Improvement of the Urban Transport System by Developing the Platform "Park and Ride" in Vilnius City

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Abstract. The article emphasizes that in the current time it is difficult to imagine a car-free world, many cities are paying more and more attention to environmentally friendly transport policy. The biggest challenge implementing the policy is to reduce the use of cars in densely populated city areas with the highest traffic flows. In order to make cities more environmentally friendly to the environment and humans, there is a need to ensure continuous investment in the renewal, improvement and development of transport infrastructure, as well as to raise people's awareness about the problems caused by cars and their impact on the environment and human health. Having in mind people's daily transport needs, it is important to restructure mobility trends radically, by encouraging people to use public transport, cycle or walk or use "Park and ride" services. Since free and unrestricted movement is very important in today's world, it is essential to guarantee the necessary mobility while limiting the use of cars in cities. The article presents the measures for solving the problems and analyzing the development of the platform "Park and ride".

Keywords: Urban transport system · Transport · The platform "Park and ride" · Economic viability

1 Introduction

The main reason for people's constant desire to move is the wide territorial location of objects of human interest. With the constant increase in passenger and freight traffic in cities, it is important to ensure the possibility of uninterrupted movement. The larger the urban area, the more difficult it is to maintain and regulate the entire transport system. Avoiding transport problems in the city, a properly designed, well-used and constantly renewing urban transport system. The urban transport system consists of three main elements, that is, vehicles, transport infrastructure, passengers or freight. In case of failure of any of these elements, the whole system becomes inefficient. The main task of the urban transport system is to ensure proper, efficient, high-quality movement of passengers and freight throughout the city, taking into account all the needs of the participants of the system. A person chooses a trip vehicle taking into account time, price, comfort and safety factors. In most cases it is a public transport:

O. Prentkovskis et al. (Eds.): TRANSBALTICA 2021, LNITI, pp. 632–647, 2022.
https://doi.org/10.1007/978-3-030-94774-3_62

underground, tram, bus, or a personal transport: cars, bikes, scooters, multimodal services are becoming relevant too.

2 The Characteristic of Vilnius City Transport System

Juškevičius, Burinskienė, Paliulis and Gaučė [1] state that the last decade the urbanization process has been considered as an unmanageable phenomenon due to a constant people's migration from villages to cities. According to Juškevičius [2], each city dweller has certain different communication needs which are determined by a person's lifestyle.

Juškevičius and Valeika [3] note that city residents and guests are considered to be the main users of the system and they determine the number of passengers and the load of the streets' networks. According to Juškevičius and others [1], the urban transport system has changed radically in recent years. Fewer and fewer people are using public transport services showing increased preference of their own cars. Vytautas and Andrius Jaržemskiai [4] claim that an own car has become a comfortable and convenient guarantee of travel. Currently, about seven hundred million cars are registered worldwide. Private transport is expected to grow to one billion by 2030.

Banister [5] claims that urban transport problems are due to the growth and expansion of cities. By 2050, seventy percent of the world's population is expected to live in cities. Increased demand for transport and road traffic have caused serious congestion, delays, accidents and environmental problems. Cities' transport emission makes up a quarter of the whole CO_2 that is released by transport and about sixty-nine percent of all accidents occur here [6]. According to Barauskas [7], the problems of the transport system arise when the transport infrastructure can no longer provide the growing needs of consumers. Banister [5] highlights the seven main problems of urban connectivity, for which city dwellers and guests show the greatest dissatisfaction. These include falling demand for public transport, heavy traffic congestion, high accident rates, pollution of the urban environment, risks and noise from vehicles to people, difficulties in pedestrian and cyclist traffic and parking difficulties.

The population density of Vilnius city is much lower than in similar European cities [8]. This is due to the rather widely spread territorial location of Vilnius city between work, recreation, entertainment and residence and consequently longer journeys. In 2019 about 1.6 million tourists visited Vilnius, who spent more than one day in the city. Nor should we forget the people coming here to work from other towns or cities close to Vilnius [8–10].

Public transport operates in order to create suitable conditions for the city's residents and guests to travel freely within the city. The survey of Vilnius population conducted in 2019 reveals that Vilnius public transport statistically is mainly used by center city residents, schoolchildren, people living alone, unemployed, pensioners or persons with lower incomes [11, 12]. In 2020, people mostly used the city's public transport services on weekdays. Around 535,000 trips are made every working day. The most loaded routes are those that connect the central part of the city with residential districts. These routes make about 16% of all daily journeys [13]. Although the level of satisfaction of Vilnius city residents with public transport services is increasing

every year. Nevertheless, in 2020, only 25% of the townspeople used public transport services in Vilnius. The number of trips made by public transport in Vilnius decreases every year. This is influenced by the rapidly increasing level of motoring in the city.

