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SOME GENERAL APPROACHES REGARDING THE HAZARD RISKS – UNGHENI DISTRICT (REPUBLIC OF MOLDOVA)

BY

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Abstract. Natural disasters bring death, destruction and social and economic disruption. Most are related to weather, climate and water. Statistics show that they tend to increase both in intensity and frequency. Without urgent and vigorous measures in the fight against disasters, no country will be able to achieve sustainable development. In order to reduce the negative consequences of disasters, it is necessary to multilaterally study these phenomena, improve forecasting methods and preventive measures. A number of laws and strategies on disaster risk reduction have been developed in the Republic of Moldova to this end. The most common disaster risks in Ungheni district include drought, torrential hailstorms, floods, landslides etc. The damage caused by natural disasters in Ungheni district in recent years exceeds half a billion MD lei. The highest losses, over 58% were caused by drought and 36% by torrential rains.

Keywords: disaster; earthquake; **s**oil erosion; flood.

1. Introduction

Among the global problems of our time, attention is drawn to the growing number of natural and man-made disasters occurring on Earth, where the increasing damage caused by major disasters poses a real threat to the

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economy not only of some regions, but of the planet as well. The average annual damage caused by earthquakes, tsunamis, tropical cyclones and floods is currently estimated at $ 380 billion (Swiss Re, 2012). At the same time, the growth rate of economic damage caused by disasters constantly exceeds the growth rate of gross product production and the risk of disasters is becoming more global.

Natural disasters bring death, destruction and social and economic disruption, primarily at the local level. Every year, millions of people are forced to flee their homes as a result of natural disasters. In 2014, 19.3 million people were displaced. On average, natural disasters kill 184 persons a day. Millions of people are forced to move each year as a result of cyclones, floods, earthquakes, droughts, rising sea levels, desertification and other natural disasters. Today, more people are displaced by disasters than by conflict. Disaster relocation has devastating effects on individuals and communities in general; leads to loss of livelihoods and unemployment, disruption of education and reduced access to basic services. As a result of natural disasters, countries are forced to reduce funding for sustainable development programs. It should be noted that many natural disasters are caused by climate change. 90% of all natural disasters are related to weather, climate and water. Statistics from the last decade (fig. 1) show that the total number of natural disasters, including hydro meteorological ones, tend to increase both in intensity and frequency. This leads to growth in property damage and the number of human sacrifices (Akimov *et al*., 2016).

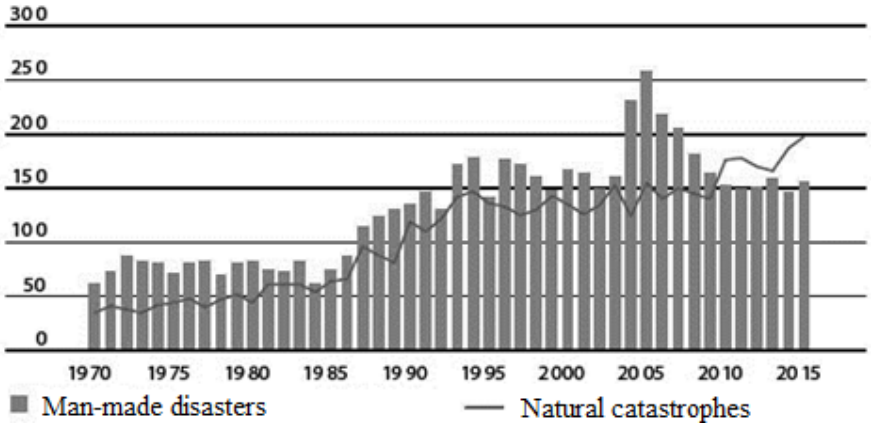

Fig. 1 – Number of events, 1970 – 2015 years.

2. Disaster Risk Reduction Policies

The international strategy for disaster risk reduction aims primarily to raise awareness of what people are doing to reduce disaster risk. According to forecasts, due to urbanization and climate change on the planet, the number of

victims will increase. As a result of natural disasters, countries are forced to reduce funding for programs to address the challenges of sustainable development. Funding for emergency response is about 20 times higher than funding for emergency prevention and preparedness, which is contrary to the principles of sustainability.

