
Methodical Aspects of Planning Sustainable Urban Mobility

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Abstract:

Purpose: The world experience of successful city management confirms the need to use effective approaches to build a system of urban planning. SUM planning requires addressing complex issues of improving urban infrastructure. Usually, solving such issues requires the creation of complex plans, the implementation of which requires the use of complex control tools. The purpose of this study was to specify and clarify key aspects of the process of planning sustainable urban mobility, as well as to identify priorities in urban planning to prevent certain inconveniences and errors in the implementation of the plan (SUMP).

Design/Methodology/Approach: The following research methods were used in the work, analysis of documents from various open sources using the method of deduction, empirical method – obtaining data for research by conducting a survey, statistical analysis.

Findings: The paper emphasized that planning should be based on economic efficiency and economic growth of cities on the way to improving the urban environment. The Sustainable Urban Mobility Plans must be based on the key interests of all stakeholders (people, market, environment, society). A simple, clear system of indicators should be used for control, which will not complicate the implementation of the control process and will not lead to excessive costs. Not all cities can prioritize environmental issues. Giving priority to electric transport may be relevant only in those cities and countries where favorable economic, technical and organizational conditions already exist.

Originality/value: This study contributes to a better understanding of the problem of creating Sustainable Urban Mobility Plans. The recommendations contained in this article should be useful for public entities dealing with urban mobility, as well as for experts and specialists in the field of urban planning. They will allow them to properly identify the needs of the analyzed city, as well as to correctly select the key SUMP implementation and control measures.

Keywords: Planning of sustainable urban mobility, SUMP, planning priorities, economic aspect, ecological aspect, electric transport.

JEL classification: O18, R42, Q01, Q56.

Paper Type: A research study.

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1. Introduction

Urban mobility is one of the most difficult problems faced by modern cities, as the existing mobility systems do not work under the current conditions. The world's population is increasingly living in cities. Currently, 53% of the population lives in urban areas and by 2050 this number is expected to reach 70%. Today, 64% of all trips are in the urban environment, and the total number of kilometers traveled is expected to triple by 2050. Therefore, the growth of demand will require significant investment in the future to ensure urban mobility and to cope with this growth (Margita *et al.*, 2015).

In addition to the growing demand for urban mobility, mobility needs are evolving. Changing travel habits - increasing demand for services with increased convenience, speed and predictability - as well as evolving customer expectations for individualization and resilience will require expanding the portfolio of mobility services and transforming the business model in which specialized players from other sectors can play an important role and influence the expansion of the mobility ecosystem. Moreover, to achieve the goal of the International Public Transport Association (UITP) to double the share of the public transport market worldwide by 2025 (compared to 2005), public transport stakeholders are working hard to improve the attractiveness, capacity, and efficiency of the mobility system, and they show the need for innovation at the system level despite increasing constraints in public financing.

In modern conditions, against the background of increasing urbanization trends, the problems associated with effective planning and management of municipal development are especially relevant. The world experience of successful city management testifies to the need to use logistic approaches to build an effective urban planning system. The latest tool for urban development planning is sustainable urban mobility planning (SUM planning), which dictates a new approach to transport planning and mobility management in urban areas sustainably and comprehensively. SUM planning also integrates and coordinates other urban and regional development plans, provides strategic vision development priorities, and provides an effective system for monitoring and evaluating the implementation of the plan (Balant and Lep, 2020; Jordová and Brůhová-Foltýnová, 2021; Damidavičius *et al.*, 2019).

The result of a given planning process is a Sustainable Urban Mobility Plan (SUMP). SUMP is “a strategic plan designed to satisfy the mobility needs of people and businesses in cities and their surroundings for a better quality of life. It builds on existing planning practices and takes due consideration of integration, participation, and evaluation principles” (Rupprecht *et al.*, 2019). In other words, it is a document, which holistically responds to the problems and challenges of transportation in cities. It should be emphasized that these plans are not obligatory, but many European cities implement them (Louro *et al.*, 2021; Tennøy and Øksenholt, 2018; Maltese *et al.*, 2021; Przybyłowski, 2018; Gil *et al.*, 2011). The SUMP aims to promote economic, social, and environmental sustainability on an urban scale (Pisoni *et al.*, 2019), which will ensure a certain level of homogeneity in all EU cities in terms of urban mobility strategies and participation level (Maltese *et al.*, 2021).

The Sustainable Urban Mobility Plan should be developed based on four phases (Spadaro and Pirlone, 2021; Wefering *et al.*, 2013; Damerau and Baston, 2021) (Figure 1):

- phase 1: preparation and analysis – in a given phase, the geographic boundaries of the affected area, as well as the structure and strategic context, are defined; the planning situation and possibilities are reviewed, including an analysis of data availability, regulatory and technical conditions for data transfer; the problems and opportunities for mobility in defined planning areas are summarized;
- phase 2: strategy development – future visions and goals for urban mobility as well as short- and long-term tasks are defined; future actions in the field of urban mobility are established with planning organizations and stakeholders; the indicators for monitoring the implementation of the plan are defined;
- phase 3: measure planning – the given phase relates to the planning process from strategic to operational level; measures to be assessed and finalized in the plan are identified; mechanisms of monitoring and planning of financial resources are described;
- phase 4: implementation and monitoring – the phase includes the implementation of pre-defined activities as well as the measurement, monitoring, review, and analysis of the plan's implementation.

