), which were absorbed by the urban expansion in an already polarised politico-sectarian east and west. Other providers including services and taxis were competing to serve a limited post-war demand (Baaj, 2008). Also, families with affiliations to politico-sectarian leaderships gained entry into the bus transport system and dominated former OCFTC routes (Chidiac, 2008). This led to the emergence of what is referred to as unregulated (Nakkash, 2017) or informal transport serving different communities, with less network interchanges for riders commuting across these communities within and around Beirut. Network connections and disconnections change according to emerging instabilities, as was experienced with the route deviation on bus number 6 during observations.

NAVIGATING SECURITISED BEIRUT

Intermittently after the war and particularly after 2005 with the assassination of the former Prime Minister Rafic Hariri, people's everyday mobility was negotiated and often compromised to the benefit of some politico-sectarian figures, rather than the public at large (Fawaz et al., 2009). Securitisation led to the territorialisation of respective city parts, reducing possibilities for encounter and encouraging insular behaviour. Instability and security measures manifested temporally at various levels starting with complete curfews, to road closures, patrols, checkpoints, and barriers, which could be fixed or emerge suddenly in the city, in all cases affecting mobility (Monroe, 2011, p. 91). Being 'mobile' in a highly securitised context meant that the path is guided by events leading to tactics and decisions, related to the person's perceptions of security and politico-sectarian affiliations. In Beirut residential areas could be mixed from a socio-economic perspective (Alaily-Matar, 2008), yet rather homogeneous from a sectarian perspective. Hence even if car-dependent, mobility varies not only by socio-economic classes (Samaha and

Mohtar, 2016) but also along politico-sectarian differences, where new boundaries were formed, accompanying demographic changes.

RIDING BEIRUT'S BUSES AND CONCLUSION

Based on observations, I demonstrate network connections and disconnections, the fluidity of stops, routes and terminals. One clear distinction across routes is how they connect suburbs to the capital's centre. Coming from a northern or eastern suburb, only few routes connect to the southern suburbs, and vice versa. Bus number 6 for instance is operated separately on two different routes, serving two separate areas without connecting them with stops, as evident on the map and experienced during my ride. In the absence of a central terminal like Martyrs Square, riders have to go through one of the two main nodes Cola in the west or Dawra in the east, to interchange and commute to Beirut and its suburbs. So 'being mobile in Beirut is a civic practice, one in which different social and territorial boundaries are fashioned' (Monroe, 2011, p. 107). This produces differentiation and inequalities (Monroe, 2011, p. 92) on the basis of current positionality and inherited politico-sectarian affiliations. The various territories are supported by spatial markers including slogans, dress codes, and images, which have become integral to the city, yet dynamically change, affecting communities' comfort zones, as one moves across them. Using the Bus Map generated by Riders Rights (RR) (http://busmap.me/#downloads), one realises that the marked stops are indicative of road segments that have affordances to act as stops. Riders have the flexibility of embarking and disembarking at any location and time. On some lines, routes deviate from the map or even alter the terminal stop for various reasons. As experienced during observations, these could include road repair works, bringing a rider closer to their destination, or avoiding temporary checkpoints. This reflects the system's flexibility to adapt to congestion, instability, and riders' needs while simultaneously shaping their spatial experience in the city. A first-time rider has to ask others to discover which line stops at which location or 'terminal' stop, as only few stops are visually defined or clearly marked, and some could be shared by more than one line such as 2 and 5.

Regarding riders, Monroe (2011) specifically refers to people's perceptions of the existing informal transport, whereby some consider the buses for foreign, particularly Syrian workers, while others consider people with such perceptions as snobbish. Another report on informal infrastructure in Beirut refers to this transport as a means of social integration, since it provides 'mobility for women and lower income population as the informal transportation is usually cheaper.' (Farjalla et al., 2017, p. 31) During observations, the riders included passengers of all ages, male and female, foreign and local, and different religions as reflected in dress codes and religious ornaments. This corroborates with what RR reflect on their webpage about riders' diversity (www.busmap.me). To RR, 'on the bus, everyone is a rider' (Chady Faraj, interview, June 2018). RR see the need to change insular car users' perceptions and stereotyping of riders. On the five bus lines observed,

there was no indication that one type of riders prevailed whether in terms of age, gender, religion or nationality. One could distinguish the regular riders from the casual ones, as they greeted other riders or the driver, while some asked for other lines, direction to a location, or what to do when disembarking. Despite perceptions and claims, an informal bus in Beirut shares the qualities of any public transport vehicle, and is one opportunity for social integration, at least through encounter with other familiar strangers, the riders.

This article explored the impact of instability in generating various experiences in urban mobility, especially when car dependency leads to the neglect of the public transport, and stigmatisation of the latter's riders. It highlighted the importance of not homogenising riders, and the significance of paying attention to the practices and culture generated by riders in an attempt to actively engage in improving the shared transport system. One recommendation following this research would be awareness raising and sensitization towards rendering this mobile public space an opportunity for social integration, which is what Riders Rights are also seeking to do (Faraj, 2018; 2019a). This would enable concrete interventions along the routes as well as revisions across the network to facilitate transfer and more equitable accessibility across the network.

REFERENCES

Adams-Hutcheson, G., et al. (2017). Introduction: Understanding Mobility in a Dangerous World. *Transfers, 7*(3), pp. 1– 5.

Baaj, M. H., (2008). The Public Land Transport Sector in Lebanon. *Journal of Public Transportation*, *3*(3), pp. 87–108.

Blokland, T. (2017). The Public Life of Social Capital. In: Hall, S. and Burdett, R. (eds) *The SAGE Handbook of the 21st Century City*. pp. 552–566. London: SAGE Publications.

Blokland, T. And Schultze, H. (2017). Belonging, Conviviality or Public Familiarity? Making Sense of Urbanity in Rapidly Transforming Neighbourhoods through the Lens of Berlin and Rotterdam. In Smagacz-Poziemska, M, Frysztacki, K. and Bukowski, A. (eds) *Reimagining the City: Municipality and Urbanity Today from a Sociological Perspective.* pp. 243–264. Kraków: Jagiellonian University Press.

Borell, K. (2008). Terrorism and Everyday Life in Beirut 2005: Mental Reconstructions, Precautions and Normalization. *Acta Sociologica*, *51*(1) March, pp. 55–70.

Bou Akar, H. (2012). Contesting Beirut's Frontiers. *City & Society*, *24*(2), pp. 150–172.

Bou Akar, H. (2018). *For the War yet to Come: Planning Beirut's Frontiers*. Stanford, California: Stanford University Press.

Buhr, F. and McGarrigle, J. (2017). Navigating Urban Life in Lisbon: A Study of Migrants' Mobilities and Use of Space. *Social Inclusion*, *5*(4), pp. 226–234.

Camett, M. C. (2011). Partisan Activism and the Access to Welfare in Lebanon. *Studies in Comparative International Development, 46*(1), pp. 70–97.

Cervero, R. (2000). *Informal Transport in the Developing World.* Nairobi: UN-Habitat.

Cervero, R. and Golub, A. (2007). Informal Transport: A Global Perspective. *Transport Policy, 14* (2007), pp. 445–457.

Chidiac, R. (2008). Le transport artisanal dans un contexte de crise politique, le ACS du Liban. In Godard, X. *Le transport artisanal dans les villes de la Méditerranée.* Les collectes de l'INRETS (Institut National de Recherche sur les Transports et leur Sécurité). Paris: INRETS, N° 114, pp. 41–60.

Council for Development and Reconstruction (CDR) (1995). *Greater Beirut Transportation Plan*. Republic of Lebanon: CDR.

Deeb, L. and Harb, M. (2013). *Leisurely Islam: Negotiating Geography and Morality in Shi'ite South Beirut.* Princeton, NJ and Oxford: Princeton University Press.

Faraj, C. (2018). Personal interview on 14 June.

Faraj, C. (2019a). Personal interview on 8 August.

Faraj, C. (2019b). Personal interview on 20 May.

Farjalla, N., et al. (2017). *The Role of Informal Systems in Urban Sustainability and Resilience – a Review*. Report by the Issam Fares Institute for Public Policy and International Affairs, American University of Beirut: pp. 234.

Fawaz, M., Harb, M. and Gharbiyeh, A. (eds) (2009). *Beirut: Mapping Security*. Germany: Diwan, IABR, Universität Stuttgart: Prince Klaus Fund for Culture and Development.

Grenberg, D. (2002). Borders and Boundaries in Post-War Beirut. In Erdentug, A. and Colombijn F. (eds) *Urban Ethnic Encounters: the Spatial Consequences*. pp. 81–96. London: Routledge.

Hanssen, J. (1998). "Your Beirut is on My Desk," Ottomanizing Beirut under Sultan Abdülhamid II (1876-1909) I in Rowe, P. and Sarkis, H. (eds). *Projecting Beirut: Episodes in the Construction and Reconstruction of a Modern City.* pp. 41–67. Munich, London, New York: Prestel-Verlag.

Jouzzy, N. and Nakkash, T. (1973). The Use of the Passenger Car for Public Transit. *Proceedings of the International Conference on Transportation Research Bruge* 13 June, pp. 321–328.

Khalaf, S. (2002). *Civil and Uncivil Violence in Lebanon: a History of Internationalization of Communal Conflict.* New York: Columbia University Press.

Khalaf, S. (2006). *Heart of Beirut: Reclaiming the Bourj.* London: Saqi Books.

Lefebvre, H. (1991). *The Production of Space.* Oxford: Blackwell Publishers

Levy, C. (2013). Travel Choice Reframed: "Deep Distribution" and Gender in Urban Transport. *Environment and Urbanization* 25(1/April), pp. 47–63.

Mady, C. (2018a). Public Space Activism in Unstable Contexts: Emancipation from Beirut's Postmemory. In Knierbein, S. and Viderman, T. (eds) *Public Space Unbound Urban Emancipation and the Post-Political Condition.* pp. 189–206. New York, Oxon: Routledge.

Mady, C. (2018b). Everyday Mobility in Beirut: Reassessing Informal Transport. *Master of Infrastructure Planning 3rd Conference 25-28 September.* Stuttgart: University of Stuttgart, pp. 95–110.

Monroe, K. V. (2011). Being Mobile in Beirut. *City and Society*, *23*(1), pp. 91–111.

Monroe, K. V. (2017). Circulation, Modernity, and Urban Space in 1960s Beirut. *History and Anthropology*, *28*(2), pp. 188–201.

Nakkash, T. (2017). *Towards Regulated Public Transport for Lebanon: Overcoming Obstacles and Rectifying Concepts* [translated from Arabic] (public lecture) Order of Engineers and Architects 25 October Beirut.

Nucho, J. R. (2016). *Everyday Sectarianism in Urban Lebanon: Infrastructures, Public Services and Power.* Princeton, New Jersey: Princeton University Press.

Perry, M. (2000). Car Dependency and Culture in Beirut- Effects of an American Transport Paradigm. *Third World Planning Review*, *22*(4) November, pp. 395–409.

Roy, A. (2009). Civic Governmentality: The Politics of Inclusion in Beirut and Mumbai. *Antipode*, *41*(1), pp. 159–179.

Salam, A. (1998). The Role of Government in Shaping the Built Environment, in Rowe, P. and Sarkis, H. (eds) (1998). *Projecting Beirut: Episodes in the Construction and Reconstruction of a Modern City*. pp. 122–33. Munich, London, New York: Prestel.

Salamey, I., and Tabbar, P. (2008). Consociational Democracy and Urban Sustainability: Transforming the Confessional Divides in Beirut. *Ethnopolitics*, *7*(2-3), pp. 239–263.

Saliba, R. (1998). *Beirut 1920-1940: Domestic Architecture between Tradition and Modernity*. Beirut: Order of Engineers and Architects.

Samaha, P., and Mohtar, A. (2016). Decoding an Urban Myth: An Inquiry into the Socio-Economics of Van Number 4 in Beirut. https://doi.org/10.13140/RG.2.1.2536.3602

Sheller, M. (2014). Sociology after the Mobilities Turn. In Adey, P, Bissel, D., Hannam, K., Merriman, P. and Sheller, M. (2014). *The Routledge Handbook of Mobilities.* London and New York: Routledge, pp. 45–54.

Sheller, M. (2018). Theorizing Mobility Justice. *Tempo Social, revista de sociologia da USP*, *30*(2), pp. 17–34.

Tabet, J. (1996). *Al-I'maar Wal-Masslaha Al-A'amah* [Reconstruction and the Public Good]. Beirut: Dar Al-Jadid.

Urry, and Sheller, M. (2006). The New Mobilities Paradigm. *Environment and Planning A*, *38*(2), pp. 207–226.

TRANSITION STREETS: A VIEW FROM PSYCHOLOGICAL SUSTAINABILITY PERSPECTIVE

Natalia Olszewska[1]
MD, Dual MSc, MU2 NAAD - Scientific Consultant at Impronta (Bergamo, Italy).
Fellow of The Centre of Conscious Design (London, UK), natalia.impronta@gmail.com

Nour Tawil
Architect – MU2 NAAD - PhD fellow at the Max Planck Institute for Human Development and IMPRS on the Life Course (Berlin, Germany), nourtawil@hotmail.com

ABSTRACT

McKinsey, the global consultancy firm, has expected that by 2030, 60 percent of the world's population will have lived in cities (50 percent today). The middle class is expected to reach more than two billion people, with a majority living in cities in emerging markets, leading to a continuous growth of megacities. The increasing congestion, pollution and climate change call for the emergence of new business and urban models to solve the faced challenges. The current urban sustainable solutions include a direction towards physical and environmental aspects, with a rather "passive" approach, neglecting dynamic interactions between humans and their environment.

Transition Movement consists of initiatives exploring local strategies for cutting energy use, reduction of carbon emissions, money savings and strengthening effect on neighbourhoods. This urban behavioural model rooted in social contribution and participation could indicate a direction for new urban models.

Drawing on the findings of studies on value-based decision-making and pro-environmental behaviour, we will explore the concept of psychological sustainability and its link with socio-ecological aspects. We argue that future urban models would benefit from the integration of neuroscience and behavioural sciences insights which provide a sound explanation of human behaviour and start to build evidence on human/environment interactions".

Keywords: Urban Sustainability, Pro-environmental behaviour, Transition Movement, Psychological Sustainability, Neuroscience-informed Design.

[1] Corresponding author

RAPID URBANIZATION - THE CALL FOR NEW URBAN MODELS

We are currently facing unprecedented rates of urban expansion almost everywhere in the world. It was predicted that by 2030, 60 percent of the world's population will have lived in cities comparing to 50 percent today. Also, more than half of the growth in global consumption is expected to come from cities' middle class, leading to a continuous growth of megacities (McKinsey, 2012).

This prognosis requires action targeted at transformation of human behaviour towards pro-social and sustainable. We start by reviewing sustainability in the urban context and we argue that the role of sustainable urbanism extends onto psychological and socio-ecological sustainability. We believe there is a need for a rather "enactive" approach which integrates neuroscience into urbanism. This view shifting away from the "passive" towards active exploration emphasizes the importance of situated cognition and agents' interactions with the world (Jelič et al., 2016). We explore Transition Movement as a model of social contribution and behavioural change. And we highlight the need for new psycho-socio-ecological urban models and frameworks informed by findings of neuroscience.

URBAN DESIGN AND SUSTAINABILITY MODELS

Defining Sustainability and Sustainable Development

Since the 'Brundtland report' (World Commission on Environment and Development, 1987), Sustainable Development (SD) is a main goal for many sectors in urban policy-making. The report has defined SD as a *"development that meets the needs of the present generation without compromising the ability of future generations to meet their own needs"*, underlining a long-term aspect.

Sustainability is mostly defined as a process of improvement and sustaining of healthy economic, ecological and social systems for human development. One definition stands out: "*a possibility that life of various species on earth will flourish forever"* (John Ehrenfeld, 2008). According to Ehrenfeld, the pioneer in the field of industrial ecology, this view requires a transformation in human behaviour, both on the individual and collective levels, and an adoption of a mind-set focused on "being" rather than "having".

Sustainable Urbanism – A Passive Approach

Over the years, many concepts, planning principles and movements have been created, and a considerable body of research was aimed at defining the characteristics of sustainable urbanism (SU). Urban design by itself lacks a theoretical framework of its own, though it is the most traditional field of planning (Sternberg 2000). While the physical dimensions of the urban built environment

focus on size, shape, land use, open/green spaces, transportation system and urban features, its sustainability depends on more abstract matters: environmental, social and economic. Most of the research on SU focuses on increasing density, ensuring mix-use, containing the urban extensions and attaining social and economic diversity and vitality (Jenks and Jones, 2010). Other popular core values of SU include compactness and biophilia (Adhya et al., 2011).

Conversely, in order to become sustainable, cities need to adopt a new approach to planning and operation. Planning and development decisions at local level play a significant role in enhancing local sustainability (Thabrew et al., 2009). In response to this concern, several thousand municipalities in different countries adopted the 28th chapter of Agenda 21, often known as "Local Agenda 21," which triggered the action at local scale. Since 2015, Sustainable Development Goals (SGDs) are included in the newer Agenda 2030. However, the UN's SDGs, although integrating previously separate social, economic and environmental agendas, are yet fragmented in their formulation and largely sectoral (Selomane et al., 2019).

New Urbanism – Community Building and Public Health

With the weakened sense of community in modern societies highlighted in social studies, individualism and the loss of communal bonds bring negative effects in reaching the goal of sustainable cities. New Urbanism (NU) is an urban design movement that arose in the US in early 1980s promoting environmental habits by creating walkable neighbourhoods that contain a wide range of housing and job types (Boeing et al.). The movement advocates the establishment and reinforcing of communities through planning activities and considers that architectural and urban solutions directly influence people's behaviour. Interactions among inhabitants, as well as a sense of community, might be strengthened by a proper organization of space. In their most recent definition of NU, the Congress for the New Urbanism (CNU) have focused on *'human-scaled urban design'*.

We cannot argue that this approach is beneficial for both humans and nature, but we tend to consider it within the passive approaches, as it does not necessarily lead to a behavioural transformation.

Transition Movement – Individual/Collective Behavioural Change

The Transition Movement (TM) is an initiative that supports and trains communities to help them become more sustainable and more resilient to climate change. Transition networks have emerged in many Europeans countries, after the first initiative launched in Totnes (a small town in UK of some 8,000 population). TM has become one of the fastest-growing community initiatives in the world, with thousands of registered towns in more than 50 countries until today, however with a noticed decline in growth in the recent years.

The initiative consists of a 12 steps plan that emphasise group collaboration as a driver of behavioural change, starting from individual level. Principles include visioning for a less consumption-driven future, inclusion of all interested parties, awareness raising about current environmental issues, resilience by building more self-sufficient cities, and encouragement of individually and collectively formed solutions. Such initiatives foster social sustainability and public engagement through community-based activities and offer immediate benefits such as cost savings, pleasure, sociability, sense of achievement, community, and self-expression (Seyfang et al., 2012).

However, there are limitations to TM in terms of reach and scope. TM rather addresses small sectors of society (Hamilton, 2010) and focuses on driving the transition in rather small towns through the efforts of local people (Taylor, 2012). Moreover, it faces internal and external challenges for surviving, replicating, and spreading (Smith et al., 2013), and requires long-term resourcing and institutional support (Seyfang et al., 2014). While championing local communities may be one way to make communities more sustainable, there is a challenge in implementing in the bigger city scale.

Our review concluded that TM, as an example of urban behaviour model rooted in social contribution and participation, is based on a socio-ecological approach for an individual and collective shift towards pro-environmental behaviour.

PSYCHOLOGICAL SUSTAINABILITY AND PRO-ENVIRONMENTAL BEHAVIOUR AS KEY TO SUSTAINABLE DEVELOPMENT

Human Behavior and Psycho-social Sustainability

As proposed in the previous section, the current urban models, which are informed by modernism, lack systematic understanding of human-environment interactions (Marcus et al., 2016; Jelič et al., 2016). Furthermore, these models neglect important cognitive and behavioural aspects and they reduce inhabitants to “disembodied human observers” (Mallgrave, 2013; Pallasmaa, 2011).

