Application of Universal Design principles for the adaptation of urban green recreational facilities for low-mobility groups (Vladivostok case-study)

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Abstract. Universal Design or "Design For Everyone" assumes the creation of the environment that meets the needs of all citizens, including the low-mobility groups of population and disabled people as their part. The study presents the research of the possibility to apply the principles of Universal Design during the adaptation of urban green recreational spaces for low-mobility groups of population. Large public spaces such as parks and beaches in Vladivostok were the object of research in the study, the elements of an accessible environment located on the territory of these objects, were the subject of the study. Based on the assessment of accessibility and convenience of use, the main approaches to the landscape organization of the investigated objects were identified. The results of the study formed the basis for project proposals for the adaptation of urban green recreational spaces for low-mobility groups of population. The project solutions confirmed the possibility of applying the Universal Design principles for the benefit of all members of society, including low-mobility groups: children, the elderly and people with disabilities.

1. Introduction

The expansion of the anthropogenic environment and the increasing complexity of new technologies affect the reduction of accessibility to the external environment for people with disabilities. According to statistics of the World Health Organization (WHO), more than one billion people (15% of the global population) suffer from various forms of disability [1]. Along with the term "disabled person", Russian normative documents use the term "low-mobility group of population", meaning people who experience difficulties with independent movement, obtaining services, getting necessary information or orienting in space [2, paragraph 3.21]. Here low-mobility group is a broader category, including not only disabled people, but also people with temporary disabilities, pregnant women, elderly people, and so on. In 2006, the UN General Assembly adopted the Convention on the Rights of Persons with Disabilities. It establishes a number of principles which are the basis of all the other provisions of the Convention, in particular: full and effective involvement and inclusion in society, equal opportunities, non-discrimination and accessibility [3, article 3]. Universal Design (UD) serves for the achievement of these principles [3, article 2]. UD is also called as "inclusive design" or "design for everyone".

Nowadays in Russia, the process of intensifying the use of UD principles in the construction of new and reconstruction of existing urban green recreational spaces, which can be considered as key

elements of the urban landscape and urban sustainability, has begun. There are studies confirming that urban green recreational spaces improve the quality of life, positively influence health, promote social interaction and inclusion (Ward Thompson C. [4, 5], Rojas C. and Páez A. [6]). In this article, we would like to focus on the main approaches to solving the problems of creating an accessible urban green recreational environment using the principles of UD. A number of studies prove that the availability of urban green recreational spaces at various levels of the urban planning hierarchy is one of the main aspects of sustainable planning that determines the welfare of different population groups (Gupta K. and Roy A. [7], Fan P. and Xu L. [8], De la Barrera F. and Reyes-Paecke S. [9], Kabisch N and Strohbach M [10], Wüstemann H. and Kalisch D. [11]).

The review of contemporary information sources has shown that in addition to the creative integrated approach (Bendixen K. and Benktzon M. [12], Clarkson P.J. and Coleman R. [13]), one can also find examples of insufficient attention to the formation of an accessible environment based on the UD principles (Carvalho de Souza S. and Duarte de Oliveira A.P. [14], Perry M.A. and Devan H [15]). One of the reasons is lack of awareness of the majority of designers due to the lack of the architecture and design of compulsory disciplines dedicated to UD in the educational process of many schools (Nazli E.H. and Karamanoglu N. [16]). The review of a number of sources (Ergenoglu A.S. [17], Kopeva A. and Ivanova O. [18], Kopeva A., Ivanova O. and Khrapko O. (eds) [19, 20], Leontyeva E. [21]) demonstrates the importance of teaching the basics of UD for design professions, principally architecture and landscape design have to attach importance to create environments that derives an accessible design by all user groups.

2. Methods

Urban green recreational spaces are an environment for leisure activities that the whole population of the city can use with minimal financial costs. Assessing the accessibility and convenience of use of urban green recreational spaces is important because their safety, design and environment (natural and anthropogenous) can influence the participation of persons with disabilities. The main approaches to the formation of an accessible urban green recreational environment were preceded by work on assessing the accessibility and convenience of use of four large facilities in Vladivostok: two parks (Pokrovsky Park and Minny Park) and two beaches (Kungasny beach and Chaika beach). The analysis of the condition of the territories was carried out according to 48 parameters on the basis of the requirements of the normative and technical documentation for the provision of an accessible environment for low-mobility groups, set out in SP 59.13330.2016, SP 35-105-2002, GOST R 50918-96, GOST R 52131-2003, GOST R 52875-2007, GOST R 52871-2007, GOST R 51630-2000. The data were analyzed with the use of descriptive statistics.

