

Contribution to the development of urban mobility in the city of Sarajevo by implementation of smart mobility hub's

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Abstract

The paper provides general information and guidelines for the development of Mobility the Hub's Action Plan of the City of Sarajevo. The action plan will cover a short-medium term time frame and vision, establishing a series of actions and measures to look for a visible and different concept of mobility through five basic components, such as: infrastructure, electromobility, auxiliary services, renewable energy sources and digital solutions. The main purpose of the work is to reduce the negative effects of traffic on citizens and the environment, encourage the transformation of urban mobility and direct the way of thinking towards sustainable development. Above all, defining the criteria for locating mobility hubs in urban areas. The conclusion is that mobility nodes are built in places of high concentration of people, which are places of exchange of passengers and places to which a large number of people gravitate. The Mobility Hub's concept represents an attractive location/facility that offers users options for environmentally clean and practical modes of travel. It unites infrastructure and services in one place, creating a reliable model for a new way of moving around the city that saves money, is healthier, and increases involvement in green city transportation.

Keywords: *Mobility hubs, Infrastructure, Electromobility, Auxiliary services*

1 Introduction

The need for more sustainable and integrative solutions in sectors related to urban mobility is generally recognized. At the European level, these solutions are gaining increasing recognition and importance.

The initial information that enabled the research in this paper is based on the global trend of favoring means of urban mobility in cities. The purpose of writing the paper is identified as contributing to a more intensive development of urban mobility, while the research in this paper will be useful for further research and implementation of the results in practical application.

Bearing in mind that the city of Sarajevo and the Canton of Sarajevo, through the Sustainable Urban Mobility Plan, entered the phase of

satisfaction for a better quality of life, there was a need to upgrade such a strategic plan [1].

New approaches to urban mobility planning include encouraging the transition to cleaner and more sustainable modes of transport, such as walking, cycling, and public transport; new patterns of car use and ownership; the use of new technologies; and the adoption of new concepts of sustainable urban logistics.

City transport is facing the challenges posed by the new technologies and the undergoing socioeconomic and demographic changes, seeking more efficient solutions and mobility services tailored to citizens' new travel behaviors and needs. The goal of this work is to offer a theoretical and scientific approximation of the modeling of the location selection of mobility hubs in selected environments so that this concept

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can be further applied to other cities around the world, which imply the transformation of the traffic system from conventional to ecologically sustainable modes of transport.

2 The defined vision in the Sustainable Urban Mobility Plan (SUMP)

The defined vision in the Sustainable Urban Mobility Plan (SUMP) is as follows: Sarajevo, open to innovations in sustainable urban mobility, a place of safe and comfortable living, clean air, and providing all its citizens with various mobility opportunities; accessible and affordable zero and low emission public transport; and wide opportunities for intensive development of non-motorized movement. This vision also depends on the aims of "sharing" and "smart" technology to create a collaborative ecosystem of smart cities that are comfortable to live in, appealing, and efficient in terms of departmental efficiency.

Today's urban transportation requirements are as follows:

- addressing the challenges of air pollution and noise pollution in urban areas,
- redesigning mobility models, establishing new infrastructure that supports innovative mobility,
- constant restructuring of the public sector as part of sustainable urban development, and
- collaboration of all city actors in the adoption of new mobility practices.

It is intended to develop creative mobility solutions that encourage public transportation and active modes of transportation, as well as a smart, environmentally friendly method of mobility, while simultaneously lowering individual transportation and automobile ownership. To enhance sustainable transportation, comprehensive action plans should be developed using new methodologies and instruments. The new notion, which will be developed further in this text, can 'trigger' changes by providing a visible and significantly distinct concept of mobility through Mobility Hubs.

