

# Challenges and Ways to Improve Availability of Transport for Small Partnerships

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## Abstract

The present paper discusses results of the studies on establishment of the main reasons for access limitations of transport, including pedestrian communications, and for people with limited mobility in Russia. It suggests the main ways to solve the problems identified. In this paper, transport means a system that includes: vehicles, transport infrastructure facilities, transport and pedestrian communications, information support, services and personnel in transport.

**Keywords:** Transport, Engineering Technology, pedestrian communications

## 1. Introduction

Transport, in its broad sense, is an indispensable attribute of the daily life of people. It is of particular importance for people with limited mobility (MGN - disability). Their share in Russia is about 30% of the total population. However, no more than one third of them have the opportunity to fully realize their transportation needs.

Since Russia ratified the UN Convention on the Rights of Persons with Disabilities in 2012, the accessibility of the environment for MGN in the country is estimated by the proportion of physically accessible objects of social, transport and engineering infrastructure [1]. However, preliminary studies conducted in 2013–2016 showed that there is a possible significant discrepancy between the official assessment of the level of accessibility of the environment and its real state [2–4]. Therefore, it became necessary to develop and research the possibility of applying a new approach to the organization of an accessible transport environment. The object of the object is the users of the transport system - MHN, for which it is necessary to ensure the conditions of accessibility of transport throughout the entire chain of movement between the points of departure and destination.

## 2. Brief description of research technique

The main objectives of the study are as following:

- identification of barriers on the priority routes for the movement of persons with disabilities impeding the satisfaction of their social needs;
- assessment in real conditions of the impact of existing barriers on transport and the degree of their importance for people with disabilities.

The research methodology contains the following main steps:

- a) Organization of a pilot study on the territory of the Moscow region to study the viability of the new approach to assessing the availability of transport and clarifying the research methodology.

- b) Cameral selection of potential respondents - active young people aged 18-35 years, belonging to the most difficult categories of people with disabilities - blind people and people with disabilities in a wheelchair.

- c) Organizing and conducting in the cities of Russia by working groups jointly disabled dispensaries for examining the availability of existing or necessary routes of movement from the place of residence to the most significant places of incidence ("door to door").

- d) Analysis of research results and conclusions. Data processing was performed using standard MS Excel statistical analysis tools, as well as using the abc-analysis method.

## 3. Main results of research

Taking into account the positive results of the pilot study, bulk of a work was carried out in 79 subjects of the Russian Federation. After rejecting about 1% of the protocols that do not meet the research methodology, 960 protocols containing data on 1835 routes were taken for analysis. Among them, about 30% are routes of blind people and 70% are routes of disabled people moving in a wheelchair.

52% of the routes were pedestrian, 25% of the routes were used by light vehicles, 23% by public transport.

A significant proportion of the movement of persons with disabilities (26.4%) is carried out in order to receive medical services, 18.9% - to visit trade facilities, 6.9-6.2% - to visit places of recreation, places to receive public services or cultural services; 5.2-5.6% is accounted for by labor movements, visits to sports facilities, rehabilitation or social services. 19% of the movement falls on the other goals. The selection was made according to the Pareto rule by the method of abc-analysis.

According to the respondents, the shares of simple and complex routes were evenly distributed. Analysis of the data showed an interesting relationship: with walking and using public transport, the complexity of the route increases with increasing its length (the length of a complex route, on average, is 60-90% more than a simple one). And when using cars, on the contrary, decreases, and

inversely proportional to the distance characteristic of public transport.

The average length of simple routes with independent walking was  $540 \pm 50$  m, and complex -  $850 \pm 50$  m (with a confidence level of at least 90%). The indicated values are 2-3 times higher than the standard of accessibility for MGN - 300 m [5]. On the one hand, this indicates deficiencies in environmental planning, and on the other hand, it characterizes the national peculiarities of behavior of people with disabilities under the prevailing conditions, especially on simple routes.

On public transport, the indicator values are  $3.2 \pm 0.5$  km and  $6.2 \pm 1.3$  km, and when using a car -  $6.7 \pm 2.5$  km and  $3.2 \pm 0.9$  km, respectively.

The presence of an accompanying person is marked on 54% of the routes. However, significant differences in the values of indicators

in the case of its presence, compared with independent movement, were not identified. The only difference was observed on difficult routes when using a car. In this case, the average trip distance was doubled. The reason why people with disabilities are forced to use the help of others is only their disability.

The results of an assessment of the level of accessibility of routes for persons with disabilities, performed independently for each of the five main stages of their movement, are shown in Figure 1. The most serious accessibility problems are observed at the stage of pedestrian movement in courtyards and on the street, and also at the stage of movement in public transport (52.70% of cases). The stage of movement in a passenger car or in a taxi is characterized by the smallest number of obstacles - in almost 44% of cases.

