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## **BARRIER-FREE ENVIRONMENT FORMATION IN THE CURRENT URBAN LANDSCAPE**

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### **ABSTRACT**

An analysis of practical and scientific experiences in foreign countries on the barrier-free urban environment formation was made. It was identified that creating a barrier-free social spaces is possible only in context of a constant dialogue between the city administration, architects and disabled persons. The model of the route for people with limited mobility and the method of its` formation were developed on the basis of practical and scientific experience. Formation of this route is an important step towards humanization of the environment in relation to people with limited mobility.

Key words: people with limited mobility, urban space, architectural environment, route, adaptation.

## 1. INTRODUCTION

The aim of the paper is to reveal the content of scientific and design work on the route formation as a means of urban space adaptation for people with limited mobility. Moreover to explain the contribution of such works for urban environment humanization, for increasing social activity of people with limited mobility. Understanding and implementation of humanism into practice is an important way of improving the urban environment in Ukraine.

Solutions to this problem include barrier-free architectural environment formation, comfortable for all people with limited mobility.

People with limited motility include people with different nosologic disabilities, the elderly, pregnant women, preschool children, and adults with children in their arms or in carriages, chronic patients with restricted mobility. Statistical studies have shown that people suffering from disorders of the musculoskeletal functions is about 10% of the total population on the planet. All over the world people spend a lot of money to adopt human environment, to create opportunities for people with limited mobility. They are based on the principles of equal opportunities set forth in the *World Programme of Action concerning Disabled Persons* (December 3, 1982) [3].

This work is at an early stage in Ukraine. Current regulations on this issue are still not covering all aspects of people with limited motility life in the city. Ukrainian cities can hardly be called socially oriented. To feel equal among equals in an accessible, comfortable environment cannot be guaranteed in the current city. Moreover, the strategic planning in urban policy has not yet been implemented.

First of all urban environment is a center of different social groups communications. The urban environment barriers prevent not only to satisfy the utilitarian human need, but the normal citizens life in general. Issues of free movement around the city are classifying as the essential for people with limited motility in Ukraine. Creating a barrier-free social space is possible only in context of a constant dialogue between the city administration, architects and disabled persons. This paper discusses the results of such work. The project of barrier-free environment formation in Kharkiv city was made by head of Town Planning Department, Iryna Dreval, and PhD student, Hanna Khakhalina, O.M. Beketov National University of urban economy. The customer of the project was regional public organization of the disabled "Kreavita". The architects were collaborated with the Chief Architect of Kharkiv city, the head of the Road Management Department, representatives of disabled people. This collaboration showed that the city administration realized the complexity of the process of adjustment of already existing urban environment to the needs of people with limited mobility. The quality of the results cannot be obtained without its direct customers. Nevertheless, there is no necessity for the total transformation of the environment.

A method of forming a route for people with limited mobility was proposed as one of the ways of solving this problem. The route includes not only elements that could satisfy all the people needs but also creating conditions for informal social communications and the aesthetic perception of the urban environment. The work use a complex method of research that relies on empirical system (full scale monitoring, measuring parameters of objects, comparative analysis, inductive method, experimental design) and theoretical base – environmental and ergonomic approaches.

## 2. THE BACKGROUND OF THE PROBLEM

The basis for the further research is analysis of the current scientific and practical experience on the issues of urban environment adaptation for people with limited mobility.

Some experience in the design and construction of barrier-free environment has been already gained, but it needs to be comprehended and systematized.

The practical realization of accessible architectural environment projects consists of implementation of a number of tasks, such as planning organization (existence of parking places, transport landing zones; pedestrian traffic routes on the surrounding area; entrances to the building, internal paths, services, sanitary facilities). The most relevant and widespread organization is availability of the pedestrian zone. The complex of pedestrian infrastructure should have the universal properties and ensure certain conditions compliance, such as:

- Continuity of pedestrian paths on the shortest and most convenient routes;
- Unimpeded network of pedestrian traffic; [5]

An important aspect of practical solution is to observe the rules in the drafting of the pedestrian zone for people with limited mobility and to create an integrated barrier-free environment. Most of the examples are isolated objects of barrier-free architecture, which can not fully satisfy the needs of people with limited mobility.

The most interesting examples of the pedestrian area adaptation for the needs of people with limited mobility are barrier-free environment at the University of Georgetown, Trade Fair Centre in Stuttgart, Barrier-Free Environment in Dresden.