Figure 1. Phases and steps of Sustainable Urban Mobility Planning



Source: Arndt *et al.*, 2019.

Separate SUM planning phases constitute a cyclical process that is constantly monitored, analyzed and updated. The preparation of the plan should comply with the current state of knowledge and the requirements of the law in force in each country, as well as be tailored to the individual needs and conditions of the selected city. In addition, the prepared SUMP should comprehensively consider infrastructural, organizational and operational issues, building a comprehensive logic of changes and strive to reduce the negative impact of transport on the environment, climate and people.

Sustainable Urban Mobility Plans should be interdisciplinary and cover transport, environment, economic and social development as well as health issues and road safety. Compared to traditional transport planning, the SUMP concept aims to shift mobility planning practices in local administrations from a traffic-centric approach to anticipating and meeting stakeholder needs (Table 1).

Table 1. Comparison of traditional transport planning and sustainable urban mobility plans (SUMP)

Traditional Transport Planning	Sustainable Urban Mobility Planning
Focus on traffic	Focus on people
Primary objectives: traffic flow, capacity and speed	Primary objectives: accessibility and quality of life, as well as sustainability, economic viability, social equity, health and environmental quality
Modal-focused	Balanced development of all relevant transport modes and shift towards cleaner and more sustainable modes
Infrastructure focus	An integrated set of actions to achieve cost-effective solutions
Sectoral planning document	Sectoral planning document consistent and complementary to related policy areas (such as land use and spatial planning, social services, health, enforcement and policing; etc.)
Short and medium-term delivery plan	The short and medium-term delivery plan embedded in a long-term vision and strategy
Related to an administrative area	Related to a functioning area based on travel to work patterns
The domain of traffic engineers	Interdisciplinary planning teams
Planning by experts	Planning with the involvement of stakeholders using a transparent and participatory approach
Limited impact assessment	Regular monitoring and evaluation of impact to inform a structured learning and improvement process

Source: Debyser, 2014.

One of the basic features that distinguish SUMP from other urban transport policy documents is the wide range of public participation. This means identifying the main stakeholders on the supply and demand side of the transport market and involving them in the planning process from the outset (Matusiewicz, 2018).

The above content shows that the Sustainable Urban Mobility planning process is multi-faceted and complex. The purpose of this study was to specify and clarify key aspects of

the process of planning sustainable urban mobility, as well as to identify priorities in urban planning to prevent certain inconveniences and errors in the implementation of the plan (SUMP). Identifying the key aspects will allow specific cities to properly approach the problem of sustainable urban mobility, considering the current needs of the city. Understanding the actual needs of the city is the starting point in developing practical and effective Sustainable Urban Mobility Plans.

2. Methodology

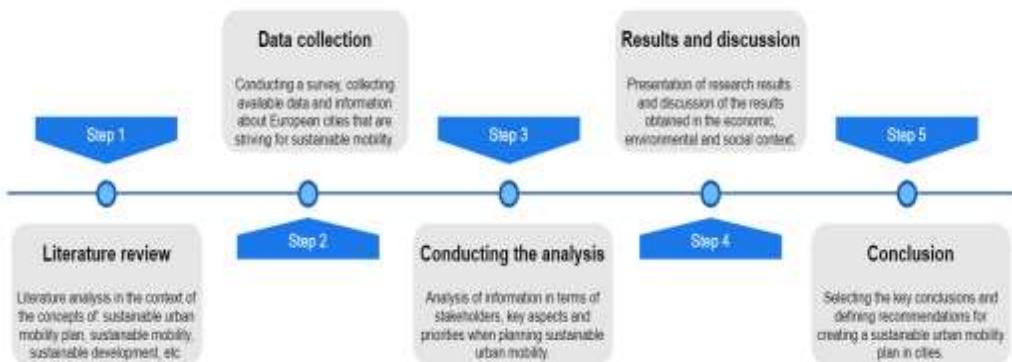
Due to changes in the environment today – increasing world population, increasing air pollution, traffic congestion and increasing vehicle numbers – the European Commission strongly recommends that European cities of all sizes adopt the concept of Sustainable Urban Mobility Plans. More and more cities are striving for sustainable mobility based on SUM planning, as shown by numerous examples in scientific works. Clear guidelines in a unified transport policy and legislation will allow city authorities at the beginning of the road to sustainable mobility to start mastering a new mobility management tool, the Sustainable Urban Mobility Plan. To support decision-making in the field of SUMP creation, the following research questions were formulated in this article:

RQ1: What are the key aspects of creating a SUMP?

RQ2: Is solving environmental problems using SUMP a priority in every city?

To obtain answers to the above research questions the following research methods were used: analysis of documents using the method of deduction; empirical - obtaining data for research by conducting a survey; statistical analysis. Available research publications from various open sources were used to analyze the documents. The methodology of the conducted research included 5 stages presented in Figure 2.

Figure 2. Methodological steps of research



Source: Own elaboration.

The first stage of the work was the review of the literature and open Internet sources referring to sustainable urban mobility plans, sustainable development, and sustainable mobility. The second stage involved collecting information on the implementation of SUMP in European cities, as well as surveying the inhabitants of selected cities.

