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RESEARCH ON THE MODAL DISTRIBUTION OF URBAN MOBILITY USING SUMP INDICATORS AND THEIR APPLICATION TO CITIES

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Abstract

Sustainable Urban Mobility Plan (SUMP) is a document of traffic planning of urban areas aimed at the development of sustainable forms of transport to achieve a balance between the now dominant use of private cars versus other forms of transport. When making the plans themselves, an important role is played in the indicator identification process. Sustainable urban mobility indicators are used as a tool for cities and urban areas to identify their mobility system's strengths and weaknesses and focus on areas for improvement. The European Commission has developed its own set of practical and reliable indicators that enable a standardized assessment of system mobility to ensure harmonized data collection. This part of SUMP creation is the subject of analysis and research in this paper. In the cities, there is still no continuous political and institutional support for SUMP where such projects would be included in urban development plans. Also, there are numerous disparities between the way of applying a certain methodology when defining the way of data collection for SUMP indicators. This paper describes the method of data collection for processing basic and additional SUMP indicators. It presents the process of research modal distribution, which can be used to create new SUMPs that are needed by cities interested in this theme.

1. INTRODUCTION

Part of the Sustainable Urban Mobility Plans is, among other things, the implementation of the proposed measures, and it consists of monitoring and evaluating progress. These processes result in the progress of the entire SUMP planning procedure and provide insight into that progress and the impact of the implemented measures, reflecting their importance. For this reason, the process must be as objective and comprehensive as possible. The European Commission has published a set of urban mobility indicators that cities can use to monitor the implementation of SUMP. In this way, cities are enabled to assess the effect of their policy, and to make comparisons with the performance of other cities. The paper is divided into basic and non-basic indicators. The goal is to demonstrate their usefulness for evaluating effectiveness measures, for discovering the strengths and weaknesses of city systems and mobility and identifying areas for improvement through comprehensiveness indicators. In this way, a standardized evaluation of cities in the EU is carried out, and a comparison can be made for cities of similar size based on the collected data. Today's practice there are several world and EU methodology that suggest indicators of mobility, sustainability, or efficiency of the traffic system in cities, with the trend of achieving standardisation of indicators (benchmarking).

2. SET OF SUSTAINABLE URBAN MOBILITY INDICATORS (SUMI)

The European Commission has therefore developed a comprehensive rally of practical and reliable indicators supported by cities to assess its mobility system and just improvements stemming from new practices or mobility policies. As part of the CIVITAS impact and process evaluation framework, a set of indicators was developed to capture and evaluate the changes triggered by mobility-related measures in six main impact categories: society – governance; society – people; the transport system; energy; economy; environment.

Each indicator is defined, explained and comes with recommendations about data collection. These indicators are used already by many cities to keep transparent track of their mobility system and the links to other domains, to monitor their general mobility evolution and to evaluate the impact of mobility-related measures [1]. Indicators of sustainable urban mobility are useful tool for cities and urban areas to identify forces and weaknesses of the mobility system and focus on the areas for improvements. A standardised, methodically sound and practically feasible indicator set can enable public authorities to gain a better understanding of the current status of the city about sustainable urban mobility [2]. The set of SUMI consists of two groups of indicators: basic and non-basic [4]. Indicators 1 to 13 are defined as basic indicators, while indicators 15 to 19 are considered non-basic indicators.

The formulation of Sustainable Urban Mobility Indicators (SUMIs), capable of measuring and assessing potential solutions, is thus the key in addressing transport problems. SUMIs would prioritise people over cars establishing a new hierarchy where priority is given to sustainable transport modes such as walking, cycling and

public transport [3]. A sustainable mobility system does not necessarily aim to completely “ban” cars, but it does seek to impose some barriers to their excessive usage. Simultaneously it should offer transport alternatives that will help people to cover their everyday mobility needs without having private cars as a mono-solution but as another (hopefully secondary) option [3]. As Modal Split, constitutes an important parameter for the calculation of several of the indicator above, is developed a spreadsheet to calculate the modal split, counting as a 14th core indicator (modal split is not an indicator but parameter for several indicators).