3. Results

None of the objects that we assessed are in compliance with legal documents, national standards and recommendations for providing an accessible environment for low-mobility groups. The main problems of accessibility and convenience of use were identified as follows:

- partial absence of public transport stops for low-mobility groups;
- inadequate number of parking spaces for low-mobility groups (of 6.0x3.6x1.2 m size);
- absence of marking and signs on parking lots;
- absence of available routes through the territory of recreational spaces;
- insufficient width of existing routes (less than 0.9 m);
- lack of navigational schemes for the movement along the facility and equipment allowing to receive supplemental information on the conditions of service for persons with hearing and sight disabilities;
- lack of accessible help buttons in the assistance waiting areas for low-mobility group representatives;
- insufficient graphic designation of traffic routes;

- unsatisfactory condition of the road surfaces on the travelling routes (the surface must be smooth and non-slippery);
- absence of recreational spaces with the possibility of calling and waiting for help on the travelling routes;
- partial absence of ramps at the intersection of a route with an edging;
- non-compliance of the ramp width to regulatory requirements (for exclusively one-way traffic - not less than 1.0 m, in other cases – a walking route edgeways);
- lack of fencing (the required height is 0,9 m) with handrails along both sides of all ramps and stairs, as well as along all elevations with differences of horizontal surfaces more than 0.45 m;
- absence of lifting devices on sites with a significant elevation (in cases when it is not possible to organize ramps);
- non-compliance of open staircases length with accessibility requirements (must have at least three steps and not exceed 12 steps);
- presence of single steps (must be replaced by ramps);
- non-compliance of distance between the handrails of open staircases (must be not less than 1.0 m);
- edging steps of staircases are not marked with color or texture;
- absence of warning tactile bands in front of open staircases (0.8-0.9 m from it and 0.3-0.5 m wide) along the walking routes;
- lack of equipped access to water for low-mobility group representatives.

Also, the lack of playing equipment available for low-mobility group representatives, as well as the lack of lighting and amenities (toilets and drinking fountains) have been identified.

On the basis of the data obtained, recommendations were developed to bring the territories of the investigated objects in line with the requirements for the formation of an accessible environment. On the basis of these recommendations, project proposals were formed for adapting these facilities to low-mobility groups by means of universal design.

4. Discussion

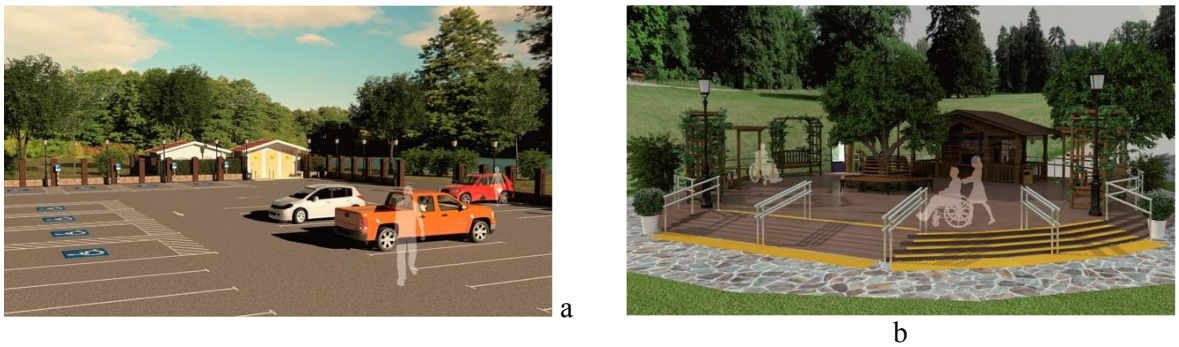
The problem of accessibility for low-mobility groups in Vladivostok is very acute, since Vladivostok is located on a challenging terrain, distinguishable by significant incline of slopes and elevations that create problems in the movement of all population groups. In this regard, decisions to create an accessible environment, based on the UD principles, may require greater economic costs than for the low land cities of central Russia.

In 2014, the city administration of Vladivostok started the implementation of the municipal program "Accessible Environment", designed for 2014-2019, which provides a set of activities allowing unlimited access to priority social infrastructure facilities in priority areas of living of people with disabilities and other low-mobility groups of population [22].