A mobility hub is a physical location that satisfies the specific requirements of the community in which it is situated. The 'Lego'

concept of being able to install a variety of physical items linked to mobility (eScooters, eBikes, eCars) or more general services (café, smart solar benches, green environment, storage lockers, etc.) that are appropriate for the site. It also allows for simple extension as the demands of the environment change. Its practicality and variety of mobility modes, increased accessibility across the city, and beautiful architecture will allow the establishment of a "5-minute city." The "5-minute city" goal implies the availability of shared electric transportation within a 5-minute walk of anything in the city. This should become the fundamental basis around which the future of urban transportation is built.

Smart mobility is a revolutionary way of thinking about how we move toward a greener, safer, and more efficient future. It refers to using alternative means of transportation in addition to or instead of owning a conventionally fueled personal automobile. Urban mobility plays a key role in the ecosystems of complex smart cities. It is considered a key factor in enabling cities to become more intelligent, which highlights the importance of identifying the drivers that improve the intelligence of cities [2]. Ridesharing, automobile sharing, public transit, walking, bicycling, and other modes of smart mobility exist. The demand for smart mobility has developed as a result of increased traffic congestion and its accompanying negative effects, such as pollution, deaths, and wasted commute time.

Shared Mobility is a transportation service that refers to non-owned modes of transportation (car, bicycle, scooter, etc.) that the public may hire for short-term journeys on an hourly or daily basis.

2.1 Step-by-step procedure for developing action plans.

The purpose of this document is to provide effective solutions as well as a general strategy for developing mobility hubs. The primary phases in developing mobility hub action plans are as follows:

- Step 1: Framework analysis,
- Step 2: Conducting a self-assessment,
- Step 3: Stakeholder analysis,
- Step 4: Diagnosing mobility hub's and setting goals,

- Step 5: Development of scenario and long-term vision, and
- Step 6: Development of an effective mobility hub action plan.

Step 1: Framework Analysis: The first stage in developing a mobility hub action plan is to identify the overall traffic and mobility framework. The goal of this stage is to identify the fundamental scenario for current traffic and mobility circumstances in terms of legislative and regulatory framework, framework for traffic and mobility planning, sustainable forms of transportation, and/or planned collaborations, and so on. It is vital to inquire as to how the notion of the mobility hub fits into the city's strategic goals. In this regard, a preliminary assessment of the current situation is recommended in terms of regulatory constraints and obligations for the implementation of the mobility hub concept, relevant strategic traffic and mobility plans that are in force or are still being developed (including all measures that are already in the strategic traffic documents approved by local governments), passenger and goods mobility services in municipalities, and partnerships that want to implement the mobility hub concept. It is vital to determine the city's stance on urban mobility upgrading, if it is legally supported, and whether this notion of the hub of mobility is sufficiently progressive in light of the change in terms of clean, green, and healthy mobility.

Step 2: Conducting a self-assessment: The second phase in developing an action plan is for the body that "leads the job" to undertake a self-assessment, identifying possible drivers and impediments that may aid in the process of unifying the vision and setting strategic objectives at the city or municipal level.

Step 3: Stakeholder analysis: Mobility hubs will always be of interest to numerous stakeholders with diverse motivations. Understanding these stakeholders and communicating honestly and transparently with them is critical to ensuring that the model works and lasts. The city administration or municipality may play a primary convening role here, and local leadership is critical for formulating principles, deciding on a management mechanism, developing proper procedures, and serving as a role model to other ecosystem participants. It is critical to establish the needs and opportunities for cooperation in all key municipal and city policy areas, particularly those related to mobility

(including land use, energy, environment, social inclusion, economic development, health, and safety).

Step 4: Diagnosing mobility hubs and setting goals. The fourth step in creating a mobility hub action plan is to perform a passenger and goods mobility diagnostic to better understand the present traffic and mobility scenario as well as the obstacles that impede effective mobility. This will allow for the development of suitable mobility policies to meet local restrictions, mobility patterns, and identified challenges.