The third stage of work concerned the analysis of the obtained information. The main stakeholders in the sustainable mobility planning process were highlighted and the key aspects accompanying the creation of a SUMP were analyzed. In the context of the analysis carried out in the third stage, the results of the research were presented and discussed from the three key perspectives of sustainable planning, namely: economic, environmental and social. These considerations became the subject of the fourth stage. The fifth stage – the last one – contained conclusions and recommendations for people interested in implementing the SUMP.

Considering the current and planned activities of European city authorities in the field of shaping sustainable mobility, it seems important to research identifying key aspects related to the creation of SUMP. It should be remembered that the SUM plans will be constantly updated and changed due to the constant development of modern technologies. Nevertheless, this research topic seems to be crucial for the next decades.

3. Research Results and Discussion

3.1 Sustainable Mobility and Main Stakeholders

Sustainable urban mobility involves the transition of cities from a normal mode of traffic dominated by private cars to a more sustainable model of urban and regional mobility based on the use of public transport and environmentally friendly modes of transport, including electric buses and electric cars, bicycles, and other non-motorized vehicles as well as walking (Dorocki and Wantuch-Matla, 2021; Kraus and Proff, 2021; Şengül and Mostofi, 2021). Urban mobility is a set of processes for managing the movement of people, goods, and information within the logistics system of the city under the needs and objectives of its development, as well as environmental requirements, and considering the fact that the city is a public organization whose main purpose is to meet the needs of its inhabitants.

Each mobility strategy with the word "sustainable" in its name raises the question of what sustainable mobility is and how it should be managed by cities. There are different concepts of sustainable mobility and the process of its implementation (Kos *et al.*, 2020; Papa and Lauwers, 2015; Basbas, 2007; Rau and Scheiner, 2020; Lopez *et al.*, 2019), but there is no agreement on a global definition of this concept. The concept of sustainable mobility is derived from the broader concept of sustainable development. The definition formulated by the World Commission on Environment and Development entitled "Our common future" interprets that sustainable development is a "development that meets the needs of the present without compromising the ability of future generations to meet their own needs" (World Commission on Environment and Development, 1987).

Among the significant and most threatening dangers of human civilization are the lack of natural resources, persistent significant loss of human potential, and increasing risks associated with inequality in the quality of life, resource allocation, living conditions and development, etc., (Mamon, 2014). Although sustainable development planning often focuses on environmental goals, such as reducing emissions and preserving the environment, municipal government surveys found that their sustainability policies are

also based on economic goals, such as saving on infrastructure costs and economic development (Wegener, 2013). Therefore, sustainable development includes three basic pillars – economic, environmental, and social, the so-called triple bottom row (Stefaniec *et al.*, 2020; Yazdani *et al.*, 2020; Litman, 2008; Liang *et al.*, 2019; Anastasiadou and Vougiaris, 2019). It is from this perspective that the above-mentioned problem of sustainable urban mobility planning in European cities will be considered.

The goals of sustainable mobility should be considered first. In the economic dimension, from our point of view, it is an efficient mobility system, regional economic development, and operational efficiency. In the social dimension - social equality (justice), security of human life and health, activity, development of people, their productivity. Instead, in the environmental dimension, it is reducing pollution, reducing the impact on climate change, reducing noise, conserving resources, conserving space, protecting biodiversity, etc.

In today's world, we are primarily accustomed to linking mobility to transport. It is the transport component of urban infrastructure that can ensure the achievement of the stated goals (Arthur D. Little and UITP, 2014). In our opinion, it is possible to ensure the sustainable development of modern European agglomerations by improving the interaction of transport with the urban space. Thus, the management of municipal development is mainly reduced to the planning of traffic flows. Planning, which includes setting goals and consequences, taking into account possible difficulties in measuring the latter, can be described as sustainable decision-making.

The Manifesto for a New Urbanity declares the importance of the role of European cities in the processes of globalization and economic development of Europe (The Congress of Local and Regional Authorities of Europe, 2008). All the variety of goals set in the plans of European cities, all the key aspects of urban mobility indicate that the goal is economic growth which will lead to active action to improve the urban environment (Cho and Choi, 2021; Badassa *et al.*, 2020). It is the economic growth of cities that must be both the root cause and the ultimate consequence of solving the problems of improving the quality of life of urban residents.

And in this sense, the Manifesto for a New Urbanity is a unique document that encourages residents of each city to look at the problems in the complex. Active measures to improve urban infrastructure may soon start to bring positive effects not only for people (city dwellers), but also for the market, the environment and, of course, the urban community.

For a sustainable urban mobility plan to be effective and to enable it to monitor the effectiveness of its implementation, it is necessary to understand who the stakeholders are. In our opinion, the beneficiaries (stakeholders) of sustainable urban mobility are (Figure 3):

Figure 3. Main stakeholders of sustainable mobility

Source: Own elaboration.

