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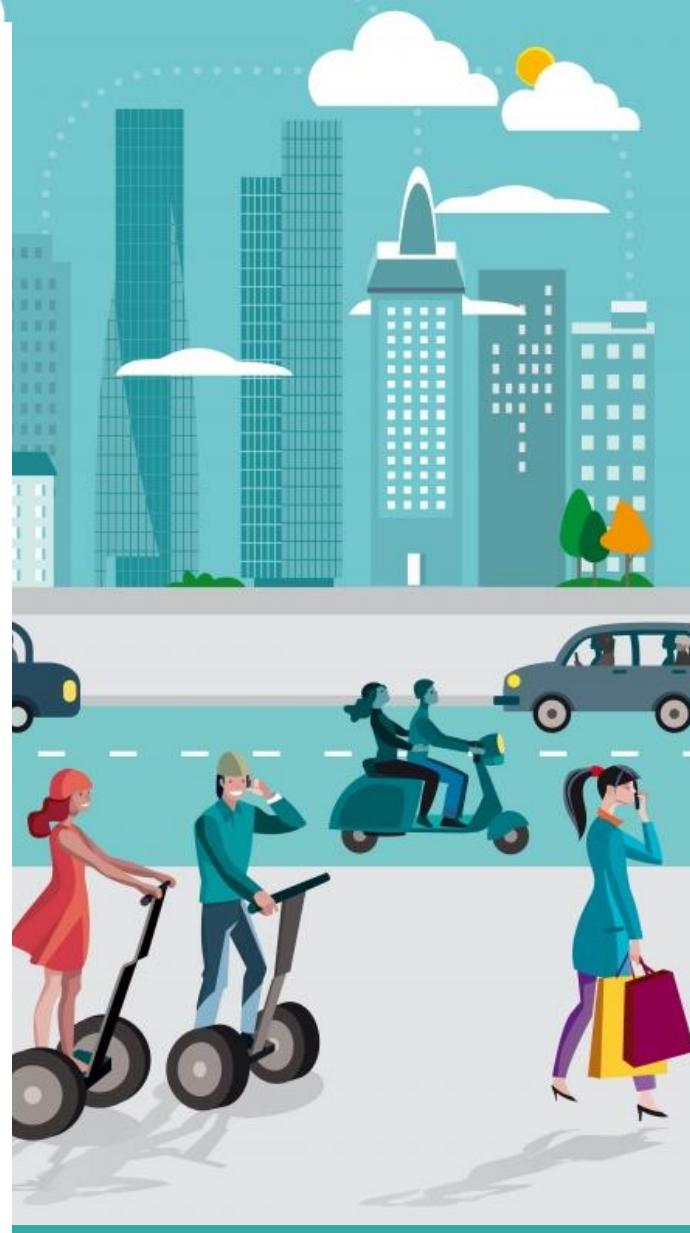

SZÉCHENYI EGYETEM
UNIVERSITY OF GYŐR

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urban SCOPE

UrbanSCOPE Conference Proceedings

Promoting sustainable urban mobility and SUMP through education and public participation

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Introduction

The need for sustainable urban mobility has been high on the EU agenda, bearing in mind the increasing importance of energy saving, sustainable lifestyle and urban quality of life. Moreover, Sustainable Urban Mobility Planning (SUMP) is a major topic in the European Commission's Urban Mobility Package. SUMP underlies cooperation across different policy areas, across disciplines and government levels, and emphasizes cooperation with citizens. It is important to integrate the concept and practices of sustainable mobility planning in the studies of all levels of education, so that the students (the later professionals and active citizens) own the basic principles of SUMP.

The UrbanSCOPE Erasmus+ project started in October 2019, and was implemented by universities, research organisations and municipalities in 3 European cities – Darmstadt (Germany), Glyfada (Greece) and Győr (Hungary). The project aimed to improve the quality of teaching in universities and secondary education institutions, by offering students a hands-on approach in the preparation of a SUMP for a locality in their cities, actively involving local communities and local authorities in the process. Further and very important aim was to bring the concept of SUMP closer to urban citizens, offering to them a learning package and tools to understand sustainable mobility better as well as exercise their public participation rights in the planning of sustainable mobility in their area.

Nevertheless, sustainable urban mobility also creates a great (and growing) interest among researchers, academics, students and practitioners. The UbranSCOPE International Conference had the idea to bring them together, offering them space for interaction, inspiration, debate and networking. The conference was held in Győr, Hungary on 15th September 2022. More than hundred participants justified the necessity of such events.

In this proceeding, you can read 9 selected studies, all evolving around the topic of sustainable urban mobility. Chapter 1 ('Theory and concept of SUMP') positions and introduces SUMP by putting an emphasis on the implementation possibilities, including the promotion, the role of R&D collaborations as well as urban logistics issues. Chapter 2 focuses on the 'Experiences of UrbanSCOPE' by introducing the project concept and activities, putting an emphasis on the local sustainable mobility audit conducted and the experiences of the public participation elements. Further studies in this chapter introduce the SUMP Competition and the idea on how to plan different mobility roads by focusing on sustainability as well as how to understand and create alternative mobility scenarios in a local context.

We hope that this proceeding will serve the best interest of not only academics and researchers, but also practitioners, who are willing to build a more sustainable future.

The editor

Chapter 1:
Theory & concept of SUMP

Promoting sustainable urban mobility in Győr through the events of the European Mobility Week

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Abstract
European Mobility Week is an initiative of the European Commission which takes place every year between 16 and 22 September, the city of Győr has been participating for several years. Beside bicycle parades, various events have been organized specially in the field of public transport mainly since 2007, in order to make this sustainable form of urban transport more popular. This is really important as the number of public transport users has been decreasing in Győr for more decades, whereas the number of cars is rapidly growing which implies heavy congestions and environmental impacts. This paper gives an overview of these initiatives, some of which have been realized on a permanent basis since the first experiments (e.g. CITY bus line, night bus services).

Keywords
European Mobility Week, Győr, public transport, CITY bus, night bus

1. Introduction

The European Commission's "flagship awareness-raising campaign on sustainable urban mobility" is called the European Mobility Week which has been organized since 2002, including the Car-Free Day which has been an initiative since 1998. It encourages European cities and towns to devote one week to sustainable mobility by trying out innovative planning measures, promoting new infrastructure and technologies, measuring air quality and getting feedback from the public. Its main goal is to achieve behavioural change in favour of active mobility, public transport and other clean, intelligent transport solutions [1].

The Local Municipality of Győr [2] has been participating in the European Car-Free Day since 2001 which has been extended to a whole Mobility Week some years later in Győr as well. The main partners of the municipality are NGOs (Keret Egyesület organizing mainly the bicycle events and Városi és Elővárosi Közlekedési Egyesület i.e. Urban and Suburban Transit Association planning and supporting some of the public transport events) [3], as well as the public bus transport operator of the city Győr as well as Győr-Moson-Sopron county (originally Kisalföld Volán Zrt., integrated into regional ÉNYKK Északnyugat-magyarországi Közlekedési Központ Zrt. in 2015 and integrated into national Volánbusz Zrt. in 2019) [4].

The aim of the planners and organizers of the European Mobility Week in Győr was not only to make events "just for fun" (though generating sympathy for sustainable transport is also important, of course) but also to test some innovative initiatives and receive feedback from the local inhabitants and the commuters, too. For this purpose, events had often been accompanied by different measurements (e.g. measuring journey times, counting the number of passengers) and surveys (e.g. questionnaires) which could be analysed in order to make detailed and responsible suggestions for realizing these initiatives later on a permanent basis which has actually happened in some cases (e.g. CITY bus line, night bus services).

2. Public transport events of the European Mobility Week in Győr

Table 1 shows the most important public transport events in Győr, also indicating the year(s) when the specified event took place. It can be seen that some popular events have been organized almost every year since 2007, e. g. the charity fair of local bus "relics", the visiting opportunity at the bus company, as well as the city tours on nostalgia buses [3] [5] [6] [7] [8] [9] [10] [11] [12] [13].

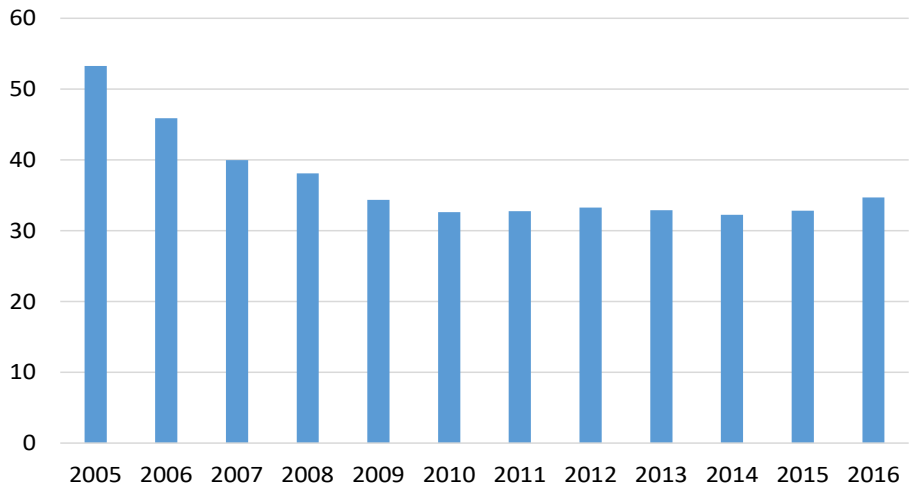
Table 1. Public transport events of the European Mobility Week in Győr

Event	Years
Free local bus services on the Car-Free Day	2001–
CITY bus line	2007, 2008
Fair of "Volán relics" (bus relics)	2007–
Nostalgia bus services	2007–
Night bus services	2008–
Competition of modes of transport	2008
Public visit at the bus company	2009–
Feeder bus lines to a railway station (in Ménfőcsanak)	2010
Future search conference	2018
Photo competition	2018, 2019

Source: documents of the author

Figure 1 explains the need for these events (as well as the overall development of public transport) as the number of public transport users has been decreasing for more decades in Győr. However, improvement of the service (e.g. introducing a new, smarter network and timetable) as well as likeable events can help in this field.

Figure 1. Annual number of passengers in the public bus transport of Győr (in millions)



Source: former ÉNYKK Zrt.

These events are presented in the following subsections, illustrated with photos.

Free local bus services on the Car-Free Day

The oldest event since 2001 is the opportunity for the potential passengers to try local buses for free on September 22 i.e. the European Car-Free Day. This is perhaps a less spectacular, but also an important action.

CITY bus line

The organizers of the European Mobility Week proposed to launch a CITY bus line in 2007, in order to provide an attractive alternative of car usage in the downtown of Győr [14]. Figure 2 shows the first test service.

Figure 2. The first test of the CITY bus line in 2007

Source: photo of the author

The line originally connected only the P+Rs around the downtown with the pedestrian zone but it was extended in 2008 during the second test, in order to reach the university as well. The initiative was very popular, and as a result, the CITY bus service operated regularly from 2011 in Győr. Unfortunately, it was abandoned in 2022 but the reason was only financial as the utilization level of the service was not low. Maybe this service can be restarted when the financial opportunities will be better again.

Fair of "Volán relics" (bus relics)

The idea of the charity fair of bus relics (Figure 3) came from Vienna, Austria. Selling old timetables, bus number and relation plates, form dresses of the drivers etc. has become a popular event in Győr as well, with ever increasing interest.

Figure 3. Pictures from the fair of "Volán relics"

Source: photos of the author

Nostalgia bus services

As saving old vehicles is an important objective of the operating company [4], it is possible to organize city tours on different types of nostalgia buses as seen in Figure 4.

Figure 4. Nostalgia buses in Győr (left: Ikarus 55, right: Ikarus EAG E99)

Source: photos of the author

Night bus service

Beside the CITY bus line, another strategic proposal was the creation of night bus services in the city, and later also in the agglomeration of Győr [15]. These services can facilitate to decrease the number of "disco accidents" and also increase public safety. The first test route (numbered "900" from 2009) was originally a circle line connecting the downtown and the discos around the university with the largest housing estates of Győr (e.g. Adyváros, Marcalváros).

After more than 10 years of experiments, line 900 has become a permanent service for weekends (Figure 5 shows the last test) and still operates as an integrated line (covering the southern agglomeration of Győr, too, including Győrújbarát, Nyúl, Pannonhalma, Győrasszonyfa etc.) as a common order of the Local Municipality of Győr and the Ministry of Technology and Industry who share the costs.

Figure 5. The last test of night bus line 900 in 2018

Source: Gergely Zátonyi (www.gyoribuszok.hu)

Since 2019, European Mobility Week's test "Owl Bus" has been operated on another line numbered "911" covering the northern part of Győr (Újváros, Sziget, Bácsa) hoping that this line could also become a permanent service in the future.

Competition of modes of transport

The competition of modes of transport (Figure 6) was organized in 2008. Its aim was not only to show the current (not optimal) conditions but also to prove that public transport could perform much better if the required measures could be provided e.g. making some critical road sections in the downtown accessible only by public transport vehicles. Guest participants of the competition were the famous and popular handball players of Győri AUDI ETO KC. The winner of the competition was the scooter, followed by the bicycle and the bus. The car received only the 4th place [7].

Figure 6. Competition of modes of transport in 2008

Source: photo of the author

Public visit at the bus company

The bus operator company has two plants in Győr (Buda utca and Ipar utca), visits to both places have been very popular among families, students and others as well. Figure 7 shows some moments of a public visit at the former Kisalföld Volán Zrt.

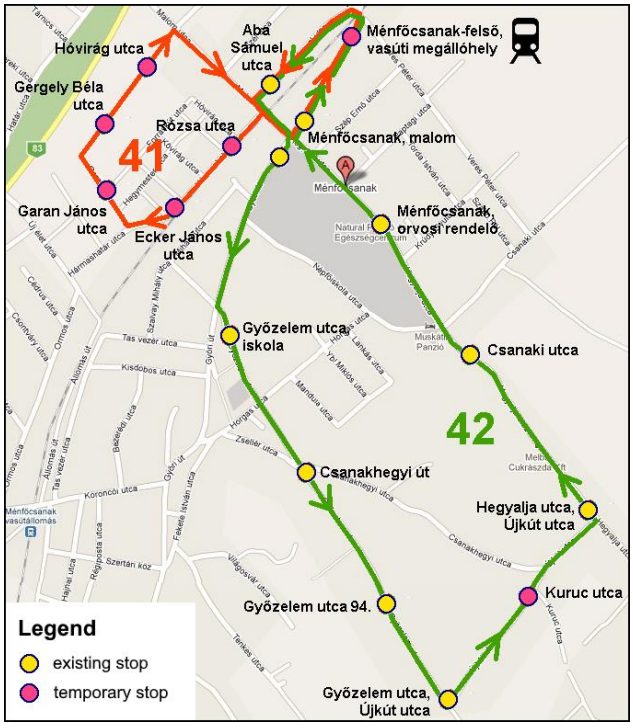
Figure 7. Pictures from public visits at the bus company (in 2010)

Source: photos of the author

Feeder bus lines to a railway station

A new initiative for the European Mobility Week 2010 can be seen in Figure 8.

Figure 8. Map of feeder bus lines to Ménfőcsanak-felső railway station in 2010



Source: former Kisalföld Volán Zrt.

Two local feeder bus lines were created for a day in the district called Ménfőcsanak in order to provide an attractive connection to the railway station of the district from different parts of Ménfőcsanak. The buses could be used free of charge. The reason for selecting this district was the heavy congestion of route 83 connecting Ménfőcsanak with the city centre (which is nowadays even worse). Railway could provide a much faster alternative for the inhabitants of this district, however the lack of common tariff system and integrated timetables discourages most of the potential passengers from using this way of transport.

The action had fundamentally been popular, however, no further steps have followed it, therefore this problem still exists and grows from year to year, although the possible solution could be available for more than a decade.

Future search conference

A future search conference in the field of transport has been organized only once so far (it was in 2018), in order to involve the inhabitants of Győr as transport has been a major problem of the city for several years. Many local people of different ages and occupations as well as transport experts participated in the conference (Figure 9).

Figure 9. Future search conference at the Town Hall of Győr in 2018

Source: photo of the author

The participants made both general and specific recommendations to the decision-makers, who, unfortunately, did not attend the conference in person but have received the statements of the conference in a written form.

Photo competition and other events

The list of the events is still not finished: photo competitions with the topic “sustainable transport”, professional conferences and various playful events (e.g. “Find Dr. Factor!”: players had to find a secret person on the local buses of Győr) also made the European Mobility Week more colourful and popular in Győr.

3. Conclusion

European Mobility Week is a proven form of attracting people's attention to sustainable transport in Győr and involving the public in planning issues. It is also a good ground for testing innovative initiatives such as the CITY bus line or night bus services and also for other new ideas which may be rational, however have not become permanent solutions so far e.g. feeder bus lines around railway lines.

The local municipality could exploit even more the potential of the European Mobility Week if the decision-makers would participate in the future events personally, too, showing that they really take people's opinions seriously. This week could also be a base for the public discussion of the Sustainable Urban Mobility Plan (SUMP) of Győr which is just under construction.

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The role of R&D collaborations in the planning of sustainable urban mobility through the example of Széchenyi István University

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Abstract

In recent decades, the sustainable urban mobility came into focus of the strategic planning of cities. The fundamental goal of sustainable urban mobility planning is to improve the accessibility and quality of life of cities by moving towards sustainable transport. In addition to using the new technological possibilities of transport, the mobilization of the reserves inherent in the development of regulatory methods and the influence of social expectations is also necessary for the creation of sustainable urban transport. In these activities, universities can be one of the main supports of the leaders of the big cities, both as research centres and as educational institutions that are capable of reaching young people and shaping attitudes.

The Széchenyi István University in Győr is the dominant higher education institution in Western Hungary, the institution currently has nearly 15 000 students and its courses cover almost all scientific fields. In accordance with the innovation theory of Triple Helix model, the cooperation of the actors of the „Győr triangle" is exemplary, the local government, the university and the economic sphere (especially in the area of the vehicle industry) maintain a close relationship, and their continuous and two-way communication establishes the development of all three sectors. Perhaps, the best example of this is the AUDI Hungaria Ltd. in Győr, which is the Hungarian 100% subsidiary of the German Audi AG, the world's biggest engine factory– maintaining a close relation with the university, among other things, they have jointly operated the Audi Hungaria Faculty of Automotive Engineering since 2015 , which provides an institutional frame for the educational and professional-scientific cooperation between the university instructors and the corporate professionals of the Audi Hungaria.

The Széchenyi István University plays a significant role in the promotion of the sustainability of the urban transport, and in the planning based on realistic foundations with its research and development activities. Several tenders and industrial projects have already been implemented on the topic, which contribute or may contribute to the more sustainable urban mobility in the future. In this study, we analyse the research and development activities of the University in this direction in recent years, as well as their results and their effects on the urban development.

Keywords

R&D, higher education, sustainable urban development

1. Introduction

The study is about the role of R&D in the planning of sustainable urban mobility. It shortly looks at the relation of sustainability and mobility, because in recent decades, the sustainable urban mobility came into focus of the strategic planning of cities. After that it presents the role of higher education in urban development and the cooperation models between local government, industry and universities. The second part of the study is about these actors' activities that are forming sustainable urban mobility.

2. Sustainability and transport

Nowadays we can see that climate change is a process that threatens the future of humanity, that is why it represents one of the biggest environmental challenges of our life. The processes leading to its

formation are extremely complex, however, human activity also greatly contributes to the increase in the concentration of greenhouse gases, thereby accelerating natural warming and the related climate mechanisms. Large scale agriculture, industrial activities and transport – as the most polluting sectors– are areas that significantly change the state of the atmosphere and result in climate change. Nowadays, the will of nations is no longer enough to handle climate change, international and global cooperation are needed to overcome it. There are a lot of international cooperations to solve this problem, and their most important aim is the complete and rapid elimination of the use of fossil energy sources.

