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“Sustainable Development Plan of Urban Mobility as a Concept of Human-Centered and Nature-Based Approach in the City of Skopje, N. Macedonia”

Assoc. Prof. PhD Viktorija Mangaroska ¹, Full. Prof. Dr. Kosta Mangaroski ²

¹ Faculty of Architectural Engineering, International Balkan University; e-mail vmangaroska@gmail.com, viktorija.mangaroska@ibu.edu.mk ;

² Faculty of Architectural Engineering, Ss Cyril and Methodius University, Republic of N. Macedonia; e-mail; kmangaroski@yahoo.com

Names of the track editors:

Claudiu Forgaci
Rene van der Velde

Names of the reviewers:

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Abstract: Urban centers are drivers of global warming, because they concentrate transportation, industries, households and many of the emitters of greenhouse gases (GHG). Cities are at the center of the climate change challenge. The impact of urbanization on climate is likely to increase given future urban population and economic growth trends. With more than half of the world's population living in urban areas and an increased percentage in the future, urban areas make up the greatest concentration of climate vulnerable people and infrastructure. Sustainable development Goals by 2030, are also focusing on Sustainable cities and communities, in particular creating safe, affordable, accessible and sustainable transport systems.

The methodology approach in this scientific paper focuses on defining the measures for sustainable development transportation, sustainable urban mobility plan in Skopje, analysis of development of plan for improvement of bike lanes in Skopje, boulevard relocation for cycling, sustainable development of the public transport, road space relocation of public transport, electro-mobility, as well as, overcoming urban capacity challenges and creating urban adaptation planning that will be factor for sustainable development in the City of Skopje. The expected outcome results in this scientific paper is creating sustainable transport, urban adaptation planning that will contribute on the complexity of the city of Skopje: transport, energy supply, buildings, energy demand, low-carbon technologies.

Effective adaptation and mitigation planning demands clear metrics of success, a protocol to identify and construct policy levers, and tools for enhancing social and ecological capacities. Conceptualizing urban areas as sets of intersecting systems provides the basis to study the structure and organization of urban systems.

Keywords: sustainable transport, urban adaptation planning, sustainable development

1. Introduction

By 2030 nearly 60% of the global population is projected to be urban. Cities are drivers of global warming and climate change: they concentrate population, built environment, industries, economic activities, transportation, as emitters of CO₂ and Greenhouse Gas emissions. Urban areas are potential hot spots of vulnerability to climate change impacts: flooding, climate and weather hazards.

Sustainable Development Goal 11 is one of the crucial aspects in the analysis of the sets of 17 Sustainable Development Goals from United Nations, known as “Transforming our World, the 2030 Agenda for Sustainable Development”,

11.1 Safe and affordable housing

11.2 Safe, affordable, accessible and sustainable transport systems

11.3 Integrated sustainable urbanization

11.4 Protect cultural and natural heritage

11.5 Protecting the poor and people in vulnerable situations

11.6 Reduce environmental impact of cities, air quality

11.7 Safe, inclusive and accessible green public space



Sustainable Development Goals indicators are evaluated for every specific country. By the analysis and detailed metadata and quantitative use for each indicator for Macedonia. Figure 1 (Breuer Data, www.sdindex.org (03.05.2018)).

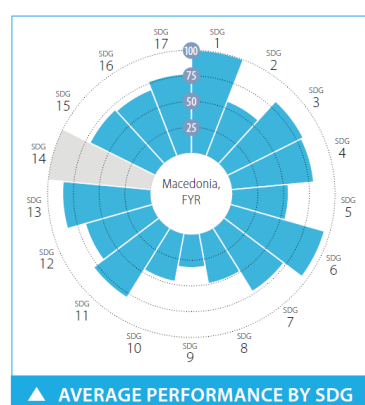


Figure 1. Detailed metadata and quantitative use for each indicator for Macedonia, source Breuer Data, www.sdindex.org

The analysis for the green gas emissions and urban adaptation scenarios for Republic of N. Macedonia presents that the total GHG emissions shall increase from 9 030 kt in 2012 to 18 340 kt in 2035, particularly high levels of green gas emissions are present from the transport and residential sector, Figure 2.

