Ways to Improve the Safety of Built-Up and Adjacent Areas

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Abstract. This paper deals with the issues of technospheric and environmental impact on the environment by artificially created objects, in particular, shopping centers. Commercial real estate is one of the investment-attractive sectors of commercial real estate. The article presents the classification of retail real estate, especially the development of retail real estate and analysis of shopping centers within the city of Yekaterinburg. Environmental safety is paramount and substantiated within any real estate design, including the surrounding areas. The paper also discusses the threat from man-made accidents in built-up areas. The classification of types of accidents is given, their causes and subsequent consequences are analyzed. Possible methods of prevention of technosphere risks in built-up areas, as well as measures of various directions for the prevention of emergency situations are considered in the form of, highlighting the environmental issues in university programmes, and improving the safety management system.

1. Introduction
At the present stage of rapid growth of cities and construction of new real estate – residential complexes, shopping and business centers, public places, the problem of ensuring the safety of built-up areas becomes urgent.

This is due to the increase in the number of accidents that occur for various reasons. In this regard, it is necessary to identify new ways to prevent or minimise the risks within built-up areas.

High rates of growth of production potential, new technologies of construction production have technogenic influence on all main components of environment. The impact of this growth increases with the size of the scale of construction and improved productivity of construction technologies.

Modern construction production creates a certain technological system that changes during technological processes over time, resulting in a destructive impact on biological and environmental systems.

Commercial real estate is one of the investment-attractive sectors of commercial real estate.

The aim of the study was to determine what combination of approaches and methods will be most effective from the point of view of safety [1].

2. Research methodology

2.1. Classification of commercial real estate
Shopping centers today are designed to fulfil the need for a popular place to visit and to provide a source of leisure. This is evidenced by the wide variety of types and forms of shopping centers.
Let us turn to the different classifications of retail real estate in Russia and in the world. Here is an example of the following classifications:

- retail real estate in the version of G. M. Sternik [2] (chief analyst of the Russian Guild of realtors);
- classification of Urban Land Institute (USA);
- classification of the international Council of shopping centers International Council of Shopping Centres;
- classification Of the Russian Council Of shopping Centers.

According to the classification of commercial real estate in the version of G. M. Sternik, there are the following types: the type of building and space-planning solution-built-attached premises, detached buildings, shopping malls; the type and nuances of the device; the range of goods sold and the trading area with its size; commodity specialization [2].

American Institute Urban Land Institute includes in the classification of district shopping center; district shopping center; district shopping center; super-circle shopping center; regional shopping center; super-regional center; specialized shopping centers [3].

The classification of the international Council of Shopping centers International Council of shopping Centres Arnd assigns to each Shopping center, one of eight classes: "the Store next door", "Regional", "Moda Center", "Power center", "Regional" and "Superregional", "Shop manufacturer", "Specialized" [1].

The classification of shopping centers developed by the Russian Council Of shopping Centers includes the following parameters: attractiveness for tenants, technological parameters, attractiveness for investors, compliance of the quality assessment of the object with the expectations of visitors [4].

2.2. Features of retail real estate development and analysis of shopping centers in Yekaterinburg

Development of retail real estate has its own characteristics. In particular, it is the need for an integrated and detailed approach to this issue, which covers options for financing the construction of commercial real estate, the development of commercial concepts and tasks for architectural design, etc., despite the large volume of elements of the development of commercial real estate, one of the main issues are security issues [5].

Analysis of shopping centers (shopping centers) of the city of Yekaterinburg showed that the city is fully saturated with these objects. In a detailed description of the most well-known existing shopping centers with an indication of the range of services provided are presented in the Table 1.

Table 1. The most well-known existing shopping centers in Yekaterinburg with an indication of the range of services [4].

| Name            | Address                      | Range of services                                                                 |
|-----------------|------------------------------|-----------------------------------------------------------------------------------|
| KIT             | Yekaterinburg Amudsena street, 65 | Shops brands of clothing, accessories and shoes. On the territory of the shopping center is a fitness center and children's playroom |
| Parakhod        | Yekaterinburg Amudsena street, 62 | Shoe center. In the same building are: group of Companie, shoe house               |
| Yekaterininskii | Yekaterinburg Sherbakova street, 4 | Hypermarket of food products, audio-video and home appliances salons, furniture, clothes and footwear, perfumes and cosmetics, food court, children's entertainment complex, cinema center, conference halls |
| Dirizhabl       | Yekaterinburg Akademika shvartca street, 17 | Shops: clothes, shoes, sports goods, leather goods, equipment for outdoor activities, perfumes. Places for recreation, large-scale events. Food-court. Theatre ticket offices, air and railway ticket offices |
Megapolis
Yekaterinburg 8
Marta street, 149
Supermarket, children's Playground, cinema, food court, cafe, restaurant, bar, services: pharmacy, travel Agency, theater box office, pet store, banks, ATMs, manicure Studio