The European Commission's sustainable and smart mobility strategy sets out a concrete vision for achieving carbon neutrality until 2050. The Strategy defines its objectives in 10 priority areas:

- 1. Boosting the uptake of zero-emission vehicles, vessels and aeroplanes, renewable & low-carbon fuels and related infrastructure
- 2. Creating zero-emission airports and ports
- 3. Making interurban and urban mobility healthier and more sustainable
- 4. Making the transport of goods more environmentally friendly
- 5. More effective incentive of carbon pricing and users
- 6. Implementing connected and automated multimodal mobility
- 7. Boosting innovation and the use of data and artificial intelligence (AI) for smarter mobility
- 8. Strengthening the Single Market
- 9. Making mobility fair and equitable for all
- 10. Step up transport safety and security across all modes

According to the Commission, the sustainable urban transport system supports freedom of movement, health, safety and quality of life for both present and future generations; it is environmentally efficient; it supports the lively city life including economy, it provides access to opportunities and services for everyone, including the less affluent, the elderly or disabled urban or non-urban citizens." (European Commission, 2004)

3. Cooperation between the stakeholders of sustainable urban mobility

In our opinion, the stakeholders of the sustainable urban mobility are self governments, citizens and civil societies, local companies and local universitities (R&D). Examined from the perspective of the universities you can find different cooperation models with an extensive literature base (Triple Helix (Etzkowitz - Leydesdorff, 1995; Quadruple Helix (Carayannis – Campbell 2009), Quintuple Helix (Carayannis – Barth – Campbell (2012) – state (1) – industry (2) – academic sector (3) – society-nonprofit (4) – sustainable environment(5)).

The Triple Helix model means that universities are becoming more and more open to their environment, in which besides providing educational and research activities, they also play a significant role on the social level, therefore they maintain academic, business and government cooperation. According to the Qudruple Helix model, the actors of the innovation ecosystem also join to the three sectors mentioned earlier (civil society). The last model, called Quintuple Helix adds the natural environment, specifically the social-ecological interactions so it can be applied to sustainable development.

According to the cooperation practice of Győr and the region, we can identify that the cooperations in sustainable urban mobility are based on the Triple Helix model. In the field of mobility, these cooperations mean urban strategies and measures, different local university research and development projects (activities), developments of local companies and corporate culture.

The City of Győr

Győr and its region are characterized by more than 110 years of machine and vehicle manufacturing experience, strong mental center, large number of technical professionals, the University in accordance with economical-social needs, the outstanding economic performance in proportion to GDP, a unique model of cooperation between the city, the economy and higher education, based on nearly half a century of experiences, the unemployment is minimal, and the wage level is one of the highest in the countryside. (Rechnitzer, 2016)

The City of Győr prepared its settlement development concept until 2030, according to this document, Győr's vision is that " in 2030, Győr is a city offering an outstanding residential, business and cultural environment both at national and Central European level. The city maintains its previously acquired strong position in the vehicle and machinery industry, and in addition to developing them, successfully diversifies its economy in the fields of the environment and health industry, the sports industry and the economic services. It provides a suitable number of jobs with adequate quality for the city and its region. The city's ability of continuous innovation is based on the close cooperation between the economy and university research and development, the education and creativity of the people living in Győr, and the excellent quality of services available in the city that support sustainable growth. The city preserves the special values of its built and natural environment and enriches them with new values. Győr has a high standard of cultural and artistic life, the tourist attraction of the city is outstanding both domestically and internationally" (https://gyor.hu/easy-docs/5dc982a0d6826 (2022.09.01)).

The strategy names the mobility, the urban transport among the main objectives:

- to increase the quality and accessibility of urban transport and
- to reduce the amount of energy used for their operation and
- to increase renewable energy sources

Sub-goals (in the subject of environmentally friendly transport):

- private urban transport
- development of parking
- development of public transport
- infrastructural development of bicycle transport
- creation of an intermodal transport hub
- development of ports
- Development of Győr-Pér Airport and related infrastructures (Settlement Development Concept of Győr 2014-2030)

The most significant projects of the city of Győr in relation to sustainable urban transport:

- In the Integrated Transport Development Operative Program, suburban transport will be renewed: The passenger information system will be renewed with the support of more than one billion, the procurement of electric buses and their charging stations will begin, as well as the establishment of new P+R, B+R parking spaces.
- Development of infrastructure and services for the bicycle transport network in Győr: as a result of an investment of nearly HUF 700 m, the city's cycle path network will be expanded, and bicycle transport will become safer
- Completed: TOP-6.4.1-15-GY1-2016-00001 Development of cycling and parking infrastructure in Győr (2 Mrd Ft)
- Győr-Bike project

Széchenyi István University

The Széchenyi István University of Győr is the dominant higher education institution of Western Hungary. The direct legal predecessor of the institution, the Technical College of Transport and Telecommunications, was founded in 1968. From January 1. 2002 - enjoying the support of economic actors - the institution received the university status and operates as Széchenyi István University. At the end of the 1980s, the number of students barely exceeded 1 000, nowadays, the university has nearly 15 000 students, and it covers almost all fields of science with its courses. The AUDI Hungaria Ltd. - 100% Hungarian subsidiary of the German Audi AG, the world's largest engine factory - has a close relationship with the University. The first cooperation agreement between the institution and the factory was born in 1999, which has become tighter and wider since then. the Department of Internal Combustion Engines was established in 2007, where the cooperation developed within a common organizational framework. Further departments were established until 2015, when the nearly 20-year-old cooperation reached another milestone with the establishment of the Audi Hungaria Faculty of Automotive Engineering. The department provides an institutional framework for the educational and professional-scientific cooperation between the instructors and Audi Hungaria's corporate specialists. (Filep at al, 2012) The organic relationship between Széchenyi István University and Audi Hungária Motor Ltd. (now Audi Hungária Ltd.) is an exemplary cooperation between higher education and economy. Significant industrial, economic and intellectual capacity has accumulated in its surroundings, especially in the area of the vehicle industry.

In addition to the vehicle industry, the institution also teaches and researches in the field of transport; Faculty of Architecture, Civil Engineering and Transport Sciences that has the following transport teaching and researching departments:

- Department of Transport (in addition to general operational and organizational issues of transport, teaching and research work in the field related to passenger transport and fixed-track transport)
- Department of Transport Construction and Water Engineering (technical infrastructure, development and operation of settlements, training and further training of engineers, as well as research, development, planning and consulting)

The strength and quality of the relationship between the society, economy and higher education is the basis for the further development of the region. (Filip et al., 2012) Recognizing this, the University is at the forefront of development and has planned a development program until 2020, which was prepared in agreement with Audi Hungaria Motor Ltd. and the City of Győr, in constant consultation with the partner companies, builds on the real industrial relationships established over the past decades, sustainably develops the technical-technological level and innovation culture of the Western Transdanubian vehicle industry, especially SMEs, enables the provision of intellectual support and services that represent added value for industry and contribute to R+D+I activity.

An outstanding strategic goal for Széchenyi István University is to play a leading role in the economic environment of the region; to contribute to the development of local companies with a strong research and development and service portfolio, and for this purpose, to establish, maintain and deepen active, working cooperations with economic actors of the region. The quality of cooperation is greatly influenced by the higher educational model in which the institution operates. The Széchenyi István University is helped to achieve its goals by the change in the higher education model, which provided them with a legal background that ensured equal conditions with market actors in market operation.

The Széchenyi István University participates in many projects that institutionalize corporate-industrial relationships, and focus on regional development. After 2016, the University implemented and continues to implement the following projects on the topic of sustainable transport:

Table 1. R&D Projects related to sustainable mobility of Széchenyi University (2016 -).

Project ID	Title
Projects implemented in corporate cooperation	
2020-1.1.2-PIACI-KFI-2020-00149	The integration possibilities of automation and digitalization in railway construction, development of complex procedures in order to increase transparency
GINOP-2.2.1-15-2017-00040	RID Gate – Development of the safety device and process system for the transport of dangerous goods by rail
ÉZFF/956/2022-ITM_SZERZ	Production and Validation of Synthetic Fuels in Large Company and University Cooperation
2020-1.1.2-PIACI-KFI-2020-00065	Development of a lightly armored military and disaster prevention off-road base vehicle with a modular system, which can be controlled remotely and is suitable for self-control
Domestically funded tender projects	
TKP2020-IKA-10	Thematic Excellence Program -2020 Institutional excellence sub-programme
TKP2020-NKA-14	Thematic Excellence Program – Autonomous transport systems
NKFIH-829-2/2021	Autonomous Systems National Laboratory
NKFIH-828-2/2021	National Laboratory of Artificial Intelligence
EU tender projects	
EFOP-362-16-2017-00002	Research of autonomous vehicle systems related to the Zalaegerszeg test track
EFOP-3.6.2-16-2017-00015	HU-MATHS-IN – Deepening the activities of the Hungarian Industrial Innovation Mathematical Service Network
EFOP-3.6.2-16-2017-00016	Dynamics and control of autonomous vehicles in synergy with the requirements of automated transport systems
International projects	
2019-1-HU01-KA203-06122_Urban Scope	Urban Sustainable Mobility in focus: student education, community involvement and participative planning

Audi Hungaria Ltd.

Audi Hungaria Ltd. started operating in Győr in 1993, and is currently one of the largest exporters of the country and one of the companies with the largest sales revenue. In addition to being the largest

employer in the region (it employed 12.342 employees on December 31, 2021), it produced a total of 1.620.767 motorcycles and 170.964 vehicles in Győr last year, operating as the world's largest motorcycle factory. The company maintains a good relationship with Széchenyi István University, a good example of this is the faculty jointly operated by the University and Audi (Audi Hungaria Faculty of Automotive Engineering). Besides the creation and operation of the organization, the relationship is also outstanding in other areas:

- continuous cooperation,
- intercultural education system,
- joint developments,
- participation in development teams (Formula Student, Shell Eco Marathon),
- foreign language courses and
- many practical opportunities abroad, they promote the quick and efficient integration of new engineers into the industrial environment. (Barabás et al, 2018)

In the operation of Audi Hungaria Zrt. the Mission Zero program is important, the goal of the project is to reduce the company's ecological footprint in the areas of production and logistics. (e.g. reduction of CO2 emissions and water use, resource efficiency and biodiversity). Audi Hungaria is Hungary's largest industrial user of geothermal energy. From January 1, 2020, after the Brussels site, Audi Hungaria also achieved full carbon neutrality.

The company also contributes to the reach of sustainable transport in terms of product portfolio and production, in 2018 the series production of electric motors started in Győr and it is constantly making improvements in the field of alternative drives (e.g. engines running on compressed natural gas).

Table 2. The most significant projects related tothe urban mobility in Győr in the reflection of the EU mobility strategy

1. Boosting the uptake of zero-emission vehicles, vessels and aeroplanes, renewable & low-carbon fuels and related infrastructure 2. Creating zero-emission airports and ports 3. Making interurban and urban mobility healthy and sustainable 4. Greening freight transport 5. Pricing carbon and providing better incentives for users 6. Making connected and automated multimodal mobility 7. Boosting innovation and the use of data and artificial intelligence (AI) for smarter mobility 8. Reinforce the Single Market 9. Make mobility fair and just for all 10. Step up transport safety and security across all modes	1	2	3	4	5	6	7	8	9	10
City of Győr Suburban Transport Project	x		x			x	x		x	
Bicycle transport network infrastructure and service development	x		x							
TOP-6.4.1-15-GY1-2016-00001 Development of cycling and parking infrastructure	x		x							
Győr-Bike project	x		x							
2020-1.1.2-PIACI-KFI-2020-00149 Integration possibilities of automation and digitalization in railway construction, development of complex procedures to increase transparency			x	x		x	x			

1. Boosting the uptake of zero-emission vehicles, vessels and aeroplanes, renewable & low-carbon fuels and related infrastructure 2. Creating zero-emission airports and ports 3. Making interurban and urban mobility healthy and sustainable 4. Greening freight transport 5. Pricing carbon and providing better incentives for users 6. Making connected and automated multimodal mobility 7. Boosting innovation and the use of data and artificial intelligence (AI) for smarter mobility 8. Reinforce the Single Market 9. Make mobility fair and just for all 10. Step up transport safety and security across all modes	1	2	3	4	5	6	7	8	9	10
GINOP-2.2.1-15-2017-00040 RID Gate - Development of the safety equipment and process system for the transport of dangerous goods by rail			x	x						x
ÉZFF/956/2022-ITM_SZERZ Production and Validation of Synthetic Fuels in Large Company and University Cooperation	x			x						
TKP2020-IKA-10 Thematic Excellence Program -2020 Institutional Excellence Subprogramme						x	x			
EFOP-3.6.2-16-2017-00002 Research of autonomous vehicle systems related to the autonomous test track in Zalaegerszeg		x					x			
TKP2020-NKA-14 Thematic Excellence Program - Autonomous transport systems						x	x			
NKFIH-829-2/2021 Autonomous Systems National Laboratory						x	x			
NKFIH-828-2/2021 National Laboratory of Artificial Intelligence						x	x			
EFOP-3.6.2-16-2017-00016 Dynamicy and control of autonomous vehicles in synergy with the requirements of automated transport systems						x	x			
EFOP-3.6.2-16-2017-00015-HU-MATHS-IN – Deepening the activities of the Hungarian Industrial Innovation Mathematical Service Network							x			
2019-1-HU01-KA203-06122 Urban Scope- Urban Sustainable Mobility in Focus: Studend education, community involvement and participative planning.	x	x	x	x	x	x	x	x	x	x

4. Conclusion

The Triple Helix model creates a complex innovation theory about the relationship between three spheres: the economic sphere, university-scientific institutions, and government bodies. At the local level, it assumes a close relationship between higher education institutions operating in the city, the municipality and enterprises. The main conclusion of the Triple Helix model is that the continuous and two-way communication of these units (university, economy, government) ensures the development of all three sectors. In Győr, the actors of the Triple Helix model are characterized by active cooperation, also in the implementation of sustainable urban mobility.

The city of Győr has a strong tradition in the field of transport sciences and the vehicle industry; the University used to operate as a college of transport and traffic sciences, and the Rába and later the Audi sites also operated and operate here. Beside the quality of local government-university-company cooperation, which seriously affects urban and regional development, Győr's vehicle industry and transport traditions also have a positive effect on the efficiency of activities related to sustainable urban transport.

A significant amount and large number of projects are currently being implemented on the topic. Looking to the future, the participation of civil organizations can enable a higher level of cooperation, as shown by the quadruple helix model.

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By Collaborating to Overcome Urban Logistics Issues - Comparative Introduction of 3 Case Studies

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Abstract
By the middle of the 20th century, the number of people living in the city had doubled. According to expectations, 70% of the world's population will live in cities by 2050. At the same time as cities grow stronger, urban traffic increases, more vehicles travel on the roads, the number of traffic jams will increase and, as a result, the level of environmental pollution will increase. With the growth of e-commerce and changes in consumption habits, the number of product deliveries increases, i.e., shipping is one of the main causes of negative effects. Since the problems of the cities have been showing an upward trend for years, the city administrations have created action plans to counterbalance them. Urban Consolidation Centres (UCC/UDC) have also been created within the framework of city logistics initiatives, with the aim of sharing transport resources, consolidating transport and reducing the number of transport vehicles. Although the effectiveness of these centres is still disputed, at the same time successful examples have proven the centres' positive impact on cities. The current paper outlines the evolution and driving forces of interest in the centres through a comparison of three case studies. The Bristol/Bath UCC has been successfully operating since 2004 and is an excellent example of public-private cooperation and the reduction of environmental pollution. In the last 10 years, city logistics challenges have intensified in Budapest as well, so a sustainable urban logistics project initiative led by BKK is presented as a second case study. In connection with the BKK project, as the third case study, the LEAD project supported by Horizon 2020 will be introduced, which tries to create adaptive city logistics solutions in 6 locations (including Budapest) with the help of digital twins. The study aims to demonstrate why it is worthwhile to address city logistics issues with the cooperation of stakeholders.

Keywords
Urban Consolidation Centre, collaboration, city logistics

1. Introduction

The demand on parcel firms is rising as a result of the recent expansion of e-commerce and changes in client expectations. Delivering the goods to the consumer presents the biggest difficulty in the parcel delivery process. In accordance with the literature, this procedure' execution accounts for a sizable share of the logistics industry's overall cost, particularly in downtown transit regions (Olsson et al., 2019). As a result of increased traffic, congestion, accidents, and pollution, parcel delivery services are also responsible for (Paddeu et al., 2016). The aggressive measures being taken by city governments to combat environmental harm are adding to the responsibilities being placed on parcel delivery services.

The last mile issue has long been recognized in scientific literature and the logistics industry, and a plethora of alternate solutions have evolved to lighten the load. Alternative fuel vehicle recommendations, the employment of distribution optimization models, drones, the growth of parcel terminals and parcel lockers, and more recently, the inclusion of regular people (crowdsourcing) in the delivery process are all examples of solutions. Only a small portion of the solutions suggested involve collaboration. The covid epidemic of 2020 has demonstrated the necessity to adopt new business models that are more efficient and sustainable than those that have been used in the past. A group of cooperating partners should be part of the new model.

City officials are under pressure to find a solution as urbanization intensifies and environmental pollution levels rise concurrently. Urban logistics centers were established in an effort to alleviate the environmental harm. The creation of UCCs also brought a new player to the parcel market. UCCs are typically found close to cities, and their main objective is to lessen the amount of commodities that are transported to and from the city. UCCs are often established by city management and run by a third party. The local administration almost forces the service providers to join in exchange for the UCC's organizational structure in order to lower the level of environmental pollution. Very few of the almost 200 UCCs that were founded in the last 25 years are still in operation. Coercion cannot be used simply by requiring UCCs to be successful. Service providers should be encouraged to join the UCC. The primary driving force for this type of cooperation is compulsion, though joining a sufficiently alluring UCC can also happen for financial reasons.

This study presents the cooperation of the private and public sectors in the planning of urban logistics and the creation of UCCs through 3 case studies. The first example outlines the steps in the development of the UCC in Bristol, the second example shows the process of developing the urban logistics plan in Budapest, and the third example shows the possible effects of the LEAD project, which is international and also involved in Budapest, in relation to the urban logistics plan. According to the above, the study provides a short literature review in the Literature Review chapter, the 3 case studies and the conclusions drawn are presented in the Discussion chapter, and the entire article is briefly summarized in the Conclusion chapter.

2. Literature review

According to Hagen and Sheel-Kopeinig (2021), the e-commerce sector grew by 35% between 2010 and 2020. Customer expectations have altered in addition to growth. Last mile providers are under pressure due to rising customer expectations and increased transportation demands. Global urbanization necessitates more transportation, according to Paddeu et al. (2016), which affects social, environmental, and economic factors. Olsson et al. (2019) claim that last-mile delivery is the major expense in logistics transportation, and Halldórsson and Wehner (2020) assert that it consumes the most energy. Suppliers are so practically compelled to cut transportation expenses while lowering social, environmental, and economic consequences. According to McLoad et al. (2020), parcel delivery-related congestion, closed road sections, streets, access restrictions, expensive parking, and increasing emissions pose the main challenges for urban logistics. According to the author, during the outbreak, customers used home delivery even more frequently. Additionally, their demand for parcel delivery has increased. Additionally, Cleophas et al. (2018) contend that city logistics, or growing urban logistics, presents significant challenges due to congestion, high emissions, and a detrimental effect on quality of life.

Urban Distribution Centers (UDC) or Urban Consolidation Centers (UCC) literature dates back to the 1970s (Zelenska & Svadlenka, 2019). In the United Kingdom, France, the United States, and Canada, the first UCCs were established. UCCs' main objectives are to make cities cleaner, emissions-free, less congested, and more sustainable. Consolidating transportation to cities is the purpose of UCCs, which helps to lessen intra-city traffic by doing so. Letnik et al. (2020) point out that while the UCC design appears to be a very advantageous alternative in theory, it frequently lacks the critical mass needed to make up for the expenditure. Clausen et al. (2016) emphasize that UCCs do not always ensure a favorable impact on the environment. Half of the more than 100 UCC collaboration initiatives, according to Quak

and Tavasszy (2011), fail even before they reach the implementation stage. However, UCCs are essential to a sustainable future because cooperation is necessary for it to exist. Due to the complexity of its underlying principles, UCCs also increase the complexity of the level of cooperation.