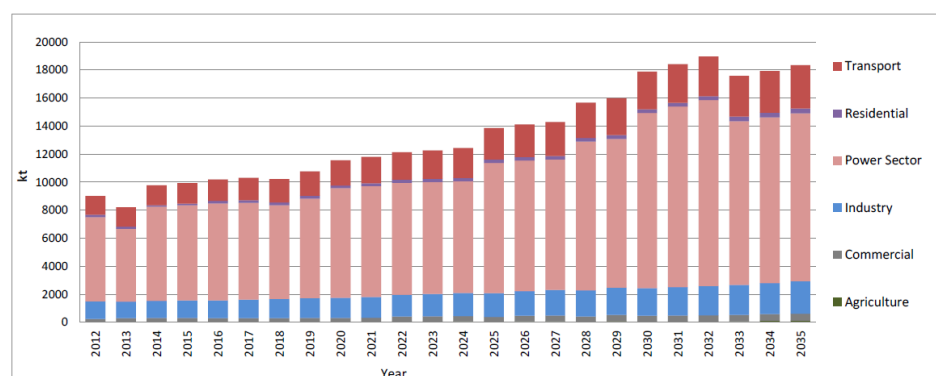
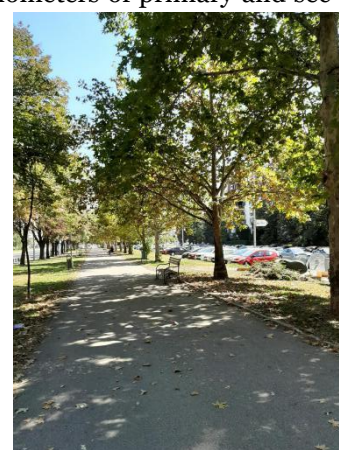


Figure 2. GHG emissions according to WOM scenario Macedonia, Source: Climate Change Mitigation in Buildings, Transport and Energy Supply Sectors, First Biennial Update Report on Climate Change, Research Center for Energy and Sustainable Development, Macedonian Academy of Sciences and Arts, 2014

The strategies for sustainable development and urban adaptation scenarios for Republic of Macedonia include the following sectors:

1. Energy Supply – low-carbon technologies
2. Transport - low-carbon technologies, bio-fuels
3. Buildings- New green building concepts,
passive zero energy house, renewable energy
4. Energy Demand- energy efficiency of buildings, changes of residents behavior
5. Low-carbon cities – public transportation, cycling

Traffic network system in Skopje is consisted by 211 kilometers of primary and secondary streets. Public transport and mobility in Skopje is developed with: cars, public transport with buses, bicycles, electrical scooters, walking, motorbikes, electro-mobiles, official transport, railway (Figure 4).



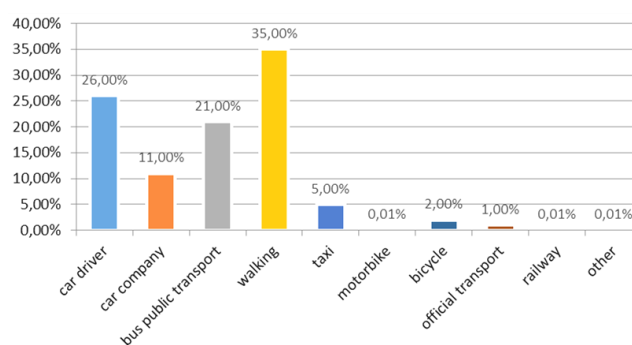


Figure 4 Modal Split in Skopje, Source:“Transport Master Plan for Greater Skopje”, 2011

Strategy for Sustainable development of public transport in the capital city Skopje, consists of:

1. Urban environmental sustainability (minimize pollution, and use energy efficient concepts) (Figure 5)
2. Economic sustainability (efficient economic transport, growth and traffic infrastructure)
3. Social sustainability (social integrated city)
4. Contribution to liveable city (urban transport system designed for people, not for vehicles)



Figure 5 Transport General Urbanistic Plan of Skopje, Source: GUP General Urbanistic Plan Skopje 2020

2. Theories and Methods

The adaptation of the city of Skopje towards human-centered approach should include: short-term, mid-term and long-term goals.

Short-term measures should include: a system of pop-up bicycle lanes and immediate traffic modifications in the city, re-adaptation of public spaces and pedestrian routes in the crucial part of the city.

The mid-term measures should include: central urban planning to endorse car-banning traffic and urban spaces, in order to create urban spaces for increasing the infrastructure for bicycle urban mobility and human-centered approach in the cities.