Georgetown University is one of the world's leading academic and research institutions, offering a unique educational experience that prepares the next generation of global citizens to lead and make a difference in the world. Comprising nine undergraduate and graduate schools, the university enrolls approximately 7,000 undergraduate and 10,000 post-graduate students from a wide variety of religious, ethnic, and geographic backgrounds, including 130 foreign countries [6].

Traffic routes on the campus have been developed for creating a friendly environment for students with disabilities. Start place of all the routes is a hostel for students with limited mobility. The routes lead to different socio-important places (Fig. 1): the University, Art Center, Chapel and others. Total number of the routes is 6.

All of them are pedestrian. Current public transport inside is not adapted to the needs of people with limited mobility. With the help of these routes, students can satisfy only their utilitarian needs. The serious drawback of this organization is the lack of social communication places for students with disabilities.

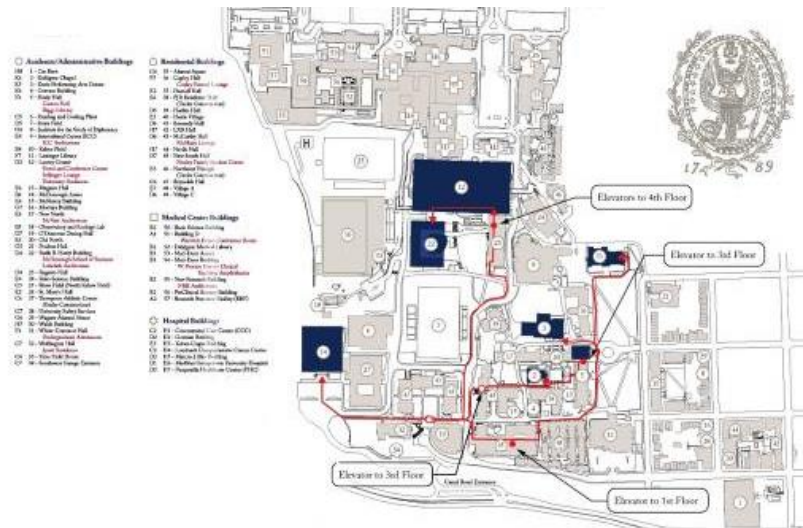


Figure 1: Barrier-free routes at Georgetown University Source: [6]

Messe Stuttgart is an exhibition and trade fair centre next to Stuttgart Airport, 7 miles south of Stuttgart, Germany. It is the ninth biggest trade fair in Germany. This modern exhibition center takes more than 30 exhibitions and fairs every year. [7]

The most important advantage of this object is a variety of routes in the center (Fig. 2).

Exhibition halls and marketplaces are available for person with disabilities. All lifts are specially equipped for people with limited mobility despite the fact that the center has three floors. The center is divided into several blocks connected by a small square. There are some adapted places on this square for relaxing and communicating. Undoubtedly, the presence of specially equipped toilets in the area of Trade Fair Centre is important.

The main disadvantage of the Center is its` location. It is a single object that is not connected with the overall structure of the city. The center is situated near the airport. Specially equipped vehicles go there only from the airport. If people with limited mobility have not got their private transport, there is no way to get to this place.



Figure 2: Barrier-free routes at Trade Fair Centre in Stuttgart  
Source: [7]

The topic of barrier-free access is of great importance in Dresden. Dresden has a population of over 508,000 inhabitants, more than 60,000 of whom have a disability. Demographic changes and an increase in the number of older people mean the number of people with disabilities continues to increase. Dresden promotion strategy based on *Convention on the Rights of Persons with Disabilities*, which came into force in the Federal Republic of Germany on 26 March 2009. [8]

The purposes of this strategy are to create a street environment for everyone, this means creating barrier-free access which benefits all residents, and to develop Brownfield sites before Greenfield sites; this also benefits disabled people as they do not have to travel far to participate in public life.

Barrier-free architectural environment was created in Dresden historical city center based on these principles (Figure 3: Barrier-free routes in Dresden). It characterized by low-floor public transport security, access to public buildings and institutions. A large number of parking spaces for people with disabilities are presented. About 38% of all public transport has now been adapted in Dresden. 14 from 28 toilets are adapted to the needs of people with limited mobility in the city center.

All these show the positive aspects of a barrier-free environment formation in Dresden. In addition, there are some disadvantages. There is no clear traffic system in the city and the lack of social communication places for people with disabilities.

