HAZARD RISK MANAGEMENT IN A CROSS-BORDER APPROACH

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Abstract

Current international context is subjected to increased exposure and manifestation of extreme natural phenomena, which underlines, on every occasion, the unpredictability and intensity of the nature force. Hazards have no border, they manifest separate of territorial division and affect altogether poor and rich, independent of gender, color, statute or any other criteria. The setting of increased hazard risk emerges the need to create strong joint strategies and build resilience to hazards. Still, it is a real challenge, for any country, to be prepared for hazards manifestations in order to reduce to minimum all types of loses. The present paper addresses the need for a sustained trans-boundary approach on natural hazard risk. The purpose of the analysis is to provide solutions and joint approaches in facing the challenge of disaster and management of disparities between countries. Basically, in the end, the main objective is to reduce the risks of disasters and improve joint emergency situation management systems.

Keywords: *natural hazard risk, hazards management, emergency interventions, disaster management disparities*

1. INTRODUCTION

Natural Hazards Risk Management is currently a topic of high interest and extreme debate, conditioned by an increased exposure to devastating natural disasters all around the world. An overview on the international structure of disasters demonstrates the unpredictable and intense force of nature. At global level there is a wide diversity of statistics [1], which talk about a dramatic increase, by 93% in the last 40 years, of hazard risk and people living in risk areas. The statistical analysis provided by the present paper uses information, mainly, from United Nations International Strategy for Disaster Reduction (UNISDR) and EU Commission [2].

Analysing the incidence of natural disasters using satellite observation data on 40 years of exposure, researchers [1] identified several major natural hazards, namely: flood, earthquake, volcano, tsunami, tropical cyclone storm surge, drought, wildfire, landslide etc.

2. MATERIALS AND METHODS

2.1. Trans-boundary Statistics and Approaches on Hazard Risk

The number of natural disasters has an increasing trend. Statistics on hazard risk management show that the loss of lives and economic impact are more extensive and severe than previously believed, so that currently "One in three people is exposed to the risk of natural hazards" [3]. Statistics talk about an Average Annual Loss increase from 65 mld $ in the 60 s to 380 mld $ in the last years, leading to a Global Economic Loss of 2.97 mld $. As for human losses, in between 2000 – 2009, have been registered 7348 major disasters, leading to 1.23 million depths and 4.2 million people wounded [4].

Still, the distribution of hazards around the world is inequitable, certain regions being more affected than others. As a result, countries adapted to the context, changing their strategies and policies. Actually, the entire international community became preoccupied by the issue of disaster increase. For example, USA or Japan restructured their policies, plans and strategies in hazard management, invested time, effort and money to reduce the consequences of these phenomena [1].

ONU General Assembly prepared special meetings like the Declaration regarding the Environment and Development, 1992; ONU Conference from Rio de Janeiro; World Conferences on Disaster Risk Reduction: Yokohama, 23-27th of May 1994, Hyogo, 18-22nd of January 2005 and Sendai, 14-18th of March 2015 [4].

Sendai framework for Disaster Risk Reduction (DRR) 2015-2030 [5] provides:

- Introduction of priority measures for disaster risk reduction at local and national level;
- Identification, evaluation and monitoring the risk factors;
- Active use of knowledge and innovative solutions for DRR;
- Decrease of risk factors;
- Improvement of disasters preparing level.

Statistics provided by United Nations International Strategy for Disaster Reduction (UNISDR) [2] show main types of hazards and their percentage values for the time interval 1997 - 2017. Figure 1 titled "Main Natural Hazards in Percentage Values" presents a ranking of hazards manifestation at international level. Can be observed that the hazard with the most frequent manifestation is the Flood (43.4%), followed by Storms (28.2%) and Earthquake (7.8%). Independent from these percentages that present the number of the natural phenomena, the consequences associated with a hazard, meaning destructions, deaths and economic loss, might change the ranking.

