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GEOGRAPHICAL PRINCIPLES OF THE REGIONAL NATURAL AND MANMADE DISASTER SECURITY MANAGEMENT IN UKRAINE

ABSTRACT. A concept of zoning that addresses Natural and Man-made Disaster Security (NMDS) is proposed. NMDS's features and factors used in regional divisions are discussed. The system of factors and the level of their influence are described. The nature, principles, criteria, and indicators for appropriate zoning are determined. Ukraine's territory is described from the standpoint of NMDS considering spatial differences and the level of population security, economic facilities, and natural ecosystems in respect to negative impacts of natural and technogenic character. Features and dynamics of NMDS of Ukraine from the regional division perspective and natural and technogenic hazards to the regions are shown. Prospects of social geography theory and methodology in the development of the foundations of NMDS are provided. A socio-geographical mechanism of NMDS for the regions is presented. Goals and key directions of its implementation are defined. A system of methods and implementation measures of socio-geographical mechanism of NMDS is proposed. The organizational and management structure of NMDS of Ukraine at different hierarchical territorial levels, particularly at the regional level, is identified. The system of organization and management of environmental monitoring and detection of human, financial, and material reserves is necessary in prevention and minimization of negative impacts of natural and manmade disasters.

KEY WORDS: natural and manmade disaster security, potentially dangerous areas, emergency situations, socio-geographical mechanism, zoning for natural and manmade disaster security.

INTRODUCTION

Territorial organization of ecological security and organizational and management structure of Natural and Man-made Disaster Security (NMDS) at different territorial levels of hierarchy in Ukraine have not been well studied yet, in particular, in terms of natural and manmade risks at the regional level. However, it is within specific regions that natural and manmade hazards can be identified and concretized most completely, the most effective territorial reserves needed for emergency situations can be pulled, and the establishment of a full range of activities aimed at risk reduction is possible.

In Ukraine, there are significant differences in manifestations of natural hazards that have a significant impact on natural and technogenic security areas. To date, the nature of technogenic security at different hierarchical levels has a sectoral basis, according to which, the bulk of resources and power is concentrated with the Ministry of Emergency Situations of Ukraine; its territorial departments supervise, control, and gather information on the status and security. Thus, a considerable flow of operational information and a holistic vision of the territory are lost; in case of natural and manmade hazards, it is only possible to characterize a certain part of emergency situations' development and balance, making situations not always predictable and controllable. In this regard, the socio-geographical approach in solving problems of the regional natural and technogenic security may be used to integrally achieve strategic and tactical objectives of NMDS, linking them with economic and social objectives of the regional development.

At the present time, only isolated issues of NMDS are solved at the regional level. However, it is impossible to completely address the problem, for example, of overcoming disastrous floods without identifying their relationships with other natural hazards, anthropogenic impact on nature, and hazards that manmade objects carry. Another negative consideration is that, in the regional division at which level the state is implementing the regional security policy, only the Autonomous Republic of Crimea and administrative oblasts of the country are considered. This ignores the real risks of emergencies' spatial features and similarities of sets and levels of danger in adjacent oblasts.

RESEARCH METHODS

Approaches of scientific support for NMDS

Theoretical and methodological foundations for zoning using ecological characteristic have not been sufficiently developed as a result of many reasons, including objective, especially considering the large quantity of region-specific factors and interaction between various features of hazard sources: natural and manmade. It is possible to say that this type of zoning is a separate branch among other sectoral zoning types, because it considers factors of production, infrastructure facilities, and resettlement of population, which brings it close to the socio-geographical division; however, it also considers natural phenomena, features of geological structure, climatic conditions, etc., suggesting a similarity to the physical-geographical zoning. In addition, during the zoning procedure, hazardous substances spreading in ecosystems (due to emissions, effluents, solid waste accumulation) should also be considered, i.e., the level of pollution must be taken into account too. While there are studies devoted to NMDS (e.g., monographs by Danylyshyn et al. [2004]; Doroguntsov et al. [1998, 2002]; Rose [2004]; etc.), approaches to zoning that utilize ecological features have not been sufficiently developed. Some theoretical principles and suggestions for zoning are presented in works of M. Kolosovskiy [1958], A. Melnychuk [2005], and A. Dovgan [2003]. There have been no synthesis efforts of the preliminary results in this scientific direction and the integrated scientific concept of zoning in terms of NMDS has not been developed. The goal of this research effort is to address these areas.