1. People (city dwellers). People are the main subject who are interested in improving their standard of living, well-being, security, i.e., in meeting their key needs. A person who works and pays taxes to the city budget has a legal right to receive certain "dividends" from the city;
2. Market (as a subject of the city's economy). It has long been known that the quality of roads, uninterrupted operation of transport, speed of its movement significantly affects business activity in the city, as logistics costs affect the cost of goods produced and in general – the price level. The expected increase in labor productivity associated with improved mobility will provide additional impetus to urban economic development. In such conditions, not only the market itself benefits but also its consumers;
3. Environment. The health of city dwellers depends on the state of the environment. Reducing harmful emissions will help reduce morbidity, which in turn will reduce healthcare costs. Funds released to improve the environment can be used to meet other people's needs;
4. Urban community (society). Satisfying communication needs through the more effective and integrated use of the existing transport and urban infrastructure, reducing the disturbing effects of noise and air pollution, improving the accessibility of transport means, improving connections between existing transport networks - these are the factors influencing the satisfaction of human social needs, which in turn determine its development. The manifestation of such development is, among others, a sense of security, the need to communicate, as well as an increase in productivity and social activity.

It is these key interests that must underpin a sustainable urban mobility plan. It is worth emphasizing that the participation of the public in the preparation of the SUMP should be ensured at an early stage of the task definition, even though the participation of residents in the planning process is not regulated at the legal level. Strategies and concepts for the city's development are developed by experts, however, it is extremely

important to involve city residents in shaping the basic theses of such documents (Ukrainian Institute for the Future, 2018). Therefore, the creation of appropriate documentation should be preceded by collecting information from residents and verifying the correctness of the theses in several stages.

3.2 Planning Priorities

It is important to have a clear idea of the priorities of the SUMP plan activities. It is impossible to solve all the problems of the city at the same time because different measures of the plan have different duration of implementation, different amounts of funding, and, most importantly, the urgency of the problems to be solved. For clarity, as an example, we can cite the approach to planning the improvement of urban infrastructure in one of the largest cities in Ukraine – Dnipro.

In 2020, in Dnipro, during a scheduled survey of residents by the city authorities on the development of city infrastructure, on our initiative, one question was asked: "Which of the problems related to public transport are most relevant to you?" A total of 1200 respondents over the age of 18 were interviewed. The data are representative at the level of the whole city in terms of gender and age (over 18 years), as well as based on the division of the city into administrative-territorial districts. As Dnipro is actively developing infrastructure and developing SUMP, the city authorities are very interested in the opinions of residents.

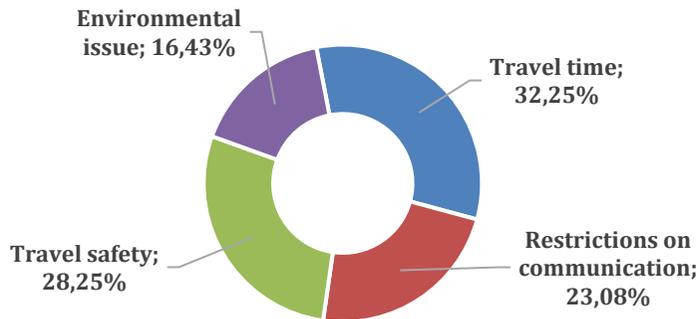
The city is already actively developing transport infrastructure, building new roads, modern "smart" stops for public transport, bicycle roads, parking lots (including intercepting parking lots) on the outskirts of the city). By attracting a large number of credit funds for infrastructure development, the government has a great interest in public opinion on the development of the city. As a result of the survey, the results were obtained, which are presented in Table 2.

Table 2. Current transport problems in Dnipro

Analyzed criteria	In total	18-30 years	31-45 years	46-60 years	> 60 years
Travel time	32,25%	34,60%	37,6%	37,7%	19,1%
Restrictions on communication	23,08%	35,10%	17,0%	19,9%	20,3%
Travel safety	28,25%	17,70%	29,8%	29,1%	36,4%
Environmental issue	16,43%	12,60%	15,6%	13,3%	24,2%

Source: Own study.

The majority of the city's residents put the travel time in the first place out of these four problems (32.25%), safety in the second place (28.25%), communication opportunities in the third place (23.08%), and environmental issues in the last place (16.43%). It is noteworthy that of the four age categories, only three (18-30 years; 31-45 years; and 46-60 years) put the problems of travel time in the first place and the environmental issue in the last place. Only residents over the age of 60 are concerned about the state of the urban environment (Figure 4).

Figure 4. Current transport problems in Dnipro

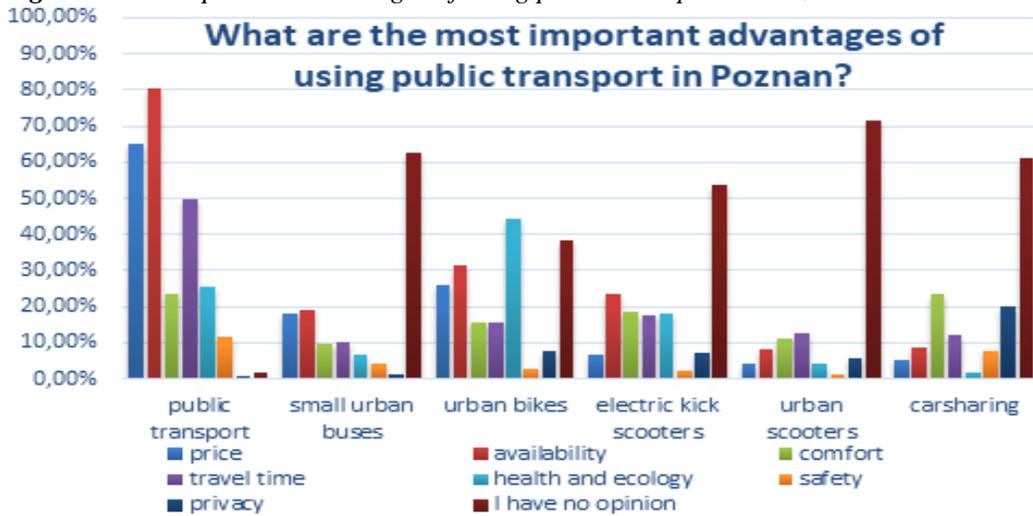
Source: Own study.

