Safety of a Barrier-Free Architectural and Planning Environment for Low Mobile Populations as a Subject of Construction Education

I Pryadko¹, I Lebedev¹

¹National Research Moscow State University of Civil Engineering, 26 Yaroslavskoe sh., Moscow, 129337, Russian Federation

E-mail: priadcko.igor2011@yandex.ru, lebedev26@mail.ru

Abstract. The article discusses one of the most important problems of present-day urbanism. The security problems of the urban architectural and planning space are of interest to both representatives of different areas of knowledge, and architects embodying theoretical developments in practice. That is why the proposed paper analyzes the steps taken by municipal authorities and construction organizations in Russian megalopolises, to organize a safe architectural and planning environment for low mobile populations. In order for social programs to improve the living conditions of disabled people and other categories of low mobile populations in urbanized areas to be implemented, it is necessary to train civil engineers, transport engineers and architects in urban planning to meet the needs of all citizens. The paper justifies the position that the training of the organization of a barrier-free architectural and planning environment should be a priority for modern Russian construction education. The paper emphasizes that there is a legal aspect of the problem associated with the protection of the social rights of disabled workers. It emphasizes the need to overcome contradictions between different groups of urban population, as well as the need to take into account the environmental trends of modern world urban planning. In particular, the urban development of the famous modern Danish architect Jan Gehl, head of Gehl Architects, currently operating in the Russian Federation, in cities in the Moscow region, is associated with the organization of a safe environment for all categories of urban residents.

1. Introduction

The problem of a comfortable architectural and planning environment, capable of meeting the needs of all urban residents, is a major problem tackled by urbanism. Major attention is driven to the development of a barrier-free urban environment for residents with reduced mobility. For this objective to be effectively attained, architects and civil engineers must be aware of the social problems experienced by residents with reduced mobility. Therefore, there is a need to educate those who generate the urban environment, to improve their awareness of social urbanism. Towards this end, the article pursues the following two goals: goal one consists in the analysis of the best practice in developing a barrier-free environment for residents with reduced mobility in Moscow. Goal two consists in making civil engineers and civil engineering students, who will design future megalopolises, aware of this best practice.
A comfortable and, most importantly, safe architectural and planning environment will provide opportunities for vocational training, retraining, advanced training of people with disabilities, for organizing sports competitions and cultural events designed for these categories of urban residents. So, we need constructions and objects of small architecture that facilitate the movement of disabled people through the streets of a megacity, making this movement safe. The current trend is associated with the involvement of disabled people not only in employment, but also in “freelancing” and in self-employment [1]. These trends should be taken into account when building architectural structures in a city. After all, the spread of self-employment and home-based work sets new requirements for architects for organizing the interior of residential premises designed for people with disabilities and for their safety. In this case, they should be not only a place of recreation and satisfaction of the everyday needs of representatives of low mobile populations, but also to become a convenient place for their work. On the other hand, it is necessary to organize a dialogue between civil society and representatives of low mobile populations living in a city.

2. Methods
The main working method is the method of retrospective analysis of sources, analysis of survey data conducted by VTsIOM among residents of the capital in 2017-2018 and the survey data conducted in the construction institute among future builders. In the last of these surveys, 120 respondents took part. In this paper, the authors take into account the views of modern Russian and foreign experts on the formation of a comfortable barrier-free environment. Of interest are the findings of such modern researchers in this field as Danilina N.V., Privezentseva S.V. [2], Shimolina M.V. [3]. Environmental aspects of the problem are considered by Zavyalova T.V. in the article [4]. Problems of a barrier-free environment are posed in the articles of Plaksina N.A. [5], Belenkaya M.P. [1], Naberushkina E.K. [6] and several others. The situation with the organization of a barrier-free environment in the megacities of South-East Asia can be found in [7]. Most of these authors share the thesis that the problem of low mobile populations is a complex, and therefore it should be solved by means of social, urban planning and psychological sciences with the involvement of architectonics, municipal workers, designers and even social philosophers and ethnologists (it is undeniable that attitudes towards disabled persons in different societies due to ethnic and cultural specificity). Transport problems of low mobile citizens are raised in studies by Orlina K.V. and Pryadko I.P. [8] and Davydova E.A. [9].

