Emergency and Disaster Reports

ISSN 2340-9932 Vol 5, Num 4, 2018

Monographic issue

Floods and Droughts in the Republic of Moldova

Alexandra Moraru

Letter from the editors

The Emergency and Disaster Reports is a journal edited by the Unit for Research in Emergency and Disaster of the Department of Medicine of the University of Oviedo aimed to introduce research papers, monographic reviews and technical reports related to the fields of Medicine and Public Health in the contexts of emergency and disaster. Both situations are events that can deeply affect the health, the economy, the environment and the development of the affected populations.

The topics covered by the journal include a wide range of issues related to the different dimensions of the phenomena of emergency and disaster, ranging from the study of the risk factors, patterns of frequency and distribution, characteristics, impacts, prevention, preparedness, mitigation, response, humanitarian aid, standards of intervention, operative research, recovery, rehabilitation, resilience and policies, strategies and actions to address these phenomena from a risk reduction approach. In the last thirty years has been substantial progress in the above mentioned areas in part thanks to a better scientific knowledge of the subject. The aim of the journal is to contribute to this progress facilitating the dissemination of the results of research in this field.

This monographic issue is about disaster risk profile of Moldova.
The Republic of Moldova is a landlocked country in Eastern Europe, bordered by Romania to the west and Ukraine to the north, east, and south.

The country is situated in a seismic zone, where the earthquake power can reach nine degrees on a Richter scale. There are strong winds in winter and heavy rains with hail in summer, that often cause catastrophic floods.

The present disaster risk profile pointed out the impact of main disasters in the country and the national system of disaster response.

Prof. Pedro Arcos, Prof. Rafael Castro, Dr. Alexandre Zerbo
Editors*, Emergency and Disaster Reports*
Unit for Research in Emergency and Disaster
Department of Medicine. University of Oviedo
Campus del Cristo 33006 Oviedo –Spain
www.uniovi.net/uied

Table of Contents

INTRODUCTION

Moldova, officially the Republic of Moldova, is a landlocked country in Eastern Europe, bordered by Romania to the west and Ukraine to the north, east, and south. The capital city is Chișinău.

Moldova declared independence on 27 August 1991, as part of the dissolution of the Soviet Union. The current Constitution of Moldova was adopted in 1994(1). A strip of Moldovan territory on the east bank of the river Dniester has been under the de facto control of the breakaway government of Transnistria since 1990.

Moldova is a parliamentary republic with a president as head of state and a prime miniester as head of government(2). It is a member state of the United Nations, the Council of Europe, the World Trade Organization (WTO), the Organization for Security and Cooperation in Europe (OSCE), the GUAM Organization for Democracy and Economic Development, the Commonwealth of Independent States (CIS) and the Organization of the Black Sea Economic Cooperation (BSEC) and aspires to join the European Union.

Moldova has a climate which is moderately continental; its proximity to the Black Sea leads to the climate being mild and sunny(3).

The summers are warm and long, with temperatures averaging about 20 °C (68 °F), and the winters are relatively mild and dry, with January temperatures averaging −4 °C (25 °F). Annual rainfall, which ranges from around 600 mm (24 in) in the north to 400 mm (16 in) in the south, can vary greatly; long dry spells are not unusual. The heaviest rainfall occurs in early summer and again in October; heavy showers and thunderstorms are common. Because of the irregular terrain, heavy summer rains often cause erosion and river silting.

The highest temperature ever recorded in Moldova was 41.5 °C (106.7 °F) on 21 July 2007 in Camenca. The lowest temperature ever recorded was −35.5 °C (−31.9 °F) on 20 January 1963 in Brătușeni, Edineț county(4).

Figure 1. Administrative map of the Republic of Moldova. Regions of development(5)

Despite recent progress, Moldova remains one of the poorest countries in Europe. With a moderate climate and productive farmland, Moldova's economy relies heavily on its agriculture sector, featuring fruits, vegetables, wine, and tobacco. Moldova also depends on annual remittances of about $1.12 billion from the roughly one million Moldovans working in Europe, Russia, and other former Soviet Bloc countries(6).

With few natural energy resources, Moldova imports almost all of its energy supplies from Russia and Ukraine. Moldova's dependence on Russian energy is underscored by a more than $5 billion debt to Russian natural gas supplier Gazprom, largely the result of unreimbursed natural gas consumption in the breakaway region of Transnistria. Moldova and Romania inaugurated the Ungheni-Iasi natural gas interconnector project in August 2014. The 43-kilometer pipeline between Moldova and Romania, allows for both the import and export of natural gas. Several technical and regulatory delays kept gas from flowing into Moldova until March 2015. Romanian gas exports to Moldova are largely symbolic.

Moldova hopes to build a pipeline connecting Ungheni to Chisinau, bringing the gas to Moldovan population centers.

The government's stated goal of EU integration has resulted in some market-oriented progress. Moldova experienced better than expected economic growth in 2014 due to increased agriculture production, to economic policies adopted by the Moldovan government since 2009, and to the receipt of EU trade preferences. Moldova signed an Association Agreement and a Deep and Comprehensive Free Trade Agreement with the EU during fall 2014, connecting Moldovan products to the world’s largest market. Still, a $1 billion asset-stripping heist of Moldovan banks in late 2014 delivered a significant shock to the economy in 2015; a subsequent bank bailout increased inflationary pressures and contributed to the depreciation of the leu. Moldova’s growth has also been hampered by endemic

corruption and a Russian import ban on Moldova's agricultural products.
Over the longer term, Moldova's economy remains vulnerable to corruption, political uncertainty, weak administrative capacity, vested bureaucratic interests, higher fuel prices, Russian political and economic pressure, and unresolved separatism in Moldova's Transnistria region. The largest national emergency aid service is concentrated and is being in service within Chisinau - the capital region of Moldova. Nowadays in Chisinau operate 60 ambulance municipal cars, instead of 92 how is required and a dozen cars of private emergency service - Calmed. Everyday there are registered and served 800 emergency calls within Chisinau and more than 2000 emergency calls within the whole Moldova per day. The core of emergency system in Chisinau is National Scientific and Practical Centre for Emergency Medicine, having 620 beds, enrolling 3138 of personnel(3).

For Republic of Moldova, citizen protection is an actual necessity, as the country is situated in a seismic zone, where the earthquake power can reach nine degrees on a Richter scale. Nine degree earthquakes triggered in this country in 1865, 1884, 1934, 1940 and 7,5 degrees in 1986(7).

Another great disaster for Republic of Moldova is strong winds - in winter, and heavy rains with hail - in summer, that often cause catastrophic floods.

At the same time, there are around 250 objectives on the territory, chemically, explosively and incendiary dangerous, and at 150-470 km distance from its boundaries there are eight nuclear power stations and no one can exclude the probability that the tragedy from Chernobyl, April 26, 1986, might repeat.

Namely how to deal with destructive consequences of disasters of different origin is elucidated in the following, elaborated on a series of historic documents and legislative acts.

Exceptional situations unleashed during peace time require the application of urgent actions in order to eliminate the consequences and execute the rescue work that cannot be postponed (8). The experience of the last years shows that the premises for restructuring not only the existent system for human and environment protection have appeared, but also for preparing citizens for effective rational, psychological and morally justified actions, in these situations (9).

OBJECTIVES

1. Assessing priorities for epidemiological emergencies investigation.
2. Highlighting the structure of the main disasters in the last 50 years in the Republic of Moldova.
3. Assessing the impact for public health and economic losses, produced by emergencies in the last 50 years.
4. Estimating the number of flood victims in different crisis situations.
5. Developing an algorithm of practical recommendations for the epidemiological inquiry in disasters.

METHODOLOGY

In order to realize this project, specialty literature has been studied, regarding specific activities of different departments and structures interested in emergency events, including epidemiological activities. In this context, different legislative and normative documents that conduct the activities in emergency events have been studied. A special element is studying the prerequisite activities at different working stages, including pre-disaster, the moment of the event and post-disaster. Another element is studying the activities depending on the genesis of the crisis situation, according to the classifications proposed by A. Cotelea, 2009(8).

At the same time, in order to achieve an epidemiological study with the appreciation of emergencies on public health, the economic impact for society and stricken people, as well as the psychosocial impact, the main informative documents issued by the Civil Defense and Emergency Service have been analyzed, i.e. informative note on emergencies and fires that occurred in the Republic of Moldova during the years 2010-2015, exceptional circumstances in the

Republic of Moldova during the years 2010-2015 and statistics indices about the number of emergencies that occurred in the Republic of Moldova during the years 2010-2015. Another relevant source is The International Disaster Data Base, which offers information on main disasters dating from 1960.

1. DISASTERS HISTORY AND IMPACTS

Figure 2. Floods in 2016 in the Republic of Moldova(10)

Phenomena causing disasters can be classified by two main criteria: phenomenon source and the effect occurrence way. By first classification, phenomena causing disasters can be divided in:

- Disaster causing phenomena, with natural occurrence source;
- Disaster causing phenomena, that have as occurrence source the human activity.

Assigned to the first category are disaster causing phenomena with natural occurrence source, geo-climatic phenomena that do not imply any form of human activity. Assigned to the second category are all disaster causing phenomena that imply human activity, especially of technogenic nature, with destructive effects upon environment, population and/or goods.

The second classification criterion is occurrence way. If any potential disaster generator phenomenon is studied, it can be noticed, that, in very few cases, its

effects can be unique, without implying the risk of another secondary effects. In this aspect, disaster generating phenomena can be classified in: primary and secondary.

It is understood from above that any risk factor that manifest itself as a disaster can train an onset of other disastrous events of greater or lesser extent, of main risk factors, that cause a disaster produced by a secondary risk factor. There are situations when a secondary risk factor can produce more serious effects than the shutter agent itself. Forwards there is a list of definitions that can be used in order to appreciate the difficulty grade in crisis situations.

Emergency - the states that are temporarily established in the country or part of it, in order to guarantee national defense or protect the population and the economy in case of military aggression, natural disasters, other types of catastrophes and or other circumstances that because of their nature or magnitude affect the internal order, the country's security or the stability of the state.

Danger of emergency - the state of that any phenomena or processes have occurred or are imminent to be shuttered, that can affect the people, their goods, state ownership, another kind of property and that can exercise a negative effect on the environment.

Risk of emergency occurrence - the probability of producing of an emergency, estimated in corresponding risk indices.

Emergency with natural character - emergency provoked by natural calamities (earthquakes, floods, landslides, meetings, fires, storms, hurricanes), epidemics, epizootics, diseases and pests affecting crops and forests.

Emergency with technogenic character - emergency caused by industrial accidents; transportation accidents; fires (explosions); accidents with potentially

release of highly toxic, radioactive, dangerous biological substances in space; sudden collapse of buildings and constructions; dam break; accidents of energy and communication systems and treatment plants.

Emergency with ecologic character - environment pollution with irreversible consequences, that present a danger for people's life and health, for flora, fauna, soil, water, atmosphere, goods and cultural heritage.

Emergency zone - the territory where the state of emergency has been declared.

State of emergency - it is declared in the case or imminence of natural disasters or catastrophes or other circumstances that due to their nature or magnitude affect the internal order, the country's security or the stability of the state, in all of the national territory or part of it, and while it lasts, the population can be mobilized.

Emergency case - dangerous incident, produced by triggering a disaster or a riot source, that has resulted in victims or present a danger for people's life and health, has caused losses for the state heritage or other property, citizens personal goods and environment.

Table 1. Specific features of the emergencies that occurred in the Republic of Moldova during in the last 50 years(11)

Year	Disaster type	Date	Total deaths	Total affected	Total economic damage
1994	Flood	24-08-1994	47	25 000	300 000
1994	Storm	11-11-1994	3	25 580	
1997	Flood	06-07-1997	9	2 244	50 000
1999	Flood	15-03-1999		1 713	4 000
1999	Epidemic	August, 1999		1 647	
2000	Drought	May, 2000	2		
2000	Storm	26-11-2000		2 600 000	31 600
2002	Flood	June, 2002	1	500	832
2005	Extreme temperature	20-01-2005	13		
2005	Flood	18-08-2005		6 500	7 752
2007	Drought				406 000
2008	Flood	26-07-2008	3	4 000	
2010	Drought	May, 2010	2		
2010	Flood	05-07-2010		12 000	
2012	Extreme temperature	30-01-2012	10		7 374
2012	Drought	Nov, 2012		5 800	
2012	Transport accident	09-08-2012	11	30	

In order to appreciate the impact of the disasters over the life quality, including public health, statistical indices issued by Civil Defense and Emergency Service of the Republic of Moldova has been analyzed. The results of the epidemiological analysis show that the territory of the country is periodically affected by different types of disasters, including technogenic, natural and biosocial.