MEGA
Yekaterinburg
Metallurgov street, 87
Hypermartks, cheap clothing stores and clothing stores, cosmetics and perfumes. Beauty salons, banks, studios, cafes and restaurants

Raduga-Park
Yekaterinburg
Repina street, 94
Hypermartk, children's entertainment center, cinema, food court, pharmacy, home life, manicure Studio, children's hairdresser

Alatyry
Yekaterinburg
Malysheva street, 5
Shops, cafes and restaurants, food court: entertainment, fitness club

Grinvich
Yekaterinburg
Marta street, 25
Many shops the goods for the house and family. Modern multiplex, many restaurants

Fan fan
Yekaterinburg
Yasnaya street, 2
Shops, cafes and restaurants, entertainment: cinema, zoo, karaoke, bowling, car wash

2.3. Structure of consumer expenditures of the population of Sverdlovsk region and their analysis of the areas in shopping centers of Yekaterinburg

The market potential of the Sverdlovsk region-consumer spending. Consumers spend 37.31% on food products and 37.13% on non-food products, which is reflected in the Table 2.

Table 2. Structure of consumer spending in Sverdlovsk region at the end of 2017 [6].

| Indicator          | Value, % |
|--------------------|----------|
| Food products      | 37,31    |
| Non-food items     | 37,13    |
| Services           | 25,56    |
| Total goods        | 74,44    |
| Total goods and services | 100     |

The population prefers food products (37.31%) and non-food products (37.13%).

According to the Ural chamber of real estate, in the shopping center of Yekaterinburg can be observed a slow reduction in vacant space (Figure 1)

According to Figure 2, vacant areas in the 3rd quarter of 2017 amounted to super-regional and regional shopping centers – 11.5%; District shopping centers – 8.9%; District shopping centers – 8.0%.

Figure 1. The share of empty space per annum in the market of shopping centers of Yekaterinburg [5] (Source: upn.ru).
Experts of the Ural chamber of real estate noted that the rates of commercial real estate do not generally have a downward trend (Figure 3).

As the monitoring showed, the degree of saturation of shopping centers of the city of Yekaterinburg is quite high. In this regard, there is a need to ensure the safety of the environment.

3. Ensuring environmental safety
To ensure the safety of the environment, namely, these industrial commercial real estate and adjacent areas, it is necessary to develop a plan to prevent risks in built-up areas.

3.1. Risks and Classification of possible accidents in built-up areas
The principle of metrological support [7] in technosphere safety is considered by Akhobadze G N. Continuous monitoring of the technosphere taking into account metrological principles is expected to produce an efficient forecast for the technosphere development and make appropriate decisions [7].

Smirnova E considers the demonstration of threats related to the uncontrolled, the dangerous and economically expensive progress of society as they indicated the need for environmental and technospheric security [8].
Technosphere risk, described as the complex index of the reliability of the elements of the technosphere, characterizes the probability of emergency situations in the operation of machines, mechanisms, technological processes in the construction and operation of buildings and structures [9].

Experts cite a range of classifications of such accidents built-up areas as shown in Table 3.

**Table 3. Classification of possible accidents of built-up areas** [10].

| Type of accident            | Causes of occurrence                                                                                                                                                                                                 | Aftermath                                                                                     |
|-----------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------|
| Fire                        | Careless handling of fire; explosions of hazardous components; arson; failure to comply with security measures; failure to observe safety precautions when using the equipment; environmental factors; failure of equipment; a consequence of the explosion | Damage to human health; territories, buildings, structures or their destruction; environment; property; economic losses; threats to human life |
| Bang                        | Careless handling of hazardous substances; failure to comply with safety measures; improper installation of equipment; failure to observe precautions when using equipment; failure of equipment | Damage to human health; territories, buildings, structures or their destruction; environment; property; economic losses; threats to human life |
| Sudden building collapse    | Errors in the design of the building; deviation from the project in the conduct of construction works; violation of the rules of installation, the commissioning of the building or its individual parts with major deficiencies; rules of operation of the building; due to natural or man-made emergency | Building failure; occurrence of fires; destruction of utilities and energy networks; formation of blockages; injury and death of people |
| Utility system crashes      | Outdated material and technical base; natural disasters; lack of financial resources                                                                                                                                  | Ecological catastrophes; disruption of work to provide the population with resources; damage to territories, buildings; economic costs; injury and loss of life |

3.2. **Geological environment and risks**

Various dangerous phenomena are not always possible to predict, however, modern knowledge, technology, and access to data can significantly reduce the possible risks. First of all, the risk refers to the natural-technosphere processes that have a connection with human activities.

