# Disaster Risk Identification Report of Ungheni District



Ungheni 2016







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# Disaster Risk Identification Report of Ungheni District (2016)

## **CHAPTER 1. INTRODUCTION**

Hazard is neither an accidental nor unpredictable phenomenon, but only the manifestation and its consequences are generally difficult to predict and control. Preparedness Since most natural and man-made hazards can be provided and the areas they affect can be determined, it is more and more emphasized the prevention and mitigation of



hazard effects, and all involved stakeholders are able to respond better to these challenges by putting in place a pre-disaster planning.

The hazard identification, assessment and mitigation have as main objective to complete the existing information sources about natural, technological and sociobiological hazards, as well as to increase transparency regarding the availability and dissemination of information to all stakeholders (local public authorities of level I and II, decentralized and deconcentrated public services, public institutions, private enterprises, NGOs, etc).

This *Risk Disaster identification Report of Ungheni District* aims to identify and initially analyze the dangerous natural phenomena (flooding, droughts, torrential rains, landslides, etc.), technological hazards (transport accidents, fires, munition detections, explosions, industrial accidents, etc.) and socio-biological hazards (epidemics, epizooties, food poisoning, crime, social unrest, etc.) affecting Ungheni

district. It is also provided a socio-economic vulnerability assessment of population and of Ungheni localities. The *Report* will include natural, technological and socio-biological hazards, described in terms of statistics and information collected from the decentralized and deconcentrated services oriented to mention the significant measures for hazard reduction in order to ensure environmental protection, sustainable development of Ungheni,



thus providing a considerable support to decision makers of Ungheni district and of the local public authorities of I level for managing the extreme events and identifying the best strategies to prevent and reduce disaster risks.

# 1.1 CRISMAS Project - Community for Risk Management and Assessment and the role of stakeholders of Ungheni district in the

disaster risk identification process

# CRISMAS Project Idea - Community for Risk Management and Assessment



Cities and regions have the greatest economic and human capital and further economic potential growth, but they are also the most

exposed and vulnerable to damages and losses. The local public authorities' committment in strengthening resilience to disasters is crucial. The local public authorities are daily confronted with disaster threats and they need a better access to policies and tools that enable them to cope with disasters effectively. Disaster risk reduction offers opportunities for capital investments in upgrading and improving the infrastructure, in rehabilitating the buildings for energy efficiency and safety, in urban renovation and in the usage of cleaner energy for more sustainable regions. Local public authorities are the level of government closest to citizens and communities. They are on the front line regarding the delivery of essential services to citizens, such as health care services, education, transport and water supply, being necessary that all these services have the ability to withstand disasters. Building community resilience to disaster provides the local public authorities and local stakeholders with solutions for disaster risk reduction and management.

Safety Region South-Holland South (VRZHZ) and ITINERIS Health & Safety within DG-ECHO Programme implemented MiSRaR and PRISMA projects, that aimed especially at risk assessment and risk management capability planning of the responsible structures.

In MiSRaR project (www.misrar.eu) a guideline was developed for local and regional risk assessment and the risk management methodologies were analyzed with a strong focus on interconnection with spatial development. In PRISMA project (www.prismaproject.eu) that guideline was tested and improved.

The climate change impact and the frequency of extreme weather events shape

the need of local policy implementation on risk assessment and risk management according to the national and sectoral risk assessments. Thus, based on the experience of MiSRaR and PRISMA projects and on the Dutch methodology of risk assessment at national and regional level, the CRISMAS project idea appeared and was oriented to Dutch experience dissemination regarding the risk assessment and risk management to other local and regional public authorities/structures, which are the project partners. Italy (Province of Forli - Cesena), Norway (Municipality of Stavanger), Bosnia and Herzegovina (Prijedor - Economic Development Agency "PREDA-PD"), Republic of Moldova (Ungheni District Council) are the CRISMAS project partners.

CRISMAS project aims to create a favorable framework for cooperation and sharing experience among 5 partners from different countries to develop local risk management policies based on Dutch risk assessment methodologies and local capability assessment. For 24 months the partners will start with identifying, assessing risks and then transforming the results into risk management strategies for the 4 regions or municipalities, assisted and consulted by the Dutch experts. A favorable environment will be created, where structures responsible for the CRISMAS project mplementation could learn from each other and exchange experience within the EU.

CRISMAS project is funded by the Directorate-General for European Civil Protection and Humanitarian Aid Operations/ DG-ECHO. Ungheni district has been selected as a partner on the recommendation of international experts, who have identified it, along with Ungheni City, as local public authorities with an extensive experience in the implementation of cross-border cooperation projects and in attracting external funds.

The risk identification and assessment at the community level represent a participatory process for the determination of risks and of the extent of their negative effects. This process leads to the probable negative risk effects upon the "risk elements" (people, households and community structures, facilities such as schools and hospitals, livelihood and economic activities, jobs, equipment, crops, livestock, infrastructure, etc.) and the reasons why buildings and some categories of people are vulnerable to certain risks. The adaptation mechanisms and the existing resources in the community are also identified.

The participation of community members is an essential component of disaster risk identification and assessment, which establishes methodologies and tools to be

used. Identifying and assessing risks with community participation combines both scientific and empirical data on known risks, as well as other possible threats to the community. Disaster risk identification and assessment with the community participation provides specific reference data in case of disasters that can be used for the development planning.

The local stakeholders play an important role in the risk identification and assessment. Decades of experience have shown that political commitment and full involvement of various stakeholders are essential to succeed. This refers to the disaster risk identification and assessment, which represents an important step in the process of developing a public policy in this area. The role of community participation in this process is very important as a means of consultation to ensure the readjustment of activities to the local context, and as well as a source of data for the micro level. Disaster reduction strategies can succeed only through a judicious collaboration among all key stakeholders - the local public services, public institutions, private sector and civil society - in the conditions in which these strategies involve special efforts that combine knowledge, technology, expertise, institutional capabilities, management skills and practical experiences to achieve optimal outcomes.

The role of stakeholders in the disaster risk identification and prevention is significant by involving them in the disaster risk identification and assessment, in the development of measures and projects to reduce disaster risks through the innovative character of initiatives that can be replicated at a larger scale by the local public authorities.

The recognition among the policy makers of the following statements is required:

- The local stakeholders have a crucial role and they represent an efficient way of disaster reduction;

- The local public administration has the obligation to ensure the public awareness on disasters in order to develop a culture of disaster prevention and encourage citizen participation in disaster risk management.

The stakeholder involvement is crucial for risk, adaptation and vulnerability assessment. Stakeholders can be characterized as individuals or groups who have something of value that can be affected by natural and technological hazards; and they are represented by decision makers, academia, communities and managers of

sectors and regions exposed to risks. Knowledge, individual and institutional experience are the main resources for adaptation to natural and technological hazards. Resilience can be developed when the stakeholders have time to strengthen the networks, knowledge and resources. The success in involving the stakeholders is not only to inform them as interested and affected, but also their involvement in assessing the viability of adaptation measures, the integration of information within its own social, economic, cultural and environmental context. The stakeholders are also very important in assessing the future needs for policy development and adaptation measures.

In the context of measures of risk reduction, the stakeholder capacity implies a timely continuous process of accurate data collection on the hazards in order to satisfy the needs of assessment and decision-making process. There are a lot of stakeholders involved in the process of hazard and associated risk identification, assessment and management. The table below provides an overview of the stakeholders and their interests within CRISMAS project.

Table

#### Important issues involving the local stakeholders within CRISMAS

Aspect	Questions
Identification	Are the stakeholders identified (through a proper process - including prioritization)?
Representation	Are all relevant stakeholders/social groups represented?
Commitment	Are all relevant stakeholders/social groups motivated to commitment?
Acces to information	Are all stakeholders that regularly attend the meetings / sessions informed?
Interest	Are the local stakeholders interested in having information?
Trust	Do the stakeholders have confidence in policy makers, institutions and in the available information?
Acceptance-process	Do the stakeholders accept the process?
Outcome - acceptance	Do the stakeholders accept the outcomes?
Dialogue	Are the stakeholders involved in dialogue with mutual listening and understanding?
Financial	Do the financial resources available meet the needs of the proces defined within the project?
Personnel	Do the staff resources available in expertise and capacity meet the needs of the risk identification, assessment and development process of the public policy on disaster management?
Time	Is it the calendar time to perform the processes covered by the project?