We argue that this gap in understanding could be filled by neuroscience, which constitutes an umbrella term for a number of disciplines applicable in architecture and urban design. In this context, the philosophical notion of ‘enactivism’ could be an important element of the framework guiding studies of dynamic relationship between the organism and the urban world (Jelič et al., 2016).

From psychological point of view, sustainability is understood in terms of promotion of human well-being and individual and collective growth (Di Fabio, 2016). The psychological sustainability model proposed by Di Fabio’s (2016) implies existence of two axes. The vertical axis constitutes the idea of ‘where I

come from' and the horizontal axis symbolizes the transition from 'I' to 'We' mentality, bridging individual and social dimensions of sustainability.

Drivers of Pro-Environmental Behaviour

What do we know about the drivers of pro-environmental behaviour (PEB) based on the social psychology research?

There are two major models of PEB that integrate **values**, **attitudes** and **beliefs**.

The first model is the *Theory of Planned Behaviour* (TPB; Ajzen and Fishbein, 1974), which suggests that PEB is more likely to occur when people have a positive attitude towards such behaviour, believe significant others already do it or believe it should be done and when they feel they can adopt the behaviour (perceived behaviour control) (Gatersleber et al., 2012).

The second model, *The Norm Activation Model* (NAM; Schwartz, 1977), suggests that altruistic behaviour underlying PEB is more likely when people feel a sense of moral obligation (Gatersleber et al., 2012).

Values, beliefs and attitudes being elements of the above discussed models, constitute the individual's **identity**. In many cases identities can form barriers to PEB (De Groot, 2008).

The environment constitutes many external influences on human decisions. Here we mention the most important drivers of PEB according to our literature review:

1. ***Connectedness to nature*** **(CN)** as identified by Geng et al. (2015) promotes PEB. Moreover, research conducted on children demonstrated a significant relationship between CN and sustainable behaviors, which, in turn, impact happiness (Barrera-Hernandez et al, 2020).

2. ***Sense of belonging (SOB)***, identified by psychologist Abraham Maslow (1943) as the third basic need in hierarchy. The SOB concerns the symbolic dimension of human and social relations and interactions, that is attachment, loyalty, solidarity and a sense of affinity and we-feeling (Pollini, 2005).

3. ***Sense of place (SOP)***, which includes strong place attachment and ecological place meaning contributes to PEBs (Field and Basso, 1999; Kudryavtsev et al., 2012). It has been also proposed that SOP could be purposely influenced in order to promote PEB and that it can be influenced by urban environmental education (Kudryavtsev et al., 2012).

4. ***Place attachment (PA)***, a concept originating from environmental psychology, stresses the existence of a bond between people and places. PA refers not only to individual experience but also to the sentiment of entire groups towards an environment. On a behavioural level, PA is expressed through actions, notably pro-environmental and pro-social behaviour (Scannell and Gifford, 2010).

Correlational studies showed that people with strong PA are likely to contribute to solutions of local environmental problems (Kudryavtsev et al., 2012).

Finally, we note that **cultural conditions** shape individuals' actions towards environmental issues (Oreg and Katz-Gerro. 2006). As stressed by Oreg and Katz-Gerro (2006), *'culture is often defined as the integrated pattern of meanings, beliefs, norms, symbols, and values that individuals hold within a society, with values representing perhaps the most central cultural feature'*.

The multicultural communities of megacities are characterized by non-converging core values and pose a challenge (Cuthbert et al., 2018).

Cognitive Affordances in Urban Context and the Behavioural Shift

Urban contexts offer plenty of opportunities through both physical and mental activities to learn, reinforce and shift human behavior towards PEB (Markus et al., 2016). Marcus et al. (2016) proposed a concept of 'cognitive affordance' as an element of a new sustainable urbanism framework. This notion is a refinement of the Gibsonian 'affordance', which was originally defined as possibilities for action provided by environmental features. However, cognitive affordance puts the stress on abilities of humans, and suggests that *"potential actions afforded by an environment influence perception"* (Djebbara et al., 2019).

Transition Movement, as an example of urban behavioural change confirms that agents rooted in social contribution and participation are more likely to act in a sustainable manner. We believe that the challenge for new urban models lies in understanding how the above discussed values correlated with PEB could be mediated in the urban contexts potentially by the use of cognitive affordances and/or other concepts emerging from neuroscientific research and theories, in the design process.

CONCLUSIONS

To conclude, shaping ecological perception of cities and education of pro-environmental behaviours becomes an urgent matter. Predominantly, urban interventions which reinforce sense of community are needed. New urban models could integrate bottom-up strategies (i.e. TM's citizen activism and initiatives originating from local communities; new technologies analyzing social sentiment like social media or responsibly used AI) with top-down policies and calls for action (collaboration within municipal government structures).

Finally, we believe a science-informed approach to design has the potential to shift the traditional efficiency metrics focused on form and mechanic performance that we currently use to evaluate spaces to effectiveness metrics focused on human experience.

REFERENCES

Adhya, A., Plowright, P., Stevens, J. (2011). Defining sustainable urbanism: towards a responsive urban design. In: Proceedings of the *Conference on sustainability and the built environment*. King Saud University, Saudi Arabia. 3–6 January 2010.

Barrera-Hernandez, L.F., Sotelo-Castillo, M.A., Echeverria-Castro, S.B., Tapia-Fonllem, C.O. (2020). Connectedness to Nature: Its Impact on Sustainable Behaviors and Happiness in Children. *Frontiers of Psychology*, Volume 11, Article 276.

Boeing, G., Church, D., Hubbard, H., Mickens, J., Rudis, L. (2014). LEED-ND and Livability Revisited. *Berkeley Planning Journal, 27(1)*: 31–55.

Cuthbert, A., Suartika, G. A. M., Zerby, J., Alexander R. (2018). Doors of Perception to Space–Time- Meaning: Ideology, Religion, and Aesthetics in Balinese Development. *Space and Culture, 21(4),* 340–357.

Di Fabio, A. (2017). The Psychology of Sustainability and Sustainable Development for Well-Being in Organizations. *Frontiers in Psychology, 8*, Article 1534.

Djebbaraa, Z., Ficha, L.B., Petrinib, L., Gramannc, K. (2019). Sensorimotor brain dynamics reflect architectural affordances. *PNAS, 116* (29).

Dobbs, R., Remes, J., Manyika, J., Roxburgh, C., Smit, S., Schaer, F. (2012). Urban world: Cities and the rise of the consuming class. (2012). *McKinsey Global Institute.*

Ehrenfeld, J. (2009). *Sustainability by Design. A Subversive Strategy for Transforming our Consumer Culture.* Yale University Press.

Field, S., Basso, H. (1999). *Senses of Place. Geographical perception*. Boydell&Brewer.

Gatersleber, B., Murtagh, N., Abrahamse, W. (2012). Values, identity and pro-environmental behaviour. *Contemporary Social Science: Journal of the Academy of Social Sciences*, 9:4, 374-392.

Geng, L., Xu, J., Ye, L., Zhou, W., Zhou, K. (2015). Connections with Nature and Environmental Behaviors. *PLoS ONE 10*(5): e0127247.

Hamilton, K. (2010). Inspired Leadership. In G8-G20: *The Canadian Summits*, edited by John Kirton and Madeleine Koch. London: Newsdesk Publications.

Hargreaves, T., Hielscher, S., Seyfang, G., Smith, A. (2013). Grassroots innovations in community energy: The role of intermediaries in niche development. *Global Environmental Change 1084*.

Jelić, A., Tieri, G., De Matteis, F., Babiloni, F., Vecchiato, G. (2016). The Enactive Approach to Architectural Experience: A Neurophysiological Perspective on Embodiment, Motivation, and Affordances. *Front Psychol., 7:* 481.

Jenks, M., Jones, C. (2010). *Dimensions of the Sustainable City*. Springer, Netherlands.

Kudryavtsev, A., Krasny, M., Stedman, R. (2012). The impact of environmental education on sense of place among urban youth. Ecosphere 3(4): art29.

Mallgrave, H.F. (2013). *Architecture and Embodiment: The Implications of the New Sciences and Humanities for Design.* New York, NY: Routledge.

Marcus, L., Giusti, M., Barthel, S. (2016). Cognitive affordances in sustainable urbanism: contributions of space syntax and spatial cognition. *Journal of Urban Design*.

Maslow, A. H. (1943). A theory of human motivation. *Psychological Review, 50*(4), 370–396.

Pallasmaa, J. (2011). *The Embodied Image: Imagination and Imagery in Architecture.* Chichester: John Wiley&Sons..

Taylor, P. (2012). Transition towns and world cities: towards green networks of cities, Local Environment. *The International Journal of Justice and Sustainability, 17*(4), 495-508.

Pollini, G. (2005). Elements of Theory of Place Attachment and Socio-Territorial Belonging. *International Review of Sociology* 15(3):497-515.

Scannell, L., Gifford, R. (2010). Defining place attachment: A tripartite organizing framework. *Journal of Environmental Psychology, 30*, 1-10.

Seyfang, G., Haxeltine, A. (2012). Growing grassroots innovations: exploring the role of community-based initiatives in governing sustainable energy transitions. *Environment and Planning C: Government and Policy*, 30, 381–400.

Oreg, S., Katz-Gerro, T. (2008). Predicting Pro-Environmental Behavior Cross-Nationally: Values, the Theory of Planned Behavior, and Value-Belief-Norm Theory. *Environment and Behavior 38*(4): 462-483.

Sternberg, E. (2000). An Integrative Theory of Urban Design. *Journal of the American Planning Association, 66*(3), pp. 265–278.

Thabrew, L., Wiek, A., Ries, R. (2009). Environmental decision making in multi-stakeholder contexts: Applicability of life cycle thinking in development planning and implementation. *J. Clean. Prod., 17*, 67–76

United Nations Commission on Sustainable Development (UNCSD, 2002). *Report of the World Summit on Sustainable Development.* United Nations Publication: Johannesburg, South Africa, 26 August–4 September 2002.

World Commission on Environment and Development (Brundtland Commission, 1987). *Our Common Future.* Oxford: Oxford University Press.

SPACE DIGITIZATION AS A TOOL TO ENHANCE THE IDENTITY OF HISTORIC PUBLIC SPACE

Milica Lazarević[1]
PhD Student, University of Belgrade – Faculty of Architecture, Serbia, Bulevar kralja Aleksandra 73/2, 11000 Belgrade, Serbia, milii.lazarevic@gmail.com

Aleksandra Djukić
Associate Professor, PhD, University of Belgrade – Faculty of Architecture, Serbia, Bulevar kralja Aleksandra 73/2, 11000 Belgrade, Serbia, adjukic@afrodita.rcub.bg.ac.rs

Branislav Antonić
Teaching assistant, PhD, University of Belgrade – Faculty of Architecture, Serbia, Bulevar kralja Aleksandra 73/2, 11000 Belgrade, Serbia, antonic83@gmail.com

ABSTRACT

The 21st century is the era of new technologies, Internet, overall digitalization, and the applications that represent a major advance in science and technology. On the other hand, these innovative technologies have had a very challenging impact on various social activities. People are spending more time in a virtual space, instead going out, socialising or enjoining outdoor recreation. Despite this, digitalization has also led to new ideas and directions for creativity, such as the creation of various applications that can encourage human mobility and interaction in the open space of a settlement. Accordingly, these applications can supplement and upgrade the values of existing open spaces, adding them a new, 'digitized' dimension. This opportunity especially comes to light when these open spaces, such as public squares, streets or quays, contain the elements of culture and heritage that make up their identity.

The aim of this paper is to examine the level which the digitalization of heritage, history, tradition, and culture is presented in open spaces in Serbia, including public squares and promenades, as well as heritage sites outside settlements. Based on this, a list of the nationally promoted digitized culture and heritage is formed, while few best-practice examples are elaborated. The focus is on their connection to real space and its identity. Therefore, all enlisted items are mapped. In that sense, the final contribution of the research is to understand the role of these innovative applications in the revitalisation and activation of open public spaces based on this new dimension of their identity.

Keywords: Open public space, identity, digitalization, culture, heritage

[1] *Corresponding author*

INTRODUCTION

Open public spaces are key places within cities (Carmona, 2003; Gehl, 2006; Gehl, 2010; Djukic, Skarzauskiene & Mačiulienė, 2019; Vlastos &Joklova, 2019).This is especially pronounced when it comes to the identity of a city or environment, and also social life, as a basic indicator of the image and identity of a city. Open urban spaces are now classified into different types and categories, such as parks, squares, playgrounds, river banks, urban forests, and even streets and sidewalks (Riether, 2016; Skarzauskiene & Mačiulienė, 2019). Each of these categories has its significance in creating the identity of place through the type of content it offers. Today, however, the development of information and information and communication technologies (ICT) has a profound impact on many aspects of everyday life, including the use of open public spaces. "Information technology has shifted the relation of space and function… Thinking about public space in the same way one might imagine people using the sidewalk as a new work environment or a street as an environment that is not just designed for cars" (Riether, 2016, p. 261). According to this, there have been significant changes in outdoor content creation requirements.

However, people are spending more time in a virtual space, instead of going out, socializing or enjoying outdoor recreation. That is why many authors, including one of the most famous urban designers and theorists of urban design, Jan Gehl, are wondering if technology can replace the function of open spaces (Abdel-Salem & El-Sayed, 2016). He claims that a physical encounter is irreplaceable and that technology cannot in any way replace it, because true quality is a face-to-face encounter (Gehl, 2010), while Keith Hampton (PPS 2014) believes that people should have a freedom of choice and that users can use technology as a secondary form of connection. Technology does not have to replace the first form of connection, and can only be used to improve and add new features. Also, many authors point out the double value of digitizing open public spaces. Smaniotto et al (2017) point out that significance "lays in their ability to enhance communication with (potential) users, transforming the production of public open spaces into an interactive process, and enabling creative community participation and empowerment" (Smaniotto et al, 2017, p. 1). Ruchinskaya, Ioannidis & Kimic (2019) point out that the introduction of mobile devices offers users both new forms of interaction with space, and opportunity to exchange information with potential creators of public spaces. Skarzauskiene and Mačiulienė (2019) also state that the importance of ICT lays in its ability to improve communication between users and stakeholders, turning the creation of open public spaces into an interactive process.

All in all, the fact is that traditional social life is slowly disappearing. Activities and entertainment in the physical environment are diminishing and, therefore, ICT is becoming the factor that must be taken into account for creating successful open public spaces. The relationship between ICT and public open spaces is becoming an increasing challenge for the profession (Skarzauskiene & Mačiulienė, 2019). All this indicates that urban design which includes the digitalization of open public

spaces must be crucial for building the social life and identity of cities. It becomes necessary to think about how to integrate ICT in open public spaces in such a way that they become lively and attractive again. However, the introduction of digital into the physical framework of open spaces is still in its infancy, with many unexplored niches.

The main research of this paper is to analyse the introduction of interactive applications as a form of ICT and the digitalization of open public spaces in order to demonstrate their role and importance in strengthening the identity of open public spaces. The polygons for this research are all open public spaces in Serbia that contain digitized dimension. The paper is focused on the digitized elements of heritage, history, tradition, and culture and how they are presented in open public spaces in Serbia. The main focus is on their connection with real space and its identity. Accordingly, this research spatially examines the interactive applications of the digitized culture and heritage that encourage users in mobility and social interaction. Therefore, all enlisted items are mapped. Considering this approach, the final contribution of the research is to understand the role of these innovative applications in the revitalization and activation of open public spaces based on this new/digitized dimension of their identity.

METHODOLOGY

The proposed research combines the elements of data collecting and case study presentation. The research is mainly focused on the analysis of open public spaces in the territory of Serbia, where ICT technology was applied, in the form of analysis of specially made applications. The first part of the paper presents a brief overview of previous research on the application of digitization at the level of open spaces. Given the reflection that open public spaces, especially those networked with cultural heritage, have on the identity of the city, community or neighbourhood, this part of paper also focuses on to the importance these tools have in terms of identity strengthening. In accordance to this, the aspiration is to show the extent of the implementation of these tools at the level of the territory of Serbia, so the central part of the work is just based on collecting and enlisting of the all open public spaces in Serbia that include and contain digitized elements, which present local heritage, culture and tradition, i.e. their identity in innovative way. Based on this, a list of the nationally promoted digitized culture and heritage is formed, while few best practice examples are elaborated as case studies.

PLACE IDENTITY IN THE CONTEMPORARY TIMES

“Urban identity is defined as a ‘place-identity’, ‘placeness’, ‘character of a place’, ‘image of a place’, ‘sense of place ’and ‘spirituality of place’. These all pertain to the urban identity as the concept of ‘distinctiveness’, denoting that places are distinguishable from one another” (Cheshmehzangi, 2012, p. 309). Costa, Lazos Ruíz & Oliveira (2016, p. 213) state that identity is something that is produced and

created over time, and as such is the characteristic of every age. This is especially important in the age of globalization in which we are living, where all cities become very similar, and "identity becomes a socially necessary condition". Therefore, cities should have their uniqueness and characteristics and, given the similarities in modern times, "they must be viewed from a historical standpoint" (Lotfabadi, 2013, p. 589), where heritage, culture, and tradition play a very important role. For [Kevin] Lynch, "identity of a place is a response to identification and recognition of objects in space, which is to distinguish one space from another" (Cheshmehzangi, 2012, p. 309). Hence, embedded in the world of an uniformed contemporary architecture, historic sites and monuments make the diversity and uniqueness of a place and thus build its identity. It is also important what these buildings matter to the viewer and what kind of 'image' some space creates in the viewer's eyes. "The interrelationship between space and man is, in fact, what we can characterize as a sense of place or a spirituality of place" (Cheshmehzangi, 2012, pg. 310). Similarly, "person's total identity involves identification with places. "When a person wants to express who he or she is, a typical response would be something like 'I am a New Yorker'; This means that human identity presupposes the identity of place" (Polat & Dostoglu, 2016, p. 1). It is clear that people are a part of any urban living environment and that they are the main ones in creating its identity. Moreover, when it comes to open public spaces, the presence of people and the activities these users perform strongly influence the identity of a particular place (Marušić & Niksic, 2012; Polat & Dostoglu, 2016). The identity of open public spaces can also be influenced by many spatial characteristics of the environment such as location, urban patterns, landscape, shape, details or design (Polat & Dostoglu, 2016).

From all the above meanings of urban identity, it could be concluded that there are many components that represent the identity of a place in public open spaces. What has the greatest value, especially in the modern age, the age of globalization and uniformity, are the historic contents as elements of uniqueness, and their experience and meaning for the users of space. This image that users create about a place is also a very important element in promoting the identity of a place (Djukić & Vukmirović, 2012). That is why it is important to focus on highlighting historical contents, such as monuments, protected buildings, and other elements that show the uniqueness of a place. Moreover, since user activities play an important role in creating the identity of the place and technology has a great impact on performing these activities, it is very important to include various digital tools. Therefore, further research will focus on analyzing educational and interactive applications that encourage the user mobility within open public spaces throughout Serbia.

DIGITIZED OPEN PUBLIC SPACES IN SERBIA

There are dozens of different interactive applications that have been identified in the territory of Serbia, which are basically aimed at promoting the history, culture, and tradition of Serbia, and, therefore, the identity of certain spaces. However, only some of them stand out as applications that simultaneously activate urban public spaces, encouraging users to explore and learn about heritage within a particular network of public spaces. These applications are shown in the following map (Figure 1) and table (Table 1), through their connection to identity and open public spaces.

Figure 1: Spatial representation of applications in Serbia; Author: M. Lazarević

Table 1: List of spaces and applications

No	Name	Relation with Identity	Relation with Open Public Spaces
1	Time machine of Vrnjci [Serb. *Врњачки времеплов*] – Open public spaces network in Vrnjci Spa	An interactive and educational application that uses virtual reality, i.e. the AR scan tag. It promotes history and learns about historical buildings in the central area of Vrnjci Spa.	The AR tag recognizes the facades of buildings that are arranged along a network of open public spaces within the central area of the spa.
2	Iron Regiment [Serb. Гвоздени пук] –Iron Regiment Memorial Park In Prokuplje	An interactive and educational application that uses the AR scan tag to promote history and maintain the memory of the soldiers.	The application supports scanning of monuments at the Iron Regiment Memorial Park. This park is an important element within the network of open public spaces in the central area of Prokuplje.