Long before the start of planning and conducting surveys, the city authorities identified the urgent problems of the city and began to change its infrastructure. The survey confirmed the correctness of the choice and helped gain time to implement radical changes in the city. On the example of the city of Dnipro, we can see that the obvious and urgent problems were the quality of roads and the travel time. Therefore, having identified these problems as a priority, the city authorities six years ago began to make radical changes in the city's transport infrastructure. And although the sustainable urban mobility plan has not yet been adopted, the city, which has more than one million inhabitants, is undergoing significant changes.

Of course, the results obtained in the city of Dnipro reflect the views of residents of a particular city on their requirements for the urban environment and cannot be used for other cities. In other countries and even in different cities of any European country, the opinions of residents on these issues may differ significantly.

An example of different opinions on changes in the context of urban transport is the city of Poznan – one of the largest cities in Poland. The study was conducted in 2020 on a sample of 1747 residents aged 18 and over (Figure 5). Respondents indicated that public transport's (i.e., trams and buses) biggest advantages are: accessibility (18.17%), price (65.25%) and travel time (49.56%). As the fourth criterion, the respondents distinguished health and ecology (25.66%).

Speaking about city bikes, the respondents consider health and ecology (44.43%), accessibility (31.55%) and price (25.95%) as the biggest advantages. In turn, the biggest advantages of electric scooters are accessibility (23.62%), comfort (18.72%), health and ecology (17.90%) and travel time (17.84%). Poznan respondents use scooters because of travel time (12.71%), comfort (11.37%) and accessibility (8.1%). Carsharing is chosen primarily for comfort (23.44%), privacy (19.94%) and travel time (12.01%) (Oleśków-Szłapka *et al.*, 2020).

Figure 5. The important advantages of using public transport in Poznan

Source: Oleśków-Szlapka et al., 2020.

In Poznan, 1564 (almost 90%) people use public transport every day or several times a week, which proves that it is the most popular means of transport in the city. Concerning the given statement and the data presented in Figure 5, it can be concluded that the inhabitants of Poznan are satisfied with the city's infrastructure and its availability, and therefore the needs that are a priority in Dnipro are not relevant for Poznan. The inhabitants of a given city are increasingly starting to think about the environmental issue, which is confirmed by placing a given aspect in fourth place in the case of public transport, third in terms of electric kick scooters, and in first place in terms of cycling around the city.

Therefore, it should be presumed that the use of bicycles (646 people use bicycles; 37%) is a conscious decision of people who want to have a positive impact on the ecology in the city. It is also worth emphasizing here that 70% of bicycle users assess the city's bicycle infrastructure as good or very good, and as many as 87% of respondents state that cycling in Poznan is safe.

Despite the good ratings of the residents, the city authorities are constantly striving to improve the city's road, tram, and bicycle infrastructure: networks of tram routes are expanded, old tracks are rebuilt, bicycle paths are created, as well as park and ride points enabling the change of own means of transport to public transport. The city's policy is focused on creating a preference for the inhabitants to use public transport (even at the expense of other means of transport).

At the national level, the State Transport Policy for 2006–2025, adopted in 2005 (setting the framework for transport policy at the national level), encourages Polish cities to develop traffic management systems that ensure priority in public transport. The recently adopted Strategy for Responsible Development also assumes striving to actively support changes in the preferences of residents.

According to this document, "activities should be aimed at increasing the efficiency and attractiveness of public transport, which will encourage residents to change the mode of transport from individual to collective" (Gadziński and Goras, 2019).

The policy of each city depends entirely on such initial factors as:

- number of inhabitants,
- condition of public roads,
- number and structure of road transport,
- development of public transport,
- dispersal of public facilities,
- state of the environment,
- lifestyle,
- cultural traditions,
- social activity of residents and many other factors that determine local specifics.

Therefore, SUMP targets and monitoring metrics may differ from city to city. But control indicators should still take into account the initial conditions set out above. Many researchers mistakenly believe that the environmental aspect is the dominant factor in determining the priorities of sustainable mobility (Wegener, 2013; Rodrigues da Silva *et al.*, 2010).

However, this statement is not always true. We were able to see this in the example of only one city. Not all major cities in Europe suffer from environmental problems. In addition, in European countries, there are many industrial cities on the territory of which there are enterprises of the metallurgical and chemical industries. Transport is not the main source of pollution in such cities, but industry, and solving environmental problems of such cities is beyond the capabilities of the city authorities. Investing in improving the environmental situation by (for example) replacing traditional modes of transport with "environmentally friendly" will not be able to significantly improve the situation.