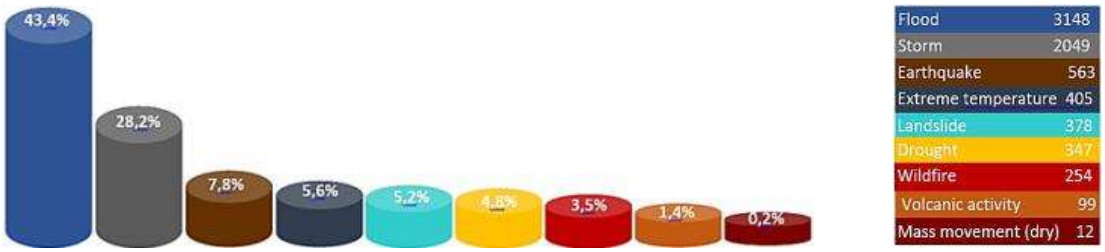


Fig. 1. Main Natural Hazards in Percentage Values

Source: author representation based on UNISDR statistics

Compliant with the international context and attitude towards disasters, European Union (EU) also created joint strategies and action plans in hazard management. One of the most significant documents was Hyogo Framework for Action: "Managing risks to achieve resilience", a ten years plan on "Building the resilience of nations and communities to disasters" [6], [7]. This Framework was adopted by 168 ONU member states which volunteered to work on five action priorities, with the purpose of making the world safer, in the face of natural disasters and to consolidate resilience to disasters.

In order to increase the capacity to anticipate, prepare and react to risks, especially to trans-boundary hazards, EU created 2020 Europe Strategy, which engages principles for new approaches in disaster risk management.

Among these [7]:

- Improve responsibility, transparency and governance, frame the results, measure the progress and applications
- Consolidate an intelligent and sustainable development
- Approach the vulnerabilities in a trans – boundary manner
- Synchronize the actions with international agenda.

2.2. Comparative Disaster & Risk Profile Romania – Republic of Moldova

In association with the international context of manifestations and approaches on Natural Hazards, the present paper makes a comparative evaluation on the natural hazard risk at the Eastern border of European Union, presenting the Trans – Boundary situation of 2 neighbour countries, Romania and Republic of Moldova.

The objective of this study was to create a Hazard Risk & Vulnerability Profile for the two Countries, addressing also the disparities on prevention and monitoring procedures, management and emergency actions associated with natural hazards. The purpose would be to bridge up the gap between Romania and Moldova related to emergency action plans and strategic approaches of natural disasters [8], [9].

Creating the profile on natural risks for the two countries implies identifying their specific hazards: earthquakes, soil sliding, floods, hurricanes, storms, high level of underground waters, hailstone, drought, frost, glazed frost, snow storm, thunder storms etc.

Information extracted from sources like ONU Institute for Environment and Human Security and Inter-Agency Standing Committee Reference Group on Risk, Early Warning and Preparedness and the European Commission (INFORM) show the countries under consideration risk and vulnerability ranking at international level [10].

ONU Institute transposed the predisposition for natural disasters, registered at global level, in a world map of natural hazards, based on exposure degree.

According to these statistics Romania is positioned on an 82nd place, in a total of 173 countries, with high risk of exposure to natural disasters, on the same position with Republic of Moldova [1].

According to the same source, in the raking for Europe related to natural disasters risk, Romania is placed on the 4th place, surpassed by Albany, Serbia and Greece.



Fig. 2. INFORM Ranking on Countries Risk & Vulnerability

Source: Compiled from Laszlo T, The Complexity and Methods of Citizen Emergency Preparedness, 2018

3. RESULTS

Based on INFORM statistics from 2020 on risk and vulnerability for a number of 191 countries, Romania is ranked on position 126 while Republic of Moldova on 119 with a value of 2.8 respectively 3.0 out of 10. Figure 2 presents the position of Romania and Moldova in a map of ranking created by INFORM. According to the obtained values for the two countries, they can be included at a “Low Risk and Vulnerability Level” [10].

Table 1, details the Risk & Vulnerability profile of the countries under consideration, showing analysis values for exposure to hazards, types of hazard, vulnerability, shocks in the last years or the lack of coping capacity, with several associated components. The general conclusion of the values refers to the similarity of the values, since Romania and Republic of Moldova are countries similar from geologic and geographic point of view. Still one value presents a significant discrepancy between the two countries. As observed in the table, DRR – Disaster Risk Reduction value shows an increased implication of Moldova, almost double, as compared to Romania in the process of decreasing the disaster risk [7], [10].