Table 1. Distribution of trips made by Vilnius city residents according of travel (compiled by the authors based on the Vilnius sustainable mobility plan).

Way of traveling	Modelic distribution of trips, %	
	2016	2020
Public transport	24.3	25.0
Bike	0.7	1.0
Walking	29.5	30.0
Own car	45.0	43.0
Public car	0.5	1.0

It can be noted that for many years the most popular and commonly used vehicle for traveling around Vilnius city are cars (Table 1). In 2020, about 43% of the city's population preferred personal cars for their trips [14]. At the end of 2019, according to the Statistics Department in Lithuania, 335,107 passenger cars were registered in Vilnius County [15]. Analyzing the data provided by the SE "Regitra", a trend in the growth of the number of passenger cars is significant.

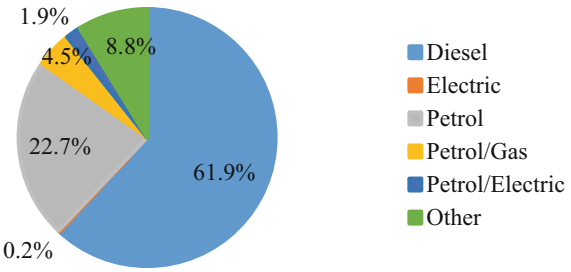

Fig. 1. Distribution of passenger cars in Vilnius by type of fuel used (compiled by the author, based on the data of SE "Regitra").

Analyzing the distribution of passenger cars by the type of fuel run in Vilnius, it can be seen in the chart that in Vilnius dominate diesel-powered vehicles, which pollute the environment quite heavily. In 2020, just over 42,000 of them were registered. This number makes about two-thirds of all vehicles registered in the city. Although electric and hybrid cars are becoming more popular every year, only a little over 2% of them are currently registered (Fig. 1). According to SE "Regitra" after the introduction of the motor vehicle pollution tax in Lithuania, the registration of vehicles run by less polluting fuels has slightly increased, however diesel-powered cars are still popular [16].

About 67% of Vilnius residents living farther from the city center make their daily trips in their own cars. This is mainly influenced by the fact that about 50% of all jobs are located in the central part of the city and its surroundings. As Vilnius city is not densely populated, the distance from residential districts to the central part of the city is quite large. The city center is the destination of the daily trips of the majority of the population. The relatively high level of automation and the low dispersion of jobs in the city often lead to congestion, which causes additional problems such as an increased risk of accidents, higher than normal noise and pollution levels, and so on [14].

2.1 Problems of Vilnius City Transport System and Reasons for Their Occurrence

Traffic flows in the city are greatly influenced by seasonality, school holidays, religious and public holidays, weather conditions and more.

The largest flows are recorded during the morning and evening peaks on weekdays. During 2019, the residents of Vilnius spent about 167 h or in other words a week in traffic jams [17]. Congestion is not the only consequence of a high level of automation. Approximately 60−70% of urban emissions are released by heavy and passenger cars. Maximum concentration of pollutants. Comparing the major cities of Lithuania, it is Vilnius that records the highest average annual values of pollutants [18]. The problem of noise in the city can not be omitted. Studies have shown that about 65 thousand of Vilnius residents live close to high-intensity streets. 78,000 people experienced an excess of noise during the day [14]. It is also worth mentioning the problem of traffic accidents in Vilnius city. Most accidents in Vilnius, as well as many other transport-related problems, are caused by heavy traffic flows and heavy traffic. The biggest accident rate in Vilnius city is recorded in autumn and spring, when traffic flows are the highest and the lewerest rate of accidents is in summer [19].

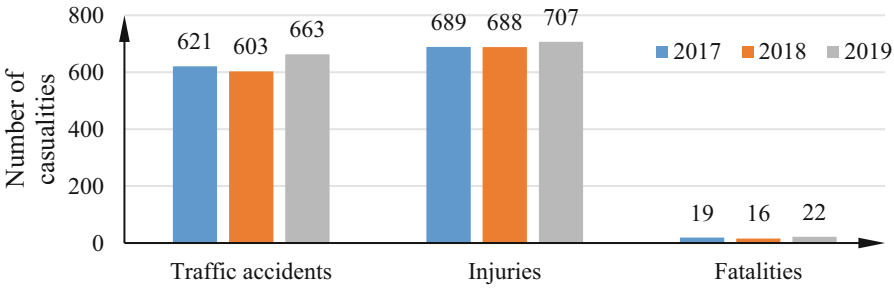

Fig. 2. The number of accidents and victims in Vilnius city in 2017−2019 (compiled by the authors, based on the data of the SE "Lithuanian road administration").