Risk is an important factor in many public policy decisions, insurance policies, and regulatory actions [Kellenberg, 2008]. Experts have emphasized the need for a systematic approach to security management [Santos-Reyes and Beard, 2008]. The NMDS provision is described as a part of organizational and economic mechanism [Danylyshyn et al., 2008]. The proper mechanism of NMDS is understood as a set of measures, methods, instruments, and tools to influence the functioning of economic entities, the vital activity of population, natural complexes, and other areas of importance. The human-geographical approach requires a broader

understanding of the NMDS mechanism as a concept. It is based on the regional system approach that considers a complex open system within which deterministic subsystems (technical objects) and self-developing systems (landscapes) are combined. Studies conducted to date show relationship between the income per capita and measures of managing risk from natural disaster [Tansel, 1995]. Isolation of regions as integral formations is influenced by human management and by self-organization [Dovgan, 2003].

Zoning, in terms of NMDS, is the division of the territory into separate parts that are different from each other in the character of natural and technogenic hazards. The characteristics of such units are: (1) the nature of risk (prevalence of natural or manmade hazards) and (2) the level of danger. The level of risk can be evaluated in absolute terms (the level of individual death risk) or relative – different integral security parameters that allow comparing different territorial units in terms of security. The areas of specific natural and manmade security level have characteristics of integral socio-geographical divisions. This includes the presence of the core, i.e., a city with the large population and industries and concentrated infrastructure facilities. The role of the core is dual: on the one hand, it concentrates a large number of hazards; on the other hand, it has concentrated population, for which it is necessary to create a safe environment. Therefore, in zoning divisions, in general, cities are the object of a detailed investigation and of the influence of the authorities and local governments in reducing risk. Socio-geographical location, natural conditions, and resources are described here in terms of addressing emergency situations that may worsen the living conditions of the population. For the given natural area, a set of natural hazards, climate conditions, and landscape features must be sufficiently similar. The definition of the nature of hazard in the area requires consideration of such features as economic specialization (to identify specific types of hazard sources: chemical, fire, explosives, radiation, hydrodynamic, etc.) and the homogeneity of climatic conditions (detection of specific types of natural hazards).

Objectivity of this type of zoning follows from the fact that the research subject, as in other areas of socio-geographic research, is a set of elements of living and inanimate nature and humans that interact with each other; this interaction provides the existence and functioning of geographical systems [Mezentsev, 2005]. In respect to NMDS and addressing hazards that are present in the technosphere, society, and environment, the procedure of regional division includes not only spatial differences and relations within socio-geographic systems, but, above all, the security level of population, economic facilities, and natural ecosystems. The fact, that regional differences in the levels of security have traditionally not been taken into account during integrated zoning, explains the intensification of natural and manmade hazards in the past decade, which is supported by statistics [National Report, 2007]. In this regard, this type of zoning can not be regarded only as a sectoral zoning, and, to a certain extent, it is the integral zoning because it includes all available information [Mezentsev, 2005], e.g., data on elements of inanimate nature, on the state of living nature, on the affected natural elements, on production activities, human beings, etc.

Like other types of zoning, the natural hazard zoning has scientific, educational, and practical value. Thus, the study of regional division allows a more detailed analysis of the security; it also allows reaching the appropriate level of regionalization for individual high-risk (potentially dangerous) regions. The delineation of these regions in integrated zoning would improve administrative and territorial division of the country. The practical significance of this approach is that the results and research of zoning and of individual regions provide the basis for management decisions to enhance NMDS in the regional context.

Algorithm, principles, criteria, and indicators of zoning

The first step should include assessment of factors that influence zoning. Factors affect the identification of the regions in different ways. These factors provided the basis for formulation of principles and criteria and they represent indicators in defining zoning in terms of NMDS. Under the principles of zoning, we consider the statements and the rules of the territorial division formulated earlier [Ishchuk, 2008]. In our study, we followed the principles listed below:

1. Accordance with the administrative division of the state, which determines that the administrative boundaries, that already exist, be used in zoning. This would allow efficiently improving security and security measures based on the current Unified State System of Response and Prevention of Emergencies [Cabinet of Ministers of Ukraine, 1998].