2. Discussion

The operations of Courier, Express, Parcel (CEP) market include their own parcel processing (distribution), their own well defined distribution network, and their own resources (trucks and human resources). The competition for clients dictates how they execute their daily business. Service providers are facing difficult problems as a result of rising client expectations (e.g.: time-window delivery) and fierce price rivalry. Environmental regulations that give people a better quality of life present new obstacles for service providers on top of those already present, particularly in cities. Delivery to downtown regions, which are at least partially closed in a large number of cities, presents the biggest challenge for last-mile delivery companies.

The literature differs between vertical and horizontal types of collaboration when defining it in terms of logistics. Gonzalez-Feliu et al. (2018) claim that a cooperation is referred to as vertical when the participants (actors) are subordinate to one another and only contribute to a portion of the chain as a whole. Vertical cooperation is frequently seen in the logistics of the supply chain. In the context of the logistics market, Cruijssen et al. (2007) define horizontal cooperation as an association of market participants who compete with one another frequently and operate at the same level.

Only horizontal cooperation between the parties will allow for the establishment of a collaborative urban consolidation center (UCC). Even though it is founded on horizontal cooperation, a third party joins the cooperation in addition to service providers at the same level. Although the local administration is frequently the third party, the actor could potentially be a separate third party.

Case study 1 – Bristol UCC

At the beginning of the 2000s, the daily volume of vehicles in Bristol was estimated at 500,000. The average speed of vehicles was 25 km/h, which in that time made Bristol one of the most polluted cities. By 2002, the city's air pollution level was in the intolerable category. The city administration developed an action plan to make the city more livable. Countless regulations were introduced, as a result of which a significant part of the city was closed to lorry traffic. The city administration obtained funding for its projects through various EU tenders. In 2006, the UCC was established, as a result of which non-food-based last mile delivery could only take place through the UCC. Products arrive in Bristol from Birmingham on 18- and 7.5-tons lorries. From the UCC to the city center, 9-tonne electric vehicles transport the goods to the shops.

Along with the local city council's subsidies, which make up 45% of operating expenses, shops and express couriers are the main sources of income. Express couriers outsource the last-mile delivery to a freight carrier in this circumstance, which is business as usual for them. As a result of pooling delivery vehicles for the last step in the supply chain, emissions in Bristol were reduced (i.e., last mile deliveries). Large companies have joined the Bristol UCC-based scheme. Those who did not join believed that the UCC costs appeared as an additional cost to the supply chain costs. The first year of UCC in Bristol was fully funded by the city, i.e., it was free for those joining. The benefits listed from joining the program included: the ability to deliver to a stock room, delivery security, scheduled delivery time, additional services offered (such recycling of cardboard and plastics), staff time saved each delivery, delivery duration, and employee safety.

The effort has considerably cut emissions while preserving customer satisfaction. The primary goals of the Bristol example are to lessen environmental harm and improve the quality of life in the city, and these goals have been backed by local government legislation. The only way for last-mile vendors to deliver future deliveries is to collaborate and join UCC. The city government not only established the regulatory framework but also made joining the UCC appealing, so the incentive for service providers to

abide by the laws was also to save money. According to Paddeu et al. (2018) although the implementation of UCC led to cost reductions, initial funding and a desire to implement them were typically necessary. The functioning of UCCs is not viable due to a lack of recurring funding.

Case study 2 – Sustainable Budapest – BKK initiative

Budapest Transport Centre (Budapesti Közlekedési Központ = BKK) is the transport authority of City of Budapest, responsible for the management of all transport modes. In 2019 the Sustainable Urban Logistics Planning for the Development of Regional Goods Traffic (SULPiTER) project has been established with the participation of Bologna, Budapest, Poznan, Brescia, Maribor and Rijeka. The goal of the project was that within the framework of the project, the creation of a regulatory environment that promotes the sustainability and livability of the participating cities. The SULPiTER tool is a decision support system, the purpose of which is to make it easier for decision makers to create different urban logistics scenarios. On 29 May 2019, the General Assembly of the Municipality of Budapest approved the Budapest Mobility Plan for a period lasting until 2030, based on sustainable urban mobility planning (SUMP) guidelines. The Budapest Mobility Plan 2030 is the transport strategy of the capital for the year 2030. As an integrated mobility manager of Budapest, BKK is responsible for the development and implementation of Budapest Mobility Plan (BMP), organizing public transport; determining routes, scheduling, traffic layouts; passenger information service; public bike sharing; making strategic decisions in connection to city-logistics and parking; authorizing taxis (control and qualification of taxi hire services); strategic road network management; development of the extended infrastructure in the city.

The BMT defined the different scenarios for the 2018–2030 investment programme with the help of a complex evaluation and programming methodology derived from domestic and EU guidelines for SUMP that equally takes into account societal, economic and environmental impacts along with a strategic environmental evaluation. In the urban context, a mixed strategy involving land-use planning, pricing schemes, efficient public transport services and infrastructure for non-motorized modes and charging/refueling of clean vehicles is needed to reduce congestion and emissions. Cities above a certain size should be encouraged to develop Urban Mobility Plans, bringing all those elements together.

Since 2019, BKK has been working to design the plan that will create the city of Budapest of the future with the involvement of the relevant stakeholders. The involved stakeholders are primarily the Budapest city government, institutions that affect transportation, and last mile service companies. BKK's primary goal is to transform urban parcel logistics into a scenario that is beneficial for all parties involved, with the involvement and cooperation of stakeholders. In addition to that, BKV cooperates with the Széchenyi István University in Győr and the Waberer's-Szemerey transport company on the EU-funded LEAD project, the joint results of which are planned to be used in the SUMP program and in the BMP.

Case study 3 – The LEAD Project

The LEAD project is establishing low-emission adaptive last mile logistics supporting the on-demand economy through digital twins. The project undertook to build more than 60 models in 36 months, with the involvement of 25 partners, in 10 countries, with the creation of 6 living labs. The ultimate goal of implementing digital twins in last mile logistics is to enhance the functionality and effectiveness of parcel delivery, lower costs and externalities through forecasting and predictions of future states, support advanced decision making throughout the entire logistics lifecycle, and encourage stakeholder participation through trustworthy real-world information. The development of solutions for integrated systems of logistics/freight operations in urban, metropolitan, and peri-urban areas, as well as the introduction of low-emission, connected/automated delivery vehicles, will be made possible by the Digital Twins, which will allow suppliers, shippers, policy makers, and urban planners to co-design value cases.

In six TEN-T metropolitan nodes (Madrid, The Hague, Lyon, Budapest, Oslo, and Porto), LEAD will build digital twins of urban logistics networks to allow experimentation and decision-making with on-

demand logistics operations in a public-private urban scenario. In order to satisfy the demands of the on-demand economy and the challenges brought on by the rise in parcel deliveries, city logistics solutions will be represented by a collection of value case scenarios that balance competing interests and add value for all stakeholders. To address the full dynamics and complexity of a city's logistical concerns, each value case will integrate a number of measures dubbed LEAD Strategies. The Madrid Living Lab is about to transform a parking lot to an UCC. In Porto the project turns retails stores to electric mobility nodes. The Hague Lab integrates las-mile logistics with demand-supply matching platforms. The Lyon lab is about to validate the last mile distribution models. The Oslo lab involves green crowdshipping through the mass transit network. Finally, the Budapest living lab makes a spatial planning of inner-city loading areas.

20% of the population of the country resides in the Budapest urban node, which is a key logistical center and is impacted by the Orient East Med and Mediterranean TEN-T corridors. Air pollution at street level has gained significant attention as a result of new restrictions. The suggested framework would quantify the various impacts of e-mobility and legislation on scenarios involving freight transportation. The advantages for all parties involved in the inner city of Budapest will be made clear through multi-objective optimization (for logistics businesses, decreased distances, efficient use of time, cost effectiveness, high service standards; better policy planning and simpler, more effective mobility management are priorities for BKK, as transportation modeling is a crucial instrument for strategic decision-making and decision-making preparation; reduced air pollution, improved transportation, and a livable city for the residents. The Budapest living lab (with the contribution of BKK and Waberer's-Szemerey) explores the benefits of serving a specific area or utilizing UCCs and minihub; air quality effects of consolidation centers; evaluation of inner-city UCC practice and demand, with some suggestions for policy improvement; optimal separation between UCCs and the delivery target; depending on the size of the vehicle, the impact of freight trucks from UCCs on the environment and traffic.

The 3 presented case studies are based on the steps taken to achieve sustainable cities. UCC in Bristol presented the steps of building a realized urban logistics center, the second example presented the ongoing plans of BKK in Budapest, also related to urban logistics, and the third presented the details of an international project that also supports case study 2. All three are based on last mile logistics. The vision of the city administration is how to implement a last mile delivery that is more favorable for the city. The 3 studies show that cooperation between last mile logistics actors is possible, however, they also draw attention to the fact that, although cooperation is an essential part of the structure of a UCC, it is not a sufficient part. The Bristol example shows that, in addition to the desire to cooperate and some level of coercion, there is also a need for serious financing in order for the successful operation of the UCC.

As a result of the cooperation, a city with a more favorable air can be created, where the number of traffic and traffic jams is significantly reduced, since during the cooperation, the actors share their resources with each other, in this way, fewer resources result in fewer harmful emissions. And the financing provided by the city administration makes it beneficial to join the UCC, also known as joining the cooperation. Therefore, cooperation exists and can exist, as long as economic and other benefits can be demonstrated for the parties. Nevertheless, the cooperation, the creation of the UCC, will only be successful if the establishment is preceded by a dialogue between the parties (city management, institutions and service providers) and the joint development of the rules.

5. Conclusion

Urban zones are becoming more crowded, thus finding creative ways to convey freight is crucial to keeping cities livable and appealing. Additionally, the e-commerce industry is still expanding and consumers' expectations have substantially changed. Due to traffic, congested roads, and rising environmental requirements, logistics service providers in urban areas confront substantial challenges with last-mile delivery. Furthermore, due to empty trips and poor load factors, last mile delivery is highly ineffective in metropolitan settings.

Countless solutions have been proposed to solve the problems of last mile logistics in the past decades, but cooperation was only a part of the solution proposals in very few cases. This study presented 3 collaborative initiatives through 3 case studies. The first example presented the steps and the results of a UCC implemented in Bristol in 2016. The second example deals with an intermediate stage of the Budapest City Logistics Plan, which is being prepared by Budapest's BKK. BKK, as the organization responsible for the development of the city's logistics plan, initiated cooperation with last mile delivery service providers, local governments, and institutions with an influence on transportation. The purpose of cooperation and dialogue is to develop a plan where regulation is implemented based on the common will of the cooperating parties. The Széchenyi István University and the Waberer's-Szemerey transport company cooperate with BKK, who support the development of the urban logistics plan through the LEAD project. The third example is the presentation of the LEAD project, where different urban logistics scenarios are modeled in 6 cities using digital twin technology.

Each of the 3 case studies proved the role of cooperation in creating an efficient logistics model. Although the Bristol UCC is the only live and working example of the 3 models, the cooperation between the city government and the service providers was crucial for the success of the model. In the initial stages of the BKK planning project, the relevant stakeholders were involved so that the urban logistics plan was developed as a result of mutual agreement. The LEAD project actually provides support for BKK's urban logistics plan, which is an excellent example of cooperation between the private and public sectors.

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Chapter 2:
Experiences of UrbanSCOPE

Introduction of UrbanSCOPE project

Urban Sustainable Mobility in focus: student, education, community involvement and participative planning SUMP - KA203 Strategic Partnership for higher education ERASMUS+

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In recent decades, the continuously growing use of cars, the increase in CO2 emissions and climate change have challenged urban transport and its planning, therefore the Sustainable Urban Mobility Planning (SUMP) is a major topic in the European Commission.
The Urban Mobility Package, which was published by the Urban Mobility Observatory, namely the ELTIS in 2013 emphasizes: the SUMP should involve the local communities and should be carry out by interdisciplinary planning terms. There is no doubt that the topic of the accepted ERASMUS+ application is current and important for the quality of life of the urban population.
The UrbanSCOPE project had a duration of 36 months, the start date was October 1, 2019, and the end date was September 30, 2022. The accepted proposal and its implementation filled the partnership with a lot of excitement, since the project did not only mean the design of the SUMP, but also the preparation of learning material, it's testing and learning of the related curriculum. All these tasks can only be successfully implemented with a good partnership.
The partnership consisted of 7 members; the lead partner was István Széchenyi University (Győr, Hungary). Furthermore, two universities, Techniche Universität (TUDA) (Darmstadt, Germany), Utrecht University (UU) (Netherlands), a Greek development institute: Centre for Development Studies PRISMA (Athens, Greece), and the municipalities of three cities were also joined, those cities provided pilot areas for the planning and testing of SUMP. The three cities were: Győr (Hungary), Darmstadt (Germany) and Glyfada (Greece).
The aim of the UrbanSCOPE project was to introduce and learn about the process of planning sustainable urban mobility and to teach it to university and secondary school's students and the urban citizens to provide an opportunity for how they can participate in the planning process. The path to the implementation led through six work packages. During the past three years, the challenge was not only the tasks before us, but rather the pandemic, (COVID-19) as well. This partly meant the impossibility of personal meetings of the partnership, partly the failure of the necessary meetings with the urban population, and especially with school and university students. Because of the latter, it was necessary to redesign and find new possibilities for implementation.
In the following I will describe the content of the six work packages and the implementation process and their milestones.
The 6 workpackages (so called: IOs) as follows:

- IO1: SUMP research in selected case study areas: designation of a pilot area through the discussions,
- IO2: Action plan for preparing SUMP scenarios in case study areas: defining scenarios for SUMP
- IO3: SUMP Learning Methodology and Tools: to create a learning course for university and school's students
- IO4: SUMP learning courses: to design and test the innovative methodologies and tool
- IO5: SUMP competition: to design mobility scenarios adopting the developed innovative tool for sustainable urban mobility,
- IO6: publication of a Handbook for SUMP learning: to summarize the experiences of the project and to share the innovative knowledge.

Implementation

SUMP research in selected case study areas: designation of a pilot area through the discussions

Research was given a role in the first work package. The first step was the desk study, collecting the SUMP literature related to the EU and the partner countries and analyzing them. The second step was designated to select the neighborhoods of the partner cities, those would be the pilot areas during the project. As a second step, we explored and characterized the geographical and traffic situation and economic and social condition of the selected areas. We explored the characteristics of the pilot areas with various research methods, such as conducting interviews with local authorities and municipal representatives, summarizing the experiences of focus group interviews, and finally a questionnaire survey among the population helped our work. The output of this thorough exploration helped the work of the next work package. It should be noted that the completion of this work package has already presented serious challenges to the partners, due to COVID-19, e.g., the public questionnaires could only be completed online instead of face-to-face.

Designated areas:

- Győr – Győr-Ménfőcsanak, Gyirmót: suburban area increasing population and number of cars with transportation conflicts,
- Darmstadt – Woogsviertel one of the neighborhoods of Darmstadt
- Glyfada - south part of the Athens Metropolitan area

Action Plan for preparing SUMP scenarios in case-study areas

The tasks of the second work package lasted until the end of the project. The first step of this work package was the establishment of the task force, involving the active representatives of the selected district/city civil society organizations, the authorities, university lecturers, teachers, and the population, who were interested and wanted to actively participate in the implementation of the SUMP project. After its establishment, the task force's first task was to discuss the development of three scenarios and then present them at several workshops. After extensive discussion, one of the three scenarios was accepted. The developed and accepted scenario served as the basis for the curriculum developed in further work packages, the learning methodology and the competition announced within the project.

The task force, whose members are approx. 10, max 12 people, organized the workshops, the first with the participation of representatives of the City Council, who got to know and voted for one of the three scenarios, then this workshop was followed by the public workshop, where city citizens, representatives of NGOs, university students, in Glyfada schoolchildren's teachers and parents also participated.

Another goal of the task force was the organization of the SUMP competition and the coordination of events concerning competition and media appearances and news preceding it.

The implementation of the tasks of the work package posed many challenges due to the pandemic, since the task force meetings, the personal consultations, developing scenarios were only possible online. Fortunately, the workshops already were organized face to face because of soft Covid.

SUMP Learning Methodology and Tools

The aim of this work package was to develop and create a learning methodology and innovative tool, with the help of which university students can learn and plan scenarios, which are more sustainable and comfortable for them in an interesting and playful way within the framework of an interdisciplinary course. Similarly, with this tool, high school students can playfully plan routes that serve sustainable mobility in their city e.g., from their home to school.

The following steps were implemented to achieve the goal:

- To design a flexible and adaptable methodology outline for university students and school student and adults as well
- To create a learning model for an integrated approach to the SUMP,
- To prepare an LBG learning tool for a course for students and citizens as well,
- The LGB gives opportunity to create an own mobility route,
- LBG serves the participants of competitions.

The creation of the LGB required a lot of work from the partners, especially that every detail had to be discussed online. A 4 day-training was planned to develop LBG tool, but due to the pandemic, the 4-day training at Utrecht University was canceled, which further made the creation of the LBG more difficult. The partners developed the tool in the frame of many online meetings. Finally, the prepared LGB was used by both university and high school students in the competition.

SUMP Learning Courses

The aim of IO4 is to prepare study courses for students:

- to create an interdisciplinary course for university students (Győr, Darmstadt)
- to create a learning course for secondary school students and adults, as a „family education" course.

Holding the learning course also presented a challenge to the partners due to the pandemic. For a long time, there was no classroom teaching at the universities, only online, Greek schools were closed for a very long time, but fortunately classroom teaching started before the end of the project, although the students had to wear the mask for a long time.

SUMP Competition

After developing the learning methodology, its usability was not only available to students taking the course, but we also announced a general competition in all partner countries so that anyone could try planning sustainable urban mobility with the help of the LBG developed during the project.

The UrbanSCOPE competition was promoted in cooperation with universities, schools and NGOs in each city organized by the task force.

The participants used the innovative tool developed by the project to create their work.

The jury of experts evaluated the competition entries and decided the best SUMP proposals and announced the winners.

The winners from the three cities were invited to take part at the final conference to present their SUMP proposals.

Handbook

The objective of this work package to summarize the experiences of the project. The Handbook gives an innovative aspect demonstrating how higher and school education can benefit from interaction with the local community in SUMP process.

The handbook consists of two main parts and the annex. The first part contains the learning methodology which was developed for students in higher education and secondary schools. The learning methodology at both educational levels (higher education and secondary school/family education) is presented, and the learning course and its experiences and the evaluation of the pilot testing also are presented in detail. The second part of the handbook is addressed to policy makers, presenting all steps

of how public participation was implemented and how it worked in the three European partner cities. It is also described the process of how to involve in the decision the citizens to get to know the scenarios and vote about it. The handbook will be published in four languages, English, German, Greek and Hungarian, so that as many people as possible can get to know and disseminate the innovative public participation method for SUMP.

Conclusion

It is not easy to summarize in a few pages the diverse and coordinated huge work that the partners made in 36 months. The pandemic presented challenges to the partners, apart from the kick-off meeting and the last SCM, the other meetings took place online. When the pandemic became weaker, the partners were able to organize the SUMP workshops in all partner cities in face-to-face form. The project was ended with a successful final conference, which was held in Győr. At the conference, not only the project was presented, but also high-quality scientific presentations related to the topic. You can get a detailed insight into the three-year work of the UrbanSCOPE project by visiting the project's website: **www.urban-scope.eu.**

Exploring the residents' and key stakeholders' behaviors and opinions on SUMP

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Abstract
UrbanSCOPE project focuses on Sustainable Urban Mobility Planning (SUMP) as an issue high in the EU agenda, and aimed to bring the concept of SUMP closer to the citizens by offering an educational package and tools for understanding SUMP and actively participating in planning. Moreover, Urban SCOPE aimed at improving the quality of higher education on the subject of SUMP by offering to the students and teachers of higher education a practical approach for engaging in SUMP, incorporating the active engagement of the local communities and stakeholders into the planning process.
By facing such a complex task, the first task was to conduct a "local sustainable mobility audit" in three European cities (i.e. in Darmstadt/Germany, Győr/Hungary and Glyfada/Greece), in order to analyse the current situation, examine the starting point and determine those areas, where development is needed. This study will focus on the results of the SUMP-Anaylsis conducted in Győr, through the examination and analysation of the selected case study area (Ménfőcsanak and Gyirmót). The behaviours and opinions of residents' and key stakeholders' were explored and presented in detail.