It is noticed that the number of accidents occurring in Vilnius city during the year is really high (Fig. 2). The annual damage in Vilnius due to injuries and fatalities in traffic accidents ranges from 40 million euro to 50 million euro [19].

The three most common types of accidents recorded in Lithuanian cities are car collisions involving another car, car collisions involving pedestrians and car collisions involving cyclists [19].

3 "Park and Ride" Parking Lots Characteristic

One of the ways to tackle congestion or other problems caused by heavy traffic flows in Vilnius city were chosen "Park and ride" parking lots so favourable abroad. In 2017, for the first time in Lithuania and in Vilnius were arranged the parking lots "Park and ride" that connected private and public transport. In 2017, three parking lots of this type were arranged in the main places of Vilnius connecting the city center and residential districts and provided parking space for about 250 cars. In 2019 another "Park and ride" parking was arranged for almost 100 cars on Savanorių Avenue [20, 21].

Since July 2017, when the first parking lots of this type were opened in the city until the beginning of 2018, more than 1.7 thousand people used this service, so a decision was made to reduce the price of this service four times from 2 euros to 50 euro cents. The reduced cost of the service has attracted a larger number of its users [21]. In 2018, about 15 thousand people used this service, in 2019 – about 33 thousand people, the number of the users doubled compared to the previous year.

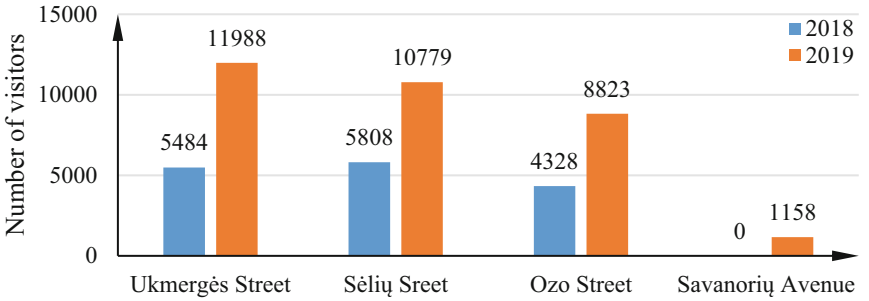

Fig. 3. "Park and ride" the number of visitors in 2018−2019 years (compiled by the authors based on SE "Transport service" data).

The chart reflects the distribution of "Park and ride" number of visitors in all 4 parking spaces in 2018 and 2019. Throughout the analyzed period the least number of people used the "Park and ride" parking lot on Ozas Street (Fig. 3). In 2018 the most popular parking was on Sėlių Street, which was used by about 10 thousand people. However, the research revealed that this car parking is mostly used by people working in the neighbourhood area as a cheap parking space, rather than by people traveling towards the central part of the city. Meanwhile, in 2019 the largest number of visitors was recorded on Ukmergės Street arranged "Park and ride" site, making almost 12 thousand [22].

Each car parking should be analyzed separately, taking into account their location, public transport service and so on. The results of the analysis of the existing "Park and

ride" parking lots in Vilnius are presented in the second table. Assessment values are (+) − meet the criteria, (−) − do not meet the criteria, (+/−) − partially meet the criteria. For more information see Table 2.

Table 2. Assessment of "Park and ride" parking's arranged in Vilnius city (compiled by the authors, based on the carried out analysis).

Assessment aspect/name of the parking	246 Ukmergės Street	14 Ozas Street	62 Sėlių Street	124 Savanorių Avenue
Appropriate location of the parking	+/−	−	−	+/−
Frequency of public transport towards city center (+/− every 10 min.)	+	+	−	+/−
Priority of public transport on streets (number of A lane)	+	+/−	−	+/−
Availability of the parking	−	+/−	+/−	+
The cost of the service	+	+	+	+

Summarizing the whole current situation, it can be stated that all four "Park and ride" parking lots in Vilnius are located in the central part of the city. "Park and ride" parking sites arranged on Ukmergės Street and Savanorių Avenue serve the purpose the most appropriately. The success of car parking's that connect private and public transport significantly depends on the quality of the public transport network. Three of the four "Park and ride" parking's are located near the stops of the public transport, where a bus/trolleybus runs towards the central part of the city approximately every 10 min. However, the high demand for public transport on these stops causes buses/trolleybuses at peak times to be overcrowded. Automatically traveling by public transport becomes uncomfortable and unattractive for a person. The main advantage of using "Park and ride" parking service is lower cost than traveling to the city center by own car. Thus, having assessed the whole current situation, it can be concluded that the main criteria were not fully evaluated for arranging "Park and ride" parking lots in Vilnius city.