Of course, solving the environmental problems of any city to some extent must be present in the SUMP. But it should always be borne in mind that the main task of sustainable urban mobility is to create comfortable living conditions, and therefore planning should be based on local priorities, the needs of residents, and taking into account the economic and organizational capabilities of the city.

As already mentioned above, Sustainable Urban Mobility Planning is strategic planning of urban development in the direction of sustainable mobility with a focus on residents and their needs, which involves improving urban forms, promoting integrated optimization of urban mobility through the introduction of intelligent transport systems, "greening" urban transport, strengthening financial support for planned actions and further monitoring the effectiveness of the urban mobility system (The Congress of Local and Regional Authorities of Europe, 2008). The methodology for assessing sustainable urban mobility varies widely, but the most common and comprehensive system of indicators that take into account the assessment of various aspects of urban mobility is a

set of sustainable urban mobility indicators that have been developed to combine key areas and characteristics needed to monitor urban mobility (López-Lambas *et al.*, 2010; Rodrigues da Silva *et al.*, 2010).

This system covers eighty-seven indicators, which are grouped into thirty-seven topics that characterize the activities in nine areas, accessibility of the transport system, environmental aspects, social aspects, policy aspects, transport infrastructure, non-motorized modes of transport, integrated planning, circulation indicators urban traffic, assessment of urban transport systems (Rodrigues da Silva *et al.*, 2010).

In turn, proposed by the consulting company Arthur D. Little and UITP Urban Mobility Index (Arthur D. Little and UITP, 2014), takes into account 19 criteria regarding the level of development of transport infrastructure, the share and attractiveness of public transport, bicycles, etc., as well as the level of use and transport efficiency, e.g., vehicle emissions, road fatalities, travel time to work.

We do not agree with this approach to the organization of control over the implementation of sustainable urban mobility plans because the proposed system of control indicators does not meet the classical principles of planning and control. Firstly, too many indicators that need to be monitored significantly reduces the effectiveness of control. Secondly, the vast majority of proposed indicators are either not subject to measurement within simple and generally accepted control tools or have a rather complex procedure for organizing this control.

This can lead to distortion of measurement results, difficulties in interpreting the results, and an unreasonable increase in control costs. In any case, the management of a particular city must determine the system of control indicators, taking into account their organizational capabilities and the number of financial costs for control, which may allow the city budget. The performance indicators of the SUMP should be correlated with the targets, i.e., each goal of the plan should meet one or more criteria for evaluating the implementation of this plan.

The goal of any plan is to achieve one or more goals. The goal should be the effect that is planned and expected. This is the main principle of goal setting. Each goal of the plan must be specific, measurable, achievable, relevant, and timed (SMART criteria) (Doran, 1981). In our opinion, for effective control, it is possible to introduce a minimum set with twelve performance indicators, which are divided into four main groups. The targets for the effectiveness of SUMP implementation in our proposal are:

1. Economic:
 - growth of business activity in the city (change in the number of manufacturing and service enterprises),
 - growth in the volume of goods produced and services provided,
 - growth of tax revenues to the city budget;
2. Logistics (intermediate efficiency indicators):
 - the number of vehicles per unit of time passing on the main highways,

- the number of places with heavy traffic,
 - the number of passengers transported in public transport,
 - the number of transported goods;
3. Social (traffic safety):
- the number of accidents,
 - the number of victims of accidents,
 - the number of diseases associated with air pollution;
4. Environmental:
- the level of air pollution,
 - the noise level on city highways.

Of course, the proposed system is not comprehensive. The list of indicators may be extended or modified for each specific city. The most important thing when planning is to take into account that the SUMP implementation monitoring system must ensure, firstly, the reliability of the measurements and, secondly, that it is not burdensome and does not require high costs.

In the proposed system of indicators, indicators of logistics efficiency are singled out. This can be explained by the fact that, although the logistical effects of SUMP are not key and are considered by us as intermediate, they can affect the achievement of key objectives. Logistics efficiency primarily affects the achievement of economic indicators – cost reduction should affect the overall costs of the city, the cost of supply of raw materials for production and goods, the cost of public transport. Logistical management of traffic flows by reducing the amount of transport in the city helps to reduce harmful emissions into the atmosphere, i.e., solves the problems of morbidity caused by air pollution. The quantity and quality of passenger traffic significantly affect the solution of social problems of the city.

As an example of a simple and visual system of indicators, we give a system of indicators of SUMP efficiency in Mykolaiv (Ukraine). The population of this southern Ukrainian city is 490 thousand people. The city is the administrative center of the agricultural region. There are two large machine-building enterprises and several dozen food industry enterprises in the city. The city is located on both banks of the Dnipro River.