Step 5: Development of scenarios and long-term vision. The fifth step in developing a mobility hub action plan is to create a scenario and a long-term vision for attaining the stated and strategic objectives. The scenarios so formed describe the expected role and potential of emerging mobility solutions (namely autonomous vehicles, shared mobility, and electrification) and include socio-economic and environmental perspectives [4]. Setting aside strategic, organizational, and financial operations and concentrating on community needs and physical characteristics, municipal leaders are ideally situated (with the assistance of planners and policy advisers) to examine how and where their first portfolio of mobility hubs may look. Action plans should include the following time frames - short/medium term (1-5 years), and long-term vision (10 years).

The short- to medium-term period (1-5 years) encompasses "quick wins" and policy initiatives that must be designed and executed within realistic timelines to create meaningful outcomes. This is the goal timetable for the Mobility Hub Action Plans, which should contain push and pull activities that will be undertaken by the towns participating as discussed in many instructions [8]-[9].

Step 6: Development of an Effective Mobility Hub Action Plan The sixth step in developing a mobility hub action plan is to devise cost-effective strategies that address the two time periods under consideration. The final step is to decide which method best suits the vision. The development of successful smart mobility, e-mobility, and other measures is at the heart of action plans whose ultimate purpose is to assure the achievement of set strategic goals. Essentially, measurements are identified in this phase in answer to the questions: what, how, where, and when? Individual experience, study, and local

interaction should not be used to determine the most successful solutions. Any initiative for local transportation and mobility that is already "on the agenda" of local authorities in the relevant strategic planning documents is a Memorandum of Understanding, a non-binding agreement between two or more parties setting out the terms and details of the understanding, including requirements and the responsibilities of each party.

3 Potential mobility hub's locations in city of Sarajevo

Mobility hubs, according to their idea, should bring together various infrastructures, equipment, and services to attract, promote, and satisfy people's desire to reach all sections of the city from wherever they begin their trip. It will allow the "5-minute city"—assuring access to needed amenities within a 5-minute walk to enable a clean, green, inexpensive, and healthy trip—with its practicality and variety of transport modes, boosting accessibility in the city, and its design and beautiful form.



Fig. 1. Concept location of mobility hub-s [5]

Locations where mobility hubs will almost surely provide benefits that many people are already aware of can be [7]:

University Campus: "captive audience" will be well aligned with all parts of what the mobility hub incorporates and provides, and the location is often physically built to absorb the infrastructure efficiently.

Railway stations or bus stations will most likely already have some facilities for bikes.

Many cities are attempting to turn their railway stations from filthy locations where the public does not want to go to nice and exciting places. Because they are public transportation hubs, a large number of people circulate here; therefore, the visual shift is quite noticeable to a broad portion of society.

Residential areas provide suitable places for dense housing where many people will demand access to shared inclusive micromobility, whether public, private, or mixed ownership. These habit-changing places may also benefit from the unique 'place-shaping' qualities of mobility hubs and special incentive processes ('push theory'). Transport modes for passengers and freight were highlighted in each scenario, along with possible implications for the individual, society, industry, and government levels [3]. Offering communal amenities (such as new shared facilities, a children's playground, equipment, or similar) for collective individual behavior improvement, for example, this may foster a good feeling of local collaboration. In such places, an inclusive agenda may be quite effective in terms of political appeal.

Park and Ride Locations: where a common location might encourage passengers [6] to explore shared e-cars as an alternative to bus transit to the city. It may, in fact, encourage those same individuals to share clean transportation on incoming trips to the park and ride.

TOURIST AND CULTURAL CENTERS - Many of them are historic sites with narrow streets and no parking.

PARKS: As people are inclined to relax, this is a chance to stress the "green" agenda and provide several supplementary services. Security and emergency response may also be included by offering a well-lit area on dark nights with 'push-to-talk' capabilities enabling worried citizens to speak to the operations center and raise security alarms, or the known position of a defibrillator if a medical emergency occurs.