3.1 The Research Methodology

In order to analyze and examine a client's and user's needs, expectations and satisfaction, various research methods are applied. The research includes a questionnaire with questions submitted on the internet space. The main purpose of the survey is to identify and name possible disadvantages and problems of "Park and ride" parking lots from the perspective of the users of this service. The main task of the research is to assess the attitude of the residents of Vilnius city and its surroundings toward the service of "Park and ride" operating in Vilnius city. Additional tasks arising from the main purpose of the survey are: to determine the respondents' ways of traveling in the city and their reasons, to assess the informativeness about the location of the sites

among the survey respondents and evaluate different aspects of the "Park and ride" (price, locations, etc.) and their influence on the choice of respondents to use or not this service.

The survey is divided into three main groups of questions which suit and enable to achieve the named tasks of the survey. The first group of the questions from the first to the sixth, is created to identify the travel habits of respondents in Vilnius city. The second group consists of questions from the seventh to the fifteenth. This group is created to clarify the respondents' opinion about the "Park and ride" parking network in Vilnius. The third group of the survey consists of questions from the sixteenth to eighteenth and identifies the demographic data of respondents, gender, age and social status.

In order to evaluate the quality of the provided service properly, it is very important to select the right respondents participating in the survey. Therefore, assessing and analyzing the quality of the service provided by "Park and ride" in Vilnius city, respondents have to be chosen according to the importance of this service for them. The survey is carried out during the period of two months.

In order to find out the reliability of the conducted survey were taken into consideration some possible mistakes in the process of calculation. The formula (1) shows how the reliability of the executive sample is calculated [23]:

$$n = \frac{z^2 \times s^2}{\Delta^2}, \tag{1}$$

where z − the coefficient derived from the Stuart Distribution Table, which is selected based on the reliability we seek and want to obtain; s − the average square deviation of the sample; n − the number of cases in the sample group; Δ the optional overall average.

To calculate the reliability of the survey the most optimal mistake was chosen = 7 and population 522,368. The population of this survey was chosen in 2020 according to the number of working people in the capital region [24]. After calculating the reliability of the survey, it was found that at least one hundred and ninety-six respondents should be interviewed in order to reflect the opinion of the interviewees. In conclusion, the aim of an online survey is to evaluate the quality of the service provided by "Park and ride" in Vilnius city. The results will be used to prepare the service quality assessment as well as to identify problematic and to be improved aspects.

A forecasting method will also be used to predict the economic viability of the "Park and ride" parking network development and its renewal project. Evaluation of the economic viability of the project will be carried out in three main stages. The first stage is the collection of the necessary data on the occupancy of the currently operating "Park and ride" parking lots in Vilnius. The economic profitability of the "Park and ride" parking lots project will be estimated on the basis of 2017−2019 statistics. The statistics of 2020−2021 will not be included in the forecast due to the Covid-19 pandemic that hit the world in 2020 and the universal quarantine introduced in Lithuania. The second step is filtering of the collected data which will allow us to select necessary and accurate data needed for precise estimation. In the article the economic payback will be estimated on the basis of the number of available parking spaces per

day expressed as a percentage. This indicator shows how the number of "Park and ride" visitors changed in the relevant years. The last third stage is the preparation and evaluation of the forecast. The economic payback will be calculated by forecasting how the number of "Park and ride" visitors will change over the years and the revenue received from the users of this service, as well as by estimating the project implementation and parking maintenance costs.

4 The Results of the Research of the Services Provided by the Parking Lots "Park and Ride" in Vilnius

In order to identify the travel habits of Vilnius residents and its guests and the reasons for it, as well as to identify possible disadvantages of "Park and ride" parking lots, informativeness about these parking lots and different aspects of them (price, location, etc.) and how they influence the consumers' choice to use or not to use this service, a survey of the residents of Vilnius city and Vilnius surroundings was conducted. Below is presented the summary of the survey results.