Today it is quite obvious that without urgent and vigorous measures in the fight against disasters, no country and not even all of humanity will be able to achieve sustainable development.

In recent years, the focal point has shifted from a disaster-focused approach to the implementation of comprehensive disaster risk reduction approaches. The World Conferences on Disaster Risk Reduction in Japan (Yokohama, 23-27 May 1994, Hyogo, 18-22 January 2005 and Sendai, 14-18 March 2015) have played a significant role in developing new approaches to disaster management. The Sendai Framework Program for Disaster Risk Reduction 2015-2030 is a comprehensive, voluntary and non-binding agreement.

By resolution 44/236 of 22 December 1989, the UN General Assembly proclaimed 13 October as International Day for Disaster Risk Reduction. The purpose of the Day is to raise awareness on how people act to reduce the risk of disaster. The program recognizes that governments play a central role in disaster risk reduction, but this responsibility must be shared with other stakeholders, including local public administrations, the private sector and others. Disaster risk depends on specific circumstances; it occurs in specific places and times and is embodied in relation to local models of impact, sensitivity, vulnerability, adaptability and sustainability of livelihoods. Therefore, risk mitigation actions and measures may have a greater impact at local level.

According to the terminology adopted by the United Nations, disaster means a serious disruption of the functioning of a society, resulting in human, material, or harmful changes in the environment, which cannot be restored by its resources. Natural disasters mean natural phenomena of geological or meteorological origin, or the illness of a large number of people or animals, produced suddenly, as mass phenomena. The category of destructive natural phenomena of geological or meteorological origin includes earthquakes, landslides, floods and dangerous meteorological phenomena, which violently affect relatively large areas of land in the long run, causing loss of life, material damage and environmental degradation.

Climate change on a global and regional scale contributes to increasing the intensity and the frequency of dangerous phenomena such as droughts, rain showers, floods, frosts etc. In order to successfully fight the negative consequences of the influence of unfavorable hydro meteorological phenomena, it is necessary to multilaterally study them, to improve their forecasting methods and especially the measures to prevent or reduce damage from their influence on the national economy and security of people.

Given that most disasters cannot be avoided, in order to significantly reduce the loss of human life in the first place and to limit the loss of property, it is good for the population to be informed.

National and local disaster risk reduction strategies must be multisector, involving policies in areas such as land use, buildings, public health, education, agriculture, environmental protection, energy, water resources, poverty reduction and adaptation to climate change.

Natural risks in the Republic of Moldova are represented by dangerous meteorological phenomena (storms, floods, drought, frost) and destructive phenomena of geological origin (landslides and earthquakes).

The territory of the Republic of Moldova is periodically exposed to the phenomenon of heavy rainfall, especially in summertime. Regarding this, practically 1/3 of the country's territory is flooded annually, causing considerable moral and material damage.

Significant floods on the Nistru River and the Prut River, often caused by human intervention, are characterized by flooding of large areas. This fact was observed in 1969, 1980, 2008, 2010. Due to the fact that most towns and villages of the Republic of Moldova are located in the valleys of rivers and meadows, individual houses and social buildings are mostly inundated during floods.

Despite the fact that there is a complex system of hydro-technical constructions for the protection of towns/villages from flood, the damage caused by these natural disasters increases from year to year, and the consequences of floods are often catastrophic. The degree of exposure of the Republic of Moldova to floods is more than 40%, and in some regions of the country it reaches up to 70-80% (Apostol, 2006).

Since the proclamation of independence, a number of laws and strategies on disaster risk reduction have been developed in the Republic of Moldova:

– Law no. 272/2011 establishes the legal framework necessary for water management, protection and use;

– Law no. 440/1995 on the water protection zones, rivers and water basins regulates the establishment of water protection zones and riverside protection strips of rivers and water basins, the regime of use and the activity of their protection;

– Law no. 271/1994 on civil protection, establishes the fundamental principles of organizing civil protection in the Republic of Moldova which is a system of measures and actions taken to ensure the safety of the population, property in conditions of natural and ecological disasters, damage and catastrophes;

– Government Decision no. 590/2018 on the approval of the Concept’s reform of the national system of management, prevention and flood consequences reduction.