Keywords
sustainable mobility, SUMP, mobility planning, attitude-analysis

1. Introduction: background of the SUMP-Analysis

The three participating cities differ in terms of population, density and terrain morphology. Győr, with a population of 134.000 citizens and the lowest population density (767 citizens per km2) among the three cities, is located half-way between Budapest and Vienna on the flat Danube area and is a major urban centre on the northwest of Hungary and a national hub for rail and road traffic. The case study areas selected in Győr are satellite suburbs of the city located approximately at a distance of 8 km from the city centre, and are spatially separate from the Győr city centre. Darmstadt, has a population of 159.878 citizens and a medium density (1.300 citizens per km2) among the three cities, is located on flat terrain in the southern part of the Frankfurt Rhine-Main Metropolitan Region. The case study area selected is part of the neighbourhood "Woogsviertel" located at the eastern part of the city, with a much higher population density than the city average - 8.330 citizens per km2. Glyfada, with the lowest population (87.305 citizens) and yet the highest population density (3.400 citizens per km2) among the three research cities, is a south suburb of the Athens metropolitan area of 3,7 million population, stretching from the seafront of the "Athens Riviera" to the foot of the mount Hymettus where the terrain is steeper. The case study area selected is a residential neighbourhood located to the south of the city, stretching from the foot of the mount Hymettus to the borders of the commercial city centre. Naturally, the results presented in the SUMP-Analysis in each of the cities also reflect to this diversity.

In the case of Győr, it needs to be mentioned that the urban mobility planning in Hungary is based on traditional planning tools, including transport development concepts or strategies. Despite the Urban Mobility Package (2013) advised for the member states to adapt the SUMP approach during the mobility planning, there was no governmental initiative in Hungary for several years (although this situation changed in 2015). On the other hand, there are several documents that can be taken into account for (or during) the development of a SUMP, like the National Climate Change Strategy (2008), the National

Development and Regional Development Concept (2014), the National Transport Infrastructure Development Strategy (2014) or the Jedlik Ányos Plan (2015). In the context of the city itself, the following documents provide the framework for the mobility planning: the Regional Development Concept of Győr-Moson-Sopron County (2013), the Regional Development Program of Győr-Moson-Sopron County (2014), the Settlement Development Concept of the City of Győr (2014), as well as the Integrated Urban Development Strategy of the City of Győr (2014). By examining the circumstances of the preparation of the SUMPs, it should be interpreted, as an important point that the plan has to be in line with the already existing planning processes and strategies of the given cities. In the Integrated Urban Development Strategy of the City of Győr, the information related to transport development are project-based, less detailed. However, it contains enough information to provide an initial guideline for making the SUMP (along with the county-level development concept and strategy) but it needs to be updated because the analyzation of the data end around 2011. Therefore, new statistical data-research and analyses are required during the compilation of the state of art of the SUMP. Moreover, not only the data but also the textual contents needs to be revised, according to the new development claims and demands emerged after 2015.

2. The case study area in Győr

For the purpose of the SUMP-Analysis, two neighbouring urban areas were selected in Győr: Ménfőcsanak and Gyirmót. Ménfőcsanak is situated at the southern part of Győr, next to the road No. 83 and railway tracks towards the City of Pápa. Ménfőcsanak has a mixed, small-town built-up area which is a very popular for people moving from Győr to the suburban fringe.

Ménfőcsanak and Gyirmót were separate settlements until 1969, but today they are part of the City of Győr (with 130.000 population). Both neighbourhoods were annexed to the city in 1970. Ménfőcsanak itself was also evolved in 1934 from the integration of three smaller settlements: Csanakfalu, Csanakhegy and Ménfő. Since the fusion with the city, Gyirmót has experienced smaller, while Ménfőcsanak experienced a bigger population growth (Table 1).

The population of Győr has been stagnated in the last two decades, with small decreases and small increases. The reason behind this is that besides the great number of incomers, powerful suburbanisation processes has also started. To the population number of the City, an agglomeration of approx. 60 thousand people needs to be also added, which includes the neighbouring 30 settlements, also causing a great commuting traffic towards the City.

Ménfőcsanak and Gyirmót has a unique condition: according to the attributes of the settlement-development they are considered as a typical suburban settlements, however they are located within the administrative boundary of the City. During the last 1,5 decades, many people has moved here from other neighbourhoods of the city (especially from the nearby huge building estates). Their mobility situation is very similar to the suburban settlements, except from the advantage that these two neighbourhoods are connected with the city centre via local bus-networks. As the local public transportation is not divided into separate zones, there is no difference between the inner city and outskirt tariffs.

Table 1. Population growth in the two neighbourhoods (1969-2011)

	1969		2011	
	Population	**Number of residences**	**Population**	**Number of residences**
Ménfőcsanak	**5009**	**1475**	**9522**	**3610**
Gyirmót	**1206**	**341**	**1359**	**518**

Source: : KSH (1970) and KSH (2019)

The two neighbourhoods is located at one of the most problematic spot from transportation aspect in Győr. Although previously the railway played an important role, today the dominant commuting platform are the public roads. Population almost exclusively travel to the inner city by private cars or local buses. The main direction of the traffic runs towards the city centre, but the main roads also collect the traffic of other agglomeration settlements, therefore (especially during peak time) the access of the inner city is

very difficult on public roads. The previous and expected infrastructural developments also aim to support the road transport, focusing on the expansion of the capacity. The rapid population growth, the expansion of the settlement structure poses a great challenge on the public transportation, which is less and less competitive against the private cars. The reason behind this is that the public transport is limited mainly to buses, and although the network is quite well-developed, but the travel time is long and difficult. Buses are also victims of the traffic jams (there are no separate bus lanes). The railway practically disappeared from the alternatives, despite the fact that the railway track is crossing the neighbourhood, and there are two train stops as well.

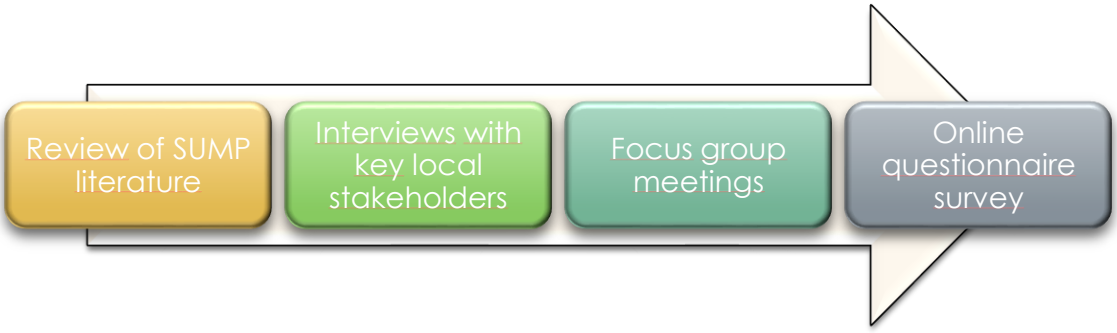
Furthermore, some bicycle path development has been made, however, usually only as the subsidiary investment of the main transport line. The growing agglomeration however would require a complex development method, also involving the expansion and harmonisation of different transportation methods.

In order to moderate the road traffic it is reasonable to increase the role of the railway again. Re-entering into service the southern train-stop could strengthen this alternative. Furthermore, the creation of parking areas and bicycle lockers would be necessary. The station has a large and currently unused area, where it would be possible. This station could also operate as a traffic intersection, since it is reached by two local buses as well. From here, residents could reach the inner city within 10 minutes. A further possibility is the creation and expansion of bicycle lanes, so that the catchment area of the railway could be further increased.

3. Methodology

In the frame of the SUMP Research in Hungary, Széchenyi István University has conducted a comprehensive research, using different methodologies. (Figure 1) The first part of the research involved desk studies and literature reviews. Relevant national literature and strategic documents were analysed in order to present the SUMP environment in Győr and the national institutional framework.

Figure 1. General overview of the different steps of the methodology



Source: own elaboration

As a second phase, the examination and analysation of the selected case study area (Ménfőcsanak and Gyirmót) has been conducted. After the desk study and the case study analysis, behaviours and opinions of residents' and key stakeholders' has been explored. SIU has followed a three-step methodology, in order to have a wide feedback. Table 2 summarizes the different methodologies and main goals of the research phase. As it is visible, SIU has conducted 6 expert interviews, organised 2 focus group meetings and collected 512 responses in the frame of an online questionnaire survey.

Table 2. Different methodologies and main results of the SUMP Research in Győr

Methodology	Main goal of the research phase	Duration, timeframe	Results
Interviews with key stakeholders	**Monitor the policy and action plan of the local authority, opinions regarding the wider implementation of SUMP**	**January, February 2020**	**6 conducted interviews, with local authority members, NGO representatives and educators**
Focus group meetings	**Collect challenges and problems in adopting a SUM policy, and monitor the potential in adopting a SUM policy in the case study area, proposals**	**September, October 2020**	**2 focus group meetings with 22 participants (14+8)**
Online questionnaire survey	**Analyse the current mobility practices, views on alternative mobility means, necessary improvements and attitudes**	**June to October 2020**	**512 collected responses, analysis of the questionnaire survey**

Source: own elaboration

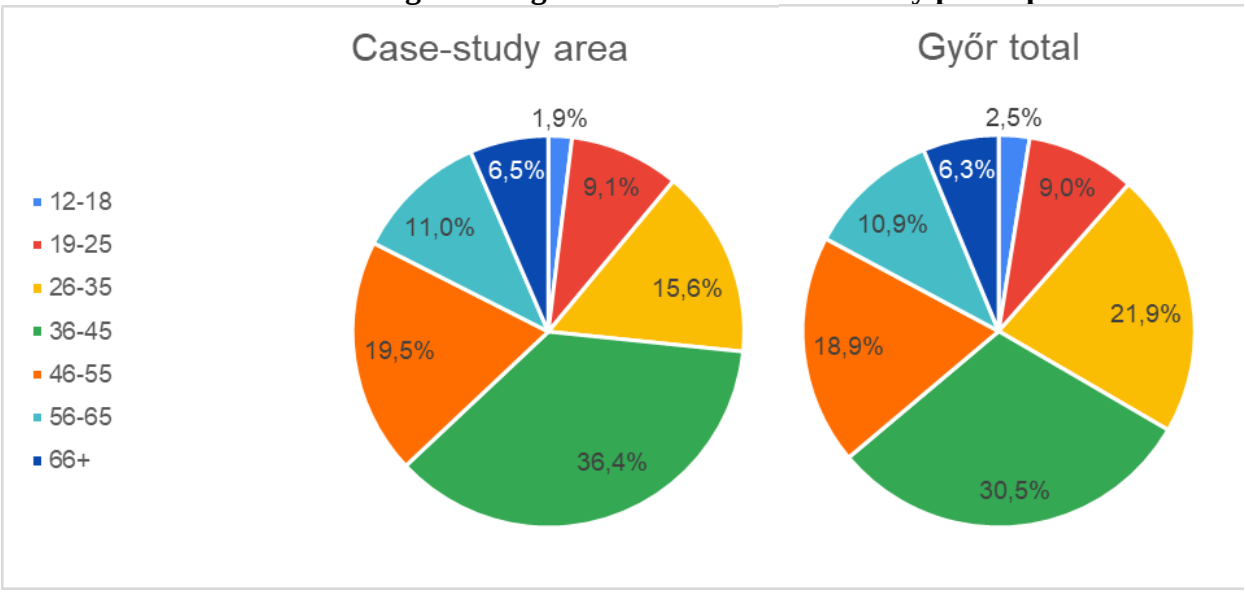
4. Main findings of the SUMP-Analysis

According to the stakeholder-opinions, elected members and officials of the local authority also agreed with the importance of SUMP, as it was observed during the interviews. Interviewees supported the previously mentioned railway developments, the elaboration of a suburban railway transport, and the harmonization of the bus and train transportation. Civil organisations and the locally elected representative of the neighbourhood emphasized the issue even more. For a more liveable district, private car use should be cut back in favour of the train transportation, while at the same time, the quality of local services, availability of public spaces, pedestrian pavements and safe bicycle lanes should be increased. SUMP planning was strongly supported for the whole territory of the city. There is a simultaneous need for awareness raising and the development of sustainable infrastructure in order to push back the private car use.

During the two focus group meetings, both the residents as well as representatives of civil organisations and local businesses have highlighted similar problems: overloaded roads due to the dominance of motorized transport, unused railway transport, districts without direct access to public transport. As a solution, participants emphasized the importance of the integrated bus-train season ticket and the elaboration of a suburban rail. The case study area has the potential for this, however it is a fact that it would require a serious investment. The elaboration of a safe cycle lane is not only a priority between the neighbourhood and the city centre, but also within the neighbourhood. At the moment, cycling in the neighbourhood due to the overcrowded streets (traffic, parking) is dangerous. Most of the services are located in the city centre and in the neighbourhood centre, and therefore the still growing suburban zones create increasing private car traffic in order to reach and use these services. In order to reduce this kind of traffic, the diffusion of services would be required.

The online questionnaire survey and the answers of the residents showed similar trends. In total, 512 citizens have filled in the survey, of which 154 live in the case study area. The total and the case study area sample have been compared, and it was visible that the distribution is very similar regarding the age groups, the educational background, and the employment status. (Figure 2)

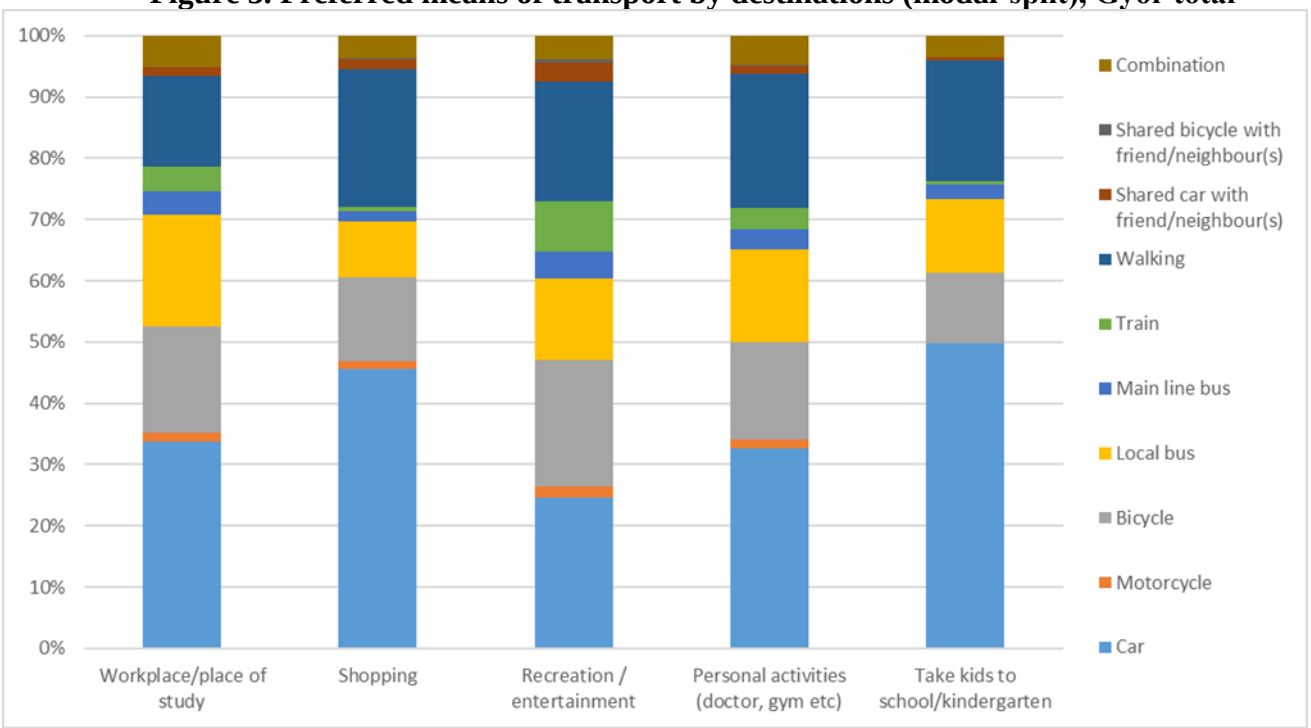
Figure 2. Age distributions of the survey participants



Source: online questionnaire survey

One third of the sample is aged between 36-45 years, both groups are characterised by a larger share of participants having completed a university degree, and in both samples 61% is employed full-time. Within the case study area, the share of families is 10% higher, which is usual in the suburban zones. As a result, activities like shopping and taking kids to school and kindergarten is generally carried out by using cars. Due to the lack of local services, two-car-households are typical, which obviously further increases the traffic.

Figure 3. Preferred means of transport by destinations (modal-split), Győr total



Source: online questionnaire survey

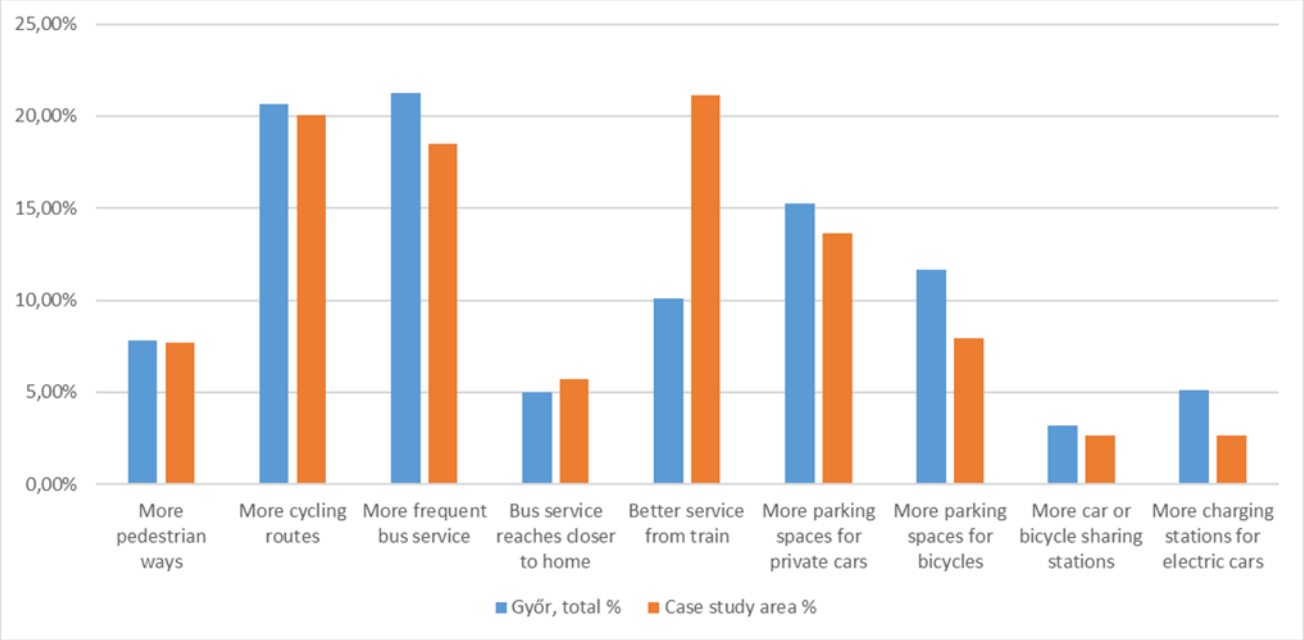
Regarding the current urban mobility trends, it is visible that car is the most commonly used means of transport. (Figure 3) On the other hand, walking and cycling have a moderate role in the modal-split (regarding any destination), however, they are still much more popular than car-sharing or bicycle sharing.

These two options remained on the bottom of the modal-split, with very low rates. Within the case study area, local and main line buses are more popular, while the share of bicycle and walking is lower. This trend can be explained by the fact that the case-study area has a distance of around 8 km from the inner city (suburban zone). Train is not frequently used, which supports the problems of the train connection (rare timetable, no parking space along the stations, etc.).

Regarding the ideal means of transport, as for the shortest distance range, walking is far the most popular option, followed by bicycle as well as electric scooter and electric bicycle. Regarding the medium distance range, bicycle is the most popular option, and it is closely followed by local bus and car. As for the highest distance range, traditional (motorized) vehicles come into foreground, like car, train, main line bus and local bus, while electric car was also a popular option. This result suggests, that if basic services (like workplace, schools/kindergartens, shops) were provided and used locally, motorized transport could be cut back.