Total number of interviewed 184 people. Among them 108 are women, that's about 59%, and 76 are men, that's about 41%. The majority of respondents belonged to the age group from 21 to 30 years, which makes up 43% of all respondents. Nearly 27% of respondents belonged to the age group of 31 to 40 years and 19% of respondents were older than 41 years old. The vast majority of respondents, 125, almost 68%, indicated that their social status is currently "employed".

Most of the surveyed people, about 53%, live in the western part of the city, about 23% of respondents live in Vilnius district and other cities / towns, another 16% live in the northern part of the city, the remaining part of respondents, almost 9% live in the southern part or in the center (for more details see chart 4).

Answering the survey questions, 71% of the respondents indicated that they mostly choose personal cars for their daily trips in the city. The results of the survey show that about 45% of respondents choose this type of travel in the city because of convenience, shorter travel time or lower costs.

When asked to comment on how often they use their own cars to travel to the central part of Vilnius, almost 22% of respondents said that they travel to this part of the city 5 or more times a week. Another nearly 16% said they travel once/twice a week. When asked to comment on where they most often park their cars in the central part of the city, the majority, almost 38%, indicated that it was on paid parking's.

Summarizing the first and second section of questions, it can be stated that the profile of users who tend to use the "Park and ride" parking service make men and women aged from 21 to 40, currently working or studying, mainly living in the western and northern part of the city or in Vilnius district or other cities and towns located near Vilnius, mostly traveling in the city by cars.

Evaluating combined city trips, almost 60% of respondents rated them positively, as long as it helps them reach their destination faster. Combined travel is also viewed positively because it promotes sustainable movement, reduces environmental damage (Fig. 4). So it means that there is a demand for combined parking among the surveyed people (Fig. 5).

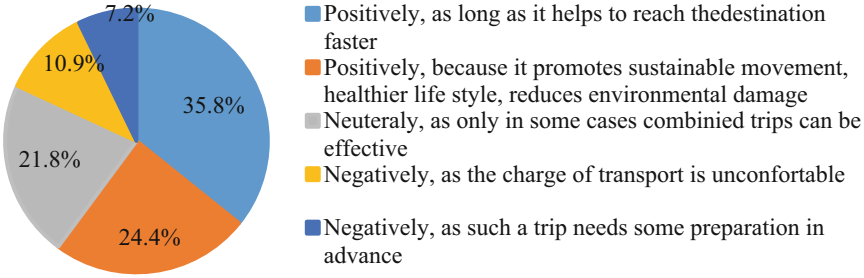

Fig. 4. Evaluation of combined trips made in the city (compiled by the authors, based on the survey results).

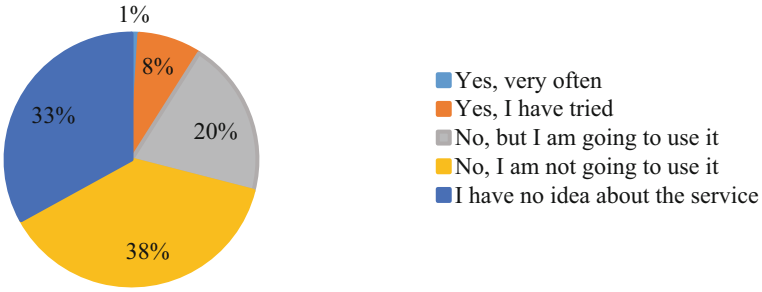

Fig. 5. Popularity of "Park and ride" parking lots (compiled by the author based on the survey results).

However, only a little more than 8% of the respondents have tested the "Park and ride" parking lots in Vilnius. The majority of respondents, that is about 58%, have not tried this service at all. However, about 20% of the respondents are planning to try this service in the future. When asked to comment on why they do not use the "Park and ride" parking service, the majority, almost 23%, indicated that they do not use the service because it does not help to reduce travel time. Another 15% indicated that they do not use this service due to the inconvenient network of "Park and ride" parking lots. When asked to rate the suitability of the "Park and ride" parking's on 1−5 point scale, 6% rated it with two points (inappropriate) and another 13% rated it with 3 points (neither appropriate or inappropriate). Other reasons why respondents do not use this service are: overcrowded city public transport, uncomfortable public transport, underdeveloped public transport network in the city and so on.