From the very beginning, in order to better reduce hazards, the level of the local stakeholder

involvement from Ungheni district was set up, as well as the

degree of the two-way communication. The local stakeholders regarding the disaster risks from Ungheni district and the decision makers at national level are represented by both structures at district level (decentralized and deconcentrated public services), as well as the stakeholders at local level (municipalities and local councils, citizens, NGOs of different levels). The role and contribution of the stakeholders within the implementation of CRISMAS project are found in the following matrix:

Matrix of the local stokeholder involvement in the disaster risk identification and assessment in Ungheni district

No	Structures/public deconcentrated and decentralized services interested in the disaster risk identification process	Roles of stakeholders within CRISMAS project	CRISMAS project impact on the stakeholders	Influence/importance of stakeholders within CRISMAS project
1.	Implementation Unit of CRISMAS project (5)	Responsible for the implementation of the project activities	<ul> <li>Capacity building in risk management</li> <li>Diversification of expertise</li> <li>Replication of good practices from the</li> <li>Netherlands, Norway, Italy, Bosnia and</li> <li>Herzegovina</li> </ul>	- High importance - Big influence - High responsibility
2.	Local Steering Committee of CRISMAS project (9)	Responsibe for coordinating and monitoring the project activities	<ul> <li>Strengthening capacity in risk management</li> <li>Accountability for making the policy on</li> <li>disaster risk management</li> </ul>	- High importance - Big influence - High responsibility
3.	Working group within CRISMAS project (13)	Responsible for: - Identifying and assessing all disaster hazards - Disaster risk management planning - Assessment of the local public authorities regarding the capabilities of the communities on disaster resilience - Achieving cost-benefit analysis of risk management in rural communities of Ungheni district - Identification of prevention and mitigation measures, information, preventive and preparedness measures for the population regarding the dangers the population may be exposed to - Development of disaster risk policy on risk management for Ungheni district with the Action Plan 2017 - 2030	<ul> <li>Strengthening capacity in risk management</li> <li>Diversification of expertise</li> <li>Replication of good practices from the Netherlands, Norway, Italy, Bosnia and Herzegovina</li> </ul>	<ul> <li>High importance</li> <li>Big influence</li> <li>Providing CRISMAS project with information and expertise</li> </ul>
4.	District Commission for Emergencies (29)	Participating in the project activities	Informing and strengthening capacities on disaster risk management	- High importance - Big influence - Providing CRISMAS project with information and expertise
5.	Ungheni District Council/President supporting staff	Participating in the project activities and assuring their visibility	Informing and strengthening capacities on disaster risk management	<ul> <li>High importance</li> <li>Big influence</li> <li>Decision-making position</li> </ul>
6.	UNDP project "Moldova Climate and Disaster Risk Reduction"	Sharing experience and providing available information for risk identification and assessment	<ul> <li>Mutual informing</li> <li>Assistance and consultancy</li> </ul>	- High importance - Big influence - Providing CRISMAS project with information and expertise
7.	Service of Civil Protection and Emergencies	Providing assistance and consultancy for the risk assessment process	<ul> <li>Mutual informing</li> <li>Assistance and consultancy</li> </ul>	- High importance - Big influence - Providing expertise, information and specialized knowledge
8.	Department of emergencies Ungheni	Actively participating in project activities and it is responsible for all-hazard identification and assessment	<ul> <li>Strengthening capacity in risk management</li> <li>Expertise diversification</li> <li>Replication of good practices from the Netherlands, Norway, Italy, Bosnia and Herzegovina</li> </ul>	- High importance - Big influence - Providing expertise, information and specialized knowledge
9.	Police Inspectorate of Ungheni	Actively participating in project activities and it is responsible for the technological	<ul> <li>Increasing capacity in risk management</li> <li>Accountability for the development of</li> </ul>	- High importance - Big influence

		risk identification and assessment (accidents)	disaster risk management policy	<ul> <li>Providing information and specialized knowledge</li> </ul>
10.	Ecological Inspection of Ungheni	Actively participating in project activities and it is responsible for the natural risk identification and assessment	<ul> <li>Increasing capacity in risk management</li> <li>Accountability for the development of disaster risk management policy</li> </ul>	<ul> <li>High importance</li> <li>Big influence</li> <li>Providing information and specialized knowledge</li> </ul>
11.	Chief architect of Ungheni District	Actively participating in project activities and it is responsible for the natural risk identification and assessment	<ul> <li>Increasing capacity in risk management</li> <li>Accountability for the development of disaster risk management policy</li> </ul>	<ul> <li>High importance</li> <li>Big influence</li> <li>Providing information and specialized knowledge</li> </ul>
12.	Ungheni Public Health Center	Actively participating in project activities and it is responsible for the socio-biological risk identification and assessment	<ul> <li>Increasing capacity in risk management</li> <li>Accountability for the development of disaster risk management policy</li> </ul>	<ul> <li>High importance</li> <li>Big influence</li> <li>Providing information and specialized knowledge</li> </ul>
13.	Ungheni Health Center	Actively participating in project activities and it is responsible for the socio-biological risk identification and assessment	<ul> <li>Increasing capacity in risk management</li> <li>Accountability for the development of disaster risk management policy</li> </ul>	<ul> <li>High importance</li> <li>Big influence</li> <li>Providing information and specialized knowledge</li> </ul>
14.	General Financial Department	Actively participating in project activities	<ul> <li>Increasing capacity in risk management</li> </ul>	- High importance - Medium influence
15.	Department of Social Assistance and Family Protection	Actively participating in project activities, especially in the socio-biological risk identification and evaluation	<ul> <li>Increasing capacity in risk management</li> <li>Accountability for the development of disaster risk management policy</li> </ul>	<ul> <li>High importance</li> <li>Big influence</li> <li>Providing information and specialized knowledge</li> </ul>
16.	Department of Agriculture and Food	Actively participating in project activities, especially in the natural risk identification and evaluation	<ul> <li>Increasing capacity in risk management</li> <li>Accountability for the development of disaster risk management policy</li> </ul>	<ul> <li>High importance</li> <li>Big influence</li> <li>Providing information and specialized knowledge</li> </ul>
17.	Department of Education	Actively participating in project activities, especially in the socio-biological risk identification and evaluation	<ul> <li>Increasing capacity in risk management</li> <li>Accountability for the development of disaster risk management policy</li> </ul>	<ul> <li>High importance</li> <li>Big influence</li> <li>Providing information and specialized knowledge</li> </ul>
18.	Section of constructions, municipal services and roads	Actively participating in project activities, especially in the technological risk identification and evaluation	<ul> <li>Increasing capacity in risk management</li> <li>Accountability for the development of disaster risk management policy</li> </ul>	<ul> <li>High importance</li> <li>Big influence</li> <li>Providing information and specialized knowledge</li> </ul>
19.	Service of land relation and cadastre	Actively participating in project activities, especially in the natural risk identification and evaluation	<ul> <li>Increasing capacity in risk management</li> <li>Accountability for the development of disaster risk management policy</li> </ul>	<ul> <li>High importance</li> <li>Big influence</li> <li>Providing information and specialized knowledge</li> </ul>
20.	Public Administration Department	Actively participating in project activities	<ul> <li>Increasing capacity in risk management</li> <li>Accountability for the development of disaster risk management policy</li> </ul>	<ul> <li>High importance</li> <li>Big influence</li> <li>Providing information and specialized knowledge</li> </ul>
21.	City halls (33)	Actively participating in project activities and providing information for natural, technological and socio- biological risk identification and assessment	<ul> <li>Increasing capacity in risk management</li> <li>Expertise diversification</li> <li>Replication of good practices from the Netherlands, Norway, Italy, Bosnia and Herzegovina</li> </ul>	<ul> <li>High importance</li> <li>Big influence</li> <li>Providing information and specialized knowledge</li> <li>Decision-making position at local level</li> </ul>
22.	Municipal Entreprise "Apă-Canal" Ungheni	Actively participating in project activities and provide information on technological risks	Increasing capacity in risk management	- High importance - Medium influence - Having information and expertise
23.	State Enterprise "Irrigation Technological Station Ungheni"	Actively participating in project activities and provide information on technological risks	Increasing capacity in risk management	- High importance - Medium influence Having information and expertise
24.	Local Mass media - PP "Expresul", PP "Unghiul" (2)	Actively participating in project activities and promoting its outcomes	Informing about the best practices on disaster risk management from the Netherlands, Norway, Italy, Bosnia and Herzegovina	High importance     Big influence     Having media techniques and tools of     promoting the project outcomes