Table 2. Number and percentage of emergencies, recorded in the Republic of Moldova, during 2010-2015(12)

Disaster type / Year	Technogenic disasters		Natural disasters		Biosocial disasters		Disasters per total	
	Indices		Indices		Indices		Indices	
	abs.	%	abs.	%	abs.	%	abs.	%
2010	214	74,3	70	24,3	4	1,4	288	100
2011	225	78,7	58	20,3	3	1,0	286	100
2012	223	67,8	102	31,0	4	1,2	329	100
2013	161	48,3	166	49,9	6	1,8	333	100
2014	215	64,2	112	33,4	8	2,4	335	100
2015	201	73,6	62	22,7	10	3,6	273	100
Disasters per total	1239	68,5	570	31,5	35	2,0	1808	100

The data above shows that the main disasters registered in the Republic of Moldova have technogenic character, thereby during the period 2010-2015, 1239 cases have been reported, with a share of 68,5%. During years, this type of disasters varies from 161 in 2013 to 225 in 2011.

Second place as intensity is held by natural disasters. It has a share of 31,5%, with a number of 570 cases. Most of the natural disasters had happened in 2013, when they reached a record number of 166 cases.

A smaller number of disasters registered in the Republic of Moldova are those of biosocial character. At the same time, this number does not reduce the importance of awareness of the competent structures. Per total, 35 cases of biosocial disasters, with a share of 2,0% has been registered in the Republic of Moldova during the analyzed period.

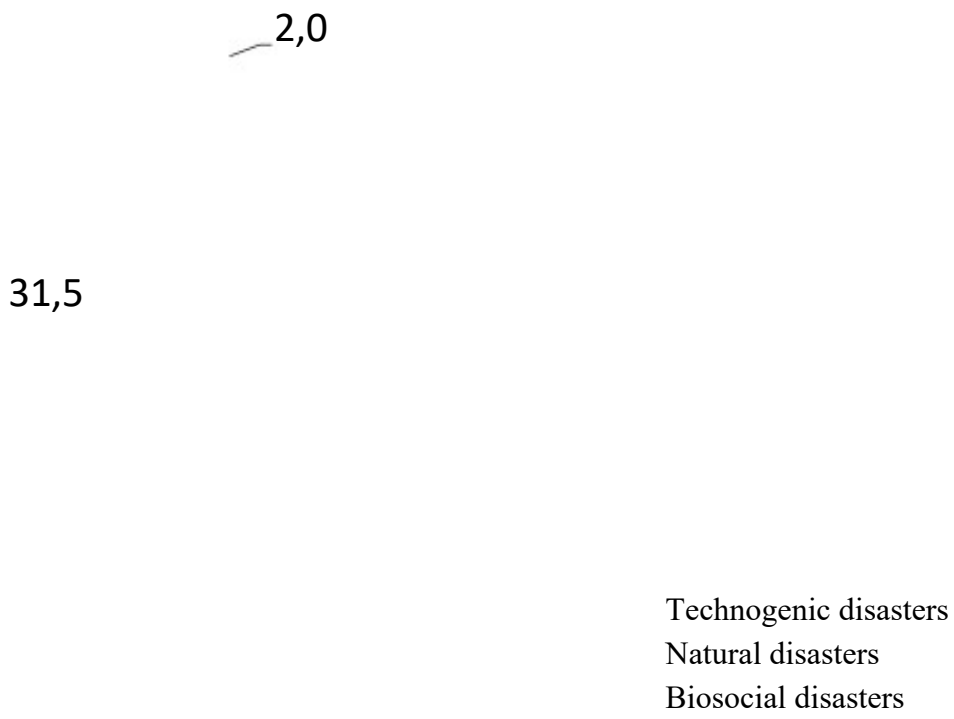

Figure 3. Disasters share, reported to their origin, registered in the Republic of Moldova, during 2010-2015

The tendency of increasing the dynamics of disasters imposes first of all the society preparedness for confrontation with different types of cataclysms and providing special services with prompt intervention forces and means to alleviate the consequences. Depending on the amplitude, disasters are classified as objective, local, territorial and national emergencies.

Table 3. Disaster share in the Republic of Moldova, according to the amplitude (2010-2015)

Disaster nature	Objective	Local	Territorial	National	Total
Absolute indicators	494	852	198	27	1571
Extensive indicators (%)	31,4	54,3	12,6	1,7	100

From a total of 1571 disasters, 852 have are at local level, with a share of 54,3%. Second place is owned by objective disasters, with 494 cases, or 31,4%. Territorial disasters are 12,6% of cases and national disasters - 1,7%.

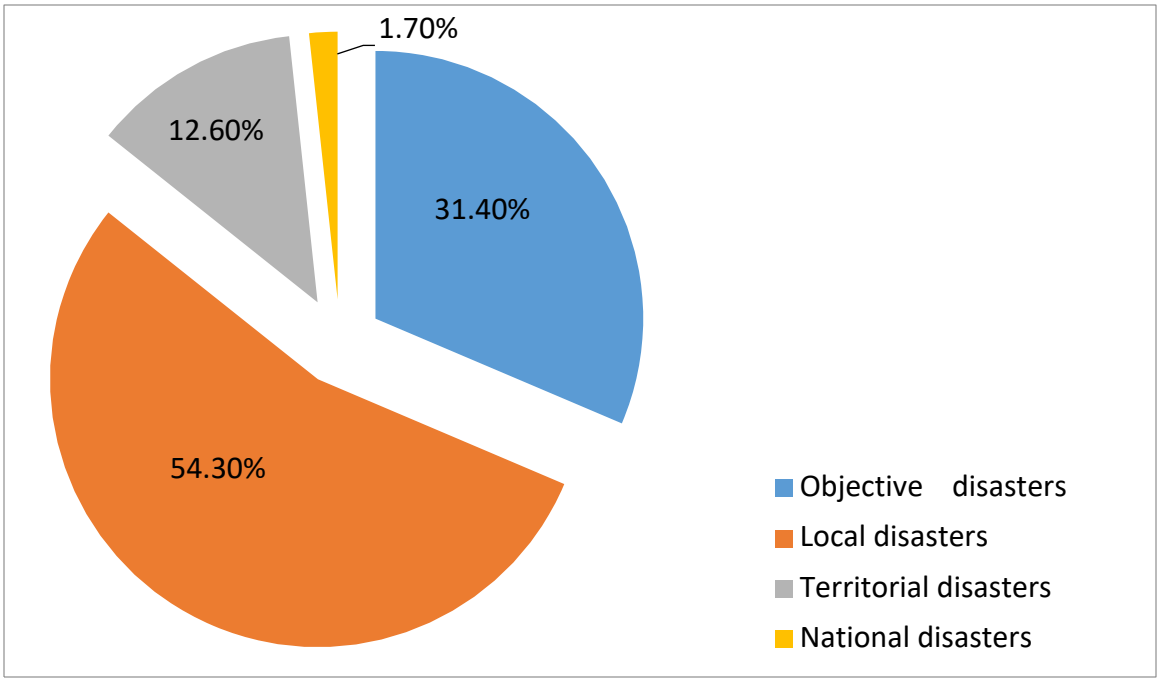

Figure 4. Disaster share in the Republic of Moldova, according to the amplitude (2010-2015)

It has been mentioned above that in the Republic of Moldova, during 2010-2015, most of the disasters had a technogenic nature. In Table 4 is the decipher of them, thereby most of them are related to the detection of unexploded ordnance and explosive. The rest of them are determined by different accidents, especially building collapse, explosions in buildings and rooms, car accidents, accidents in drinking water supply systems, accidents at thermal systems and railway accidents.

As a result of above mentioned cases, 191 people had suffered, and 78 had died. Most of the victims are as a result of car accidents, that had implied 149 people, 56 of them lost their lives.

Table 4. Technogenic disasters registered in the Republic of Moldova during 2010-2015(12)

Nr.	Disaster type	Number of cases	Number of victims		Share of deaths		Material damage (mln lei)
			abs.	%	abs.	%	
1.	Railway accidents	1	23	100	8	34,8	0,1
2.	Thermal systems accidents	6	-	-	-	-	0,4
3.	Accidents in drinking water supply systems	6	-	-	-	-	0,5
4.	Car accidents	12	149	100	56	38,1	6,5
5.	Explosions in buildings and rooms	15	19	100	14	62,5	7,0
6.	Building collapse	20	-	-	-	-	2,0
7.	Detection of unexploded ordnance and explosive	1179	-	-	-	-	-
Total		1239	191	100	78	39,8	16,5

Another disaster with a severe impact on public health is the railway accident, registered in 2011, in which 23 persons had suffered, including 8 deaths. The third place is held by the buildings explosions. Per total, this type of disasters reached a number of 15 cases, with 19 victims, among them 14 deaths.

The other disaster types did not have a direct impact on public health, but had brought an important damage to the national economy. During 2010-2015, technogenic disasters has caused a 16,5 million MDL damage to the state. The

costs for defusing unexploded munitions and explosives are not mentioned, but it has an important role for the public health wellbeing.

A detailed analysis of the natural disasters, determines that this type of calamities is the main that prejudice the state. There had been registered a total of 12 types of natural disasters, as a result, the state had suffered a damage of 3 billion MDL. The Civil Protection Service does not offer the exact direct impact on public health, this is why the epidemiologic analysis does not refer to the total number of victims. At the same time, as a result of floods and torrential rains in 2010, three persons had died.

In the epidemiologic analysis, an indirect index of the impact on public health is the material damage for the society. In this study, the economic damage caused by natural disasters is produced by torrential rains, including hail and strong winds. It is established that this kind of disaster had caused material damage estimated at two billion MDL, during the period 2010-2015. On second and third places, according to the economic impact are the drought and floods in 2010, with a damage estimated at 355,7 and 149,4 million MDL.

Table 5. Number of natural disasters, according to the material damage for the national economy, during 2010-2015(12)

No.	Disaster type	Number of disasters	Material damage (mil MDL)
1.	Torrential rains, including hail and strong winds	459	2127,5
2.	Strong storms	26	38,8
3.	Strong winds, including whirlpools	18	35,3
4.	Glazed frost	15	54,9
5.	Frosts	7	34,7
6.	Landslides	3	33,2
7.	High level of groundwater	3	31,2
8.	Lengthy rain	2	37,1
9.	Drought	2	355,7
10.	Floods	1	149,4
11.	Thunderstorms	19	30,9
12.	Strong sleet deposits	1	26,4
Total number of natural disasters		556	2955,1

The other natural disasters registered in the Republic of Moldova during 2010-2015, are biosocial disasters.

Table 6. Biosocial disasters registered in the Republic of Moldova during 2010-2015(12)

No	Disaster type	Number of disasters	Number of victims		Share of deaths		Material damage (mln MDL)
			abs.	%	abs.	%	
1.	Poisoning as a result of food consumption	122	841	100	1	0,1	-
2.	Toxic poisoning	7	14	100	7	28,6	-
3.	Cases of infection with contagious diseases among groups of people	3	12	100	0	0	-
4.	Single cases of infection with particularly dangerous contagious diseases among farm animals	4	-	-	-	-	0,05
5.	Massive deployment of plant pests	3	-	-	-	-	0,4
Total number of biosocial disasters		139	867	100	8	28,7	0,45

In the above mentioned period there were five types of biosocial disasters registered, including: poisoning as a result of food consumption, toxic poisoning, cases of infection with contagious diseases among groups of people, single cases of infection with particularly dangerous contagious diseases among farm animals, massive deployment of plant pests. As a result of biosocial disasters, 748 persons

had suffered, including five deaths. Most of the victims were those of poisoning as a result of food consumption (841 people). As a result of toxic poisoning, 14 persons had suffered, among them 7 deaths.

Single cases of infection with particularly dangerous contagious diseases among farm animals and massive deployment of plant pests caused a material damage of 500 thousands MDL to the state. It is essential to make a deep epidemiological study, in order to appreciate the material damage determined by the cost of the treatment applied to the victims and the loss of temporary (permanent) work ability.