Country	INFORM Risk	Rank	Reability Index	Hazard &Exposure	Natural	Earthquake	Flood	Drought	Vulnerability	Vulnerable groups	Development & Deprivation	Recent shocks	Lack of coping capacity	Institutional	Infrastructure	Communication	Physical infrastructure	Access to Health Care	DRR
Ro	2.8	126	3.8	3.5	4.1	6.6	7.0	2.8	1.7	1.5	1.8	0.0	3.5	4.6	2.3	2.2	1.0	3.6	3.8
Md	3.0	119	3.3	3.0	4.1	6.3	5.6	5.4	2.0	1.2	3.2	0.1	4.6	6.3	2.4	2.2	1.6	3.3	6.2

Table 1. INFORM Risk Index 2020

Source: Compiled from INFORM Report 2020, Shared evidence for managing crises and disasters

Figure 3 presents the border between European Union Countries and Non – EU Countries. The paper intends to detail on similarities and differences associated with this separation.



Fig. 3. Romania – Republic of Moldova Border

As EU Member, Romania implemented a serial of laws and strategies for natural hazard risk management like Decision no. 762/2008 for National Strategy for Emergency Situations Prevention or became a contributory member of International Strategy for Disaster Reduction (ISDR) in order to implement Hyogo Framework for Action towards global disaster risk reduction movement and building a stronger, a more systematic and coherent "culture of prevention“.

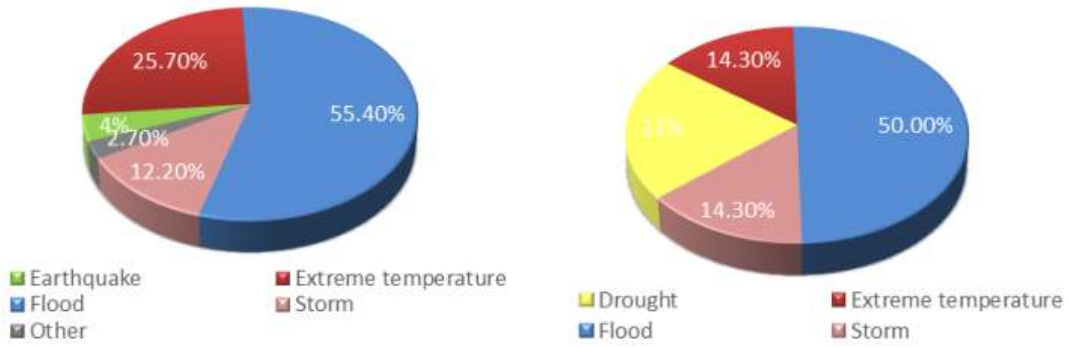
Republic of Moldova currently faces delays and confusion in intervention procedures, associated with hazards manifestations. This context describes an urgent need for evaluation and prevention mechanisms for hazard risks. Recent implications of Republic of Moldova in the area of DRR, as shown by INFORM Report for 2020 and changes in the legislation [7], [11] show some changes to a Report from 2007 provided by World Bank Sustainable Development Department Report on Moldova.

The conclusions in World Bank Report on Republic of Moldova implication in DRR mentioned the need to review disaster mitigation by institutions, develop inter-sectoral preparedness and risk reduction strategies; create mapping and GIS databases; improve risk and vulnerability approaches; establish linkages between threats; improve emergency preparedness, early warning and communication since Emergency communication and disaster management information systems are deficient in Moldova and emergency response equipment is currently absent or antiquated; use land planning based on seismic mapping; enhance national capacity for hazard mitigation and management through improved data sharing, information flow and planning; data consolidation and sharing, using modern information technologies.

Since World Bank Report, Moldova legislation in the area of Risk Management added several documents:

- Governmental Decision no 433/2012 for the approval of Rules on Protection Dams against Floods, for compulsory liabilities by all people and companies involved in the design, construction and exploitation of protection dams in Republic of Moldova. Governmental
- Decision no. 1009/2014 regarding the approval of Republic of Moldova Strategy for adaptation to Climate Change until 2020 and Action Plan for its implementation.
- National Strategy for Administration of Disaster Risk 2013 – 2020.

