

DEVELOPMENT OF A MECHANISM FOR COMPREHENSIVE ASSESSMENT OF THE INFRASTRUCTURE FACILITY FOR COMPLIANCE WITH THE REQUIREMENTS OF LOW-MOBILITY GROUPS OF THE POPULATION

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In this paper, a new approach based on the use of special information technologies (mechanisms) has been developed, aimed at evaluating an urban development object from the standpoint of the degree of satisfaction with the level of its equipment with elements of an "accessible environment" for low-mobility groups of the population. To implement the proposed approach, a comprehensive assessment procedure has been developed, the result of which are recommendations for making managerial decisions based on modeling the preferences of subjects belonging to low-mobility groups of the population. The presented assessment approach differs in that the level of accessibility is not determined comprehensively, as in modern methods, but piecemeal. This mechanism of complex evaluation has the principles of non-manipulability of results - for this, a model of the preferences of the subject of choice is first constructed, and only then the process of ranking and quantifying the characteristics of the object under study is carried out.

Keywords: *development of mechanism, justification of the choice, technical solutions, low-mobility groups of the population, comprehensive assessment.*

РАЗРАБОТКА МЕХАНИЗМА КОМПЛЕКСНОЙ ОЦЕНКИ ОБЪЕКТА ИНФРАСТРУКТУРЫ НА СООТВЕТСТВИЕ ТРЕБОВАНИЯМ МАЛОМОБИЛЬНЫХ ГРУПП НАСЕЛЕНИЯ

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В данной статье разработан новый подход, основанный на использовании специальных информационных технологий (механизмов). Он направлен на оценку градостроительного объекта с точки зрения степени удовлетворенности уровнем его оснащённости элементами «доступной среды» для маломобильных групп населения. Для реализации предложенного подхода была разработана комплексная процедура оценки, результатом которой являются рекомендации по принятию управленческих решений на основе моделирования предпочтений субъектов, относящихся к маломобильным группам населения. Представленный подход к оценке отличается тем, что уровень доступности определяется не комплексно, как в современных методах, а по частям. При этом используются принципы неманипулируемости результатов. Для этого сначала строится модель предпочтений субъекта выбора, и только затем осуществляется процесс ранжирования и количественной оценки характеристик исследуемого объекта.

Ключевые слова: *разработка механизма, обоснование выбора, технические решения, маломобильные группы населения, комплексная оценка.*

Introduction

One of the relevant directions at the moment is the development of an accessible urban environment for all categories of the population. Since 1990, scientific research has been carried out in the field of creating a comfortable urban environment for low-mobility groups of the population, namely architectural and planning solutions. Based on the research obtained, certain regulatory complexes have been created to ensure the necessary requirements for the formation of a comfortable infrastructure for people

with disabilities. Since 2011, the state program "Accessible Environment" has been implemented in the Russian Federation, dedicated to the design of a barrier-free urban environment for low-mobility groups of the population. By 2025, it is planned to equip engineering, social and transport infrastructure facilities in a percentage ratio of up to 61,8 %.

Many fundamental theoretical works are devoted to the problems of providing an accessible environment for the disabled. The results and conclu-

sions of the study of the essence, content and features of providing an accessible environment for low-mobility groups of the population are described in the works of philosophers, sociologists, organizers, economists and management practitioners [1-11]. But, as practice shows, many urban development facilities, despite the stated provision, are not fully accessible to low-mobility groups of the population. This is due to the fact that when designing infrastructure facilities, there is no methodology for a comprehensive assessment of the importance of acquisition (availability) certain elements for a particular object of the urban environment that affect the level of comfort of the object for low-mobility groups of the population as a whole. Sometimes the absence of a single element of an accessible environment makes it impossible to use it for a whole group of low-mobility groups of the population.