At the same time, in none of these articles there was a question about including the problems of organizing a barrier-free environment for low mobile populations in the training of urban planners. We will try to connect the achievements of scientists and practitioners in the field of urban planning with the requirements of construction education and with the requirements of social security for low mobile populations through the application of legal knowledge. After all, what experts write about in articles can also be included in the educational programs for builders and architects.

3. Results. Experience in creating a barrier-free environment in the interior of public institutions
The availability of social services, the convenience of urban infrastructure in general in the Russian Federation in some cases continues to be a factor of social inequality for disabled persons. Today, one of the tasks of the complex organization of a barrier-free urban space is to overcome this inequality. Aggressive, filled with various obstacles, the architectural and planning environment of Russian cities is uncomfortable and unsuitable for citizens who need special conditions and special care. The authors of this article believe that to overcome this negative trend, an interdisciplinary model of training builders is needed. This model is aimed at mastering the competences to create a barrier-free architectural and planning environment in cities (for a competence-based approach in construction education, see: [10]). In order to implement this model, it is necessary to develop curricula and courses that enable civilian engineers to determine the social needs of persons with reduced mobility. In this regard, the Russian construction education is still significantly behind the global level. Coordination of the efforts of urban planners, social workers, representatives of civil society, entrepreneurs,
economists and the faculty of construction universities is needed. It is necessary not only to improve technical means for the rehabilitation of persons with reduced mobility, but also to create conditions for their socialization, conditions for satisfying not only basic physiological, but also social, cultural, spiritual, and sometimes religious needs (see, for example, [11]). Today, social activities are often carried out separately from the architectural and planning ones. In order to overcome the inequality between capable and disabled persons, persons with reduced mobility, job fairs and conferences on the employment and entrepreneurship of disabled persons are held in the capital region. Within the framework of such events, teachers, business representatives, psychologists help persons with reduced mobility to believe in themselves, get a job and even start an entrepreneurial activity [1]. The authors of the article proceed from the confidence that architects and builders interested in this social problem could join the work of these fairs. With their participation at such events, complex inquiries from persons with reduced mobility would appear, including requests for the arrangement of a particular urban environment.

For example, one of the central psychological problems of persons with reduced mobility is the problem of loneliness, which results from the inability to overcome spatial barriers (this is a simultaneously urban-planning and psychological task). Up to 41% of Muscovites surveyed by VTsIOM are convinced that the number of loners in the city is constantly increasing [12]. Hence the task: to organize the architectural and planning environment so that such barriers do not exist, and loneliness is overcome. This task should be set and solved already at the training stage of future town-planning specialists.

The organization of a barrier-free environment inside rooms and dwellings should become a factor of safe living for disabled persons and similar categories of citizens. The life of persons who have received road and rail injuries, persons with neurosurgical pathology is rather difficult in modern interiors, which the regional press quite often writes about [13]. Surveys, including those conducted among students of NRU MGSU, have shown that the layout of interior rooms and interior spaces intended low mobile categories of residents, should be completely different from rooms designed for other citizens. The entrance to the bathroom and the exit to the balcony can be provided with a ramp (here, at least, there should be no threshold preventing the passage of the wheelchair), and the doors should open in the direction opposite to the movement of a wheelchair user. Projects of the 60s and 70s (for example, buildings of the K-6 series) were built without taking into account the requirements of low mobile residents, nor was it envisaged to re-equip or additional equipment of apartments for wheelchair users. For this reason, at present, such an additional equipment of apartments for low mobile populations is very difficult due to the small room area. According to the respondents, it is advisable to return to the system of adjacent rooms, which will also provide the disabled people with better access to the premises themselves. At the same time, it would be desirable to provide pivot pads with sufficient size for wheelchairs. Cases where ramps are installed with gross violations of existing ergonomic requirements (see Fig. 1 and Fig. 2) are not allowed.
When designing apartments for low mobile populations (namely, those apartments within the MCD, which will be issued by the state exclusively for wheelchair users), it is necessary to take into account modern trends in architecture and construction, where the desire for autonomy is becoming more pronounced. “A person, emphasizes the modern author, needs a house that will allow him (her) not to depend on the external environment” [14]. Home safety for disabled persons should remain a priority. It is also important, while making efforts to green the urban architectural and planning spaces, to preserve the transport facilities for persons with reduced mobility [15].

