

9th INTERNATIONAL CONFERENCE
"TOWARDS A HUMANE CITY"
Reshaping Mobility
Novi Sad 19th and 20th October 2023

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DEVELOPMENT OF NEW PUBLIC TRANSPORT SERVICES - CASE STUDY OF ŠIBENIK

Keywords

Urban mobility
Insufficient
public transport
Tourism and
mobility

Abstract

The goal and purpose of the research is to show a sustainable way of developing and implementing a completely new system of public passenger transportation on the example of a typical medium-sized Mediterranean city - Šibenik. The hypothesis of the study is to present a possible sustainable implementation of a new system of public passenger transportation regardless of financial, spatial, or other limitations. The research consisted of data and measures determined by the study of the development of urban passenger transport in the city of Šibenik, as well as problems that arose during the implementation phase. The results of the research and study are to confirm the hypothesis and give the possibility to other similar urban areas that sustainable public transport is the future of the transport system of Mediterranean cities.

1. INTRODUCTION

The research's objective is to demonstrate a sustainable method of creating and executing a fully new public passenger transportation system using the example of a typical medium-sized Mediterranean city - Šibenik. The study's hypothesis aims to

propose a feasible long-term deployment of a new public passenger transportation system, independent of budgetary, geographical, or other constraints. The research included data and metrics derived from a study of the development of urban passenger transportation in the city of Šibenik, as well as issues encountered during the implementation phase. The findings of the research and study are expected to corroborate the theory and provide hope to other similar urban regions that sustainable public transportation is the way of the future. To improve the city of Šibenik transportation system, a new, more efficient system of public passenger transportation must be defined. Given that this Study will serve as the foundation for the creation of a new public service agreement (PSA) contract under which municipal regular bus transportation will be provided in the administrative area of the city of Šibenik, the emphasis on defining a new system of public passenger transportation is concentrated specifically on the bus subsystem. The purpose of a quality bus subsystem in the city of Šibenik must be enabling efficient and reliable transport for the purpose of compulsory travel (work and school) and for the purpose of optional travel (recreation, leisure, etc.), providing a reliable transport service for users who do not have access to an alternative mode of transport, ensuring quality transport connections, increasing the mobility of citizens and visitors of the city of Šibenik by increasing the capacity of transport services on the city corridors, increasing the energy efficiency of the transport system of the city of Šibenik, and reducing the traffic load on the road network and related adverse consequences by providing an effective alternative to private transport. As a result, by establishing high-quality municipal regular transportation, positive effects such as increased accessibility of city content to more users, reduced time loss and traffic delays, reduced negative environmental impacts of transportation, increased the attractiveness of city space and creating preconditions for its revitalization, and increased traffic safety will be realized. The primary purpose of the new public transportation system's design is to attract as many people as possible. The publication includes a literature review, study methodology, findings, and discussion, as well as conclusions and recommendations for future researchers.

2. LITERATURE OVERVIEW

In many cities, there is growing concern about reliance on automobiles and the need to clean up the environment. One strategy is to build new public transportation networks. Around the world, cities are developing and building a lot of these. The decision-making process for such systems is the subject of this essay, specifically its justification and how it affects the environment, urban development, and travel demand in the city. The analysis is based on a global survey that was conducted as part of a project to investigate how people decide which technology is best for an urban transportation system [1]. In situations where the management of public transportation is divided among several stakeholders, it can be difficult to design effective systems that draw users. As a result, topics like coordination, collaboration, and steering in settings with complex governance have received more attention in recent public transportation research. What must be done, however, is better

understood than how to bring about the required adjustments. In order to better understand how to improve the conditions for public transportation, this paper presents a systematic review of the relevant literature. The reviewed articles are analyzed to better comprehend the significant obstacles to developing and putting into action policies to promote the use of public transportation, the methods used to address issues raised in the literature, and the benefits and drawbacks of various methods. Based on the analysis, an analytical framework is created that can be used to research and assess working methods for dealing with pressing issues. The framework is made up of three interrelated components: institutions (laws and regulations that control how the actors interact), work processes (phases in this interaction), and actors. Considering the findings of the systematic review, several crucial issues for developing working procedures for addressing the difficulties are emphasized for each of the factors [2]. The techniques for the development of urban transportation sustainably are described in this. In the context of modern transport, paper, are examples that lend support to the thesis policy based on the use of environmentally friendly measures, such as cycling and walking, if an alternative to the current system is one that is properly coordinated with public transportation single-person motorized transportation predominance. In order to create this kind of transportation policy it is necessary to implement suitable measures, such as raising drivers', for the system to function properly, awareness of social responsibility as it relates to being motivated by environmental preservation, increasing health as well as efficiently using the city's resources (cultural, sporting, and recreational opportunities, etc.) [3].