The purpose of this study is to create an approach that will allow, on the basis of a comprehensive assessment of an urban development facility in terms of the degree of satisfaction with the level of its equipment with elements of an "accessible environment", to make managerial decisions to specialists aimed at improving its operational properties, which will increase the level of comfort of people's living.

The scientific novelty of this study lies in the development of such an approach, which allows to comprehensively assess the compliance of the social infrastructure object with the criteria of accessibility, safety, informativeness and comfort, to provide measures to prevent harm in the formation and further provision of an accessible environment.

The proposed approach will make it possible to effectively implement management decisions on the formation and further provision of an accessible environment for low-mobility groups of the population based on the principle of "reasonable adaptation". Within the framework of the proposed approach, it is necessary to consider the object of urban planning as a system of "accessible environment", divided into its components and elements.

The main research methods of this work are analysis and comparison, synthesis, generalization, methods of visual observation, sociological methods, methods of projective management.

Description of the procedure for justifying the choice of technical solutions for the infrastructure object

At the initial stage, it is necessary to choose the object of research. In this work, a sports and recreation complex located on the territory of the Perm Region was chosen as the object of research.

At the next stage, it is necessary to analyze the project of a sports and recreation complex, to present it as a system that includes components and elements representing the necessary devices and equipment that meet the requirements of an "accessible environment". Build this system as a model with a criteria tree.

Then it is necessary to assess the availability and level of equipment of the studied object with these elements in accordance with the code of rules 59.13330.2020 "Accessibility of buildings and structures for low-mobility groups of the population". This assessment should be carried out as follows:

- analyze groups of the low-mobility population and identify the needs for the main elements of an "accessible environment" for a sports and recreation complex and compare them with the requirements of the code of rules;
- conduct a sociological survey of people belonging to low-mobility groups of the population and who are visitors to this sports and recreation complex for satisfaction with the level of provision of the facility with fixtures and equipment;
- conduct a comprehensive assessment of the facility and form recommendations to improve the quality of stay of low-mobility groups of the population in the studied facility.

In order to implement the proposed approach, it is necessary to develop a procedure (mechanism) for a comprehensive assessment, the result of which will be recommendations for making managerial decisions based on modeling the preferences of subjects belonging to low-mobility groups of the population. The information processing scheme for complex assessment is shown in figure 1.

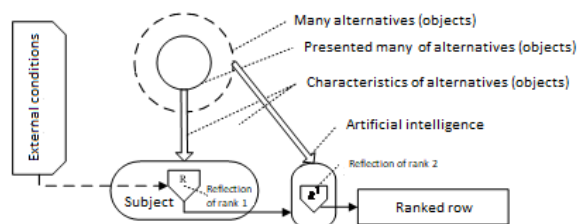


Fig. 1. Scheme of information processing by the subject of choice

This mechanism of complex assessment should have the principles of non-manipulability of results. To do this, it is advisable to first build a model of the preferences of the subject of choice, and only then carry out the process of ranking and quantifying the characteristics of the object under study. The proposed mechanism should be equipped with the possibility of a comprehensive assessment of the parameters of the development of both the system under study as a whole and its individual element. Therefore, at the initial stage, it is necessary to evaluate each element of the system, and only then determine the degree of its influence on the comprehensive assessment of the entire system. To this end, the integrated assessment procedure should be based on linear and matrix convolutions. The sequence of performing complex evaluation in the "Jobs-Decon" software package based on linear convolution is shown in figure 2.