– Government Decision no. 955/2018 regarding the approval of the Management Plan of the Danube-Prut and Black Sea river basin district;

– Government Decision no. 814/2017 regarding the approval of the Management Plan of the Dniester river basin district;

– Government Decision no. 887/2013 for the approval of the Regulation on flood risk management;

– Government Decision no. 866/2013 for the approval of the Regulation on the procedure for elaboration and revision of the Management Plan of the river basin district;

– Government Decision no. 433/2012 for the approval of the Regulation on flood protection dams establishes mandatory provisions for application by all natural and legal persons involved in the design, construction and operation of flood protection dams located in the Republic of Moldova;

– Government Decision no. 751/2011 on the approval of the Program for the development of water management and hydro-improvement in the Republic of Moldova for the years 2011-2020", in order to streamline the activity of the water management and hydro-improvement sector;

– Government Decision no. 1030/2000 on the approval of the Scheme for the protection of localities in the Republic of Moldova against floods implies the implementation of primary measures for the protection of localities and lands related to floods and counteracting negative actions on the national economy and the environment;

– National Strategy for Disaster Risk Management (GRD) 2013 - 2020;

– Flood risk management plans;

– "Moldova 2030" Strategy;

– Government Decision no. 1009/2014 on the approval of the Strategy of the Republic of Moldova for adaptation to climate change until 2020 and of the Action Plan for its implementation.

3. The Situation in Ungheni District

Ungheni district is geographically located in the central - western part of the Republic of Moldova. The total area of the district is 108.3 thousand ha, of which 49.9 thousand ha is the agricultural area, 28.8 thousand ha are forests and other lands with forest vegetation, and 4.7 thousand ha are occupied by aquatic resources. The land of Ungheni district is characterized by areas of low hills, wide valleys, and meadow of the Prut river middle course.

The most frequent disaster risks in Ungheni include exceptional natural situations. The most common are torrential rains with heavy hail and less frequent are storms and whirlwinds. It was found that the most common risks don't always cause the greatest damage. The drought ranks 5th by frequency, but regarding the damage to the district, the drought takes precedence, followed by torrential rains with heavy hail. Hail and storms are much localized

phenomena, while hoar-frost, glazed frost and early frosts occur annually, with high intensity.

Soil erosion, reduced fertility and landslides have become permanent processes. In the last 50 years, the profile of exceptional natural situations has been dominated by floods and droughts, which have the greatest economic impact. Thus, an average of 4-5 severe droughts have happened in 10 years, while statistics show an increase in their intensity and frequency. The heavy rains and floods in the summer of 2008 and 2010 damaged Ungheni district by more than 13 million lei, while the heavy hail storms in June 2016 affected 16 villages in Ungheni district. The increase of the precipitation amount (up to 615 mm at MS Cornești (Fig. 2)) in the region of the Central Moldavian Plateau (on the general background of their decrease in the direction from northwest to south) is determined both by the increase of altitude and the presence in this region of the largest forest massifs (Nedealcov *et al*., 2018).