3. METHODOLOGY OF CONDUCTED STUDY

To begin, the current transport model of Šibenik from 2015 was used as a starting point, and that year did not represent the relevant status of the transport system. The model has several flaws, including an insufficient level of zoning in the Šibenik settlement and an insufficient level of network model in the Šibenik area, inaccuracy of certain parameters of existing roads, incorrect public transportation system data, a lack of description and a clear structure of origin-destination travel matrices for all transport subsystems, and a lack of origin-destination matrices for light and heavy goods vehicles. The model's correction, supplement, and calibration were based on primary and secondary research. A field study of manual traffic counting at important places in the city of Šibenik, as well as counting the entry/exit of passengers on public transportation lines, was undertaken as part of the main research. The secondary study comprised an examination of submitted and publicly accessible data regarding Šibenik transportation system. The field survey was conducted in February 2022 due to structural, financial, and other issues. Also, February was chosen because the focus of the study was to detected mobility patterns of inhabitants of City of Šibenik. Study covered the following tasks: counting categorized vehicles at intersections and intersections, counting passengers on public bus transport, counting passengers in the maritime port of Šibenik, and counting of parked vehicles in the parking lots "Draga", "Mulo Krke", "Pier Vrulje"

and "Railway Station". By counting all forms of traffic in the wider area of the city of Šibenik, it is possible to explore the cause-and-effect relationship, as well as the mutual impact of certain types of traffic on each other, as seen in tables 1. and 2.

Table 1. Demand on city bus lines

Number	Name	Length h	Travel time (min)	Departure /day	Daily demand
1	1 SI Njivice-Tržnica-Vidici-Njivice	10,8	30	27	359
2	2 SI Meterize-Tržnica-Meterize	6,5	19	27	186
3	3 SI Šubičevac-Tržnica-Šubičevac	6,8	21	27	185
4	4 SI Ražine-Tržnica-Ražine	12,7	30	30	387
5	5 SI Brodarica-Tržnica-Brodarica	15,8	27	27	384
6	6 AK-Solaris-Zablaće	19,5	30	14	96
7	7 SI Mandalina-Bilice-Tržnica-Mandalina	17,2	37	10	26
Total		90,82	-	159	1.623

Table 2. Demand on suburban lines

Number	Name	Length	Travel time (min)	Departure/day	Daily demand
1	AK - Brnjača	43,8	105	6	30
2	AK - Lepenica	45,67	110	8	64
3	AK - Perković	50,22	121	8	84
4	AK - Lozovac	27,19	65	8	89
5	AK - Brnjica	40,44	97	5	28
6	AK - Raslina	28,83	69	14	120

The process of calibration of public transport models consists of creating an initial public transport matrix, assigning trips to the network, and calibration of model results according to actual data. Created public transport matrix in the city of Šibenik is divided into the inner-city matrix (between the zones within Šibenik), and suburban matrix (Demand on suburban bus transport, ship and rail transport).

4. RESULTS AND DISCUSSION OF STUDY

The administrative area of the city of Šibenik includes a large area with mostly sparsely populated area. For this reason, it is extremely challenging to implement the municipal system of public transport in the optimal ratio of supply and demand, so that the transport service is not financially unsustainable. Accordingly, in the dimensioning of the future transport service for the suburbs of the city of Šibenik, it is proposed to optimize transport capacities in relation to the current situation. In the proposed variant, the aim was to ensure the greatest possible connection between the administrative area of the city of Šibenik through the rationalization of operational indicators. Because of this, some suburban lines are shorter than the existing ones, because, according to the existing condition, they connected areas with insufficient transportation demand for municipal bus transport. Such remote settlements with low population density should be connected through an on-call transportation service to rationalize transport costs. The service in question would ensure a higher level of mobility of the population because the transport offer would be created exclusively according to the wishes of the user. The production and attraction of communal bus travel was estimated using data of the actual demand for passenger exchange at public transport stops, according to which the total demand of utility bus lines is 1,623 passengers/day. Then, each of the 43 internal zones of Šibenik was assigned demand depending on the bus stop belonging to the zone. Assuming that the demand at individual stops is weighted in relation to the population of the associated zones, the production and attraction generated by the existing utility bus systems by zones is known. After the production model and travel attractions were prepared, the distribution of these trips across the zones followed. To estimate the distribution of travel on city bus lines, the Fratar model was used, which distributes traffic between zones based on travel costs. The final demand for public transport in the city of Šibenik has a total amount of 2,430 trips/day, which are divided into:

