

*Materials of Conferences***CONCEPTUAL PRINCIPLES
OF THE ENSURING SYSTEM THE
GEOLOGICAL SAFETY
OF THE LARGE CITIES**

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Developed the Concept of the geological security of a large city, its realization is offered on the basis of the following principles:

1. Gradual solution of geological-ecological and engineering-geological problems; the establishment of short-, medium – and long-term goals and tasks; planned, consistent with gradually increasing the detail study of the geological environment of the city on the basis of the engineering-geological and geoeological mapping.

2. System approach to the mapping involves research on different hierarchical levels and scales: an overview and regional – outside the city (1:200 000), the city and the suburbs (1:100 000) town (1:50 000), district (1:25 000), microdistrict (1:10 000) quarter (1:5 000).

3. Priority – the identification of geological risk and solution of the tasks on its reduction at the sites of potential geological hazards (the principle of «hot spots»).

4. Priority is development and implementation of measures to ensure the geological safety for the territories of the enterprises and objects of the critical or clearly unfavorable geological situation (the principle of «concentration of efforts on local problems»).

5. Optimization is ensured by the minimally sufficient volume of research and data (quantitative aspect) and the correct choice of the objects of research, observation points and routes (qualitative aspect).

6. Complex approach involves the study of all the components of the geological environment, with application of a wide range of methods, with a priority on engineering-geological mapping.

7. The objectivity of the works implementation is ensured by the construction of the accurate cartographic model of the geological environment, which should fairly and adequately reflect the engineering-geological, hydrogeological and geoeological conditions.

8. Criteria and ecological compatibility of mapping – is ensured by objective criteria and indicators of the state of geological environment on the basis of a system of ranking the degree of engineering-geological complexity and environmental standards.

9. The efficiency and dynamism assumes unification, the systematization of the data, creation of

information banks; modeling on the basis of a continuously updated electronic database, to reflect the current state of the geological environment.

10. The versatility of the system of provision of geological safety – is the ability to perform the functions of providing information, analysis, assessment, forecast.

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**GEOLOGICAL-ECOLOGICAL PROBLEMS
OF THE LARGE CITIES
AND THE CONCEPT OF THE
GEOLOGICAL SAFETY**

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The main and common problems for geological safety of the large cities are: development of geological processes (flooding, swamping, erosion, landslides, suffosion, karst, etc.); increase seismic danger, especially in the geodynamic active zones with a high degree of fracturing; chemical pollution of all natural environments and the accumulation of waste; the problem of underground spaces of cities, etc. On an example of the Perm, the largest industrial city of the Western Ural (800 sq. km. – the third in size city in Russia after Moscow and St. Petersburg), developed the Concept of the geological safety of the city, which shows the ways of overcoming of geological and environmental problems. The main purpose of the Concept – formation of the system of provision of geological safety at the complex development of the city, the creation of a scientifically grounded system of the forecast geological hazard reduction of geological and other risks, rational use of underground space, the decision of questions of ecology, creation of geologically safe environment for present and future generations of people.

There were developed principles and criteria for the creation of unified geo-information system of the geological environment of the city, containing the database of the engineering-geological, hydrogeological and geo-ecological information, compiled an Atlas of special geological maps. Developed a Program of geological study to 2030, with the system of program activities:

1) theoretical and organizational fundamentals of creation of the system of geological safety: theoretical, legal and methodical maintenance; cartographical provision and creation of the required

mapping framework of the geological environment; geoinformation provision, creation and maintenance of a database; the study and estimation of geological and natural-technogenic conditions and factors;

2) monitoring of subsurface area: organization of a system of monitoring regional – municipal level; monitoring within the existing industrial zones and sites of urban development (territorial and object level);

3) a complex of engineering-geological and geo-ecological mapping and research activities carried out consistently in the scale of: 1:50 000, 1: 25 000, 1:10 000.

The most important targets of the Concept: increase the level of protection of the population and engineering of the objects of various levels of responsibility the territory of the city of geological hazards; reliable prediction of places manifestations and timely warning of negative consequences from the geological processes and phenomena with minimum cost and with maximum economic, social and environmental effects.

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ECOLOGICAL FRAME OF URBAN DISTRICT OF VORONEZH (RUSSIA)

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Present situation in urban areas planning in Russia doesn't satisfy requirements of urban agglomerations sustainable development. The main problem are standards of urban areas designing in last decades. The standards rely on the efficient functioning of the separate areas (industrial areas, residential areas), but not on urban area efficiency in whole. This is also typical for urban district of Voronezh. Conservation of biodiversity of cities may be possible if ecological frame will develop. Ecological frame is the sum of ecosystems with individual regimes of land use. The ecosystems create spatial-organized infrastructure which supports ecological sustainability of areas, prevent the loss of biodiversity and degradation of natural landscapes.

The city of Voronezh was founded in 1586 as an embattled city. For 426 years the city and its landscapes changed dramatically. Today we faced some serious problems: how to preserve and augment historical-cultural, biological, landscape and architectural-spatial originality of the city. The

problems may be solved by using designing city's ecological frame and its efficient work [3].

The master plan of the city was created in 1970. The plan determined the stage of a scientific approach using for urban landscapes creating. The approach based on a ratio of public areas (including green areas) and restricted areas. They have to form an integrated ecological system and become the most important factor of stabilization and improving of environmental conditions. Environmental and recreational functions of natural territorial complex are determined to be essential. Natural territorial complexes consist of green and protected areas. Out of all natural territorial complexes the most accessible for visiting are parks and public gardens. These areas are subjected to a great recreational pressure [7, 8].

Modern ecological frame of the city of Voronezh is a multistructural system. It integrates elements of different age, functional purposes and types of green infrastructure. Its node points are areas of selection and introduction of arboreal-shrub flora and protected areas of Voronezh [4, 5]; old public gardens and parks; relatively young urban gardens and parks; embankments, avenues and boulevards; gardens in residential areas; large cemeteries; woodlands within a city. These elements are the most important node points of Voronezh ecological frame map (figure). Their areas, position relative to industrial and residential areas and biodiversity help us to understand what kind of frame we have now and how we should develop it.

A detailed analysis of all the elements and their properties gave us a base for a critical assessment of the current state of the ecological frame. The main complains are: disunity of its component parts, disparity of their functional purpose, dilapidation and neglect of many node points of the ecological frame. The main ecological corridor in the city is Voronezh reservoir. The right bank of the reservoir is high and the left bank is low. A developed net of ecological corridors are typical only for north and central parts of urban district of Voronezh. All the rest parts of the city suffer from lack of relations with green areas of different categories of land use.

Currently we are working out new ways of improving properties of ecological corridors and developing city ecosystem of higher quality. In order to organize the high quality city ecosystem some legal, spatial and territorial, architectural and economic activities are needed. They are as followed:

- 1) creating of new recreational areas within the city;
- 2) rehabilitation and creation new parks instead of old and lost ones, especially in a new densely build-up areas;
- 3) conservation and development the existing public and restricted areas;
- 4) creating new green areas between motorways for each administrative district;