The educational program for the creation of architectural and planning space for persons with reduced mobility, which could be used in the practice of training, should be aimed at meeting the requests of representatives of low mobile citizens and compliance with the standards for the organization of an accessible environment. For example, it is obligatory to observe such Federal laws as: Federal Law of December 27, 2002 N 184-FL “On Technical Regulation”; Federal Law of November 24, 1995 N 181-FL “On Social Protection of Disabled Persons in the Russian Federation”; Federal Law of March 30, 1999 N 52-FL “On Sanitary and Epidemiological Welfare of the Population”, on the basis of which the “Code of Practice (CP) CP 59.13330.2016 Accessibility of buildings and structures for low mobile populations” was developed and enacted in the Russian Federation. An updated edition of the SNiP 35-01-2001 (English name: Accessibility of buildings and structures for persons with reduced mobility), which indicates that the regulatory framework of the Russian Federation for the protection of persons with reduced mobility exists and does not contradict the World Health Organization Convention UN “Standard Rules equal opportunities for disabled persons, adopted by General Assembly Resolution 48/96 of December 20, 1993) should be added to the above.

Let’s elaborate on the development of a barrier free environment in the capital. The co-authors are convinced that a comfortable environment for residents with reduced mobility represents a multi-faceted and systemic problem. A big city must launch a social transport network. Social buses may use public transport lanes. Buses must have lower floors to become convenient for wheelchair users and parents with baby strollers. These requirements are honoured in the Russian capital. In one of his interviews M. Liskutov, Deputy Moscow Mayor and head of the Department for Transport and Road Infrastructure Development, said that 100% of Moscow buses had low floors [16]. All public transport vehicles have ramps designated for persons with disabilities. Convenient transport vehicles must be accompanied by convenient pedestrian underpasses, sidewalks and driveways leading to socially significant facilities. The number of socially significant facilities, that are completely or to some degree adapted for residents with reduced mobility, goes up. In the early 2018, the number of these facilities reached 85%. According to another representative of the executive authorities of the Moscow megalopolis, V. Petrosyan, head of the Department of Labour and, Social Protection, the barrier free environment is being developed according to the principles of universal design and comprehensive adjustment of facilities for persons having any types of disabilities. In 2018, the amount spent on the development of a barrier free environment for wheelchair users reached 1.2 billion RR. Above we spoke about the requirements applied to interiors for the latter to be easily accessible for residents with reduced mobility. The apartments, occupied by disabled persons with substantially reduced mobility, have special ceiling-mounted systems that enable the residents to travel around the apartment.

Special service providers, incorporated by the municipal authorities, make a substantial contribution into the social adaptation of disabled persons. Those disabled persons who have no permanent residence, can find jobs and places to live in thanks to such service providers [17]. Lonely elderly residents are taken care of at home. Particular attention is driven to the leisure activities of elderly residents.