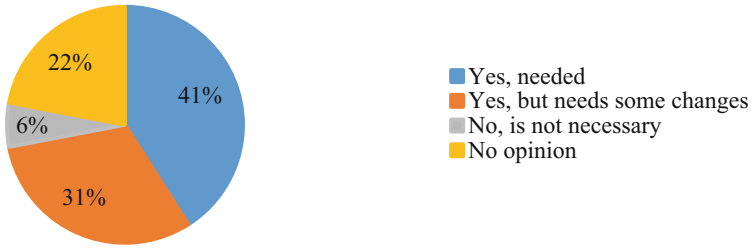

Fig. 6. Respondents' opinion on the need for a "Park and ride" car parking network in Vilnius city (compiled by the authors based on the survey results).

Almost 72% of respondents think that the "Park and ride" parking network is needed in the city. 31% of respondents state that the network of "Park and ride" parking lots currently operating in Vilnius requires some changes, but in general, it is necessary (for more details, see Fig. 6). When asked to comment on what they think should be changed to make the service more accessible, most respondents indicated the need to upgrade the public transport fleet, to increase the number of car parks and also to change the location of existing car parks. Summarizing the results of the survey, it can be stated that the majority of respondents positively evaluated the combined way of traveling in the city. It can be concluded that the demand for such parking lots does exist, but the problem is that the majority of respondents do not know or do not use the project of specific combined parking lots "Park and ride" operating in Vilnius city. However, most of the interviewed people believe that the "Park and ride" parking network in Vilnius is still necessary, but it requires certain changes. After some changes, this service would become much more popular among Vilnius residents and city guests.

4.1 Problematic Areas of Vilnius City Transport System

Analyzing the Vilnius city transport system, some of the problematic areas appeared. The problematic areas of the Vilnius city transport system are the following: large number of diesel-powered cars in the city; high level of motorization in the city; long journeys by public transport in the city; the price of the public transport service does not correspond to the quality of the service; lack of combined parking lots.

4.2 Suggestion of the Development and Renovation of "Park and Ride" Parking Network

The main everyday objects of human's needs are located in the central part of Vilnius. The constant growth of Vilnius population and the relatively rapid development of the suburbs lead to a large number of daily trips and growing level of motorization. In order to solve the problems caused by high levels of motorization, are raised parking prices, changed road markings and directions, Vilnius residents and city guests are encouraged to use constantly renewal public transport services, are being created new and reconstructed existing bicycle paths, developed "Park and ride" parking network

and other. The Old town is the busiest area of the city. Banning vehicle traffic in this part of the city, where there are many job places, educational, entertainment, service and cultural facilities, would create a CO_2-free zone where priority would be given to pedestrians, cyclists or public transport, but not cars. When designing new and reconstructing the existing cycling paths in the Old Town, it is important to take into account that the layout of the cycling paths would be linked not only within this area, but also to the cycling paths outside this area. The number of successfully operating platforms of renting and sharing bikes could also be increased in the city. It is important that public transport routes in this urban area would be designed so that pedestrians and cyclists could reach them without much difficulty. Moreover, the public transport network should be accessible to people with disabilities. The quality of public transport is a prerequisite for restricting vehicle traffic in the Old Town. Banning car traffic in the Old Town would lead to free parking spaces, which are located in this part of the city. Most of them could be converted into bicycle storage areas adapted to the storage and maintenance of different types of bicycles and electric or simple scooters. Other car parks would continue to serve their main purpose but would be better adapted to electric cars with the necessary infrastructure. In order to ensure more convenient access to the Old Town for the guests and residents of Vilnius, the "Park and ride" parking ring will be developed on the outskirts of the city. Restricting car traffic in the Old Town and developing the "Park and ride" car parking network, it should be located and installed in places that are easily accessible to both citizens and city guests, ensure good access to the existing public transport network, and provide fast, convenient and cheap travel by public transport. In this way the service would become more popular and acceptable to the public. It would also reduce the transit transport running through the city. A public survey shows that the majority of respondents are in favor of a combined mode of travel, as long as it allows them to reach their destination faster. Having analyzed the composition of Vilnius city public transport network and human's needs objects, current mobility situation (distribution of traffic flows, most intense traffic crossroads and etc.) impact of noise, air pollution and accidents caused by transport and currently operating "Park and ride" parking network in Vilnius, the following suggestions would not only increase the demand for the "Park and ride" service but also reduce the high level of motorization in the city as well as the side effects caused by transport.

