Management of Development Risks for Regional Social-Natural-Technogenic System

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ABSTRACT

The assessment of development risks for regional social-natural-technogenic system is defined mostly by the existence of hazardous technogenic objects, industrial complexes, derelict land and other. Sources of natural and industrial risks both at the national and regional levels are remained high deterioration and degradation of technical systems, increase in the degree of resources exhaustion for the objects safety, arrangement of the population and social objects in areas of dangerous natural processes, low levels of adherence for safety standards, insufficient development of forces and means for natural and technogenic emergency responses [1].

Ensuring of territorial security, effective management and sustainable development are impossible without a comprehensive assessment and analysis of the S-P-T system risks and the reduction of individual and social risks to acceptable scientifically-based levels. The basic strategic risks of regional C-P-T systems vary significantly for the socio-, techno- and ecosphere both in the types of risks and in the completeness of the initial data and in the assessment methods (Table 1).

Table 1 – Basic objects and groups of strategic risks for regional S-N-T system

	Technosphere	**Sociosphere**	**Ecosphere**
Object	Condition of technical systems	- loss of human life and health - life expectancy - level of income - education - health	ecosystems natural and antropogenic
Type of basic risk	- risks of emergencies and incidents (by type of emergency) - antropogenic risk and reliability - material risk	- individual risk - social or population risk - material risk	- ecosystem vulnerability risk - risk of acceptable anthropogenic impact - material risk

The ability to assess the basic risks is largely limited by the availability of monitoring data. Models of individual risk assessment of human morbidity and mortality can be classified by the number of influencing factors: one-parameter, multi-parameter and non-parameter. The Principal difference in approaches to risk assessment is the interpretation of risk either as a determinate value (mostly the expected damage) or as a random value (the probability distribution of the damage degree).

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To date, individual risk assessments have been performed for the some components of the S-P-T system using the example of the Krasnoyarsk territory. An analysis of the accident risks and individual death risks as a result of anthropogenic emergencies made it possible to rank the regional municipalities (dangerous, borderline and safe territories) by the quantitative risk level. A methodology to assess the ecosphere risks is being developed based on a combination of classical methods of multivariate statistical analysis as applied to forest ecosystems. Materials of forest fire, phytopathological and other types of monitoring are used as initial data.

To assess the socio sphere risks a quantitative analysis was performed for the influence of environmental factors such as air and drinking water pollution, specific climatic parameters on the population morbidity and mortality. For the first time estimates were made of the combined effect on the population mortality of air pollutant concentrations and climatic features, including heat and cold waves sudden changes in air temperature. Maps of the health risks caused by air and drinking water pollution, the risks of death in natural and anthropogenic emergency and the risks of dangerous events and incidents have been developed using GIS technology.

At the same time, the assessment of the human morbidity and mortality in the interaction with the regional S-N-T system is significantly limited by the lack of knowledge regarding the impact risk objects in terms of consequences analysis. In addition, the existing models applying to natural, social and technological risks are not identical. These models do not allow to justify the standard requirements for data collecting and analysing, monitoring parameters and risk management.

Thus, a methodology for forecasting risks is required depending on the technologies for collecting data, control, monitoring taken to counter risks.

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