A particular type of disaster that cause essential economical damage and a negativ impact on public health is fire. This type of disasters is determined by many factors, especially anthropogenic and natural. In all studies reffering to emergencies, the number of fires essentially overcomes the number of the other types of disasters. At the same time, the number of victims caused by fires overcomes the number of victims as a result of the other diasters in a specific geographic region.

During this period, the share of children varies from 4,7% in 2014, to 30,6% in 2013. The analysis of mortality, determined by emergencies, established a number of 82 deaths, including adults and children. Mortality assessment among two population categories (adults, children) indicates a higher mortality among children (14,2%), comparing to the same index among adults (8,8%). General mortality is 9,5%. This phenomenon characterizes the children as vulnerable actors in emergencies.

It has been mentioned the number of 1701 victims, among them 941 as a result of fires and 867 as a result of other biosocial factors. General mortality assessment as

a result of fires and other disasters has established higher mortality indices among fires.

The share of people who had lost their lives as a result of fires is 73,2%, with a number of 689 persons. Among fires, the mortality rate is seven times higher than the other disasters. In the Republic of Moldova, during 2010-2015, as a result of disasters, 86 people had died, which is 0,8% of the number of victims.

In conclusion, it is ascertained an increase in the number of disasters during past six years, the biggest number is of natural disasters (66,1%) and local disaster (54,3%). The annual average of the material damage produced by different disasters, including fires, is 655,5 mil MDL, creating an essential economic impact on the budget.

A direct impact of the disasters on public health is established for calamities with biosocial and technogenic nature. The number of victims as a result of biosocial disasters is 867 people, and 161 victims as a result of technogenic disasters. Even more alarming is the situation of the victims as a result of fires, 941 people. At the same time, the imposing number of children among victims, including deaths, is alarming.

Along with those listed, the impact of disasters on public health is manifesting a late effect, as a result of psychologic factor, that can worsen the health of victims through the exacerbation of chronic diseases, limited access to quality food and drinking water, health services, lack of respect for personal hygiene conditions, etc.

2. MAIN DISASTER FEATURES

Figure 5. River map of the Republic of Moldova(5)

2.1 Floods

In the past 70 years, on the major rivers in the Republic of Moldova (Dniester and Prut), had been signaled around 10 massive floods, the most destructive being the ones in 1941, 1955, 1969, 1974, 1980, 2006, 2008 and the last one - summer of 2010. At the same time, big floods on the small rivers are quite common (1948, 1956, 1963, 1973, 1984, 1989, 1991, 1994, 1998, 1999, 2005). The total area of the Republic of Moldova, subjected to periodic flooding, is around 20% from the total area of the country, or more than 600 thousand ha.

10% of the embankments and hydraulic structures are damaged, presenting a great danger for the cities around. There are 168 spots, with a total area of 1300 km^2 and around 160000 citizens, in danger of flooding. In total, there are 659 spots placed in potential flood areas, among them 625 villages, 31 towns and 3 munipalities.

During May-July, 2010, in West Ukraine, where the superior courses of Dniester and Prut Rivers are located, big loads of precipitations had fallen, overcoming the multiannual average for that period. That period big loads of precipitations had fallen on the territory of Republic of Moldova. For example, during May 1- July 15, 2010, the quantity of the precipitations fallen on a big area of the country formed 200-400 l/m^2 or 50-80% from the annual average, twice overcoming the multiannual average for that period and occurring once in 20-50 years(12).

Isolated, in some places in the North and Center of the republic, the quantity of precipitations was even bigger, reaching 471 l/m^2 in Edinet (292% of the average for this period), phenomenon that had occurred for the first time during the whole observational period. The number of days with rainfalls ($\geq$0,1 mm), during May 1- July 15, 2010, is 30-45 days, the average is 26-30 days.

During May-July, 2010, the Republic of Moldova, Ukraine, Romania, Poland and other countries in the area had been affected by the one of the most lengthy and serious flood in the past 100 years.

As a result of huge quantities of rainfalls in the West Ukraine, in the superior courses of Dniester and Prut Rivers, starting with May 18, 2010, large storm floods had formed, that overlapped and created one single flood wave on the territory of Republic of Moldova, as the water level did don manage to decrease to the anti-flood level.

As a result of a huge atmospheric cyclone (June 23-25), in the Dniester and Prut Rivers basins in Carpathian area, very strong torrential rains had fallen, forming the maximum flood wave. That natural phenomenon during June-July provoked a lengthy storm in the Dniester and Prut Rivers on the territory of the Republic of Moldova.

In Prut River (Chernivtsi, Ukraine), on June 26, the water flow was 1740 m^3/s. At the entrance of the water storage Costeşti - Stânca, the water flow oscillated between 1440 and 1350 m^3/s. On June 29-30, another flood wave occurred, creating flows between 1740 and 1930 m^3/s by July 2. On June 25, the mixed moldo-romanian subcommission, according to the Regulation for Hydrotechnical Node Costeşti-Stânca exploitation, established the exhaust flow from the Costeşti-Stânca reservoir with a volume of 427 m^3/s, a number that was increased starting with June 28 to 618 m^3/s. On July 1, given the situation, the mixed moldo-romanian subcommission decided to increase the flow drain from Costeşti-Stânca lake up to 800-830 m^3/s.

At the beggining of July, on the Prut River (Ukraine), the fifth storm wave had been formed, with an increase of water level at the hydrological post Şireuţi

(Republic of Moldova) up to 5,2 meters and a maximum flood flow up to 2220 m^3/s (July 10). Water evacuation at the Hydrotechnical Node Costeşti-Stânca continued with a 830 m^3/s flow by July 11. On July 3, the biggest volume of water was registered - 1170,7 bil m^3. Together with Romanian Part, all possible actions were made in order to evacuate the water incidentally. The mouths had been flooded because of high water levels in Dunai River and partial penetration of it in Prut River. On June 7, the highest level in Dunai River reached 581 cm, overcoming the historical highest level registered on April 26, 2006.

Starting with July 24, the increase of water flow caused the damping, crumbling and breaking of the dams, provoking flooding of agricultural lands and some villages in the districts: Nisporeni, Hânceşti, Leova, Cantemir and Cahul. On July 6, the protection dam yielded, flooding an area of 380 ha in Leuşeni meadow, where three villages are located. On July 13, the controlled disruption of the protection dam on Prut River had been executed, excluding the possibility of yelding and flooding the meadows and villages because of the storm and allowing controlled water evacuation.

Starting with July 16, the water flow in Costeşti-Stânca reservoir was decreased to 480 m^3/s, and starting with July 19 - to 400 m^3/s. On July 19, in Goteşti village, Cantemir district, a new rupture on the protection dam had been registered, causing floods in the meadows around Ghletosu and Stoianovca villages. On July 21, at the confluence with Large River, a controlled rupture of the protection dam on Prut River had been executed, allowing water evacuation on a 2800 ha area. On July 23, preparatory work for plugging and reconstructing the rupture of the limitrophe protection dam in Nemţeni village, Hânceşti district,had been launched.

On the Prut River, the flood storm in summer 2010 gathered around 130% of the annual average drain.

For Costeşti area - the floods in 2010 were much more severe than those from 2008. There was only one flood in 2008, and the soil stayed dry.

The comparative analysis of the floods on the Prut River in 2008 and 2010 drive us to the following conclusions:

1. The flood in 2008 registered maximum flows, but small drain volumes, because of the short period of the phenomenon.
2. The flood in 2010 registered lower maximum flows, but because of the lengthy phenomenon, it had higher flow volume.

In the Dniester River (Ukraine), during the same period, three big storms took place. The first two storm waves were in June, with a maximum increase of water level from 2,3 to 3,8 meters and maximum flow 1130 m^3/s and 2650 m^3/s.

The third storm wave (Ukraine) was in July and caused a maximum increase of water level with 5,0 meters and a debit of 3590 m^3/s. This phenomenon needed an increase in daily average debit in the accumulation lake Dnestrovsk up to 1540 m^3/s, as well as forced short-term evacuations up to 1700 m^3/s.

The increase of water flow in accumulation lake Dnestrovsk caused a significate increase of water level in June: on the Otaci- Dubăsari sector, as a result of the first storm wave, with 1,5-2,0 meters and a maximum debit of 1410 m^3/s, and as a result of second storm wave - from 2,5 to 3,4 meters and a maximum debit of 1710 m^3/s (July, 12).

As a result of water flow increase in the accumulation lake Dubăsari up to 1500 m^3/s (July 14), the increase of water level in Dubăsari - Turunciuc arm, after rthe first flow wave was 2,5 meters, and after the second flow wave - 4,5 meters. On the Turunciuc arm sector - the increase in water level after the first wave did not occur, and the general water level increase was about 2,0 meters.

In the Dubăsari City area - at the Dniester River mouth - the meadow on the non-dammed areas of the river was flooded, affecting the infields, state forest and recreational areas from Ciuleni, Grigoriopol, Anenii - Noi, Căuşeni, Slobozia and Ştefan-Vodă. On the Dniester River the flow had been managed, without serious consequences.

The total volume of the flood storm in summer 2010 on the Dniester River was: at the Moghilev-Podolsc hydrometric station- 6232,9 mil. m3, and at the Bender hydrometric station - 7539,8 mil. m^3.

This way in the Dniester River (Bender hydrometric station) the flood storm in summer 2010 gathered around 76% from annual drain average. At the same time, the flood storm from summer 2008 on the Dniester River (Bender hydrometric station) gathered around 40% from annual drain average.

The comparative analysis of the storms from 2008 and 2010 on the Dniester River allows us to make the following conclusions:

1. The flooding in 2008 registered maximum debits, but small drain volumes, because the phenomenon was short.
2. The flooding in 2010 registered smaller maximum debits, but, due to the lenghty phenomenon, it registered bigger drain volumes.

The exceptional flooding in summer 2010 caused damages of 0,15% of the GDP. In the districts situated in Prut River meadow not only the houses, roads, infields were destroyed, but also a large number of mills and wastewater collection system. Large areas of infields and pastures had been flooded for a lengthy period.

A total of 13000 people had been affected by floods. Around 1105 houses, 4308 ha of infields, 4800 ha of pastures and 930 ha of forests had been destroyed. 4000 people had been evacuated.

The Governemnt of the republic of Moldova requested a Post-Disaster Need Assesment (PDNA) from the Developing parteners. As a response, the parteners created a team of local and international experts in order to realise the process of PDNA for the fooded areas. It had estimated that the damages and loses as a result of floods reached a number of 535,25 mil MDL (41,75 USD).

During the flood storm, the Hydrometeorologic State Service ensured 24 hours operative and qualitative information regarding hydrologic monitoring, including flood propagation (hydrological informative notes, hydrological forecasts, hydrological bulletins, hydrological warnings).

The Environment Quality Monitoring Service of the Hydrometeorologic State Service during the flood period made an assessment of the surface water quality on the whole area of the Republic of Moldova. In the scrapings measurements had been done in order to evaluate the physico-chemical water condition, as well as accidental pollution after a natural disaster. The laboratory analyses for the collected stamps estimated that the water quality from both small and big rivers was within the allowable limits for fish ponds and indicated no accidental pollution.

The main flood mitigation and risk reduction methods proposed by HSS, based on its areas of activity are:

- Modernising and optimising the National Hydrologic Monitoring System from HSS, by installing automatic hydrological posts on the Dniester and Prut Rivers (based on the negotiated credit with the World Bank and the project submitted by the Gouvernemnt of Chech Republic);

- Propagating and completing the ongoing regional data bank "Moldova Hazards" in order to perfect the methodology for predicting weather-climate and hazardous hydrological phenomena, including floods;
- Regionalizing and mapping the main floodplains;
- Drawing up a topographic map.

Taking into consideration the different types of economical activity on the areas, it is recommended to highline the areas with a 20% flood insurance (for inlands), 5% flood insurance (for village buildings), 1% flood insurance (for urban areas) and 0,3% flood insurance for railways.

Figure 6. Floods in 2016 in the Republic of Moldova(13)

2.2 Torrential rains.

Territorial and local scale emergencies caused by torrential rains took place in May-July, 2011. As a result, 30 spots had suffered, 6 bridges and 34,55 km of road had been destroyed, 28 houses, 96 cellars and 16 mills had been flooded, 1409 ha

of crops and 137 ha of private gardens had been affected. Total material damage had been estimated at 21,8 mil MDL. In 2010 the material damage had been estimated at 26,4 mil MDL(12).