4. Discussion
In the previous paragraph, we already talked about the need for close communication between people with reduced mobility and representatives of other groups of townspeople. There is an urgent need for communication between low-mobile categories of townspeople and civil society. Trained architects
should help to improve it. They will accept the advanced world experience and satisfy the demands of the urban residents of the future. Thus, Danish city-planner invited by the authorities of the Russian capital, the head of Gehl Architects, Jan Gehl, taking into account in his projects the social component of the architecture, advises to expand the footpaths (see Fig. 3), to expand recreational areas in order to facilitate the movement of people with physically reduced mobility in the megalopolis [18].

![Image of a street scene with people walking and cycling]

**Figure 3.** Ramps and footpaths in Jan Gehl's projects are convenient for low mobile townspeople.

The third group (after the city authorities and representatives of civil society), which should be involved in solving the problems of persons with reduced mobility, are entrepreneurs. Entrepreneurs and managers of enterprises have the obligation to certify workplaces, ensure the accessibility of the work area, comply with labor legislation and sanitary-technical standards [19]. In most cases, employers are frightened by the law “On Special Evaluation of Working Conditions” [20], since in accordance with the provisions of this regulatory legal act, special conditions for the assessment of work and safety will be applied to disabled persons. Meanwhile, in order to solve the problem, it is sufficient to arrange a disabled person to work as a homeworker, which in turn will not be a violation of Section 3, Art. 3 of this law, since such work is not subject to special evaluation. At the same time, within the enterprise itself, the employer is obliged to re-equip with ramp congresses both the entrance to the building and moving around the building of a wheelchair user.

Curtilages are being redesigned to meet the needs of persons with reduced mobility for them to get integrated into the urban life; ramps and bus ramps are being installed there. The local newspaper describes municipal activities and those of the house committees as the “redevelopment boom”. In the 2019, Moscow authorities are going to redevelop 1.1 thousand Moscow streets. The attention of the Moscow authorities is focused on the so-called “bedroom communities” of the metropolitan agglomeration. P. Biryukov, Deputy Mayor of Moscow for Housing, Utilities and Amenities, said in his interview given to the Metro newspaper: “This year (2019 – clarified by I. Pryadko) our focus is shifted to the far-away districts in order to make sure that all groups of muskovites (italicized by I. Pryadko) felt comfortable.” The asphalt coating, including the coating of sidewalks, needs to be repaired. It means that wheelchair users and parents with baby strollers will find the megalopolis more comfortable. The plans also include the arrangement of flower beds and lawns. Each work item is to have been completed by the first of November 2019 [21].

The expansion of the subway network is vital for challenged passengers. As early as in mid 2019, new subway stations opened in the north of the capital: Lyublinsko-Dmitrovskaya subway line is being extended [22]. In this district, a tunnel will be constructed. It will be 2.3 km long, and it will reach Lianozovo train station. The Moscow subway develops most intensively in the south-western direction. There, the Moscow subway has reached Kommunarka village. It is noteworthy that new subway stations have lifts, convenient driveways and wheelchair ramps. These facilities are available at Salaryevo, Filatov lug, Rumyantsevo hubs, etc.
Lifts are installed even in Moscow leisure areas. The restructuring schedule, developed for the Patriarch bridge, comprises a new pedestrian area between the Bersenevskaya embankment and Yakimanka. Soon this area will boast the lifts taking their passengers down to the water’s edge, ramps for persons with reduced mobility and wheelchair users, an amphitheatre, a centre of culture, a stair, and a pier that will be built along the Bolotnaya embankment. Sergey Sobyanin has informed the audience about the plans of the Moscow city hall in the newspapers and social networks [23].

It is noteworthy that in the urban leisure areas persons with reduced mobility, primarily, handicapped citizens and retired residents, get involved in the social life. This is how the awareness of the healthy mode of life is generated, and social optimism is spread among socially inept urban residents. “Moscow Longevity” is the most widely known programme of this kind. This program encompasses varied events, contests, and concerts, including a flash mob of dancers held as part of the “Peace in the family stands for peace on Earth” festival [24].