Ungheni district, due to its geographical location and due to the existing economic potential, could be affected by various types of disasters or exceptional circumstances of natural character (floods, earthquakes, landslides, snow, frost,

strong winds, hail, torrential rain, whirl), socio-biological risks (epidemics) and technological risks (accidents with potential danger of release of dangerous chemicals, accidents with potential danger of radioactive substance emission, fires, explosions, and transport accidents). Disasters cause numerous casualties and property damage, that directly affects the economic and social development of a community. Disasters have become common and frequent, beeng increasingly difficult to predict. In these circumstances, it is necessary that efforts for preventing disasters and mitigating their impact on society should become integral parts of sustainable development policies of the community and this approach is promoted by CRISMAS project through the proposed activities.

Within CRISMAS project the risk identification and assessment of Ungheni district are carried out and the results will be included in the district strategy on disaster risk management, which will include measures to be taken before, during and after disasters. A big advantage within the process of the district strategy development on disaster risk management is that we can be inspired by the experience of the partner cities and regions of the project and especially by the experience of partners from the Netherlands, gained in the previous projects MiSRaR and PRISMA. At Ungheni district level a working group has been established, being composed of local stakeholders (representatives of local public authorities, private sector and civil society) that are involved in identifying and assessing risks, analyzing the situation in the district, developing the emergency profile of Ungheni district and participating in drafting the Action Plan for the district strategy on disaster risk management with concrete measures and project ideas. This strategy will ensure the Ungheni district resilience to disasters.

# 1.2 CRISMAS project goal and objectives

CRISMAS project aims to support the partner cities and regions in the implementation of evaluation and management methodologies of all kinds of hazard risks, including the sectoral and cross-border cooperation dimension. The project will build a broad community at European level for experts from governmental bodies responsible for risk assessment and management to foster cooperation and exchange

of experience within the European Union and improve links between local policies and stakeholders involved in the disaster risk management cycle (prevention - preparedness - response - recovery). Thus, the efforts of the project partners will be focused on the transfer of best practices, on enhanced cooperation between local /regional governments within the EU and between local/regional and national levels, strengthening the capacity on risk assessment and management and raising awareness of partners regarding risks and developing the local networks, sharing experience on cooperation between governments and other sectors.

In this context, CRISMAS project will create a specific learning environment for project partners and local stakeholders, as well as a virtual learning community open to all local/regional governments within the EU. The results of this learning community will be documented and shared at EU level. Technical support and methodological advice to project partners regarding risk management process and implementation of methodologies for risk assessment and planning processes will be considered and used to create networks on the involvement of local stakeholders and project partners. Dutch expertise will be the basis for the all-hazard assessment and risk management planning for the project partners and concrete policy recommendations for reducing risks and increasing readiness to risks will be suggested by the Dutch experts.

To identify the main types of hazards in Ungheni district, to design the potential areas affected by these dangerous phenomena and to provide hazard mitigation measures and increase resilience are among the important objectives of this project. In this regard, we have adopted the common typology accepted and used according to the dominant driving agent; so there are three major categories of items such as natural hazards, technological and socio-biological hazards, which have been later subdivided, detailed and localized at Ungheni district level. Among the final objectives of this project, the provision of appropriate measures to reduce the effects of hazards and to increase resilience of Ungheni district is included.

# 1.3 The place/role of risk identification in the risk assessment process

The disaster risk assessment with the community participation has three interdependent phases, as follows:

<u>**Risk identification**</u> includes the vulnerability and hazard assessment. The hazard assessment covers the identification of nature and behavior of hazards affecting the community. There are also sources of threat identified, as well as the

level of probability of their occurrence. The vulnerability assessment identifies what items are at risk and why they are at risk (the reasons of their vulnerability). Community capacities are also identified to determine the community ability to cope with potential risks.

<u>**Risk analysis**</u> aims to develop various risk scenarios and determine the degree of risk and risk characteristic. This includes the estimation of potential damages and losses that may be experienced due to the occurrence of a hazard. This determines the likelihood and the consequences and, therefore, the level of risk. Risk analysis takes into account the range of potential losses and damages and how they might appear. The capacity and resource assessment falls into this category too.

<u>**Risk prioritization**</u> implies the comparison of risks with the preset criteria or elements. Most important risks from the perspective of vulnerable persons are identified within this process. This also stimulates the decision-making process regarding the possible strategies that should be developed.

Within CRISMAS project the three stages of risk assessment process will be carried out and the partners will go further at the development of a public policy on risk management. This report describes the climate risks and disaster risks identified in Ungheni district, Republic of Moldova. The risk identification took place with the stakeholder involvement from Ungheni district, and the report was developed by the local implementation team of CRISMAS project. The process of risk identification and rapid risk assessment has included several phases: collection of general information, including data on disasters and natural hazards; verification of data collected from the local public authorities; meetings with the consultancy and advisory structures created within CRISMAS project, on-site meetings with the local public deconcentrated and decentralized services responsible for risk prevention and management of Ungheni district and presentation of the outcomes of the risk identification process of Ungheni district to local public authorities.

# **CHAPTER 2. FEATURES OF UNGHENI DISTRICT IN RISK FIELD**

# 2.1 Geographical layout and climate features

<u>Area. Neighbourhoods.</u> From geographical point of view, Ungheni District is situated in the central-western part of the Republic of Moldova, on a total area of 108,3 thousand hectares/10830 km<sup>2</sup>, from them 49,9 thousand ha - agricultural grounds, 28,8 thousand ha - forests and other grounds with forest vegetation, 4,7 thousand ha - water resources.

Ungheni District is bordering with Romania in the west, with Calarasi and Telenesti Districts in the east, with Nisporeni District in the south and Falesti and Singerei Districts in the north.

Ungheni District has 33 territorial-administrative unities of level I: 2 towns (Ungheni and Cornesti), 12 villages and 19 communes with 60 localities. Ungheni District has 107755 inhabitants (data from 01.01.2015). Ungheni City is the residence centre of the district.

Geographical location of Ungheni District is represented in Figure 1.



<u>Climate regime</u>. Climate in Ungheni District has a well-marked temperate continental character due to its geographical position, relief and influence of air masses that are moving at temperate latitudes. Winter is mild and short, summer is hot and long. Average annual value of relative air damping is 78 %, and the highest values of damping are registered in winter.

Precipitations fall as rain starting with the third decade of March and ending with the same decade in November (7 months), in the other year interval (5 months) the precipitations fall as snow and sleet, then there may be registered on the average 33 - 41 days of snowfall. The richest in precipitation months of the year are May, June and July, with the highest values in June, when the month average is about 75-80 mm.

The lack of precipitations for a longer period of time of 10-14 days leads to drought that has negative consequences on the economy.

The predominant wind direction is north-west being determined both by the circulation of air masses and orientation of the high relief, as hilly massifs and plateaus and below relief, as hilly plain.

The average annual temperature is positive and oscillates between 8°C and 9°C.

Annually, on the district area there are dangerous hydro meteorological phenomena (storms, heavy rainfalls accompanied by hail and thunder), that lead to important material damages.

The district relief is specific to the plateau of Central Moldova and is featured by areas of low hills, large valleys, river meadow of Middle Prut.

## 2.2 Hydrographical network

The hydrographical network of Ungheni District is represented by 1 river, 11 runnels, 95 springs, 130 pools, lakes and rain waters. The main alimentation of rivers, runnels and water basins is made from rains and snows.