In 2012, local (10), territorial (1) and national (1) disasters caused by torrential rains had been produced in April, May and July. 20 spots had suffered, 10 public buildings, 4 bridges and 6,7 km of roads had been damaged. 20 houses, 21 auxiliary buildings, 75 cellars and 33 mills had been flooded. 6 ha of vineyards, 2418 ha of crops and 39 private gardens had been affected. The material damage in 2012 had been estimated at 15,4 mil MDL.

In 2013, local (22), territorial (10) and national (2) disasters caused by torrential rains had been produced, affecting 106 spots per total. As a result, 460,8 km of roads, 19 bridges, 2 dams, 3 households and 70 buildings had been destroyed. 100 living houses, 340 cellars and 41 mills had been flooded. In Cahul District one person drowned. 5721 ha of crops and 184 ha of private gardens had been affected. The material damage had been estimated at 109 mil MDL.

In 2014, local (14) and territorial (6) disasters caused by torrential rains had been produced in May-July, as a result of torrential rains, affecting 18,3 km of roads. 3 houses, 3 auxiliary buildings and 8 cellars had been flooded. As well, 4358 ha of crops, 122 ha of orchards and 24 ha of private gardens had been affected. Total material damage had been estimated at 14,8 mil MDL.

2.3 Torrential rains with hail.

Torrential rains with hail can cause huge disasters. In 2011 they represented the cause of territorial and local emergencies in May-July where, as a result, 377 ha of orchards, 125 ha of vineyards, 2171 ha of crops and 22 ha of private gardens had

been affected. Total material damage consisted of 23,8 mil MDL. In 2010 it consisted of 160,8 mil MDL.

Local (10) and territorial (3) disasters took place in May-July 2012, where, as a result, 7378 ha of orchards, 247 ha of vineyards, 5228 ha of crops and 63 ha of private gardens had been affected. 6 cellars had been flooded, 3 bridges and 5,4 km of roads had been destroyed. Total material damage consisted of 31,5 mil MDL(12).

2.4 Torrential rains with large hail.

In May-July, 2012, torrential rains with large hail occurred in 113 spots, affecting 2886 ha of orchards, 779 ha of vineyards, 24290 ha of crops and 168 ha of private gardens. Total material damage consisted of 31,5 mil MDL(12).

Most of the natural calamities caused by torrential rains with large hail had been registered in 2013 in districts Cahul, Floreşti şi Soroca, Cantemir, Criuleni,Ştefan Vodă, Căuşeni and Teleneşti. As a result, one person had died. There were 30 cases of national level reported. In June, in districts Soroca and Râşcani, 324 private and public buildings and 22 km of roads had been destroyed. Total material damage consisted of 241 mil MDL.

Most of the frequent natural phenomena in 2014, as in the previous year, had been the torrential rains with large hail, that caused 23 cases of emergency at local level, 11 cases at territorial level and one case at national level. In May-August torrential rains with large hail occurred in 57 spots, causing damage of 3 houses, 3 bridges and 11,5 km of roads and flooding of 1394 ha of orchards, 2030 ha of vineyards, 5847 ha of crops and 8 ha of private gardens. 181 birds drowned. Total material damage consisted of 97,1 mil MDL.

In 2015, 9 cases of torrential rains with large hail had been registered at local level and 6 cases at territorial level. The phenomenon occurred in 35 spots, destroying 1 granary, 6,3 km of roads and blocking another 0,3 km. 721 ha of orchards, 697 ha of vineyards, 5237 ha of crops and 602 ha of private gardens had been affected. Total material damage consisted of 54,1 mil MDL.

2.5 Large hail.

Scale emergencies at national, territorial and local level are frequently caused by large hail. In May-July, 2012, this phenomenon affected 33 spots, with 2921 ha of orchards, 584 ha of vineyards, 3167 ha of crops and 579 ha of private gardens. Total material damage consisted of 40,5 mil MDL. Comparing to the previous year, it was almost 1,5 times bigger.

In 2012 the large hail caused 25 emergencies at local level and 13 at territorial level. In May-July it occurred in 94 spots, affecting 4007 ha of orchards, 2067 ha of vineyards, 19067 ha of crops and 408 ha of private gardens. In July 396 buildings had been destroyed. Total material damage consisted of 215,2 mil MDL(12).

In 2013 the large hail caused 21 emergencies at local level, 15 at territorial and 1 case at national level. This phenomenon occurred in 71 spots, affecting 2422 ha of orchards, 1107 ha of vineyards, 19405 ha of crops and 79 ha of private gardens. 154 buildings had been destroyed. Total material damage consisted of 212 mil MDL.

The large hail caused disaster at local level (22), territorial level (6) and national level (1) in 2014, occurring in 44 spots and affecting 1732 ha of orchards, 468 ha of vineyards, 3431 ha of crops. Total material damage consisted of 49,1 mil MDL.

In 2015 the phenomenon caused 10 cases at local level, 3 cases at territorial level and 1 case at national level, occurring in May-August in 16 spots and affecting 1066 ha of orchards, 54 ha of vineyards and 314 ha of crops. Total material damage consisted of 22,9 mil MDL.

2.6 Torrential rains with hail and strong winds.

This phenomenon occurred in 2011 in 12 spots, destroying 11 houses, 3 industry objectives, 3 administrative buildings and 6 households. 251 ha of orchards, 25 ha of vineyards, 311 ha of crops had been destroyed. Total material damage consisted of 23,1 mil MDL. In 2010 this phenomenon caused damages of 25,7 mil MDL.

In 2012 the same phenomenon caused 9 cases at local level and 6 cases at territorial level, in 28 spots. As a result, 17 households and 50 buildings had been destroyed. 1122 ha of orchards, 1216 ha of vineyards, 4413 ha of crops and 20 ha of private gardens had been affected. Total material damage consisted of 68,7 mil MDL(12).

In 2013 the torrential rains with hail and strong winds caused disaster at local (8), territorial (8) and national (1) level in May, June and August, in 49 spots, destroying 45 km of roads, 1 bridge, 18 households and 277 buildings. 606 ha of orchards, 1496 ha of vineyards, 13693 ha of crops and 1084 ha of private gardens had been affected. Total material damage consisted of 122,5 mil MDL.

In 2014 the phenomenon caused 8 cases at local level and 2 cases at territorial level in May, July and August, in 15 spots, destroying 15 km of roads and one bridge.

As a result, 3 houses and 6 auxiliary buildings had been flooded. At the same time, 230 ha of orchards, 339 ha of vineyards, 2955 ha of crops and 251 ha of private gardens had been affected. Total material damage consisted of 22,2 mil MDL.

In 2015 the phenomenon created 3 cases at local level, 5 cases at territorial level and 1 case at national level, in June-August, in 19 spots, destroying 5,5 km of roads, 1 bridge, 1,2 km of electrical network lines and 1,2 km of communication network lines. 6 houses and 9 auxiliary buildings had been damaged, 7 cellars and 13 mills flooded. 653 ha of orchards, 472 ha of vineyards, 2961 ha of crops and 331 ha of private gardens had been affected. Total material damage consisted of 58,7 mil MDL.

2.7 Torrential rains with strong winds.

In 2011 this phenomenon affected 10 spots, destroying 185 ha of orchards, 200 ha of vineyards and 4305 ha of crops. Total material damage consisted of 23,1 mil MDL. In 2010, the same phenomenon caused damage of 6,7 mil MDL(12).

In 2012 the torrential rains with strong winds caused disaster at local level -5, and territorial level -4, in 18 spots. As a result, 28 km of roads, 36 houses, 7 educational institutions, 2 socio-cultural institutions, 9 auxiliary buildings and 22 households had been destroyed. 567 ha of orchards and 111 ha of crops had been affected. Total material damage consisted of 13,1 mil MDL.

In 2013 the phenomenon caused 7 emergencies at local level and 2 at territorial level in June, July and September in 15 spots, destroying 24,3 km of roads, 1 bridge, 5 households and 67 socio-cultural buildings. 22 houses, 12 cellars and 2 mills had been flooded. 55 ha of orchards, 140 ha of vineyards, 146 ha of private gardens and 288 ha of crops had been affected. Total material damage consisted of 21,8 mil MDL.

In 2014, the torrential rains with strong winds caused 3 local level disasters and 2 territorial level in May, July and August, in 7 spots, destroying 2,8 km of roads and affecting 100 ha of crops. In Obileni village, district Hânceşti, as a result of the torrential rains with strong winds, 0,1 km of lines of electricity network had been broken, electrocuteing 2 cattels. Total material damage for that year consisted of 4,1 mil MDL.

In 2015 the phenomenon caused 4 cases of emergency at local level in June and October in Cantemir and Criuleni. 3 spots had been affected, 4,9 km of roads destroyed and 6 houses, 21 cellars, 4 mills had been flooded. 6 ha of private gardens had been affceted, with a lost of 110 birds. Total material damage consisted of 0,4 mil MDL.

2.8 Drought.

The 2012 Drought. The State Hydro-Meteo Service (SHS) reported temperatures in June-July that were 3.7-5.1 C^o higher than annual averages and the precipitation in the same period was only 15-60 %of the multiannual average, with soil temperatures reaching record heights. The number of days with max. air temperature higher than +30 degrees and higher for summer period was 39-62 days (the norm being 8-27 days). Drought is a production constraint when precipitation is out of the normal average parameters.(14)