Regarding the necessary improvements, more frequent bus service was the most frequently mentioned improvement, closely followed by the need for more cycling routes. (Figure 4) Many respondents have also referred to the problems of parking spaces. However, this is a more serious problem in the inner city, than in the case study area. Considerably higher percent of respondents have stated in the case study area that they would like to see a better service from train. This result again supports that with a more accurate/frequent and better service, train would be used by a greater number of case study area residents. Improvement ideas regarding the train service almost exclusively mentioned the creation of a suburban train line, which would be quite costly, however, could be a good alternative in those places, where railway is already constructed.

Figure 4. Necessary improvements in the total sample and in the case study area (% of mentioning)



Source: online questionnaire survey

The environmental consciousness of the residents is supported by the result that on short distances, walking and cycling are preferred as the ideal transport modes, while private car would be ideally used for longer (above 4 km) distances. Environmental awareness amongst the participants is further supported by the result that 80-85% of the respondents (both in the overall and in the case study area sample) agreed that private car-transport should be reduced in order to improve the condition of the environment, contribute to the fight against climate change and reduce the exhaust fumes. On the contrary, we should not forget that the current mobility trend is obviously dominated by the private car. Most respondents strongly agreed with the statement that offering good quality infrastructure would encourage citizens to

walk or cycle more. From this point of view, a more sustainable urban mobility is an infrastructural/supply issue. However, we shall not forget that moving towards sustainable urban mobility also requires the changing of habits, and therefore it is also a demand issue (and it is not only relying on the services offered by the municipality).

5. Conclusion and outlook

To summarize the main results, it can be stated that residents of the case study area, representatives of civil organisations as well as members of the local authority consider sustainable urban mobility of extreme importance. Despite this, private car, as a means of transport is still dominant within the modal split. All actors prefer fixed-track transportation (railway), but the conditions are not given at the moment. However, in order to get closer to a sustainable mobility, these developments seem unavoidable. This development is also necessary due to the constant enlargement of the agglomeration, since the main roads of the case study area also collect the commuters from the surrounding settlements, making these roads (especially No 83) even more overcrowded. According to the results of the questionnaire survey and the focus group meetings it can be stated that residents and civil organisations have an environmental conscious thinking, which can be further increased through community partnerships.

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The involvement of local society in Sustainable Urban Mobility Planning. The experience of UrbanSCOPE

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Abstract
The UrbanSCOPE project aimed at testing a methodology for community engagement and co-design of alternative Sustainable Urban Mobility (SUM) scenarios and a SUM Action Plan, which followed the principles of ELTIS and was implemented in the three pilot areas included in the project, namely in the cities of Glyfada, Greece, Gyor, Hungary and Darmstadt, Germany. The UrbanSCOPE methodology was based on the setup of a Task Force in each pilot area, which brought together the local City Council, representatives of the civil society and the education community, and planning experts. Good practice in the application of the methodology is outlined, as experienced in the city of Glyfada, and the lessons learnt, that are of wider application, are highlighted. An awareness raising campaign which complemented the public participation effort of the Task Force is also described and evaluated.

Keywords
Sustainable Urban Mobility Planning (SUMP), Task Force, co-design, awareness-raising, community engagement

1. Introduction. Public Participation and awareness-raising in Sustainable Urban Mobility Planning

Sustainable Urban Mobility Planning (SUMP) is closely connected with public participation, because the implementation of SUM measures is to a large extent dependent on the citizens' willingness to change their mobility habits and promote the idea and practice of sustainable mobility. European Commission's policy documents (European Commission 2013), emphasise citizen and stakeholder engagement in the process of SUMP, as well as fostering changes in mobility behaviour; while a participatory approach to the composition of a Sustainable Mobility Plan is outlined in EU documentation (European Commission 2013A), involving the relevant actors - citizens, as well as representatives of civil society and economic actors – not only in developing but also in implementing the plan throughout the process, aiming to ensure a high level of acceptance and support. Similar approaches have been also published at national level, providing great emphasis on public participation during the full process of sustainable mobility planning, including examples of methods that can be applied to achieve the best results in engaging local stakeholders and citizens (Vlastos & Bakoyiannis, 2019).

The European Platform on Sustainable Urban Mobility Plans (ELTIS) also presents detailed guidelines for developing and implementing SUMP (Rupprecht Consult/ELTIS), which clearly state that "*dedicated activities should be conducted from the start to ensure political ownership and stakeholder and citizen engagement should be planned early on"* and offers advice on methods and tools for both in-person and online engagement. In the guidelines provided by ELTIS, prominent position holds the set-up of a 'steering group' of politicians and other key stakeholders taking into account the planning requirements and geographic scope of the SUMP in question. Citizen participation is scaled according to four levels of engagement, from "Inform", to "Consult", to "Collaborate" and to the highest level "Empower".

The UrbanSCOPE project embraced the above guidelines and adapted them to the scale of the project activities and the experimental nature of these activities. Regarding the scale of participation, the three first steps were adopted, namely inform, consult and collaborate, with reference to the design stage of a

local sustainable mobility plan for a pilot area in each of the three implementing cities, i.e. Glyfada in Greece, Gyor in Hungary and Darmstadt in Germany. The adopted methodology is based on the following premises:

- Key local stakeholders must be involved in a co–design setting, for drawing a collaborative local sustainable mobility action plan f or the pilot area.
- Consultation mechanisms should be employed to reach a wider audience of citizens and local stakeholders; and
- A publicity and awareness-raising campaign should be mounted to provide information about the proposed Action Plan and SUMP more generally to the population of the city.

2. The UrbanSCOPE methodology for the engagement of local communities

Considerable resources need to be invested to ensure the involvement of local society in the process of raising awareness about sustainable mobility and co-design of SUM measures. UrbanSCOPE adopted a methodology for accomplishing this, which included two stages:

In the first stage, a qualitative and quantitative review of the citizens' opinions and mobility practices in the three pilot areas gave the opportunity to individuals and local organisations to think more deeply about several issues concerning sustainable mobility, as well as share their views about it more widely. This research is reported in another part of this volume of proceedings.

In the second stage, a special effort was made to co-design sustainable mobility measures in the pilot areas of the project, based on a collaborative effort which brought together the local authority of each pilot area, representatives of the civil society and the education community, key individuals with local influence as activists, and urban planning experts. On this premise, a "Task Force" was created in each area, with the remit to design alternative SUMP scenarios for the pilot area and propose an Action Plan to implement the preferred one.

The Task Force composition emerged to be of great importance for the success of this venture. A balanced composition and a personal commitment of the Task Force members defined in the end the efficiency and effectiveness of the operation of the Task Force. Moreover, combination of political presence, the civil society, the local education community and planning experts provided a solid ground for discussion and debate, but also for resolving differences of opinion and allegiance, and at the same time resolving issues that needed technical knowhow and planning skills.

The process of creating the alternative scenarios and the Action Plan included the following steps:

Firstly, the sustainable mobility **vision** had to be defined and agreed upon: what is the mobility target that should be achieved, what the expected benefits for residents would be, how the support from local people would be ensured.

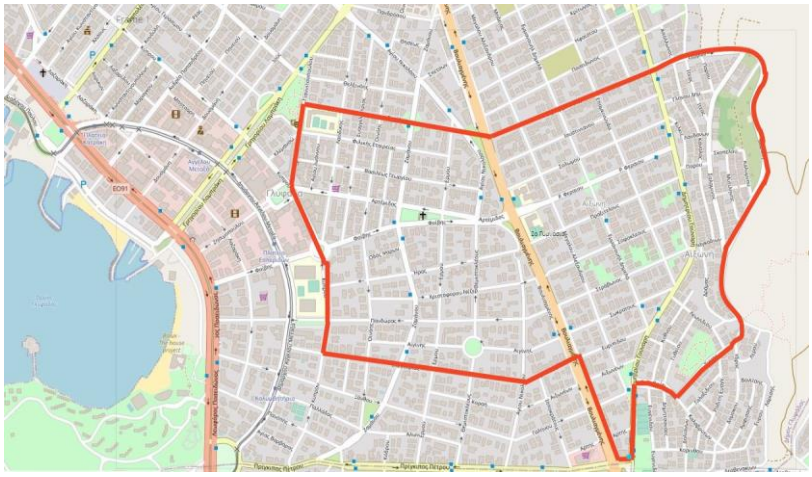
Secondly, three **SUMP alternative scenarios** were drawn. For this, the Task Force had several options for the definition of the scenarios. For example, they could be based on the prevalence of alternative sustainable mobility mean, i.e. walking, bicycling, public transport of different types, or even the private car, but in a more sustainable pattern of use. Or, it could be based on an evolutionary model, starting from a scenario for short term interventions and progressing to the "ideal" long-term sustainable solution.

Focusing on the pilot area in Glyfada, Greece, as an example of good practice, the vision was defined by the following elements:

- A city friendly to pedestrians

- A city that welcomes the bicycle and scooter
- A city with municipal transport services that respond to the mobility needs of citizens
- A city connected to key metropolitan public transport networks, like the Metro and the tram
- A city where the role of the car is respected but controlled, and eventually regulated and restrained, using intelligent ways to reduce car traffic but enhance the mobility of citizens

The Task Force in Glyfada also demonstrated in itself characteristics of good practice, as it benefited from a diverse membership, comprising all the main players mentioned above: two local Councillors, two municipal officers (one technical, one high-ranking executive), four representatives of local civil society associations (one of them a well-known SUM activist), one member of the local education community (secondary school), two urban planning experts. This Task Force met on average once a month for nearly two years, and created, as a final product, alternative SUMP scenarios and an Action Plan for promoting sustainable mobility in the selected pilot area, which is shown below.



The three scenarios designed by the Task Force in Glyfada represented different stages of the implementation of a sustainable mobility plan, which would lead from the present situation of non-sustainable mobility to a fully sustainable city in terms of mobility. Thus, in the first (short-term, mild) scenario, the necessary interventions are identified to make pedestrian and bike mobility easier and safer in the short term. The main priority of the short-term scenario was to improve the walkability of the pilot area, by carrying our small-scale interventions, like the following

- Removal of the municipal waste bins in places where the width of pedestrian passage is reduced below 80 cm, and especially from pavement corners where they obstruct accessibility ramps.
- Removal of low vegetation which reduces or eliminates the passage width for pedestrians
- In cases of big trees and public utility infrastructure (e.g. electricity poles) which reduce the passage width to less than 80 cm (the legal minimum), the width of the pavement is extended locally at the expense of one or more car parking spaces.
- Immediate improvement of zebra lines in pedestrian crossings.
- Review the location of pedestrian crossings in areas which are dangerous for pedestrians (e.g. near street corners), remove obstacles in contact with the crossings and place access ramps at the length of the crossings.
- Activate the practice of imposing fines by the municipal police on cars that obstruct the free movement of pedestrians; and increase the number of “No Parking” signs at such locations.

- Place physical barriers along the pavement, in areas where the phenomenon of parking on the pavement is more often observed (e.g. at the Glyfada city centre).



In addition, provisions were made to offer a better service by the municipal busses; and improve the existing network of cycleways.

In the second (medium-term, moderately dynamic) scenario, measures that would reduce car traffic, especially in and around the city centre and in shopping precincts located in the pilot area are proposed, alongside with the introduction of electric buses and active encouragement of electric cars, encouragement of wider use of bicycles through the construction of a network of cycleways, introduction of electronic information on bus routes etc.

In the third (fully dynamic) scenario, further measures to ensure car restrictions in wider areas are introduced, car sharing is organised and encouraged, car parking facilities are proliferated to cover all residents' and visitors' cars at defined points, while all other measures included in the previous two scenarios are fully implemented city-wide.

The Task Force in Glyfada decided also to place the proposed Scenarios and Action Plan to open public discussion and seek consultation by the citizens of the area and by other stakeholders, not included in the Task Force. To this end, a **public meeting with a wide audience** of local citizens and organisations was held to discuss the scenarios at draft stage, which gathered ideas and drew conclusions that were introduced to the draft version, thus leading to the final configuration of the scenarios and the subsequent Action Plan.

On its completion, the SUMP scenarios and Action Plan for the pilot area of Glyfada were submitted to the City Council and were approved, while a moderate budget was set aside for the implementation of the most urgent of the proposed measures straight away.

3. Awareness-raising campaign

Part of the remit of the Task Force was to organise an awareness raising campaign for sustainable mobility in their city. For this, a combination of online and printed publicity material was necessary, as well as a number of public events that would involve citizens, aiming to provide information on the benefits of sustainable mobility and stimulate their interest. An additional awareness-raising activity introduced by UrbanSCOPE was the student competition that was held in the three cities, which is presented in another chapter of this volume.

Focusing again on good practice introduced by the Task Force in Glyfada, we can refer to a variety of publicity material that was produced to raise awareness and interest on sustainable mobility among citizens. Examples are provided below:

The website of the City Council hosted various announcements of project activities and events and invited citizens to participate. Moreover, posters and leaflets were produced, informing citizens about sustainable mobility benefits and UrbanSOPE activities, while a catchphrase ("I move freely") accompanied by the logo of UrbanSCOPE was printed in all publicity materials, including t-shirts and sun caps, which were used mostly during the scheduled dissemination events.

Public meetings, preferably face-to-face, proved also very good channels to raise awareness about sustainable mobility, because they provide a ground for interaction between the organisers and citizens and offer the opportunity for discussion and answering questions that citizens may have on a subject that is not well-known, or is misunderstood, in many cities. In this context, several public events were initiated by the Task Force in Glyfada, such as:

- A public meeting was held near the end of the Action Plan preparation period, as a public participation event (mentioned also above), targeting the civil society, the education community and citizens, who were invited to respond to the proposed scenarios and Action Plan and provide their own ideas on sustainable mobility.
- A public workshop was held during the final year of the project, to inform citizens about the benefits of sustainable mobility, publicise the results of the UrbanSCOPE project, including the Action Plan and the education activities; and launch the competition, as the ultimate awareness raising event among young people and students. The education community was specifically targeted in this workshop, but also local organisations of the civil society and interested citizens were attracted and welcomed.
- A special event was organised at the city centre of Glyfada, actively supported by the local City Council, which aimed at showing to citizens how the city centre would look and feel like, if sustainable mobility measures were applied in full. For this, the city centre of Glyfada was closed to cars on a Sunday morning for 3 hours, following previous arrangements involving the municipal police and the Metropolitan traffic police. The event was organised by the Task Force as a SUM celebration, including music and fun performances by stilt walkers and clowns, and was widely advertised, attracting over 300 local people, who joined with their families. A Kiosk was set up delivering posters, leaflets, t-shirts and sun caps, informing about the UrbanSCOPE project and the advantages of sustainable mobility for Glyfada. A giant screen was also dispersing information, showing examples from other countries; while the mayor and members of the Task Force spoke to the participants about the importance of SUM. Finally, a treasure hunt was held for young people, leading to the prize of a bicycle.

4. Conclusions: Lessons learnt from the application of the UrbanSCOPE methodology

The experience of implementing the UrbanSCOPE methodology for public participation points out to a number of conditions for success, as well as a number of likely challenges that need to be tackled.

The **necessary conditions** that would facilitate the implementation of the UrbanSCOPE methodology and in particular would increase the effectiveness of the work of the Task Force are summarized below.

- **Close collaboration with the local City Council** makes the work of Task Force more efficient and the process of public participation and co-design more effective. Active involvement of elected members of the Council and municipal officials in the Task Force of Glyfada determined to a large extent the success of its work. Needless to say that the involvement of other key stakeholders, such as representatives of the civil society, local activists and educators was equally important, but if the whole effort was not actively supported by the City Council it would be less likely that the public engagement and co-design process would achieve results "on the ground".
- **Commitment and enthusiasm of the members of the Task Force** is essential for the success of its work. In Glyfada, commitment was demonstrated by the willingness of the members of the Task Force to meet frequently and over a long period of time; and their sustained contribution of ideas for the alternative scenarios and action plan. Equally important was the mutual respect of opinions among the members of the Task Force and the creative cross-fertilisation of ideas and views, leading to a final co-design product that was "owned" equally by all. The presence of urban planning experts was vital for resolving technical issues and advising on planning principles, regulations and procedures.
- **The method of work of the Task Force** in Glyfada was also of vital importance for the composition of a realistic and workable Action Plan. It included a thorough documentation of the SUM problems in the area addressed, which was carried out by members of the Task Force, so that they obtained a first-hand experience of the sustainable mobility issues that prevailed in the area. The identified problems were depicted in photographs and stored in an open source facility, making this material openly accessible to all interested members of the public, who could also add comments to photographs in relation to the addressed problem (link: https://siftr.org/Glyfada_mobility/). Following their documentation, the identified problems were listed by type, discussed and prioritised, in order to be included in the interventions proposed in the SUMP scenarios and accompanying Action Plan.
- To have a **successful and far reaching awareness raising campaign**, it is important to secure the support of the civil society and the education community of the city, as well as the support of local media, while it is always more effective to operate under the aegis of the local municipality. It was also noted that public events that take place in an informal, relaxed environment, which simulates an ideal SUM situation, and address all the family, can be more effective to carry through a message like

sustainable mobility, which is still for many citizens running against the comfort and speed offered by the use of their car.

Inevitably, **some challenges** have been also present during the process of co-design and participation of the different stakeholders involved in the Task Force. Examples of such challenges, identified during the implementation of UrbanSCOPE in Glyfada, include:

- A fine balance had to be kept between the political view and the reality of SUM priorities in relation to citizens' needs and the "vision" of the Task Force. The presence of local Councillors in the Task Force helped to achieve this balance, following vivid discussion and debate.
- Despite the official approval of the Action Plan by the City Council and the approval of an initial budget for SUM improvements included in the first, short-term scenario, the bureaucracy of public bodies, such as local authorities, delayed the promised implementation of the Action Plan, causing frustration to local citizens and organisations who helped the work of the Task Force.
- Over-dependence of citizens on car transport makes it rather difficult for most citizens to realise the benefits of SUM measures. Thus, a radical change in the design of cities is necessary to change citizens' mobility behaviour, as well as introducing sustainable mobility education of citizens from young age, in schools; and mounting an awareness-raising campaign.
- Moreover, to have a successful campaign with real results in changing people's mentality regarding sustainable mobility, some preconditions are necessary: firstly, the campaign should be long-term, and should include a variety of publicity means and media, to reach a wide audience; and secondly, the long-termfunding of the campaign should be secured, which is a major challenge.

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Scenarios related to the sustainable mobility of Győr-Ménfőcsanak and Győr-Gyirmót: Experiences of taking part in the Task Force

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Abstract
Sustainable mobility is one of today's more significant challenges. As there are more and more passenger vehicles, more and more traffic congestion develops, as well as an increasing level of air pollution and traffic-related noise. The population of Győr-Ménfőcsan and Győr-Gyirmót has grown significantly in the last couple of decades. The public transport options in these areas are not satisfactory, so the majority of the population travels by car. This vehicle-oriented traffic causes congestion on Route 83, which causes morning and afternoon traffic jams and increases the public's dissatisfaction with traffic.
In this article, as a local resident, I first describe the local situation, and then the problems and suggestions. Finally, I present the scenarios developed by the UrbanSCOPE action group.

Keywords
Sustainable mobility, Traffic congestion

1. Introduction

The aim of sustainable transport is to ensure the mobility necessary to enforce environmental, social, and economic aspects [1]. Sustainable transport prioritizes "conservative" ethics instead of "consumer ethics", which means that it prefers structured production and consumption patterns that involve minimal resource use and waste generation [2]. As there are more and more vehicles on the roads, the importance of developing sustainable mobility becomes paramount for every city [3].

The UrbanSCOPE Action Group dealt with the sustainable mobility of the city of Győr, within which two adjacent parts of the city, Győr-Ménfőcsanak, and Győr-Gyirmót, were selected. In these areas, the population has increased significantly in recent years, putting a strain on the local infrastructure as well [4,5].

I joined the work of the UrbanSCOPE Action Group as a local resident because I live in Gyirmót, my child goes to school in Ménfőcsanak, and I regularly use public transport, so I am faced with the traffic problems of both parts of the city on a daily basis.