3	Old Knjaževac [Serb. *Стари Књажевац*] – Open public spaces network in Knjaževac	An interactive and educational application that uses the AR scan tag to promote history and learn about heritage within the central area of Knjazevac.	The AR tag recognizes the facades of buildings that are located within the network of open public spaces that includes the shores of Svrljiški Timok, numerous parks and other places in the central area of Knjaževac.
4	Old Bač [Serb. *Стари Бач*] –Bač Fortress as a part of open public spaces network in Bač	An interactive and educational application that uses the AR scantag to promote the history of Bačand teaches about significant elements of heritage.	The AR tag recognizes certain elements within the fortress, which is located near the centre of Bač and the promenade along the Danube-Tisa-Danube canal. Considering the location and the green space within the fort, it is the important part of the network of open public spaces.
5	Hidden Places – Savamala, Belgrade	Educational and interactive application that promotes lesser-known Belgrade history.	The application works by locating users using Bluetooth technology in the Savamala area. It is one of the most significant spaces in Belgrade's open public space network.
6	Cultural monuments of Vojvodina[Serb. *Споменици културе Војводине*]	Educational and interactive application that contains maps, texts, 3D tours and promotes history and heritage.	It informs about monuments within the parks in the territory of Vojvodina, even in the entire protected areas such as Lake Palic, etc.

Author: M. Lazarević. A Djukić & B. Antonić

There are numerous similar applications for the other sites, such as Timacum minus, Archaeological Site of Lepenski Vir, Museum of the Battle of Batina, Flooded Archaeological Treasure of the Iron Gates, etc. All these and many other applications are also interactive and directly related to space. However, they were not chosen for this paper because these sites are not the part of the urban network of open public spaces.

CASE STUDIES

Among the list of the nationally promoted interactive applications (Table 1) two types of applications have been identified – first using the AR tag, and the second using Bluetooth technology. Two best practice examples are elaborated as case studies. The choice was influenced by the importance that the application has on a given space.

CASE STUDY 1: Hidden Places is an interactive application that works by locating users with the help of Bluetooth beacons. When the user is located in a certain location, the story of some lesser-known building or hidden element that marked the history of Savamala become unlocked. This is also an educational application that promoting the lesser known history of Belgrade. The app teaches

users about hidden places in the Savamala area. This area is the one of the most significant spaces in Belgrade's open public space network. It is connected to the promenade along the right bank of the Sava River, limited by the Kalemegdan Fortress, Kosančić Wreath and the main bus station. The central street is Karadjordjeva. This app is very important for this zone, because today this area is primarily a place for entertainment and young people, while only few know its historic significance.

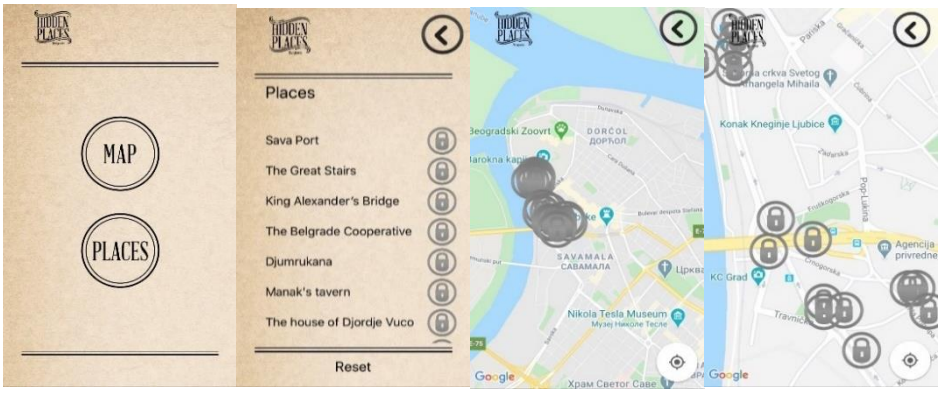


Figure 2, 3, 4 & 5: App options, Places you should visit to unlock stories, Savamala position, Map with places you should visit; Source: Hidden Places

CASE STUDY 2: Time machine of Vrnjci is an interactive application that supports the AR tag that recognizes the facades of protected villas within the central zone of Vrnjci Spa. The application also contains a voice guide through the spa and stories not only about mentioned buildings, but also about the buildings that used to be in this area. It contains songs, paintings, and a virtual catalogue of fashion from the 1900s and 1970s. This is an educational application that promotes the history of this age and learns about buildings that remained in the central area of Vrnjci Spa.

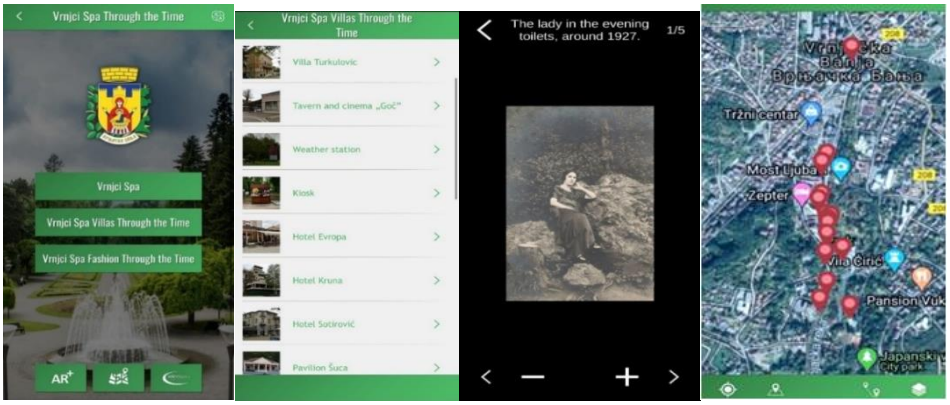


Figure 6, 7, 8 & 9: App options, Vrnjci Spa Villas list, Old picture from 1927, Map of Vrnjci Spa Villas to scan; Source: Vrnjci Spa

The application is a time guide that connects the story of the buildings that are arranged along the Promenade Park, near the pedestrian bridge “Bridge of Love”, and other pedestrian zones within this area, which are interconnected. The AR tag recognizes the facades of these buildings. The scanning unlocks new information in the form of photos, stories and 3D tours. All this should encourage users to go on a tour and interactive, educational walk through this area.

CONCLUSIONS

All these applications mentioned above have a dual role and value when it comes to promoting identity in open public spaces. On one hand, it opens up a new form of user interaction with space. That means that users, as the main factors of the identity of a space, through applications actively influence the formation of the identity of the public spaces. On the other hand, the applications, with their cultural and historical content, promote the heritage that is also of great importance for the identity of the place.

This is especially important for less-known and under-promoted content and locations. Nevertheless, existing applications are mostly made for places that are attractive, significant, or places that are famous tourist destinations. Such spaces are already alive, active and full of different content, so this kind of interaction, at least for the time being, is just an additional element to an already vibrant locality.

Limitations are also recognized in the passivity of the applications themselves. The digitalization of cultural heritage within public spaces has been seen as a complement to the main content and physical experience of the site. Additionally, the mentioned applications are usually promoted only within the complex, and not enough on the Internet. That is the reason why a small number of people know about them. Some of these applications are not supported by all operating systems, which is a limitation for certain users. All mentioned reasons are due to poor organization in a general sense. Therefore, the final recommendation of this paper is to dedicate to the promotion and advancement of different approaches to the expansion of virtual reality. To conclude at the end, an analysis should be made and a special typology of spaces should be formed where the need for digitalization is recognized and in which way and to whom should be created.

REFERENCES

Abdel-Aziz, A. & Abdel-Salam, H. & El-Sayad, Z. (2016). The role of ICTs in creating the new social public place of the digital era. *Alexandria Engineering Journal*. 55. https://doi.org/10.1016/j.aej.2015.12.019.

Carmona, M., Heath, T., Oc, T., & Tiesdel, S. (2003). *Public Places Urban Spaces*. Oxford: Elsevier Ltd.

Cheshmehzangi, A. (2012). Identity and Public Realm. Procedia – *Social and Behavioral Sciences*. 50. 307–317. https://doi.org/10.1016/j.sbspro.2012.08.036

Costa C. et al. (Eds.). CyberParks – The Interface Between People, Places and Technology. *Lecture Notes in Computer Science*, vol 11380. Springer, Cham. https://doi.org/10.1007/978-3-030-13417-4_15

Costa, M. & Lazos Ruíz, A. & Oliveira, R. (2016). The Role of Public Parks in the Creation of an Urban Identity. 10.5176/2301-394X_ACE16.14

Djukic, A. & Vumirović, M. (2012). Creative cultural tourism as a function of competitiveness of cities. *Technics Technologies Education Management*, 7(1), 404-410.

Djukic A., Vlastos T. & Joklova V. (2019). *Liveable Open Public Space - From Flaneur to Cyborg. In: Smaniotto Costa C. et al. (eds) CyberParks – The Interface Between People, Places and Technology. Lecture Notes in Computer Science*, vol 11380. Springer, Cham

Gehl, J. (2006). *Life between buildings*. (Sixth ed.) Arkitektens Forlag. The Danish Architectural Press and Jan Gehl.

Gehl, J. (2010). *Cities for People (first ed.*), Island Press, Washington, DC.

Hidden Places Belgrade. Walk round Savamala and as soon as you reach a place included in the app, short story about it would be shown followed by selected historical photos. https://play.google.com/store/apps/details?id=com.danubecc.hiddenplacesbelgrade&hl=en_US

Iron Regiment [Serb. Гвоздени пук]. AR-part recognises the names of the receivers of the order of Karađorđe's Star, inscribed on a monument in a memory park. https://play.google.com/store/apps/details?id=org.arhimedia.emg.gvozdenipuk

Lotfabadi, P. (2013). The Impact of City Spaces and Identity in the Residents' Behavior. *International Journal of Humanities and Social Sciences*, 2.

Marušić, B. & Niksic, M. (2012). Multilayered identity of places: Linkage between physical form, behaviour patterns and public perception. The Role of Place Identity in the Perception, *Understanding, and Design of Built Environments*. 120-132. https://doi.org/10.2174/978160805413811201010120

Old Bač [Serb. *Стари Бач*]. Guidance through historic Bač Town and nearby sightseeing sites. https://play.google.com/store/apps/details?id=org.arhimedia.emg.bac

Old Knjaževac [Serb. *Стари Књажевац*]. AR-part recognises the facades of the existing houses in Knjaževac historic core and projects old photos on them. https://play.google.com/store/apps/details?id=org.arhimedia.emg.stariknjazevac

Polat, S. & Dostoglu, N. (2016). Measuring place identity in public open spaces. Proceedings of the Institution of Civil Engineers – *Urban Design and Planning*. 170. 1-14. https://doi.org/10.1680/jurdp.15.00031

Project for Public Space – PPS (2014). *Technology Brings People Together in Public Spaces After All*. Retrieved from

https://www.smartcitiesdive.com/ex/sustainablecitiescollective/technology-brings-people-together-public-spaces-after-all/289076/

Riether, G. (2016). *A Public Space for the Digital Age*. 260-265. https://doi.org/10.5151/despro-sigradi2016-766

Ruchinskaya T., Ioannidis K. & Kimic K. (2019). *Revealing the Potential of Public Places: Adding a New Digital Layer to the Existing Thematic Gardens in Thessaloniki Waterfront. In: Smaniotto Costa C. et al. (eds) CyberParks – The Interface Between People, Places and Technology. Lecture Notes in Computer Science*, vol 11380. Springer, Cham

Skarzauskiene, A. & Mačiulienė, M. (2019). Assessment of Digital Co-Creation for Public Open Spaces: Methodological Guidelines. *Informatics.* 6. 39. https://doi.org/10.3390/informatics6030039

Smaniotto, C., Bahillo, A., Álvarez, F., Erjavec, I., Menezes, M. & Pallares-Barbera, M. (2017). Digital Tools for Capturing User's Needs on Urban OpenSpaces: *Drawing Lessons from Cyberparks Project. In: Smaniotto Costa C. et al - CyberParks – The Interface between People, Places and Technology: New Approaches and Perspectives.* Springer, 2019 M03 1

Time machine of Vrnjci [Serb. *Врњачки времеплов*], AR-part recognises the facades of 10 villas and gives information about them. https://play.google.com/store/apps/details?id=org.arhimedia.emg.vrnjackabanja

POTENTIALS AND EXPERIENCE OF STREETSCAPE TRANSFORMATIONS - RECENT EXAMPLES FROM MARIBOR

Kaja Pogačar
Assist. Prof., PhD, Faculty of Civil Engineering, Transportation Engineering and Architecture, University of Maribor, Smetanova ulica 17, 2000 Maribor, Slovenia, kaja.pogacar@um.si

ABSTRACT

The paper is addressing the topic of contemporary urban streetscape transformations. City streets, which have been subject to the motorized traffic over the past 100 years and have mostly been treated as technical corridors, are becoming places with new functionalities, encompassing different mobility options, allowing coexistence with new forms of street use and the implementation of a new design. More importantly, the processes leading to the transformation of city streets have also changed. New approaches and tools, such as citizen participation, temporary interventions, tactical urbanism, etc. focus on new issues, including ecology and social cohesion, and open up space for many unused potentials.

The paper presents a case study of the spatial transformation of three streets from Maribor - 'Cesta zmage', 'Cafova ulica' and 'Koroška cesta' - which incorporate new impulses for urban development. The results show new design solutions, but also different forms of citizen participation processes and related procedural differences. Despite improvements in street design, as all three streets have become friendlier spaces for pedestrians and cyclists and have also improved the quality of the living environment in many ways, the participation process still has a long way to go. For the residents in particular, the transformation process can be seen as a sensitive issue, as it is associated with rights gained and habits maintained. It is therefore necessary to impart more knowledge and ensure greater sensitivity in the management of local authorities when it comes to such projects. In conclusion, the current transformations of streetscapes open up many new potentials for the urban fabric and are at the same time the key element on the way to a more sustainable urban development.

Keywords: Streetscape transformations, Temporary interventions, Participation, Maribor

INTRODUCTION

City streets are part of infrastructural and social spaces that have undergone visible changes since the beginning of the 21st century, primarily as a demand for pedestrian and bicycle-friendly spaces and a better living environment (Mehta, 2013; NACTO, 2013). City streets, which have been subject to motorized traffic over the last 100 years and have mostly been treated as technical corridors, are once again becoming places with various functionalities, accommodating different mobility options and enabling coexistence with new forms of street use (von Schönfeld and Bertolini, 2017) while at the same time implementing a new design (Furchtlehner and Lička, 2019). More importantly, the processes leading to the transformation of city streets have also changed (Zavetoski and Agyeman, 2015). New approaches and tools, such as citizen participation, temporary interventions, tactical urbanism, etc. (Lydon and Garcia, 2015), which focus on issues such as ecology and social cohesion, open up space for many unused potentials.

The paper addresses the issue of contemporary transformations of urban streetscapes in the geographical context of Slovenia and attempts to answer the question of what has changed in the process and outcomes over the past decade. When talking about processes, the focus is set on the participation of citizens, how they are informed, involved or even organised when dealing with the transformation of streets. Beyond the theoretical model of the Arnstein's ladder of participation, Baum defines citizen participation as citizen involvement in public decision making. It includes different aspects, among them autonomous citizen activities, such as social action but also communicating the information (Baum, 2001), which are both important for this research. With regard to new functionalities, mobility options and design, it is analysed what has changed and whether these changes support the goals of sustainability and create better conditions for pedestrians, cyclists and residents overall, but also whether they offer space for new uses.

METHODOLOGY

To understand the changes in street design and the characteristics of the processes, the paper analyses the spatial transformation of three different streets in the centre of Maribor (Slovenia), namely Cesta zmage, Cafova ulica and Koroška cesta (Figure 1). All three have undergone a profound transformation in recent years, and their common ground is also that they have received considerable media attention due to the problems they have faced. Data was collected through research and observation on the ground before, during and after the transformation, and secondary sources were also used, mostly published studies and documents, but also newspaper articles and web sources.

RESEARCH

All three streets discussed are located in the centre of Maribor, the second largest city in Slovenia (with about 110,000 inhabitants). Maribor was known as an industrial city (with metal, textile, but also automobile industry), therefore the dependence on cars was and is very high, also in terms of status symbols. This is also important to understand in relation to the street design, because e.g. the streets were designed for car traffic, they were mostly asphalted, parking places along the street were important and bicycle lanes were the exception rather than the rule. Although all three streets differ in their context and hierarchy, they have many common problems and potentials.

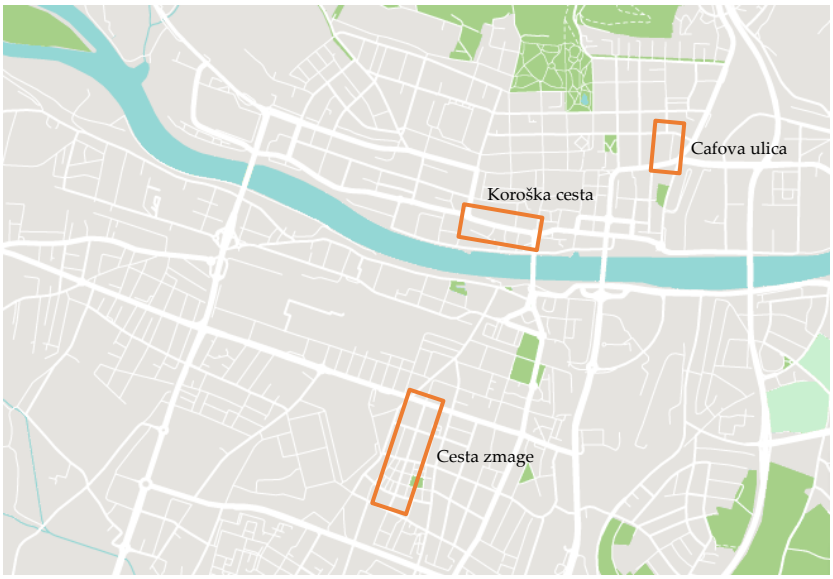


Figure 1: Location of three streets in Maribor (source: Kaja Pogačar / OSM)

Case 1: Transformation process of *Koroška cesta*

Koroška cesta is situated in the centre of Maribor and is connected with the Main Square on its eastern edge. The observed sequence of about 250 m in length has been part of the mediaeval city of Maribor since 1250 and is considered the mother of all streets in the city (Sapač, 2013). Despite its historical significance, it took many decades from the first attempts at transformation (Pogačar, 2017) to its final implementation in 2020 (still under construction at the time of writing this article). An important milestone and the basis for the reconstruction was the 2010 architecture and urban planning competition, won by SL-MX Architects, two years before Maribor was entitled the European Capital of Culture. Mainly due to the unresolved traffic reorganisation in the centre of Maribor (the observed part of *Koroška cesta* is one of the few east-west connections on the left bank of the Drava River) the planned reconstruction was not carried out for a decade. In the period

after 2014, however, numerous activities focused on initiating the transformation process, which is documented in several scientific papers (Pogačar, 2017; Šenk and Pogačar, 2019). These activities include about 40 meetings with street residents, regular annual demonstration events with music, culinary, sports including temporary interventions and closing the street to motorised traffic, three urban hackathons were organised in support of urban change (Pogačar and Žižek, 2016). In addition, the interim design of the street (Figure 2) at the time of European Mobility Week 2015 with additional traffic monitoring, which would indicate the redistribution of traffic flows in case the street is closed to traffic (Pogačar, 2017). All the above activities have received a strong public response, both positive and negative.

The changes related to the redesign of *Koroška ulica* listed in Table include granite paving over the entire surface, a modern and separate rainwater drainage system, underground waste containers, green islands, bicycle stands and bus stops, and new LED streetlamps. The traffic regime changed from the one-way street proposed in the competition to the shared space with the two-way traffic (street without curbs) (Figure 3). It should be mentioned that Institute for the protection of Cultural Heritage requested installation of local granite from Cezlak, not to repeat the bad practice from the past as in the case of the renewal of the *Trg Leona Štruklja*, where the entire stone for paving was imported.