The main river Prut runs on the territory of Ungheni District, between the locality Gherman and locality Frasinesti and crosses the territory on a length of 60 km, from the total length of 967 km. Other 10 rivers and runnels, including the affluents of the river Prut, that cross and run on the territory of Ungheni District are the following: Vladnic - with a length of 5,698 km, Delia -2,5 km, Ichel -2,5 km, Garla Mica -3,95 km, Garla Mare -1,3 km, Cula - 1,05 km, Soltoaia - 0,92 km, Bratuleanca - 0,85 km, Valcea Bailesti - 0,85 km, runnel without name - 0,85 km, Varsovca - 0,8 km. Ungheni District has 95 springs as well, from them only 57 are arranged.

The district hydrographical network is completed by 130 water basins (pools and storage lakes) that lie on an area of more than 1500 ha. The majority of water basins are created artificially by baring valleys, being used for joint use, irrigation, pisciculture, entertainment, watering animals, pasture, resting areas. Rather worrying is the situation regarding lakes administration, the majority of them are given in rent for different time periods, some of them are not adequate for using and are transformed in wilderness. The following lakes are considered to be dangerous water basins: "Delia" - Ungheni City, "Satului" - commune Petresti, "Principal" - village Cetireni, "Chirpiceni" - commune Sculeni, "Macaresti" - commune Macaresti, "Satului" - village Chirileni.

A feature of Ungheni District is that from the total quantity of atmospheric precipitations fallen on the territory in a year only over 14- 15 % feed rivers and lakes, the biggest part is consumed by infiltration and evaporation.

The water basins located on Ungheni District area have a very important role in maintaining the hydro regime of rivers they are on; they retain big quantities of water during the maximal running periods of March-June and supplement the running during low levels. Thus, more agricultural areas and pastures are protected and preserved from floods.

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Due to the existent hydrographical regime, in Ungheni District is possible to happen some phenomena with serious consequences, especially, during the high waters, that may need to apply measures for preventing the population from the areas with danger to be affected and organizing actions for population, animals and material goods evacuation. Also, accumulations from rivers and pools of local interest, whose dams are made only of soil, provide the danger of floods amplification if they are broken.

Another feature of the existent hydrographical regime is spring high waters and floods conditioned by heavy rains of summer, for their prevention, in Ungheni District, are needed hydro technical constrictions for localities protection.

#### 2.3 Critical infrastructure

The very complex and dynamic process of society globalization, in the last 10-15 years brought a number of new concepts of vulnerability that influence decisively aspects concerning national security, people and information, national and international institutions safety. With the interdependences increasing, the security of citizens, social communities, nations and states is in close connection to a number of infrastructure systems that ensure the essential services of all social life fields. Their continuous functioning is, in this way, a vital issue for a good society functioning.

An infrastructure or a component is considered critical according to the strategic position in the general system and, especially, according to the interdependences by which is connected to other components or infrastructures. The **Directive 2008/114/CE of European Council**, regarding the identification and designation of European critical infrastructures and the assessment of their protection improvement need, adopted in December 08, 2008, provides the following definition:

"Critical infrastructures refer to those objectives, networks, services, physical activities and IT means that are too vital for nations, that their removal from service or destruction may have a serious impact on the citizens health, safety, security or economic welfare, or on the effective functioning of governing act in member states".

In comparison, approaching at NATO level of Critical Infrastructure Protection is different from the EU one because it is viewed from the perspective of civil emergency protection. For this reason, there are not set up common rules and norms in the field.

Critical infrastructure systems for which there are set up special protection measures, within EU, are:

- ✓ Facilities and distribution networks in energetic field (especially facilities for energy production, oil, gas, storage facilities and refineries, transportation and distribution systems);
- Communication and information technologies (telecommunication, radio broadcasting systems, programs, IT material and networks, including Internet etc.);
- ✓ Institutions that ensure financial-banking sector and stock and investment markets;
- Platforms and health system institutions (hospitals, patient care facilities and blood banks, laboratories and pharmaceutical products, emergency, searching and rescue services);
- ✓ Production and distribution means for food sector;
- ✓ Water supply (reserves, storage, treatment and distribution networks);
- Railway, road, air, water transportation and used afferent facilities (airports, seaports, intermodal facilities, railways, mass transit networks, traffic control systems);

- Production, storage and transportation of hazardous products (chemical, biological, radiologic and nuclear materials);
- ✓ Administration (army, gendarmerie and police, basic services, facilities, information networks, actives, important places, national monuments).

Protection of a critical infrastructure is constituted from the totality of set up measures for risk reduction of functioning blocking or its destruction.

In this context, in our country there still exist debates that refer to the identification of system categories/locations that may be framed in critical infrastructure, respectively, of those society vital structures that, by their discontinuity, lead to the impossibility to accomplish the duties. Inexistence of a unique language between the stakeholders from public - private field, that facilitates interstate communication as well, determines the incapacity to create a unique code for initiating the dialogue regarding the risk management strategy necessary to activate the entire action flow. An analysis of a critical infrastructure risk potential entails an integrated approach of all strategies, procedures and programs regarding the prevention, provision, response and recovery methods in disasters and emergencies.

In the Republic of Moldova, the concept of "critical infrastructure" is mentioned very vaguely in National Programs, although, in some aspects, this concept being realized in a certain measure by state institutions (Emergencies Department, MIA, Moldova-Gaz, GAS-UnionFenosa etc.). So it is mentioned that we don't have legislation that would foresee exactly the protection of "critical infrastructures" and nor specialized institutions in this sense, a disadvantage being the fact that there is a lack in the collaboration between state institutions.

## 2.4 Ungheni District specific

**Used sources:** Development Strategy of Ungheni District 2012 - 2020 (<u>http://www.crungheni.md/Concept</u>) and statistic data provided by mayoralties, decentralized public services.

According to the data of ED and statistics registered at Ungheni District level, each locality of the district provides one or more increased risk situations concerning potential disasters, as unauthorized or authorized dumps, but not arranged, landslides areas, lack of access ways, lack of qualitative drinking water, flood areas, areas where there are placed chemical storages or other dangerous objects, number of vulnerable persons, houses situation, presence of steeps and situation of

intercommunity roads. These disasters may be prioritized at local level, but at district level it is necessary to inventorize them.

The actual situation in Ungheni District provides more difficulties regarding the management of emergencies, from them the most alarming are:

- Lack of access ways in certain areas that reduce the possibility to provide assistance in time, as well as reduce the access to other different helping means.
- Lack of functional alarming systems.
- The landslides cover a big part of localities.
- Bad quality of drinking water.
- Not arranged and unauthorized dumps that pollute the environment, waters, soils, affecting population health.
- Lack of sewerage and lack of wastewater treatment plants.
- The poor state of dams and dykes.

- Low level of informing, especially, citizens who do not assimilate the information provided by ED or ignore it that increases their risk. Naive and ignorant perceptions of situations that is a danger for human health.
- Lack of a dialogue between departments and some horizontal collaboration between the workers from different fields.
- Lack of vulnerable persons' preparation for disasters.

# CHAPTER 3. UNGHENI DISTRICT PROFILE REGARDING DISASTER RISKS - RISK CLASSIFICATION AND PRIORITIZATION

# 3.1 Definition of elements of risk (probability, effect, vulnerability)

The concepts of disaster, risk of disaster and vulnerability were elaborated and developed in frame of the International Strategy of United Nations for Reducing Disasters (UNISDR).

Since now, the notion of disaster has not been largely used in the legal specialty in Republic of Moldova. For events and situations that fall within the definition of disaster there was used particularly the notion of "exceptional circumstances", which has a largely similar interpretation of the term "disaster" and that is defined in official documents of UN.

According to the Government's Decision No. 1076 from November 16<sup>th</sup> 2010 "an exceptional situation is the situation on a certain territory as a result of a failure, dangerous natural phenomenon, catastrophes, natural disasters or having other nature that may cause or have caused human casualties, damages to human health or the environment, considerable property damages and have

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affected human vital activity conditions".