These examples of forming a barrier-free architectural environment show a great progress in solving local problems and some preconditions for handling this issue at an urban level.



Figure 3: Barrier-free routes in Dresden Source: [8]

### 3. SIMULATION OF THE ROUTE FOR URBAN ENVIRONMENT ADAPTATION

The main structural elements of a route-planning were identified:

- beginning / ending place of the route. It includes: specially equipped public transport stops, parking places for individual transport, toilets for people with limited mobility, informational recourses about the route and landscaping, pedestrian crossings. Beginning / ending places provide orientation function.
- linear elements for purposeful movement. They include: sidewalks, the elements for a short rest and inspection; available objects of public services, recreation, pedestrian crossings. Every element must conform the ergo-design requirements (Figure 4: Main qualities of barrier-free routes).

Beginning / ending places of the route were chosen by the criteria's of transport connectivity with different parts of the city.

Free choice of movement for people with disabilities appears only when there are a great number of adapted pedestrian crossings. It is possible to organize various additional routes. The recoverability of the route is achieved through a great number of adapted pedestrian crossings.

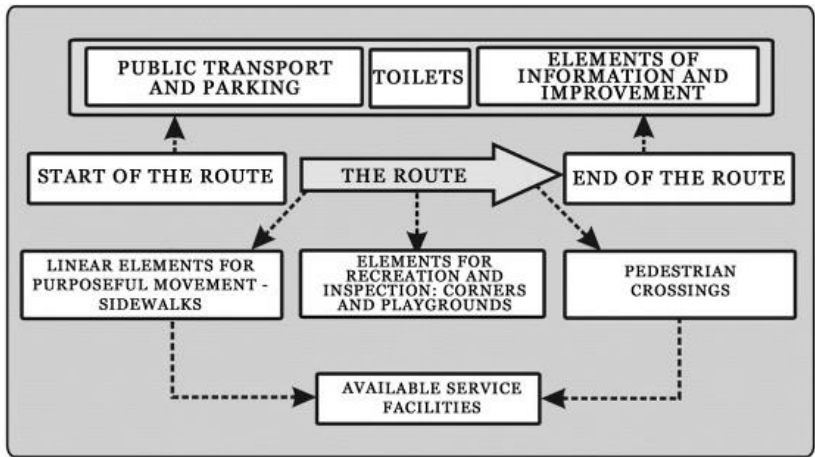


Figure 4: Main qualities of barrier-free routes Source: scheme made by the author

Furthermore, the architectural environment for people with limited mobility must correspond a number of comfort requirements (Figure 5,6: Main components of the route comfort). There is physical and physiological comfort, as well as spiritual and emotional comfort.[1]

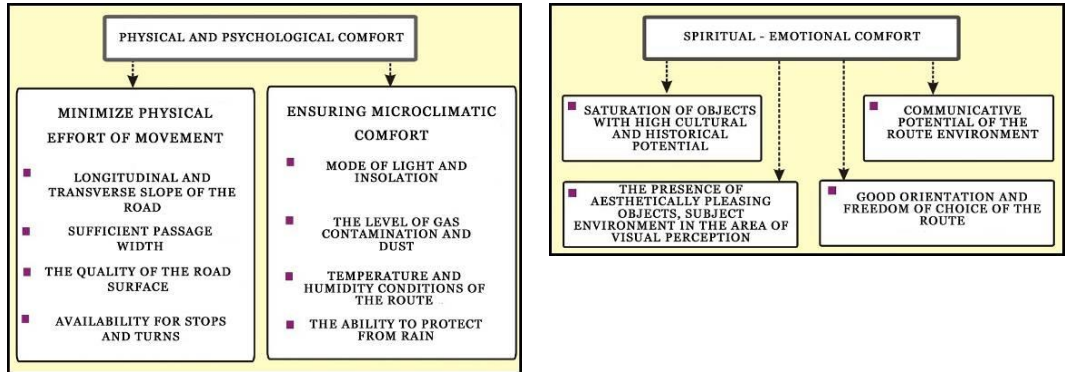


Figure 5, 6: Main components of the route comfort Source: [1]

It is necessary to minimize the physical effort during the movement. Only after that the physical and physiological comfort will be achieved.