2. Potential value of individual regions, which considers hazards that have the established and objective basis for the existence and that impact the livelihoods of the population. Their mitigation should be included into long-term plans and programs of the regional development.

3. Consideration of interrelations between natural and manmade hazards (synergistic effects). Although the mechanisms of natural and manmade hazards are different, there is interaction between them. Often, large damage caused by an emergency situation of the natural character is linked with a poor reliability of technical systems, such as construction of residential buildings and major infrastructure facilities in flood areas without existence of dams. Also, natural disasters often trigger large-scale manmade disasters, for example: droughts are the factor of fires and explosions at potentially dangerous objects.

Furthermore, during the implementation of zoning, it is desirable to adhere to such requirements as continuity, uniqueness, and single scale use, sometimes known as zoning requirements. They are the key to the appropriate general zoning division grid [Mezentsev, 2005]. Definition of criteria and zoning indicators is difficult for the traditional types of zoning and for the new one; it is a key question, the answer to which affects substantially the final result, i.e., the configuration of the regions. One of the main criteria may be the presence, in the area, of some prevailing environmental problem caused by disharmony in interaction and mutual influence of natural elements, anthropogenic systems, and human behavior. The examples of this problem are the Chernobyl nuclear power plant in Polissia and flood forecasting and prevention in the Carpathian region. We define quantitative criteria as the integral calculated coefficients that reflect the level of natural and man-made threats and the level of individual death risk.

The system of indicators that reflects the level of NMDS in general has been developed. The first group of indicators that estimate the level of both natural and manmade hazards is as follows:

– size of potentially damaged area, km^2;

– ratio of the area of the likely damage to the total regional area,%;

– population of the area of possible damage, thousand of people.;

– percent of population living in the area of possible hazard relative to the total population of the area, %.

For manmade hazards, the following indicators are also included:

– number of potentially hazardous objects and vehicles;

– distribution of potentially hazardous objects by degree of danger, %;

– quantity of hazardous substances on potentially hazardous objects, ton;

– distribution of hazardous substances in terms of toxicity, %.

The delineation of the regions should also consider indicators of industrial activity (industrial production by sector, area specialization index), social development (frequency of major diseases), and pollution (amount of mineral extraction, emissions, discharges, accumulation of solid wastes).

Cluster analysis applied to the socio-geographical zoning proved to be very helpful [Popovkin et al., 1994]. To justify the

Ranking of the administrative regions (oblasts) of Ukraine by the level of NMDS

№	Regions	Integral rank by manmade hazards	Integral rank by natural hazards	Emergency character criterion	Generalized emergency character criterion
1	Donetska oblast	55	28	1.96	2.17
2	Luganska oblast	88	37	2.38	
3	Dnipropetrovska oblast	68	41	1.66	1.57
4	Zaporizska oblast	100	58.5	1.71	
5	Kirovogradska oblast	75	66	1.14	
6	Cherkaska oblast	107	60	1.78	
7	Khmelnytska oblast	68.5	70	0.98	0.80
8	Vinnytska oblast	71	75.5	0.94	
9	Ternopilska oblast	44	54	0.81	
10	Chernivetska oblast	42	87	0.48	0.72
11	Lvivska oblast	59	74	0.80	
12	Zakarpatska oblast	38.5	83	0.46	
13	Ivano-Frankivska oblast	51.5	76	0.68	
14	Volynska oblast	63	68	0.93	
15	Rivnenska oblast	80	59	1.36	
16	Zhitomirska oblast	48	70	0.69	0.78
17	Kyivska oblast	45	69.5	0.65	
18	Chernigivska oblast	56	105	0.53	
19	Sumska oblast	51	78.5	0.65	
20	Poltavska oblast	58.5	63.5	0.92	1.07
21	Kharkivska oblast	61	50.5	1.21	
22	Mykolayivska oblast	81	73	1.11	1.03
23	Khersonska oblast	66.5	74	0.90	
24	Autonomous Republic of Crimea	58	54	1.07	
25	Odeska oblast	87	50	1.74	1.74

division of the country in terms of NMDS, we performed cluster analysis of administrative regions (oblasts and the Autonomous Republic of Crimea (ARC)). The ranking method allowed us, first, to identify the nature of the hazard and the prevalence of certain hazards in specific groups, and, second, to group oblasts and the ARC into groups that formed the basis for the divisions. Ranking allowed delineating the boundaries precisely, which was not possible by the cluster analysis alone. The nature of risk was determined by the appropriate criterion, calculated as the ratio of the ranks in a natural hazard to the relevant indicator of a manmade hazard. To determine ranking, the integrated hazard criterion was used [Danylyshyn et al., 2008], which was supplemented by calculated relative indicators of the number of situations of natural and manmade character.