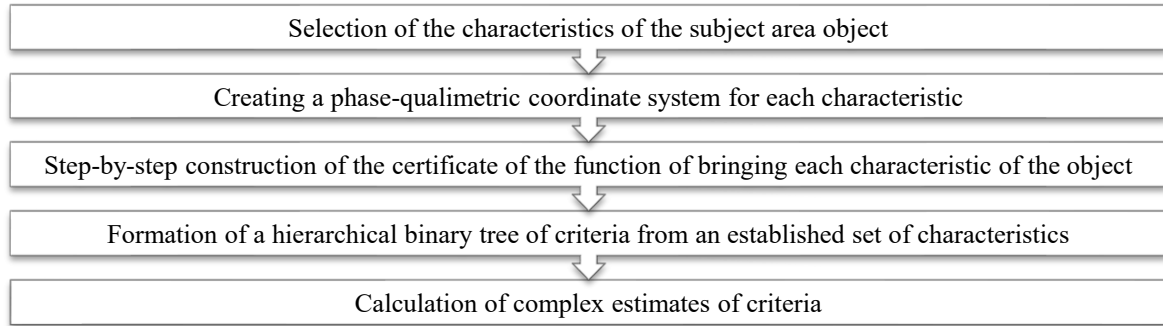


Fig. 2. The sequence of complex object evaluation in the "Jobs-Decon" software package

After performing the procedure of complex evaluation based on linear convolution, we will get an estimate of each element depending on its degree of importance for a particular property. After that, we will carry out a comprehensive assessment of

the entire system and determine which elements ensure its development to a greater extent.

The sequence of complex evaluation in the "Decon-Table", software package based on matrix convolution, is shown in figure 3.

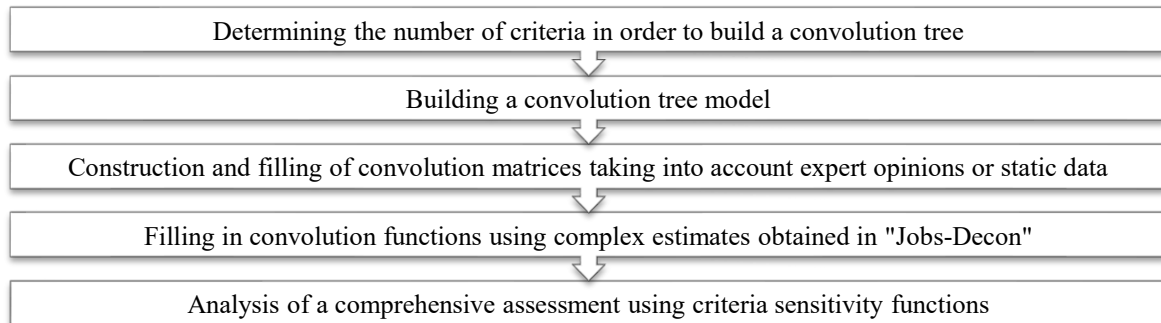


Fig. 3. The sequence of complex object evaluation in the "Decon-Table" software package

Construction of a procedure for justifying the choice of technical solutions for an infrastructure object

To date, in the Russian Federation there are a huge number of obstacles for low-mobility groups of the population when visiting sports facilities that are considered to meet the requirements of an "accessible environment". Let's consider the work of the proposed approach on a concrete example. As a system, let's consider an object that is a sports and recreation complex, recently put into operation on the territory of the Perm Region, and evaluate it for accessibility.

To build a comprehensive assessment procedure, the selected object will be examined according to certain criteria (characteristics) identified during the analysis of regulatory documentation and visual inspection of the building. Based on the identified criteria, we will build a system of a sports and recreation complex in the form of a tree of criteria that together form the level of accessibility of the environment (Fig. 4). Each of the criteria is collapsed in pairs, forming a new cumulative criterion.