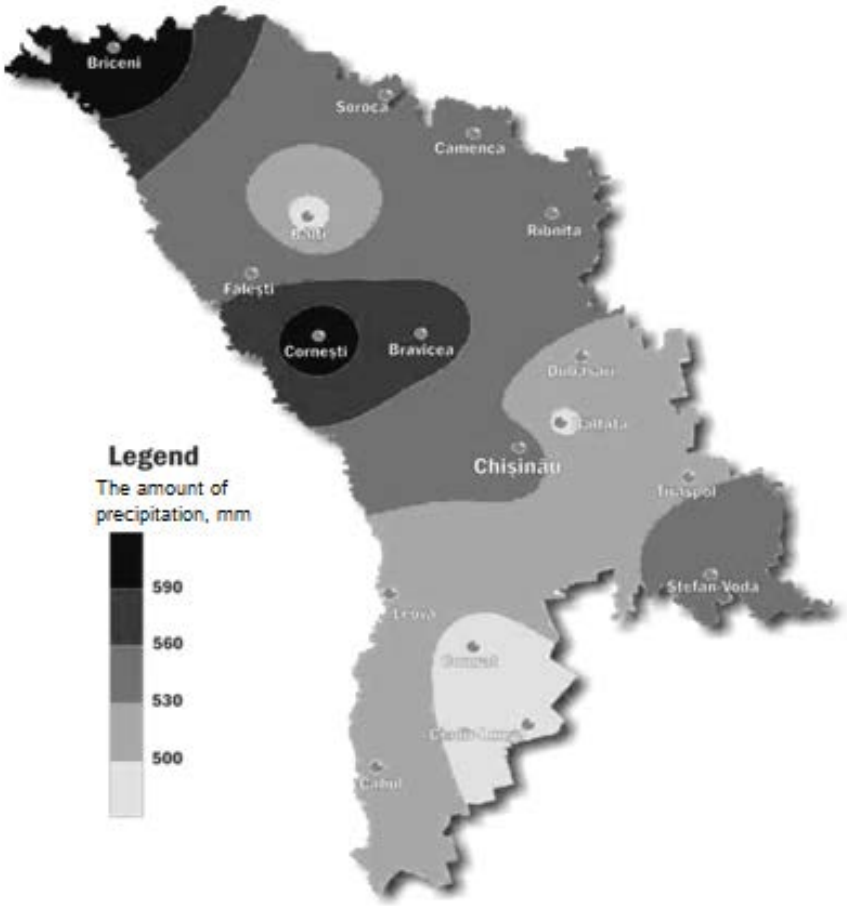

Fig. 2 – The average multiannual amount of precipitation (1985-2015).

In Ungheni district landslides affect 80 percent of the area. Hîrceşti village risks being destroyed by landslides. 37 households are under landslides, while the rest, which suffered from the old landslides, were abandoned by their dwellers.

In some areas of the Prut riverbed, the ability to cross the abundant watercourse is insufficient due to the landslide process. Activation of the landslide process leads to narrowing and raising the bottom of the riverbed, to the overflow of abundant water on the meadow. Such situations took place in the meadow in the area of Medeleni, Zagarancea, Măcăreşti.

The natural disasters produced in Ungheni district during 2008 - 2020 (analysis period) fortunately did not bring human losses, however they brought material losses in the private sector and in the economic objectives (Tables 1 and 2).

Table 1

The Demage Caused by Natural Disasters in Ungheni, Years 2008 - 2020

Damage title	Units of measurement	Total
Human losses		0
Evacuated families, including		428
Evacuated persons	persons	1035
Evacuated children	persons	438
Material damage		
Housing losses		
Destroyed	objection	14
Broken	objection	15
Deteriorated	objection	2214
Flooded houses	objection	54
Flooded cellars	objection	59
Flooded wells	objection	48
Losses to economic objectives		
Industrial	objection	0
Agricultural	objection	53
Educational	objection	38
Medical	objection	6
Trade	objection	2
Administrative	objection	6
Socio-cultural	objection	5
Losses to economic objectives		
Power lines	km	1,0
Pillars	objection	4
Damaged bridges	objection	2
Damaged roads	km	17

Table 2
Material Losses Caused by Natural Disasters in Ungheni District, Years 2008 - 2020

The name of the calamities	Total material damage (thousand lei)
Drought	344.922,6
Torrential rains and hail	212.294,7
Floods	16.941,5
Snow fall	8.482,0
Frosts	4.043,7
Squall/ windstorm	776,3
Total	**587.460,8**

The biggest losses, over 58% (Fig. 3) were caused by drought, followed, paradoxically, by torrential rains with 36%. Other disasters together caused less than 6% of the material damage.