The generalized nature of the risk criterion indicates the ratio between natural and manmade hazards in the territory. The proximity of the criterion's values and consideration of the principle of administrative division allowed uniting the oblasts into the districts (see Table).

Human-geographical mechanism of NMDS

Selecting regions within Ukraine is the main consideration in optimization of the regional policy and the prerequisite of effective human-geographical mechanism of NMDS. Using the theory and methodology of social geography in the development of the foundations of NMDS involves primarily understanding its characteristics as a complex of human-geographical parameters. NMDS's status is determined by the level of balance of human-geographical complex, rational allocation of enterprises, engineering structures, and transportation facilities that are potentially dangerous. Human-geographical arrangement should include actions, methods, and means of influence based on the use of space resources of regional development and provide risk reduction by improving the regional territorial structure and by establishing the necessary connections and relations in the system of the regional NMDS.

The human-geographical mechanism of the regional NMDS includes scientifically based activities of the government aimed at reduction of natural and manmade hazards for the public, commercial facilities, and the region in general to acceptable levels by improving measures to prevent and minimize the consequences of natural and manmade disasters. An effective organizational and economic mechanism of NMDS regulation may still have some shortcomings and may need improvement, including the implementation of human-geographical activities.

RESULTS

Activities to ensure NMDS at different hierarchical levels

At the global level, it is important to ensure the country's participation in the world-scale international activities aimed at studying natural and technogenic risks, forecasting, prevention, and minimization of the consequences of emergencies. The most successful, in this regard, is the participation of governmental delegations in the global-level international forums where negative consequences of anthropogenic impact on global environment are discussed and steps to resolve the most urgent environmental problems are determined (Rio de Janeiro (1992), Johannesburg (2002), and Copenhagen (2009)), and, the clearly established and mutually beneficial cooperation between Ukraine and NATO in the field of NMDS.

Our country participates actively in international exercises, forums, and meetings of experts from NATO. At the initiative and with support projects of this organization, the global information preparedness and response system to emergency situations have been created. Ukrainian experts participated in training courses in the states – the Alliance members. Another solution to security

problems is associated with the system of intergovernmental regional arrangements. For our country, the most important is the interaction within the CIS (the Interstate Council on Emergency Situations of Natural and Manmade Character) and the GUAM (Organization of Black Sea Economic Cooperation). Coordination of security legislation and assistance facilitates overcoming the powerful impacts of emergencies and promotes coordinated measures to enhance NMDS of the population.

Globalization of the scale and consequences of emergency situations and their increased cross-border impacts are forcing our country to be included in a wide range of international cooperation activities in this field. Ukraine has a number of bilateral intergovernmental agreements in preventing the emergency situations and minimizing their effects: with the Russian Federation, Armenia, Kazakhstan, Slovakia, Greece, and Belarus. Ukraine is a participant of international conventions on nuclear security, which is the key element to the global nuclear security. It has governmental bilateral agreements in radiation security with Austria, Poland, Germany, Norway, and Finland. Our country is also a member of the International Civil Defense Organization. Ukraine participates in UN activities and exercises aimed at improving NMDS.

The bodies that determine the impact on NMDS in Ukraine are: the National Security and Defense Council of Ukraine, the Cabinet of Ministers of Ukraine, the Supreme Council of Ukraine, the Ministry of Emergencies, chief departments of the Ministry of ARC, oblasts, Kyiv and Sevastopol, their districts, city departments (sectors), local administrations, local authorities, civil defense services, fire-rescue and emergency rescue units, and economical entities that own objects with increased risk [Danylyshyn, et al., 2008].

A substantial risk decrease in the regions of Ukraine should be provided with a clear realization of regional policy in the sphere of security through the development and implementation of comprehensive public regional programs. They are implemented through effective management of NMDS. The system of control over NMDS in Ukraine requires substantial reorganization, automation, and geographical reorientation.