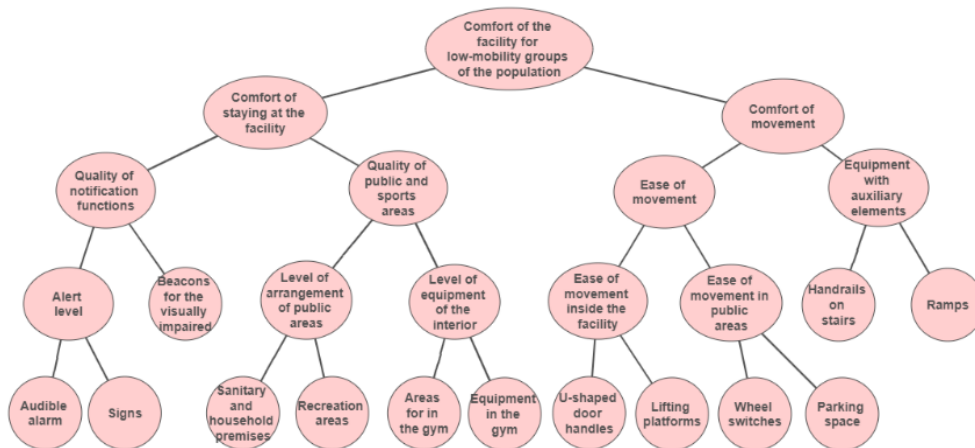


Fig. 4. The sequence of complex object evaluation in the "Decon-Table" software package

Each given criterion has its own characteristics and its own variation intervals in the phase (physical) space in accordance with the technical passport. To build a model of complex estimation based on linear convolution, it is necessary to determine weighted coefficients for these characteristics. This will allow you to determine the degree of importance of each element in the system from the perspective of stakeholders. To do this, you can conduct a sociological survey that will allow you

to determine, based on statistical processing of the results, weighted coefficients for each element and rank them. As respondents, visitors of this sports and recreation complex were accepted, which also include low-mobility groups of the population.

For an example of building a model of a complex assessment of a specific criterion, let's take the criterion "Sound alarm":

1. Set the name of the criterion and determine the main characteristics (fig. 5).

Fig. 5. Selection of the main characteristics of the object for low-mobility groups of the population

2. At the next stage, on the basis of regulatory documents and taking into account the preferences of interested persons (FOC respondents), we will construct reduction functions for each selected characteristic. The reduction functions make it possible to translate the physical values of the characteristics into a qualimetric space with an interval from 1 to 4, where 1 is unsatisfactory, 2 is satisfactory, 3 is good and 4 is excellent For all the criteria presented in figure 5, similar functions are constructed.

3. Further, on the basis of statistical data that allow us to determine the degree of importance of each element, we build a ranking procedure and determine weighted coefficients in the integrated assessment model (fig. 6). The degree of importance of each element is determined on a scale from 0 to 10 points.

At this stage, we can assume that the procedure for constructing a comprehensive assessment

model for the first criterion is completed (Fig. 7). Next, we enter alternately the real values of the characteristics of each criterion and get its comprehensive assessment. The comprehensive assessment of the "Sound alarm" criterion is 3.77, which is interpreted as "excellent". The construction of models of complex evaluation of all other criteria of the object is carried out similarly.

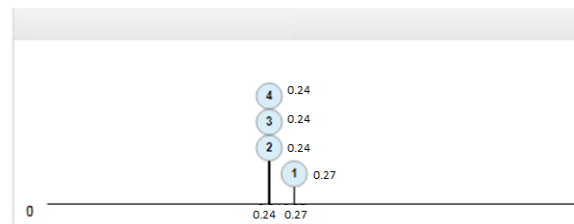


Fig. 6. Determination of weighted coefficients of characteristics



Fig. 7. Comprehensive assessment of the "Sound alarm" criterion

The next step is to assess the level of quality of human exploitation of the totality of all the listed elements in the object. To do this, we will build a model of complex evaluation in the "Decon-Table" software package, which is based on the mechanism of matrix convolutions [12, 13].

The next step is to enter the real values of the complex estimates of each criterion obtained in the "Jobs-Decon" software package (fig. 8).

After building the tree, we approach the second stage of building the model – building convolution matrices.

Let's analyze the folding of matrices using the example of the matrix M (The comfort of the object

of a physical culture and wellness complex for low-mobility groups of the population). This matrix has two criteria: the comfort of movement and the comfort of staying at the facility. The matrix is filled

in taking into account expert opinions (statistical data). For the most favorable conditions, we need to increase both criteria. Therefore, we fill in the matrices as follows (Fig. 9).

