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ANALYSIS OF RISK FACTORS FOR THE OCCURRENCE OF NATURAL DISASTERS

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ABSTRACT: *Management of crises caused by natural disasters is one of the main functions of the state. The ability of our country to respond adequately to constantly accompanying natural disasters is one of the main approaches to ensure security. Essential for the management of natural disasters are properly identified and defined risk factors and threats. Increasing the different by their nature emergencies throughout the country puts more strongly the questions about the effectiveness of forecasting and planning at national, institutional, regional and object level.*

KEYWORDS: *management, security, risk factors and threats, natural disasters*

Introduction

The basis for making science-based decisions in the management of natural disasters is the availability of sufficient reliable and precise forecasts for the development of the crisis. That is why in the world today are carried out intensive applied science researches aimed at the development of mathematical models of different types of crises. However, these problems are very complex and despite intensive work on them, it requires some of the common patterns to be specified for the relevant geographic regions so as to maximize the accuracy of the forecasts for the development of natural disasters. Hence the need to properly identify and define risk factors and threats.

In this regard, the purpose of the report is:

1. To identify and classify risk factors and threats for the occurrence of natural disasters.

2. To identify potential hazards to which is exposed the territory of Bulgaria.

Exposition

Everyone, depending on their experience and the environment in which they develop, has a different idea and attitude to risk. Different types of activities and professions define the term risk in different ways.

Risk can be defined as a combination of the probability of a particular event and its consequences [2, 3].

Risk factors are the ones that favor the appearance of risk in a particular area called risk area. The risk factor introduces object-specific factual dimension, which assumes the risk.

For effective management of natural disasters it is necessary a proper identification and definition of risk factors and threats. If a few decades ago security was described primarily in military terms, currently perception of security is much more complex and is associated with a stable and efficient operation of all social systems in society. More and more attention is paid to environmental threats, the rights and freedoms of citizens, health and social problems, budget and trade deficits, macroeconomic stability, etc. The global society now faces the non-military issues and security threats.

Potential hazards exist in the public and in the natural spheres. The risk of their occurrence may be found at the interaction between these two systems, and it is a very important role of the human factor that balances, organizes and manages the process of this interaction.

Threat or danger of threat can be any breach of the relative stability of security, regardless of the reasons for this instability. Unlike in the past, now the risks are numerous and multifaceted, and therefore difficult to predict and assess. Extended is the spectrum of new and specific risks and security challenges.

The main security threats have complex character. In the global world in which we live, there is no country that cannot cope alone with the risks and threats, and this reinforces the interdependence of policies undertaken at national and international level. It is recognized that addressing and dealing with existing risks and threats can be realized not through isolation but through cooperation and integration. UN, NATO, EU, OSCE and other international organizations have an important role in the security of European and Euro-Atlantic integration of joint efforts to combat the risks and threats, prevention and timely response in case of crises and post-conflict reconstruction.

Destabilizing risk factors and security threats can be grouped based on various attributes:

- by place - internal and external;
- by nature - military and non-military;
- by duration - permanent and temporary;
- by areas of influence - political, socio-economic, informational, environmental, natural, demographic, humanitarian, ethnic and religious;

- by the extent of their occurrence and effects - real or potential, direct or indirect, and others.

This distinction is arbitrary, since some of them appear combined. Typical of modern situation is the occurrence of predominantly internal rather than interstate conflicts. Global risks to the existence of humanity today require the construction of specific national, regional and international resources to prevent their occurrence or reduce their harmful consequences. Risk events can be differentiated broadly into two main groups of criteria by the possibility of human intervention [4]:

- events resulting from natural phenomena;
- events resulting from human activity.

In the group of events resulting from natural phenomena we can include: cosmic cataclysms, earthquakes, floods, droughts, landslides and rock falls, high winds, tornadoes phenomena, tsunamis, dust storms, forest and field fires, hail, snow-drifts and icing, outbreaks of contagious diseases and epidemics among humans, animals and plants. Within the territory of Bulgaria may occur, in varying degrees, each of these phenomena, as most of them - snowdrifts and icing, landslides and landslips, hailstorms and other occur annually or are in a constant process of development.

In the group of events resulting from human activity are: accidents at sites with hazardous industries, accidents with vehicles, terrorist activity, massive violation of the statutory order in the state, financial, economic and political events that endanger the well-being of large groups of people.

Risk assessment for the territory of Bulgaria requires targeted use of significant scientific and expert resources for preparing, testing and evaluation of specific scenarios for the origin and development of different types of crisis situations.