Assuring a common terminology offers coherency to the process of risk assessment on national level and assures harmonization of used vocabulary in the methodologies of risk assessment from EU member states and in UN documents. Forwards there are lusted the terms used in this report.

**Disaster** "is a serious disturbance of one community activity, followed by human causalities, material, economic damages or environmental losses, exceeding the affected community's capacities to cope with the situation by using its own resources".

#### 1. Hazard

Is a dangerous process or phenomenon, substance, human activity or situation that may cause human casualties, injuries or that may generate another impact on health, damages to properties, losses of livelihoods and services, social disruption and economic or environmental damage.

The hazards may be classified depending on origin in 2 types:

- natural hazard (natural process or phenomenon)

- anthropic hazard (man-made process or phenomenon).

#### 2. Risk

The risk is the mathematical estimation of the probability of human casualties, property damage and environmental damage, social and psychological damage over a reference period, respectively a future and in a given area, for a specific type of risk event.

The risk is defied and a product between probability of disaster to be produced and its impact.



Risk matrix represents a graphic instrument for ranking and viewing risks which allows comparing different types of risks or scenarios and consider the probability of values and impact.

#### 4. Exposure

Exposure is represented by totality of people, property, systems or other elements presented in hazard areas that may suffer some lossev. Expose has a variable character depending on the moment when the events occurs, fact that may generate different impact.

#### 5. Vulnerability

Represents the measure where a system may be affected as a consequence of impact with a hazard that includes the totality of physical, social, economic and environment conditions that increase the susceptibility of respective system.

Same as hazard, vulnerability is an indicator of a future state of a system, defining the level of system's (in)capacity to cope with the expected stresv.

Vulnerability may be voluntary or involuntary. It depends on infrastructure and socio-economic conditions within a space; reducing exposure to a hazard leads implicitly to reducing the vulnerability.

#### 6. Impact

Represent the negative effects of a hazard expressed in terms of impact towards population, economy and environment and social and psychological impact.

#### 8. Impact towards population

Represents a type of impact that refers to number of causalities, number of injured persons, as well as the number of evacuated and isolated personv.

#### 9. Economic and environment impact

Economic impact refers to the quantification of totality of material and economic losses generated by risk phenomenon, expressed as amount in national currency and percentage of GDP. Environmental impact refers to the affected surface as consequence of risk event, expressed as outcome between the affected area, number of species and number of years necessary for restoration.

#### 10. Social and psychological impact

Social and psychological impact refer to effects towards social stability and takes into account daily interruptions of community's / society's activities caused by risk events, as well as psychological impact on citizenv.

#### 11. Probability

Probability refers to the possibility that a hazard will occur within a predetermined period of time, taking into account the available information.

#### 12. Risks assessment

Process of identification, analysis and estimation of risks, in order to determine risk acceptability.

#### 13. Risk identification

Represents the process of risk identification, acknowledgement and description. Risk identification involves identifying risk sources, events, causes and potential consequences of eventv.Risk identification may involve utilization of historical data, analysis, informed opinions of experts and stakeholders' needv.

#### 14. Risk analysis

Is the process of understanding of risk nature and determining risk level.

#### 15. Risk estimation

The process of comparing the results of the risk analysis with risk criteria as to determine whether the risk and intensity are acceptable or tolerable.

#### 16. Risk management

Risk management represents systematic application of policies, procedures and practices of management of communication, consulting, background and assessment establishment, treatment, monitoring and re-assessment of risk.

#### 17. Scenario

The scenario is a representation of a risk or multi-risk leading to significant impact selected for detailed assessment of a particular type of risk that is representative, or that may be an informative example or an illustration.

In order to understand and to use correctly the terms, it is important to take into account that fact that the notion of risk has two distinct interpretations: first interpretation is focused on *possibility or probability of an event*; the second is focused on *consequences or effects of an event*, in particular related to possible damages in relation to a reason, place or period of time. The definition "disasters' risks" used in the report is based on the second interpretation, used mostly in the international specialized terminology and in the concept of disasters' risks management.

Disks' disasters are determined depending on <u>combination between</u> <u>probability of an event and its negative consequences</u>, which in turn are determined by vulnerability of exposed elements (people, goods, organizations, communities, societies, etc.) and define the seriousness of negative consequencev.

Therefore, a disaster occurs when a hazard seriously affect people and their livelihood.

#### Disaster Risk Equation:

Hazard (H) X Vulnerability(V)

Risk (R) =  $\_$ 

Ability to overcome

Disasters' risks profiling is a necessary action in order to define disasters' risks management structure and to establish actions and priorities as regards interventions as to increase the level of resilience against disasterv.Disasters' risks profile is determined by the combination between hazards, vulnerabilities and capacities to cope with them.

According to the Government Decision No. 1076 from November 16<sup>th</sup> 2010, "exceptional situations" are classified depending on two criteria:

(1) Proportion of extension and consequences seriousness

(2) Particularities of its development.

Depending on proportion of extension and seriousness of consequences there may be distinguished: object, local, territorial, national and cross-border exceptional situationv.Depending on particularities of development, exceptional situations are divided in the following types: natural, technical, biological-social.

Using the term "exceptional situation" in the national legal framework was accompanied by the approval of rules of accumulation and information presentation in field of population and territory protection in case of emergenciev. In this context, profiling hazards and disasters in Republic of Moldova was carried out by using accumulated information as regards emergencies with formalized rules for classification and collection.

#### **Vulnerabilities**

Vulnerabilities assessment represent another key element of the concept of disasters risks management. According to the terminology of UN/UNISDR, vulnerability is defined by *characteristics and circumstances determined by physical, social, economic and environment factors or processes that may worsen the effects of disasters / hazardv*.Vulnerabilities may vary substantially over time.

**Physical vulnerabilities** are determined by features such as geo-physical structure of the territory, population density, placement and fitting out of the territory, infrastructure's design, characteristics and quality, especially of critical infrastructure, etc.

Social vulnerabilities are caused by people's, organizations' and communities' inability to resist to hazards impacts due to inherent characteristics of social, institutional and cultural values interaction. These vulnerabilities are tied to the level of population's, communities' and society's wellbeing, by the level and quality of education and knowledge, inclusively by ensuring their own security and heritage, the level of security and respect for human rights, the functionality of governance and collective organizational systems, the value of legal norms and traditional customs and beliefs, etc.

**Economic vulnerabilities** are caused by population's, community's and nation's economic statuv.Frequently, poverty and poor economic status are reasons for a higher vulnerability towards disasters due to the lack of resources in order to create resistant structures and to undertake protection measures as protect against their negative effectv.

**Environmental vulnerabilities** are especially caused by breakdown and degradation of natural resourcev.

Major vulnerabilities towards disasters for population, economy, environment and territory of Republic of Moldova are caused by: geo-physical structure of the territory, significant changes of the climate, environment degradation, wrong management of natural resources, establishment of human settlements in dangerous areas, rapid urbanization, wrong or inefficient policies of territory's development and infrastructure, reduced efficiency of central and local public administration, increasing level of poverty, underfunding efforts of preventing and reducing negative effects of disasters, etc.

Vulnerabilities peculiar for Republic of Moldova are influenced by a number of objective and subjective factors that contribute to their expansion and amplification, including:

✓ Significant importance of agriculture for national economy (peculiar for Ungheni district too) and major dependence of agriculture on climate conditionv.Due to its great dependence on climate conditions, agriculture is the most vulnerable sector of the Moldavian economy. Constant increase of average annual temperatures and decreasing quantity of precipitations will lead to reduced agricultural productivity, desertification, soil salinization and could affect the country's food security.

 ✓ Historical placement of localities and economic infrastructure centres in areas with a high potential risk of floodv.Around 30% of Ungheni district's localities (24 villages) are situated in flooding areas of Prut river, which is extremely vulnerable to floods effectv.

 $\checkmark$  The status, quality and difficulties of management of critical infrastructure.

In Ungheni district there are around 135 lakev.Most dams and other critical infrastructure facilities were built over 40 years ago and requires constant monitoring and restoration. Water supply systems of large cities operate at limited technical capacity and lack alternative sources of water supply that allows operation in case of disaster. Most hospitals and educational institutions have no alternative sources of electricity.