Management of the most significant public natural and manmade risks can be achieved at the level of regional divisions selected in this work. According to earlier studies [Kononenko, 2007], factors of division can be grouped into three categories: human, natural, and organizational and management. According to the calculations, the main impact on the state of NMDS, among human activities, is provided by the level of development of industry. The significant concentration of industrial capacity in certain regions, uneven development of industrial infrastructure, specialization of the industrialized regions of Ukraine associated with high level of potential emergency situations (coal mining, power, chemicals and petrochemicals, etc.) form a significant territorial differentiation of distribution of anthropogenic emergency situations. Natural hazards include landslides, floods, flooding, and seismic instability. Natural hazards, e.g., dangerous geological, hydrological, meteorological phenomena, may be of a greater importance to the western regions of the country. Among the organizational and management factors that impact the security of the population, organizational, productive, engineering, control, and legal and financial resources can be identified. The influence of these factors is significant, especially considering the fact that the system of natural and technogenic security in the regions has not been yet fully implemented. Factor analysis [Kononenko, 2007] identified two groups of factors that provide the greatest effect, i.e., of the anthropogenic and of the natural character: the influence of anthropogenic and natural factors on the regional ecological security is 52% and 11%, respectively.

Cluster analysis of selected groups showed, first, similarities in the manifestation of threats in Polissia oblasts (Chernihiv, Zhytomyr, Rivne, Volyn, Kiev, and Sumy regions); second, the formation of the group of oblasts in the western region, which includes Chernivtsi, Ivano-Frankivsk, Ternopil, Lviv, and, also, the Khmelnytsky and the Vinnytsia oblasts; third, closeness of NMDS indices of Poltava and Kharkov oblasts; and, fourth, the isolation of southern and eastern oblasts, with, among the southern regions, Odesa, Mykolaiv, and AR of Crimea have common characteristics. The following oblasts can be isolated individually: Kherson, Dnipropetrovsk, Donetsk, Kirovohrad, Cherkassy, and Transcarpathia.

In terms of natural and manmade hazards, the following divisions in Ukraine were identified based on a particular structure of regional human-geographical complexes, on areas of influence of existing facilities and sources of increased danger, on security features of the prevailing regional industrial complexes, on the prevalence of some types of natural and manmade risks, on cluster analysis, and on collected statistics:

I. West: high risk of floods, geological, and manmade emergency situations related to meteorological hazards and forest fires;

II. North: frequent floods and manmade high risk related to forest fires, floods, spread of infectious diseases, accidents at hydrodynamic facilities;

III. Central-Western: geological and manmade risks and frequent meteorological emergency situations;

IV. Central: radiation, chemical, explosion, fire, flood, and landslide risks and high risk of emergencies at facilities of the hydrodynamic and energy complex;

V. Northeast: floods, chemical, explosions, fire danger, and risk of emergencies of meteorological character;

VI. East: explosion, fire, chemical, and geological risk and high risk of emergencies of meteorological character;

VII. South: geological and manmade risk and high risk of meteorological emergencies associated with floods;

VIII. Southwest: geological, explosion, and fire risk and high risk of emergencies at municipal facilities; risk associated with production.

The socio-geographical aspects of differences in internal security within certain groups of oblasts have been researched and identified; analysis of natural and man-made disasters has been performed (Fig. 1).

The human-geographical mechanism of the regional NMDS

The human-geographical mechanism of the regional NMDS (Fig. 2) outlines the procedure and the content of the governmental policy aimed at achieving the strategic goal of NMDS management [Oliynyk et al., 2010].

We consider the effectiveness of territorial organization of the regional NMDS as defined by: the allocation of its centers of different hierarchical levels (inter-district, district, and local levels) and of high risk objects outside the settlements; the areas of high risk due to a psossible negative impact on the public caused by natural and manmade hazards; the level of infrastructure development (networks of human, financial, technical, and material resources stocks; the system of civil alert in case of emergencies, etc.); and the efficiency of NMDS management.

Under the natural and industrial security centers, we propose to consider the population centers, whose components form the territorial structure of specific combinations of natural and manmade hazards to human life, the system of forces and means of emergency situations prevention and of minimization of their effects, and risk emergency management.