Based on analysis performed by United Nations Office for Disaster Risk Reduction, figure 4 below details several comparative results for Romania and Republic of Moldova on the frequency of natural hazards, mortality rate associated with main hazards and economic losses associated with risks manifestation. All these information and data contribute to the creation of Disaster & Risk Profile for the two countries.



Romania **Republic of Moldova**

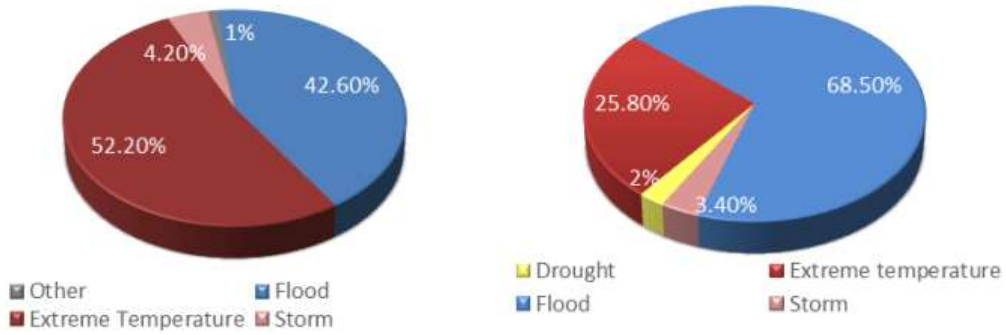
Fig. 4a. Hazard Frequency for Romania and Moldova

Source: Compiled from OFDA/CRED - International Disaster Database

As observed in figure 4a, the most significant hazard manifestation, both for Romania as for Moldova are the Floods, followed by extreme temperate in Romania and drought in Moldova. A characteristic issue Romania refers to the integration, in the statistics, of the earthquake hazard with a value of 4%.

Figure 4b details on the mortality factor associated with hazards. In Romania the highest rate is associated with extreme temperatures, a 52.2% value followed by floods. In Moldova the main

mortality factor is associated to floods, in a very high percentage of almost 70%, followed by extreme temperature.

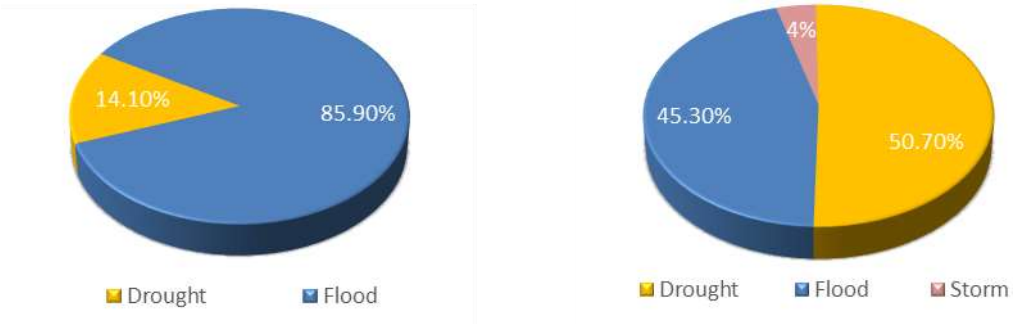


Romania **Republic of Moldova**

Fig. 4b. Mortality associated to hazard manifestation for Romania and Moldova

Source: Compiled from OFDA/CRED - International Disaster Database

Figure 4c describes the distribution of economic losses among hazards. Can be observed, for Romania, that the majority of losses are associated to floods, 86% and only 14% to drought. As for Moldova, the losses due to drought have the highest percentage, over 50%, followed by floods and storms.