- city trips (1,623 trips/day) and
- suburban travel (807 trips/day).

Accordingly, the following guidelines and theses were used when defining the new public transport system:

- Simplicity of bus lines: The new bus lines are designed to simplify the existing scheme of bus lines in the city area (Figure 1.),
- Introduction of tact timetable: Tact timetable is a timetable in which public transport vehicles have departures at equal intervals throughout the day or a larger period of the day (e.g., departures every 1 hour, 30 minutes, 20 minutes, etc.),
- Defining the system in accordance with the road infrastructure: The analysis of the organization and regulation of the road network in the city of Šibenik determined favorable corridors for tracing bus lines,
- Adapting the service to users: new timetables are aligned with the working hours of the population, school teaching times and other needs of the population, timetables are organized in such a way that from the terminal points of travel to the key points of attraction arrive at an adequate time.

Before defining the operational indicators of the new public transport system, the identification of more than 1,500 points of transport demand in the city area was carried out,

- Designing transport services depending on the spatial-demographic characteristics of the area,
- Facilitating layovers: The organization of new routes is planned with the provision of easy and efficient transfers to other utility bus lines in mind,
- Integration: As public passenger transport in the city of Šibenik develops in the future, it is necessary to ensure mutual complementarity of the transport subsystem.



Figure 1. Scheme of city lines

5. CONCLUSIONS AND RECOMMENDATIONS

The implementation of the new public transport system in Šibenik (JGP Šibenik) proved to be successful. The methodology of research and planning resulted in the development of four variants of city bus lines:

- Variant 1G: Minimal corrections of the route and stop in relation to the current situation with a significant increase in the frequencies of vehicles on the lines – test variant.
- Variant 2G: (long-term variant): Complete reorganization of bus lines with a significant increase in the frequencies of vehicles on the lines with the construction of new bus stops and turnstiles
- Variant 2.1G (medium-term variant): Complete reorganization of bus lines with increasing vehicle frequencies on lines, but with minimal corrections to existing stops and turnstiles
- Variant 2.2G (short-term variant): In agreement with the Client, the variant in question was developed, which represents a complete reorganization of bus lines, but with reduced operational indicators with minimal corrections of existing stops and turnstiles for the purposes of the transitional period of the PSO contract.

The main objective of the project was to increase the number of passengers and this goal was achieved already in the first four months since the establishment of public transport in the last year (September 2022 – December 2023) when 300.000 passengers were transported. In the first six months of 2023, 500.000 passengers were transported on public transport lines, and in July a record of 100.000 passengers was achieved. So, the goal of the project has been achieved many times over and this year it is planned to reach the figure of one million passengers. In addition to defining city lines, the organization of suburban lines has been proposed. From 01.09.2022. The new public transport system started with the 2.2G variant. The consequences of the methodology of the research and planning of the future system of JGP Šibenik proved to be excellent at the very beginning of the establishment of the service. Which implies that an expert approach based on the real state produces positive results. The new public transport system in city of Šibenik has shown a great improvement in service from what it was in the past, so to speak this in Šibenik is a renaissance of public transport, and this is precisely expertise and the correct approach, based on real data from the field. It is important to emphasize that with the renaissance of public transport in Šibenik, the job is not finished, on the contrary, it is necessary to monitor the situation from day to day / month to month, to listen to the wishes and needs of the population, and it is necessary to cooperate well with the representatives of the city of Šibenik because under their jurisdiction is the maintenance and construction of infrastructure (traffic signalization, equipment, bus stops / lay-bys...).

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