Figure 2: *Koroška cesta* interim design (left), (photo: Kaja Pogačar); Figure 3: *Koroška cesta* during final renewal works (right) (photo: Kaja Pogačar)

Case 2: Transformation process of Cesta zmage

Cesta zmage is located in the Tabor district, in a dense residential settlement designed by the famous Slovenian architect Ivan Vurnik. The Vurnik's Workers' Colony (slo: Vurnikova delavska kolonija) was built in 1828 as a result of the housing shortage and provided 147 small semi-detached houses with gardens. It is still considered an important urban and architectural contribution to social housing, not only in the national context as a first example, but also in the international context. The colony planned as a garden city has been under the protection of cultural heritage since 1992 (Ciglenečki, 2014). It also gained importance for its

ally with 92 lime trees. Since the street was not paved until 1980, the conditions for the growth of the trees were favourable and made the lime-tree ally a unique ambient. After paving, many problems occurred, such as constantly appearing cracks and the unevenness of the road (Figure 4). Since 2016, the municipality announced the need to thoroughly renew the street including the old utility infrastructure and paving, but also to rejuvenate the 90-year-old ally. As the ally was not listed, the opinion was given that the majority of the trees needed to be replaced because of the potential dangers associated with their condition (Figure 5). Unfortunately, the project was only presented to the local community the day before the official start of construction. There is a divided opinion between the local residents and the municipal officials as to whether the information about the planned intervention was adequately and timely disseminated (according to the municipality, the project was officially approved by Maribor City Council and by Tabor City District; it was characterised as a maintenance work and did not require a building permit, so the official opinion of the Institute for the protection of Cultural Heritage was not obtained). Furthermore, two citizens' initiatives were founded, one for the preservation of the ally, the other for the replacement of old trees. The latter highlighted the need to improve the quality of life on the street and also pointed out the damage caused by the roots of some cellars and the asphalt, fearing the danger of the old trees collapsing. The initiative for the preservation of the trees underlined the strong identity of the ally and the importance of preserving at least the healthy trees, which represent 60%, but it also exposed the ignorance, lack of dialogue and information on the part of city officials (Ćatović, 2017). The final decision was a compromise to replace the 72 trees. The felling of the trees caused serious emotional distress to a certain group of the local population (Bradač, 2017).

The changes in street design listed in Table 1 show some improvements in the streetscape compared to the past, especially for cyclists, pedestrians and functionally disabled people (Figure 6). With good lighting during the night, the street could become an important artery for cyclists, if only its continuation towards the city centre was realised. On the other hand, the newly planted trees are well maintained. However, the visual impression differs from that dominated by the large trees - the new road layout has a rather clean technical character. As an unplanned effect, many houses in the colony have improved their facades since the street renovation.

Figure 4: *Cesta zmage* before the renewal (left), (photo: Kaja Pogačar); Figure 5: *Cesta zmage* while cutting trees (right) (photo: Andrej Petelinšek)

Figure 6: *Cesta zmage* after renewal (photo: Kaja Pogačar)

Case 3: Transformation process of *Cafova ulica*

Cafova ulica is a 150 m long street near the main railway and bus station in Maribor. Its importance has increased since the District Court moved to the location. There is also a business high school, a college of hospitality and tourism, and several restaurants and bars. The eastern side of the street is mainly residential. The scope of public services along *Cafova ulica* influenced the decision of the city administration in 2018 to transform the street into shared space in order to improve conditions for cyclists and pedestrians (Figure 7). However, the process leading to the renewal was again paved with a lack of information as residents learned of the municipality's intention from newspapers, few days before the project was confirmed by the City Council Maribor (Tošić Golob, 2018). Their dissatisfaction and fears were linked to the loss of parking spaces (from 17 to 6) and a possible escalation of nightlife. At the public presentation that followed, the residents were confronted with the facts, along with an allegedly arrogant speech by the mayor. The street was reopened in December 2019.

According to Table 1, the street has gained in ambient quality through new street furniture, green elements and paving (Figure 8). In fact, it is the first street outside the old city centre that has been completely paved and refurbished in the sense of

a public square. It has been declared a shared space with two-way traffic, and although the entrance to the street is blocked by retractable bollards, the speed is reduced to 10 km/h. For pedestrians, for the pupils of both schools, but also for the residents, a qualitative improvement of the space is noticeable.

Figure 7: *Cafova ulica* before renewal (left) (photo: Google street view); Figure 8: *Cafova ulica* after renewal (right) (photo: Kaja Pogačar)

Design solutions and process overview

Table 1 shows and summarises the changes in the design of all three streets and lists the features before and after. The design aspect covers a wide range of elements. In addition, characteristic features of each process are presented.

Table 1: Summary of changes in design and in the process

	design solution - before	**design solution - after**	**characteristics of the process**
Koroška Cesta	- two-way traffic - funnel-shaped street (9 to 14 m wide) - pedestrian walkways of varying width on both sides, with high kerbs - asphalt paving - no separate bicycle path, no parking spaces, no trees, no bicycle racks - lamps mounted on houses	- shared space - two-way traffic with reduced quantity - flat surface of the street without kerbs - paving made of granite plates and cubes in the fishbone pattern - modern and separate rainwater drainage - underground waste containers - green islands, bicycle racks - LED lamps	- lengthy process including traffic studies, workshops, architectural competition, temporary interventions, interim design, traffic monitoring - participation of the local community in about 40 meetings (led by House Society!), followed by the self-organised initiative of Koroška cesta - more information requested from the side of municipality - high media attention

Cesta Zmage	- two-way traffic - tree ally along the entire street between the parking spaces on both sides - pedestrian walkways on both sides of the street - no separate bicycle lane, no bicycle racks - asphalt paving	- two-way traffic with the sharrow system for cyclists - newly planted trees (smaller), between parking spaces on both sides - pedestrian walks on both sides of the street, with lower kerbs toward the street - all intersections entirely elevated - new benches at the intersections - asphalt paving and tactile paving for blind and visually impaired persons at the pedestrian crossings - new LED lamps - classic trash bins and rainwater drainage	- lack of information and dialogue between the local community and the municipality - sensitive topic with a deep emotional component - different expert opinions - two citizens' initiatives with conflicting objectives - confrontation approach - high media attention
Cafova Ulica	- two-way traffic - trees and parking spaces on one side only - pedestrian walks on both sides of the street - asphalt paving - no separate bicycle lane, no bicycle racks	- shared space - two-way traffic (reduced motorised traffic and reduced speed, 20km/h) - even surface of the street paving made of concrete plates - new street furniture - 5 parking spaces at the entrance of the street, 1 for delivery - new LED lamps	- different motivation for the renewal from the side of residents and bar/restaurant owners - insecurity because of lack of information (fear of losing parking spaces, fear of potential night life escalation) - confrontation approach - high media attention

DISCUSSION / CONCLUSIONS

The paper examined three selected examples of streetscape transformations in the city of Maribor. The results show that the transformation of the city's streets can be considered a sensitive issue, especially for the residents. For them, the street represents an extension of their living space, which carries an emotional bond, as was also researched by Appleyard in the 1970s and 1980s. It is therefore understandable that they want to be involved in the decision-making process or at least be adequately informed about what is planned in their immediate environment

and what changes are pending. The research has shown that although all three streets have become friendlier spaces for pedestrians and cyclists and have also improved the quality of the living environment in many ways, the participation process still has a long way to go. On the positive side, however, there are examples of civic participation and self-activation, which were not observed in this form a decade ago, but also new practices of temporary interventions and interim design phases that can have a positive impact on personal experience in the changing streetscape. The transformation of city streets is also associated with gained rights and persistent habits; therefore, it is necessary to provide more knowledge and ensure greater sensitivity in the management of local authorities when it comes to such projects. It should be the duty of local government officials to avoid the unnecessary accumulation of anger and fear among residents due to lack of information and communication. For this reason, excuses and references to formal procedures are simply not sufficient and justified. It is necessary to bring the culture of information, communication and mediation to a higher level, to eliminate ignorant behavior, but also to develop tools and skills for a more inclusive and democratic society.

In conclusion, we find that the current changes in streetscapes open up many new potentials for the urban fabric and are at the same time the key element on the way to a more sustainable urban development. The cases presented show progress in the redesign of city streets, although many potentials have not yet been fully exploited and there is still much room for improvement if we want streets to become environmentally, socially and economically sustainable spaces.

REFERENCES

Baum, H. S. (2001). 'Citizen Participation', in Smelser, N. J. and Baltes, P. B. (eds) *International Encyclopedia of the Social & Behavioral Sciences*. 1st Editio. Elsevier, pp. 1840–1846. https://doi.org/10.1016/B0-08-043076-7/04439-9

Bradač, B. (2017). *Cesta zmage: Protest ni obvaroval zdravih lip*, *Večer*. Available at: https://www.vecer.com/cesta-zmage-protest-ni-obvaroval-zdravih-lip-6299134 (Accessed: 2 February 2020).

Ćatović, A. (2017). *Zgodba posekanih lip na Cesti zmage*. Available at: https://almiracatovic.wordpress.com/2017/11/14/lipe-na-cesti-zmage/ (Accessed: 2 February 2020).

Ciglenečki, M. (2014). *Vurnikova kolonija v Mariboru*. Ljubljana: Založba ZRC.

Furchtlehner, J. and Lička, L. (2019). 'Back on the Street: Vienna, Copenhagen, Munich, and Rotterdam in focus', *Journal of Landscape Architecture*. Informa UK Limited, 14(1), pp. 72–83. https://doi.org/10.1080/18626033.2019.1623551

Lydon, M. and Garcia, A. (2015). *Tactical urbanism : short-term action for long-term change*. Washington: Island Press.

Mehta, V. (2013). *The Street: A Quintessential Social Public Space*. New York: Routledge.

NACTO (2013). *Urban Street Design Guide*. New York: Island Press.

Pogačar, K. (2017). 'Struggle for Change-Process of Urban Transformation of Koroska Street in Maribor'. In Schrenk, M. et al. (Eds) *Real Corp 2017 Proceedings/Tagungsband*. Vienna, pp. 549–560.

Pogačar, K. and Žižek, A. (2016). 'Urban Hackathon - Alternative Information Based and Participatory Approach to Urban Development', in: *Procedia Engineering*. https://doi.org/10.1016/j.proeng.2016.08.788

Sapač, I. (2013). 'Mariborski srednjeveški obrambni sistem: znanstveno teoretični in projektni elaborat'. Maribor: Mestna občina Maribor.

von Schönfeld, K. C. and Bertolini, L. (2017). 'Urban streets: Epitomes of planning challenges and opportunities at the interface of public space and mobility', *Cities*. Elsevier, 68(May), pp. 48–55. https://doi.org/10.1016/j.cities.2017.04.012

Šenk, P. and Pogačar, K. (2019). 'Tracking Contemporary Streetscape Transformation Processes – Two Case Studies from Slovenia Sledovanie aktuálneho procesu transformácie ulíc – dve prípadové štúdie zo Slovinska', *Architektura a Urbanizmus*, 1–2, pp. 60–73.

Tošić Golob, T. (2018). *Oživitev ulic Maribora: Tako bo po prenovi izgledala Cafova ulica*, *Maribor 24*. Available at: https://maribor24.si/lokalno/ozitev-ulic-maribora-tako-bo-po-prenovi-izgledala-cafova-ulica (Accessed: 10 February 2020).

Zavetoski, S. and Agyeman, J. (2015). 'Complete Streets. What's missing?'. In Zavetoski, S. and Agyeman, J. (Eds) *Incomplete Streets: Processes, practices, and possibilities*. 1. Edition. New Yorl: Routlege, pp. 1–13.

UTOPIA OR DYSTOPIA IN MOBILITY CULTURES? BEIRUT'S INFORMAL BUS SYSTEM AND BUS MAP PROJECT AS SOCIAL INNOVATIONS

Carine Assaf[1]
PhD researcher, KU Leuven, Kasteelpark Arenberg 1 -3001 Leuven, Belgium,
carine.assaf@kuleuven.be

Christine Mady
Assoc. Prof., PhD, Notre Dame Univeristy-Louaize, 72 Zouk Mikael, Zouk Mosbeh, Lebanon
christine.mady@ndu.edu.lb

Pieter Van den Broeck
Assist. Prof., KU Leuven, Kasteelpark Arenberg 1 -3001 Leuven, Belgium,
pieter.vandenbroeck@kuleuven.be

ABSTRACT

Mobilising an institutionalist perspective, social innovation theory and the concept of transportation (in)justice, the objective of this paper is to address whether and how the grassroots initiative Bus Map Project (BMP), is responding to the politics of everyday mobility in Beirut, which have trapped the informal transit system in perceptions of being unsafe, irregular and even non-existent. However, this system manifests the unmet needs of the dispossessed to navigate life without a car in Beirut and its outskirts. Hence, the young activists devised bottom-up strategies to bring to light the availability of the Beirut informal transit system, unknown to many, by documenting it. In other words, the paper questions whether BMP and the informal transit system are socially innovative. To do so, the dynamics of transit activists are studied in relation to the predominantly car-oriented mobility mechanisms in Beirut. In that manner, collective action may generate seeds for socio-spatial justice and an equitable mobility for all.

Keywords: Social innovation, Beirut informal transit, Bus Map Project, mobility injustice

INTRODUCTION

Riders' Rights, which was only recognised by the state as an NGO in 2019, grew out of a grassroots mapping initiative known as the Bus Map Project (BMP) that began in summer 2015. BMP produced the first two maps of Beirut's informal transit network in 2016 and 2018 (Baaklini, 2020). The local grassroots initiative

[1] *Corresponding author*

encompasses a collective action, which seeks to achieve socio-spatial justice and equitable movement for all, by recreating and reshaping the debate of Beirut's informal transit system. This system has emerged from Beirut's perpetual equilibrium of fragmented realities (Tfaily, 2020) and later became a mitigation tool for the chaotic, fragmented politico-sectarian society as well as a reflection of an ill-divided state. The latter originated in the Constitution of Lebanon in 1943, and continued according to the power-sharing formula through the Charter of Lebanese National Reconciliation (Tai'f agreement) created to end the civil war (1975-1990). Failing to find a consensual democratic model and a common ground that could embody the country's political cleavages and social divergence, this gave rise to authoritarian inner state entities and produced an oligarchic political system, which caters for the needs of the various communities to everyday life necessities, including mobility practices (Salamey, 2009). Ziad Nasr for example, President and director general of the Railways and Public Transportation Authority (RPTA), stated during a personal interview in 2018, that "the history of Beirut's everyday mobility had to face a completely corrupted, clientelist and chaotic environment perceived as a form of informal arrangements, which are customised to people's needs and feed the political system" (freely paraphrased).

In other words, mobility in Beirut cannot be taken for granted, as it is not only an everyday practice equally available to all, but varies according to socio-economic classes and "spatial positionalities" (Buhr and McGarrigle, 2017; p.232), as it depends on Beirut's sectarian territoriality and political differences (Monroe, 2010; 2017). Hence, the reality of urban transport politics and the economy of a dysfunctional elitist post-civil-war government produced injustices, such as major gaps encountered at the level of public transport service provision. There was no political will to (re)establish and (re)invest in public transportation, even though Beirut was known for its glorious mobility past (Nakkash, 2016), which resulted in the insurgence of informal practices. The latter emerged as "beyond-the-state" (Swyngedouw, 2005; p.1) political arrangements, to be found in each corner of the city, manifesting the unmet needs of the dispossessed (Monroe 2010; Baaklini, 2020) within a "laisser-faire" milieu to navigate life without a car in Beirut and its outskirts, and supporting the legal politico-sectarian and economy framework of the state. This informal system is characterised by its resilience (Bayat 1997; Scott, 1989), as a gap-filler, a self-managed practice to the apparent chaos (*fawada* in Arabic) in transport and the absence of an adequate public transportation in Beirut.

However, the politics of daily mobility have trapped this network in perceptions of being unsafe, irregular and even non-existent (Nakkash, 2018; 2020; Tfaily, 2020). The streets of Beirut are taken by almost 80% of commuters relying on private cars, leaving a small room for other modes of transport, including 18% for taxi-services, 1.7% for vans and buses, and 0.3% for unmotorized transport (Anas et al., 2017; Mohieddine, 2018).

The main objective of this paper is to address and problematise the emergence of the grassroots initiative BMP, and whether it is socially innovative or not, through

understanding its dynamics in relation to mobility practices in Beirut. In the next sections of this paper, literature will be mobilised on socio-spatial mobility and transport (in)justices (Bayat, 1997; Scott, 1989; Cervero and Golub, 2007; Sheller, 2018; Pereira, Schwanen, Banister, 2017) and social innovation (SI) in territorial development by Moulaert et al. The focus of SI lies within the context of local development of communities and neighbourhoods and the inclusion of excluded groups into different spheres of society (Moulaert and MacCallum, 2019). The paper's methodology builds on socio-spatial and ethnographic analysis for the informal transit practices. It is based primarily on conducted interviews, between 2018 and 2019, with bus drivers and operators, riders and non-riders, and state actors conducted by the first author. Moreover, secondary data was used including maps and urban regulations on transportation and planning as well as online articles and news reports. A triangulation of information was achieved through combining these primary and secondary data sets to re-interpret the state of public transportation mobility in Beirut. The first part of the paper examines how the informal (self-managed) transit system is negotiating the city's socio-spatial needs within a quasi-absent state. Then, it reveals informal arrangements empowering certain actors, while disempowering others. This part builds an argument that informal transit is socially innovative only to a certain extent, since it is still a mere reflection and product of a divided society. The next part examines the extent to which BMP is reshaping the culture of mobility through mapping the informal transit system. To note, part of the primary data collected for this part is based on a participatory reflective action-research process with BMP since 2018. The paper concludes that the radical ambitions of socially innovative arrangements are not utopian, geopolitically marked (Moulaert and MacCallum, 2019), and possible in unstable contexts as Beirut (Harb, 2018). However, they are limited by the forces of an ill-functioning divided state and market forces that set the rules of the game.

TO WHAT EXTENT DO COMMUNITIES FIGHT BACK MOBILITY INJUSTICE IN SOCIALLY INNOVATIVE WAYS?

In social innovation (SI) literature by Moulaert et al., the paradigm is often presented with clear analytical, prescriptive and descriptive concepts. Going beyond a materialistic understanding of development and growth, its three dimensions focus on improving human conviviality in a broad sense, aiming at the "transformation of institutions, overthrowing oppressive structures of power, supporting collective agency to address non-satisfied needs, and building of empowering social relations from bottom-up approaches" (Moulaert and Van Dyck, 2013; p. 466). Nevertheless, the mechanisms of SI are not only an outcome of collective action, but also of institutional processes. Much of the process, which is inherently political, lies in making decisions on whose basic needs are to be addressed. By which means and why? And who are the beneficiaries? (Van den Broeck, 2011).

SI research "has to be seen as a deeply institutional endeavour" (De Blust and Van den Broeck, 2019; p. 100), addressing the interplay between individuals, collective actors and different social groups to assess how socio-territorial innovation capacities are differentially embedded in institutional frames, and how they can be mobilised. All this highlights the importance of looking at the socio-political content with regard to socio-territorial innovation (Van den Broeck, 2011). Hence, the actors involved in dealing with unmet social needs through creative strategies to reshape the way of thinking could be perceived as agents of innovative social actions (Van den Broeck, 2011; Gracía and Pardel, 2019). According to Hillier, "it is an in-between, a locus for socio-cultural transformation showing openness for the future to overcome the traditional inertia and stasis" (2013; p.169). In other words, to create structural change in the city, the current actors have to step out of their comfort zone and break the box, and rethink their beliefs and look for new innovative ideas that can reinstate socio-spatial justice in the city (Albrechts, 2005).

