

THREATS OF NATURAL CHARACTER, FACTORS AFFECTING SUSTAINABLE DEVELOPMENT OF TERRITORIES AND THEIR PREVENTION

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Abstract: XXI century is characterized by globalization of socio-economic processes, economic growth, and excessive consumption of natural resources that leads to imbalance in socio-economic systems. Significant threats to the sustainable development of territories are natural and anthropogenic disasters, the extent and severity of which significantly increased in recent decades. They do great damage to economy and environment, often accompanied by loss of human lives. Russia with its broad territory, significant difference in climate conditions, is exposed to the wide range of natural hazards and disasters. The most dangerous are earthquakes, floods, forest fires. About 20 % of the Russian Federation is situated in zones of high risk, which are inhabited by more than 20 million people.

Area of flooding as a result of floods can reach over 400 km². Annually in the forests appear from 100 to 300 thousand of fires on the total area of 1.5 - 2.5 million hectares.

The impact of natural disasters on the sustainable development of territory is considered in the article as an example of one of the Russian regions – the Republic of Mordovia. It was analyzed the dynamics of emergencies for the period of 2000 – 2012 years, paid attention to natural emergencies (forest fires and floods).

Despite the fact that occurrence of emergency and catastrophic situations of natural character happens spontaneously, size of damage they do largely determined by timeliness and accuracy of the prediction and adoption of adequate preventive measures. In this regard, the article provides recommendations to reduce threats of natural character for the sustainable development of the Republic of Mordovia. They cover a range of activities on monitoring of natural phenomena, protection of the population from emergency situations to minimize potential damage, training of population in the face of natural disasters, development of economic policy in the region and training of personnel in the sphere of environmental management.

Key words: natural disasters, emergencies, forest fires, floods, sustainable development of territory, economic damage

Currently, natural disasters are global problem, source of profound social upheaval, economic losses. They also have direct impact on stability of socio-economic systems of countries, regions and municipalities. Analysis of natural disasters suggests that despite the development of scientific and technological

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progress, improvement of forecasting tools, protection of people and technosphere from threats of natural character does not increase. The number of victims in the world from ravages of natural disasters in recent years has increased annually by 4.3 %, while number of people affected by disasters - by 8.6 %. Economic losses are growing by an average of 6% per year.

The main reasons for the growth of deepening of natural hazards are: growth of human impact on environment, improper location of industrial facilities, settling of people in areas of potential natural hazards, inadequate environmental monitoring systems and life safety of people.

On the territory of Russia there are more than 30 natural hazards, among which the most devastating are floods, gales, storms, hurricanes, earthquakes, forest fires, landslides, mudflows, avalanches. The most frequent in the last decade become catastrophic natural phenomena of atmospheric nature – storms, hurricanes, squalls, they accounted for 28% of all disasters in the earthquake – 24%, in the flood – 19% of forest fires and other natural disasters – 29 %. The total annual economic cost of the most dangerous natural processes in Russia is 10-12 billion rubles per year. The annual direct economic losses from disasters in Russia are estimated at 4-5% of GDP and may reach 10%.

From geographical disasters earthquake is one of the most powerful, terrible and destructive phenomena of nature. In Russia the zones of high seismic risk cover about 40 % of the total area, including 9 % of the territory are 8-9 tenths zones. In seismically active areas there are more than 20 million people (14% of the population). Among the seismically dangerous areas are 330 settlements, including 103 cities.

Floods in Russia are the most common natural disasters in frequency and the second after earthquakes by number of victims and the specific property damage. One great flood covers an area of about 200 km² of the river basin. On average, each year is flooded up to 20 cities, which affects up to one million inhabitants.

About 40 to 68 large floods happen at the territory of Russia each year. The threat of flooding exists for 700 cities and tens of thousands of villages.

Two major floods in 1998 occurred in Yakutia on the Lena River. The total economic damage in these years is 1.3 billion rubles and 5.9 billion rubles respectively.

In 2013 the south of the Far East of Russia was the epicenter of disasters. Monsoon rains have filled rivers. In some areas has dropped two seasonal norms of rain. Excess moisture in the large catchment area of rivers has led to severe flood, affecting 102 million of people, including 19 million of children and 11 million of building. According to estimates the total damage from flooding in the Far East exceeds 30 billion of rubles.

