

The Strategy of Sustainable Development of Urban Transport

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Abstract. In the modern economy, the actual purpose of business (profit) came into conflict with the social and environmental results of production activities. The internationally recognized concept of sustainable development provides a comprehensive solution to economic, social, environmental and other problems for present and future generations. Cities are the hubs of these problems. Urban passenger transport (UPT) plays an important role in the life support of cities. Mass motorization does not solve these problems, but exacerbates their negative manifestations. Sustainable development of the UPT is aimed at creating a favorable urban environment, achieving its transport accessibility, contributes to improving the quality of life of residents of cities that make up the bulk of the population. In the interests of sustainable development of the UPT, the Russian legislation currently establishes the use of transport planning. On the instructions of the Ministry of transport of Russia with the participation of the authors of the article developed methodological support of transport planning in the cities of the country. The methodology of transport planning is based on advanced foreign and domestic experience, a comprehensive approach to assessing the effectiveness of decisions. The theoretical basis of transport planning is the results of applied research in the field of transport, including the achievements of the scientific school of Scientific and Research Institute of Motor Transport (NIIAT). The practical use of the developments considered in the article provides a solution to the problems of urban development and transport in accordance with the existing documents of strategic planning, aimed at improving the quality of transport services to the population.

1. Introduction

More than half of the world's people now live and work in cities. The share of urban population in developed countries is about 75 % (in Russia – 74 %). The scarcity of urban land and overcrowding exacerbate various social contradictions in cities. Cities account for the largest share of the GDP of industrialized countries. Therefore, cities have become point and powerful sources of pollution entering the environment. Thus, urban transport alone is the source of about 80% of urban emissions of greenhouse gases and other pollutants [1,2,3].

The need for personal contacts of urban residents in the implementation of labor and educational activities, as well as in everyday life, while expanding the urban area, requires the solution of transport problems. Residents of cities spend about 20% of their free time on regular trips. Urban passenger transport (UPT) is designed to ensure the mobility of the urban population. At the same time, up to 10 – 20% of urban land (road transport network, parking and land transport infrastructure) is used for the needs of the UPT. This leads to the effect of "land sealing" in cities [2].

UPT facilities that use energy from hydrocarbon combustion have a serious impact on air basin emissions and increase the level of thermal exposure. Traffic congestion leads to an increase in the time spent on movement in cities and also worsen the environmental situation in cities [4, 5, 6].

Motorization has led to the question on the agenda: do cities exist for cars or, after all, for people? Road transport has become a major source of danger to life and health. More than half of all road traffic accidents (RTA) occur in cities.

Solving the transport problems of cities requires the involvement of innovative technologies and financial means [7,8,9]. The main approach is a reasonable combination of the use of passenger cars and public transport (PT) for the transport of passengers in cities. Transport policy should provide for the stimulation of citizens to use the PT. At the same time, it is important not to rely on the use of prohibitive measures, but to develop the PT in the direction of improving the quality of passenger transport services.

An obstacle to the development of PT in this direction is the traditional economic model used by PT carriers. To date, the main indicators of the PT remain the volume of passenger traffic (pass.) and passenger turnover (pass.-km.). But these gross meters characterize only carriers transport work. They are poorly related to the needs of passengers in travel. Passengers are not interested in the gross assessment of the activities of carriers, and only travel time and ease of movement. The resolution of this contradiction is possible using the concept of sustainable development of the transport system [10,11,12].

2. Relevance and experience of sustainable development of urban passenger transport

The concept of sustainable development (SD) is a global vector of progress of modern society. The theoretical foundation of SD was the research carried out at the turn of the XIX and XX centuries by Eduard Louis Emmanuel Julien Le Roy (1870-1954), Pierre de Chardin (Pierre Teilhard de Chardin, 1881-1955) and their followers. The noospheric doctrine was created, according to which uncontrolled anthropogenic activities can become a source of harmful effects on the environment. Initially, this doctrine was perceived as theoretical reasoning. In the modern world, environmental disasters have become a reality [13].

Under the aegis of the UN, the world community (representatives from 166 countries, thousands of public organizations and leading scientists participated) developed a concept at several international conferences that provides an innovative approach to assessing the results of industrial and economic activities on the basis of integrated consideration of a set of factors of different nature - economic, social, environmental, political, resource, geological, etc. [14,15]. The effect of various factors is considered not simultaneously, but in time. Thus, sustainable management is carried out in the interests of present and future generations [18].

Urban passenger transport has become one of the pioneers of SD implementation. This is due to objective reasons:

- cities are sources of point and powerful environmental pollutants (centers of environmental load), including main suppliers of industrial and domestic wastes;

- cities are home to the majority of the population using the UPT for transportation;

- cities are hubs of social problems;

- the level of development of the UPT has a significant impact on the quality of life of citizens, their productivity, road safety, the formation of the urban environment.

The most experience in the sphere of SD UPT have European countries. Main ways of the SD recognized application of modern information technologies and the forming of smart cities, reasonable

legal regulation and control of traffic, logistics of passenger and cargo flows, taking into account various external effects, transport planning, rationalization of tariff, tax and financial and investment policy [4,16,17].