Viewed through the lens of Social Innovation (SI), social turns are hence necessary to negotiate socio-spatial injustices in relation to mobility practices and transportation instruments, to pave the way for profound socio-political transitions in cities. In that sense, social innovation in transportation should not just be understood within a spatial-technological context, as if it pertains merely to technical artefacts (see the mobilities paradigm Cresswell 2006; Sheller and Urry 2006; Jensen, 2015), but it evolves around transforming and (re)creating social relations (Moulaert et al., 2013; 2019). Transit systems are hence a complex bundle of invisible politics that condense power dynamics, obscuring fundamental questions on who has the right to the city, who is allowed to participate in urban activities, who decides how space will be planned and produced (Sheller, 2018). Accordingly, socio-spatial injustices occur in everyday life mobilities and (re)create (in)justices for some passengers while excluding others (Pereira, Schwanen, Banister, 2017).

The question then is whether and how socially innovative initiatives are mobilised to negotiate socio-spatial mobility injustice to create an inclusive transit system? Mobility justice seems indeed to be advocated by bottom-up (collective) initiatives, as "informal or formal arrangements engaging in the act of governing outside and beyond-the-state (often with the explicit inclusion of parts of the state apparatus)" (Swyngedouw, 2005; p. 1-2), and foregrounded by citizens separate from ruling technocrats and formal planning institutions, characterised to be self-managed, activists or social entrepreneurs. Such initiatives appear to show in dramatic fashion how the socio-spatial transit (in)justice tenet needs to be (re)thought in more dynamic and creative manners (Sheller, 2018). From this multi-disciplinary perspective, the following sections examine whether and how the Beirut informal transit system and Bus Map Project can be seen as bottom-up strategies that aim to recreate a solidarity-based transport community challenging existing narratives on the real meaning of mobility in Beirut.

FILTERING BEIRUT'S URBAN TRANSIT INFORMALITIES

Until 1980, a public transport network has been implemented in Beirut, but was later weakened by the civil-war, and then undertaken by the private sector. Beirut's informal transit includes thirty-five state-owned buses, and more than 4000 (registered) privately-operated buses and minivans that often negotiate and compromise to the benefits of some political figures, operating on approximately fifty trajectories (Mohieddine, 2018; Nakkhah, 2018;2020; Nasr, 2018). Many transport stakeholders and citizens actually refuse to acknowledge the informal transit network and perceive it ubiquitous, but invisible. Indeed, for an outsider, the informal transit practices might appear "quixotic" (Scott, 1989; p.37), however, decoding its operational system can reveal how in fact a monopolised privately-operated collective transport incrementally constructed defies, and re-defines socio-economic variables, while reinforcing socio-political hierarchies to persist (Bayat, 1997) and resist to the apparent chaos in transport.

Informality has hence created a situation in which the bus system empowers some groups including bus owners, operators and passengers (Cervero and Golub, 2007), challenges the predominant car system and fills in the gaps left by an ill-functioning state with endless social, political and economic complications. For example, many transport-related stakeholders, such as Ziad Nasr, Ali Mohieddine (Vice President of the Union of Syndicates of Drivers of Public License Vehicles in Lebanon) and Tammam Nakkash (Transport expert and founder of Managing Partner at TEAM International), affirmed while they were interviewed in 2018 that "part of the system is by the people and for the people" (freely paraphrased), expressing a subtle balance between the power of the operators, the interests of the drivers and the inputs from passengers. In addition, the operators consider the system as "collective transit", and feel they should be legitimised: today the reluctant state provides permits to people who aim to be part of this practice (Monroe, 2010; Nakkash, 2018; Nasr, 2018). In that sense, the system is a private-public-civil hybrid.

However, in the interplay between the dynamics of social innovation and informal sectors, the latter is not necessarily good per se for different reasons. First, based on a socio-spatial and ethnographic analysis carried out between 2018 and 2019, the whole operational system revealed that the lanes, as divided among operators, serve their own communities. In that sense, each lane portrayed its political party/clan, as if the system is a field of battle between various political parties and sectarian groups. For example, when talking about the routes, some drivers, expressing their particular party allegiance, choose to drive in their sectarian territoriality to hunt for "their riders since the drivers' duty is to serve their people, and the system operates just like board-games" (freely paraphrased). Each bus lane is hence a reflection of a consociational state structure. Second, lack of data makes the system quasi-inaccessible for non-riders and non-transparent for riders and operators. Social injustice is hence reproduced within the internal system.

DOES MAPPING THE INFORMAL TRANSIT SYSTEM REINSTATE JUSTICE?

To palliate the lack of information and fill the gap in public knowledge, BMP, a collective mapping initiative, emerged to reshape the culture of mobility through recognising the real meaning of public transportation, which is contextually dependent (see Figure 1). According to the BMP founders, mapping is a powerful vector to tell realities about injustices, legitimise the informal transit system's existence, and above all, create a community engagement. The question however is, to what extent the mapping initiative is responding to the politics of everyday mobility?

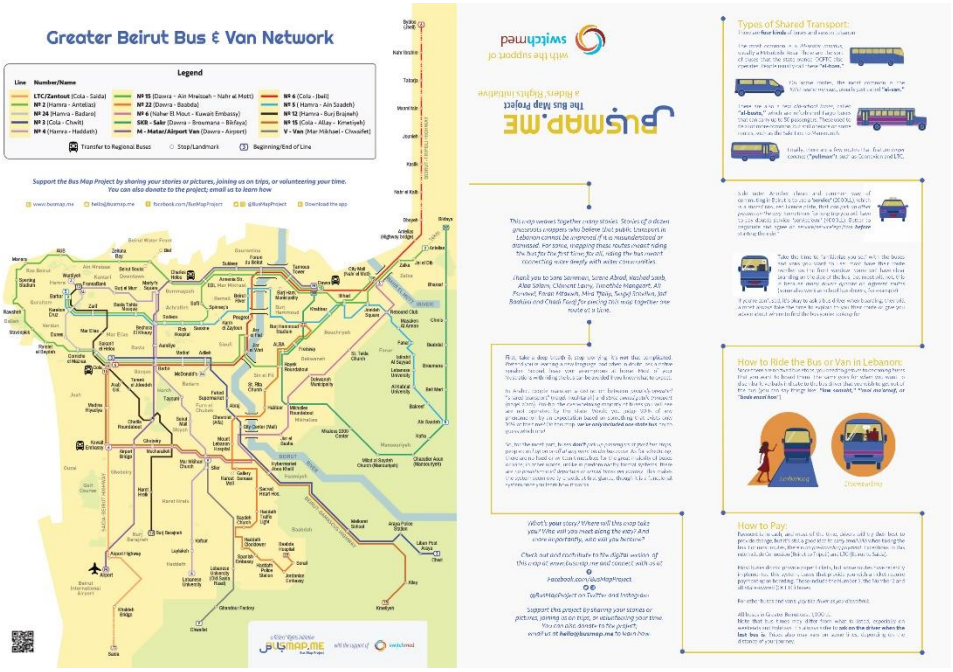


Figure 2: Greater Beirut informal transit network map attached to a guide on how to use the system *(Bus Map Project, retrieved from http://busmap.me/#downloads)*

El-Kayssi, (General Director of Land and Maritime Transport at the Ministry of Public Works and Transport), one of the political figures in the transport sector, interviewed in 2018, did not tire to point out that BMP is surpassing the state legal authorities, considering that "the growing frustration of the state entities lead to ignore the production of the map". The production of the map is not a threat per se according to Nakkash. The real gist lies rather in acknowledging the existence of (informal) public transportation infrastructure "as a way to reproduce the social infrastructure destroyed after the civil war". And, "the state is benefiting from all of this sectarian mobility scenario" (freely paraphrased). Therefore, BMP is a collective force that can create advocacy because of its resilient character in the face of state entities. For other transport stakeholders, the initiative is a medium-term solution and the state should adapt strategies accordingly.

From the view of BMP volunteers, to act on documenting means participating collectively in teaching the society to reconsider alternatives for the existing mobility patterns. Mapping hence unfolds the complexity of the existing milieu, mirrors and uncovers different realities, as it reveals "the hidden potentials" (Corner, 1999; p.20). The surveyors, while tracking the informal transit system, did not only produce a map, but they also painted the landscape of inequalities lived by the operators, riders and even non-riders, and identified dead areas and angles that needed to be connected. In that manner, the map could be considered as a manuscript for people to apprehend and accept Beirut mobility landscape. Further, the documentation itself was for the drivers and riders a way to expose the Lebanese urban mobility landscape, including the existence of the informal system. Overall, the map emphasized the creativity of the operators in being able to provide a public service while the ill-functioning and divided state failed. It allowed both riders and non-riders to explore new ways to navigate the territories, regardless of the sectarian territorial divisions in Beirut.

Viewing the work of BMP from the perspective of different transport stakeholders, clarifies that BMP's relation to social innovation dynamics are not utopian, as they paved the way to reframe justice and generated seeds for collective action. However, they are not fully socially innovative. De facto, BMP has a horizontal character and contests the differential instabilities of the country, but lacks financial resources, which limits their progress. The team, for instance, works on low-cost solutions, such as using donated phones and free GPS applications to track the buses. In that manner, BMP could bring to light the availability of the Beirut informal transit system unknown to many by documenting it, but they did not contribute in reversing the ratio between 80% of car users and 1.7% bus riders. To have an impact on society as a whole, BMP should adopt strategies that can fill the gaps that exist within the informal transit system, to trigger justice for the whole society. But without financial resources, BMP has focused on building-up a network of bus users and coalitions of local and international actors, such as Transit Union Riders in Seattle, NGOs related to people with disabilities, or public transportation as Train-Train, Chain Effect, and academics.

CONCLUSION: UTOPIA OR DYSTOPIA IN UNSTABLE CONTEXTS

Combining an institutionalist perspective, social innovation theory and the concept of transportation (in)justice enabled the analysis of informal mobility practices and mobility initiatives in Beirut. The project of mobility justice through collective transit practices, is about an activity of struggles for different reasons. The paper could expose the hurdles that the collective transit practices might face in attempt to negotiate transportation instruments in societies. Transportation or physical movements are not neutral technological artefacts or practices. Rather, they are a complex bundle, often invisible, of socio-economic, sectarian territoriality political and cultural differences, which (re)produce concomitant (in)justices. Moreover, the social turns in this paper could shift the focus of transportation studies to comprehend the relationships between actors and their interests, such as who

belongs to the city, who is allowed to participate and in what urban activities, who decides how spaces will be designed and produced, and who gains from urban transformation in relation to transportation. Thus, transportation politics are always pursued for the benefit of some to the detriment of others.

In that manner, mobility systems should not be isolated from socio-political and physical relations, which materialise the condition of urban existence and the essential capacity for participation in collective life. Rather, society should learn how to create a heterogeneous mobility environment. Hence, the notion of (in)justices enacted by the local initiative BMP and informal transit arrangements is conceptually rich, as both practices are seeking redistributive remedies to historic problems, and are not satisfied with being excluded. Socially innovative initiatives hence appear to empower the dispossessed, but happen in an unstable context filled with practices of differentiation. Therefore, movements such as these and their adopted strategies could teach the government how to shift towards more just practices, policies and discourses regarding the transport system, and confront market forces, which could be the dystopian ending for collective practices.

REFERENCES

Albrechts, L. (2005). *Creativity as drive for change. Planning theory, 4(3).*

Anas, A. et al. (2017). *Reducing traffic congestion in Beirut : an empirical analysis of selected policy options (English). Policy Research working paper. WPS (8158).* Washington, D.C.: World Bank Group.

Baaklini, J. (2020). *The road to mobility justice is not paved by technocrats.* Retrieved from https://thepublicsource.org/mobility-justice-technocrats

Bayat, A. (1997). *Un-civil society: The politics of the 'informal people, THIRD WORLD QUARTERLY, 18(I).*

Buhr, F., McGarrigle, J. (2017). *Navigating urban life in Lisbon: a study of migrants' mobilities and use of space. Social Inclusion, 5(4).*

Cervero, R., Golub, A. (2007). *Informal public transport: a global perspective*. *TRANSPORT POLICY*, 14, 445-457.

Corner, J. (1999). *The agency of mapping: speculation, critique and intervention" in Mappings.* 213-252. Reaktion Books, London.

Cresswell, T. (2006). *Towards a politics of mobility. ENVIRONMENT AND PLANNING A*, 38, 207-226.

De Blust, S., Van den Broeck, P. (2019). *From social innovation to spatial development and planning in Social innovation as political transformation: thoughts for a better world.* 100-105. Edward Elgar Publishing.

El-Kayssi, A. (2018, May 4). *Personal interview.*

Jensen, O. (2015). *More than A to B: cultures of mobilities and travel in handbook of transport and development.* Edward Elgar Publishing.

Harb, M. (2018). *New forms of youth activism in contested cities: the case of Beirut, The International Spectator, (53)2.*

Hillier, J. (2013). *Towards deleuzean-inspired methodology for social innovation and practice in the international handbook on social innovation: collective action, social learning and transdisciplinary research*. 169-180. Edward Elgar Publishing.

Gracía, M., Pardel, A. (2019). *Bottom-linked approach to social innovation governance in in Social innovation as political transformation: thoughts for a better world*. 97-98. Edward Elgar Publishing.

Mohieddine, A. (2018, March 9). *Personal interview.*

Moulaert, F. et al. (2013). *The international handbook on social innovation: collective action, social learning and transdisciplinary research*. Edward Elgar Publishing.

Moulaert, F., Van Dyck, B, (2013). *Framing Social Innovation Research: a sociology of knowledge perspective, chapter 3.5. in International handbook on social innovation: collective action, social learning and transdisciplinary research*. Edward Elgar Publishing.

Moulaert, F., MacCallum, D. (2019). *Advanced social innovation.* Edward Elgar Publishing.

Monroe, K. (2010). *The insecure city: space, power, and mobility in Beirut.* Rutgers university press New Brunswick, New Jersey, and London

Monroe, K. (2017). *Circulation, modernity, and urban space in 1960s Beirut. History and Anthropology, 28(2).*

Nakkash, N. (2016). *Assessing the failure of Beirut city in implementing a sustainable transport system.* Retrieved from https://www.linkedin.com/pulse/assessing-failure-beirut-city-implementing-transport-system-nakkash/

Nakkash, T. (2018, March 1). *Personal interview.*

Nakkash, T. (2020, June 5). *Right to Mobility Post COVID-19 talk delivered at Riders' Rights Lebanon online session.* Retrieved from https://www.youtube.com/watch?v=BbXxu7VLkdM&t=496s

Nasr, Z. (2018, March 8). *Personal interview.*

Pereira, R., Schwanen, T., Banister, D. (2017). *Distributive justice and equity in transportation*. *Transport Reviews, 37 (2).*

Salamey, I. (2009). *Failing consociationalism in Lebanon and integrative options. International Journal of Peace Studies, 14(2).*

Scott, J. (1989). *Everyday forms of resistance. Copenhagen Papers, 4(89).*

Sheller, M. (2018). *Mobility Justice*. Verso.

Sheller, M., Urry J. (2006). *The new mobilities paradigm*. *ENVIRONMENT AND PLANNING A*, 38, 207-226.

Swyngedouw, E. (2005). *Governance innovation and the citizen: the janus Face of governance-beyond-the-state. URBAN STUDIES*,42, 1991-2006.

Tfaily, M. (2020). *Beirut's Buses and the Filtering of Urban Informalities.* Retrieved from https://www.jadaliyya.com/Details/40377

Van den Broeck, P. (2011). *Analysing Social Innovation through Planning Instruments: A Strategic-Relational Approach in Strategic planning as a catalyst for transformative practices.* Routledge.

TRACK T10: STREET LIGHTING – SUPPORTING SUSTAINABLE URBAN DEVELOPMENT

Track Chair:

Tomaž Novljan,
University of Ljubljana, Faculty of Architecture, Ljubljana, Slovenia

Exterior lighting has always been an essential element of nocturnal cityscapes; initially it was primarily based in function, providing night-time security and orientation within the built environment. These functional needs were in turn augmented by advertising and outdoor living ambiances that established multi-scaled spatial hierarchies as well as creating multifarious views of the city during the darkness of night. Nocturnal lighting within the urban landscape is one of the many challenges that any contemporary city faces.

Track 12 welcomes the contributions on the proposed topics:

- *Establishing orientation and hierarchy in cityscapes;*
- *Creating "another face" of the city;*
- *Nocturnal public spaces;*
- *Lighting art and advertising;*
- *Obtrusive light and light pollution.*

Keywords: Exterior Lighting, Nocturnal Cityscapes, Urban Landscape

URBAN LIGHTING AMBIENCES

Tomaž Novljan
Assoc. Prof., PhD, University of Ljubljana, Faculty of Architecture, Slovenia
tomaz.novljan@fa.uni-lj.si

ABSTRACT

An ambience can be defined as a space with certain properties encompassing one or more persons or things. An architectural ambience is a space containing a number of special architectonic quantities. Light is one among them. Light is the most powerful immaterial construction material. Light reflects from various surfaces and enters into a human optical perceptive system. DEGRADED LIGHTING AMBIENCE designates special spatial layers inside architecture where otherwise qualitative segments of space are negatively affected by improper lightning. The following text delivers a proposal of 12 typical lighting aspects that should be considered prior to designing a quality ambience and furthermore, it introduces light as an essential tool in the process of making new or refurbishing degraded urban ambiences.

Keywords: *ambience, architecture, lightning.*

INTRODUCTION

One can define an ambience as a space with properties that encompass one or more persons or things, in other-words: surroundings. It can be perceived through many different scales – from micro to macro; it can be defined as a relative quantity.

Architectural ambience is a space where architectural quantities are accentuated, e.g., the relationship between certain Euclidian geometrical elements (lines, surfaces, bodies) and their surroundings. Different materials are used to support diversity of architectural tasks. These materials reflect the specific language of the ambience, artistic expression or simply the wealth of the investor. Various shapes, colours, textures and patterns are created during the design and construction process. All this is possible only through the presence of light. Light makes the ambience visually perceptive, real and dynamic. Quality architectural ambience fits within the spatial context; it has a "narrative", where forms, light, shadows and movement are involved. It also has material and immaterial hierarchy.

A human - he primary user of an architectural space perceives his/hers surroundings through different sensory organs; mostly through vision (approx. 80%), hearing, and touch. Via these inherent senses the relationship between urban space and its users becomes established. As previously mentioned, this paper asserts that light is the most powerful among the "building materials" in the

manmade environment. It reflects from various surfaces and enters into a human recognition system. Lighting generates illuminations, where not only the orientation is projected, but also functional and aesthetic enrichment of the space becomes possible. At the Faculty of Architecture in Ljubljana a special system is being developed that can serve as a tool for the analysis and evaluation of the light ambiences. A 12-point criteria is based on the experience in dealing with the most common areas of errors that were made in several different cases of lighting concerning architectural ambiences: overdosed illumination, insufficient illumination, glare, shadows, reflections, light "pollution" etc. A new term LIGHT-DEGRADED AMBIENCE has been coined and designates a special spatial level within the architecture where improper lighting deteriorates otherwise quality segment of an architectural ambience.

EVALUATION CRITERIA

Relation to quality architectural elements and to overall composition

This kind of deficiency, if present, can lead to the overall degradation of architecture. It is a well-known fact—in theory and in practice—that accented illumination serves as visual amplifier of higher-value architectural elements. However, too many accentuations at the same level can lead to the opposite effect Even in the process of making accentuations it is necessary to take into account both gradation and hierarchy. Within an architectural composition usually some elements are more important than the others. Illumination intensity must follow this order. With the proper amount of light a "lighting composition" is established and as such complements and even upgrades the "original" artistic/geometrical intention.

Insufficient illumination – generally and/or in detail

This lighting aspect must address two items: personal safety and orientation in urban space, and the negligence and inconsideration of architectural elements. One of people's basic necessities is that of personal safety; it is perhaps one of the most important, and adequate illumination is a vital factor in the manifestation of "safe" spaces. Architectonic space fundamentally consists of permanent components, i.e. buildings and other, more or less static, exterior and interior elements and, of variable components, mostly human users of exterior and interior environments. A human, who lives and moves through an urban environment, typically seeks other humans. This is particularly true at night when large amounts of people have left urban places. Next is orientation in space. The human brain constantly seeks balance. If it is very hot we want it to be colder, in the case of too bright an environment we want it to be darker. Also, we want to be aware of our bearings – on a physical level as well as on a more abstract level. We can find ourselves in a certain place or space, which we know well from our experience, and as such can

frame it within a wider spatial context. In the other instance we can find ourselves in a space/room where we are able to locally recognize its physical properties: tall, narrow, wide, clean, dirty etc. We cannot frame the space within a broader spatial context directly, but we can call upon our other senses for help: our sense of smell and hearing.