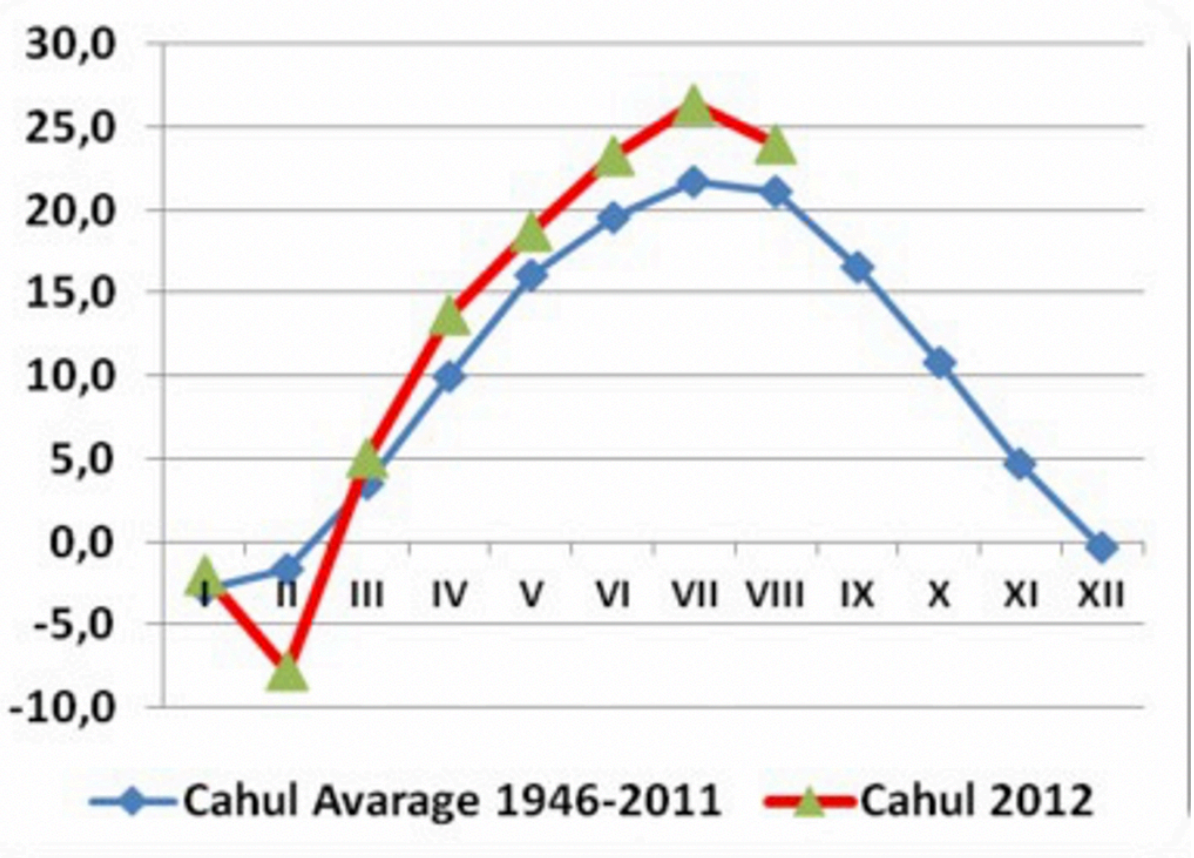

Figure 7. Average monthly °C) in 1946/2011 and 2012 hidro-meteorological Service

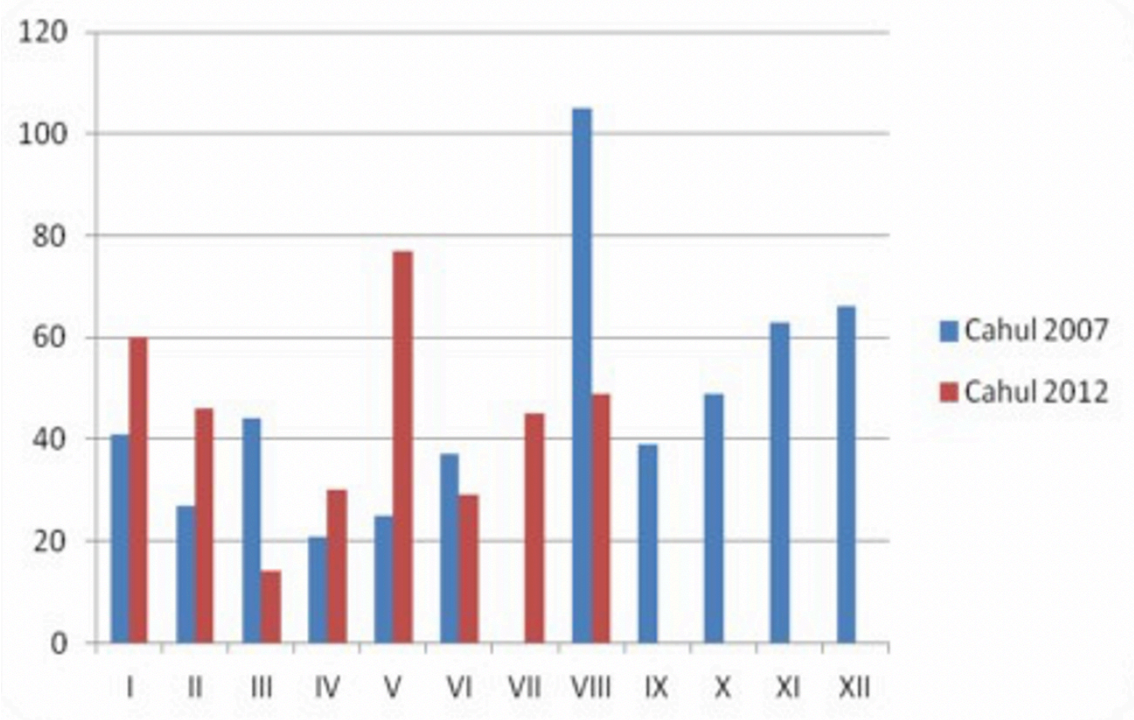

Figure 8. tity (mm) and 2012 al Service

The surface water flow reduced by 30-50 % compared to the multiannual average, in substantial catchments areas (Dniester and Prut rivers) and by 20-40 % in smaller catchments areas and rivers.

- Sept ’11 - July 12 rainfall 30-50% of multiannual average
- In certain (southern & central areas) 20% the of multiannual average rainfall

Peak temperatures 3-5% higher the multiannual average

- Soil moisture 1/3 of the multiannual average(14)

During June and July 2012 the hydrothermal coefficient was 0.1-0.5 across most of the country. Values over 0.7 were recorded in several districts.

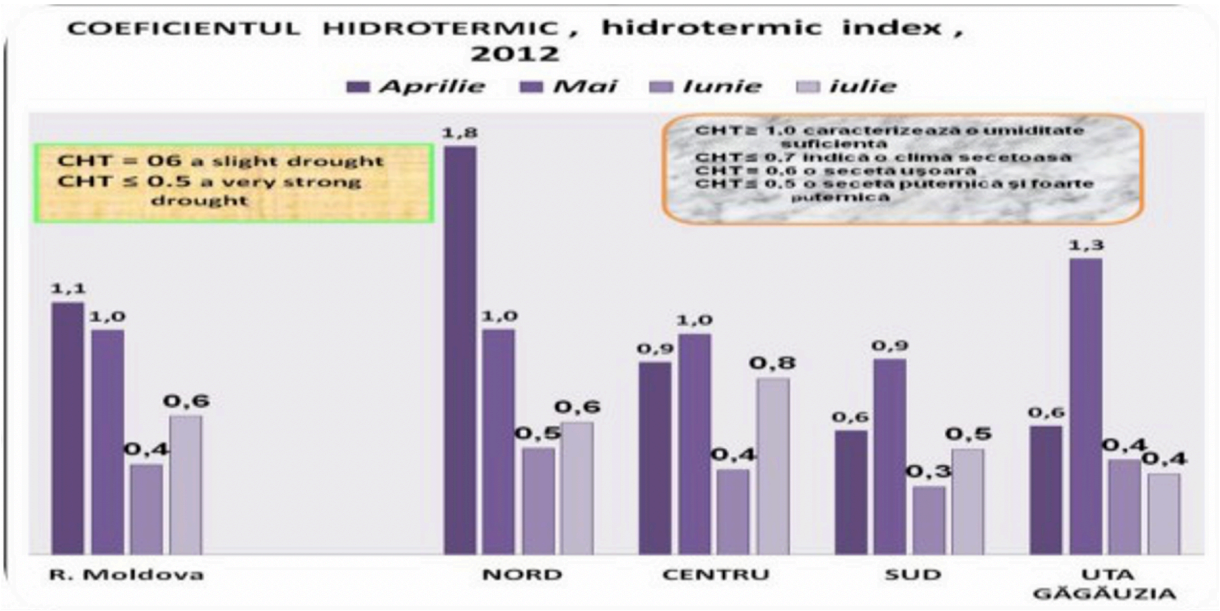

Figure 9: Impact of the 2012 Drought - Plant production

The impact of the drought on crop production is moderate at national level.

- North - moderatly affected
- Centre - very affected
- South - strongly and severly affected (Taraclia, UTA Gagauzia, Basarabesca Cahul and Cantemir etc.),

Severely affected southern areas accounts for 11.7% of the total population (420,000 residents) and 15.4% (5,217 km^2) of the total territory of Moldova.(14)

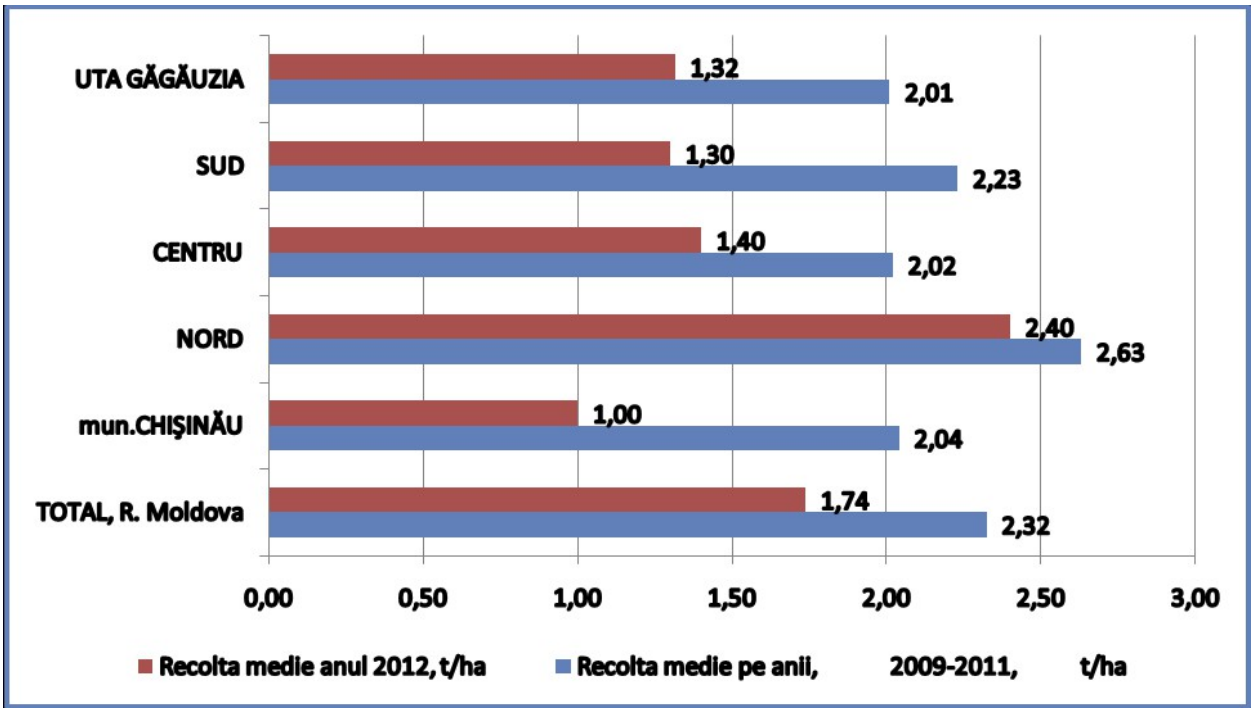

Figure 10. Winter wheat average yield (t/ha) in 2012 compared to the 2009-2011average.

MAFI - National wheat yield decline in average - 25%

Impact of the 2012 Drought - Livestock

1. Livestock Production

Available stocks account for 30-50% of the total animal feed needs.

By the end of the harvest (maize), additional 10-20% of the feed needs will be accumulated.

It is estimated that destocking of up to 10% of the national cattle herd has occurred by the end of August 2012.

2. Destocking is an on-going trend in Moldova.

It is estimated that the drought related destocking will account for 15-20% of the national cattle herd.

In most affected areas such as Gagauzia and Taraklia, the impact may well be higher.

Past experiences show unlikely restocking and permanent loss in livestock and contraction in livelihoods.

Impact of the 2012 Drought

The affected population can be divided in three categories, with effects of the drought impacting each group differently.

- Leaders (businesses) cultivating on large areas will absorb most of the damages. They will obtain reduced or no yields, and will be constrained to cover the land lease costs and to invest in the next season's production.
- Rural residents, estimated at some 70% of the rural population on average, renting their land to leaders and will possibly benefit from the land lease and employment.
- Small to medium size farmers including farmers with own livestock and the small leaders (businesses) cultivating less then 10 ha, constitute between 10 and 30% of the rural population.

These small to medium size farmers will be most severely impacted. In addition, to reduced or lost yields, they have to invest in next season's production and/or in animal feed.

Figure 11. Drought in the Republic of Moldova, 2012

MAIN FINDINGS

1. Limited Food security implications due to the drought.
2. Impact of the drought on crop and livestock production is negative at the national level: North - moderatly affected, Centre - very affected and South - strongly and severly affected.
3. Severe natural hazards affect Moldova on regular basis. The Ministry of agriculture is well aware and making efforts for long term mitigation (introduction of no-till cultivation, drip irrigation, etc.).

4. There is a need to improve the coping mechanisms in drought prone areas and knowledge across the livestock and plant production sectors.
5. Limmitted capacities of the local public authorities and other specialized units to cope with drought effects.

ACTIONS TAKEN

- The Ministry of Agriculture and Food Industry with technical assistance and support from FAO, evaluated the damage of the drought.
- The findings are presented in a Comprehensive Drought Damages report. The estimated losses are 3 billions MDL, of which 2,5 billions MDL are in the phytotechny sector and 0,5 billions MDL in horticulture.
- The Ministry of Agriculture and Food Industry will distribute 161,5 MT winter wheat seed to the severely affected farmers (output from FAO GCP/MOL/001/AUS project financed by the Austrian Government).
- To mitigate the impact of drought in the frame of disaster risk preparedness initiative, the Government will subsidize inputs for winter 2012 crops (autumn planting) to the severely affected farmers.

ASSESMENT - NEEDS - POSSIBILITIES

- The Ministry of Agriculture and Food Industry is interested in development of community based agriculture disaster risk preparedness and awareness systems, including monitoring, evaluation and coordination mechanisms, as well as actions plan for response with clearly set intervention thresholds.
- Currently the Government of Moldova asks for support in preventing of destocking and addressing the immediate needs of the most severely affected farmers, by:

- Prevent destocking od livestock and ensure the immediate needs of the most affected agricultural producers, by offering support for sustaining of 1 head of cattle per household:

  Animal fodder (100 kg/maize grain/household) for critical 100 days of winter feeding (for 26,000 pregnant cows or 68% of the cattle population) (approximately 12 millions MDL or one million US$)

- Support for partial cover of costs for the winter campaign for a surface of 420 thousand of hectares for the yield of 2013 (agricultural inputs: fuel, seeds, fertilizers). Total estimative costs: 1062 millions of MDL or 88,5 millions USD (at an aprox. exchange rate: 12 MDL for 1 USD).

