

Geo-ethical dimension of community's safety: rural and urban population vulnerability analysis methodology

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Modern world based on relations more than on causalities, so communicative, socio-economic, and socio-cultural issues are important to understand nature of risks and to make correct, ethical decisions.

Today major part of risk analysts declared new nature of modern risks. We faced coherent or systemic risks, realization of which leads to domino effect, unexpected growing of losses and fatalities. This type of risks originated by complicated nature of heterogeneous environment, close interconnection of engineering networks, and changing structure of society. Heterogeneous multi-agent environment generates systemic risks, which requires analyze multi-source data with sophisticated tools. Formal basis for analysis of this type of risks is developed during last 5-7 years. But issues of social fairness, ethics, and education require further development. One aspect of analysis of social issues of risk management is studied in this paper.

Formal algorithm for quantitative analysis of multi-source data analysis is proposed. As it was demonstrated, using proposed methodological base and the algorithm, it is possible to obtain regularized spatial-temporal distribution of investigated parameters over whole observation period with rectified reliability and controlled uncertainty. The result of disaster data analysis demonstrates that about half of direct disaster damage might be caused by social factors: education, experience and social behaviour.

Using data presented also possible to estimate quantitative parameters of the losses distributions: a relation between education, age, experience, and losses; as well as vulnerability (in terms of probable damage) toward financial status in current social density.

It is demonstrated that on wide-scale range an education determines risk perception and so vulnerability of societies.

But on the local level there are important heterogeneities. Land-use and urbanization structure influencing to vulnerability essentially. The way to calculate a distribution of losses connected with decision making in land-use is demonstrated.

Rural community's vulnerability determines by water availability, quality of soils, effectiveness of land use (including climate change adaptation), intensity of pollutions, crop productivity variations during the period of crop rotation, annual national distribution of crops output, and distance to city centres. It should noted here that "distance to city centres" is not comprehensive indicator of market accessibility in general case: quality and availability of transport infrastructure should be described more detailed on the next stages of analysis.

Urban population vulnerability determines by distribution of urban fractures and quality urban environment: density, quality and availability of infrastructure, balance between industrial, residential and recreational zones, effectiveness of urban land use and landscape management, and social policy, particularly, employment.

Population density is closely connected with social density, with communications and decision making. Social learning, as the function of social communications, is the way to increase sustainability.

Also it possible to say that social sustainability is a function of intensity and efficiency of communications between interlinked and interacted networks in the heterogeneous environment.

Therefore the results of study demonstrated that risk management study should includes issues of risk and threats perception, which should be described in framework of appropriate tools and approaches connected with ethical dimension of vulnerability. For instance, problems of accessibility and availability of safety resources in view of social fairness and socio-economic dynamics should be included into future studies in field of risk analysis.