Romania **Republic of Moldova**

Fig. 4c. Economic Losses associated with Hazards - Romania and Moldova

Source: Compiled from OFDA/CRED - International Disaster Database

As a general overview on the three figures, can conclude on the similarity of the two border countries from the point of view of hazard frequency, mortality factor and economic losses. In a trans-boundary analysis for a 10 years period (2005 – 2014) on the natural hazards manifestation, associated depths and economic losses, table 2 below presents the registered values for the time interval under consideration according to OFDA/CRED - International Disaster Database www.emdat.be. Can be observed the significant number of casualties in Romania and the significant economic loss. [2]

	Romania	Republic of Moldova
Events	4	1
Deaths	58	3
Economic loss (,000 $)	243,543	41,375

Table 2. 10 year average analysis (2005 – 2014)

Source: Compiled from OFDA/CRED - International Disaster Database www.emdat.be

Except from the statistics performed on previous hazard manifestation, can be useful to evaluate the Probabilistic Risk of Hazards which provides an overview of estimated loses, guiding the prediction of future loses. One significant hazard for Romania is the earthquake. Although difficult to predict, it is a dangerous hazard, which can determine high losses expressed in casualties, destructions and economic losses. The Probabilistic Risk Results can be reflected in Average Annual Loss (AAL) by Hazard, which implies expected loss per annum, associated with the occurrence of future dangers, assuming a very long observation timeframe. [2], [10]

Figure 5 presents the contribution of two types of hazards, floods and earthquake, to the Average Annual Loss for considered countries. In case of Romania, the earthquake has a high percentage of 33, while for Moldova, the value is reduced only to 3%. In its case the main contribution to AAL is associated with floods.

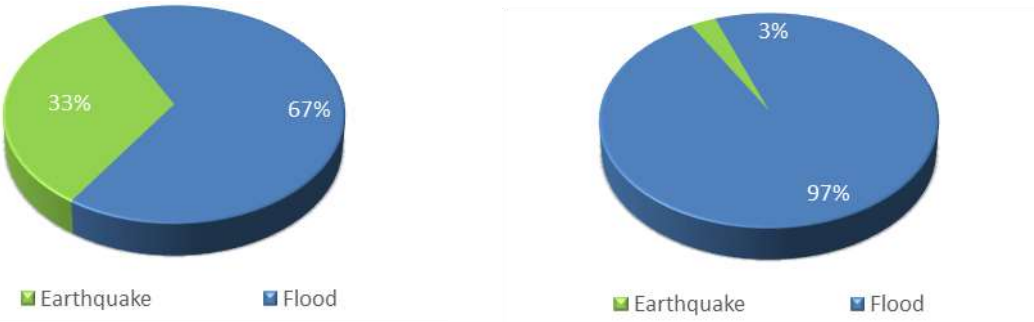


Fig. 5. Hazard Contribution to Average Annual Loss (AAL) for Romania and Moldova

Source: Compiled from OFDA/CRED - International Disaster Database

4. CONCLUSIONS

World practice demonstrated the fact that events decisive of exceptional situations can't be avoided, but, sometimes they can be managed and their effects reduced, using measures and preventive actions, strategic plans and joint activities implemented for the reduction of risks associated to these phenomena.

Natural hazard risks from the last decades conditioned the need for cross-border international cooperation in the area of intensification of preventive actions, reduction and control of negative consequences associated with the risks.

International and national strategies for reduction of disaster risk must be multi-sectorial, associating policies in area like land use, building construction and administration, public health, education, environment protection, adaptation to climate change.

Hazard Risk Management at the Eastern border of EU is characterized by significant disparities between EU Countries and Non-EU Countries on prevention strategies, plans and mechanisms, available resources, technological innovations, education and training. The disparities are a major

problem in the context in which border countries, Romania and Republic of Moldova, are similar from geographical point of view and are exposed to similar hazard risks, floods, extreme temperature, drought, storms and earthquake.

In order to reduce the consequences of these hazards manifestations it is necessary to invest in preventive measures at local level and trans-boundary level. Among these measures are identification of areas highly exposed to risks; create structural protection measures; elaborate strategies and develop proper legislation; invest in maintenance and rehabilitation of old buildings; increase population awareness and implication etc.

ACKNOWLEDGMENTS

This publication/material has been produced with the assistance of the European Union. The contents of this publication are the sole responsibility of <Alina Mihaela Nicuță Precul, "Gheorghe Asachi" Technical University of Iași> and can in no way be taken to reflect the views of the European Union or of the Joint Operational Programme Romania-Moldova 2014-2020 management structures.

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