- Support for purchase of maize seeds for spring planting and restarting of the fodder production. Estimative costs: 190 millions of MDL or 16 millions USD (14)

2.9 Risk factors

It is important to mention the main risk elements that are significant in the country:

- Population as a whole, due to the low level of education.
- Low productive and functional capacities of local population.
- Workings that implies high risk sources.
- Poor urban infrastructure, as well as vital networks and systems at a national and local level.
- Poor support systems for social services.
- Weak methods for response in disaster.
- Poor capacities for collecting, storage and processing information.
- Natural environment.

3. DISASTER RESPONSE SYSTEM

3.1 The civil defense organization in emergency context

The civil protection issue includes a variety of aspects that have tangent with both military and civil departments (15). In order to avoid any confusions regarding the clue of civil "protection" (defense), many definitions had been given, being influenced by the existing doctrine at a specific moment. One of them is as follows: "Civil defense is a component of the national defense system together with other elements, it materializes the participation of all the people in homeland defense, totaling precautions to protect the population against enemy air attacks". This definition constrains the content of civil protection activities for only war, disasters and the precautions in this circumstances are neglected or tangentially accosted.

At the moment, the accepted definition for Civil Defense is as follows: "Civil Defense is a component of the precautions and activities planned and applied as an emergency, in order to ensure protection for people, material goods, cultural values and environmental factors in cases of wars and disasters" (9).

Analyzing the definition of civil defense, it can be stated that, since old times, worries about population and goods protection had existed (15). The history brings plenty of supportive examples. Most of the military actions had been preceded by evacuation of non-fighting population and material goods (9).

The immediate evolution of the action for protection is related to the science evolution, especially the science of war. First World War brought a number of new elements that influenced the way of organizing the population and goods protection.

There are at least two main elements: use of a new means of conducting military actions - airplane - and, use of toxic substances in battles. It is the first time when it is recognized that in case of conflict not only the army suffers, but a great part of population as well.

After 1940, the concept of realizing the protection measures for population and organizational structures had been influenced by the existing structures in USSR. The basic element was strongly related to the danger of using mass destruction weapons, particularly nuclear weapons, by the enemy.

The Independence Proclamation of the Republic of Moldova on August, 27, 1991, formed a reformatory effort for the state institution. In order to regulate the activity of the Moldovan Civil Defense structures and in accordance with the Moldovan Declaration of Independence, in 1991, the President of the Republic of Moldova, through the Decree no. 244 of December 12, 1991 "Regarding Civil Defense of the Republic of Moldova", decreed passing the Staff of the Civil Defense, the institutions and organs of command and the military units of the Civil Defense of the USSR deployed in the country, under Moldovan jurisdiction(1).

By decree was established that all General Staff of the Civil Defense of the Republic of Moldova and of subordinated institutions assets, weapons and material-technical base of military units of the Civil Defense of the USSR deployed on the territory of the republic are the property of the Republic of Moldova.

Further, by Government Decision no.265 of May 14, 1993, Civil Defense Staff was subordinated to the Defense Ministry. Then, by General Staff of the Armed Forces of the Republic of Moldova Directive No.17/018 of September 1, 1993, Civil Defense General Staff was reorganized into the Department of Civil Protection and Emergencies.

Taking into consideration that the civil defense system in most of the developed countries is separated by the Armed Forces, and the specifics of everyday administration of civil protection, as well as in emergencies, through central public and local administrative organs and traders, Moldovan government, by Resolution 541 of October 2, 1996, withdrew the Department of Civil Defense and Emergency from the Ministry of Defense, the Fire and Rescue Department from the Ministry of Internal Affairs, with all their departmental structures, equipment, assets, core funding and other measures, that were included in the departments structure.

By the Moldovan Law No.75-XV of April 18, 2001 "To amend Law No. 64-XM of May 31, 1990", the department name had been changed into Emergency Department. Related to the approval of the new governmental structure, according to GD no.357 of 23.04.2005, "Measures for reorganization of ministries and central administrative authorities in the Republic of Moldova," the Emergency Department had been reorganized into the Ministry of Internal Affairs. The fundamental principles of Civil Defense organization, tasks and legal framework in this area of activity are established by the Law "On civil protection" No. 271-XIII of November 9, 1994(9).

Under the current conditions, the doctrine and topics related to the field of civil protection has undergone radical changes. High proportion social, political and economic reforms in recent years have brought organizational changes in the functional structure of all spheres of activities in Moldova. These changes have influenced the full extent of the civil protection system. With diminishing the international situation of tension and nuclear war danger, priorities in civil protection system change. The focus is not only on the conditions generated by an armed conflict, but on the problem of ensuring security to people, its material and cultural values, in emergencies subjected to an environmental catastrophe, natural or technogenic disaster. The issue of population protection against dangerous and

harmful factors of technogenic accidents, catastrophes and natural disasters, is being placed in front of the civil protection. The rapid development of scientific-technical progress and the emergence of advanced technologies causes a constant increase of the destructive force of natural and technogenic disasters and the damage caused by them is estimated at millions of MDL. The causes lie in excessive concentration in some regions and cities of the industrial objects, complicated processes, use of dangerous substances and explosives, complicated and more expensive measures of security technology, development of methods and means of personal and population protection.

Currently, the civil protection in the Republic of Moldova is a system of measures and actions undertaken to the entire state in peacetime and war, to ensure protection of people and property, in terms of natural and environmental disasters, accidents, disease outbreaks and fires (12). At the same time, it should be noticed that in Moldova the issue of prevention and liquidation of accidents and catastrophes has taken a particularly aspect, resulting from socio-economic situation, production decrease, use of fixed production assets and non-standard fuel, lack of accountability of rulers and control attenuation by the state supervisory bodies (9).

3.2 Main Civil Defense Tasks

In the general context of every modern state defense, alongside military defense, civil protection (defense) is included as an important component. The meaning of the two elements of defensive action can be identical, but most often the object is different. The adoption by most small and medium states of the military doctrine based on the principle of "sufficient defense" has brought renewed attention to the role of civil protection measures that are plausible survival in armed conflict.

In the defense doctrines of some countries there is the aspect of state protection of the population against military aggression. As a major activity, some countries (Sweden and Switzerland), consider civil protection the second, if not the first, element of the defense structure.

Other countries with advanced democracies, as Germany, France, Italy, Spain etc., consider the protection of immobilized citizens, particularly children and women, as a state policy, earmarking significant amounts of money to achieve, since peacetime, their protection against the effects of wars and disasters.

The issue of locating and eliminating consequences of natural disasters and catastrophes is resolved, usually by creating special organizational structures. These forces are placed proportionately throughout the country, specially prepared for humanitarian actions, or included in fast reaction(interference) forces.

Thus, it can be said that civil defense has an important role within state structures. In this framework, the role of civil protection service is given the importance and complexity of the incumbent tasks (9).

The main duties of civil protection are:

• preventing the disaster onset or enemy attacks;

• protecting the population against the effects of conventional or mass destruction weapons and disaster;

• ensuring protection of property and cultural values;

• participating in limitation and liquidation actions of disasters or enemy attacks consequences;

• remediating the territory from unexploded ordnance;

• participating with specific means and forces in national economy and territory preparedness for disasters onset or armed conflict;

• preparing and carrying rescue and other emergency works in disasters in order to liquidate their consequences;

• multilateral preparing of population, national economy objects and civil protection forces to carry out the actions in order to prevent emergencies due to their outbreak (9).

Civil Defense, in accordance with its duties, organizes and carries out a series of measures, such as:

• organizes the necessary forces capable of protecting the public and state property in extreme situations, provides technical and material equipment and special training, maintaining permanent state of readiness to act under emergency situations;

• creates and maintains constant state of readiness in control and communication systems; organizes radioactive, chemical, bacteriological and fire state control within the country;

• accumulates necessary fund of protection structures and keeps it in constant state of readiness for accommodating the population exposed to danger;

• accumulates and keeps in safe the individual protection means;

• ensures water sources, food, feed, animals and plants protection against radioactive, chemical and bacteriological contamination;

• prepares ways of evacuating the population and property from dangerous areas;

• informs the governing bodies and the population about the danger of emergency, brings in a state of complete readiness the forces and means of civil protection, leads and directs their actions in carrying out rescue work;

• assists victims;

• drives the economic units in prevention and liquidation of the emergency effects;

• exercises control over carrying out preventive measures to reduce the likelihood of emergencies and reduce their proportions, in order to ensure security and stability in functioning of all branches and national economy objects;

• provides fire safety to national economy objects and population, in order to bridge fire;

• organizes and carries out training among population and economic units, in order to ensure life security in emergencies.

3.3 The structure and organization of Civil Defense Service in the Republic of Moldova

The Civil Defense Service of the Republic of Moldova is a system of measures and actions at a state level, in peacetime and war, to ensure protection for people and property in terms of natural and environmental disasters, accidents and catastrophes, epidemics, disease outbreaks, fires, as well as use of mass destruction weapons.

In case of emergency, local authorities develop and approve appropriate action measures reflected in special civil protection plans and programs.

Civil Defense includes:

• bodies;

• national network for observation and laboratory control over environment and potentially dangerous objects;

• forces and means of liquidating the emergency effects;

• training system for civil protection.

Civil Defense is organized according to the territorial principle of production, in accordance with administrative and territorial division of the country, including all branches of national economy. Civil Defense organization has a mandatory character. Responsible for Civil Defense organs are the Government, ministries, departments, local governments and economic units.

The Civil Defense and Emergency Service has the direct leadership of Civil Defense, including soldiers and civilians who bear responsibility for the overall preparation to fulfill their tasks.

The Civil Defense and Emergency Service carries out:

• coordinates the civil protection work with ministries, departments and local government entities;

• informs the governing bodies about the emerging danger;

• adopts, within its competence, decisions on issues of organizing and implementing civil protection;

• develops and carries out special programs for people and material goods protection;

• organizes rescue work in exceptional situations;

• prepares draft laws and plans on civil protection and submits them to the Government for consideration in the manner established by law;

• organizes and supports international cooperation in civil protection;

• organizes further action in accordance with law.

3.4 Civil Defense and Emergency Service Forces

The issue of localizing and liquidating the consequences of natural disasters and catastrophes is resolved, usually by creating special organizational structures. These forces are placed proportionately throughout the country, prepared and equipped specifically for emergency actions. Civil Defense and Emergency Service Forces include subunits and formations, Rescue and fire Department, specialized formations, institutions and organizations. Direct leadership of Civil Defense and Emergency Service Forces for liquidating emergency effects is exercised through the Civil Defense and Emergency Service General Staff.

Specialized bodies of ministries and departments, designed to exert permanent control over environment, hazardous objectives for national economy and liquidate the effects of emergencies, act in accordance with the concerned ministries and departments responsible for preparedness to perform assigned tasks.

Civil Defense and Emergency Service System (CDESS) shall be filled from among the working age population. It is created according to the territorial principle and organized at national, town, village (community) level, as well as economic unit level. CDESS necessarily includes Moldovan citizens, especially men - from 18 to 60 years and women - from 18 to 55 years.

The number of parties, their organizational structure and usage are laid down in the CDESS Regulation. The responsibility for preparing the CDESS in order to fulfill its duties, is being held by national economy objects, under which these system is created.

Observations on environmental radioactive, toxic and bacteriological pollution is conducted by the National Network for Observation and Laboratory Control (NNOLC), which includes: sanitary, hygienic and epidemiology centers and institutions under the Ministry of Health, the Hydrometeorology Service Network under the Ministry of Environment, veterinary and agrochemical laboratories, plant protection stations under the Ministry of Agriculture and Food Protection.

NNOLC includes main institutions (municipal, district), specialized laboratories and bacteriological research centers. The number of institutions and laboratories of NNOLC is approved by the Government. Observations and laboratory control are being organized and carried out in accordance with NNOLC Regulation. Civil Defense and Emergency Service has the full control over the NNOLC activity(9).

3.5 International cooperation in the field of Civil Defense and Emergency

Given that the world supports less the war idea and becomes more concerned of decreasing the disasters effects, international cooperation in the field of Civil Defense and Emergency becomes more imperative, because disasters are unavoidable, unpredictable and, equally, without border.