This is possible when recommended longitudinal and transverse slope, sufficient passage width of the sidewalks, high-quality road surface and the presence of "pockets" for the stops and places for a short rest are being used.

It is important to ensure microclimatic comfort in the adapted area due to illumination registration and insolation regulation, with the help of landscape design techniques, the possibility of precipitation protection, registration of gas and dust level of certain parts of the route.

Spiritual and emotional comfort is achieved by saturation of the historical and cultural objects inside the route, the presence of free choice, the presence of aesthetically pleasing objects in the visual perception area and the possibility of communicative potential realization inside the route environment.

The following functional objects of the route were determined. There are administrative, educational, informational and business, cultural, entertainment, catering, consumer services, as well as recreational and symbolic architectural objects (monuments of history, culture, architecture).

Methodology of forming a route includes the following steps:

- Choice of the route place in the city area. This place must satisfy all the needs of people with limited mobility. The main of them are public services, social communication, recreation, and aesthetic perceptions and emotions.
- Determination of beginning/ending places of the route. It is chosen on the criterion of maximum transport and pedestrian connectivity with other parts of the city;
- Examination of the existing architectural environment on the characteristics of the functional filling, planning organization, the historical and architectural value, the state of landscaping elements, sanitation parameters;
- Identifying available functional elements of the urban environment and recording their existing access level;
- Comprehensive assessment of the route environment on the criterion of its friendliness to people with limited mobility;
- Study the needs of people with limited mobility in the course of their social activity and identify the perspective available facilities for them;
- Development and deployment of necessary elements for equipment the route (consumer services, toilets, parking places for individual transport, recreation areas and et al);
- Organization of the new or adaptation of existing places for taking the rest inside the route structure;
- Identification of pedestrian crossings and proposals for their reconstruction;
- Development of movement recommendations on the specified area, taking into account the physical and communicative comfort, maximum functional efficiency and aesthetic needs of people with limited mobility;
- Ensure the possibility of the movement return and free choice of the route direction.

Formation of the route as a way of urban environment adaptation for people with limited mobility in Kharkiv the city was carried out. It is based on the formulated concept. The selected area, Sumskaya Street in Kharkiv city, is most attractive for the pedestrian zone adaptation to the needs of people with limited mobility (Figure 7: Sumskaya Street in Kharkiv city structure).

It has the following properties:

- high transport connectivity with other areas of the city;
- saturating objects of city value (City Council, Regional Administration, Drama Theatre, Opera, etc.);
- high architectural and artistic potential for urban environment;
- presence of public facilities which are available to all people with limited mobility;
- high level of accomplishment and large number of parks and gardens;
- high degree of pedestrian connectivity of Sumskaya Street with socially significant objects of the city.

These characteristics provide a high historical and cultural, aesthetic, communicative potential of the route, and contribute the attractiveness of the city center not only for the citizens but also for the tourists.

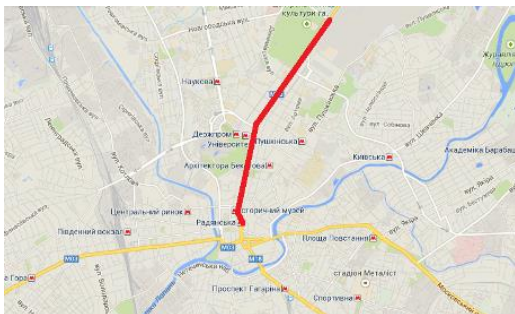


Figure 7: Sumska Street in Kharkiv city structure. Source: Google map of Kharkov city

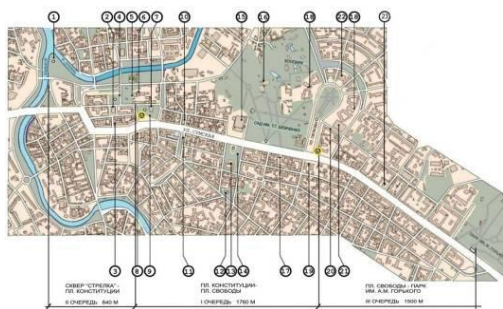


Figure 8: Basic available public services and recreation facilities Source: scheme made by the author

Three stages for the gradual formation of the pedestrian zone, adapted for pleasure and target movement for people with limited mobility on Sumska Street were provided (Figure 8: Basic available public services and recreation facilities).