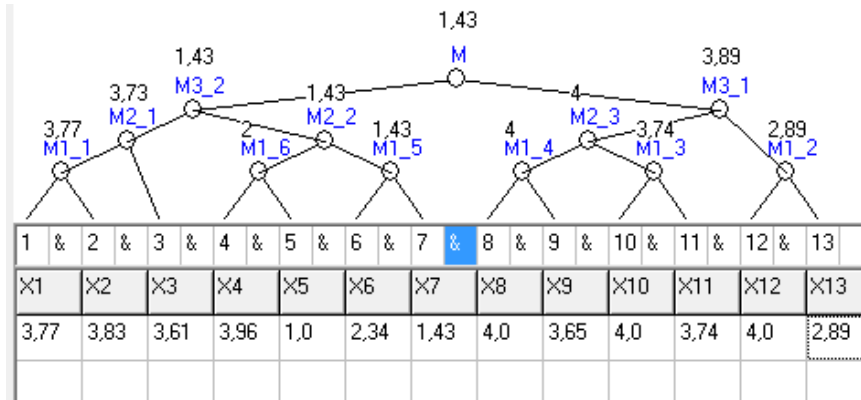


Fig. 8. Tree-convolution of the complex estimation model

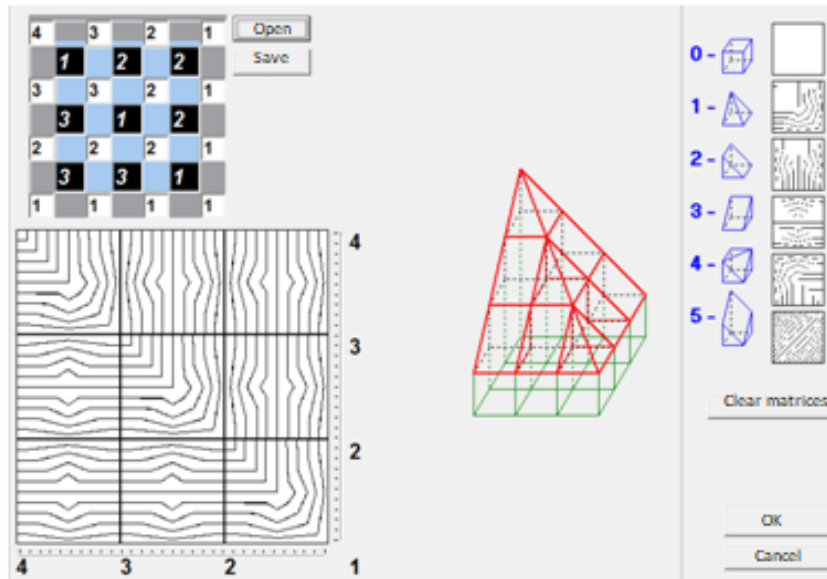


Fig. 9. Convolution matrix of vertex M

For vertices M1_1 - M1_5, the matrices will be filled in as shown in Figure 9. This filling of the matrices is due to statistical data.

Convolution function. The convolution function is necessary to obtain a comprehensive assessment of the model. In the criteria field, fill in the tabular form. We get the convolution values of the criteria that are specified in the convolution matrices.

From the results of calculations, it can be seen that the comprehensive assessment describing the comfort of the facility for low-mobility groups of the population is 1.43, this shows its current state, at the moment the sports and recreation complex is not developed according to some indicators.

Next, we will analyze ways to improve the project of a sports and recreation complex, taking into account the requirements of low-mobility groups of the population, using the tools of the "Decon-Table" software package, which allow analyzing the

sensitivity functions. Fig. 10 shows the sensitivity functions of the criteria that can be controlled.

1. Criterion "Equipment for low-mobility groups of the population in the gym" (a): re-equipment of the gym taking into account the requirements for low-mobility groups of the population by installing specialized training equipment.