Consideration of the possibility of glare

Glare is an optical condition where the difference between a bright and dark object which are put close together is so extreme that a simultaneous perception of both objects is difficult or even impossible. It must be stressed that with glare, the degree of impact depends highly on one's age. The higher one's age, the lower one's threshold of tolerance. Because of glare certain architectural elements or compositions or forms cannot be recognizable. Glare is also an important factor when we speak about traffic safety.

Shape, design and size of the luminaries

In most cases a lamp plays a significant role in co-designing an overall appearance of an architectural ambience. Until recently a luminous power was closely related to the dimension of the lamp: the higher the power, the bigger the dimension. Of course every shape and/or dimension of a lamp is not suitable for every architectural ambience. Physically larger ambiences which are perceptible as a whole from greater distance can stand larger and more robustly designed lamps. Smaller, less articulated and minimalistic designed ambiences are much more sensitive and require lamps which are designed in the same manner. The scale of the space is, together with its articulation and function, an essential measure that determines whether a certain lamp in the shape, dimension and even colour corresponds and fits into the specific spatial instance.

Disposition of the luminaries regarding maintenance and vandalism

Maintenance, exposure to vandalism and investment-costs must be considered too when planning the arrangement and position of lamps. Usually the disposition of lamps in certain ambience obeys the need of evenly illuminated surfaces or the need of providing special lighting effects. To achieve evenly illuminated (horizontal) surfaces the lamps are usually positioned on relatively high poles (it is always a trade-off between the height of the poles and their spacing) so vandalism does not represent a potential risk. In this case the maintenance and exchange of burned-out lamps have to be taken into consideration. But when considering lamps for special ambient effects (spotlights, lamps on short poles, lamps encased in pavement, grass etc.) one must also consider the possibility of vandalism. This problem can be partly avoided by the proper selection of adequate, more robust or built-in types of lamps.

"Managing" shadows

Shadow is an optical phenomenon that helps in the perception and orientation in 3D space. It helps us to determine the position of a particular surface or body in relation to other surfaces and bodies in space. Shadows as a "by-product" of natural illumination help us with orientation during the day. Natural shadows are parallel and homogeneous. Shadows that appear as the result of electrical illumination can be more heterogeneous and can be dynamically changed regarding the number, power, position and colour of the light sources (Figure 1). Spatial orientation in this case becomes less certain; sometimes even causing disorientation. If shadows are too strong, too contrasting and/or too large they can cause decreased perception of structure, texture and colour.

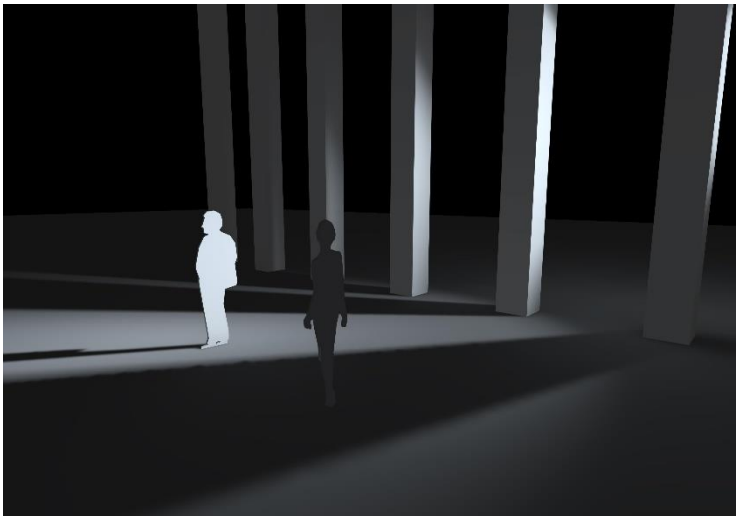


Figure 1: Sharp-edged and over-contrast shadows resulting from the illumination with only one, very powerful light source. Novljan, T., 3D simulation, Dialux Evo 9.1, 2020.

Adaptability to eventual changes in urban ambiences

Among the essential properties of a contemporary urban ambience is that it is able to meet the needs of different functions. The city and its squares are transformed into a stage, the facades form the – admittedly unchanging – backdrop[1] . The reasonable disposition and flexibility of illumination arrangements can contribute to a faster and cheaper change to new temporary functions within an ambience as well as bringing the original situation back to its original state.

[1] BRANDI, 2007:87

"Managing" reflections

Reflected, indirect light is as important as direct light. Considering the reflecting surface, indirect light can have even stronger architectural significance. It should be pointed out that reflections from smooth, shiny and moving surfaces like water, moving vehicles and glass façade elements are of special importance. The most undesired result of the reflected light is glare. A work of art, a monument for example, should be the brightest part of the field of view, with gently graded brightness to the surrounding visual field, but there must be a total absence of glare, both direct and reflected[2].

Brightness of surfaces

Brightness is another photometric quantity that is directly perceivable with our eyes (reflected light). Regardless of the level of illumination of a certain surface the level of brightness of this surface can be too high or too low. In architectural design and expression this difference between the perception and measurement is very important. A "good" example are large advertising panels in urban areas and, in certain natural ambiences, too. In spite of their triumphant advance in many European cities, illuminated advertisements are subject to planning approval, and rightly so. They are even prohibited in some districts.[3] However, in such cases the brightness of illuminated surfaces depends mostly on a displayed graphic (Figure 2). As understood by experience, advertisements change very frequently and so does the relation between brighter and darker surfaces; however, the level of illumination remains constant. This results in under-dosed or overdosed illumination, and further on in unwanted illumination of the surroundings and produces glare etc.

Figure 2: The left advertising panel displays 30% higher luminosity than the right advertising panel. Both panels receive equal illumination. Novljan, T., 3D simulation, Dialux Evo 9.1, 2020.

[2] CUTTLE, 2007:8
[3] BRANDI, 2007: 79

Consideration of structure, texture and color

Structure, texture and colour are basic properties of any architectural object. We distinguish more and less structured surfaces and compositions that need to be nocturnally illuminated. A strongly articulated structure causes more shadows, particularly if more light-sources are used to illuminate it. If the resulting shadows are too contrasting the "visual denial" of the intended architectural expression can occur and the architectural object gains a new, usually unwanted and unpredicted image. Similarly, this applies to texture, which is a 2-dimensional visual property in architecture, somewhat similar to the structure itself. An observer/occupant can thus traverse from the structure to the texture and again to the structure and again to the texture … It depends on the scale or the distance of observation. The third basic property of all spatial elements is colour. The relation between absorption and reflection of light from a surface generates colour impressions of this surface and affects both structure and texture.

Light pollution / obtrusive light

The scattering of redundant light in the atmosphere causes so-called sky glow. This phenomenon can disturb natural as well as human habitats. Light pollution greatly depends on conditions in the atmosphere (humidity, clouds, presence of particles - natural as well as industry-produced). These factors act as vast diffusers and amplifiers of light. Such light can travel very long distances. One of the obtrusive light by-products is also glare.

Special ambient conditions

Architectural ambiences of special historic values, or cultural importance require additional attention regarding illumination. The importance of proper lighting – both natural and artificial has played an important role through the history of mankind. This can be particularly stressed in the field of sacred architecture, where sunlight has consistently played an important role as an element of worship and thus in its design. The Stonehenge, the temples of Egypt, public buildings of antique Greece and Gothic cathedrals are just few among the most well-known examples of the utilisation of light as a means of psychological influence on humans. Currently these historical buildings generally perform a documentary and educational role. It is important to stress here that lighting of historical buildings must consider the context of time when these historical buildings were built and used. Modern light sources are very powerful and cannot be compared to the artificial and natural light sources of different technological eras. A desire for bringing an old castle ruin into every tourist guidebook often results in overdosed illumination that degrades both the historical and ambient value of a historic site.

Figure 3: Bridge Theatre of Light: Student workshop Lighting Guerilla 2012. Photo: DK 2012.

CONCLUSIONS

The term *Light Degraded Ambience*, which evolved as a part of educational process and research at the University of Ljubljana, Faculty of Architecture, designates a special architectural level where improper lighting can damage the perception and use of a certain urban architectural ambience or element. The set of 12 points discussed above can be used as tools in analysing urban luminous environments prior to the start of any lighting design project. Research in this field is an ongoing process. Each year more experience is garnered, and if needed, these 12 "aspects" will certainly be modified over time - primarily through various workshops in urban spaces. The study and evaluation of different ambient quantities and qualities will be used to propose solutions with the aim to improve degraded urban ambiences through proper lighting methods. Properly illuminated spaces attract people and public programmes culturally and commercially. In the past decade via this project and in conjunction with The Lighting Guerilla annual international lighting festival of Ljubljana these aspects have been investigated through designing and setting ephemeral lighting installations in public urban space of Ljubljana (Figure 3). Within these workshops future architects learned the whole lighting design process from the start to the final implementation on the streets, parks and squares. Proper lighting has to become one of the important tools for qualitatively improving Ljubljana's or any other city's "grey" urban areas.

REFERENCES

Brandi, U. (2007.). *Light for cities,* Birkhauser, Basel

Ching, F. D. K. (1996). *Architecture – form, space and order,* John Wiley&Sons Inc., New York.

Cuttle, C. (2007). *Light for art's sake*. Elsevier, Oxford

Fotios, S., Utterly J., Fox, S. (2019). A whole -year approach showing that ambient light level influences walking and cycling. *Lighting Research & Technology 51*, 55 – 64.

Lam, W. M. C. (1992). *Perception & lighting*, Van Nostrand Reinhold, New York

Scielke, T. (2019). *The Language of Lighting: Applying Semiotics in the Evaluation of Lighting Design LEUKOS, 15:*2-3, 227 – 248. Retrieved from https://www.tandfonline.com/doi/full/10.1080/15502724.2018.1518715

OUTDOOR LIGHTING PLAN – RETHINKING OF TRG OSVOBODILNE FRONTE IN LJUBLJANA

Lanlan Wei
student, University of Ljubljana, Faculty of Architecture, jennyweill@outlook.com

ABSTRACT

City street lighting level and extent of illumination are affecting the safety and comfort, as well as people's driving routes and activity areas. Redefining the application of new lighting technologies, switches and dimming modes. And planning night-time activities based on new lighting to promote the positive impact of outdoor night-time lighting on life. Research methods used were: study of lighting theories, standards, and legal regulations, relevant case studies, and field trips and data measurement on site. Taking advantage of the outdoor lighting plan of the central transport district and its surroundings, the lighting design was considered to be one of the important factors for the quality design of the city of Ljubljana.

Keywords: road, lighting, environment, adaptive plan

INTRODUCTION

From ancient times to the present, there have been many stories about light and how it is beautiful, mysterious, sacred and a representation of power in different cultures, beliefs or myths. Light in the night sky was considered in early civilizations to be a powerful and sacred force, something that only the gods could produce and release.

In ancient China, the image of the god of thunder was constantly evolving. Initially, it was portrayed as a monster with a human head and a dragon body, and thunder was emitted by striking its stomach. Later, it gradually changed into a monkey-faced figure. In Taoist mythology, there are many numbers of thunder gods of various levels, the lowest level being the "Thunder man", the upper level being the ordinary "Thunder God", and the upper level being the "Thunder King". The Chinese folk set the birthday of the God of thunder (Leigong the God of thunder, his wife is Dianmu, Chinese goddess of lightning) on the 24th day of the 6th lunar month. The ceremony is held on this day, which conveys the good wishes of the Chinese working people to expel evil spirits, avoid disasters and pray for good fortune.

Raijin is the Japanese god of storms, a chaotic being born of death who brings the world vital rains as well as chaos and destruction. He flies across the sky on dark clouds and throws lightning onto unsuspecting denizens below. A popular kami (a type of god

or spirit in the Shinto religion) despite his connection to death and destruction, Raijin is represented in Shinto and Buddhist imagery, as well as in folk belief and popular art (Wright, 2020).

After centuries of using a different but less efficient solution for street lighting, in 1792 the inventor William Murdoch used gas distilled from coal to light his house.1807, London. The first street lit by gas lanterns was opened. The gas lanterns were placed on poles and then lit and extinguished by hand every evening and morning. Later, other cities around the world followed. Until the arrival of electricity (History of Lighting, 2020). After that, electric lighting spread the world and is still here today.

Lighting of street and buildings accounts for up to 75% in electricity demand of lighting (Kazarinov et al., 2011). The new methods of street lighting control based on network technologies enable to configure street lighting in real time mode and in a scientifically justifiable and dynamic manner (Filimonovaa et al., 2017). A well-illuminated space in which faces and facial expressions are recognizable creates a sense of increased comfort and users feel protected and not threatened by the presence of others (Cariboni group, 2019). Changes which reduce lighting, particularly ‘switch off’ and part-night lighting in urban areas, have attracted considerable public and media concern, centring on crime, fear of crime, per-captions of safety, and road safety. These are all important de-terminates of health and wellbeing: directly in the case of road safety; and indirectly, in that fear of crime, for instance, has multiple pathways that impact on mental health (Lorenc et al., 2012).

CASE STUDY: TRG OSVOBODILNE FRONTE IN LJUBLJANA

Nearly 15% of global electricity consumption is used for lighting (International Energy Agency, IEA/UNEP 2014), lighting is used every day, all the time, all over the world. Lighting is a huge energy consumer and emitter of carbon dioxide.

As LED technology applications become more flexible and diversified, the role of lighting has increasingly gone beyond the need to fulfil the lighting function, it has given more social.

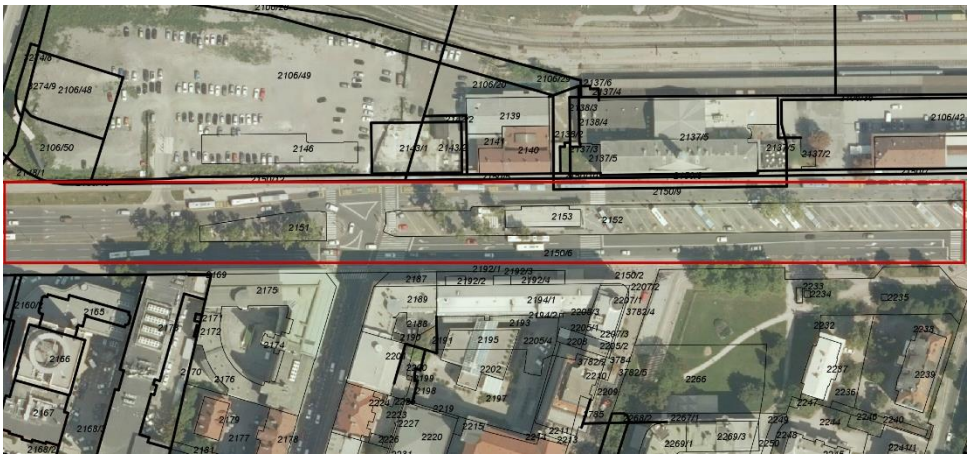


Figure 1: Location of Trg Osvobodilne fronte (source: GIS Portal Municipality of Ljubljana)

Trg Osvobodilne fronte (Figure 1) is in the front of the Ljubljana central transport district. This district is surrounded by a number of active residentials and office buildings, this area carries many functions, it is a neighbourhood for local residents, a transport point for intercity people taking buses, and the first impression of Ljubljana for international tourists. It is not only a functional area during the day but also at night.

Reasonable distribution of lighting levels and lighting switch modes will be more conducive to safe, harmonious, guidance and enhance the city's image at night.

The Current Situation

Due to the long story, the area of Trg Osvobodilne fronte is has been in a state of waiting for reconstruction, its night lighting (Figure 2) has been less maintained and unmodified, with old and energy-consuming equipment, lack lighting continuity and functionality in some areas confusing switching systems, and so on. Some parts have high lighting levels, such as road surrounded billboards, signals of stores, etc., some parts are unilluminated like the junction area between main road and pathway.

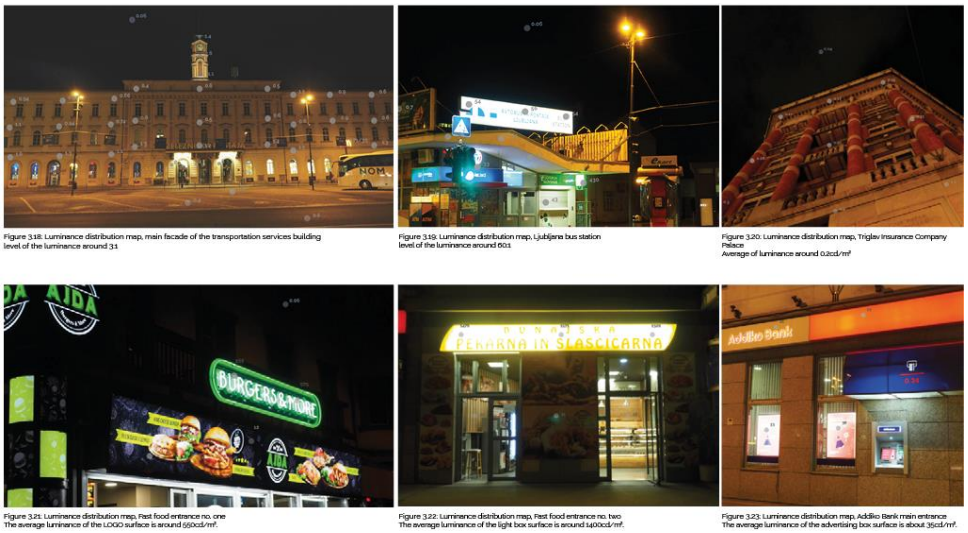


Figure 2: Luminance distribution around the district

POTENTIAL LIGHTING IMPROVEMENT AREAS AND PLAN

Certainly, the most obvious symbol of the station is Clock tower, and it is likely perceived as a lighthouse whether the observer is looking at it from the surrounding area or from inside the station area. Arriving from the northern side of the city, the Clock tower can be easily seen as the prominent ornament of the area. However, the Clock tower should not capture the full attention of those persons that are looking for the North Entrance of the building. This should have a clear view of the observer as well.

Walking toward the north entrance of the station, you will first find large steps that one will need to walk down. Lighting uniformity is very important to safely walk down the steps and to identify your connection to the platforms or to the underpass situated behind the steps.

Areas that should have the priority for improvements are the zones from the underpass to the platform and the connecting steps as indicated. The underpass requires 24/7 light artificial light services. It is important to consider the strong glaring effect created by the daylight when a person is approaching the entrance or exit of the tunnel. It is recommended to equip the lighting in the underpass with control sensors that can be located at the north and south end of the tunnel. The control should work together with the luminaires to adjust the illuminance levels to the daylight conditions at both ends of the tunnel. It is recommended a maximum of 100 lx average illuminance at night and a maximum 300 lx average illuminance during the daytime. Along with the previously recommended improvements, it is necessary to reinforce the identification of the boundaries of the station, this is aimed to avoid overlooking the edges of the platform areas at night, especially

when the surroundings are having insufficient lighting. A dedicated continuous line of lighting should be provided from the south entrance of the underpass to the front of the bus waiting area, and from the south side of the road leading to the city center.

The main parking area and the parking lot requires lighting to drive people's attention to the central station area. This will facilitate easy identification and will serve as a "light" nighttime guidance. As indicated previously, the lighting of the clock tower and the façade of the station (Figure 3, 4) should be designed to meet the recommended ratio according to their hierarchic position in the environment. These two elements are key to create the image of the area. The view from the south side of the center of the city is a key pedestrian route linking the station to the city center. In this route, a monument (Figure 5, 6) is found that will require special lighting. This pedestrian corridor will need lighting to provide safety as well as to allow the monument lighting to be enjoyable. Connecting to the main street (Figure 7) is also important to drive people's attention. The station sign, main façade, and clock tower are the main structures visible from that view. This is finally complemented by the west side view where the clock tower is paramount.

