CONTENT OF TRANSPORT ACCESSIBILITY CONCEPT

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ABSTRACT

The semantics and essence of the concept of «transport accessibility», its use in featured works and legal acts of the Russian legislation are considered. The main aspects of transport accessibility (accessibility of territories, objects of transport infrastructure, vehicles, transportation services) are identified. Qualitative characteristics that should be reflected in the standards of transport service are established. The definition of «accessibility of public urban transport services» is proposed as property of a city's transport system to allow an unlimited range of individuals to travel and to carry permitted hand luggage and baggage in accordance with the terms of a public transportation contract for a passenger and with the conditions of a transport license issued to a carrier, mandatory legal requirements for the carrier, as well as with standards and rules accepted and declared by the carrier.

Keywords: transport, accessibility, sustainable development, service quality, terminology, concept content.

Background. *Certain modern scientific studies on transport contain a lot of mistakenly interpreted and fuzzy concepts, which is explained by the lack of particular training of researchers, imperfection of translation of foreign sources, customer focused bias approach, changeable conjuncture and other factors related to shortcomings in organization of professional work of researchers in that field.*

In many cases, the concept of «accessibility» is often used in relation to various aspects of transport services.

The intuitively perceived concept of transport accessibility in a scientifically formal sense has not been adequately studied and needs to be more clearly interpreted. The existing fuzziness can lead to a shift in the meaning of the concept and of the phenomenon treated with it, to the unequal interpretation of that notion by different users and to a range of undesirable uncertainties. In turn, this may adversely affect the work of transport, the quality of services for passengers and cargo owners, as well as joint activities of various participants in transportation.

Therefore, in order to streamline and theoretically revise the terminology, we have made an attempt to provide an adequate justification for the concept of «transport accessibility».

Objective. *The objective of the authors is to consider transport accessibility concept and relevant terms.*

Methods. *The methodology used in the article is based on a comparative analysis of the application of the concept in a range of works and acts of transport legislation, linguistic analysis and the semantic content of transport accessibility (both in its entirety and its separate manifestations), and the establishment of significant aspects of the research subject for inclusion in the description of the concept.*

Results.

Focus of the research

It turned out that transport accessibility as a concept appears most frequently and in a very diverse manner in relation to transportation of passengers. Their main volume is carried out in urban and suburban types of transit. The largest share of research and development concerns those areas of transport services. However, the results obtained can be fully attributed to transportation of passengers by other modes of transport and to carriage of goods.

In total, about 1,2 thousand large-scale works were carried out [in Russia] on the problems of passenger transportation by urban and commuter transport (research and development works ordered by transport ministries, departments, preparation of more than 80 projects of normative-legal and normative-technical acts, monographs, scientific and production publications, textbooks and study guides, theses, articles in scientific publications, etc.).

According to the classification of scientific specialties, research in the field of transportation and of the quality of the related services belongs to a group of specialties from the branches of technical and economic sciences [in conformity with officially set Russian classification]:

- *05.22.10 – «Operation of road transport» (technical sciences);*
- *05.22.01 – «Transport and transport-technological systems» (technical sciences);*
- *05.22.08 – «Management of transportation processes» (technical sciences);*
- *08.00.05 – «Economics and management of the national economy (transport, logistics) « (economics);*
- *05.23.22 – «Urban planning, planning of agricultural settlements» (technical sciences).*

Leading scientific schools have been established in the Scientific Research Institute of Road Transport, MADI Technical University, St. Petersburg University of Civil Engineering and in several other universities. Among our colleagues involved in the discussed topics we can quote the names of M. E. Antoshvili, M. D. Blatnov, N. O. Bludyan, G. V. Bolonenkov, O. A. Dmitriev, L. B. Mirotin, E. E. Mun, A. D. Rubets, D. S. Samoilov, M. P. Ulitsky, M. S. Fishelson, M. V. Khrushchev and many others.