Commercial areas and shopping centers: transportation alternatives for more people may be supplied by old-world technology; storage cabinets can be useful; and shared light eMobility possibilities are a welcome shift.

3.1 Location 1 – (NEDŽARIĆI - Novi Grad)

Due to the closeness of the student dormitory, as well as the “Alipašino polje” residential neighborhood, a considerable number of trips occur. The target demographic is students, who are prospective consumers of micro-mobility and other services. Students are usually an excellent target audience for strategies to promote the use of these services. Furthermore, private automobile ownership is quite low among this group of prospective consumers.



Fig. 2. Visualization of location 1

3.2 Location 2 – (OTOKA - Novi Grad)

RESIDENTIAL AREA is suitable for the Mobility Hub for the following reasons: A high number of new journeys are arising as a result of the newly constructed residential area and the concentration of a large number of inhabitants in that region. Attractions include the Olympic Pool, which is located near the retail mall and market. It is feasible to use the time spent shopping to charge electric vehicles, trolleybus and tram interchange, appropriate for changing and continuing the trip.



Fig. 3. Visualization of location 2

3.3 Location 3 – (THE UNIVERSITY CAMPUS – Novo Sarajevo)

The University Campus is suitable for the Mobility Hub for the following reasons: The movement of a large number of individuals, Due to the vicinity of a significant number of faculties, it might be regarded as a site with a high number of finishing and starting journeys. The closeness of the major bus and railway stations makes it easy for visitors to continue their trip to the city center and the historic section of town.



Fig. 4. Visualization of location 3

3.4 Location 4 – (NATIONAL MUSEUM – Novo Sarajevo)

Sarajevo center is suitable for the Mobility Hub for the following reasons: A tourist destination due to the National Museum itself, as well as neighboring retail and business areas, hotels, and so on. Due to the proximity of Wilson's promenade, one of the most renowned promenades along the Miljacka river, there is a high concentration of people. An excellent starting place for completing the trek to the city center on electric scooters. Proximity to high school and college: high school students are prospective customers of micro-mobility and other services, but they are also an excellent foundation for fostering innovative, green, and smart mobility technologies.



Fig. 5. Visualization of location 4

4 Conclusion

Mobility plays a vital role in our daily lives and has become a defining factor of current society, the way we live and move. Mobility, or the ability to move from one location to the other, links cultural, economic, social, and political aspects of our global society.

Global mobility demand continues to grow, along with the mobility systems' carbon impact. In order to manage future mobility demand, and a much-needed transition to sustainable, low carbon mobility, it will be crucial to achieve seamless transitions from one transport mode to another.

The sole provision of transport options will not be enough. Beyond providing the modalities necessary to manage a shift to more sustainable transport options, mobility behavior needs to shift in order to enable a successful adoption of these. Mobility hubs can constitute the missing piece – they can make alternative options easier, more attractive, and more convenient to use. The design, location and specifically the associated services of a mobility hub can influence this.

The outcomes of all the preceding processes will be summarized in mobility hub action plans. Following the final review, the representatives must officially accept the action plan at the municipal or city level. It is also critical that the action plan be generally approved by stakeholders and the public. Previous agreements must be examined internally and by key external stakeholders, including external reviewers, to verify that they accurately represent the draft plan. The shape and conditions of adopting action plans will be determined by the national or local regulatory framework and administrative structure.

In general, the following goals should be met: the entities in charge of developing actions and budgets should also accept the action plan, assuring conformity with national and local rules surrounding its approval and, in part, with the needs of Sarajevo's sustainable urban mobility plans.

The action plans must be evaluated in terms of procedural requirements and must be in accordance with the EC, national, regional, or local regulatory framework. To guarantee wide ownership of the plan, it is vital to educate and engage stakeholders (associate meetings) and people as part of this stage. Stakeholders and residents should feel as though this is "their"

strategy to increase mobility and quality of life. Before presenting the action plan to the public, it must be modified and harmonized depending on the outcomes of the pilot activities.

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