2.1. Indicator 1: Accessibility of public transport for the poorest groups

Definition: Proportion of the poorest household budget quartile required to own a public transport (PT) pass (unlimited monthly travel or equivalent) in an urban area of residence. Parameter: Rating = (Price of a monthly PT ticket * average household size) / income of the poorest 25% of urban residents [5].

2.2. Indicator 2: Accessibility of public transport for groups with reduced mobility

Definition: This indicator determines the availability of public transport services for people with reduced mobility. Such vulnerable groups include those with visual and hearing impairments and those with physical limitations, such as pregnant women, users of wheelchairs and mobility devices, the elderly, parents and caregivers who use buggies, and people with temporary injuries. Parameter: Proportion of total public transport services made accessible to individuals who would otherwise not be able to use them [5].

2.3. Indicator 3: Emissions of air pollutants

Definition: Pollutant emissions into the air of all modes of passenger and cargo transport (exhaust and non-exhaust for PM2.5) in the urban area [5].

2.4. Indicator 4: Noise disturbance

Definition: Disturbing the population with the noise generated by city traffic. Parameter: The percentage of the population disturbed by city traffic noise, based on the disturbance factor for data on the population's exposure to noise-by-noise range [5].

2.5. Indicator 5: Deaths on the road

Definition: Deaths on the roads from all traffic accidents in the urban area on an annual basis. Parameter: The number of deaths in the period of 30 days after a traffic accident as a result of the annual ones caused by urban transport per 100,000 inhabitants of an urban area [5].

2.6. Indicator 6: Access to mobility services

Definition: Share of the population with adequate access to mobility services (public transport). [5] Parameter: Percentage of population with adequate access to public transport (bus, tram, metro, train).

2.7. Indicator 7: Greenhouse gas emissions

Definition: Well-to-wheel greenhouse gas emissions of all types of passengers and freight transport in urban areas [5].

2.8. Indicator 8: Stoppages and delays

Definition: Road traffic and public transport delays during peak hours compared to off-peak travel (private road traffic) and optimal public transport travel time (public transport). Parameter: Weighted sum of delays on representative corridors for road private and public transport [5]. For road private transport, the sum of weighted averages for 10 representative car travel corridors as a ratio of peak travel time to off-peak travel time. For (road) public transport, the sum of weighted averages for 10 representative corridors for public transport journeys as a ratio of peak travel times to estimated optimal travel times.

2.9. Indicator 9: Energy efficiency

Definition: Total energy consumption in urban transport per passenger km and ton km (annual average for all modes) [5].

2.10. Indicator 10: Opportunity for active mobility

Definition: Infrastructure for active mobility, i.e., walking and cycling. Parameter: The length of roads and streets with sidewalks, bicycle paths, 30 km/h (20 mph) zones and pedestrian zones in relation to the total length of the city's road network (excluding highways) [5].

2.11. Indicator 11: Multimodal integration

Definition: An interchange is any place where a passenger can change from one mode of travel to another, with a minimal/reasonable amount of walking or waiting. The more modes available at the exchange, the higher the level of multimodal integration. Note: This indicator is called "Multimodal integration", not "Intermodal integration", because the term "Intermodality" refers to freight transport (mainly container transport). Parameter: An index between 0 and 1 that shows the average level of multimodal connectivity of distribution points within the urban transport network [5].

2.12. Indicator 12: Satisfaction with public transport

Definition: Perceived satisfaction with using public transport. Parameter: Average reported satisfaction with moving in the urban area by public transport [5].

2.13. Indicator 13: Active modes of traffic safety

Definition: Fatalities of users of active modes in traffic accidents in the city in relation to their exposure to traffic. Parameter: Number of deaths within 30 days after a traffic accident as a result of an event per year caused by active modes of transport, per billion journeys per year (exposure) [5].

2.14. Indicator 15: Quality of public spaces

Definition: Perceived satisfaction of public spaces. Parameter: The parameter is a successful result of survey responses on respondents' perception of satisfaction with green and non-green public areas [5].