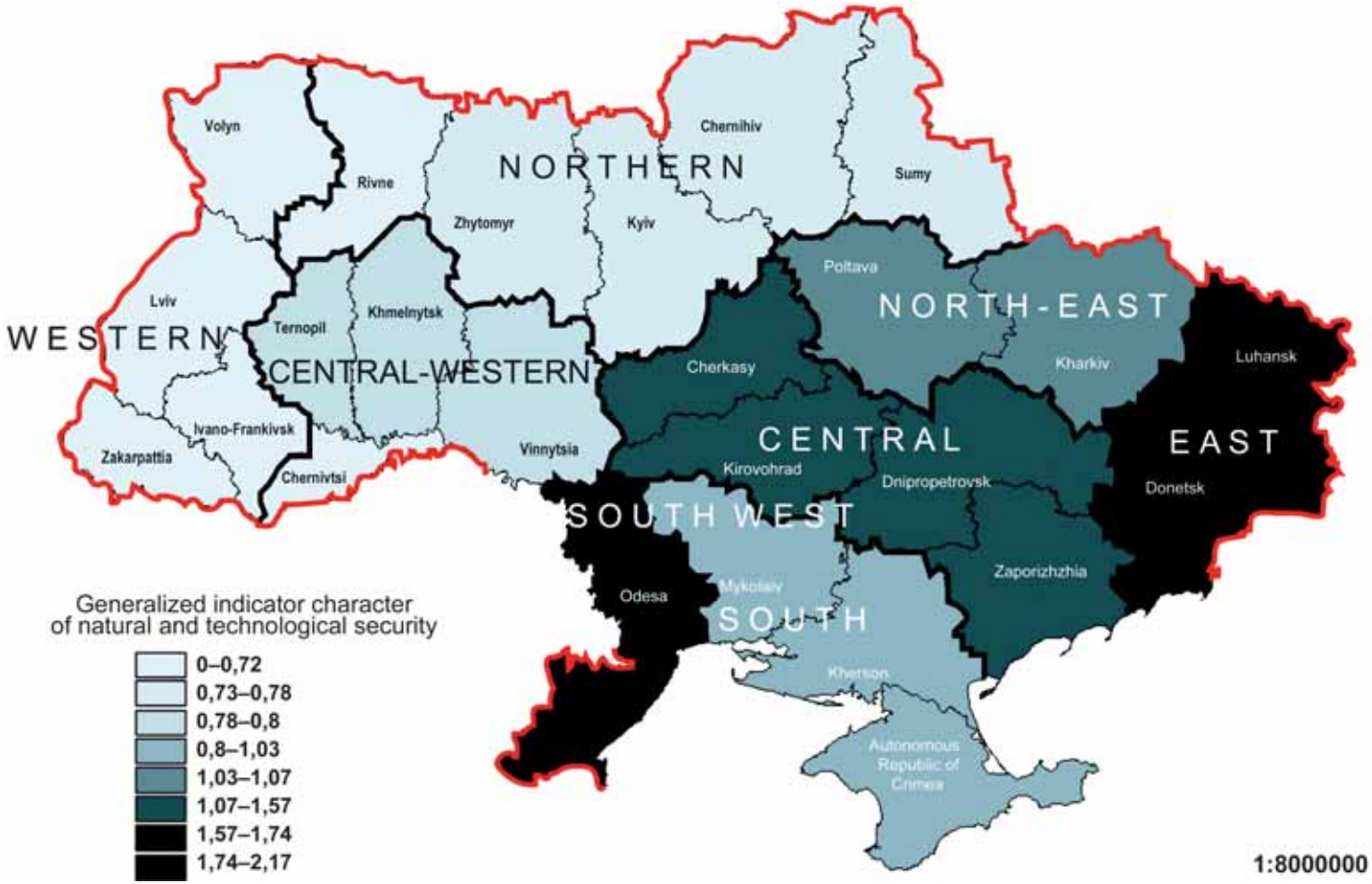

Fig. 1. Divisions based on the level of NMDS

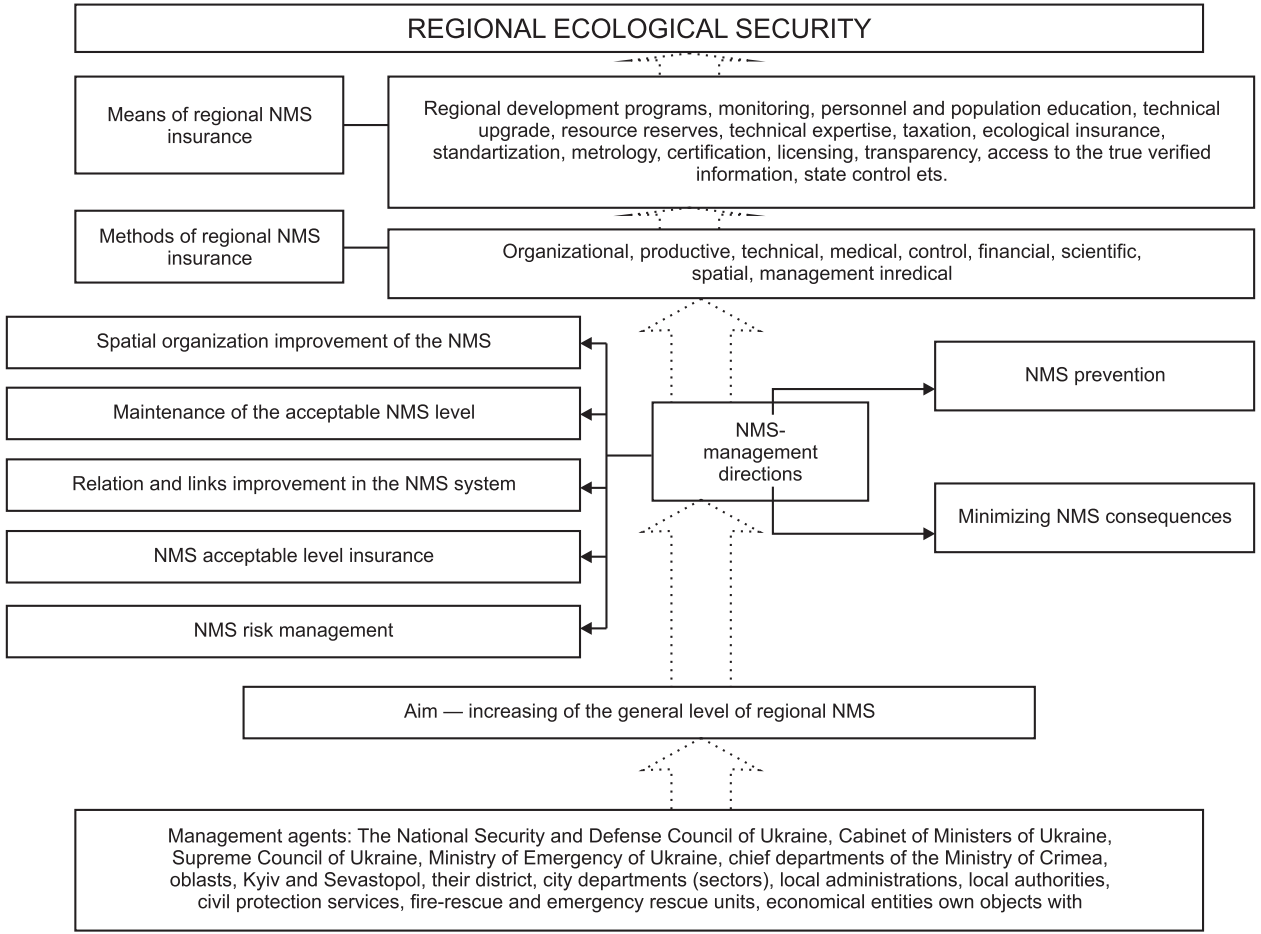

Fig. 2. The human-geographical mechanism of the regional NMDS

The improvement of the territorial organization of NMDS is associated with reducing natural and manmade territorial risks through the elimination of high-risk objects that do not play an essential role for the regional development, through the optimization of placement of the objects whose elimination is not possible, through increasing emergency-prevention activity and a level of population readiness, and through the appropriate authorities preparedness in emergency situations; it can be achieved by development of appropriate infrastructure and optimization of management of NMDS.

Optimal spatial relations in NMDS systems depend on the complexity of their functional structures. The most important components are environmental, industrial, infrastructural, and management relations. Uncontrolled anthropogenic pressure (associated primarily with economic activity) dramatically increases the risk of natural disasters and the number of people who live or work in the areas of possible hazardous situations. Close interrelation of natural and manmade risks creates high potential for disasters or accidents within compact areas. It is especially dangerous because of a possible combination of effects of several types of emergencies. Thus, elimination or minimization of negative consequences is a complex and difficult task. Spatial manmade relations are caused by dangerous areas growing as a result of hazardous substances movement and proliferation of dangerous technologies that should fall under the system of strict control and management. It defines the role of infrastructure bonds. Various sources of natural threats, high risk objects, services of preventing emergencies and minimizing their consequences, and appropriate management structures are considered and included, via appropriate infrastructure, into a unified integral territorial system of NMDS.

