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The “Engineer” publishes the most significant results of scientific and applied research carried out in universities of transport profile, as well as other higher educational institutions, research institutes, and centers of the Republic of Uzbekistan and foreign countries.

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Traffic flows on urban roads and their impact on public transport users

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Abstract: This article analyzes the formation and development of urban traffic flows and their impact on public transport users. Currently, the increase in population, urban expansion, and the growing number of vehicles have intensified traffic congestion on city roads. This situation negatively affects public transport operations, causing time losses for passengers, a decrease in comfort levels, and adverse environmental impacts. During the study, urban traffic flows were analyzed under real city conditions, and the factors affecting the efficiency of public transportation were identified. The article proposes solutions such as reducing congestion through the use of modern transport models, prioritizing public transport, and improving passenger convenience. According to the results, measures such as allocating dedicated lanes for public transport, implementing intelligent traffic light control systems, and forecasting passenger flow in advance are of significant importance. In conclusion, effective management of urban traffic flows ensures a convenient and stable transport experience for public transport users.

Keywords: transport, passenger transport, public transport sector, education, system

1. Introduction

The current period is characterized by the rapid development of cities, the improvement of improvement works and the sharp increase in the number of city residents. In such conditions, provision of high-quality transport services to city residents requires further development of city passenger transport, development of new and more efficient ways of transportation [1]. The organization of road transport in the city transport network has its own characteristics. It should be noted that the main complexity of the management of passenger transportation processes in cities is the uncertainties in the formation of transportation flows [2,3]. The impact of most factors affecting the size of the passenger flow is changing over time and has a probabilistic character.

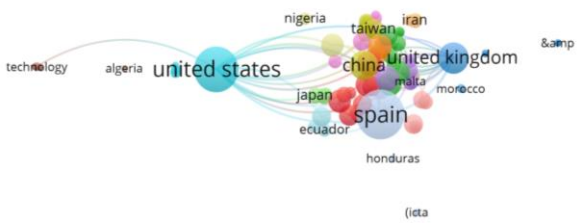

Fig. 1. Countries engaged in urban passenger transport

The multi-phase study was based on individual in-depth interviews with 50 senior local passenger transport operators, government officials, lobbyists and experts from New Zealand and around the world; and four validation workshops with 28 sector stakeholders [4]. The data was analysed using mostly pre-determined themes from which four scenarios were constructed and then validated. The implications are that the local passenger transport system is about to transition to a system of 'shared mobility; public transport will need to evolve to stay relevant but will remain important in any scenario; and the role of Government will be vital in overseeing the transition to the shared mobility era. These lessons are now being used to inform transport and broader policy decisions across New Zealand [5]. Overall, the study is the first to apply such a global and qualitatively rich dataset to view the long-term future local passenger transport system as a whole [6].

2. Research methodology

Much has been written about the accelerating pace of societal and technological change, but, until recently, such statements have not typically been applied to the public transport sector. Indeed, the operational concept underlying the bus for instance (i.e. large vehicles on fixed routes and operating on fixed timetables) has not fundamentally changed as a concept since its introduction almost 200 years ago [7-9]. There is however growing evidence that this perspective is now beginning to change, with several recent reports serving to emphasise the need to understand the changing mobility landscape and the implications for the public transport sector. Thus, the UK government policy paper, The Future of Mobility (GOfS 2019) proclaimed this to be "a time of unprecedented change in the transport system", whilst KPMG's Mobility 2030 study reported that technological innovation will "completely disrupt" the mobility ecosystem within a decade [10].

In response to this situation, in August 2015 the New Zealand Ministry of Transport commissioned the Public Transport 2045 (PT2045) study to consider how different local public transport futures might affect society over a 30-year time horizon, and at how governments might best respond to secure the 'best' outcomes possible. The latter aim reflects the strong influence that transport systems have on the liveability of cities. A role for policy makers at a time of technological and behavioural transition is to envision the types of places that their citizens can live in and to shape the urban transport systems involved. The purpose of this paper is to present the results of this study.

The formation of passenger flows is also influenced by the time of day, days of the week and seasons of the year[10,11].

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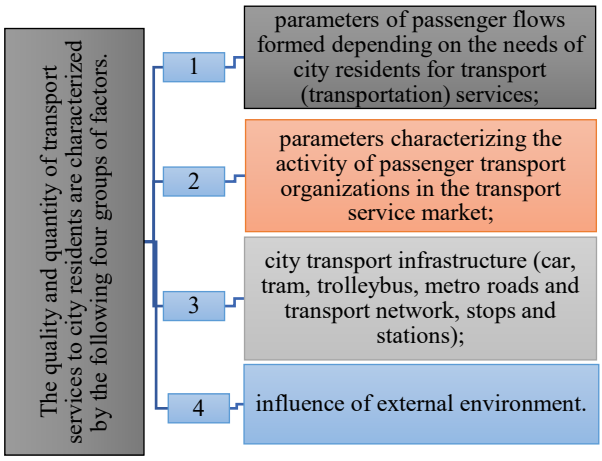

Fig. 2. The quality and quantity of transport services to city residents are characterized by the following four groups of factors

3. Results and Discussion

The demand for urban passenger transport services can be estimated based on the study and analysis of passenger flows. To a certain extent, the study of flows can also provide information about the movement of the population between different territorial districts, areas and addresses of the city territory. Flows arise from the need of passengers to move around the city.