Significant role in increasing the frequency and magnitude of devastating floods play human factors – deforestation, unsustainable farming practices, improper exercise of flood protect measures, accidental discharges of water reservoirs. The aggravation of the problem of flooding is also associated with an aging of the major assets of water sector, placing on flood areas of economy facilities and accommodation.

In Russia such disasters as forest fires are also frequent. Annually at the country territories happen from 10 to 30 thousand of forest fires in the area of 0.5 to 2 million of hectares. Anomalous heat was observed not only in the middle lane, but also in the Arctic. So, 2012 became the warmest in the history of meteorological observations.

Center for Strategic Studies of Civil Protection Emergencies of Russia expects a continue increasing of emergency situations number of various kinds. It will significantly affect the rate of economic growth and will hold the Russia's transition to the sustainable development strategy. In this regard, the activity of prediction and prevention the disasters acquired a national significance, became the subject of public policy and national security. Solving of this problem is important for all Russian Federation'. All of them should be included in developing unified state system of monitoring and predicting natural and man-made threats, taking into account the possibilities of international cooperation in these areas.

The Republic of Mordovia is one of the agro-industrial regions of Russia. The territory of 26.1 thousand of km², population – 833.3 thousand of people. Natural resource and production potential, the structure of the economy refers to the Republic of Mordovia Group III regions of the Russian Federation, characterized by a slight potential and moderate investment risk. This group includes many subjects of the European part of Russia, as well as part of the eastern regions.

Natural resources of the Republic of Mordovia are agricultural land, marly - cretaceous rocks and flask used for the production of high-quality cement, bog oak, phosphate rock, peat, mineral paints, and ironstone. However, the raw

material base of the Republic of Mordovia is characterized by the lack of mineral resources such as oil and natural gas – Russia’s main exports. This situation determines the low value of economic weight index (IEV) Region : Republic of Mordovia in 2009 ranked 62 th in the Russian Federation (1996 - 55 th, 1999 - 60th) [6, p . 7].

Republic of Mordovia, in spite of the difficult demographic situation still remains one of the densely populated areas of central Russia. The density of the population - 31.9 people per 1 km². This figure is 3.8 times higher than the national average and 1.11 times higher than the average level in the Volga Federal District.

The Republic of Mordovia is characterized by three types of emergency situations (ES):

- ~ man-made;
- ~ natural;
- ~ biological and social.

The analysis of emergency situations occurring in the territory of the republic led to the conclusion that the greatest risk of disasters related to natural and man-made emergencies and to a lesser extent to the risks of biological and social nature. Total for the years 2000-2012 on the territory of the republic was 49 ES, 30 of them are man-made disaster, natural disasters, and 14 5 ES biological and social problems that arise at different levels (Fig. 1).

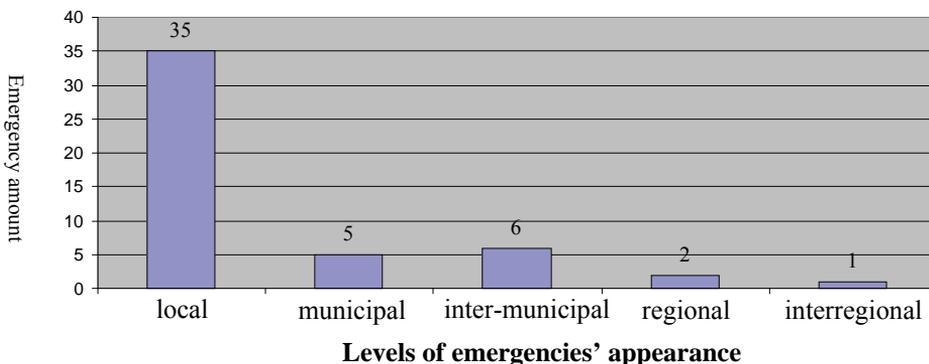


Figure 1. Number of emergency situations in 2000-2012 occurring at different levels of governance in the Republic of Mordovia.