In two universities of the city - at the Department of Design and Technology of Vladivostok State University of Economics and Service (VSUES) and the Department of Architecture of Urban Planning of Far Eastern Federal University (FEFU), great attention is paid to the design of urban green recreational facilities based on the UD principles. In 2017, a group of students from VSUES and FEFU under the guidance of professors took part in the architectural contest of student works "Universal Design 2017", organized by "Perspektiva" - the regional public society of disabled people - in the nomination "Adaptation of Parks" for Vladivostok. On the territory of two city parks - Pokrovsky Park and Minny Park - and on two city beaches – Kungasny Beach and Chaika Beach, studies were carried out to identify the accessibility of the environment and further suggest possible solutions to bring its elements in line with regulatory requirements. Projects on adaptation of urban green recreational spaces, based on the principles of Universal Design, were implemented. The main task was to develop solutions to achieve the full inclusion of people with disabilities in public life. This required the transition from the creation of an accessible environment to complex inclusive solutions of the environment.

Pokrovsky Park is located in the central part of the city and has an area of 9 hectares. There are the objects of Vladivostok eparchy situated on its territory. At present, its territory has lost the original recreational functions of the city park of culture and recreation, but is still popular among the elderly, couples with children, dog owners and tourists. The project provides the arrangement of the following zones: parking, photo, dog walking, sports, children, sanitary, food and recreation areas with seating places. Walking routes are planned, non-slippery coverings and tactile tiles are applied. There are ramps on the ground that are duplicated by stairs, handrails are provided. Rest areas are equipped with comfortable benches, help buttons for calling first aid and kiosks for selling water.

Minny Park is located in a residential area in the southeastern part of the city – it is the largest green massif in Vladivostok and the object of cultural and historical heritage. The park is popular, as it is conveniently located next to the transport hub. The area of the territory is 37 hectares with a challenging terrain, in some places the vertical incline reaches 30 m. The project proposal provides the division of the park into two sections: the north-eastern (16.5 ha) and the south-western (20.5 ha) with three vast artificial ponds. The project suggests the arranging of parking lots with provision of parking spaces for disabled people, as well as installing lifting platforms for inclines in the park (figure 1). Several walking routes for low-mobility group representatives with recreation areas, equipped with help buttons, sheds, benches, signs, toilets have been designed. There are information map-stands providing the necessary sound and tactile information. The walking routes are extended for free travel of disabled people on a wheelchair, ramps are installed, transverse slopes of routes are adjusted in accordance with regulatory requirements, tactile bands are applied. A walking route is organized along the lakes with equipped paths to the water and fences. There is a suggestion to arrange greening, lighting and gaming equipment.



a b

Figure 1. Examples of project proposals for “Minniy” park: a – car parking; b – recreation area

Kungasny beach is located on the shore of the Amur Bay in the central part of the city, close to public transport facilities. The 800-meter coastline has the area of 2 hectares. In the project proposal, the beach is divided into three zones according to the nature of the coastline. The project provides parking arrangements in each zone with the allocation and marking of places for disabled people. A walking rout is arranged, connecting the zones, with rest areas within every 150 meters equipped with sheds, benches, litter bins, handrails and emergency call buttons. Routs to the water are planned, the arrangement of children and sports grounds adapted for low-mobility groups (figure 2) is suggested. Container gardening and arrangement of lightening will be implemented.

Chaika Beach is located on the shore of the Amur Bay in the suburb near the railway station. The length of the beach is 800 meters, the width varies from 10 to 30 meters. There is a parking lot with spaces for people with disabilities in the northern part of the beach. The entrance from the parking lot to the beach is equipped with a ramp and rest facilities. A walking route has been designed along the beach with the application of a wooden cover, level differences are equipped with ramps and handrails. Routs to the water are available for low-mobility groups. Emergency zones have emergency call buttons.


a


b

Figure 2. Examples of project proposals for Kungasniy beach: a – recreation area; b – playground

The project proposals of all listed facilities also include safe and affordable sanitation facilities; lighting; graphical support in the form of signs and markings; comfortable walking surface; elements of geoplastics for games and rest; sports grounds and recreation areas.

5. Conclusions

Our assessment revealed the main problems that hamper the organization of a safe and accessible environment for low-mobility groups on four major urban green recreational territories in Vladivostok. As a result of the research done, the design of these facilities was proposed, based on the principles of accessibility, safety and convenience – universal for the use and interaction of all population groups. The current situation with the formation of an accessible environment requires more ambitious and comprehensive assessment of all urban green recreational spaces in Vladivostok. To continue this work, the participation of specialists who have the necessary training is required, thus, the inclusion of UD training courses in architectural education is needed. Obviously, the problem of the formation of an accessible environment by means of UD, one way or another, should be the basis of the research and design activities of the universities.

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