Potential threats to Bulgaria

Potential hazards faced by the country's territory can be considered in three main areas: infrastructure and regional location, business, and climate and geography characteristics [1, 4].

Infrastructure and regional location under the influence of denationalization, privatization and market economy are highlighted by economic interests, and protection issues of businesses have remained in the background.

Favorable geostrategic position of the Republic of Bulgaria is an important prerequisite for a busy road, rail, air and water transport to Central Europe, the Middle East, the Baltic States and Russia. This creates conditions for accidents related to the transport of dangerous goods, which may cause environmental pollution and endanger the lives and health of people.

Within the country , in the process of developing and disseminating, are communication transmissions of oil and gas (Figure 1). They are subject to control in order to avoid risky situations in their functioning.

Along the Danube River and the Black Sea, which connect us with the countries of Central Europe and Black Sea basins, are transported large quantities of petroleum products and accidents can occur with heavy oil spills and disastrous environmental impact.

Figure 1: *Transmission pipeline network of the Republic of Bulgaria*

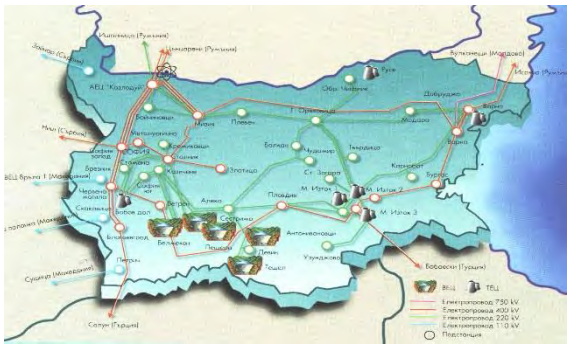

Figure 2: *Electricity grid of the Republic of Bulgaria*

In a complex crime situation it is quite possible deliberate causing of accidents due to sabotage of oil pipelines, gas pipelines,power supply network, theft and trafficking of radioactive sources (Figure 2). In some cases, it may result in damage to the dikes, walls of reservoirs and other infrastructure and production facilities. The expansion of some of these potential hazards can lead to escalation of tension in a crisis situation that will evolve into crisis.

Business in the country is associated with the operation of multiple objects of the energy, chemical, petrochemical, metallurgical and pharmaceutical industries. Most of them operate with explosive, flammable, combustible and highly toxic substances that can cause industrial accidents and fires with the release of highly toxic substances. There is the possibility of a breach of technological discipline and of safety regulations. All these circumstances influence the vulnerability and risk status of the national economy.

Under adverse weather conditions different harmful substances can cause pollution of the environment with cross-border impact.

Violating safety standards in the operation of Kozloduy NPP can lead to destruction of the protective barriers causing an accident accompanied by the release of radioactive products into the environment. Moreover, there can be created complex radiation situation and radioactive contamination in an area with a radius of 50 km.

The country has sites and companies working with technological sources of ionizing radiation. In case of accidents and incidents in them it is possible to occur local outbreaks that are dangerous for staff. They do not constitute an immediate danger to the population but may become subject to abuse, criminal traffic and radiation terrorism.

Within the country there are unexploded aviation, artillery, sea, and infantry ammunitions of uncertain quality and location. Some of them have retained their

combat capabilities and constitute a hazard. Improper handling could cause possible major industrial accidents, related to casualties and considerable material losses.

There are possible outbreaks of diseases due to insufficient control in trade and the military export regime of animals and products.

From seismological point of view, 98% of the territory of the country can be subjected to seismic impact. Bulgaria falls within the Alpine-Himalayan seismological belt and is influenced by both internal and external seismic regions with an estimated magnitude up to 8 on the Richter scale.

Figure 3: *Seismic zoning of Bulgaria, dated 1987*

Figure 4: *Map of recurrence period 475 in accordance with EUROCODE 8.*

As a result of studies conducted in Bulgaria, the territory is divided into three seismic regions: North-East, Srednogorski and the Rila-Rhodope region (Figure 3) [1].

During the period 2007 - 2009 was conducted a new seismic zoning of Bulgaria, which is in accordance with Eurocode 8 (Figure 4). In accordance with the existing provisions, currently are applied parallel rules for design and construction according to the seismic zoning from 1987, and the latest seismic zoning in accordance with the EU 8 [1].

Climate and geography features define as potential threats the dangers of earthquakes, floods, landslides, forest fires, heavy snowfalls, blizzards, icings, extreme temperatures and drought, hail, strong winds and tornadoes [1, 4, 5].