The long-term methods and measures should include: changing the reforms in the education system in Macedonia in all levels of learning processes towards defining human-centered approaches in the cities.

Sustainable urban mobility planning for the people is organized towards: plan implemented by interdisciplinary planning approach, combination of infrastructure, information, promotion, green space development, main objective: accessibility and quality of life, cost-efficient achievement of sustainable goals, intensive monitoring evaluation and optimization for quality of the main aspects.

3. Results

The concept of sustainable urban mobility development in Skopje is defined by bicycle sustainable action plan for improvement and urban re-adaptation of 50 km bicycle lanes in the city of Skopje. The main sustainable goals of the action plan for the sustainable urban mobility is to improve the bicycle traffic infrastructure system (Figure 6) (Figure 7):

1. Increase of bicycle traffic in relation by 2021 up to 5% of the total number of bicycle traffic
2. Increase the long-term usage of the bicycle infrastructure network by 50% by 2021
3. Reducing the number of traffic accidents by 2021
4. Reduction of CO₂ emissions by 10% by 2021

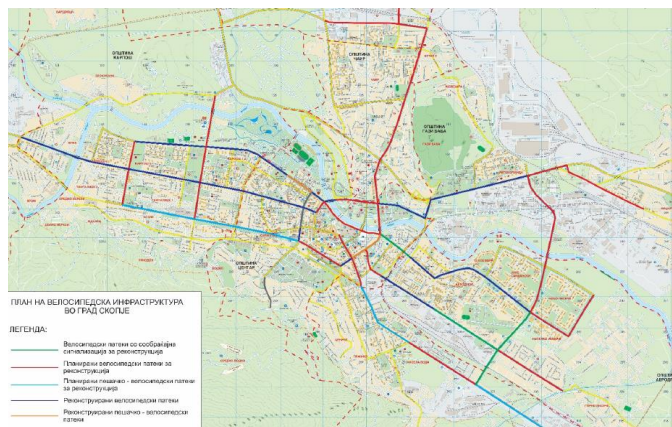


Figure 6. Sustainable urban bicycle mobility in Skopje, Source: Bicycle Infrastructure Action Plan in the City of Skopje

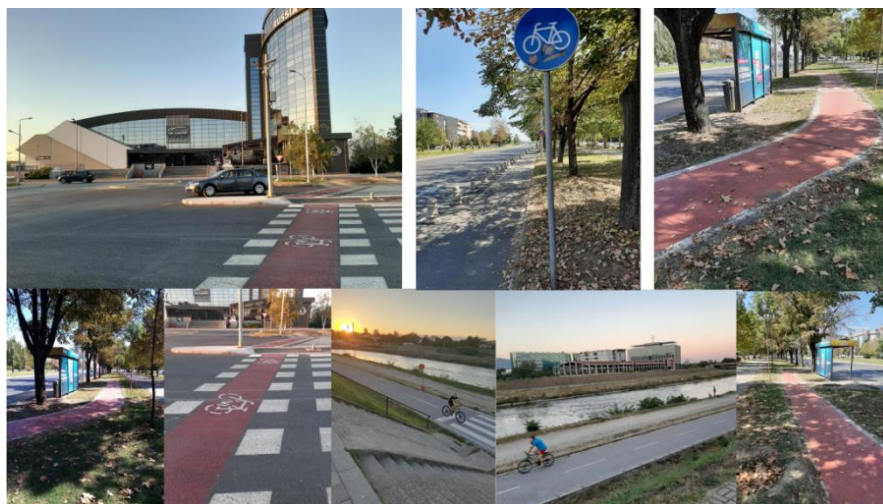


Figure 7. Sustainable urban bicycle mobility lanes in Skopje



Figure 8. Sustainable urban bicycle mobility infrastructure in Skopje

Boulevard relocation for bicycle lanes- bicycle lanes adapted with elastic pillars by re-dimensioning of the three car traffic lanes from the boulevard from 3,5 meters to 3 meters to provide space for bicycle lane of 1.5 meter (Figure 9) (Figure 10).