My observations about the two neighborhoods are not based on professional knowledge, but on local experience and the opinions of the local population. My proposals relating to the sustainable mobility of Gyirmót and Ménfőcsanak, despite this, in several cases I indicate my proposals for Gyirmót separately because this part of the city differs from Ménfőcsanak in several aspects, such as population, existing infrastructure, public transport.

After describing the current problems, I formulated proposals based on my own and the local population's opinions. Then I also briefly introduce our field trip.

Finally, I present the three scenarios developed by the UrbanSCOPE Action Group.

2. Residents' proposals regarding the sustainable mobility of Győr-Ménfőcsanak and Győr-Gyirmót

2.1. Further development of public transport, supplementing it with other modes of public transport

- Increasing the number of scheduled flights would not be a solution for the population, since if there were more buses, it would be possible to travel more comfortably, but these buses would still be part of the morning traffic congestion.

- Rail transport could be a solution: use a few wagons as local services for this purpose. Of course, with train services that would serve this section only, I am not thinking of long-distance trains running according to the schedule, but of local train services that would depart from here, from Ménfőcsanak, at the same time every morning. A local flight would be available with a pass, and it would provide local residents with a ride home from the city center in the afternoon. This would be practical, because you can get to the city in 12 minutes by train, and if there were trains departing at a fixed time (ie trains that are not always late according to the schedule, coming from elsewhere), then traffic could be significantly relieved.

- The connected track is accessible, and there are currently 2 railway stations in Ménfőcsanak. However, at the moment the train only stops in the northern part of the settlement, at the "Ménfőcsanak felső" stop. There is no parking here, and there are a few bicycle storage facilities nearby, but their number is low compared to the population.

- In the southern part of Ménfőcsanak, the stop called "Ménfőcsanak alsó" is currently out of use. As you can see in the picture below, it could be suitable for serving a larger number of people, but it would require serious modernization.

1. picture: "Ménfőcsanak alsó" railway station

- Regardless of the technical condition, the fixed track is a given, the space is available, so the railway transport can be connected to the local transport network, thereby significantly relieving the burden on the part of the city as a kind of suburban transport solution. With predictable flights that depart from Ménfőcsanak at a fixed time and can be used with a local pass, a significant part of the population could be diverted to rail transport. In this way, the morning traffic congestion could be significantly reduced, thereby relieving the load on road No. 83, so it would be possible to get into the city with less waiting time.

- The introduction of the suburban railway could operate on a test basis in the first period. In the future, it would be worthwhile to create P+R parking lots and bicycle storage facilities near the railway stops, and by regularizing "carry-on" buses, a convenient and fast transportation solution could be offered to the population (both from the distant streets of Ménfőcsanak and Gyirmót).

- In the future, the development of a 3rd stop could also be of great importance, e.g. next to Hármashatár út, which would mean a boarding option for the population in the middle of Ménfőcsanak.

- This suburban network could be extended to all sections of the city that already have a built-in railway track, so the local service of the city of Győr could be developed quickly and efficiently.

- In addition to the significant "time savings" spent in morning traffic, our city would also see a significant reduction in pollutant emissions if more people used public transport and fewer used their cars,

as air pollution increases significantly during these periods. One of the important pillars of sustainable mobility is the reduction of environmental pollution, so this aspect must be taken into account in every case.

- As far as Gyirmót is concerned, the transformation of the local service system would already represent a significant step forward, in such a way that service 1 could be replaced by service 37, or the two services could operate alternately during the day since the majority of the population living here prefers to get to the hospital, as to Kálvária út and then to Újváros with bus number 1. The hourly flight frequency during the day could be satisfactory if the route of the flight was adapted to the needs of the population.
- In addition, it would become necessary to build a route that would connect Gyirmót with the southern part of Ménfőcsanak, where the school, nursery school, and community center are located. Currently, Gyirmót's district school is in Marcalváros, but despite this, many children go to Petőfi Sándor School in Ménfőcsanaki, as it is a family-run, smaller school. However, it is not possible to transport these children between Gyirmót and Ménfőcsanak by public transport, as the route to Győr stops only in the northern part of Ménfőcsanak, from where they need to walk at least 15-20 minutes. Cycling is not suitable either, within Gyirmót you have to go along Ménfői út, which is also not suitable for driving, as no two cars can really fit comfortably next to each other, there is no cycle path, the pavement does not allow cycling, and there are concrete ditches next to the road can be found, which pose a danger to cyclists pulling away.

2.2. The development of the local road networks

- Gyirmót can currently be approached via road 83, so in any case, it is necessary to travel on this road section for both public transport and private cars.
- The dirt road located at the extension of Gerle street, which provides access all the way to Koroncó, would provide an opportunity to improve the road network. Many people use bicycles and scooters in good weather. By concreting it, it would provide the opportunity for those traveling in that direction from Gyirmót to avoid road 83.
- In terms of both Gyirmót and Ménfőcsanak, the creation of a safe bicycle road network would also be a significant help, both adults and children could use it in good weather.

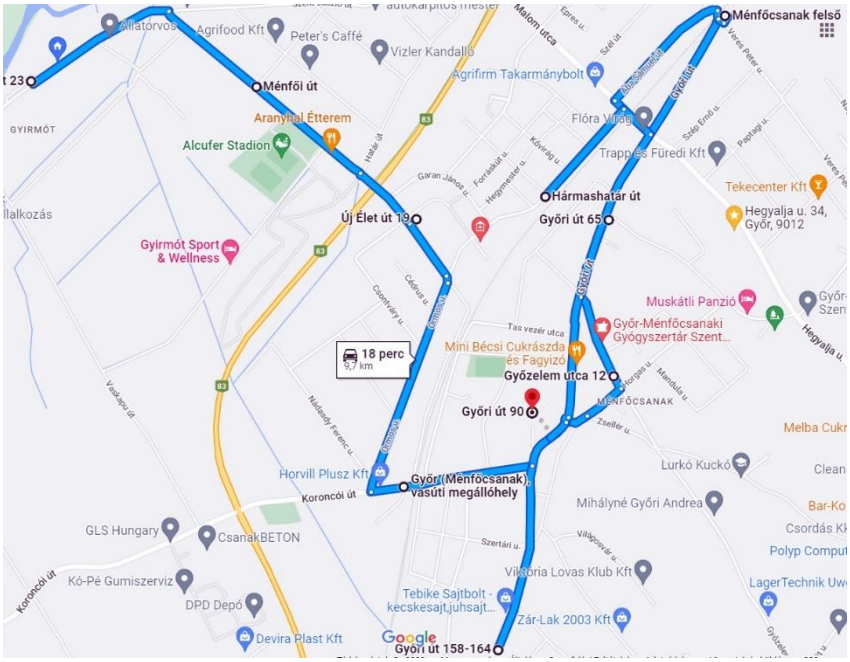
2.3. Attitude formation among residents

- Avoiding cars is an important element of environmental awareness. If there were suitable transport alternatives in these parts of the city, a significant part of the population would choose something else instead of the passenger car. If e.g., suburban transport would be realized by using the bound railway tracks, instead of the current 45–55-minute travel time at peak times, the city could be reached in 12 minutes. This alone would be such an attraction for the local population that they would prefer to use public transport. In addition, bus transport would also be relieved, because those who continue to use the local bus network would be able to travel more comfortably ("free of mass congestion").
- Both Ménfőcsanak and Gyirmót have retained their village character, but both parts of the settlement have grown significantly in population in recent years. Despite this, both children and adults like to use bicycles, and many also travel on foot. In addition to a suitable network of bicycle paths and the expansion of the traffic knowledge of local residents (e.g., a cress course for both children and adults), a formation of an environmental attitude could also be started, which also supports the sustainable mobility of the future.

3. Field trip

In order to support the work of the UrbanSCOPE Action Group, I organized a field trip. The stops of the field trip belonged to those parts of the settlement where the listed problems appeared.

The starting point is Gyirmót, Szent László út 23, which is the parking lot of the store located on the local main road.



2. image: The map related to the field trip

Afterward, we visited the following locations and important points, partly by car and partly on foot:
• Ménfői street
• Ménfőcsanak - Gyirmót intersection
• "Ménfőcsanak alsó" railway station
• Roundabout connecting to Sokoropátka road
• Petőfi Sándor Primary School
• Győri road
• "Ménfőcsanak felső" railway station
• Hármashatár road
• Bezerédj Castle (Culture House)
What was seen during the field visit adequately represented that the collected public comments and suggestions have relevance.

4. **Scenarios**

Finally, I present the three scenarios developed by the UrbanSCOPE Action Group.

4.1 Scenario 1: BAU & Necessary changes

Vision of the scenario

Scenario 1 focuses on personal car transport; however, the aim is not to ease car traffic. The vision recalls that we have to accept that the number of personal cars will increase in the future, and the suburban zones (Ménfőcsanak, Gyirmót, and the surrounding settlements) will expand. This means that the current trends will not change. Although the priority will be given to car traffic, the aim is to move towards sustainability.

Beneficiaries of the scenario are definitely those, who travel by car, however, in the name of sustainability, it will be important to introduce more strategic mobility, and encourage people to leave their cars behind.

In order to reach the goal, it is necessary to establish infrastructure elements, which are able to reduce the car-use. These developments do not need serious investments; in many cases, the success depends on the appropriate space use and reorganization.

Main focus of the scenario

The scenario is car-centric but tries to make car use more sustainable. The biggest problem is caused by taking the children to school/kindergarten as well as commuting to work, therefore alternative solutions should be introduced to solve these problems. Naturally, car-sharing possibilities as well as bicycle lane development also get into the foreground.

Necessary interventions

One of the most important interventions would be to lighten the load of parents taking their children to school. For this purpose, the ideal would be if many of the neighborhood's children would attend primary school in Ménfőcsanak. Generally, by selecting school accessibility and logistic is also a core aspect. The solution from the mobility perspective would be to interconnect the surrounding settlements and schools by a school bus lane. The willingness and support of the parents could be easily surveyed.

The introduction of the solution should not depend on the bus service company, and the operation of schools has been taken out from the municipalities' budget several years ago. Therefore, an important disadvantage is the uncertainty of the financer. Nevertheless, the school bus program would be important (also as a national program), and most probably the local education authority should start the initiative. As a result of this action, a mass amount of crowd would leave the cars and be removed from the morning peak hours (since this is now a non-existing line.)

However, this service has many conditions, and there are several open questions: a teacher should accompany the children, the necessity of bus drivers. (However, the service could also generate workplaces). On the other hand, no infrastructure development is needed.

Another solution would be offered by car-pooling. In order to get to schools, primarily acquaintance parents can come into question, however, this could also be given an organized format (for example through an application, where parents can communicate with each other). Serious doubt is, whether there is any openness, and the question of responsibility is a disadvantage.

The implementation of a "home escort" service (and a school bag carrier trolley) would also offer a solution, with the involvement of teachers, parents, and/or volunteers. In Ménfőcsanak, the school has a quite central location, 3-4 km is the farthest point of the settlement, but the majority of children is living within 2 km distance (half an hour walking).

Not only the access to schools, but the commuting to work is also a critical question. In their case, the following possibilities should be considered: car-pooling and the establishment of community offices. This would mean small offices for 5-8 people, where different (city center based) companies could rent tables. Employees of different companies could work together without the need to leave their neighborhood and commute to the city center. This solution does not equal the home office, because the office environment is given.

Further infrastructure elements to implement the scenario and reduce the car-use:

- Establishment of parking spaces near the city center (10-15 minutes walking). In many cases, commuters also cause mobility problems within the city.
- Designation of short parking zones in front of the schools (in order to avoid congestion).
- Bicycle lane developments (primarily between Gyirmót and Győr, between Gyirmót and Ménfőcsanak, and within Gyirmót). At the moment, cycling here is not safe.
- Checking of speed limits (monitoring and penalties)
- Application of speed bumps (especially in Gyirmót)
- Other transport-related solutions: raising the pedestrian crossings from street levels, narrowing the lanes, and implementation of self-explaining roads. (The paintings do not need a high investment.)

4.2 Scenario 2: Encouraging public transport

Vision of the scenario

Scenario 2 is focusing on the strengthening and development of public transport. The scenario generally envisages intensive investment in order to develop a public transportation supply that will perceptively and definitely reduce personal car use.

Main focus of the scenario

During the further development of public transport, the main emphasis is placed on the suburban railway, since it can save a significant amount of time during peak hours (40 minutes vs 10-15 minutes to the city center). However, several problems should be solved regarding railway transportation. At the moment, trains stop only at one station ("Ménfőcsanak-Felső"), although at this location the development of P+R parking is not possible or only very limited. The reintegration of the second (currently unused, but available) train station is necessary since the conditions for a new parking block are much better around this station.

The other pillar of the scenario is bus transport, which is facing excessive centralization at the moment. From the two neighborhoods, buses are only leaving towards the city center (through Marcalváros). Intruding local round lines and demand-driven vehicles would be ideal. The current bus lines have a very long travel time, due to the long distances and many stops. Because of the main problems, the target audience of the buses are students and elderly people.

The community bike system (Győr-Bike) can have a supplementary role in the scenario. Since the inner city is further away, it could contribute to transportation within the neighborhoods.

It is expected that the Municipality can get financial resources therefore, it is worthwhile to consider the following options.

Necessary interventions

Regarding the development of the railway, there are several interventions to mention.

- Reintegration of the second (currently unused but available) train station in Ménfőcsanak.
- It is necessary to establish enough P+R parking places near the train stations, adapted to the recent traffic volume. Further analysis of a suitable location of the parking space is necessary.
- It is necessary to establish parking places not only for a personal car but for bicycles as well. Establishment and capacity development of current bicycle storage will be required.
- At the moment, the Ménfőcsanak-Győr direction is offering trains only every 2 hours, the frequency should be increased during peak hours.
- For the combination of train and bicycle transport, the more frequent use of low-floor rakes would be necessary.

Furthermore, the train service (at the moment) leaves out several, important intersections. In order to encourage mass utilization, multidirectional improvement is needed:

- Opening towards the Industrial Park/AUDI Factory. There have been ideas previously to create a passenger station here.
- The location of the train station in Szabadhegy is not ideal, the relocation of the station would allow ensuring a proper connection with the mall and the hospital. This development would also affect the residents of Szabadhegy.
- There is a cargo station between the neighborhood Marcalváros I. and II., which could also be extended to the passenger traffic. (However, this is already a long-term perspective).

As for the bus transportation, in the case of Gyirmót, one bus leaves hourly towards the city center (bus line No. 1). However, even this line does not approach several important destinations (for example the hospital or the market hall). The travel time is long (50-55 minutes), and buses are crowded. There is another option to get to the inner city (bus line No. 37), however, this departs very rarely. A systematic review of the bus lines, frequency, and itinerary would be necessary.

As for Ménfőcsanak, the residents of Hegyalja street are not connected to the local public transport, although there is a demand. The hospital and two important neighborhoods (Szabadhegy, Adyváros) can not be reached without changing bus lines. More frequent bus services are a real need, furthermore, the reintegration of the old bus line No. 40 should be considered.

An obvious goal of the scenario is to create bus lanes along the main road No. 83.

Since there is also an emphasis on the Győr-Bike system, it is advised to install further stops within Ménfőcsanak and Gyirmót (currently there is only one community bike station). A new function of the system could be the integration of electric bicycles, which would offer a better alternative for commuters. However, the economic feasibility of the action should also be considered.

Among the long-term objectives it can be mentioned that together with the surrounding agglomeration settlements, a significant number of residents is assembled. The goal is to reach a high-quality connection between these settlements, the case study area, and the city center of Győr. The conscious development and coordination of different public transport modes (i.e. trains and buses) can contribute to this goal. It is advised to handle these settlements together and establish a real suburban transportation system.

4.3 Scenario 3: Local Network Development

Vision of the scenario

The main idea of Scenario 3 is that Ménfőcsanak and Gyirmót can not be treated separately, these areas are core parts of the southwestern agglomeration region. In order to implement the scenario, municipalities have to think of complex systems and it is not enough to only deal with the transport issues of the single settlements or neighborhoods.

Main focus of the scenario

The main transportation method is fixed track transport (similar to Scenario 2), however, it is more complex than that. Besides the development of feeder services, the main aim is the satisfaction of the local structure. This means the appearance and/or extension of different services within the area (for example shops, medical services, offices for government-issued documents, etc.). Bearing in mind the whole agglomeration area, it is a matter of developing the inner (horizontal) connections of a city-wide territory.

An important aspect is the expansion of services and the development of settlement sub-centers, at the same time reducing the car use of the inner space. Scenario 3 does not deal with meeting the needs of the traffic flowing towards the center of Győr, but it focuses on the solution of the demand with local (inner) services.

By looking at the main transportation modes, both the Győr-Pápa and the Győr-Veszprém railway line could be used, however, a more uniform and balanced system should be planned. The investment needs of this scenario are completely different from the previous ones.

Necessary interventions

It needs to be emphasized that the complex development of the agglomeration, the rational settlement-development of the inner centers, as well as the thinking in zones is also a matter of external factor, and it requires a shift in the development focus.

Nevertheless, if the external factor is given, several interventions can support the development of the scenario, in order to make the living space of Ménfőcsanak and Gyirmót viable. The first step of establishing a local center is the satisfaction of the different needs and demands. In other words, it should be analyzed, why people commute to the city center and create alternatives locally.

The following aspects should be taken into consideration:

- The number of local shops is appropriate, however, the variety of products does not necessarily serve all the needs of the residents. There are two hypermarkets nearby, however, traveling to here also burdens the traffic of the main road No. 83.

- It is necessary to establish service buildings. In the case of rentable offices several (inner city) workplaces could be evoked. This means that the Győr-based companies would develop local units for their co-workers living in the area, reducing the traffic flow towards the city. Motivation could be given by the lower rental fees.
- Expansion of sport-facilities (workshops for children, swimming pool or sports hall). From the side of the Municipality, there is a concrete idea already, therefore this can be realized in the near future. Although the planned area is at the border of Ménfőcsanak, commuting towards Győr can be reduced.
- Expansion of entertainment facilities. For this, the given infrastructure could be utilized and better used. The program of the community center should be directed more towards the local youth. (At the moment, there is an ongoing survey about their needs).
- Establishment of a Medical Centre (doctor's office). Other (nearby) examples prove that these facilities are very popular among the local population (since the central medical services are usually very crowded). It is important to broaden the service palette.

The above interventions and the satisfaction of the local needs should be attained by the least possible personal-car use. Therefore, the residents should be encouraged to cycling or walk (placing bicycle storage around the neighborhood).

In order to ease the inner personal car traffic, the further development of bicycle lanes is necessary, so that not only adults but children can also safely use them.

An idea to ease the bicycle and pedestrian traffic is the redesign of the streets (paintings, signs) or the designation of bicycle streets (for example in Ménfőcsanak the Hármashatár street). Within the residential areas, speed limits could be introduced.

Nevertheless, these interventions as well as the better utilization of local services definitely need education and behavior change in people.

5. Conclusion

The population of Győr-Ménfőcsanak and Győr-Gyirmót has grown significantly in recent years. The infrastructure located here can no longer handle the increased vehicle traffic, which is generated not only by the two neighboring districts but also by the residents of the surrounding villages, who use road 83 for their daily commute. Due to the regularly occurring traffic jams, the UrbanSCOPE Action Group chose this part of the city in connection with the sustainable mobility of Győr.

At the beginning of the article, I explained that I joined the work of the Action Group as a local resident, trying to collect the suggestions of the residents of Győr-Ménfőcsanak and Győr-Gyirmót and my own experiences. In the course of my work, I organized a field trip for the members of the Action Group, during which I was able to adequately represent the suggestions of the local residents.

The three scenarios were prepared with the specialists working in the Action Group, using local comments as well. After the vision and main focus of the scenarios, the interventions necessary for their implementation were also presented, which would make sustainable mobility accessible in the Győr-Ménfőcsanak and Győr-Gyirmót neighborhoods.