✓ Existence near the national territory of infrastructure and industrial objects presenting major risks for Republic of Moldova and the difficulty to counteract the risks generated by them. In the immediate vicinity of Ungheni district there are dams, factories and large enterprises, representing major risks of

disasters for the district. Despite the fact that there are valid international agreements, Republic of Moldova is limited in its capacity to influence actions to reduce risks from those sources and cannot assure exclusion of devastating consequences for the population.

- ✓ Degradation of sweet water resources and increasing risk of water deficit. Since now, around 44% of population doesn't have access to secure drinking water sourcev.Although cities and over 65% of rural localities have centralized systems of drinking water supply, only 50% of these systems are in good technical conditionv.
- ✓ High level of population's poverty, especially in rural areas, as well as low level of knowledge and culture as regards personal community and environment security. Such a combination of factors lead, among others, to utilization uncertified and dangerous electrical and thermic supplies, their installation by violating technical standards, ignoring the rules of supervision and using. The same factors determine the quality of rural and urban housing infrastructure, level of complying with building standards, using widely inadequate construction materials and techniquev.
- ✓ Globalization effects, significant increase of international intensity of passengers and international economic exchangev.Recent examples from international experience prove cases of contagious diseases spreading rapidly with origins in distant regions of the globe (viruses, avian flu, Anthrax, etc.) and that are less known in Moldova or for which counteract there is insufficient capacity at national / district levelv.This expansion of emergencies areas is favoured primarily by frequency of human international contacts and the necessary control / prevention actions difficulties.

#### Responsibilities regarding risks analysis and management

# **Documents of reference**

Disasters risks identification report of Ungheni district is drawn up based on:

- ✤ Law No. 271-III from November 9<sup>th</sup> 1994 regarding civil protection;
- Law No. 93/2007 regarding Civil Protection Services and Emergencies;
- Law No. 212 from June 24<sup>th</sup> 2004 regarding Emergency, Siege and War estate;
- Government Decision No. 1076 from November 16<sup>th</sup> 2010 regarding classification of emergencies, collection and presentation of information regarding population and territory in case of emergencies;

- Parliament Decision No. 1318-XII from February 3<sup>rd</sup> 1993 regarding Republic of Moldova accession to some international conventions;
- Law No. 267 from November 9<sup>th</sup> 1994 regarding protection against fires;
- Government Decision No. 1340 from December 4<sup>th</sup> 20012 regarding Commission of Emergencies of Republic of Moldova;
- Government Decision No. 282 from March 14<sup>th</sup> 2005 regarding approval of Regulation of trainings in field of civil protection;
- Government Decision No. 1048 from October 6<sup>th</sup> 2005 regarding approval of Regulation regarding organization of transmission and notification in case of emergency or in case of occurrence of an emergency;
- Government Decision No. 928 from October 8<sup>th</sup> 2010 regarding approval of the Regulation regarding organization and supervision of the state in field of civil protection;
- Government Decision No. 830 from 20.11.2015 regarding measures of preparation of Civil Protection of Republic of Moldova for 2016.

## Organizational structures

Responsibilities regarding disasters risk analysis and management fall on all factors, which according to the Law, have duties or ensure supporting positions regarding territorial emergencies prevention and management.

Organizational structures and institutions having responsibilities related to emergencies management on Ungheni district level are:

- a) Ungheni County Council
- b) Local Public Administrations of level I (Town Halls)
- c) Commission for Emergencies
- d) Territorial structure of Ministry of Domestic Affairs:
  - Department of Emergencies Ungheni
  - Police Inspectorate Ungheni
- e) Public institutions and decentralized public authorities:
  - Ecological Inspectorate Ungheni
  - State Enterprise for Silviculture "Silva-Centru" Ungheni
  - Municipal Enterprise Apa Ungheni
  - State Enterprise "Technological Station for Irrigation Ungheni"
  - Department of construction, communal household and roads
  - $\circ~$  Department of Agriculture and Food / Public Security

- Service of land and cadastre
- Department of Social Assistance and Family Protection Ungheni
- Department of Education Ungheni
- Centre of Public Health of Ungheni district

# Responsibilities or bodies and authorities having duties in the field

# 1. County Council of Ungheni:

- a) To carry out execution of ensuring civil protection activity in the territories and objects of national economy that are subordinated and to bear responsibility for the civil protection condition;
- b) To undertake in due terms and to carry out the whole load of actions for civil protection;
- c) To carry out a complex of measures and actions as to increase security and stability of administrative-territorial units operation, forestall or minimize the likelihood of emergencies;
- d) To take needed measures of protection of employees and population in conditions of emergencies;
- e) To create, train and maintain in state of readiness formations of Civil Protection, to train workers and population to learn the processes of defence and action under emergency circumstances;
- f) To organize and to carry out rescue works and other urgent works under emergencies;
- g) To create reserves of technical-material equipment, medicines and other means in order to ensure security and stability of operation entities, to accumulate necessary capital of security constructions, to maintain them under permanent readiness for persons exposed to danger accommodation.

# 2. Service of Civil Protection and Emergencies through Department of Emergencies Ungheni

- a) To participate to the elaboration and accomplishment of state policies in the field of people's and territory protection or emergencies and /or fires triggering, ensure chemical and radiative security;
- b) To elaborate and to apply regulation standards related to ensuring population's and territory safety in case of danger or triggering of emergencies and /or fires;

- c) To contribute to the elaboration of standards and rules in field of civil protection and protection against fires, to approve projects of standards, technical conditions, standards and rules containing regulations in this field;
- d) To carry out rescue and other release emergency activities for the liquidation of consequences of emergencies;
- e) To elaborate special technical-scientific programmes, focused towards prevention of emergencies;
- f) To inform public authorities, other institutions and population about problems related to prevention or liquidation of emergencies consequences, fires, ensure chemical and radiative security;
- g) To maintain in permanent readiness the staff forces of the Service;
- h) To enhance the technical-material basis of the Service;
- i) To participate to the activities of the commissions of
- j) To participate in the committees of final reception of constructions and related facilities funded from the state budget or local budgets.

# 3. Commission of Emergencies

- a) Coordinate the activity of state system of prevention and liquidation of emergencies;
- b) Analyse received data regarding occurred situations, study character, causes od triggering and proportions of emergencies, approve decisions regarding applying of emergency measures, as well as some further measures of population, territory and patrimony security, localization and liquidation of emergenciev.Bodies of central and local public administrations inform the Commission about the situation through the Service of Civil Protection and Emergencies of the Ministry of Domestic Affairs;
- c) Control and analyse the way of carrying out the rescue activities and emergency interventions, approve measures as to assure adequately with needed forces and means;
- d) When necessary, decide on evacuation of the population from the affected areas;
- e) Examine reports of decision-makers regarding carry out of rescue-releasing activities and providing the first aid to victims;
- f) Assure population information through mass media about causes and proportions of emergencies, measures taken by Government as to prevent and

liquidate their consequences, population's and territory protection, familiarize the population with the rules of behaviour in emergencies;

g) Inform the leaders of neighbouring countries about the outbreak of emergency of cross-border type on Republic of Moldova territory, existing danger character for the environment and population of these countries and taken measures by the Government of Republic of Moldova as to liquidate them; in case of a large proportions emergency there is launched the international appeal for providing aid with rescue forces, material and financial resources, if needed coordinate with mentioned countries the actions of liquidation of emergenciev.

## 3.2 Description of priority risks for Ungheni district generating emergencies

Geo-climatic conditions of our country and the technological explosion of recent decades have paved the existence of risk types. According to the provisions of the **Government Decision No. 1076 from 16.11.2010** regarding classification of emergencies and the way of information accumulation and presentation in field of population and territory protection in case of emergencies, depending on types of specific risks, in Ungheni district there were identified the following types of risks:

## <u>A. Natural risks:</u>

#### a. Dangerous geophysical phenomena::

• Earthquakes.