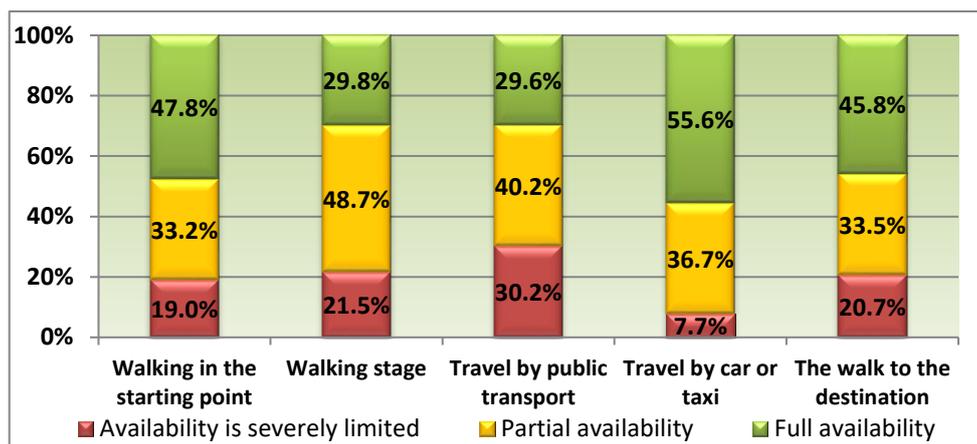


Fig. 1: Distribution of answers about the availability of routes at each stage of movement

The presence of different barriers at each stage of movement leads to the fact that only 23% of respondents can use public transport services, while the real share of users ranges from 40 to 60%. The most difficult situation is observed with the availability of metro and electric trains.

On the basis of abc-analysis of 95% of hard-to-reach routes, a list of the most hard-to-reach elements is determined:

- sidewalks and pedestrian paths outside the yard territories (8.7% of the total number of estimated route elements);
- land crosswalks and other intersections of pedestrian and transport roads in the same level (6.5%).

Less critical elements of the routes are:

- Elements of arrangement of public buildings: stairs, ramps, elevators and lifts, entrance groups, sanitary facilities, information and orientation means, services (from 2.0 to 2.5%);
- yard areas (2.5%);
- public vehicles, stopping points and services provided for them (only 0.6-0.7% due to the small demand for travel due to restrictions on the availability of pedestrian approaches to stops and vehicles).

Parking places for disabled cars were available to less than half of the respondents.

The overall assessment of the availability of transport infrastructure facilities, made on the basis of the degree of availability of elements of these facilities on each route, taking into account regulatory requirements and the subsequent evaluation of the number of available facilities in each group of their total, showed the following results:

- 1) fully accessible - 39.9% of the objects;
- 2) partially available - 34.6%;
- 3) not available - 25.5%.

The obtained values correlate with the data of official statistical reporting. At the same time, the integral assessment of the availability of routes, defined as the ratio of the number of routes of movement of MGN, corresponding to the established degree of accessibility to the total number of routes, showed:

- 1) fully accessible - 0.01% of routes;
- 2) partially available - about 3.4%;
- 3) unavailable - almost 96.6%.

The final assessment of availability is presented in Table 1.

Table 1: Scale of accessibility assessment of transport for people with disabilities

Grading scale availability	Estimated Accessibility *	
	infrastructure facilities	Routes MGN
	very low	insignificant
up to 20%	low	at a low level
20-59%	low	on the Middle level
61-79%	high	at a high level

\* When forming the scale, the following assessments by respondents of the availability of route elements were taken into account: "fully accessible" - there are no answers in the questionnaire: "unavailable" and "partial"; "Partially available" - there are no answers "inaccessible"; "Inaccessible" - contains at least one answer "inaccessible".

In the additional part of the study, the following main problems associated with the identified systemic problem were identified, which limit the availability of transport for MGN:

- the backlog of technical regulation documents from the real needs of society;
- application of international standards without adaptation to Russian conditions, which is not always justified and effective;
- the lack of technological solutions in the field of creating integrated information, monitoring and payment systems in transport, taking into account the personal characteristics of persons with disabilities;
- underdevelopment of intelligent systems and personal navigation tools for people with disabilities of various categories;
- low level of use of the domestic research base in the preparation of documents of technical regulation, as well as in the rationing and evaluation of indicators of accessibility of transport for people with disabilities of various categories;

- low level of training of technical specialties in this area, and others.

#### 4. Conclusion

In the two categories which were studied the comprehensive accessibility of transport for people with disabilities was 28 times lower than the accessibility of the elements of this environment separately. It follows the point that the model of formation and assessment of an accessible transport environment adopted at the state level does not take into account the entire chain of communication and informational connections of a person when moving in space. Consequently, it does not comply with the principles of continuity and accessibility established in the UN Convention on the Rights of Persons with Disabilities, and requires changes through the transition to a comprehensive model for assessing the availability of routes of movement of MGN. This model should be the basis for the development and improvement of regulatory legal and technical documents in the field of transport.

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