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Organising a SUMP Competition for University and secondary education students

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Abstract
The UrbanSCOPE project employed a SUMP Competition as a method to engage students in higher education and secondary education, as well as the local communities, in SUMP. The Competition, launched in the 3 project cities in Hungary, Germany and Greece – Győr, Darmstadt and Glyfada, invited university students, secondary education students and interested citizens to enter the competition, define issues and challenges related to SUMP along a selected route, and propose alternative SUMP scenarios using the UrbanSCOPE digital tool to examine different alternatives. The competitions helped in spreading the message and starting a local dialogue on SUMP, engaging the participants in a planning exercise "on the ground", and developing knowledge, skills and positive attitudes on SUMP.

Keywords
Sustainable Urban Mobility Planning (SUMP), Competition, awareness-raising, community engagement, participative planning

1. Introduction – Employing a SUMP Competition as a method to engage citizens in SUMP

The UrbanSCOPE project employed a SUMP Competition as a method to stimulate the interest of University and secondary education students, as well as the local communities, in SUMP and engage them in SUM Planning. The UrbanSCOPE Competition was organised in the 3 project cities – Győr (Hungary), Darmstadt (Germany) and Glyfada (Greece) – inviting University students (in Győr and Darmstadt) and secondary education students (in Glyfada) to participate in a SUMP exercise and formulate their planning proposals for promoting SUMP in their respective cities. In this section, the implementation of the UrbanSCOPE Competition is presented as an effective method that can be easily replicated in other cities with the target groups of University and secondary education students, through the use of the UrbanSCOPE tools or through alternative means.

2. Why a SUMP Competition

Organising a Competition on Sustainable Urban Mobility Planning for University and secondary education students is useful in order to:

- Contribute to the SUMP campaign and spread the message of Sustainable Mobility in the participating cities. The UrbanSCOPE Competition was 3 cities – Győr, Darmstadt, Glyfada
- Encourage students to think of SUMP in their own neighbourhoods and cities, identify issues and come up with creative proposals
- Develop the participants' knowledge, skills and attitudes towards SUMP
- Bring the proposed Scenarios to the attention of the local communities and help start a local dialogue on SUMP

3. The Competition framework

It is important to develop a Competition framework, presented through a "Competition Terms and Conditions" document, outlining the competition rules conditions that apply to all participants, as well as information on what the competition is about, how to enter, the steps necessary to submit an entry, and access to the UrbanSCOPE tools. The Competition can be disseminated through a "Competition Announcement", outlining the main information about the competition and how to enter, and referring to the "Competition Terms and Conditions" document for more information. The Competition can be launched in a special event hosted by the Competition organiser. A Competition Help Desk should also be available by the organiser, in order to respond to questions of potential participants regarding technical issues or the competition rules (creating a Q&A section on the competition webpage is strongly advised).

Every Competition should include a prize for the winners, in order to stimulate the interest of potential participants and reward the winners for their efforts – a small reward for all participants in the form of a token of participation for all participants can also be considered (e.g. a T-shirt, a badge, etc.). The prize for the winners can be related to Sustainable Urban Mobility (e.g. an annual subscription to the local rent-a-bike network, a season ticket to the local public (and municipal) transport networks like bus service, the train or metro, etc.), and/or cover the winners' expenses to travel to another city and present their proposals and experience in an event dedicated to SUMP. The Competition documentation for the UrbanSCOPE Competition, i.e. the "Competition Terms and Conditions" and the "Competition Announcement" are freely available in the project website www.urban-scope.eu in English, as well as in Hungarian, German and Greek.

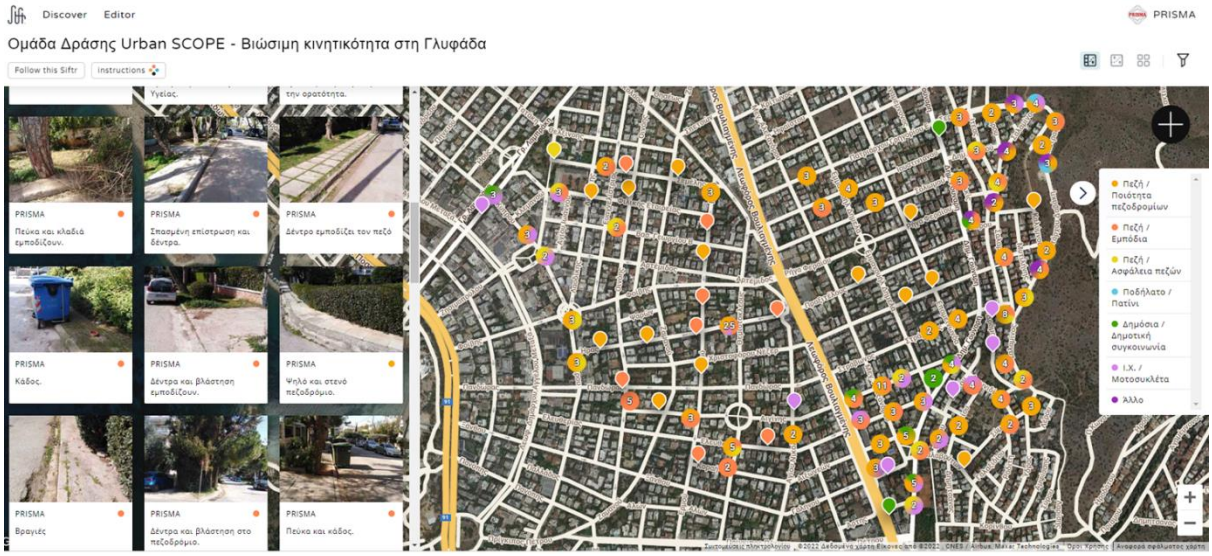
Photo from the event launching the UrbanSCOPE competition in Glyfada (Greece), with the participation of secondary education students, teachers, as well as representatives of the educational community, the Municipality and experts in SUMP.

4. What the Competition is about

The Competition outlines the main challenges in terms of SUMP in the city in focus (in the case of the UrbanSCOPE Competition in Győr, Darmstadt and Glyfada), and iinvites the participants to identify issues in their own neighbourhood/city and use the UrbanSCOPE Digital tools (MEES platform, Siftr) to propose alternative mobility scenarios on the basis of the principles of Sustainable Urban Mobility.

The participants need to take 4 steps, as follows:

STEP 1	Think of a route you would like to examine in your city and define the starting point (A) and the destination (B). For example the starting point A can be your home or a meeting place in your neighbourhood, and your destination B can be your school or the city centre. It's up to you!
STEP 2	Move along the route from A to B and define issues and challenges related to SUMP, i.e. accessing your destination by walking, cycling, public or municipal transport (e.g. bus, train, tram, metro). Challenges can relate to safety, lack of infrastructure, obstacles etc. A great tool to map these issues using your mobile devices is Siftr (www.siftr.org).
STEP 3	Based on your findings please use the MEES platform to design the necessary interventions to support 3 alternative routes from A to B, using various combinations of sustainable mobility means (i.e. walking, cycling, public transport) or even the car or motorcycle. Interventions can include the integration of new public transport infrastructure (e.g. tram, metro or train lines, bus routes etc.), bicycle lanes or stations, pedestrian ways or pavements, car parking stations or parking control, etc. Remember, the alternative routes you propose must be environmentally friendly, respect the mobility needs of all citizens (young and old, able and disabled), be economically sustainable, and promote healthier lifestyles.
STEP 4	Fill in the application form and submit it. The application form will ask you to explain your choice of interventions and routes, and justify them in terms of effectiveness with regard to SUMP: - Environmentally sustainable (i.e. reducing carbon emissions) - Socially inclusive (i.e. taking into account the mobility needs of different profiles of citizens like children, the elderly, the disabled, etc.) - Economically sustainable (i.e. offering affordable options, making the most of the existing infrastructure and not requiring too expensive interventions) - Promoting healthy lifestyles (i.e. physical exercise, minimizing stress etc.)



Screenshot from a Siftr mapping issues related to SUMP – Siftr is a great tool to employ in Step 2

5. The Evaluation criteria and the scoring

A set of 5 evaluation criteria were eployed to assess the competition entries. The assessment can be performed by a competition jury of independent experts in SUMP, representatives of the local municipality, NGOs active in the field of SUMP, representatives of the academic/educational community, etc.

The evaluation criteria and the scoring system employed in the UrbanSCOPE Competition are presented in the tables below:

No.	Name of criterion	Explanation of criterion
1	**EFFECTIVENESS**	Scenarios should tackle the Challenge presented effectively, taking into account the existing issues in the selected study area and proposing integrated and targetted solutions with respect to the values of SUM.
2	**ORIGINALITY**	Scenarios should propose an original concept and include the necessary interventions to support it in an original way. Scenarios that simply copy proposals made in the SUMP Scenario example or good practice examples from other cities or countries without integrating them successfully to the local context, will not be rated highly.
3	**CLARITY**	The Scenarios must be presented in a clear and concise way, easy to understand. The visualised Scenario in the MEES application should be in accordance with your descriptions, and in turn your text descriptions should explain the rationale behind your proposed visualised Scenario.

4	**IMPLEMENTATION POTENTIAL**	The Scenario and interventions proposed must be realistic, both in terms of their practical implementation and cost. Scenarios that propose technically challenging solutions or foreseeing unrealistic costs, will not receive a high score under this criterion.
5	**DEPTH OF ARGUMENTS PRESENTED**	The descriptions submitted should argue efffectively on how the Scenario fulfils the various aspects of SUMP described above, i.e. environmental, economic, social, public health. Entries should argue that their proposed mobility concept reduces CO_2 emissions, is economically sustainable, socially just and inclusive, and promotes healthier lifestyles.

The number of points that define a score include the weighting of the model (original assessment of point range x weighting = points). An entry may get maximum 50 points in total.

Criterion		Point range	Weight
1	**EFFECTIVENESS**	**0 -10**	**1,3**
2	**ORIGINALITY**	**0 -10**	**1,0**
3	**CLARITY**	**0 -10**	**1,0**
4	**IMPLEMENTATION POTENTIAL**	**0 -10**	**0,9**
5	**DEPTH OF ARGUMENTS PRESENTED**	**0 -10**	**0,8**
	Total (max)	**50**	**-**

6. Example – The Competition winners in Glyfada, Greece

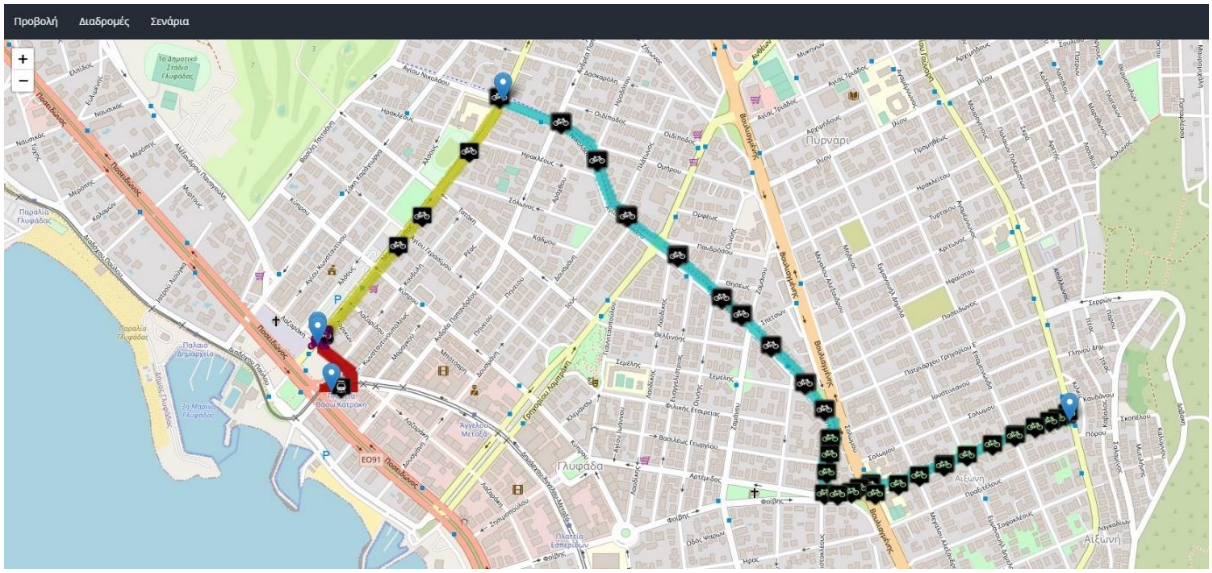
The winners of the Competition in Glyfada, a group of secondary education students from the 2nd Gymnasium of Glyfada named "Oramatistes" (*i.e. the Visionaries*), selected a route popular to children their age (in secondary education) as well as many other residents of upper Glyfada who need to access the commercial city centre. The proposed 5 scenarios focused on being practical as well as sustainable. Thus, the creation and continuation of a cycleway, the creation of a wide pedestrian way, and the use of buses and trams, are aimed at reducing the emissions of carbon dioxide. In addition, the proposed regeneration of green spaces aim at enhancing the quality of the environment of the city and especially the atmosphere.

The proposed scenarios also aim at taking into account the special mobility needs of a wide range of citizens profiles. The second scenario especially focuses on the mobility needs of persons with special mobility needs like persons with disabilities, senior citizens etc., making use of already existing infrastructure in combination with small additions. The first scenario focuses on encouraging children and their parents to use their bikes without fear. The third scenario proposing a wide pedestrian way at the city centre aims at allowing parents with strollers and small children to enjoy a carefree stroll.

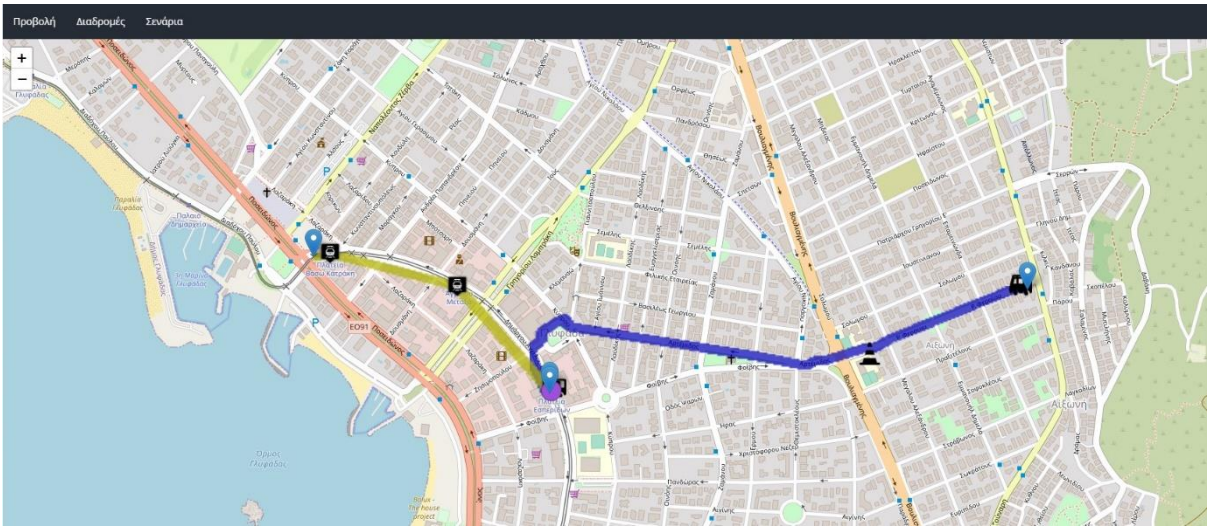
The scenarios utilize the already existing infrastructure and facilities in combination with new ones to promote SUMP. For example, in the first scenario the proposed new cycleway connects to the already existing one. In other scenarios, the already existing tram and bus networks are utilized and combined with walking or cycling.

The scenarios are also aimed at encouraging healthier lifestyles and mobility behaviours. The proposed extended and continuous cycleway will encourage residents and visitors to cycle, while the proposed pedestrian way will encourage residents and visitors to walk without fear and exercise while doing their shopping. The enlargement of the pavements and the creation of more cycleways will encourage residents to move safely and sustainably.

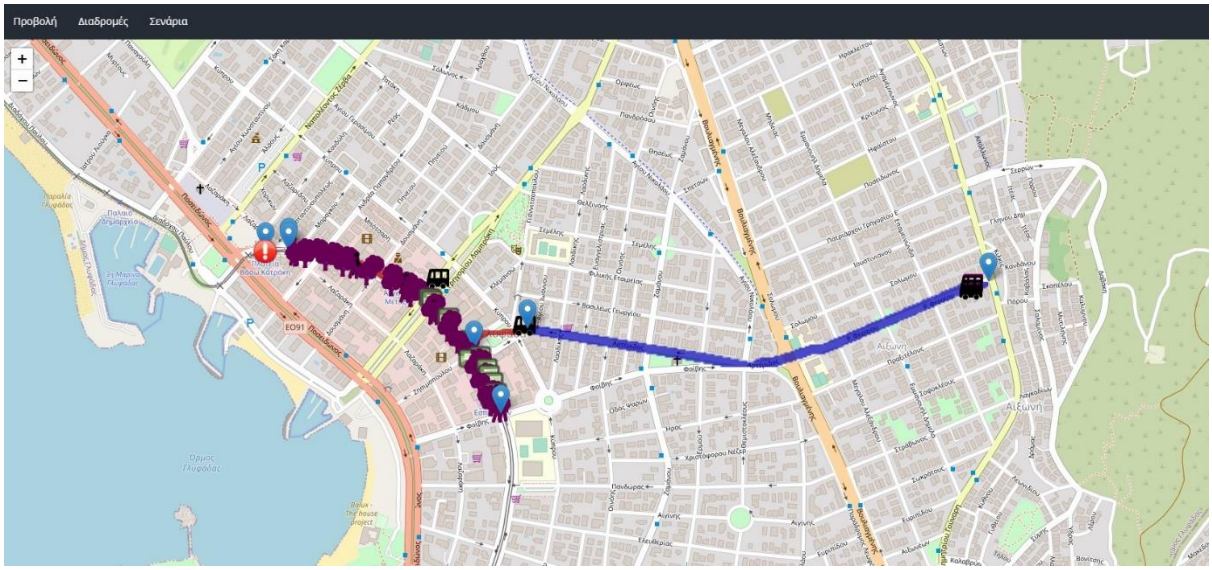
Finally, the competitors identify obstacles and points on the route where there is a risk for the safety of pedestrians and cyclists, and make necessary proposals in line with their scenarios.