Starting with one of the basic principles of the Yokohama Strategy and Plan Action for a Safer World (1994), it can be said that "each country has primary responsibility for protecting its own people, infrastructure and other material goods from natural disasters impacts" (9).

Disasters that had affected various regions of the world had shown that they strike with the same intensity and the same serious consequences all countries, whether it is rich or poor, and they must be treated equally by all of us, especially by international bodies responsible for disaster management. The statistics show that every year the number of victims after natural disasters increase by 6%. According to The Centre for Research on the Epidemiology of Disasters (CRED) (Brussels), during 1965-1992, due to natural disasters, 3.6 million people had died and over 3.0 billion people had been affected. The worldwide estimated damages were 340 billion US dollars(11).

This generated joint forces of the most of the world states, recognizing the importance of international cooperation in the field of response to disasters, accidents and catastrophes. Worldwide cooperation in the field of civil protection is achieved by the International Organization of Civil Protection, and the Republic of Moldova had joint this organization in January 1997.

International Organization of Civil Protection is carried out in accordance with international and bilateral agreements, in regional and general security purposes. This collaboration is geared towards:

• creating a single policy for the prognosis, prevention, mitigation and removal of emergency consequences;

• continuous participating in international projects on civil protection;

• free information exchange on scientific and technical achievements in the field of civil protection;

• experience exchange in civil protection organization and management;

• humanitarian aid and other assistance for victims of disasters;

• attracting mutual civil protection forces in order to liquidate disaster consequences under international agreements and mutual requests.

Moldova's international relations in the field of civil protection are regulated by several laws:

• Government Decision no.120 of 02.12.2001 "On approval of the Regulation on the Law of the Republic of Moldova nr.595-XIV of 09.12.1999 on international agreements";

• Government Decision no.120 of 09.12.1999 "On approval of the Regulation on the mechanism of international agreement conclusion ".

Moldova has signed bilateral agreements with neighboring states:

- Agreement between the Ministry of Defense of the Republic of Moldova and the Ministry of Defense of Romania on preventing industrial accidents, natural disasters and liquidation of their consequences (February 1993);

- Agreement between the Government of the Republic of Moldova and the Government of the Russian Federation on cooperation in preventing industrial accidents, natural disasters and liquidation of their consequences (January 1995);

- Agreement between the Government of the Republic of Moldova and the Government of Ukraine on cooperation in the prevention of industrial accidents, natural disasters and liquidation of their consequences (August 1998);

- Agreement on cooperation in prevention and liquidation of natural and technological disasters consequences within CIS (January 1993);

The Republic of Moldova has agreements within international bodies, such as:

- Agreement between the UN and the Government of the Republic of Moldova on measures to speed up the import of humanitarian aid and personnel property in disasters and emergencies (September 1999);
- Cooperation Agreement between the Governments of member countries of the Black Sea Economic Cooperation (BSEC) on liquidation the consequences of natural and technological disasters (March 1998);
- Partially Open Agreement of the Council of Europe "EUROPA - Major Risks" on prevention, protection and aid in case of large-scale natural and technological disasters (November 1997).

The Republic of Moldova cooperates with many international organizations in the field of civil protection:

- North Atlantic Treaty Organization (NATO) with its headquarters in Brussels, Belgium;
- Civil Protection Committee (CPC);
- Euro-Atlantic Disaster Response Coordination Centre (EADRCC), created in 1998;
- International Civil Defense Organization (ICDO), based in Geneva, Switzerland, created in 1931;

The Republic of Moldova participates in various international programs, such as:

- United Nations Development Programme (UNDP), 1995-1998;
- International Decade for Natural Disaster Reduction (IDNDR);
- The Partnership for Peace (PfP) - around 1994.

4. DISASTER MANAGEMENT

During history, human civilization has been always accompanied by earthquakes, volcanic eruptions, floods, hurricanes and other natural calamities. The twentieth century, especially the second part of it, is characterized by a fast developing of the scientific and technical progress, a deed that determine a tendency of increasing the number and breadth of technogenic catastrophes: increases the number of human victims, the volume of material damage, the ecological condition worsens, a. o. The phenomena that cause the increase of social vulnerability towards disasters are:

- Increase in population number;
- Excessive urbanization;
- Environmental degradation;
- Lack of education in this direction;
- Lack of local structures specialized in disaster management;
- Poverty;
- Unstable and chaotic developed economy;
- International and regional cooperation inefficiency.

There is no reason to believe that natural disaster frequency and magnitude would decrease in future. Analyzing the data base, it can be confirmed that they would increase due to the climacteric global change.

In 2006 the Government of Republic of Moldova had informed WHO about the integrated support and the intention of implementing IHR (2005), naming the Health Ministry - responsible authority. IHR (2005) is a frame document aiming to fortify the capacity of prevention, supervision, response and health protection against danger with a potential for international spread, while the applied measures would not create useless interferences among passenger and goods traffic. In 2008 the National Implementation Plan of IHR had been approved. During 2007-2011, several activities in order to amplify the health system capacity for early detection and rapid response had been implemented. Every year the progress of implementing the IHR is monitored by WHO and Government.

Government Decision no 475 from 26/03/2008: Action plan regarding implementation of IHR in Republic of Moldova

I part - general aspects and the distribution of activities towards ministries and departments implied.

II part - plan of actions (31 actions, 10 services).

- Ministry of Health
- Customs Service
- Border Guard Service
- Ministry of Agriculture and Food Industry
- Ministry of Internal Affairs
- Ministry of Transportation and Road Infrastructure
- Administration of Free International Harbor Giurgiulesti
- Ministry of Culture and Tourism
- State Administration of Civil Aviation

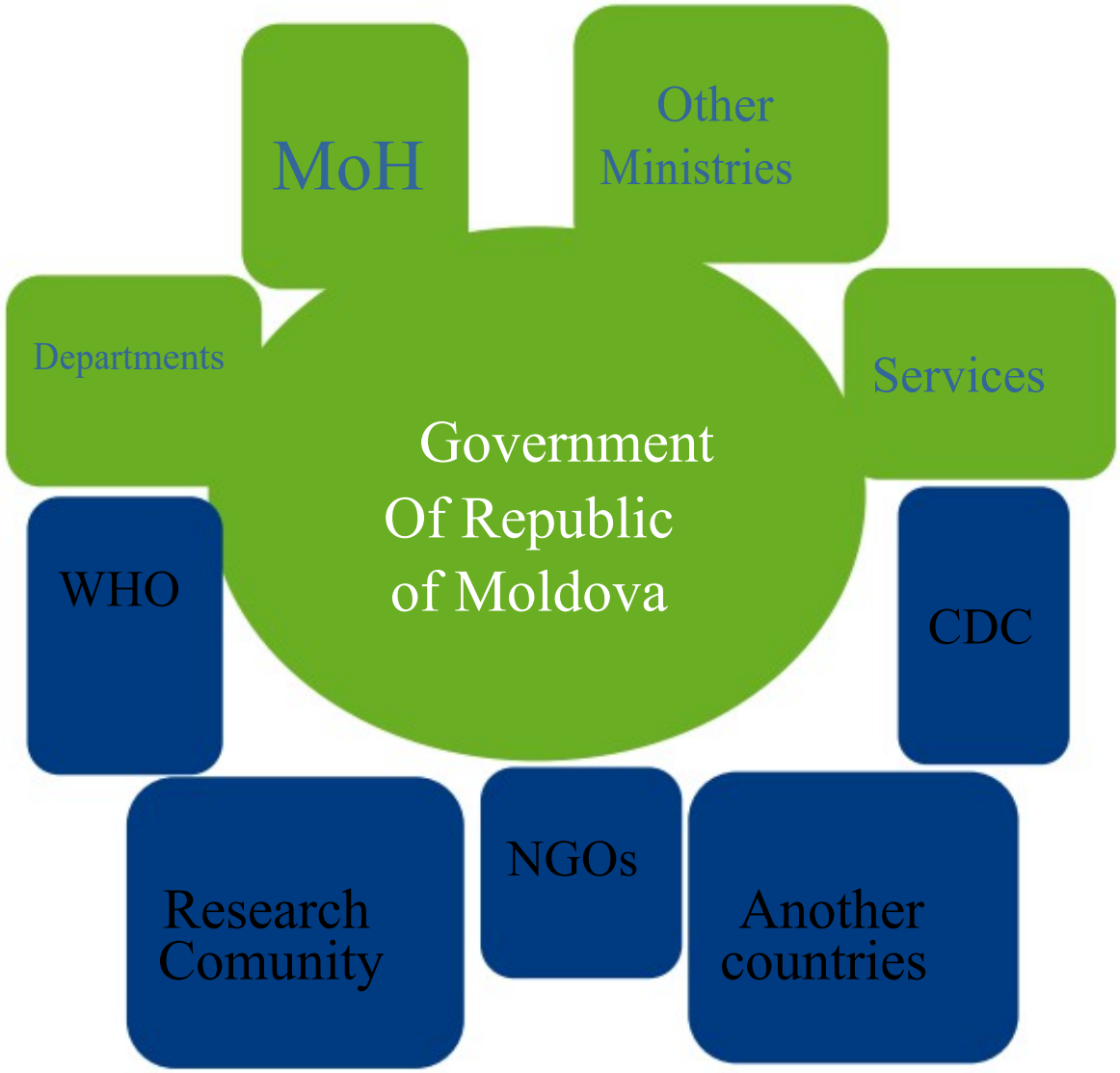

Figure 12. Cooperation, National and International Partnership

Basic capacity for IHR Supervision and Response (2005)

Article 5. Surveillance

1. Each State Party shall develop, strengthen and maintain, as soon as possible but no later than five years from the entry into force of these Regulations for that State Party, the capacity to detect, assess, notify and report events in accordance with these Regulations, as specified in Annex 1.

2. Following the assessment referred to in paragraph 2, Part A of Annex 1, a State Party may report to WHO on the basis of a justified need and an implementation plan and, in so doing, obtain an extension of two years in which to fulfil the obligation in paragraph 1 of this Article. In exceptional circumstances, and supported by a new implementation plan, the State Party may request a further extension not exceeding two years from the Director-General, who shall make the decision, taking into account the technical advice of the Committee established under Article 50 (hereinafter the "Review Committee"). After the period mentioned in paragraph 1 of this Article, the State Party that has obtained an extension shall report annually to WHO on progress made towards the full implementation.

3. WHO shall assist States Parties, upon request, to develop, strengthen and maintain the capacities referred to in paragraph 1 of this Article.

4. WHO shall collect information regarding events through its surveillance activities and assess their potential to cause international disease spread and possible interference with international traffic. Information received by WHO under this paragraph shall be handled in accordance with Articles 11 and 45 where appropriate.(16)

Article 13. Public Health Response

1. Each State Party shall develop, strengthen and maintain, as soon as possible but no later than five years from the entry into force of these Regulations for that State

Party, the capacity to respond promptly and effectively to public health risks and public health emergencies of international concern as set out in Annex 1. WHO shall publish, in consultation with Member States, guidelines to support States Parties in the development of public health response capacities.

2. Following the assessment referred to in paragraph 2, Part A of Annex 1, a State Party may report to WHO on the basis of a justified need and an implementation plan and, in so doing, obtain an extension of two years in which to fulfil the obligation in paragraph 1 of this Article. In exceptional circumstances and supported by a new implementation plan, the State Party may request a further extension not exceeding two years from the General Director, who shall make the decision, taking into account the technical advice of the Review Committee. After the period mentioned in paragraph 1 of this Article, the State Party that has obtained an extension shall report annually to WHO on progress made towards the full implementation.

3. At the request of a State Party, WHO shall collaborate in the response to public health risks and other events by providing technical guidance and assistance and by assessing the effectiveness of the control measures in place, including the mobilization of international teams of experts for on-site assistance, when necessary.

4. If WHO, in consultation with the States Parties concerned as provided in Article 12, determines that a public health emergency of international concern is occurring, it may offer, in addition to the support indicated in paragraph 3 of this Article, further assistance to the State Party, including an assessment of the severity of the international risk and the adequacy of control measures. Such collaboration may include the offer to mobilize international assistance in order to support the national authorities in conducting and coordinating on-site

assessments. When requested by the State Party, WHO shall provide information supporting such an offer.

5. When requested by WHO, States Parties should provide, to the possible extent, support to WHO-coordinated response activities.