There is only a road bridge that connects areas of the city. There is a sea trade port. The Eurasian Transport Corridor and the Transport Corridor of the Black Sea Economic Cooperation pass through Mykolaiv. The city has long had serious transportation problems related to both passenger and commercial traffic. One of the first SUMPs in Ukraine has been developed and implemented in the city in 2019. To control the implementation of the plan, a system of 34 indicators was created, among which one of the most important are (TOV "A + C Ukraine", 2019):

- % of delays in public transport relative to the schedule,
- % of fatal accidents compared to last year,
- % of road accidents involving children compared to last year,

- % of road accidents with victims involving vulnerable groups of road users (pedestrians and cyclists) compared to other groups of road users,
- the number of pedestrian crossings that meet the needs of less mobile groups to the total number of pedestrian crossings,
- the length of streets free of vehicles,
- noise and air quality indicators,
- % of car trips from the total number of trips in the city,
- % of public transport routes managed by the city due to dispatching,
- % of trips by electric transport from the total number of trips of public transport,
- % of bicycle trips from the total number of trips,
- the length of quality cycling infrastructure,
- the number of intercepting parking lots,
- the area of parking spaces in the city center,
- the share of heavy goods vehicles in the flow outside the permitted routes.

Different indicators have different frequencies of data collection, some of them are collected daily and grouped into reports quarterly while others are collected once in a year or even a few years. However, it is important that data in all indicators are comparable and that corresponding periods have been selected.

On the example of the city of Mykolaiv, it is possible to see the existence of clear criteria concerning the measurement of efficiency of the introduction of SUMP. In the process of approbation of the plan, criteria that are not subject to simple measurements and require complex and financially intensive measures were excluded from it.

3.3 Environmental Priorities

As already mentioned, it is not a priority for all cities to solve environmental problems with the help of SUMP. Moreover, by reducing road transport, solving environmental problems can exacerbate other problems (economic and social). When planning, it should be borne in mind that the number of cars in the city is determined by the need to move people and transport goods. The specificity of transport (including automobile) as a sphere of economy is that it does not produce products, but only participates in its creation, providing production with raw materials, equipment and delivering finished products to the consumer.

The main task of transport is transportation (passengers or cargo). To some extent, transport can be seen as the "blood vessels" of any economy. Therefore, any action to reform the city's transport system in the event of a failed approach could destroy infrastructure and lead to economic losses. The main directions of transport reform in SUM planning should be in such areas as optimization of load capacity, passenger capacity, reduction of distances for transportation, reduction of the number of empty trips, logistical management of transport flows, etc. Replacement of transport on hydrocarbon fuel with electric transport can take place only in the presence of economic preconditions.

In recent years, technological progress has encouraged humanity to switch to the use of electric transport. But when considering this topic, it should be divided into two components. The first is the urgent needs and opportunities of urban communities to introduce electric transport in the urban environment. The second is the commercial and marketing components of this issue, which provoke people to the fastest transition to the use of electric cars.

It is also necessary to take into account that the active introduction of electric transport in the urban environment will not solve environmental problems at the global level. In some cities the environmental situation will improve, in others – it will worsen. In this case, the solution of environmental problems will be transferred to other levels (national and international). Let's dwell on some aspects of the environmental friendliness of electric transport in more detail.

Car transport generates about a third of the world's carbon dioxide production. In this case, the use of fossil fuels, i.e., petroleum products, creates a major problem - the carbon contained in oil and gas, when burning fuel creates CO₂. But let's look at this problem from another angle. Electricity is produced mainly at thermal power plants (over 60% of it is obtained by burning coal and gas). That is, charging electric vehicles with this electricity changes the place of origin of CO₂ - from highways to power plants. The main renewable energy source is hydroelectric power plants. New types of electricity generation - windmills and solar panels – which are quite popular in Europe, account for less than ten percent of global production (Kucherjava and Sorokina, 2019; Oroschakoff and Mathiesen, 2021).

It should be borne in mind that the share of coal used to generate electricity has not changed for many decades, as has the share of hydroelectricity. Only nuclear power plants, which make almost no contribution to CO₂ emissions, are losing ground. For example, the popularity of electric cars in Norway is because in this country almost all electricity is produced by hydroelectric power plants. That means that in Norway, the abandonment of the use of cars with internal combustion engines reduces air pollution and CO₂ emissions.

In turn, in China, 2/3 of electricity is generated by burning coal, and the transition to electric drive is explained by the plan of export of electric cars and environmental problems of large cities (Chongqing, Beijing, Shanghai, etc.). That is, the safety of an electric car or hybrid for the environment will be largely determined by what types of power plants produce electricity for them. The conclusion is that electric cars will not be useful for the environment everywhere, at least in the near future (Timpe *et al.*, 2017; Hall and Lutsey, 2018; Ensslen *et al.*, 2017; Oroschakoff and Mathiesen, 2021).

The analysis of the subject also revealed another aspect of the problem of environmental friendliness. A study by the Institut für Wirtschaftsforschung (Ifo Institute, Munich, Germany) showed that the extraction and processing of Li, Co and Mn required for the production of car batteries are very energy-intensive. Production of one battery, the service life of which is 10 years, leads to the emission of 11-15 tons of CO₂.

Hence, at a mileage of 15 thousand kilometers per year, the electric car, they point out, retains 73-98 grams of carbon dioxide per kilometer (GlobeScan and MRC McLean Hazel, 2007). And if we take into account that a significant part of the electricity with which this machine is "refueled" is produced at coal-fired power plants, the greenhouse gas emissions of the electric car are even greater – 156-181 grams per kilometer. The corresponding figure of a similar car with an internal combustion engine is 112 grams of CO₂ per kilometer.