Figure 9. Sustainable urban bicycle mobility infrastructure and boulevard relocation for re-adaptation of bicycle lanes in Skopje



Figure 10. Sustainable urban bicycle mobility infrastructure and re-adaptation of bicycle lanes in Skopje in Skopje

Sustainable traffic principles and human centered mobility development within nature-based approach in urban mobility includes incorporating green areas, landscape design and minimization of the vehicular circulation in Skopje by the following methodology and measures (Figure 11):

1. Minimize the amount of vehicular circulation
2. Preserve natural features and create street that complements the natural topography
3. Create design for natural drainage
4. Provide natural street-scape
5. Minimize road pavement
6. Provide adequate pedestrian connections
7. Incorporate multi-model travel, with incorporation of mobility with organization of urban network with bicycle lanes

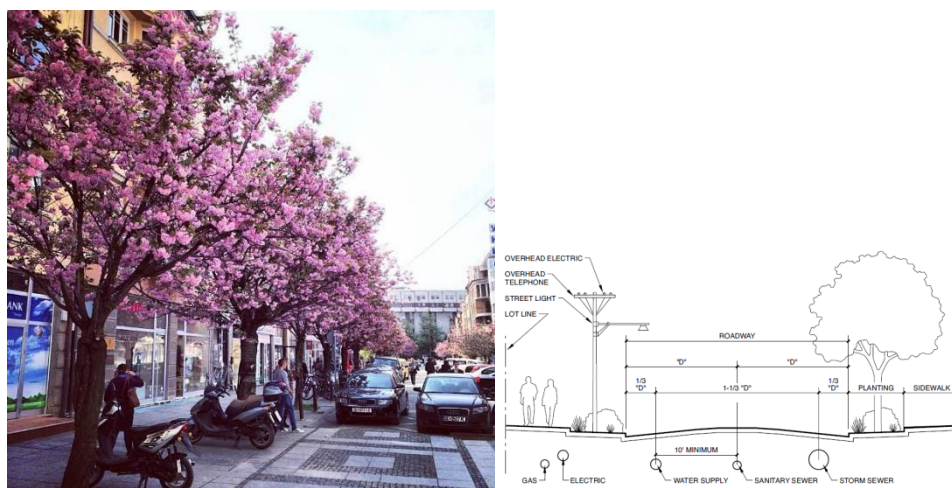


Figure 11. Sustainable traffic principles and human-centered nature-based mobility development

The green and human centered sustainable development in the transport system of the city of Skopje includes: Boulevards in Skopje are separated with green medians. Medians perform a functional and an aesthetic purpose and provide character of the street (Figure 12):

- a) physically separate traffic moving in opposing directions
- b) prevent uncontrolled and unsafe traffic movements
- c) safe landing for pedestrians one-half of the way across a major street
- d) provide a planting area for landscaping and streetlights;



Figure 12. Medians and sustainable traffic principles and human-centered nature-based mobility development

4. Discussion

There is a challenging perspective of dichotomies vs dialogues between the concept of traditional transport planning and sustainable urban mobility planning concept towards sustainable urban development in the city Skopje. Urban planning are facing many challenges in balancing urban development interests vs the concept of ecological functional green space, urban mobility and to safeguard urban public space.

This scientific paper explores the dichotomies vs dialogues towards trans-disciplinary process of integrative and operative planning approaches towards sustainable large-scale urban green resilient concepts. Sustainable urban mobility includes trans-disciplinary approach from different disciplines, which is opposite of traditional transport planning which includes only transport engineering professionals. Sustainable urban mobility planning is planned by combination of infrastructure, information, promotion and green space, where traditional transport planning only focuses on infrastructure as the main aspect. The main objective in sustainable urban mobility planning includes accessibility and quality of life, where in traditional transport planning the main objective is the traffic flow capacity and speed.

The future directions of the discussions interpreted as perspectives of dichotomies vs dialogues, will include series of educational seminars, workshops and lectures, and educational programme that will provide trans-disciplinary approach towards sustainable urban mobility concepts from professionals from different disciplines: fields of urban planning, urban design, ecology, landscape design, environmental history, as well as city regional planning. The process combines tentative design of tactical urbanism, urban mobility concepts, landscape design of urban space, as well as theoretical level of hands-on design in local urban context.

Planning and management of large scale urban structures of large green structures in resilient science introduces the complexity of the visible synergies, alternatives in resilience present conservationist perspectives on green space planning, and resilience to be combined with the concept of defining the sustainable goals and sustaining large-scale green spaced and urban mobility concepts over a period of time.