6. When requested, WHO shall provide appropriate guidance and assistance to other State Parties affected or threatened by the public health emergency of international concern.(16)

National Legislation

Law no. 411/1995 regarding health protection.

Law no. 10-XVI/2009 regarding public health state supervision.

Governmental Decision no. 1076/2010 regarding classification of emergency states and the way of gathering and presenting the information regarding population and territory protection in emergency state.

Governmental Decision no. 820/2009 regarding Extraordinary National Commission of Public Health. It is compound of 17 authorities, and the President of the Commission, who is the Deputy Prime Minister.

Responsibilities:

- Integrated approach of public health dangers.
- Multisectoral mobilization for ensuring the adequate preparative level for public health emergencies.
- Integrated approach of prevention and management activities of public health emergencies, which include:

- Risk assess.
- Increase of vulnerability and danger.
- Assess the preparation level in case of public health emergency at a national and international level.
- Estimate the damage caused by public health emergencies.
- Assess the necessities and organize response measures.

- Define responsibilities.
- Allocation of human, financial and material resources.
- Establishing mechanisms for informing and training the population.

NFP Competences

National Public Health Center exercise the role of National Focal Point for IHR (2005), with following responsibilities.

- Continue collection of data regarding public health emergencies.
- Assess the public health risks and emergencies.
- Develop response measures.

Competences:

1. 24/7 accessibility for communication via telephone, email, fax with other IHR points.
2. Communication with contact points for IHR of WHO.
3. Spread the information received from WHO to the relevant sectors responsible and vice versa.

- Supervision and report, public health services, clinics, hospitals.

Entry points, ministries, departments for:

- Risk for public health and events that can form public health emergencies.

- Provisory and permanent recommendations, other information from WHO.

4. Consolidate data through identifying relevant sectors and establishing efficient and functional communication channels in order to:
   - Analyze the events.
   - Assess the national public health risk.

Fortifying the supervision and response capacity, with the support of World Bank, European Union:

- National system of communicable diseases supervision:
  - Assess the national system of communicable diseases supervision.
  - Create case definitions for supervision.
  - Prioritize diseases for supervision system.
  - Create an electronic system for communicable diseases and public health events (technical assistance, training) supervision, including those from Transnistria Region.
- Laboratory network:
  - Rebuild the virology laboratory.
  - Assess the laboratory capacity.
  - Buy equipment, reagents, consumables.
  - Fortify national reference laboratories and the laboratory network.

Supervision system represents integral part of health system.

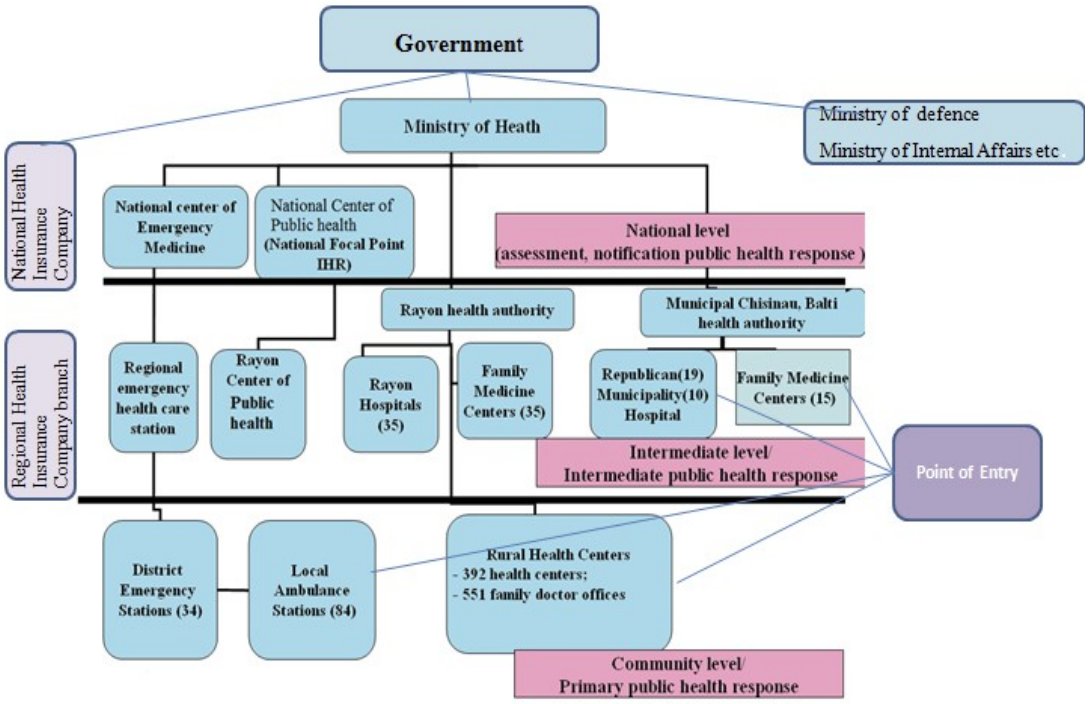

Figure 13. Health system through IHR

Table 7. Public Health basic activities

Local	Intermediate	National
1) Early detection of the disease cases and events with an increased morbidity / mortality compared to the expected ones for the specific time and place	1) Confirmation of the event status 2) Application of the aditional control measures 3) Immediate assessment of the event, providing laboratory support;	1) Immediate assesment and notification (48 hours) 2) Fast determination of control mesures 3) Ensure laboratory support
2) Immediate report of the essential data available	4) Immediate communication at national level (serious event and / or with unusual or unexpected nature)	4) Direct operational linking within and across sectors 5) Multidisciplinary teams
3) Immediate implementation of the preliminary control measures	5) The establishment, implementation and maintenance of territorial health emergency response plan	6) Establishment, implementation and maintenance of a national health emergency response plan

Strengthening early detection and response capabilities in border crossing points - with the support of WHO, UNICEF, World Bank etc.

- Develop the Strategy and Implementation Plan of Integrated Border Management in the years 2011- 2013 (GD nr.1212 / 2010);
- Train specialists (1 200 people), BCP competent authorities (Customs and Border Guard services) - 21 trainings (2010-2011), including 3 seminars with international participation (Interpol, NATO, EU);
- Develop procedures for early notification and primary response measures, conduct guides in public health emergencies, intervention plan model;
- Procure and install Thermo-Scanner - Chisinau International Airport;

Procure personal protective equipment.

Planning and providing training:

According to MoH Order nr.928 / 2011, as coordinators of the preparation, response and medical consequences liquidation in emergency states and public health emergencies, are named PHC in districts and Medical Directions in municipalities, for the following events:

- Earthquakes;
- Infection diseases outbreaks;
- Major transport accidents and disasters;
- Epidemics;
- Radioactive contaminations;
- Damages at explosion and fire hazards objects.

Special detailed plans of the preparation and response health department:

- Avian/pandemic influenza;
- Cholera and acute diarrheal diseases;
- Infectious diseases, poisoning outbreaks;
- Radiologic accidents.

Strengths

- National plan for managing emergencies and national committee to coordinate activities, laboratory network;
- Preparedness and response system for public health emergencies, structured on three levels: local, intermediate and national;
- Appointing coordinators and service cooperation with central and local government authorities in primary health care, emergency, hospital, public health;
- Communicable disease surveillance system for continuous monitoring of infectious morbidity and unusual and unexpected health events (time, place and population group) with early detection, risk assessment and organization of response measures;
- Specific developed and approved intervention plans, operating procedures for managing public health events of biological and radiological origin (infectious diseases outbreaks, poisoning, etc.);
- The existence and functionality of the National Public Health Committee headed by Deputy Prime Minister.

Priority activities that require perspective support:

- Draft a government decision to strengthen and maintain surveillance and response capacities in public health emergencies, in order to ensure public health security;
- Assess screening, evaluation, risk and public health emergencies management and collaboration of both health system levels (local, intermediate and national) as well as intersectoral;

- Strengthen early detection and rapid response system to public health emergencies by developing specific procedures for public health emergencies;
- Equip the medical institutions with computers, at all levels of medical assistance, in order to implement the electronic system for communicable disease surveillance and early report on communicable diseases and public health events.
- Integrate electronic surveillance on communicable diseases in the electronic information space;
- Develop electronic mapping on public health risk;
- Develop and update national standards for response teams (planning, preparation, needs assessment, intervention actions, post intervention assessment);
- Equip and train intervention teams in accordance with international standards for public health emergencies management (planning, preparation, needs assessment, vulnerability, risk management, communication, etc.);
- Integration into regional and global surveillance and response networks: Global Alert and Response (GAR), Global Outbreak Alert & Response Network (GOARN), Global Chemical Incident Emergency Response Network (ChemiNet), for data standardization and operative information exchange.

CONCLUSIONS

1. There is an increase in the number of emergencies in Moldova for the past five years, the biggest share is held by natural disasters (66.1%) at a local level (54.3%);

2. The average annual material damage produced by various disasters, including fires, is 655.5 million MDL, that constitutes an essential economic impact on the country's budget;

3. A direct impact on public health have biosocial calamities, technogenic disasters and fires;

4. Different categories of people, including children (13.1%), may be affected by emergencies;

5. Children are the most vulnerable actors in disasters, mortality is considerably higher among children (14.2%) compared to the similar index in adults (8.8%).

RECCOMMENDATIONS

1. Strict monitoring by the competent bodies of national economic objectives with technological accidents risk;

2. Acontinuous registration of contingency plans in case of emergency, including the pre-disaster and post-disaster period, as well as the moment when disaster harshness;

3. Active cooperation and reciprocal information between the Civil Defense and Emergency Service and all stakeholders, including the State Service for Public Health Supervision of the Republic of Moldova;

4. Active collaboration and mutual information between the Civil Defense and Emergency Service of the Republic of Moldova with counterparts in neighboring countries;

5. Informing the population about the possible disasters in Moldova and about the ways of individual and collective protection in case of necessity;

6. Targeted studies to assess the indirect impact on public health, determined by:

- Psychological factor that can worsen the health of victims by acute exacerbation of chronic diseases;

- Limited access to quality food and drinking water;

- Lack of access to health care and lack of respect for personal hygiene conditions, etc.

REFFERENCES

1. Declaratia de independenta a Republicii Moldova [Internet]. No 125-126 of 25.08.06. 2006. Available from: https://web.archive.org/web/20080205095219/http://www.moldova-suverana.md/index.php?start_from=&ucat=7&subaction=showfull&id=1156426235&archive=1156767681&
2. The Constitution of the Republic of Moldova. Monit Of al RMoldova No 1 18081994 [Internet]. 1994; Available from: http://www.e-democracy.md/en/legislation/constitution/
3. Moldova [Internet]. Available from: https://en.wikipedia.org/wiki/Moldova
4. "Moldova's Climate" [Internet]. Weatheronline.co.uk. 2013. Available from: http://www.weatheronline.co.uk/reports/climate/Moldova.htm
5. Atlas of Moldova [Internet]. Available from: https://commons.wikimedia.org/wiki/Atlas_of_Moldova
6. Moldova Economy Profile 2016 [Internet]. 2016. Available from: http://www.indexmundi.com/moldova/economy_profile.html
7. List of earthquakes in Moldova [Internet]. Available from: https://en.wikipedia.org/wiki/List_of_earthquakes_in_Moldova
8. Cotelea Adrian PV. Epidemiologia în situaţii excepţionale. Chişinău; 2009. 215 p.
9. DSE. Protecţia civilă. 2003.
10. Torrential rains caused floods in Moldova [Internet]. 2016. Available from:

http://earth-chronicles.com/natural-catastrophe/torrential-rains-caused-floods-in-moldova.html

11. http://www.emdat.be/country_profile/index.html.
12. http://www.dse.md/ro/node/26.
13. CATASTROPHIC IMAGES IN MOLDOVA. Last night rain causes floods, enormous damages [Internet]. 2016. Available from: http://en.publika.md/catastrophic-images-in-moldova-last-night-rain-causes-floods-enormous-damages_2623965.html
14. Assessment of Drought related damages in the Republic of Moldova. 2012.
15. GD No 1076 of 16.11.2010 “Cu privire la clasificarea situaţiilor excepţionale şi la modul de acumulare şi prezentare a informaţiilor în domeniul protecţiei populaţiei şi teritoriului în caz de situaţii excepţionale.” Monit Of. 2010;Nr.227-230.
16. World Health Organization. International Health Regulations. Who. 2005;82.