Station sign and street billboard

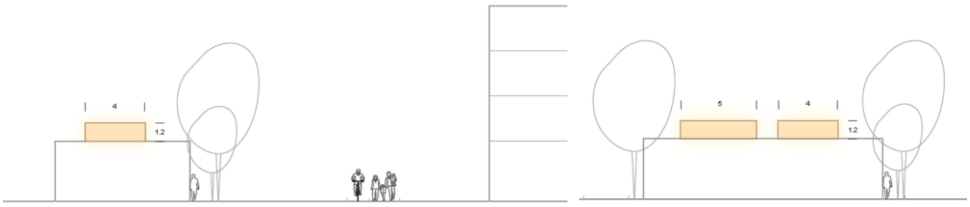


Figure 3: Station sign and street billboard

- Luminance level. Maximum Luminance will be planned with 20 cd/m^2. During the night hours, which commence no later than one hour after sunset, luminance levels shall not exceed the maximum values provided dimming gradually illuminance levels. It is recommended that after 23:00 hours the illuminance level of the sign should be gradually dim down as the time moves towards midnight.

- Billboard Size Limits. Larger billboards may heavily impact the night-time environment. For extra-large billboards, for those ones installed near to pedestrian roads and/or roadways, they will not be lighted.

- Power Density Limits. Use power of less than 80W per square meter.

- Lighting projected from bottom – top on signs and advertising panels are not permitted.

- Advertising lighting with rapid color changes is not permitted.
- LED interior light box lighting is recommended for signage and billboard lighting. (Size less than 30 m^2)
- Billboards shall be switched off completely after 00:30 (or 30 minutes after the close of business for on-premises signs, whichever is later), and remain off until one hour before sunrise or opening of business whichever is sooner.

Façade and clock tower area

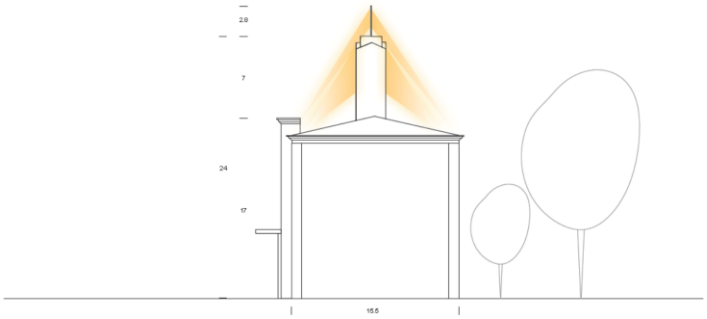


Figure 4: Façade and clock tower section

- The average luminance value of the clock tower should be Lave=5 cd/m^2, which is the highest luminance level in the area of facade lighting.
- The projection luminaires will be installed on the roof and will project light onto the tower in two layers, the first layer mainly cover the central part of the clock tower and the second layer on the upper part of the façade and the top of the mast.
- For the facade, it will be better to use the wall washer lighting distribution to well control the spill lighting; for the top of the mast, a adjustable narrow beam lighting fixture will be used to minimize the spill lighting. The same lighting levels and methods will be used on all four sides of the clock tower.
- It will be important the uniformity of the lighting of the clock tower combined with the precision of the lighting of the mast section.
- The luminance of the facade lighting section calculated from the average value of the total area of the facade lighting section shall not exceed 1 cd /m^2.
- Projected white light should be <3000K.

Monument sculpture

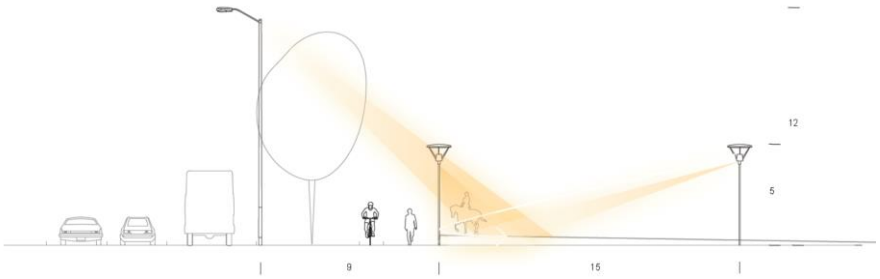


Figure 5: Monument sculpture area section

- The illumination of cultural monuments should provide the required luminance levels for visibility and modelling at the same time. The renderings below show the light levels hitting the monument and the surroundings, not ex-exceeding 1 cd / m2.

- The luminaires will be mounted on adjacent street and park using medium size poles. The light will be projected from three different locations and from top to bottom to create the modelling by contrast using a mix of narrow and medium beam angles.

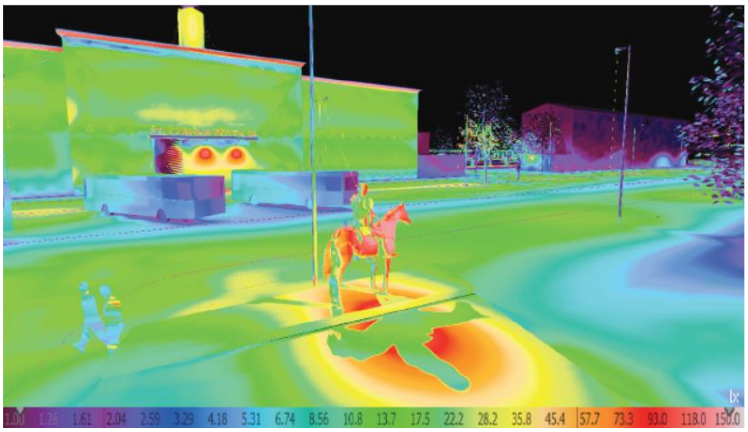


Figure 6: False colour rendering image of the monument to General Maister

Active street frontage

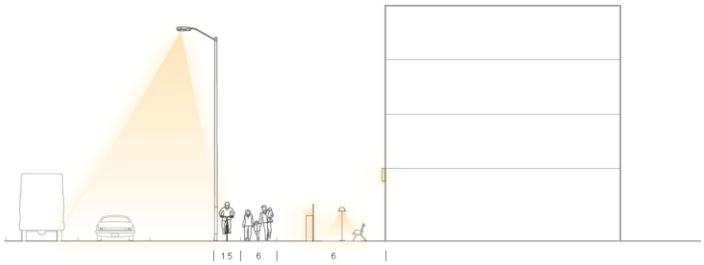


Figure 7: Active street frontage section illumination diagram

The shopping street connecting the south of the station is dominated by fast-food restaurants and cafes. This street is the busiest one and business hours are extended up to 11pm at night.

The main forms of lighting are doorway advertising lightboxes, wall mounted vertical advertising lightboxes, and outdoor shop lights. Upward advertising lighting is not permitted.

Except for safety-related lighting, which shall remain ON overnight, all other lighting must be switched OFF before 00:30 hours. Use fully shielded fixtures that emit no light upward.

Connection areas with the park and Kolodvorska ulica

The pedestrian corridors from the station's north underpass entrance to the north surrounding area and from the south bus waiting area to the city centre are the most used pedestrian corridors at night. These areas are also heavily used by bicycles and people who like to walk.

Promote the continuity of night-time lighting in the commonly used corridors and station neighbourhoods and surrounding commercial streets to enhance the night-time image of public places.

Promote the use of adaptive control system

Adaptive lighting systems can be dynamically managed with all the functions for maximum flexibility and use scenario mode management as needed to reduce unnecessary energy consumption.

CONCLUSIONS

There are many possibilities for lighting as a tool and material for night-time public spaces, lighting use enhance the night-time public environment with a small number of inputs, make more night-time activities possible, promote safety, beauty and diverse lifestyles, and contribute to sustainable development.

This paper is a part of the master's thesis DEVELOPMENT OF ADAPTIVE PLAN FOR OUTDOOR LIGHTING IN THE CENTRAL TRANSPORT DISTRICT OF LJUBLJANA done at the Faculty of architecture, University of Ljubljana September 2020.

REFERENCES

Filimonovaa, A., Barbasovaa, T. A., Shnayder, D. A. (2017). Outdoor lighting system upgrading based on Smart Grid concept. 8th International Conference on Sustainability in Energy and Buildings, SEB-16, 11-13 September 2016, Turin, ITALY. *Energy Procedia 111*(2017), 678-688. https://doi.org/10.1016/j.egypro.2017.03.230

Historyoflighting.net. 2020. History of Lighting - Development Of Lighting Technology. [online] Available at: <http://www.historyoflighting.net/> [Accessed 14 August 2020]. International Dark-Sky Association. 2020. Light Pollution | International Dark-Sky Association. [online] Available at: <https://www.darksky.org/light-pollution/> [Accessed 14 August]

International Energy Agency, IEA/UNEP (2014).

Greena, J., Perkins, C., Steinbach, R., Edwards, P. (2015). Reduced street lighting at night and health: A rapid appraisal of public views in England and Wales. *Health & place*, 34, 171-180. https://doi.org/10.1016/j.healthplace.2015.05.011

Kazarinov, L. S., Shnaider, D. A., Barbasova, T. A. (2011). *Automatic control systems of efficient lighting*. Chelyabinsk: Publisher SUSU.

Lorenc, T., Clayton, S., Neary, D., Whitehead, M., Petticrew, M., Thomson, H., Cummins, S., Sowden, A. Renton, A. (2012). Crime, fear of crime, environment, and mental health and wellbeing: mapping review of theories and causal pathways. *Health Place*, *18*(4), 757-765.

Wright, G. (2020). *Raijin – Mythopedia*. [online] Mythopedia. Available at: <https://mythopedia.com/japanese-mythology/gods/raijin/> [Accessed 14 August 2020]

LIGHTING IN URBAN SPACE – CHALLENGES IN ZOUK MOSBEH, LEBANON

Aleš Švigelj[1]
mag. inž. arh., University of Ljubljana Faculty of Architecture, Ljubljana, svigelj.ales@gmail.com

Marko Lazić
mag. inž. arh., University of Ljubljana Faculty of Architecture, Ljubljana, lazo.marko90@gmail.com

ABSTRACT

Lighting is one of the strongest factors that can transform the perception of any space, especially in urban environments where it importantly influences the quality of life. One of the biggest issues in today's urban space is the balance between the lack of lighting and lighting pollution. How to establish the appropriate lighting in the city is especially challenging in cases such as Zouk Mosbeh area in Lebanon. Due to the domestic and neighbor's wars, the area grew from an agricultural village into a densely populated area of tall buildings practically over the night. Among other important urban assets, it suffers from a lack of sufficient and appropriate lighting infrastructure, which would offer the newcomers and the residents a quality space for interactions with each other and ensure different activities in public spaces which are extremely important for such a densely populated and heterogeneous area. The article offers a review of the importance of lighting in urban space and provides an insight into the effectiveness of light on people's moods and feelings. The article tries to establish new perspectives in urban light design based on exploratory research in the Zouk Mosbeh area in Lebanon as a case study. The end goal of this article is to help urban designers and architects understand the importance of appropriate lighting in the urban space especially in the fast-growing and heterogeneous cities such as Lebanon and how this, beside other important factors such as safety, comfort, and the attractiveness of the public space, has the social impact in the fast-growing and densely populated spaces.

Keywords: Lighting, Zouk Mosbeh, Lebanon, Urban space

INTRODUCTION

Lighting is one of the most important factors in urban space and it is as critical for the public as for the private spaces. Since the birth of public lighting (which, in Europe, can be traced back to the Middle Ages), public spaces - the empty spaces

[1] *Corresponding author*

in the city - have always been lit (Narboni, 2017). City lighting plays important role in the quality of people's lives, their aesthetic perception of space, and feelings of safety. It is only with the benefit of light after all that urban spaces become accessible at night. (Geissmar-Brandi & Brandi, 2006). A quality lighting environment was defined as the lit space that supports human behavioral needs, with considerations for architectural and economical aspects of the installation (Veitch, 2001). Whenever we are planning from the beginning or we are renovating the existing public space we consider the impact of the design on a wider scale. The same should be the case with lighting design for urban spaces. Good lighting has the potential to transform the neglected city areas into attractive urban settings as well as it can result in the extended hours for commercial and social activities (Gokhale, 2013). Besides the costs of lighting (maintaining, light pollution, and energy consumption) also esthetical and emotional impacts are important. Good lighting design can display the culture and the characteristic of the city and establish a charming world of light (Kutlu & Manav, 2013). It can transform urban spaces far beyond their purpose so they don't represent just the function but create a unique experience for people. As the morphology of the city evolves, we can imagine a new urban future, one in which there is a new relationship between public and private spaces (Narboni, 2017). Public spaces play a vital role inside the communities. They offer a space that regenerates the area and creates social cohesion of the community which is vital in extremely heterogeneous areas where a lot of nationalities come together but do not communicate due to historical or ethnical arguments. If we upgrade these public spaces with appropriate lighting people can easier and faster accept them. This leads to public spaces where citizens can create a powerful sense of belonging or further joint actions.

IMPORTANCE OF LIGHT FOR URBAN SPACE AND LIFE

The lighting has always been an important element of urban space and life. For millennia human beings have sought to transcend the limits of the cycle of day and night by artificially lighting essential spaces (Narboni, 2004). Light emphasizes specific aspects of the urban environment which change the daytime appearance, while the absence of light can create a part of the luminous composition (Gokhale, 2013). The purpose of outdoor lighting is totally different compared to the lighting in the interior space, especially at night - in 50% of the world's time, it is a crucial factor as the functionality of the space at that time totally depends on the lighting. Appropriately designed night lighting influences the way people use and enjoy the city, the way they move around its streets, and even how they feel. Because urban spaces are essential for every city and its citizens, they must have appropriate lighting so that they feel safe and welcoming to the users. Beyond that, lighting transforms them into a unique experience for every visitor. On the other hand, it is challenging because of specific conditions. The sky is naturally always dark by night which means big contrasts to the enlightened areas. They can be seen from great distances and can sometimes become distracting or disturbing.

Feelings and experiences of people are sensitive and their perception of safety and security changes very fast. Also, the requirements at night time are very specific because of performing different occasions. Illuminating public spaces also create a night-time environment in which pedestrians can quickly and accurately identify objects and maintain orientation (Azari, Khakzand, 2014). Effective lighting of public open spaces combines engineering solutions with urban strategies: the two should go together if there is to be a successful transformation of public open spaces (Altitude Services, 2020). Establishing an effective lighting design requires expert knowledge in lighting, urban planning, and sociology. Properly considered lighting positively impacts the 'total architecture' of our cities; reinforcing urban design principles, enhancing cultural experiences, and encouraging social interaction (Lam, 2020). It can contribute the strengthening experience of the image at night, thus encouraging people to remain and to interact with each other, as well as promoting socialization within the urban community (Cariboni group, 2019). The unsuccessful design immediately causes lighting pollution - that is why lighting shall be well-thought during the process of the design, not to disturb the well-being of the animals, insects, or nature within or over the skies of the cities (Rich and Longcore, 2006). Overall urban lighting isn't just about meeting safety needs through code compliance or achieving an aesthetic effect. It represents a significant opportunity to fundamentally improve the quality of urban life and citizens' experiences (Lam, 2020)

LIGHTING AND EMOTIONS

Light, as the most important element of the universe, plays a significant role in the quality of human life (Goudarzi, 2018). Almost all living beings have a 24-hour biological cycle called the circadian cycle which represents the responsiveness to natural light. These cycles are influenced by light reception among the temperature and other stimulators which play an important role in the above-mentioned process. Our so-called natural clock is linked to photoreceptors which are synchronizing our internal clock with the light that we absorb during the day. The circadian cycle also affects our rhythm, mood, digestion, sleep, temperature, etc. A human being needs light as an indispensable environmental input that controls the basic functions of the human body (Wurtman, 1975). Different researches show that enough light improves our mood and energy while lack of light leads to depression and other negative impacts on our bodies. The type of lighting and its amount directly affects our concentration, appetite, mood, and other aspects. Also, the perceived attributes of lighting and emotional reactions are interrelated. Janet Lennox Moyer studied relations between perceived attributes of lighting based on the direction and brightness of light and people's emotional reactions to it. By her studies, the eye admitting light and the brain interpreting visual information are providing direction and cues for people at night for emotions such as interest, pleasure, comfort, etc. This means that with controlling the brightness in the space, or on a wider scale with the lighting design of the space we influence how people see and feel about it. Strong light is not necessarily bad but also not necessarily useful. Many types of

researches showed that people exposed to bright light feel more positive, find some people more attractive, or even choose spicier food. Just like we feel more optimistic on a sunny day. Also walking towards the light feels comfortable, meanwhile, high contrast creates confusion. The illumination created by lights, their color and warmth, affect a human being physiologically and psychologically (Birren, 1988). A well-illuminated space in which faces and facial expressions are recognizable creates a sense of increased comfort and users feel protected and not threatened by the presence of others (Cariboni group, 2019). Just like the other senses, appropriate lighting in public space creates positive feelings of the citizen towards the city and other citizens. It changes people's nightly image of the public space into interesting experiences and encourages them to stay there and interact with others. This furthermore leads to better socialization and the establishment of a stronger urban community.

STUDY CASE – ZOUK MOSBEH AREA IN LEBANON

This chapter reports the findings of the exploratory research which was carried out in the Zouk Mosbeh area in Lebanon. It included 25 people who were interviewed about their perspective on public spaces and lighting of the area where they reside. The age groups from 15 to 82 years were included in the research.

Brief history review of the Zouk Mosbeh area in Lebanon

The Zouk Mosbeh is an area in Lebanon, which has long been known for its green environment and agriculture. Over the years its character has changed and transformed rapidly. The Civil War, which lasted for 15 years, caused the immigration of a huge number of people who saw shelter in the green area. In addition to immigration during the war, the biggest change occurred in the post-war period when the migration expanded from the national to the global level. This included high population growth and rapidly growing construction activities which neglected all the rules and regulations due to the increased needs. This resulted in a completely unique image of the area. This partly explains why Zouk Mosbeh nowadays is a place of refuge for many people from neighbouring countries who came to the area because of war and problems in their countries. These processes transformed Zouk Mosbeh from the agricultural village into a densely populated area of tall buildings.

Spatial perceptions

Despite the extremely rapid construction and immigration of people, the region of Zouk Mosbeh was not fully built over. There are very few public spaces and buildings in the area where people gather, socialize, and where social encounters and cultural exchanges take place (Figure 1). This is a serious problem in the area as well as throughout the whole country of Lebanon. The area suffers from a lack

of public spaces and sufficient infrastructure, which would offer residents space for interactions with each other. It would also ensure different activities in public spaces that are extremely important for such a densely populated and heterogeneous area. All elements in the area form an impenetrable built fabric where the pedestrian perspective and the importance of the public space are lost. Very few existing public spaces are inappropriately positioned, unconnected, and not user friendly especially at night as there is no light, or to the contrary – the street space is light-polluted due to numerous shop signs. Just like the area also the lighting has its own extreme. The first and main problem is, as mentioned before, the bad infrastructure. The area was growing too fast so the infrastructure couldn't hold such load. This is especially seen in the case of power shutdowns which happens a few times during the day and more often at night. From the perspective of the user, this is not very comfortable because you stay in the middle of the alley, street, or public building in total darkness. There are also dark alleys and public spaces which are dangerous and not very inviting for people to use. On the other hand, due to the shops, that are located practically on every ground floor, the apartment buildings area has extreme light pollution – the shop signs cause the over-exposure of people and make the street not very pleasant for them to stop there or even walk by. That is why Lebanese are usually traveling by car, taxi, bus, or motorcycle and never go on foot. This means that even if you walk at night along the road, all the vehicles with their lights constantly disrupt your vision on the path which is disturbing. All these factors are causing that people which live in the area do not interact, they are not communicating, and further on they are not establishing the public interactions which are so important for the city.

In our case study research, we made interviews with 25 people living in the area. We included age groups from 15 to 82 years and asked them about their perspective on public spaces and lighting of the area they are living in.