Two of the four "Park and ride" parking lots currently operating in Vilnius do not meet the set criteria and requirements. They are located on Ozo and Sėlių Streets. These parking lots will be completely dismantled and converted into ordinary parking's. The new "Park and ride" parking lots will be installed in more suitable places of the city, that is the parking lot from Sėlių Street will be moved closer to the edge of the western part and the parking lot from Ozas Street will be moved closer to the edge of the northern part of the city. In both the western and northern parts of the city, the new "Park and ride" parking lots will be installed on the land belonging to Vilnius City Municipality.

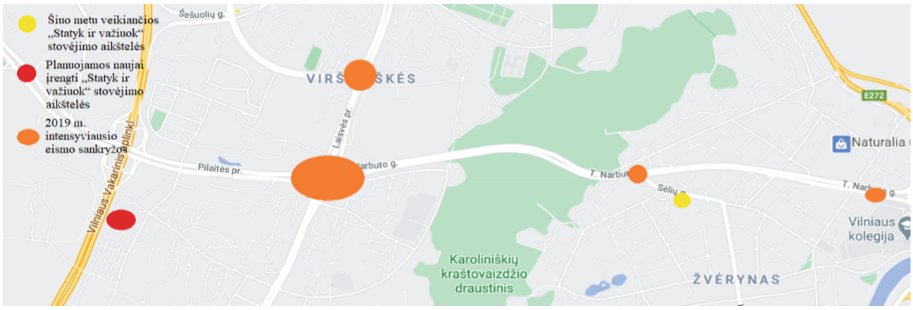

Fig. 7. The plan of the most intense traffic crossroads in 2019 and “Park and ride” parking lots in the western part of the city (compiled by the authors, based on the data of Vilnius City Municipality).

Figure 7 simulates how the situation would change if the current “Park and ride” parking lot on Sėlių Street was turned into a simple parking and a new one would be installed closer to the western edge of the city.

Figure 8 simulates how the situation would change if the current “Park and ride” parking lot on Ozo Street was turned into a simple parking lot and a new one would be installed closer to the northern edge of the city.

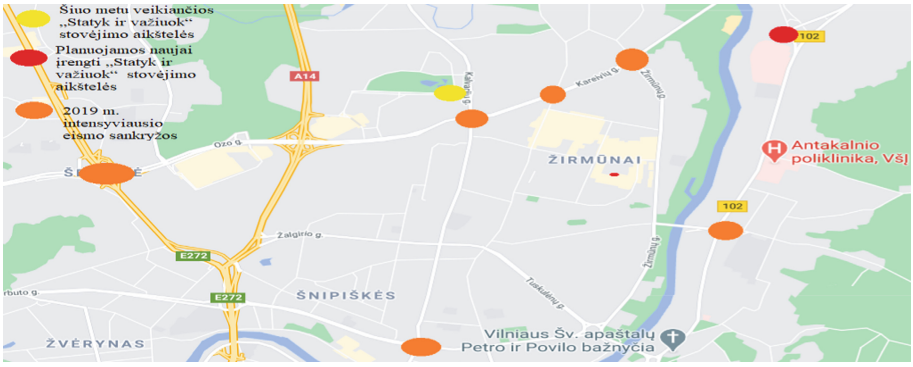

Fig. 8. The plan of the most intense traffic crossroads in 2019 and “Park and ride” parking lots in the northern part of the city (compiled by the authors, based on the data of Vilnius City Municipality.

It can be seen from the eighth and ninth pictures that the locations of the newly planned “Park and ride” parking lots meet the set criteria and requirements much better than the previous ones. The parking lots installed in these places will allow the user to avoid city congestion, as they will be accessible before reaching the busiest streets and intersections in the city. There are also public transport stops (400−500 m on foot) for the 4G fast city bus going to the central part of the city, close to the newly built “Park and ride” car parks. The buses on this route are less crowded during the peak hours

compared to the fast buses that stop at stops near pervious parking lots. There are also several more frequent trolleybuses, city and suburban buses running to the central part of the city. Bus lanes installed or planned to be installed in the near future on these routes, will also allow public transport to gain an advantage over cars and reach their destination more quickly. By installing new "Park and ride" parking lots in these places and adding the existing ones on Ukmergės Street and Savanorių Avenue, the main entrances to the city will be fully covered.

The tenth and eleventh graphs show the obtained results of economic viability of the suggestions.

Assessing the expected payback of the suggestion according to the accumulated value, it can be seen from the tenth graph that the funds invested in the implementation of the "Park and ride" parking lots development and renovation will pay off in six years, that is in 2026 (Fig. 9).