Of the total number of emergencies accounted for 14 emergencies of natural origin (fires, floods, hail, and heavy snowfall). Analyzing the dynamics of

natural disasters have occurred in the last 13 years, it may be noted that the largest number of registered was in 2005 (3 ES), 2004 (2 CHS), 2010 (2 CHS), in other years, the number of natural disasters has been no more than one. The main sources of emergency were: loss of large hail, heavy squally wind and snow, the rise in water levels in the rivers during the spring flood, drought and wildfires.

The dynamics of natural emergencies for 2000-2012 is shown in Figure 2.

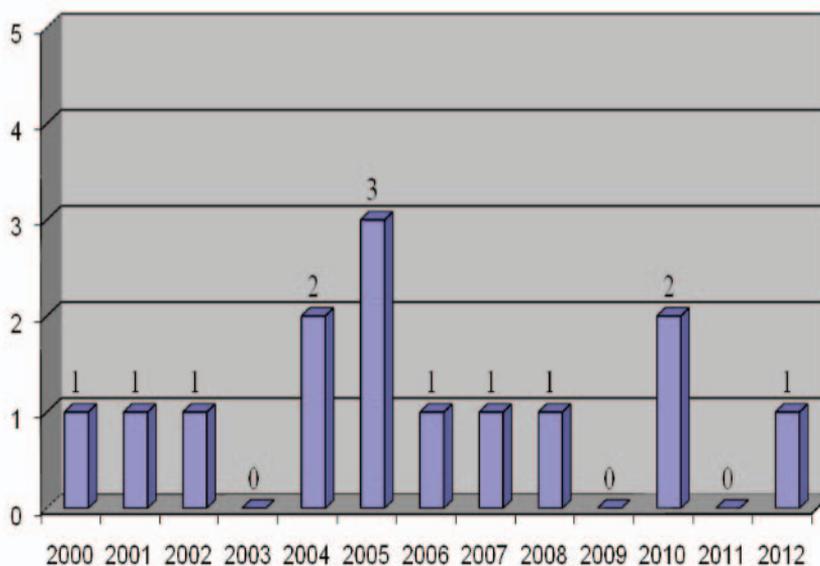


Figure 2 . The dynamics of natural emergencies for the period 2000-2012 years.

Natural hazards are usually characterized by a deterministic distribution of their areas of origin (hazards) in the territory of a random location (uncertainty) and the local action of the negative factors that depend on the strength of the phenomenon. Analysis of the observations of the natural hazards (RP) indicates some of their cyclicity, largely related to solar activity and other natural phenomena, as well as man-made and man-made factors. Hazardous natural processes as a source of emergency situations can be predicted only in the short term. The greatest threat to the natural character of the Republic of Mordovia associated with fires and floods .

With equal probability of extreme fire danger can be installed in early summer (May -June) and the end (July-August, sometimes in the beginning of September). It is mainly characteristic of the forests.

In accordance with the scale of wildfire hazard plantations, forest resources of the republic are differentiated into five classes of fire danger. Distribution of the forest lands of the Republic of Mordovia on classes of fire danger is presented in Table 1.

Table 1 - Distribution of the forest lands of the Republic of Mordovia on classes of fire danger

№	Title of the forestries	Classes of fire danger					Total	Middle class
		I	II	III	IV	V		
1	Ardatovo forestry	6058	16889	18249	20994	3867	66057	2,9
2	Berezniki forestry	10221	18501	33000	9121	0	70843	2,5
3	Vindrey forestry	8700	19842	44426	20953	0	93921	2,8
4	Vyshino forestry	9217	2954	5934	37686	0	55791	3,3
5	Zubovo forestry	770	25503	48791	11679	0	86743	2,8
6	Kovylkino forestry	4012	7708	14364	41611	2040	69735	3,3
7	Krasnoslobosk forestry	8734	16815	25804	28630	7998	87981	3,1
8	Saransk forestry	0	8145	277844	38124	0	74113	3,4
9	Temnikov forestry	12208	17615	5186	29426	11109	75544	3,1
Total		59920	133972	223598	238224	25014	680728	3,1
%		8,8	19,7	32,8	35,0	3,7	100	

The highest fire danger is different forest reserve Bereznikovsky forest, middle class fire danger is 19% higher than the average forest areas - 3.1 class. The lowest of the forest fire danger have Saransk, Wyszynski Kovylninsky and forestry.