Achievements and main results of scientific activity of domestic and foreign researchers in the field of quality management of urban passenger transport (UPT) are summarized in several reference publications for specialists [1, 2]. Such publications are a sort of handbooks for those who organize passenger transportation in all regions of Russia and neighboring countries. In these handbooks, among other things, the essence and principles of building an integrated quality management system for the

work (IQMSW) of passenger transportation organizations and the introduction of a system to better meet the needs of the population are set out. IQMSW has set one of the main quality indicators as accessibility of passenger transport services, which was characterized by the saturation of the controlled area with means of transport (unit per 1 km^2) and the density of the public route network (unit per km^{-1}), informative for users, and affordable fare.

The domestic methodology of product quality management was generalized in the encyclopedic edition [3].

Accessibility as such

In the works of many authors there are indications of «accessibility», «transport accessibility», «accessibility of transport services», etc. Let's briefly dwell on the most interesting recent research.

The modern concept of quality management of transport services was developed by a team of researchers from Plekhanov Russian University of Economics [4]. A distinctive feature of this concept is the use of a marketing approach that, unlike the traditional approach, relies not on production indicators, but on the expected, delivered and perceived levels of quality of transport services assessed by consumers of transport services [5]. The accessibility of transport services is considered as a complex characteristic and is estimated by the passenger's physical ability to use transport to make a trip without disproportionate effort and expense.

At the same time, the experience of assessing the accessibility of transport services in the EU countries, US and other countries was studied and taken into account [6–10]. In them, transport accessibility (transport service) is considered to be: coverage of the territory by a route network, the distances between adjacent stopping points on routes, the maximum distance from a stopping point from the most inconvenient transport place of the passenger's stay, the time of travel to the nearest interchange node on the transport network, stopping points with equipment for low-mobility passengers, the largest interval of vehicles on the route. In addition, foreign authors pay attention to the information availability of data on the transport service for users [11, 12].

Today, the generally recognized concept of sustainable development of the transport system dominates in the management of the development of urban passenger transport [10, 13, 14]. The concept proceeds from a comprehensive review of the developed and implemented projects for improving the transport system (social, economic, operational, marketing, environmental, etc.) are taken into account, including the accessibility of transport services for passengers and cargo owners. Moreover, the accessibility of transportation services for users is recognized as one of the fundamental factors determining the quality of transport improvement projects.

Passengers' perception of various aspects of the accessibility of urban passenger transport in Moscow showed the following results, expressed as a percentage of the desired level of service [4]:

• remoteness of stop points from the places of beginning and end of movement – 85;

• time spent en route, as well as the time of operation of the routes – 77;

• intervals of movement on routes of UPT – 69;

• time spent on interchanges in route – 68;

• availability (convenience) of payment for travel – 56.

Judging not only by these figures, transport accessibility has been comprehensively studied by the applied science of transport and concerns the totality of such properties of the transportation process and the transportation system as:

• saturation of the urban territory with transport (the degree of manifestation of this property is measured by the indicator «density of the route network», i.e., the number of UPT lines per 1 km^2 of the residential area of the settlement);

• informative nature of the transport system (for assessment, the indicator «the level of information service of passengers» is used, which is determined by the proportion of the units of the rolling stock of UPT and its infrastructure facilities that have proper equipment and information support);

• accessibility of tariffs (this property is manifested in the use of socially-oriented tariffs, their relative stability over time and establishment of benefits in paying for travel for passengers of certain social categories).

Taking into account the current trends, the emergence of new models of rolling stock, the development of information technologies and methods of organizing transportation in the composition of simple properties that characterize transport accessibility it is necessary also to include:

• accessibility of embarkation in a vehicle and disembarkation from it at stopping points;

• availability of ticket purchases before the commencement of travel (in urban terminals or through the use of information technologies).

Norms, law, standard

The concept of transport accessibility is applied in normative-legal and normative-technical acts.