However, it is also important to assess the payback of "Park and ride" parking spaces in terms of operating costs.

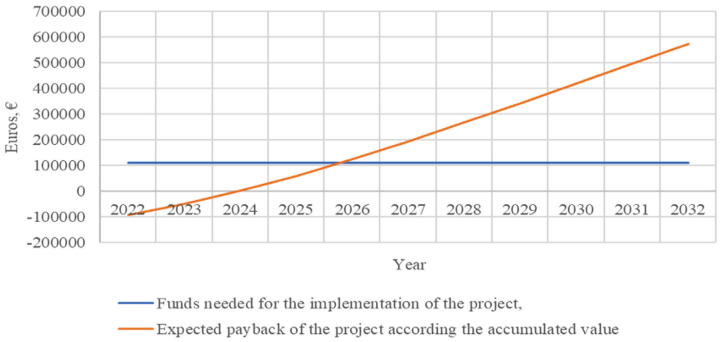

Fig. 9. Economic viability of the suggestion, results according accumulated value (compiled by the authors based on calculations).

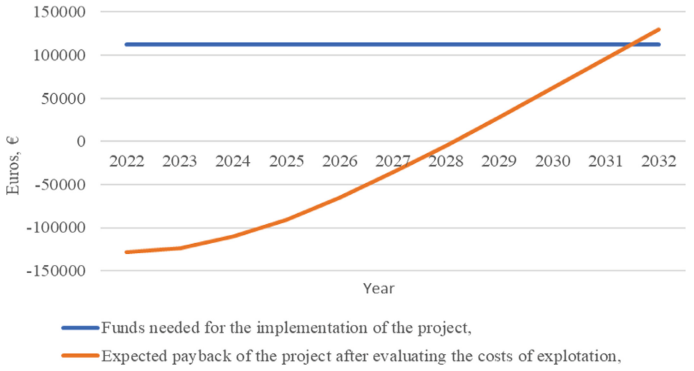

Fig. 10. Economic viability of the suggestion, after estimating operating costs (compiled by the authors, based on calculations).

According to the eleventh graph, it can be concluded that after the implementation of the "Park and ride" parking lots' renovation and development, this service will become profitable in about nine years, that is, in 2031 (Fig. 10).

5 Conclusions

The relocation of the "Park and ride" parking lots from the locations that do not meet the basic criteria and requirements to more suitable locations and increasing the number of parking lots on the "Park and ride" parking's, the number of visitors should double and reach about 70,000 per year. However, the "Park and ride" car parking network development and renewal project alone is not enough to solve the city's current problems caused by high traffic flows, high levels of motorization and its side effects. Banning the traffic in Vilnius Old Town and implementing the project of development and renewal of the "Park and ride" parking network, positive changes will not be noticeable immediately, but the biggest changes should be noticeable in the Old Town. Banning car traffic in the Old Town would create more space for bike paths. This would increase the popularity of bicycles in the city, which is still not very high for some reasons. Also, banned car traffic in the Old Town would mean safer streets for pedestrians. In the Old Town will be created an environment that takes into account the different needs of people, with a special focus on the most vulnerable groups (the elderly, people with physical or sensory disabilities, people using walking aids or wheelchairs) that meet people's expectations. The space of the Old Town will become safe and attractive where an active street life and pedestrian culture will flourish.

It is expected that the introduction of certain restrictions on the movement of cars in the Old Town and this part of the city, creating suitable conditions for comfortable walking, cycling, electric or simple scooters, renovating and expanding the "Park and ride" parking network, with time being will change the distribution of travels in the city. It means a decrease of car trips and an increase of travels by public transport, walking or cycling. The planned distribution of trips should look like this.

- Of all daily trips in the city, 30% will be made by personal cars;
- Of all daily trips in the city, 28% will be made on foot;
- Of all daily trips in the city, 7% will be made by bicycle, electric or simple scooters, and other non-motorized vehicles;
- 30% of all daily trips in the city will be made by public transport;
- Of all daily trips in the city, 5% will be made by other road transport (public shared cars, taxis, etc.).

Such a model of change in the distribution of travel in the city would reduce the traffic congestion, which is quite often caused by high levels of motorization. Reducing congestion in the city would also reduce the number of accidents and the undesirable side effects of vehicles, such as the level of emissions and additional noise from vehicles. Assessing the ecological viability of the project, it is estimated that 3,202,168 kg or 1,630,195 m^3 of CO_2 less emissions will be emitted into the environment in a decade than at present.

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