The above two examples show that the problem raised is not simple and unambiguous in defining further moves. On the one hand, the world is beginning to develop an interest in the transition to electric transport. On the other hand, certain problems need to be resolved to make this idea come true. There are still many controversies regarding the rapid development of electric transport. That is, planning (SUMP) should also consider the real possibilities of introduction and use of electric transport, taking into account technological and economic problems that already exist or may arise in the near future.

It should always be borne in mind that all actions according to the plan (SUMP) should lead to the development of the city. The philosophy of the Manifesto for a New Urbanity (The Congress of Local and Regional Authorities of Europe, 2008) envisages the development of cities that will make life comfortable for its inhabitants. But not all cities can afford the luxury of developing infrastructure solely to meet the consumer needs of the population. It should be assumed that the implementation of SUMP should lead to economic growth, which in turn will improve the quality of life in general. The convenience of movement, communication, ecology, security is not a dogma. It is necessary to make decisions on the priorities of urban environment development based on economic opportunities, development prospects, the presence of urgent problems, and requests of city residents.

4. Conclusions

In this study, we tried to specify and clarify the key aspects of the process of planning sustainable urban mobility and identify priorities in urban planning to prevent certain inconveniences and errors in the implementation of the plan (SUMP). Of course, the planning process always has a creative basis, and we did not aim to create a specific template for SUMP. We have considered only a few key aspects of planning, which we believe are very important.

The first aspect of SUMP planning. We emphasized that economic efficiency must always be present when solving the problems of any city. The economic growth of cities is declared in the Manifesto of New Urbanism as a key thesis (The Congress of Local and Regional Authorities of Europe, 2008). It is the economic growth of cities that must be both the root cause and the ultimate consequence of solving the problems of improving the quality of urban residents' life. The priority of actions for the improvement of the urban environment should be determined by the fact that solving a selected problem of the city should lead to economic effects and, consequently, to the improvement of the quality of life.

The second aspect of planning. The sustainable urban mobility plan must be based on the key interests of all stakeholders (people, market, environment, society). It depends on how effective SUMP will be and what results in its implementation will lead to. It is impossible to solve all the city's problems at the same time, but if the identified priorities of the plan take into account the urgent needs of the city, it is possible to gradually solve all the problems, starting with the most important ones. The experience of two Ukrainian cities shows that it is possible to change the urban environment even in conditions of funding shortages.

The third aspect. The system of SUMP control indicators should be simple, clear and not costly. In the sources studied by us, the authors offer a wide variety of indicators that should be monitored during the implementation of SUMP. Theoretical research is designed to have an alternative in developing a plan. Not all researchers' recommendations need to be adapted to each specific situation. Cities must independently determine control indicators based on local interests and the importance of the problems to be addressed. The complexity of control and the justification of its costs should also be taken into account.

The fourth aspect. We emphasized that it is not a priority for all cities to solve environmental problems with the help of SUMP. It should be borne in mind that solving environmental problems by reducing road transport can exacerbate other problems (economic and social). In addition, not all environmental problems can be solved by cities. Problems such as air pollution by enterprises are beyond the competence of local administrations.

The fifth aspect. Active implementation of electric transport in the urban environment will not solve environmental problems at the global level. Replacing traditional transport with electric ones may lead to the transfer of environmental problems to other levels (national and international). We have shown that not in all countries it is possible to make an active transition to electric transport quickly and without significant costs. Despite the significant interest in electric transport in the world, certain problems need to be resolved to make this idea come true. In addition to controversial issues regarding the environmental friendliness of electric transport, there are technological and organizational problems that will be quite problematic to solve even by large cities. This should also be taken into account when planning sustainable urban mobility.

There are no identical cities, therefore, in principle, there cannot be a standard SUMP or its ideal model. SUMP is developed taking into account local conditions and specific territory, the same applies to procedural aspects, sequence of steps, and mechanisms for choosing the necessary measures. Specific goals, objectives and solutions should not be imposed on cities - SUMP should be adopted at the local level, based on their specifics and the results of consultations with the population, business representatives and other stakeholders. Good planning is not about drawing up a large package of activities, but a correctly assembled sequence of actions - taking into account a set of recommendations and basic guidelines – aimed at a socially significant result, at a real budget, and strict implementation of everything planned.

In the past decade, technological innovation has been gaining momentum, and consumer preferences have also changed. Innovative technologies (intelligent transport systems and information platforms) are changing the concept of mobility and opening up new opportunities. It is important for SUMP developers not only to understand global trends in the development of transport and the market for mobility services but also to correctly predict their impact on a local scale, including on the quality of public transport services and environmental policy. Since the SUMP should be built in such a way that the city has the opportunity to update it (as financial opportunities appear, supplement it with new events), then the monitoring process also will need to be constantly updated and improved.

The recommendations contained in this article should be useful for public entities dealing with urban mobility, as well as for experts and specialists in the field of urban planning. They will allow them to properly identify the needs of the analyzed city, as well as to correctly select the key SUMP implementation and control measures. In turn, further research on a given topic should focus on the impact of modern technologies on the change, updating and monitoring of sustainable urban mobility plans.

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