In the Russian Federal Law «On organization of regular transportation of passengers and baggage by road and urban land electric transport in the Russian Federation and on introduction of amendments to certain legislative acts of the Russian Federation» No. 220-FZ of 13.07.2015, article 14 «Organization of regular transportations at regulated tariffs» it is determined that: «1. In order to ensure the accessibility of transport services for the population, the authorized executive bodies of the constituent entities of the Russian Federation, authorized local government establish municipal regular routes, intermunicipal regular routes, adjacent interregional routes of regular transportation for regular transportation at regulated tariffs». Furthermore, articles 26 and 32 indicate that information included in the registers of regular transport routes, information included in the register of stopping points for interregional routes of regular transportation, posted in information resources, should be available for inspection free of charge.

The Federal Law «Charter of Motor Transport and Urban Land Electric Transport» No. 259-FZ of 08.11.2007 (article 21.1 «Transportation and peculiarities of servicing disabled passengers»)

establishes that passengers with disabilities are provided with conditions for the accessibility of carriage and transportation of their baggage by road transport and urban land electric transport, and the owner of the object of transport infrastructure – the conditions for accessibility of transportation by road transport for disabled persons on an equal basis with other passengers.

The Ministry of Transport of the Russian Federation has adopted a social standard for the purpose of ensuring the quality of passenger transportation [15], which means «the quality of transport services provided for the population, expressed in the presence of the possibility for the population to receive services for transportation of passengers and luggage by road and urban land electric transport along the routes of regular transportation». Accessibility is characterized by the observance of a set of conditions, which include:

• territorial accessibility to the stopping points of the routes of UPT (it is normalized by the maximum permissible removal of the object from the stopping point);

• accessibility of stopping points on routes, bus stations and passenger bus stations for disabled people and other low-mobility citizens;

• accessibility of UPT vehicles for disabled people and other low-mobility citizens (the possibility of convenient embarkation and disembarkation, accommodation in the cabin);

• information accessibility (equipping transport infrastructure facilities with visual information of passengers with up-to-date information and other elements of arrangement in accordance with the requirements established by the rules for transportation of passengers and luggage.

Also the social standard set the maximum allowable intervals on the routes (in order to ensure the connectivity of the transport system of settlements) and the price[1] (tariff) accessibility of services for passenger transportation.

In town planning legislation, legislation on local self-government and social legislation accessibility (transport) means:

• normative indicator of the time spent on transport communications between different points within the systems of group settlement;

• provision of the territory with transport infrastructure.

Building regulations [16, 17] regulate the rules for placing various objects and territories in populated areas, depending on their population density, social and economic purpose, historical features and other significant factors. The size of urban quarters and microdistricts, the density of street and passages location, the distance from the places of residence of people to different places of visits (trading enterprises, pharmacies, cultural centers, storage facilities, etc.) are normalized.

As a result, with proper use of the established urban development standards, the maximum time spent in cities on movement from places of residence to places of work for 90 % of workers (one-way) should not exceed:

2000 thous. people	45 min;
1000 thous. people	40 min;
500 thous. people	37 min;
250 thous. people	35 min;
100 and less thous. people	30 min.

The density of the network of land UPT lines in built-up areas according to town planning standards should be adopted depending on the functional use and intensity of passenger traffic, as a rule, within the range of 1,5–2,5 km^{-1}. In the central regions of large and the largest cities, the density of this network can be increased to 4,5 km^{-1}.

Assumes accessibility

The results of the linguistic analysis of the semantics of the concept of «accessibility» showed the following (only definitions that are relevant for the purposes of the article are given).

For an urban environment with a dense location of various objects of gravity of residents, Walkability is important – the quality of the urban environment that characterizes the degree of fitness for pedestrians. The high degree of pedestrian accessibility of the urban area contributes to physical activity and health of the inhabitants, improvement of the ecological situation due to a decrease in the use of means of transport for movement of people. The degree of pedestrian accessibility is influenced by the presence or absence of various infrastructure elements, their quality, traffic and road conditions, the level of danger in the streets and the risk of accidents. Pedestrian accessibility refers to one of the basic principles of modern urbanism.