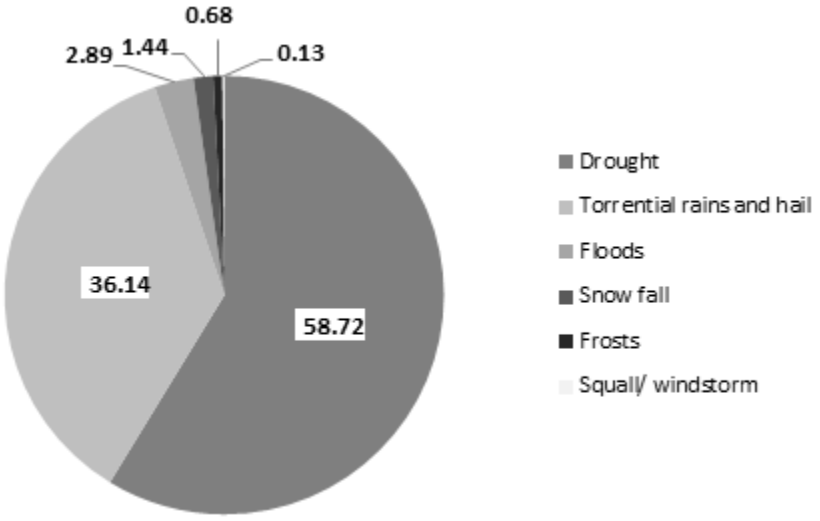

Fig. 3 – Material losses caused by natural disasters in Ungheni district, % years 2008 – 2020.

Analyzing the situation in Ungheni district, the causes of material losses as a result of natural disasters are:

- The complicated socio-economic situation in the housing and industrial sector, the lack of the necessary reserves quantity, destined for the liquidation of the catastrophe damages, for the functioning of the vital insurance systems of the population;

- Unsatisfactory execution by local authorities of Government decisions in the field of prevention and liquidation of exceptional situations;
- Financing the civil protection system in proportion of 20-30% of the necessary. The allocated financial sources do not meet the needs of civil protection in providing the necessary equipment and tools to perform rescue work;
- Damage of buildings, constructions, technological equipment, means of transport, engineering communications reaching 60-70 percent and more;
- Lack of urban plans in the rural sector and construction without taking into account possible natural disasters;
- Low production culture, degraded agriculture, reduction of competence and responsibility of specialists in enterprises, staff turnover;
- Poor information and indifference of the population.

4. Conclusions

- Global practice has shown that events generating exceptional situations cannot be avoided, but sometimes they can be managed and their effects can be reduced through a systematic process involving the establishment of measures and actions to help reduce the risk of these phenomena.
- The natural risk phenomena of the last decades have conditioned the need for international cooperation in the field of intensifying the activities of prevention, reduction and combating the negative consequences of the mentioned risks.
- National and local strategies for disaster risk reduction must be multisector, associating policies in areas such as land use, buildings, public health, education, agriculture, environmental protection, energy, water resources, poverty reduction and adaptation to climate change.
- The biggest material damage in recent years in Ungheni district is caused by drought, torrential rains and hail. The amount of precipitation can be explained by increasing the altitude of the area, and the damage caused by drought - by degraded agriculture, lack of cumulative basins, lack of irrigation systems.
- In order to reduce the damage caused by these risks, it is necessary to develop prevention measures at local level: elaboration of general urban plans, exact delimitation of areas at risk, implementation of structural protection measures, proper maintenance of existing infrastructure, creation of local arrangements for the accumulation of rainwater, irrigation systems, informing the population etc.

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ABORDĂRI GENERALE PRIVIND RISCUL DE HAZARD – DISTRICTUL UNGHENI (REPUBLICA MOLDOVA)

(Rezumat)

Dezastrele naturale aduc decese, distrugeri și perturbări sociale și economice. Marea lor majoritate sunt asociate vremii, climei și apei. Statisticile arată o tendință de creștere atât a intensității cât și a frecvenței acestor fenomene. În absența unor măsuri urgente și semnificative în lupta împotriva dezastrelor, nici o țară nu va fi capabilă să obțină o dezvoltare durabilă. Pentru a reduce consecințele negative ale dezastrelor, este necesar un studiu multilateral al acestor fenomene, îmbunătățirea metodelor de prognoză și a măsurilor preventive. Un număr de legi și strategii pentru reducerea riscului de dezastre au fost dezvoltate în Republica Moldova până în acest moment. Riscul major de dezastre in districtul Ungheni, Republica Moldova include seceta, furtuni torențiale, inundații, alunecări de teren etc. Distrugerile cauzate de dezastrele naturale în districtul Ungheni, în ultimii ani, depășește ca valoare jumătate de billion Lei Moldovenești MD. Pierderile cele mai mari, peste 58%, au fost cauzate de secetă, secondate în procent de 36% de ploile torențiale.