Figure 3: The only designed public space in the area

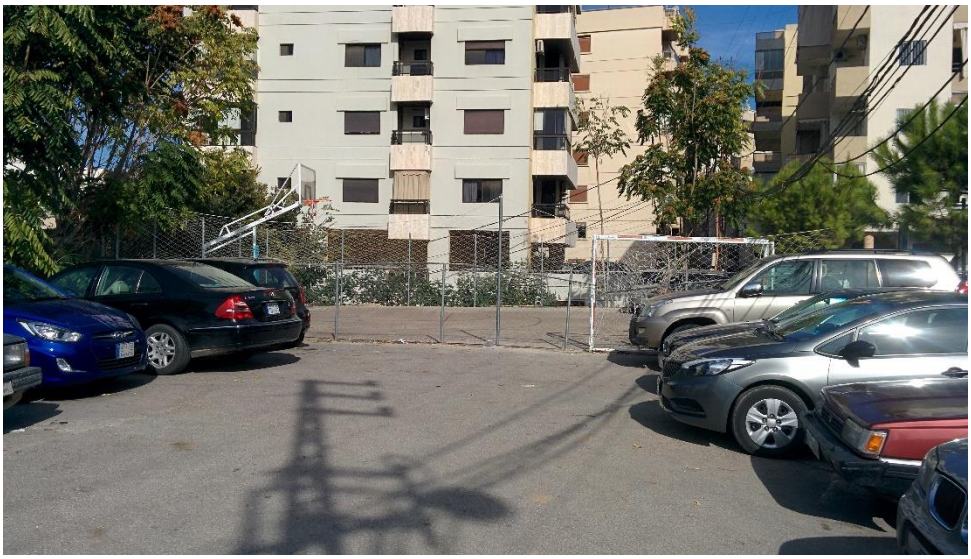


Figure 2: Common situation of the area – the dominance of the vehicles

Case study results

We found out that 85 percent of interviewees are afraid to walk by night because there is insufficient lighting. Almost all of them are using motorized transport at night because they feel safer. All the interviewees also said that they miss public spaces. Especially young ones aged between 20 and 35 age pointed out that they would love public spaces where they can meet at night because Lebanon has a Mediterranean climate with only a 1-month rain period during the whole year which means it is warm even at night and very pleasant to gather and enjoy the public space. Despite all problems, the area has a few green surfaces that represent a void space and big potential for the establishment of quality public space with appropriate lighting to attract and offer people a more quality and safe space. These spaces could be the main triggers to revitalize the area and offer its inhabitants a unique experience of the public space. As explained earlier in this paper, urban lighting affects human perception, and crucially influences their moods. These are very important factors in the case of the heterogeneous urban spaces such as Zouk Mosbeh area and could be one of the steps on the way to bring many different people together and to create or strengthen the feeling of a more connected community.

CONCLUSIONS

The case study of Zouk Mosbeh area in Lebanon shows that urban lighting has a strong influence on the quality of the urban space. In addition to human behavior, lighting represents an important factor in the functionality of the space. The light has a crucial role because it can create attractive night spaces meant for many

different social activities and occasions which dark spaces cannot offer. Architects, urban designers, and engineers should give more attention to the process of light design - by combining human, spatial, and time factors of urban environments a complex phenomenon is addressed that should not be underestimated when designing new urban spaces or just renovating the existing urban structures. One of the important factors is also the technology which gives numerous options to work with lighting and is a tool to be used to achieve the desired results. With the help of technology, there are numerous opportunities to explore light further, especially nowadays when the context of the Smart City is very actual. The role that urban lighting in the cities will have is strongly connected to environmental, economics, technology, political and social factors. Urban spaces will have to be more adaptable for the rapid changes that are happening today in the world, but on the other hand also safe and attracting space to live in.

REFERENCES

Altitude services (n.d). *Why is lighting important for parks and public spaces*. Retrieved from https://www.altitudeservices.co.uk/news-and-articles/2019/february/why-is-lighting-important-for-parks-and-public-spaces/

Arup (n.d). *Cities Alive – Lighting the urban night-time*. Retrieved from https://www.arup.com/perspectives/cities-alive-lighting-the-urban-night-time

Birren, F. (1988). *Light, Color and Environment*. Schiffer Pub Ltd; Revised, Subsequent Edition.

Cariboni group. (2019, March 4). *The social impact of urban lighting*. Retrieved from https://www.caribonigroup.com/en/news/the-social-impact-of-urban-lighting/

Ebbensgaard, C.L. (2015). Urban Lighting, Light Pollution and Society. *European Planning Studies*, 23, 7.

Geissmar-Brandi, C., Brandi, U. (2006). *Light for Cities: Lighting Design for Urban Spaces, a Handbook*. Birkhäuser Architecture.

Gokhale, V. (2013). People's Perception of Urban Lighting in Public Space. *The Journal of Architecture*, 1, 24.

Goudarzi, A.R. (2018). Smart City by Smart Lighting: Utilizing Smart Lighting in Urban Texture Based on Effective Using of Power to Save in Macro Economy and Create Diversity in Cities. *Trends in Civil Engineering and its Architecture*, 2, 324-330.

Khakzand, M., Azari A. (2014). Context-oriented lighting strategy in urban spaces (using space syntax method) case study: historical fabric of Isfahan. *International Journal of Architecture Engineering & Urban Planning*, 24, 37-44

Kutlu, R., Manav B. (2013). Lighting scheme as a design tool in urban identity: A case study at bosphorus region in Istanbul. *World applied sciences Journal*, 23, 81-87.

Moyer, J.L. (2013). *The Landscape Lighting Book.* Wiley; 3rd Edition.

Narboni, R. (2017, February 15). *Imagining The Future of the City At Night*. Retrieved from https://www.archlighting.com/projects/imagining-the-future-of-the-city-at-night_o

Rankel, S. (2014). Prihodnja osvetlitev in nočna podoba mest: študija primera. *Urbani izziv*, 25, 56-70.

Rich, C., Longcore, T. (2006). *Ecological Consequences of Artificial Night Lighting*. Island press.

Veitch, J.A., Newsham, G.R. (2013). Determinants of Lighting Quality I: State of the Science. *Journal of the Illuminating Engineering Society*, 92-106.

Wurtman, R.J. (1975). The effects of Light on Man and Other Mammals. *Annual Review of Pysiology*, 37, 467-483.

Zielinska-Dabkowska, K.M. (2014). Urban city lights. Light pollution as one of the effects of incorrectly designed external illumination. How can a successful lighting masterplan diminish its impact?. *SLLP 2014, 1st International Conference on Sustainable Lighting and Light Pollution at: Seoul/KR*, 1, 59-67.

TRACK 11: POSTER SECTION

JOINT DEVELOPMENT OF TRANSIT CORRIDORS - RE-STICHING THE CITY

A. Savvides ,
A. Savvides S. Gregoriou, Dept. of Architecture, University of Cyprus

S. Gregoriou ,
Dept. of Architecture, University of Cyprus

ABSTRACT

Transit hubs have always been sites of intense activity and the buildings housing their functions have oftentimes been expressed in innovative and multi-layered systems. The central theme of the poster is to address the potential for urban regeneration and improved mobility presented by transit oriented development (TOD) especially as it pertains to the crossroads of multi modal transportation corridors and key stations along them. This poster will also attempt to suggest some important qualities of expanded mobility as a smart-growth principle in the creation of more livable urban environments that would constitute healthier cities for their inhabitants. Integrated mobility is a cornerstone of efforts to promote smart growth and its synergistic relationship with Transit Oriented Development (TOD) introduces building components and building typologies whose design elements are coupled with the uses they house so as to complement this urban typology and to allow for new ways of restitching urban fabric that has been separated by urban transportation rights-of-way.

Key-words: Transit Oriented Development; Transportation Corridor; Urban Design

JOINT DEVELOPMENT OF TRANSIT CORRIDORS

RE-STICHING THE CITY

AUTHORS: A. SAVVIDES & S. GREGORIOU, DEPT. OF ARCHITECTURE, UNIVERSITY OF CYPRUS

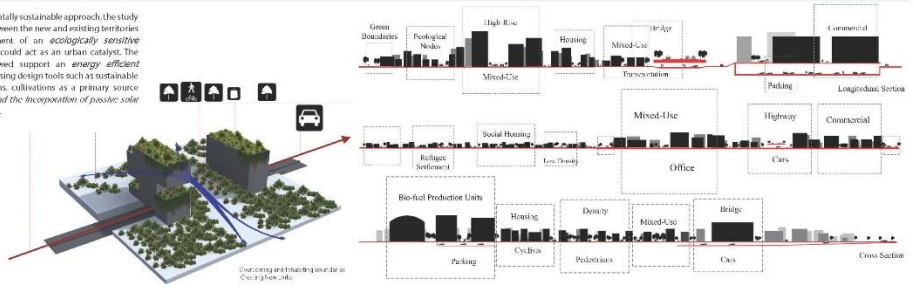
Transit hubs have always been sites of intense activity and the buildings housing their functions have oftentimes been expressed in innovative and multi-layered systems. The central theme of the poster is to address the potential for urban regeneration and improved mobility presented by transit oriented development (TOD) especially as it pertains to the crossroads of multi modal transportation corridors and key stations along them. This poster will also attempt to suggest some important qualities of expanded mobility as a smart growth principle in the creation of more livable urban environments that would constitute healthier cities for their inhabitants. Integrated mobility is a cornerstone of efforts to promote smart growth and its synergistic relationship with Transit Oriented Development (TOD) introduces building components and building typologies whose design elements are coupled with the uses they house so as to complement this urban typology and to allow for new ways of restitching urban fabric that has been separated by urban transportation rights of way.

CONCEPT

The proposal focuses on the development of an urban void in Nicosia, the capital of Cyprus, adjacent to existing major *urban territories currently fragmented and disconnected* from the overall fabric. The site under study, which is located around the primary translocal vehicular entrance of the city, is defined by an intense separation of uses. The sprawling residential, commercial, financial, industrial and green areas are waiting for a *unifying foundation of increased density.*

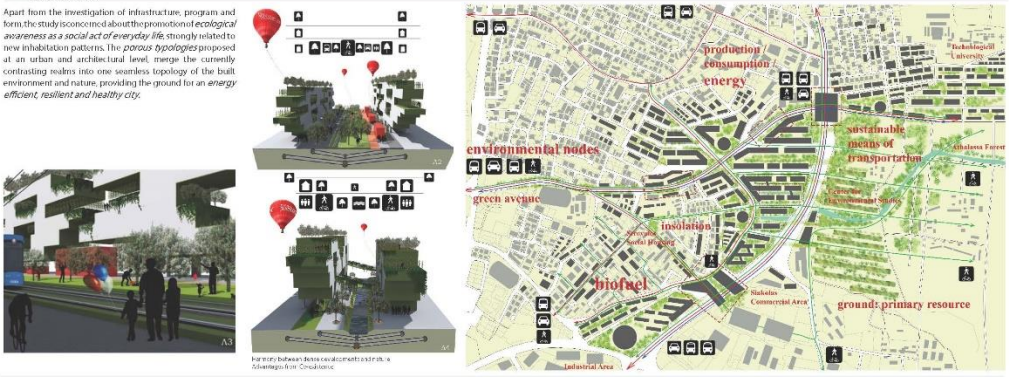
ANALYSIS

Following an environmentally sustainable approach, the study is searching for links between the new and existing territories through the development of an *ecologically sensitive neighbourhood* which could act as an urban catalyst. The design strategies followed support an *energy efficient bioclimatic approach*, using design tools such as sustainable means of transportations, cultivations as a primary source *of biofuel production and the incorporation of passive solar radiation in architecture.*



PROGRAMME

Apart from the investigation of infrastructure, program and form, the study is concerned about the promotion of *ecological awareness as a social act of everyday life*, strongly related to new inhabitation patterns. The *porous typologies* proposed at an urban and architectural level, merge the currently contrasting realms into one seamless topology of the built environment and nature, providing the ground for an *energy efficient, resilient and healthy city.*



STREETS FOR 2030:
PROPOSING STREETS FOR INTEGRATED,
AND UNIVERSAL MOBILITY

CITY STREET4, LJUBLJANA 23.-26.9.2020

UNIVERSITY OF LJUBLJANA, FACULTY OF ARCHITECTURE and URBAN PLANNING INSTITUTE OF THE REPUBLIC OF SLOVENIA in collaboration with NOTRE DAME UNIVERSITY-LOUAIZE, RAMEZ G. CHAGOURY FACULTY OF ARCHITECTURE, ART AND DESIGN

WHAT CHANGES ARE AUTONOMOUS VEHICLES BRINGING TO URBAN SPACE

Urban Bračko,
University of Ljubljana, Faculty of Civil and Geodetic Engineering

Peter Lipar ,
Assistant Professor, University of Ljubljana, Faculty of Civil and Geodetic Engineering

ABSTRACT

It is no longer a question in what kind of direction technology is developing. In a not so distant future transport will become fully electric and autonomous. This will largely improve road safety and lower the impact of traffic on the environment. It will as well create new opportunities for architects and planners to make urban space kinder for pedestrians and cyclists. But on the other hand it will also require several changes in the infrastructure due to the needs for the operating of intelligent transport systems. These are not only part of enhanced vehicle equipment but are at the same time part of the infrastructure that needs to be installed along the streets. The key importance is the orientation of a self-driving car and its position on the road. They can both be already guaranteed by video detection of lane markings, radar detection of other vehicles and improved real-time GPS. However they soon might be replaced by new in-road technology which will no longer be limited by weather conditions. With autonomous vehicles traffic flow will function in a more controlled way and much higher level of mobility is expected to be achieved. People will need to adjust their traveling habits where an important role will be played by a service of car sharing and the new types of public transport. All this will change the street environment and its usual cross section. According to the urbanistic trends smart cities will continue to evolve rapidly. The internet of things and a large connectivity of different platforms can lead to significantly better efficiency of operations. Civil engineering could play a decisive role in this process by paying more attention to the trends set by the informatics and electronics.

Keywords: *Civil engineering, future urbanism, autonomous driving, intelligent transport systems*

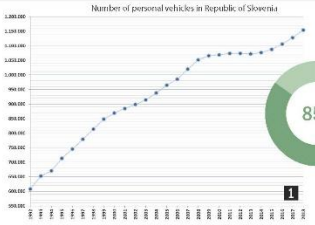
WHAT CHANGES ARE AUTONOMOUS VEHICLES BRINGING TO URBAN SPACE

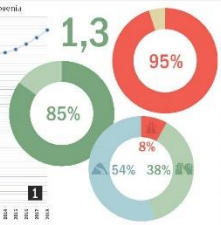
AUTHORS: URBAN BRAČKO & PETER LIPAR, UNIVERSITY OF LJUBLJANA, FACULTY OF CIVIL AND GEODETIC ENGINEERING

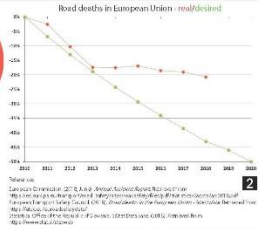
1,3 is the average occupancy of personal vehicles in the Republic of Slovenia meaning that there only is one passenger in 85% of all the cars on the road. The number of personal vehicles in the country is rising unstoppably. (1) In spite of plenty additional law measures and having planned the use of many elements for calming the traffic down, European Union is no longer successful in reducing the number of fatalities according to its projected plan. (2) The goal is to halve the number of casualties in traffic accidents by 2050.

The lowest percentage of fatal accidents occurs on motorways where it adds up to only 8%. The speeds are the highest, but large horizontal elements and the absence of weaker participants creates the safest traffic environment. There is no additional way of creating such conditions in urban area, where the space is vastly limited, and traffic flow is no longer unified nor continuous.

95% of crashes are caused by a human error. The main reason is exceeding of the speed limit, followed by drunk driving and attention loss. Distraction is most commonly induced by the use of a cellphone, radio or navigation.







INFORMATION TECHNOLOGY

The autonomous vehicles could present the solution to all the problems. With total elimination of the human factor a Vision Zero would actually become possible. For its realization the main role is played by intelligent transport systems. The most important among those is a further development of those embeded in vehicles known as driver assistance systems. Transportation engineering will need to contribute a lot into a progression and implementation of those systems. New technology will effect road designing, planning and constructioning. Instead of taking into account the needs of driver, we will need to plan accordingly to the needs of smart systems. Internet of things is going to enable the exchange of information between the vehicles, road infrastructure, control rooms, satellites, applications etc., (3)

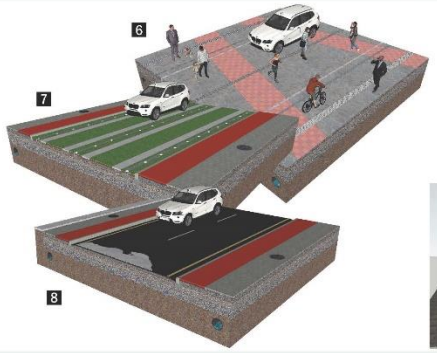
There will consequently be a possibility to control the load of road network according to real-time demands and achieve optimal occupancy of all the vehicles through the known destination of the passengers. (4) Exchange of data will enable a faster response of intervention through the release of the shortest route and adjusted activity of traffic signalization. (5)

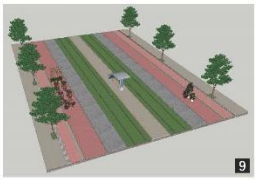
ROAD DESIGN

The purpose of paved surfaces, currently often shaped as shared space, will no longer serve for traffic calming. At the beginning it will be very important, that the right material and the right pattern of paving is chosen. (6) This is the only way to guarantee the right functioning of intelligent systems which to a great extent base on video detection.

The problem of such systems and the LIDAR system are extreme weather conditions. Civil engineering needs to find different ways of suitably adapting traffic infrastructure. The first solution that is appropriate to be implemented into the existing roads and can be used either on paved surfaces or green roads, could be micro chips installed into the surface course of the road. (7) Chips would inform the vehicle about its on-road-position. The alternative is to set plastic elements inside the road structure that can be detected by ground-penetrating radar. (8)

On all major transit streets there is one travel lane predicted in each direction with the access lane on its right. Due to the safety reasons bike lanes would be maintained on a distance from the access lanes of minimally 30 cm. Center lanes would be intended for masive public transportation. Most likely in form of light rail that is already highly automated and electrified. The waiting platform would be slightly lifted. (9) Most of the downtown streets would be planned similarly, but with no center lanes for public transport. All neighbour and residential streets that particularly have an access role would be transformed into green roads. Surfaces would only be paved for the pedestrians and cyclists. For vehicles a hardened surface could be provided by concrete elements only in the area of tyre tracks. Road structure will still need to be designed in a way that endures the weight of intervention vehicles. (10)





URBAN PLANNING

Surface of traffic roads represents one third of all urban area and 80% of open space. (11) In the future the role of road infrastructure will heavily change. It will no longer be exclusively used for vehicles. Car sharing and efficient public transport will cause that parking lots will not be needed at all. Currently car parks cover 15-30% of space in all bigger cities around the world.

The solution lies in green infrastructure which is going to have a positive impact on walkability and will largely increase the number of pedestrians and cyclists. (12) Besides its social role green infrastructure also reduces stormwater runoff and heat island effect, it improves air and water quality and through permeable surface helps to recreate natural environment.

A smaller number of vehicles will eliminate the necessity after wide multilane roads. The perspective of planing will change and roads will be able to adapt to real-time demands. On access lanes autonomous vehicles will normally pick up passengers but demands for transportation vary during the day and therefore flex zones with different purpose of use will be created. (13)

There will be no traffic on most of the local streets. Door-to-door access will be enabled only in case of an intervention and for a passenger registrated as a patient, disabled or elderly. Finding out the importance of food self supply will create surfaces for gardens, orchards and vertical farms. (14)

STREETS FOR 2030: PROPOSING STREETS FOR INTEGRATED, AND UNIVERSAL MOBILITY

CITY STREET⁴, LJUBLJANA 23.-26.9.2020

UNIVERSITY OF LJUBLJANA, FACULTY OF ARCHITECTURE and URBAN PLANNING INSTITUTE OF THE REPUBLIC OF SLOVENIA in collaboration with NOTRE DAME UNIVERSITY-LOUAIZE, RAMEZ G. CHAGOURY FACULTY OF ARCHITECTURE, ART AND DESIGN

AUTHORS INDEX

L

M

N

O

P

R

S

Š

T

V

W

Z

Ž