#### b. Dangerous geological phenomena:

- landslides;
- collapses;
- soil erosion.
- c. Dangerous meteorological and agro meteorological phenomena:
  - storms;
  - large hail;
  - torrential rains;
  - snowfall;
  - strong storms;
  - strong ice;
  - drought;
  - frosts;

• heavy storms with thunderstorm

# d. Dangerous hydrological phenomena:

- High level of water (flooding);
- Water overflow;
- Floods rains (snow);
- e. Emergencies caused by changing the state of the earth (soil, subsoil, the landscape):
  - Intensive soil degradation, desertification of vast areas, caused by erosion, salinization, swamp etc. .;

# **B.** Technological emergencies

- a. Transportation accidents (catastrophes):
  - transportation accidents on bridges and passages of intersection with the railroad;

# b. Fire, explosion, explosion hazard:

- explosion or fire in buildings, communication and technological equipment of industrial facilities;
- fires or explosions where are stored flammable substances, flammable and explosive and their transportation;
- fires or explosions in residential buildings and social-cultural constructions;
- fires or explosions at dangerous radioactive objectives;
- detection of unexploded ammunitions.
- c. Breakdown with release of (with risk of release) of hazardous chemical substances:
  - Breakdown with release (with risk of release) of hazardous chemical substances during the keeping (burial) process;
  - sudden release of methane and other toxic substances and gasev.
  - Breakdown to the natural gas distribution networkv.

# C. Biological-social risks

- a. Human contagious diseases:
  - group infections with dangerous contagious diseases;
  - epidemic.
- b. People's intoxication:
  - People's intoxication because of food consumption;
  - People's intoxication because of water consumption;
  - People's intoxication because of toxic and other substances (group intoxications).

- c. Contagious diseases of farm animals:
  - enzootic;
  - epizootic.

## Definitions for destructive natural phenomena:

- Iandslide = movement of rocks that form the slopes of hills, cliffs of hydrological or other land improvement works;
- **earthquake** = brutal rupture of rocks in the earth's crust due to tectonic plate movement, which generates a vibratory ground motion that can result in human casualties and material destruction;
- **4** dangerous meteorological phenomena = violent weather phenomena that affect relatively large areas of land in the long term, causing casualties, property damage and environmental degradation;
- floods = land cover with a layer of water in stagnation or motion that by its magnitude and duration cause human casualties and material damage which disrupts the smooth conduct of activities of social-economic affected area.

# <u>31</u> Definitions for events with particularly serious consequences on the environment caused by accidents (technological):

- *chemical accident* = uncontrolled release into the environment of toxic substances during its production, storage or transportation;
- **biologic accident** = uncontrolled release into the environment of a pathogen agent during its production, storage, handling or transportation;
- **uclear accident** = event affecting nuclear facility and cause irradiation and contamination of personnel, population and the environment above the permissible limit;
- **hydro technical accident** = malfunction of a hydraulic structure resulting in losses of human lives and material destruction downstream of its location;
- major accidents at hazardous technological equipment = destruction or damage of technological equipment due to human negligence, resulting in numerous victims and large material losses;
- major accidents on inland communications = temporary interruption of the movement that generates destruction of these forms of communication, human victims, as well as animals and property damages;

- # major damage to plants and telecommunications networks = partial destruction of plants and telecommunication networks due to or natural human action;
- *cosmic objects falling* = casualties or material damages caused by the crash impact on the earth of satellites, meteors or comets;
- **#** mass fires = natural or artificial burning, which results in significant losses of human lives, animals and property damages.

#### 3.2.1 Natural hazards

**A. Earthquakes** represent a potential risk for Ungheni district located in Vrancea seismic zone. The epicenter of earthquakes in this area is located in the mountains of Vrancea, Romania, at a distance of 100 km. The maximum oscillation force is 7.5 degrees (very strong) according to the seismic intensity scale MSK-64 (12 degrees).

Statistics show that the last hundred of years, in Vrancea seismic zone there were noticed periods with high seismic activity: in 1940, 1977, 1986 and 1990. Ungheni district present a high risk of earthquake due to the vulnerability of buildings (in the city) and houses, high intensity recovery periods when there were no seismic protection rules and due to buildings' wear. In the area of possible damages from earthquakes are the old constructions sectory. Here are mainly located houses built in the 70s, in which construction were used extensively adobe, unburnt bricks, broken stonev. In case of an earthquake, the greatest danger is represented by the houses which were built by neglecting such constructive steps as the anti-seismic installation zones and joggles, ferro-concrete building, ensuring plates rigidity.

Usually, the phase of maximum intensity of seismic movement manifests itself in the first moments (seconds) thereafter at different intervals of time there may occur aftershocks of lesser intensity, but with destructive effects are the same, because the structural elements of buildings that have been affected in the first phase are in a precarious balance.

Tectonic earthquakes occurring in Moldova and implicit in Ungheni can generate the following effects:

- Destruction or damage to civilian buildings (houses, social cultural, religious buildings etc.);
- Destruction of damage to industrial constructions;
- Destruction or damage to household networks (water, gas, heating, electricity, telecommunications, etc.);
- Generation of fires (in general isolated);
- Generating mudslides or landslides, avalanches;
- Damages to hydro technical constructions;
- Outbreak of epidemics as a result of the degradation of environmental quality;
- Production of mass effects (panic, stress etc.).

**B.** Floods (high level of water) represents one of the most dangerous meteorological phenomena.

The main causes leading to catastrophic consequences during floods are:

- Torrential rains with high intensity;

- Location of houses, agricultural objectives in the flood plains of rivers;

- Existence of new and old ponds / lakes built without projects designs, coordinated with the respective bodies of technical supervision;

- Unsatisfactory exploitation and fault condition of installations of water discharge and evacuation;

- Non comply with standards for the construction of auto bridges, pipes and other installations in the places of intersection of surface waters with roads.

From 74 localities of Ungheni district, in flooding areas are places 24 villagev.

As location, the 24 localities at risk of flooding are situated in 6 rivers basinv. In the basin of Prut river there are located 11 villages, in the basin of river Soltoaia - 2 localities, in basin river of Vladnic - 4 localities, in basin river Varsavca -



5 localities, in basin river Cula - 1 locality and in basin river Delia - 2 localitiev.

Currently, from the areas of risk of localities placed in Prut river basin, most of residents were evacuated. Except, villages Macaresti and Frasinesti and Ungheni city, in these flooding areas still love a number of familiev.

<u>Măcăreşti village</u> is situates in a dangerous flooding area, placed in Prut river basin. Totally, in dangerous areas of flooding there are placed over 578 houses, of which 98 in villages Macaresti and Frasinesti. The checks carried out by Emergency Department in the localities placed in Prut river basin and according to the analysis of floods from July-August 2008 it was ascertained that the protection dams in Frasinesti village (commune Macaresti) is unsatisfactory: it is necessary to raise dams' height and to reinforce these dykes in village Frasinesti. There is a lake in the village that according to Emergency Department should be liquidated. This dam is very weak and

is under the risk of breakage. The lake from Frasinesti village is in a critical situation - 4,76 ha is under high risk of flooding. From the flooding area of Prut river, most of inhabitants have left, around 7 people are still there.

<u>Ungheni city</u> is situated in a flooding area, placed in Prut river basin. Taking into consideration the placement of settlements within the boundaries of floodplain rivers of Prut and Delia and carried out calculations, it was established that the main river course (river Prut) could flood 400 houses, while the water side (lake Delia) could flood 51 housev.Carried out checks within the localities situated in Prut river basin and according to the floods from July-August 2008, itwas concluded that protection dams from Ungheni city are in poor conditions, being necessary to raise and reinforce their heightv.In the city there is also the water storage dam, which was repaired at the end of 70v.This dam on is damaged, especially this fact can be noticed by its inclination, cracks and subsidence, some concrete slabs are moved, resulting in adhesive material flush and resistance. Similarly damaged is the crossing bridge near the dam, presenting danger for cars that are crossing it daily.

In Zagarancea village the risk of flooding is characteristic just for farmlands and 4



housev.

Todirești village which is placed in Vladnic basin river and is located in a flooding risk area due to the fact that it is in the way of lakes cascade with damaged damv.Around 20 houses are under flooding risk. According to Emergency Department data, the

dam lacks some necessary security elementv.