According to the Explanatory dictionary of the Russian language of S. I. Ozhegov and N. Yu. Shvedova «accessible» means: one to which or on which you can approach; one that is suitable for many, all (if possible to use, for moderate price).

According to the Great explanatory dictionary of modern Russian language of D. N. Ushakov, «accessible» means: 1. Such, to which or on which it is convenient to approach; transferred – easy for understanding; 2. Open to be visited or used, one to which access is free; ...5. Cheap, received for a moderate fee.

According to the dictionary of T. F. Efremova, the noun «accessibility» comes from the adjective «accessible» – 1. Such, according to which or on which you can come, approach; open to the eyes; ... 4. One that fits, suits all or many.

Popular Internet resources, although they do not have official recognition of the scientific community and are littered with slang, can in some cases be useful in identifying key words that determine the semantics of the concept of «accessibility». So, according to the Wiktionary, accessibility is a property or state by the meaning

[1] On transport, instead of price accessibility, it is more appropriate to use the concept of «tariff affordability», since there is no price for transport services, but there are tariffs for travel. – *authors' note*. [In Russian both terms – accessibility and affordability – sound and are written completely similar, but their translation into English is different. To better show authors' approach and as accessibility is more general, the term is translated further on as accessibility, without differentiating it from affordability. – *editorial note*].

of the adjective «accessible»: availability, the ability to access anything; the possibility of obtaining, acquiring something. In this interpretation, it is important to point out that accessibility is a property or state of the corresponding object.

That is, in relation to the service for transporting a passenger in a city communication, according to a linguistic context, it is necessary to reflect in the definition of accessibility of public transport services:

firstly, accessibility as a property or a state;

secondly, accessibility as suitability (fits, suits) of transport services to all or many and the ability to use the transport system;

thirdly, accessibility as receiving services for a moderate fee;

fourthly, accessibility as an opportunity to pass, drive, freedom of access.

When using the notion of «accessibility» in scientific circulation, it should be clearly indicated, the availability of what is being considered (taken into account, evaluated, normalized, etc.) – which is the object of accessibility. For urban passenger transport, these are:

- **accessibility of urban areas** *(the city as a whole, its separate districts). It is considered to be minimally sufficient if all the places of residence of citizens, all organizations in the settlement and all large passenger-forming nodes are removed from the closest stopping point of regular routes of UPT for a distance of not more than 500 m. It is necessary to take into account the actual location of pedestrian access routes, the presence of obstacles, rivers, ravines, wetlands, wastelands, enclosed areas, etc.). In the presence of reliable electronic maps, they can be used to determine the accessibility of the territory in automatic mode;*
- **accessibility of the route** *of a bus, a trolley or a tram is usually not considered, since network trips with interchanges (no more than two for most passengers) are always allowed in the big city, and instead of accessibility of the route accessibility of the stopping point is used;*
- **accessibility of the stopping point** *is determined by implementation of the distance norm of 500 m. The map establishes the boundaries of the permissible distance from the stopping point along various directions of foot traffic. As a result, a territory with objects of the urban environment that are accessible to passengers relative to the stop point under consideration is obtained;*
- **accessibility of rolling stock** *– the possibility of unhindered embarkation of a passenger in a vehicle or disembarkation from it, taking into account the quality of the landing platform of the stopping point and its other elements, embarkation/disembarkation tools of rolling stock. At the same time, it should not be assumed that accessibility of rolling stock is absent or limited when it is overfilled by passengers, because the occupancy rate and the probability of rejection of embarkation are operating characteristics;*
- **accessibility for persons with disabilities** *– disabled people and other passengers belonging to low-mobility citizens. It should be understood not as granting any special rights to these individuals (discrimination of people is prohibited by law), but solely as an obligation of the authorities and carriers to ensure equal transport conditions for all passengers. Accessibility for people with disabilities should be totally universal, understood in any case by keeping pedestrian paths in proper technical condition – they should all be suitable for wheelchair travel, be provided with the installed equipment, including embarkation and disembarkation means for moving wheelchairs and their placement inside the vehicle's cabin.*