The European Commission's attitude to urban transport – ECAUT) recommends the implementation of a sustainable development of the UPT on the basis of transport plans (Sustainable Urban Mobility Plans – SUMPs). Transport plans are developed in order to increase the mobility of the population, taking into account economic, environmental and socially significant results [2,8,19]. A comparative analysis of the features of the use of SUMPs in 28 countries (provinces) of Europe, conducted by experts of ECAUT, showed both common features and national-territorial differences in the methodology, formulation of goals, policy and legal support of transport planning. The general principles of transport planning are clear goal setting, multivariance of SUMPs projects, wide use of IT and computer modeling, participation of civil society institutions in transport planning, integrated assessment of results.

3. Problem statement and methodology of its solution

In Russia, transport planning at UPT are carried out in accordance with the Federal Law "About the organization of regular transportations of passengers and luggage by motor and urban ground electrical transport in the Russian Federation and on amendments to certain legislative acts of the Russian Federation" from 13.07.2015 N 220-FL (further – Law N 220).

This law establishes the obligation of the executive authorities and local governments to develop and use a document for planning the transportation of passengers. As part of the urban planning document include:

- measures for the development of passenger transportations with the definition of sources of financing;

- lists of routes with regulated and unregulated tariffs by executive authorities;

- type of UPT serving each of the routes, number of units and their capacity on each route;

- schedules on routes;

- the size of the regulated tariffs for transportation;

- the UPT routes on which traffic is to be re-organized, discontinued or changed.

Plans for the development of transportations on the UPT are formed in accordance with:

- with city development plan;

- state and municipal programs of social and economic development;

- programs of complex development of transport infrastructure of the city;

- complex schemes of the organization of traffic in the city;

- social standards containing requirements for the quality of transport services.

Transport planning methodology accumulates developments in the field of passenger transportation, IT use, urban planning, economics, sociology, ecology and other applied researches.

4. Theoretical bases of planning of sustainable development of UPT

The sustainable development of transport systems should be carried out primarily through the intensification of existing opportunities. Extensive development of the UPT requires investment and should be pursued where necessary, for example by expanding the route network to serve new development areas. The experience of developed countries shows that the methodology of sustainable development includes a set of innovative technical means and technological solutions. These tools and solutions provide monitoring of passenger traffic and the work of the UPT, improving the quality of transport services, modeling and optimization of passenger transportation, minimizing environmental damage, organization of the transportation process on the principles of logistics.

Smart City technology ensures the development of transport taking into account various factors and the complex application of IT. This technology allows to create control systems with distributed intelligence. Control over the movement of transport vehicles, monitoring of passenger traffic, determining the time spent on travel on their individual elements, the assessment of transport mobility provides the

use of satellite navigation. IOT technologies minimize the need for transport movements and reduce environmental damage. Optimization of urban logistics, including the principle of "transport without transport" improves the quality of passenger transport services, reduces the need for budgetary financing of the UPT, helps to minimize environmental damage.

According to the terms of reference of the Ministry of transport of the Russian Federation JSC "NIAT" on the basis of FL No. 220 prepared guidelines for sustainable transport planning of the UPT on regular routes. These recommendations provide for the solution of tasks:

- meeting the needs of citizens in transportation along the routes of the city, including on the condition of achieving mobility of the population;

- ensuring the level of quality of passenger transport service to the level at which the minimum social requirements are met and the city's expenses for possible subventions to carriers are not exceeded. At the same time the tariffs are set socially favorable for passengers based on the potential solvent demand of the population for transportation;

- creation of preconditions to encourage passengers to use UPT vehicles instead of passenger cars (solely through measures of "smooth" impact and increase the competitive advantages of the UPT).

Transport planning methodology is based on the following principles:

- guarantee of compliance with the requirements of transport service standards;

- accounting in the transport planning of existing and future plans for urban development, urban planning and territorial development, the organization of the street-road network, infrastructure development projects, etc.;

- consideration of the UPT in an integrated link with other modes of transport on the basis of a single logistics model of passenger and cargo flows and taking into account the capacity of the street-road network;

- comprehensive accounting of transport, economic, social, environmental, urban planning consequences of implementation of transport plans;

- variation in the development of transport plans;

- achieving a high level of road and transport safety;

- creating a barrier-free transport environment, including for the disabled;

- creation of a coherent framework of the urban transport system based on the optimization of the scheme of routes of the UPT working with the use of regulated tariffs;

- division of the UPT routes into two groups; working on regulated and unregulated tariffs;

- coordinating the schedules of rolling stock on different routes;

- rationalization of transport hubs where different modes of transport and routes are concentrated;

- raising awareness of potential passengers about the work of the UPT;

- involvement of civil society institutions in transport planning.

In Europe, Japan, China and other countries developed and used many methods to control UPT - based IT satellite navigation, cloud technology, crowd-logistics (CL) distributed intelligent technology, innovative economy (taking into account internal and external deliverables, discounted over time). In the short article it is not possible to consider the results of these developments in all details, so we will point to the most interesting works [20 – 25].

5. Conclusion

Transport planning development of UPT is a major and complex area of improving of passenger transportations. Implementation of transport planning by executive authorities is established by the Russian legislation.

The methodology of transport planning is fundamentally different from the national economic planning of the past time. This methodology is based on an innovative economic model of the organization of relations between carriers and transport customers, information technologies, focus on the quality of transport services, an integrated approach to the evaluation of the final results (economic, social, environmental, urban planning, etc.), coordination of different modes of transport and carriers,

reasonable transport and tariff policy, participation in the management of civil society institutions. It is important to take into account the best foreign experience.

The priority problems of transport planning are the development of new legal acts, methods of solving the problems of transport organization, the creation of a system of monitoring the initial data for transport planning, the formation of modern transport infrastructure and training of transport workers.

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