Risk management of natural and manmade disasters, as the area of government regulation, involves a complex of measures aimed at maintaining risk (for certain high risk objects, industries, regions, etc.) at the lowest possible level. Risk management process is cyclic and includes the following mandatory steps: monitoring NMDS and risk identification, risk assessment, selection of methods and means of risk management, their implementation, and evaluation of the application effectiveness. The principal methods of reducing risks are risk elimination, localization, redistribution, control, insurance, and absorption. Each of these methods involves the use of a set of measures depending on the initial level of risk, availability of resources, and economic and social feasibility of dangerous economic activities [Kononenko and Melnychuk, 2006].

At the regional level, the goal, direction, and implementation of methods to ensure NMDS define the following measures:

- development of the action system and, if necessary, of the state regional program, for the implementation of a range of preventive measures aimed at reducing risk of emergency situations and minimizing their consequences;
- monitoring in addressing natural and manmade hazards;
- training for response of population and the personnel of high-risk objects in emergency situations;
- effective manmade interaction of high-risk objects;
- required reserves of human, financial, and material resources; necessary supplies of medicines, equipment, and personal protection;
- technical expertise in the area of population and territorial security at the design stage of high-risk objects, technical processes improvement, and standard technology and production equipment upgrading;
- introduction of the effective taxation systems, environmental insurance, standardization, metrology, certification,

licensing, and representation in the sphere of NMDS.

– provision of the population with objective information about natural and industrial hazards in the region, their severity, the ways to overcome them through the establishment and maintenance of regional geographic information systems and through the creation of modern back-up notification systems for emergencies;

– verification of these measures, and managing risk of natural and manmade emergencies at an acceptable level.

Effective management of NMDS is based on pasportization (i.e., classification) of regional risks. The passports of the country divisions, defined based on the level of natural and industrial hazards, must include geographic features and identified sources of high risk. They should be coded and classified according to types. The types of serious hazards and emergencies associated with them should be defined. Potential chain emergencies, their probability, acuity, and the most serious negative consequences that may arise in response to natural and manmade disasters must be defined. Existing governmental bodies; services; material, financial, and human reserves available to prevent and minimize negative consequences of emergency situations; and their main characteristics and parameters should be taken into account. All emergency situations that occurred in the past and their main features and options for response must be described [Oliynyk et al., 2009].

Only a comprehensive system of state measures based on principles of priorities for human security can significantly improve the condition of NMDS in Ukraine. Warning of the natural emergency situations will be more efficient through the development and implementation of the new equipment and technologies for monitoring natural hazards, through modernization, and through adequate funding of the relevant services. There should be broad awareness of structure and acuity of the most significant hazards in the country and its regions and of response means.

Strengthening the supervisory functions of the state, especially at the regional and local levels of security, is the main precondition for reducing risks of manmade emergency situations.

Effective, comprehensive, and specific activity to manage natural and manmade security can be effectively provided at the level of divisions defined by the level of natural and industrial hazards.

CONCLUSIONS

The results presented in this paper form the part of theoretical and methodological foundations of regional studies of NMDS from the standpoint of human geography. The paper also discusses the development and implementation of the socio-geographical mechanism.

By NMDS zoning, we understand the division of the territory into separate parts that are different from each other by specific combinations of natural and manmade hazards. Their primary characteristics are the origin and level of hazard. The principles of NMDS zoning were identified. They include compliance with the state administrative-territorial system and potential features of divisions that take into account the balance between natural and manmade hazards (synergistic effects). Quantitative zoning criteria are used in the integral calculation indicators reflecting the level of natural and manmade hazards and the level of the individual death risk.

Centers for prevention of natural and manmade hazards in each region would be able to reduce significantly risk of natural and technogenic emergency situations. The centers should provide analysis of factors, distinguish sources and high risk objects, perform risk certification and monitoring, created resources of material, financial, and human reserves, and interact effectively with business community and public organizations. ■

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