- 1<sup>st</sup> stage: part of the route within the Constitution and Liberty squares with a total length of 1760 m;
- 2<sup>nd</sup> stage: part of the route within the Liberty square and Gorky Park, total length is 1500 m;
- 3<sup>rd</sup> stage: part of the route within the Constitution and “Strelka” squares, total length is 840 m.

Sumska Street is a highway of a city value with an adjustable, two-way traffic. Pedestrian sidewalks located along the roadway. Their width varies from 3.1 to 12 m. Street is equipped with regulated and unregulated pedestrian crossings. Longitudinal slopes goes up to 6%.

Visual inspections of the street shown that the great number of the pedestrian crossings do not correspond the requirements of the comfortable environment for people with limited mobility.

Its main disadvantages are (Figure 9: Conventional solving a problem of a pedestrian crossing for people with limited mobility; Figure 10: The absence of adapted recreation areas (Theatre Square):

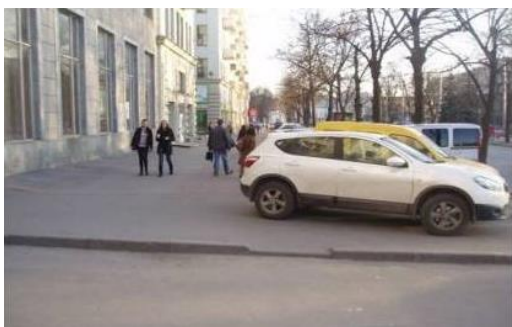


Figure 9: Conventional solving a problem of a pedestrian crossing for people with limited mobility Source: author's photos



Figure 10: The absence of recreation corners and adapted recreation areas (Theatre Square) Source: author's photos



As well as the absence of reducing pavement on pedestrian crossings, highways and signal (tactile) lanes for blind pedestrians.

Beginning / ending places of the route, Constitution and Liberty squares, were selected on the criterion of maximum transport connectivity with the other parts of the city area.

According to the concept of functional organization of the route, people which arrive on individual or public transport can start moving from a place equipped with a toilet, an information stand with the basic characteristics of the route and the objects associated with them. Route scenario suggests the possibility of return to any point of the route and making "loop-like" walking passages, for example inside Taras Shevchenko garden, Pobedi Square, Liberty and Constitution Squares. Moreover, there are passages on the streets, connected with the main route, but currently they need also to be adapted to the needs of people with limited mobility (Skrypnyka Street, Sovnarkomovskaya and Ivanova Streets).

Thus, the route structure implemented such an important quality of the urban environment as its diversity and the presence of free choice. Information richness has a great importance in the maintenance of the route scenario. It is provided by the visual perception of Sumskaya Street historic environment. The street lighting at different day times and special environment perception of people with limited mobility must be taken into account.

Numerous recreational areas and catering facilities which are available for people with limited mobility give the opportunity to realize communication quality of the urban environment.

Currently the first stage of forming a route for people with limited mobility in the structure of the pedestrian area of Sumskaya Street is being completed. The implementation of the project proposals will significantly increase the level of humanization of the city; create conditions for increasing social activity of people with limited mobility and will provide their integration into citizen community.

#### **4. CONCLUSIONS AND IMPLEMENTATION**

1. Humanization is the new trend of current city development. The city has to be comfortable to live and work of its citizens. The man and space creating for his health maintenance; self-actualization; identity his belonging to the society, understanding of its values; social, professional and creative personality development; self-management and social communication, self-organization and information exchange have become the priority in the process of city development.

2. The results of the positive experience analysis of a barrier-free urban environment formation for people with limited mobility has shown that the creation of barrier-free space is one of the most important problems of current urban planning. Practical examples of forming a barrier-free architectural environment show a great progress in solving local problems and some preconditions for handling this issue at an urban level.

3. The formation of a special functional and planning element of the urban infrastructure - the "route" for people with limited mobility - is an effective tool for adapting the urban environment to the needs of this category of population for countries with moderate economic prosperity, which is Ukraine at present. The solution of the problem of the disparity of the city's infrastructure with the needs of people with limited mobility is aimed at humanizing the environment as one of the stages of restoring harmonious and democratic relations between separated social groups of citizens.

4. The method of route formation for people with limited mobility in Kharkov city includes such components: the formulation of the concept of the route, modeling of the main planning elements of the route, adapted for this category of people; clarification of the functional filling of the territory, planarily connected with the pedestrian part of the route; development of the steps sequence for organizing the route.

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