2.15. Indicator 16: Urban functional diversity

Definition: Functional diversity refers to the mix of spatial functions in an area, creating proximity to interrelated activities. Parameter: Average (value 1) or not (value presence 0) of 10 spatial functions related to daily activities other than work in 1 km x 1 km grids [5].

2.16. Indicator 17: Travel time to work

Definition: Travel time to and from work or educational institution, using any type of mode [5].

2.17. Indicator 18: Use of space for mobility

Definition: Proportion of land use taken by all modes of urban transport, including direct and indirect use. Parameter: Square meters of direct and indirect use of space for mobility per capita [5].

2.18. Indicator 19: Safety

Definition: Perceived risk of crime and passenger safety in city traffic. Parameter: Reported perceptions of crime-related safety in the city's transport system (including freight and public transport, the public domain, cycle paths and roads for car traffic and other facilities such as car or bicycle parking) [5].

3. MODAL DISTRIBUTION OF URBAN MOBILITY AND APPLICATION TO CITIES

Problems in the implementation of SUMP often arise due to misunderstanding of the authorities and insufficient interest in starting the processes. A standardized, methodical and practically feasible set of indicators can also lead to the fact that the authorities better understand the current status of the city in terms of sustainable urban mobility and that they start implementing it more efficiently. A definition is given for each of the indicators, as well as their parameter. Clear instructions on how to obtain data for calculating these parameters have been given and this is helpful for large and small cities when it comes to the problem of data collection, which is usually reflected in the lack of human and financial resources. Definition modal split for passenger mobility: Modal division according to passenger kilometers travelled; Modal division according to vehicle kilometers travelled; Modal division according to the number of trips made; Modal division according to the number of vehicle kilometers travelled per trip. Definition modal split for cargo: Modal division according to kilometers travelled by goods vehicles; Modal division according to freight tons and kilometers travelled. Parameter: Modal breakdown by passenger kilometers travelled: the total number of passenger kilometers travelled for each mode of operation within an urban area compared to the total number of passenger kilometers travelled for all modes of travel within an urban area. Modal breakdown by vehicle kilometers travelled: the total number of vehicle kilometers travelled for each mode within an urban area compared to the total number of vehicle kilometers travelled for all modes within an urban area. Modal split by number of trips: the total number of trips for each mode within the urban area compared to the total number of trips for all modes in the urban area. Modal division by freight vehicle kilometers travelled: the total number of freight vehicle kilometers travelled for each mode of goods transport within the urban area compared to the total number of freight vehicle kilometers travelled for all types of freight vehicles within the urban area. Modal division according to vehicle tons travelled: the total number of ton kilometers of goods travelled for each type of goods transport within the urban area compared to the total number of ton kilometers travelled for all types of goods transported within the urban area [5].

4. CONCLUSION

The adoption of the Sustainable Urban Mobility Indicator - SUMI is a framework that helps cities overcome challenges related to more efficient planning of public policies, while at the same time encouraging the implementation of SUMP and smart mobility strategies. SUMI can serve as an important tool for identifying deficiencies sustainable urban mobility and areas where additional measures need to be taken and serves to assess progress towards set goals. One of the greatest advantages of such a standardized approach is that it enables cities to be compared with each other on the basis of databases, and that in this way examples of good practices can be more easily identified and that they can be applied to cities with similar characteristics. EU cities and urban areas and individual cities in Bosnia and

Herzegovina continue to develop sustainable urban mobility plans (SUMP), it is important that the process be standardized to be documented to ensure that achievements and implementation become useful and efficient for cities and its citizens. For the needs of measurement, the situation of mobility, efficiency or sustainability in all cities, so in Bosnia and Herzegovina cities need to be aware of the importance of the cities of collecting data process, and collected data standardize in the comprehensive database of indicators throughout the area of research while permanent monitoring EU development indicators in the segment of mobility. According to that, it is needed to ensure that cities are required to monitor systemic innovations mobility through establishing clear standards, guidelines and database to exchange EU standards, or the proposed SUMI with defined initialers, account and the way of collecting.

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