5. Conclusion
Having analyzed the development of a barrier-free space for handicapped persons and similar residents, we can make a conclusion that the Russian capital turns more accessible for persons with reduced mobility. It has new public transport routes; urban authorities buy new comfortable buses; the city has a social taxi service, and ramps are being installed. The Moscow social taxi service fulfills over 600 orders a day. The service, reporting to the Moscow Urban Transport Authority, helps handicapped citizens, multi-child families and veterans. These groups of residents can use this service to get to their offices or leisure areas. Thanks to this taxi service, they can attend sports centres and institutions of culture.

The principles of urban planning of the XXI-st century should be taken into account, in particular, the principles of complexity and consistency in creating a barrier-free architectural and planning space and the principles of organizing an exclusive space for residents of apartment buildings with reduced mobility. At the same time, it is important to take into account the trends in architecture and urban planning, which have become widespread not only in the west, but in the east.

References
[1] Belenkaya M 2018 Disabled people told why they work Metro 12 3
[2] Danilina N, Privezentseva S 2018 The people with limited mobility in transport interchange hubs Bulletin of Tomsk State University of Architecture and Civil Engineering 20 49-56
[3] Shimolina M 2015 The people with limited mobility in modern Russia: aspects of social inequality Modern problems of science and education 1 1491
[4] Zavialova T 2016 Estimation of ecological trails of the city of Moscow in terms of their ADAP-trovanodsi under low-mobility groups of the population Landscape Architecture Bulletin 8 36-41
[5] Plaksina N 2017 Tolerant environment-barrier-free environment for children with special educational needs in: Proc. Conf. «Barrier-free environment in school and society» (SPb.: Ed. by ISPP) pp 198-201
[6] Information on http://ecsocman.hse.ru/data/2011/02/13/1214888091/Naberushkin_07.pdf
[7] Ma H, Peng Z 2017 Study on Law of Barrier-free Environmental Construction in China Proc. International Conf. on Education, Culture and Social Development 80 220-223
[8] Orlina K, Pryadko I 2012 Transport and the urban environment: the organization of barrier-free and comfortable architectural environment for low-mobility groups of the population Urbanism 1 19-21
[9] Davydova E 2011 In the modern metropolis, in: Collection of reports of the Institute of Fundamental Education of MGSU (Moscow) pp 145-155
[10] Odrich I 2016 Methodological principles of design of process of forming of professional competences of bachelors of construction of the profile Baltic Humanitarian Journal 1 132-135
[11] Sergienko E 2016 Temple, accessible to everyone: one of the aspects of the formation of an accessible urban environment in: Proc. Conf. «Architecture, construction, design» vol 1 (Moscow) pp 235-243

[12] Neshevets M 2018 In Russia there are practically no lonely people Metro 2 3

[13] Semenova N 2014 Health is priority How did doctors in Seljatino in the past year City centre 11 4-6

[14] Zdarilova R 2016 An analysis of the User’s Perspective of Bareer-Free Housing, 3rd International Multidisciplinary Scientific Conference on Social Sciences and Arts, SGEM Book4 (Vein) pp 59-63

[15] Boro E 2012 Our cities are turning green Metro 3 12

[16] Shevtsova M 2018 An accessible city The Evening (Moscow) 29 23

[17] Vinogradov M 2018 Social adaptation centre helps “lost” citizens The Evening (Moscow) 29 23

[18] Samarin V 2014 Walk useful Springs 33 6

[19] Zolotarevkaya A 2018 Why the law on quotas of workplaces for disabled people does not solve the problem Metro 3 3

[20] Federal Law of 28.12.2013 N 426-FL (Ed. from 27.12.2018) «About special assessment of working conditions»

[21] 2019 The capital is overfilled with improvements Metro 2

[22] 2019 The subway car is going northwards Metro 2

[23] 2019 Lifts will take passengers down to the water’s edge Metro 2

[24] Sokolova D 2019 Grandmas danced to rap Moskovsky Today 12 8