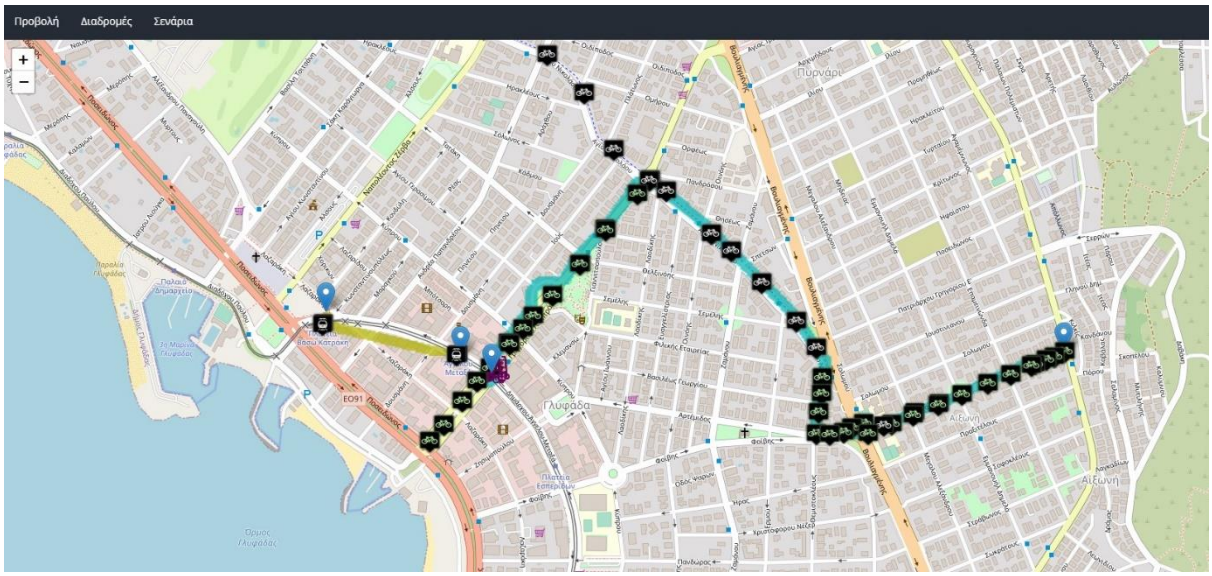
Scenario 1 – Access by cycling, combining existing and new proposed cycleways



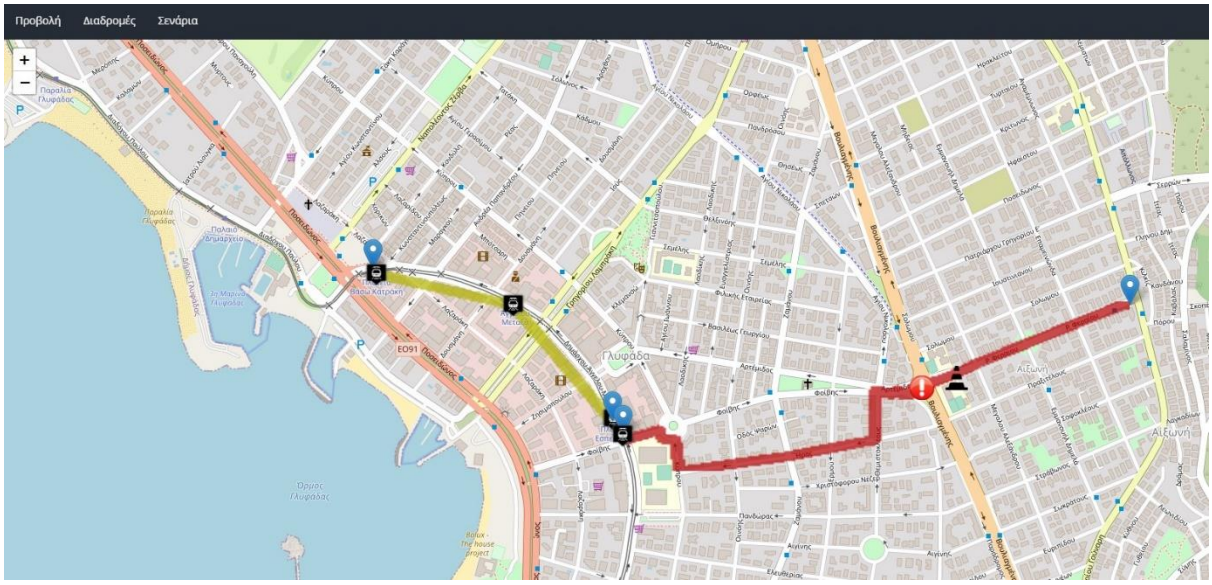
Scenario 2 – Access through the combination of bus and tram



Scenario 3 – Access through bus and walking, proposed wide pedestrian way at the city centre



Scenario 4 – Access through cycling and tram



Scenario 5 – Access through walking and tram

7. Conclusions

The outcomes from the implementation of the UrbanSCOPE Competition in the 3 cities strongly support the effectiveness of employing a competition as a method for encouraging public participation and engaging the public in SUMP, by:

- Spreading the message of Sustainable Mobility through the participation of schools and Universities.
- Offering the opportunity to participants to reflect on actual "on the ground" issues and to weigh the pros and cons of alternative SUMP scenarios, actually engaging them in a planning exercise that takes them beyond the theoretical knowledge on the benefits of SUMP, and towards recognizing the complexity of SUM planning and the need for compromise and vision for the future.
- Helping the participants develop knowledge, skills and positive attitudes on SUMP.
- Bringing the proposed winning Scenarios to the attention of the local communities – e.g. presenting the winning Scenarios to the City Councils and the local community, inviting them to start a dialogue on the future of SUMP in the city and specific neighbourhoods or districts.

The Competition can easily be replicated all over Europe by City Councils, Universities, Schools, NGOs etc. as an activity to stir up public dialogue and enhance public participation in SUMP. Although the target group of the UrbanSCOPE Competition were University and secondary education students, the Competition can extend to other target groups or to the general public. The UrbanSCOPE Competition documentation is freely available and can be used or adapted for organising a SUMP Competition in any city.

Urban Scope International Competition

Overcoming the distance between home and university through sustainable mobility

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Abstract
This study summarises the route plans implemented by the applicant in the framework of the UrbanSCOPE International Competition, which contribute to the implementation of sustainable mobility. The main objective of the competition, as set out in the call for entries, is to achieve transport within and between the city(s) concerned in an ecologically sustainable way, while promoting health. To this end, it was necessary to define a starting point "A" and a destination "B", and to draw up a plan(s) of possible routes and modes of transport between the two end points, using a very useful programme, MEES.

Keywords
Sustainability, Sustainable mobility, Route planning, MEES Platform

1. Introduction

As stated in the competition, the task needed to be structured in 4 steps in order to answer the main question of the project (How to design sustainable mobility scenarios?) and to find visions that integrate the vision to increase Sustainable Urban Mobility (SUM) between the end points.

The steps are as follows:

1. Define the starting point and the destination: the starting point (A) could be, for example your home or a meeting point, and the end point (B) could be a frequently visited place such as your workplace, city Centre, gym or even university,
2. Route and mode(s) of transport: the route can be optimised according to current obstacles (road construction, traffic jams, etc.), allowing for multiple routes on foot, by bicycle, or by public transport (bus, train, car, etc.),
3. Design the MEES platform routes: identify at least 3 proposed alternative routes (scenarios) that are environmentally friendly, respect the transport needs of all city dwellers (young and old, healthy and disabled), economically sustainable and make the most of the infrastructure already available, and promote healthy lifestyles,
4. Choosing the best senator: why choose this one?
    a. Environmentally sustainable (e.g. low emissions)
    b. Socially inclusive (e.g. taking into account the mobility needs of different sections of the population such as children, elderly, disabled, etc.)
    c. Economically sustainable (e.g. low costs)
    d. Supportive of healthy lifestyles (e.g. exercise, minimising stress, etc.)

2. Main transport modes between Budakeszi and Győr.

In this chapter, the specific routes are presented based on the 4 steps defined above, taking into account the terms of reference.

The first step was to define the starting and the ending points, not only in one city, but also in two cities. The starting point is Budakeszi (2092 Budakeszi, Kert street), where the author[1] lives, and the end point is Széchenyi István University (Győr, Egyetem Tér 1). The choice of starting point A and ending point B is justified by the frequent travel between the two points for university seminars and exams, and the many travel options that can be associated with the route.

The next step is to consider that there are a number of modes of transport that can be combined to make the journey. In addition to long-distance bus, train, car, or even carpooling (carpooling), walking and cycling are not excluded within a certain distance. It is of course necessary to take into account the advantages and disadvantages of each of these modes of transport (possible connections) when designing the journey, in order to optimize the scenarios as far as possible in the future.

The **Table 1** below lists the possible modes of transport between the two endpoints and highlights 3 to 3 positive and negative features of each mode that could influence the decision. It is important to note, however, that only advantages and disadvantages specific to the Budakeszi-Győr route have been highlighted in the table and that these have been identified primarily on the basis of the own criteria.

Table 1. Analysis of possible transport modes between Budakeszi and Győr

	Advantages	Disadvantages
Long distance bus	• Low cost (e.g. student discount) • Convenient • Relatively fast	• Polluting • Long distance between bus stop and destination • Timetabled
Train	• Low cost (e.g. student discount) • Low CO^2 emissions • Comfortable (e.g. learning on the move)	• Timetabled • Relatively slow (Many stops) • Long distance between bus stop and destination
Own car	• Mobility high • Comfortable • Fast	• Costly • High CO^2 emissions • Stress factor high (e.g. due to traffic)

	Advantages	Disadvantages
CAR SHARING	• Low cost • Fast • Opportunity to build relationships	• Unpredictable (Short term risk of trip cancellation) • Inflexible in terms of entry and exit points • Requires a lot of organisation
Bike	• Environmentally friendly (e.g. does not damage roads, air) • Healthy • Cost-effective (may incur costs for intermediate transport such as train)	• Weather dependent • Dangerous (road traffic) • Not suitable for long distances
Walk	• Environmentally friendly (e.g. does not damage roads, air) • Healthy • Cost-effective (may incur costs for intermediate transport such as train)	• Weather dependent • Slow • Not suitable for long distances

Highlighting some of the modes of transport included in the table above, parking difficulties in the city have deliberately not been included as a disadvantage when travelling by private car. The rationale is that in this case a university card can be used to use the on-campus car parks, where there are plenty of parking spaces available. This form of transport is the most convenient, but also the most polluting and costly.

Pedestrian and cycling transport can only be a complementary form of transport between Budakeszi and Győr, as a supplement to train, car or bus transport, so pedestrian and cycling transport can only be considered as a complementary element of multimodal transport due to the long distance.

As far as carpooling is concerned -based on our own experience- it is basically a fast and cost-effective form of travel, but it can involve a lot of advance planning and subsequent (but pre-departure) adjustments, which may not always be compatible with a student's life in terms of arrival time (for example, due to exam dates). Another negative point can be the short-term cancellation of the trip, which quickly forces the student to look for a new alternative.

The disadvantage of the long-distance bus is the frequency of 1 service per day and the difficulty of overcoming the distance to bus stops. The vehicles currently running between Budapest and Győr are

[1] In the following chapters, author and student are used to mean the same person

diesel internal combustion engines due to the long distances involved, which also have emissions as a disadvantage.

For the train, the only disadvantage is the distance from the stops, in addition to the relatively slow journey time, as the train timetable is compatible with an hourly departure (but this cannot be compared, for example, with a private vehicle, where the departure depends on the author. Therefore, the timetable is nevertheless a disadvantage).

In the following, the modes of transport in the table above are analysed in terms of travel time, kilometres travelled and emissions. For some modes of transport, walking or cycling cannot be practically excluded (due to the distance between starting and ending points and stops), so their use is highlighted separately.

Table 2. Specificities of transport modes for one route (from Budakeszi - to Győr)

Means of transport	Calculated emission	Travel time to the means of transport	Travel time and distance	Travel time to the end point	Density of traffic
Long distance bus (Line 1268)	69g CO^2/KM/passenger x 125KM=8625g[2]	Additional transport on foot: 20min 1.8KM + Bus: 20min (9.4KMx69g= 648.6g) + Subway: 36min (9KM x 65g CO^2/KM/passenger[3]=585g)	1h 33min[4] 125 Km	Additional transport on foot: 21min 2KM	1/day
		Additional transport by bike: 1h 5min 18KM		Additional transport by bike: 7min 2KM	
Electric Train (Nr. S10)	45g CO^2/KM/passenger x 131km=5895g[5]	Additional transport on foot: 23min 2,2KM + Bus: 20min (9.4KMx69g= 648.6g) + Subway: 8min (1KM x 65g CO^2/KM/passenger=65g)	1h 54min[6] 131 KM	Additional transport on foot: 20min 1,8KM	Every hour
		Additional transport by bike: 40min 10,8KM		Additional transport by bike: 6min 1,8KM	
Own car	200g/KM x 116KM = 23.200g[7]	1min 100M	1h 14min 116KM	1min 200M	Independent from timetable
Car sharing	e.g.: with Tesla Model 3 car: 0g/KM x 116KM = 0g[8]	Sporadic	~1h 14min 116KM	Sporadic	Sporadic

[2] I could not find information on the type and environmental classification of bus Nr.1268, so I used an average value. The value of 69g CO^2/km/way is based on data from Miljolare.no. Online: https://www.co2nnect.org/; Downloaded: 05.06.2022

[3] The value of 69g CO^2/km/way is based on data from Miljolare.no. Online: https://www.co2nnect.org/; Downloaded: 05.06.2022

[4] Source: Website of Volánbusz Zrt.; All rights reserved ©2022 Volánbusz Zrt.; Online: https://www.volanbusz.hu/hu/menetrendek/vonal-lista/vonal/?menetrend=1268; Downloaded: 05.07.2022

[5] CO^2 data: Nyitrai-Cseh, M. – Domokos, Cs. (2021) *Személyszállítás karbonlábnyomának meghatározása;* denkstatt Hungary Kft page 11. Distance by train: Google Maps

[6] MÁV-START Zrt. Online: https://elvira.mav-start.hu/elvira.dll/x/uf?iehack=%3F&ed=6294E83B&mikor=-1&isz=0&language=3&k=&ref=&retur=&nyit=&_charset_=UTF-8&vparam=&i=BUDAPEST*&e=Gy%C5%91r&v=&d=22.06.01&u=1156&go=Suchen; ELVIRA v07.19 (E4); Downloaded: 07.05.2022

[7] Own vehicle emissions are based on engine specification data, Source: Technische Daten Audi A6 2.5 TDI (103 kW / Automatik). Distance by car: Google Maps

[8] Source: Tesla Germany GmbH, Online: https://www.tesla.com/de_de/model3; Downloaded: 01.06.2022; Tesla © 2022. Distance by car: Google Maps

For the long-distance bus, the route between Budapest Népliget and Győr Bus Station is possible with the Line Number 1268 (Budapest-Győr-Pannonhalma). The distance by bus is 125km according to the google map. Calculated with this distance, a one-way trip will result in 8625g CO^2 emissions if only the emissions of the long-distance bus trip are taken into account. However, walking to the bus station, 1 local bus (Budakeszi - Széll Kálmán tér) and 2 metro lines (M2 Széll Kálmán tér - Deák Ferenc tér and M3 Deák Ferenc tér - Népliget) are required. If the approximate emissions of all these "additional" means of transport are added, the total emissions of 1 trip between Budakeszi and Győr are approximately 9,858.6g.

In the case of train transport between Budapest Déli railway station - Győr Railway Station, the calculated emissions from the train (S10 electric train) are also affected by the value of the pollutant emissions from the means of transport to the train station, if not by bicycle. In light of this, the calculated approximate value of a trip is 6608.6g CO2.

The journey to the end point is always on foot, regardless of whether the student arrives by long-distance bus or train, so no values for the journey by public transport have been included in the "Travel time to the end point" column for the long-distance bus or train.

The emissions of my own car, according to the technical data sheet of the installed engine, have an environmental impact of 200g/km, which is the highest value on the emissions list.

With a car sharing option, emissions would be about half that, because there are at least 2 people per 1 car. However, this result depends on the engine the vehicle is equipped with. For the example, let's assume that the author is having a lucky day and manages to get a seat in the driver's seat of a Tesla Model 3, for example. It is important to note, however, that the author has calculated the vehicle's emissions (currently 0g) only during the journey. It does not take into account any main drivers, such as the carbon dioxide emissions from the production of the Tesla Model 3 battery itself, which is an integral part of the total vehicle lifetime (km travelled to be decomposed), if we talk about global emissions over the entire life cycle of the vehicle's production, use and disposal.[9]

The following is a 6-point scoring matrix to illustrate how many points each mode of transport scored when grouped according to different criteria. After summing up the scores, we can see which transport mode is the most efficient according to the mathematical calculation. This is illustrated in Table 3.

[9] Source: Falschmeldung bei Facebook: Wie viel CO2 verursacht die Produktion einer Tesla-Batterie? 08.07.2021; Online: https://www.stern.de/auto/oekobilanz-einer-tesla-batterie--wie-viel-co2-verursacht-die-produktion--30607202.html; Downloaded: 31.05.2022

Table **3**. The scoring shows 6 points for the most efficient and 0 points for the least efficient result per column.

Table 3. Evaluation matrix according to the defined data

Means of transport	Calc. Emissions during the whole distance [g]	Whole time [h]	Whole distance [KM]	Density of traffic	Total costs	Results
Long distance bus (Line 1268)	Additional transport on foot: 9858,6g (2 point)	3h 20min (2 point)	147,2KM (3 point)	1/day (4 point)	BKV[10] bus ticket: 350HUF[11] + BKV subway ticket: 350HUF + Long-distance bus ticket: 2200HUF (student ticket) In total: 2900HUF (3 point)	14 point
	Additional transport by bike: 8625g (3 point)	2h 45min (4 point)	145KM (4 point)		Long-distance bus ticket: 2200HUF (student ticket) + bike: 800HUF In total: 3000HUF[12] (2 point)	17 point
Electric Train (Nr. S10)	Additional transport on foot: 6608,6g (4 pont)	3h 5min (3 point)	147,45KM (2 point)	Every hour (5 point)	BKV bus ticket: 350HUF+ BKV subway ticket: 350HUF+ Train ticket: 1260HUF (student ticket) In total: 1960HUF (5 point)	19 point
	Additional transport by bike: 5895g (5 pont)	2h 40min (5 point)	143,6KM (5 point)		Train ticket: 1260HUF(student ticket) + bike: 630HUF In total: 1890HUF[13] (6 point)	26 point
Own car	23200g (1 point)	1h 14min (6 point)	116KM (6 point)	- (6 point)	7,437 litres of fuel x 480HUF In total: 3569,76HUF (average consumption: 6,7l/100KM) (1 point)	20 point
Car sharing	0g (6 point)	1h 14min (6 point)	116KM (6 point)	Sporadic (3 point)	Between: 1900HUF-2500HUF (Dependent on the driver) (4 point)	25 point

[10] Budapest Transport Privately Held Corporation (BKV) – Public transport company in Budapest
[11] 1€~400HUF (Summer 2022)
[12] Amount determined by last trip
[13] Source: https://jegy.mav.hu/jegy/vonat Downloaded: 03.06.2022

However, there may of course be differences in the table: in the case of car sharing (regardless of the fact that the vehicle emission in the above example is 0g), the driver may specify a certain amount for the Budakeszi - Győr journey, as the vehicle's e-charging will be paid for in most charging points.[14]

In the matrix, car sharing therefore scores 4 points for the amount to be paid, as it is always based on the ratio between driver and passenger.

Long-distance bus and train travel is possible either by bicycle (in which case this one mode of transport is added) or by foot, but walking is also possible by travelling the distance between Budakeszi - Budapest Széll Kálmán tér on the 22A or 22 bus, or between Széll Kálmán tér - Déli Pályaudvar on the M2 subway. The latter mode of transport can be replaced by a 10-minute walk, but looking at the results, it does not make a significant difference in terms of time, distance or cost. A major advantage of travelling by private car is that it is not tied to a fixed frequency of services and has a very fast journey time. The high emissions and significant cost put it in 3rd place overall, after train-bicycle and telecommuting.

In reality, however, the author has practically never chosen to travel by long-distance bus, as the frequency of 1 bus a day can practically never be reconciled with the time of university classes and exams. The situation is similar with car sharing, as it is most often difficult to find a driver at the right time, not to mention the inflexibility of the pick-up and drop-off points.

The train (by bicycle or on foot) and the private car are the most frequent modes of transport for the author for the Budakeszi - Győr distance.

5. Conclusion

The increasingly strong winds of digitalisation in the city of the future will encourage city governments to set up pilot programmes that can manage the uptake of digitalisation. The urban design principles for the city of the future are already in place, and they are essentially as follows. The second principle is to get people moving rather than vehicles. The aim is to ensure that public transport, cycling and walking are favoured by the city authorities instead of vehicles. This can be achieved by setting up cost-effective cycle points for hire at a user charge, or even by offering discounted tickets and passes, or in extreme cases by restricting access to vehicles. The essence of this principle is to make streets people-centred, not to mention significant environmental and noise protection, to name just two examples. However, it is important to underline that technology (such as self-driving vehicles, smartphone-based control, smart cities, etc.) is only a tool and can be used to best effect if cities develop processes to maximise the public benefits of technology and manage the transition to a new inclusive and sustainable economy. Ultimately, all these principles cannot be realised if city governance is not characterised by a sense of immediacy, requiring the city to take a proactive approach to creating a people-centred future. By people-centred, we can mean striving to build a more efficient, sustainable transport system, with the most optimal planning of land use patterns, based on streets redesigned for safety and efficiency.

In summary, we can therefore expect to see a shift from the very high levels of car use we know today to active modes of transport (walking, cycling, cycling, scooters), and an expectation that the new generation will expect public transport to be supported by mobile phone applications rather than timetables, to help them to use different modes and means of transport flexibly.

[14] Mennyibe kerül a villanyautó töltés? Copyright © 2022 Villanyautósok. Gábor Szűcs 05.04.2022; Online: https://villanyautosok.hu/2020/05/01/mennyibe-kerul-a-villanyauto-toltes/; Downloaded: 03.06.2022

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