Floods in Bulgaria occur mainly during the winter and spring season due to the rapidly melting snow and heavy rainfalls. Significant flooding may occur along the river Danube. It is possible for drifting ice formations to occur that quickly rise the water level and cause disasters. Prolonged rainfall in the mountains can cause flooding in the upper and lower course of rivers. Along the coast of the Black Sea floods can occur in stormy, continuous eastern winds and strong earthquakes in the sea. Potential threat to the population and the national economy are the large dams and their floodplain areas, close to settlements, important communication areas and agricultural lands.

Landslides and abrasive areas which are active represent a threat to a number of settlements along the Black Sea coast and along the river Danube (Figure 5). The registered landslides in the country to the date of 31.03.2013 are 1755, with a total area of 209,000 decares, of which 1164 are in urban areas [1]. Active and periodically active landslides number is 692 with an affected area of about 58,000 decares. In 2011 and 2012 the number of newly registered landslides is 110. Abrasive processes registered on the Black Sea coast have affected about 234 kilometers of coastline [4].

Figure 5: *Areas of landslides on the territory of the Republic of Bulgaria according to the level of risk for their activation* [1]

Our country is located in the temperate continental climate zone, which is characterized by large temperature differences that can cause severe winters, frost, snow-drifts, wind and hail, which often cause damage to crops. The sharp fluctuations in winter temperatures lead to some snowfall accompanied by strong winds. As a result, snowdrifts on the roads and the mountain railways are formed. Icing of power lines and open communication facilities is something common.

Snowstorms as scourge appear every 2-3 years, and then large areas remain with impaired electricity, water supply and disrupted communications. Annually, about 50-60% of the country is threatened by snowdrifts.

Hail ,caused by spring and summer instability of the atmosphere, bring extensive damage to agriculture and can therefore be attributed to particularly dangerous natural phenomena.

During the hot summer days, particularly characteristic are large forest and field fires arising from thunderstorms, technological human activity or intentional ones. Fires can disrupt rail and road transport. As a result, substantial material losses and damage may be caused, and they may disrupt the ecological balance in the regions concerned.

Dust storms known as "wind spout", are difficult to predict and cause significant damage to property, forest areas and population.

Forecast and analysis of the potential hazards shows that they can lead to serious difficulties in the normal operation of infrastructure in crisis areas. Distorted are the vital control systems, the normal functioning of the national economy, and the lives and health of the population are endangered.

The analysis of manifestation and characteristics of modern risks and challenges shows that they are extremely heterogeneous and diverse. Therefore, their detailed study requires the use of specific methods for each specific type of crisis. To support the foregoing is the statistics in Table 1 which presents the crises in Bulgaria for the period 2003-2013 [6].

Table 1: *Distribution of the crises in Bulgaria for the period 2003 - 2013*

Events of crisis	2003	2004	2005	2006	2007	2008	2010	2011	2012	2013
Fires	4002	4467	3801	3017	6245	6319	1630	2185	3010	764
Landslides	239	238	392	374	151	177	59	76	72	51
Earthquakes	14	31	9	3	1	14	12	4	22	6
Droughts	13	0	0	0	42	5	6	30	23	3
Floods	285	531	1657	945	591	322	651	382	692	547
Storms, Tornadoes	111	115	204	136	137	190	47	48	528	89
Hails	17	40	45	17	13	17	16	13	14	13
Snow storms	99	82	121	49	68	153	103	94	93	50
Icings, Frosts	16	1	15	8	28	77	18	134	186	20
Accidents and Emergencies	6292	1530	1341	4086	1077	1156	1937	5218	5858	1155
Pollutions	139	106	92	271	201	152	45	42	7	19
Epidemics	47	21	13	18	14	10	12	7	7	7
Other disasters and crisis events	461	36	54	37	23	14	21	9	2	2
total	**10975**	**7102**	**7600**	**8624**	**8491**	**8482**	**4571**	**8268**	**10826**	**2728**

The effects of those natural phenomena described, can be substantial for the population, the infrastructure and the economy, and that is why our country can be characterized by a particularly high degree of risk in this sphere. This requires the legal regulation of the social relations, arising from disasters, which can significantly reduce the risk.

Conclusion

Increase of risks and the threats of the occurrence of different types of natural disasters in the country puts more strongly the questions about the effectiveness of forecasting and planning at national, institutional, regional and object level. Proper identification and definition of risks and threats is a criterion for good security status. It also helps to effective risk management, which is expressed in the ability to anticipate threats and minimize their adverse effects.

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