Base points of the definition

Tariff accessibility[2] is ensured by the tariff policy carried out by the authorities and the tariffs used during transportation. The federal legislation for passengers belonging to the categories of citizens who need social protection has established a preferential procedure for using the UPT services (free travel for disabled and pensioners, benefits in paying for travel to students, free transportation of baby carriages, etc.). The executive power sets tariffs for the UPT services on routes with regulated tariffs and controls their correct application by carriers. The most complete idea of the state's participation in providing tariff access to urban passenger transport is provided by the following fact: approximately 60 % of the funds spent for its financing come from budget sources.

Accessibility of UPT services of general use is the main indicator characterizing the possibility for passengers to travel and carry permitted hand luggage and baggage. This understanding of accessibility accumulates in itself all the above-mentioned particular characteristics of accessibility. It is this accessibility in the transportation service that a passenger using the UPT acquires. Moreover, public transport forms the highest level of requirements to the quality of services in the city.

In this regard, it should be pointed out that the passenger receives a structurally integrated transportation service, rather than its separate mandatory or optional elements (for example, waiting for embarkation, the possibility of using communication channels, air conditioning in the vehicle, etc.). Indeed, by itself, moving to a stopping point for embarkation in urban transport (approach) or moving in a bus cabin without performing the initial and final elements of a passenger transportation service does not make any sense to a consumer. These are not services, but their components for transportation. Similarly, for a consumer of passenger transportation services, the possibility of using communication channels en route is an optional service, often provided free of charge as a marketing gimmick. In fact, transportation and the ability to use communications are two different services. Therefore, it is necessary to clearly identify the mandatory elements of the service itself for passenger transportation, and all other useful or unnecessary for a particular passenger, actions of the carrier attributed to additional, separately provided services.

After all, according to civil law, the presence of a ticket certifies the conclusion of the passenger carriage contract. Given that it refers to contracts of a real type, it can only be concluded upon embarkation on the appropriate vehicle.

[2] Affordability – see editorial note above.

It is in this way that the passenger transportation service is considered in the Civil Code of the Russian Federation (Chapter 40 «Transportation»), the Federal Law «Charter of Motor Transport and Urban Land Electric Transport», the rules for the carriage of passengers and luggage by road and urban land electric transport, normative-legal and normative-technical acts.

Often mistakes are made associated with consideration of the service of transporting the passenger as consisting of elements. Not a service for transportation and sale of tickets to passengers. Issuance of a ticket to a passenger in exchange for a fare is not a service or even a part of it, but one of the carrier's obligations under the passenger carriage contract (the carrier must accept the fare and hand the passenger a ticket). However, if the ticket is purchased not in the cabin of the vehicle, but in advance before the trip, then relations of a different kind take place. The sale of travel documents prior to travel in this case is a special service. In essence, a passenger does not even buy a ticket, but only a document that is a «stocking» of the future ticket and which must be composted (activated) at the beginning of the trip. Only after this procedure, the application document will purchase all the ticket details.

Conclusion. *In view of what has been said, the following definition is proposed:* **accessibility of public urban transport services** *– state and property of the city's transport system is guaranteed to allow an unlimited range of individuals to travel and carry permitted hand luggage and baggage, in accordance with the conditions of a public transportation contract for a passenger and the conditions for a transport license issued to a carrier (permit), mandatory requirements for the carrier, established in regulatory legal acts, as well as standards and rules accepted and declared by the carrier.*

This definition can also be transformed to characterize the accessibility of passenger transportation in other types of traffic, transportation of cargo and mail.

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