SUSTAINABLE URBAN MOBILITY DEVELOPMENT

Traditional Transport Planning	Sustainable Urban Mobility Planning
<u>Focus on the Traffic</u>	<u>Focus on the People</u>
Plan implemented by transport engineering	Plan implemented by Interdisciplinary planning approach
Infrastructure as the main aspect	Combination of infrastructure, information, promotion, green space
Main objective: Traffic flow capacity and speed	Main objective: Accessibility and quality of life
Investment guided planning	Cost-efficient achievement of sustainable goals
Limited monitoring of the impact assessment	Intensive monitoring evaluation and optimization for quality of the main aspects
<i>If you plan cities, for cars and traffic, you will get cars and traffic</i>	<i>If you plan cities for people and places, you will get people and places, Jan Gehl</i>

5. Conclusions

Urban mobility goals for sustainable development, urban mobility and human-centered approach in urban mobility in the City Skopje should provide effective adaptation

and mitigation planning in the city of Skopje demands clear strategy to identify the urban mobility goals for Sustainable development in Skopje:

- Reduction of car use and improving sustainable public transport
- Infrastructure and investment in bicycle facilities
- Improved system for walking environment
- Smart City and Livable City (Technological innovations with on-demand services, cycling etc)
- Improvement of public transport
- Sustainable Transport which will reduce air pollution

This scientific paper proposes short, mid and long term methods in order to implement urban transformations towards sustainable human-centered approach in the city Skopje, towards providing safer public urban space, urban mobility concept and introduction of sustainable environment in any part of the city.

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References

1. Graham, Wade, *Dream Cities: Seven Urban Ideas That Shape the World*, Harper Perennial, 2017
2. Newman, Peter; Jennings, Isabella, *Cities as Sustainable Ecosystems: Principles and Practices*, Island Press, 2008.
3. Mike, Lydon. *Tactical Urbanism: Short-term Action for Long-term Change*. Island Press, Washington DC, 2015
4. Andovski. New Possibilities in Post-Pandemic Era in Design of Cities, IJTNS, 2020
5. <https://www.tandfonline.com/doi/abs/10.1080/14649357.2013.813960>, date 28.09.2021
6. Harper, Gar On Yeh, Heliosa Costa, *Dialogues in Urban and Regional Planning*, 2008
7. Agenda 21 on Sustainable Construction, CIB Report, Publication 237 – ISBN 90-6363-015-8, Rotterdam
8. Pearson, David; *New Organic Architecture – the breaking wave*; The University of California Press
9. Brophy, Lewis, *A Green Vitruvius, Principle and Practise of Sustainable Architectural Design*, Dublin, 2011
10. Jodidio, J. Wines, Taschen, *Green Architecture*
11. *Experimental Green Strategies - Redefining Ecological Design Research*, Architectural Design, Wiley 2011

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12. Urban Areas and Climate Change: Review of Current Issues and Trends, Institute for the Study of Society and Environment, Patricia Romero Lankao Ph.D., 2008, pp.7
 13. Macedonia- Environmental and Climate Change Policy Brief Final draft, 2009-05-04, pp.15-16
 14. Студија за воспоставување на зелени коридори, Град Скопје 2017
 15. Plan za unapreduvanje velosipedski soobrakaj 2019, Grad Skopje
 16. Transport Master Plan for Greater Skopje, 2011
 17. Macedonia's First National Communication under the United Nations Framework Convention on Climate Change, Ministry of Environment and Physical Planning
 18. Climate Change Mitigation in Buildings, Transport and Energy Supply Sectors, First Biennial Update Report on Climate Change, Research Center for Energy and Sustainable Development, Macedonian Academy of Sciences and Arts, 2014, pp.50-51
 19. Brown, R.D., Gillespie, T.J. (1995) *Microclimate landscape design: creating thermal comfort and energy efficiency*. John Wiley and Sons, Chichester, 192 p.
 20. Adaptation to Climate Change-Policy instruments for adaptation to climate change in big European cities and metropolitan areas Ecologic Institute, Berlin/Vienna together with AEA group, ICLEI - Local Governments for Sustainability, European Secretariat and the Regional Environmental Center for Central and Eastern Europe (REC), 2007, pp.105-106
 21. Urban Adaptation to Climate Change in Europe 2016, European Environment Agency, Denmark, pp.30-31