Although there are currently many methods of monitoring and analyzing passenger flows, the following two disadvantages are common to all of them:

1) the study of passenger flows is carried out in a certain area of the city at a certain time interval, however, the results obtained in this case are generalized to the whole city and used for all time intervals;

2) the studied situation belongs to the past, but its results are used for future solutions. In other words, the studied passenger flow is the result of the actual fulfillment of the demand for transport in the past, and the expected flow in the future may be different from it;

3) the study and analysis of flows is a very labor-intensive activity (thousands of man-hours), which requires very large costs. The problem can be solved through mathematical models that reflect the connection between the volume of transportation expected in the future and the factors that cause the movement of the city's population. It is important to take into account the factors of the following three groups that shape the transport mobility of the population when determining the future sizes of passenger flows (Figure 1):

The first group of factors allows to characterize the conditions of passenger transport: city plan and planning; location of residential areas, cultural recreation areas, trade centers and industrial enterprises, field yards; road network and infrastructure location; the observed time - season, month, days of the week, hours of the day, etc.

The second group of factors characterizes the population's demand for passenger transportation. The segmentation of this demand depends on the social and professional structure of the city's population. This largely depends on their requirements for the price of the transport ticket, speed of movement, convenience, reliability and safety. The indicator of grouping of passengers' demands for urban transport can be a socio-economic assessment of the time spent on their movement.

The third group of factors is explained by the competitive environment of urban passenger transport. Carriers with various forms of organization and ownership participate in the city transport service market: joint-stock companies, limited liability companies or private entrepreneurs, etc.

The activity of city passenger carriers is carried out within the framework of the current legal and regulatory provisions and under the control and influence of the city authorities. Management of passenger transportation processes in the city is to effectively meet the needs of the population on the basis of effective planning and management of passenger flows and the delivery of relevant information from the destination to the destination. The purpose, tasks and indicators of the planned transport service are determined by the transportation needs of the population. The logistic goal of public transport activities is to minimize the total costs while being able to fulfill the tasks of providing services to the population.

The criteria for providing transportation services to the population is determined based on the extent to which the requirements for the volume and quality of transportation must be fully met. For example, it is necessary to ensure the exact execution of the established action schedule. The higher the requirements for the level of service, the higher its price. But the price itself cannot be an objective function, so a certain compromise has to be found. The main problem in determining the purpose of the transport service is the need to take into account all the interests of society. In doing so, we should not limit ourselves to taking into account the interests of vehicle owners or public transport companies.

Due to this, it is necessary to take into account the implementation of the following stages in order to achieve the goal based on the formation and application of the strategic logistic management model of passenger transportation processes in the city:

Stage 1: the political and social goals of the city management bodies to improve the quality of passenger transportation processes in the city and justification of ways to achieve them;

2nd stage: to determine the factors affecting the criteria for the population's choice of means of transportation in the city, to influence these factors in order to increase the convenience of city passenger transport;

Step 3: determine the costs necessary to ensure the development trajectory of the logistics system, compare them with existing opportunities and, if necessary, identify sources of additional opportunities.

Based on the performance of the above steps, the necessary levels of the indicators of passenger transportation service impact on traffic safety will be determined.

The following can be indicated as such indicators:

1) walking distance to the stops of the passenger transport route;

2) operational qualities of the passenger transport vehicle (capacity, ease of walking, etc.).

Regardless of the ownership of the buses, they mainly run on predetermined routes and provide transport services to the population.

The concept of route is important in setting and solving issues of organizing and managing passenger transportation processes. In short, it is necessary to implement the political and social goals of the strategic logistics management model

of passenger transport processes in the city. The analysis shows that the importance of transport in the private sector is increasing day by day. The main reason for this is the creation of various forms of private ownership, the adoption of laws and decisions on the development and protection of small and medium-sized businesses, and the creation of conditions for free competition between them and their protection by law.

The transport system is about to transition to a system of 'shared mobility'. Three of the four scenarios envisage futures where private car ownership has dramatically fallen because alternatives have developed that people find more attractive. So, in 'Shared Shuttles', increasing urban density makes it easier for many people to access work, education, recreation, and friends.

4. Conclusion

It is the first study to take such a broad view of the long-term future passenger transport system whilst using such a qualitatively rich and globally diverse set of interview and workshop data. Specifically, the study draws on 50 in-depth interviews with practitioners from New Zealand and from around the world, the results of which were then validated at four workshops which were attended by 28 practitioners in total.

Due to the fact that the questions asked in this study were intended primarily for a Government study, survey interviewees were assured raw data would remain confidential and would not be shared.

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