During 2001-2012 in the forests of the Republic of forest fires occurred in 1043, cover a total area of 39,254.15 hectares (Fig. 3 and Fig. 4).

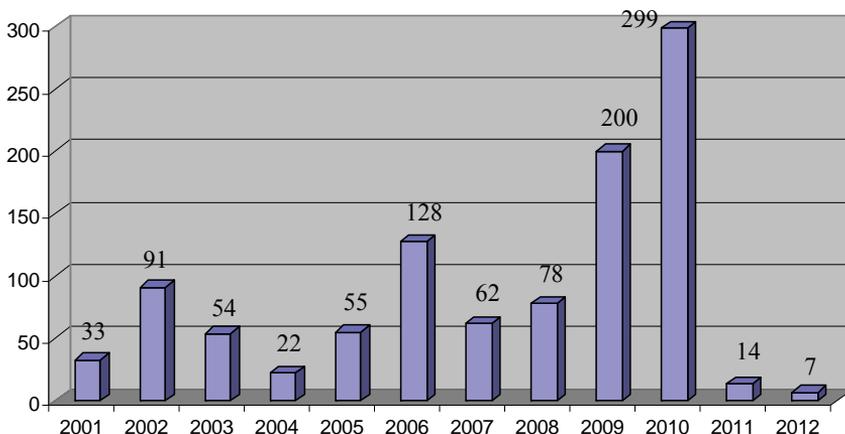


Figure 3. Amount of the forest fires at the territory of the republic of Mordovia for the period of 2001 to 2012 years.

Analyzing the dynamics of forest fires may be noted that the most flammable were 2009 and 2010. In comparison with the previous period, the number of occurrence of forest fires and the area of their distribution increased by several tens of times. A particularly difficult situation with forest fires observed in 2010. Abnormally hot and dry weather contributed to the emergence of large wildfires. For the first time in 12 years a source of a natural disaster become wildfires. In 2010, the republic had recorded the highest number of forest fires - 299, the fire covered 38,629.41 hectares.

As a result, fires burned huge areas of forest are being destroyed unique ecosystem. With the fires in the atmosphere huge amounts of smoke containing hazardous pollutants (carbon dioxide, carbon monoxide, nitric oxide) .

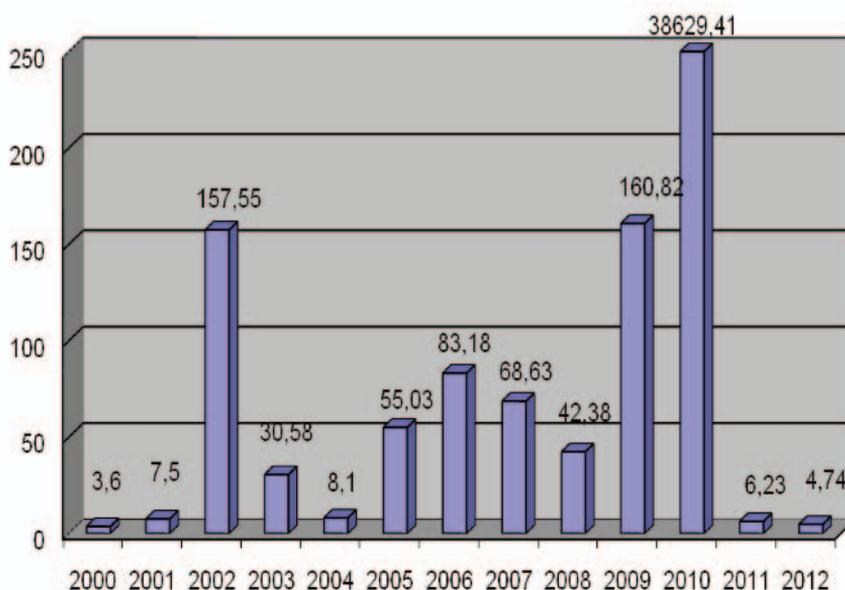


Figure 4. Area of forest fires on the territory of the Republic of Mordovia in the period 2000-2012.