In the presented connection, it makes sense to move to an advanced strategy of security in the construction and reconstruction of urban areas, focused on urban planning, taking into account the risks. At different stages of design and planning work should be carried out to analyse not only socio-economic, architectural and planning, commercial and other factors, but also the state of the geological environment.

Important elements of urban development that guarantee the safety of the environment are engineering-geological zoning, monitoring and forecasting of dangerous phenomena [11].
3.3. Ways to prevent technosphere risk in built-up areas
We will present ways to prevent man-made risks of built-up areas in order to ensure the safety of users of buildings and structures:

1. Engineering protection – a complex of structures aimed at protecting people, buildings, structures, or territory, from the impact of dangerous natural processes of man-made impact, threats of a terrorist nature, as well as to prevent the consequences of impacts.
2. Organizational, technical, regime and operational measures to avoid fires.
3. Timely examination of the condition of the building or structure for cracks and damage to the supporting structures.
4. Improvement of fire protection systems and strict observance of fire safety rules in the process of construction and operation of buildings and structures.
5. Using the results of emergency forecasts to improve security systems.
6. Improvement of methods of preparation of life support systems of buildings for operation in the cold period [1].

4. Results and suggestions

4.1. Measures on prevention of emergency situations
Select the number of measures on prevention of emergency situations, reduction of their scope in case of occurrence and potential losses (Table 4) [12].

Table 4. Measures focus on the prevention of accidents.

| Measure                         | Principles on the use                                      |
|---------------------------------|-------------------------------------------------------------|
| Social advertising              | Tools to attract public attention to the problem of man-made disasters in built-up areas |
| The control of the management companies | Periodic inspection of buildings for signs of risk of accidents, monitoring of repairs |
| Internet portals, mobile applications | Development and implementation of channels to inform about accidents |

4.2. Training in universities in the direction of "Technosphere safety"
Fire prevention and control, ensuring the safety of civil and industrial facilities requires highly qualified specialists.

As an option for the development of this issue, it is necessary to improve training in universities in the direction of "Technosphere safety", including the profile of "Fire safety" (Table 5) [1].

Table 5. Improvement of training at universities in the direction of "Technosphere safety".

| Indicator                  | Position                                                                                                                                 |
|---------------------------|------------------------------------------------------------------------------------------------------------------------------------------|
| Area of competence        | Ensuring fire safety of industrial, public and residential buildings and structures; natural areas; minimization of technosphere impact on the natural environment; preservation of human life and health, through the use of modern technical means, methods of control and forecasting |
| Objects                   | Human and hazards associated with human activities; environmental hazards associated with human activities; environmental hazards associated with natural hazards; methods and means of assessing hazards, risk; methods and means of protecting humans and the environment from hazards; rules of regulation of hazards; methods of human rescue |
| Types of professional activity | Design and engineering; service and operational |
It is also necessary to create special documents for the creation and implementation of the technological process in the field of environmental and technosphere safety, which aim to carry solutions to create conditions for the conservation of natural resources and environmental safety; improving ways to improve environmental safety in the field of industrial facilities, in particular shopping centers [12].

4.3. Improvement of safety management system

It is also necessary to create special documents for the creation and implementation of the technological process in the field of environmental and technosphere safety, which aim to carry solutions to create conditions for the conservation of natural resources and environmental safety; improving ways to improve environmental safety in the field of industrial facilities, in particular shopping centers.

The management system of the Federal Executive Supervisory authority—the Ministry of the Russian Federation for civil defense, emergencies and elimination of consequences of natural disasters – a set of management bodies, forces and means aimed at solving problems in the field of civil defense, protection of the population and territories from natural and man-made emergencies, fire safety and human safety at water bodies [11].

It should be noted the 2030 plan and the development of a mechanism for improving the system of emergency management in Russia.

The order of 23.01.2017 № 21 approved the action Plan of emergency situations of Russia for the implementation of the fundamentals of the state policy of the Russian Federation in the field of civil defense for the period up to 2030. In the field of improving the system of civil defense management, warning systems and informing the population about the dangers of peace and wartime, a number of measures have been reflected [9].

Taking into account the forms of achieving the Plan to improve the management system 2030, attention is focused on the creation of “a single technological chain of protection of the population and territories: monitoring – assessment – response – interaction – effective assistance”, which includes the improvement of the Supervisory authority by optimizing the risk-oriented approach; training of qualified personnel to identify risks; technical equipment to identify risks [12, 10].

Also note that in order to avoid human and material losses, it is necessary to draw public attention to the described problem, to control the functioning of built-up areas, to adhere to precautions on a permanent basis. Conducting fact checks after the tragedies will not be an effective measure.

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