2. Criterion of "Recreation areas in public places" (b): arrangement of recreation areas on the territory of a sports and recreation complex with the help of special benches.

3. Criterion "Zones for low-mobility groups of the population in the sports hall" (c): organization of additional places for low-mobility groups of the population in the sports hall of the sports and recreation complex.

4. Criterion "Beacons for the blind and visually impaired" (d): retrofitting the object with sound beacons with a wireless button.

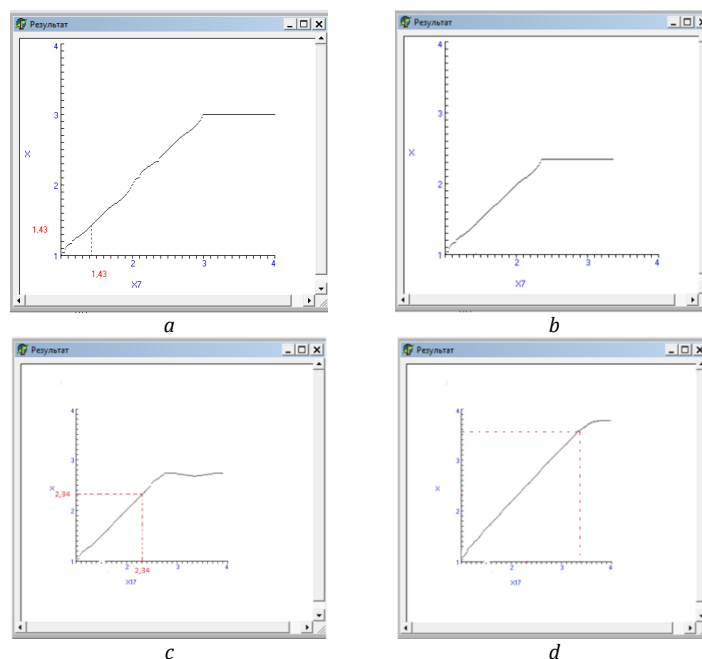


Fig. 10. Sensitivity function of criteria that can be controlled

Acknowledgment

Two models of complex assessment were built, allowing to evaluate the necessary object for compliance with the requirements of low-mobility groups of the population and the presence of specific elements of the accessible environment. With the help of the obtained estimates and the use of the tools of the "Decon-Table" software package, which

allow analyzing the sensitivity functions, recommendations are made to increase the comfort of staying of low-mobility groups of the population at the facility of the sports and recreation complex.

Promising areas for continuing scientific work can be considered an increase in the number of criteria in the integrated assessment procedure, as well as the representativeness of the social survey sample, for a more accurate comprehensive assessment.

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**ВЛИЯНИЕ УПРАВЛЕНИЯ ИНВЕСТИЦИОННОЙ ДЕЯТЕЛЬНОСТЬЮ
НА РАЗВИТИЕ ЭКОНОМИКИ РЕГИОНА**

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В настоящее время инвестиционная деятельность играет важную роль в развитии, как каждого региона, так и во всей экономике страны в целом. Правильное и эффективное управление инвестициями может благотворно повлиять на экономическое развитие региона, предприятия, государства. В работе рассмотрены понятия инвестиции, управления инвестиционной деятельностью региона, проанализирована инвестиционная деятельность в Астраханской области. Выявлены основные приоритетные направления повышения инвестиционной привлекательности региона. В заключении исследования были предложены меры по повышению эффективности инвестиционной деятельности на основе развития механизма государственно-частного партнерства в данном регионе.

Ключевые слова: инвестиции, экономика, потенциал, государственно-частное партнерство, инвестиционная деятельность, сельское хозяйство, инфраструктура, регион, бизнес, экономический рост.

**IMPACT OF INVESTMENT MANAGEMENT ON THE DEVELOPMENT
OF THE REGIONAL ECONOMY**

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