On forest fires spent huge amounts of money. Each year, property damage from fires registered in the Republic of Mordovia in the average 62 million.

Unreasonable people's attitude to nature, their negligence is the major causes of fires in forests and peat lands. In this regard, the state and social institutions (family, school, high school, organization, and community groups, etc.) requires the creation of new models of human behavior. They should focus on the formation of a new world view and perception of the world, which will require changes in the systems of education, education and culture.

Adequate to the requirements of sustainable development of the society behavior patterns must be formed from birth to near its social environment (parents, older brothers, sisters, cousins). Their respect for nature, concern for people, animals and plants are the role models and intelligent behavior. The most common natural causes of forest fires are usually lightning and droughts. Currently, the share of natural fires (lightning) is 7-8 %.

With increasing volumes of timber harvesting to maintain and meet the needs of a developing timber industry of the Republic of Mordovia attention should be paid to reforestation efforts, especially in clearings and burnt areas, while reducing the area of non-forested land. The main method is to create

reforestation plantations. With an increase in output of the woodworking industry felling area will also increase. In the calculation version of it may reach 1.4 - 1.5 thousand hectares. Against this background, the volume of reforestation should be adequately increased (Table 2).

Table 2 - Estimated amount of work on forest restoration, ha

Index	2013	2014	2015	2016	2017	2018
Forest reproduction, total	1 351	1 061	1 070	1 120	1 220	1 320
Including:						
Afforestation	1 056	807	827	890	990	1 090
Promotion of natural regeneration	231	220	220	220	220	220
Combined forest reproduction	64	34	23	10	10	10
Preparing the soil for forest plantations	841	850	900	1 000	1 100	1 200
Maintenance of forest plantations	7 415	6 560	7 000	7 300	7 400	7 500
Addition of forest plantations	375	350	323	300	270	250

An important role in ensuring the security of the national wealth of the republic has fire protection of forests. The priority in this area will be the protection of the population, as well as industrial and infrastructural facilities , which are located in the forest area , from fires and other emergencies. Also provides for the establishment of the system of monitoring of forest resources and the execution of forest legislation.

Representative for the Republic of Mordovia are as hydrological emergencies - floods and floods. High water level in the rivers Moksha , Insar , Alaty, and Tavla has, on average 2 times 10-11 years. The territory of the republic annually exposed to a greater or lesser extent, affected the spring flood, depending on a number of factors (supply of water in the snowpack before snowmelt , precipitation during the spring thaw and high water , the depth of soil freezing , etc.) that affect the inflow rate melt water and their volume . During the flood inundation of low land areas in the settlements , agricultural fields and farmland , roads , damage to major industrial and transport facilities. Floods and floods are the most vulnerable Atyuryevsky , Elnikovskiy, Kovylnino, Ruzaevskiy and Romodanovskiy areas. Spring floods could create a dangerous situations,

including the threat of human life , resulting in flooding of dwellings, industrial and agricultural facilities, the demolition of buildings and structures, or damage to the equipment of enterprises , the destruction of waterworks and communications. Total damage only in 2012 on the hydrological emergencies was 3.776 billion rubles, the main part of it fell on the flooding of farmland and homes population.

The impact of floods caused by the size of ecological, economic and social damage depends on the level of preparation in advance of the population to act in the flooding, the extent and timing of notification of the impending flood and other natural disasters. Every year in the Republic of Mordovia forecasts are flood situation. Almost all the villages falling under the flood, are notified in advance, and the population is prepared to promptly organize the evacuation, rescue teams mobilized.

In order to achieve sustainable socio- economic development of the Republic of Mordovia and reduce the threat of natural character is necessary to develop a set of measures to monitor natural phenomena, forecasting of emergency situations and protect them from the population.

Given that human factors are the main sources of natural hazards in the Republic of Mordovia in the framework of regional policy should give special attention to education of the population in the face of natural disasters. Life safety issues should be the focus of educational institutions, the family, public authorities and society as a whole.

Reduced economic losses and adverse social consequences of natural disasters will also contribute to training of managers and employees of organizations basics of environmental management.

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