<u>Florițoaia Nouă locality</u> is situated in Varsavca river basin. Upriver there are other 4 lakes, which technical conditions are not known. Due to their placement - cascade of lakes, the area is under potential risk of flooding (5 houses).

No.	Locality	Flooding areas					
		Locality			Population, thousands persons		
		Total	Inclusively		Total	Inclusively	
			cities	villages		cities	villages
1	2	3	4	5	6	7	8
1.	City Ungheni	1	1	-	0,517	0,517	-
2.	v. Măcărești	1	-	1	0,064	-	0,064
3.	v. Frăsinești	1	-	1	0,036	-	0,036
4.	v. Costuleni	1	-	1	0,011	-	0,011
5.	v. Valea Mare	1	-	1	0,049	-	0,049
6.	v. Zagarancea	1	-	1	0,013	-	0,013
7.	v. Semeni	1	-	1	0,007	-	0,007
8.	v. Medeleni	1	-	1	0,009	-	0,009
9.	v. Blindeşti	1	-	1	0,013	-	0,013
10.	v. Sculeni	1	-	1	0,045	-	0,045
11.	v. Morenii Vechi	1	-	1	0,029	-	0,029
12.	v. Morenii Noi	1	-	1	0,094	-	0,094
13.	v. Floriţoaia Nouă	1	-	1	0,012	-	0,012
14.	v. Alexeevca	1	-	1	0,077	-	0,077
15.	v. Romanovca	1	-	1	0,049	-	0,049
16.	v. Hristoforovca	1	-	1	0,026	-	0,026
17.	v. Todireşti	1	-	1	0,064	-	0,064
18.	v. Zăzulenii Noi	1	-	1	0,011	-	0,011
19.	v. Negurenii Noi	1	-	1	0,013	-	0,013
20.	v. Negurenii Vechi	1	-	1	0,029	-	0,029
21.	v. Ţighira	1	-	1	0,051	-	0,051
22.	v. Chirileni	1	-	1	0,035	-	0,035
23.	v. Petreşti	1	-	1	0,038	-	0,038
24.	v. Boghenii Noi	1	-	1	0,037	-	0,037
		24	1	23	1,292	0,517	1.145

# Areas of possible flooding in Ungheni district
Around 37% of protection dams within the district are damaged, presenting significant risk for localities. Under flooding risk are 24 localities and around 1292 inhabitants. The most destructive floods in Ungheni district registered in the last



years were the ones from 2008 and the last - in the summer of 2010. The outrush from 2008 in Ungheni started on July 26<sup>th</sup> through rapid increase of flows from 110 m3/s on 26.07 to 480 m3/s on 30.07, which is almost 74 m3/day. The maximum was registered on 05.08 and was of 698

m3/s. Flood's decrease was as sudden as it beginning, from 616 m3/s on 16.08 to 129 m3/s on 23.08, which is 60 m3/daily. Hydrograph's shape is a rectangle with a well

expressed, maximum, which is due to controlled discharges from hydro knot Costești-Stânca.

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The outrush from 2010 in Ungheni district started on 24.06 and ended on 07.08. The total duration of the outrush was of 45 days. Flows increase was slow, same as their decrease.



Comparative analysis of the floods from 2008 and 2010 in Prut river, district of Ungheni leads to the following conclusions:

- 1. The flood from 2008 registered maximum flows, but low discharges because it has a short duration.
- 2. The flood from 2010 had lower maximum flows, but due to its long duration, it registered much higher volumes of discharges.

	Water flows in Prut river									
River Standard of average monthly discharge, Q m <sup>3</sup> /s		Flood -Augi	Flood from July Flood from Jul -August 2008 August 201		om June – st 2010	Multi annual characteristics Q max m <sup>3</sup> /s				
	July	August	Q max m <sup>3</sup> /s	date	Q max m <sup>3</sup> /s	date	July	Date	August	date
Prut - Ungheni	113	103	698	05.08.	739	08.06.	589	21.07. 98	687	13.08. 91



Possible flooding map

### The main effects of the flood wave and floods:

The effects occurring in the flooding area are:

- Human causalities, as consequence of the flooding wave, as well as of accidental causes (the collapse of buildings, panic, unacquaintance of issues related to the phenomenon, etc.);
- > Partial or total destruction of buildings (buildings, walls, halls, etc.);
- Damages of networks of water, gas, heating, power, telephone through partial destruction of blocking;
- Flooding of shelters, basements or different levels where are high-value goods (archives, high-precision machinery, etc.) or where production processes are carried out;
- Spreading of toxic substances or waste from the deposits, stores and places affected by the flood with direct effect on humans and animals;
- Decommissioning for a longer period of high precision equipment working on fixed regime (computers, microprocessors, measuring and control devices, etc.);
- Sustained corrosive process of iron materials of technique, machinery and metal parts of all kinds;
- Flood zone infestation with germs and pathogens specific to the rapid propagation in water and wetlands, with short and long term effects on humans and animals;
- > Losses registered due to their depreciation and land sloughing;
- Blocking or impracticability of pathways, hamper of people and technology access to places and points which should be paid special attention as to eliminate losses of all kinds (materials, releases of toxic substances, with continuous fire, explosion hazard etc.);
- Panic, disorganization of management and activities of all kinds, at many hierarchical levels;
- Attraction of work force, technical and supplementary materials as to limit human losses and material damage.

Floods effects showed in figures register damages of over 13 million of lei in Ungheni district.

Years			Consequences	
	No of emergencies	Deceased	Number of affected localities	Material losses (thousands lei)
2008	1	0	7	3690.1
2010	1	0	9	10168.4
Totally	1	0	16	13858.5

### C. Landslides

In the last decades the role of human factor in manifestation of erosion processes has increased. The assessment of farmlands quality is necessary as to argue a complex system of measures in order to prevent soil degradation and conservation of production capacity. In Ungheni district, soils with different level pf erosion occupies an area of 18272,61 ha, which is around 20% of soils' surface.

### General characteristics of lands in Ungheni district

Total area of the district is 108,3 thousand hectares, of which:

- > 73,6 thousand ha farmland
- > 21,4 thousand ha forests and other forest greenery lands
- > 2,1 thousand ha water resources.

The category of arable land is the most spread, being of 85% of farmlands.



### General use of agricultural use of lands

The description of lands used for agriculture purposes in Ungehni district is described in the table below:

No	Locality	Arable area per locality (ha)	Grassland s (ha)	Vineyards (ha)	Orchards (ha)	Forests (ha)
1	Agronomovca	855,84	26,11	-	4	-
2	Alexeevca	1110,54	12,39	2	134,56	-
3	Boghenii Noi	1094,21	6,64	200	174	-
4	Buciumeni	729,69	-	-	26	-
5	Bumbăta	1038,05	0,21	-	9,95	-
6	Buşila	1430	0,6	11	-	-
7	Cetireni	1538,42	-	38,8	67,72	-
8	Chirileni	1534,11	-	64,19	97,3	-
9	Cioropcani	1573	-	-	372	-

10	Condrătești	845,6	10,16	65,4	169	-
11	Cornești	767,94	74,32	232,3	200	-
12	Cornova	595	2,5	122	60	-
13	Costuleni	1450	13,01	61,5	17,48	-
14	Florițoaia Veche	1176,54	17,18	63	179,77	-
15	Hîrcești	1075,5	3	154	239,5	-
16	Măcărești	2137,42	19	89	87	-
17	Măgurele	689	1,5	46	89	-
18	Mănoilești	1574,46	12,51	2,25	90,77	-
19	Morenii Noi	682	-	43	8	-
20	Năpădeni	733	2,57	120	103	-
21	Negurenii Vechi	2031,62	-	-	99,44	-
22	Petrești	2179,7	-	14,11	32,95	-
23	Pârlița	2771,62	17,13	6	22	-
24	Rădenii Vechi	1397,39	-	20	289,61	-
25	Sculeni	3083,89	-	25	184	-
26	Sinești	882,52	48,36	57	113,31	-
27	Teşcureni	879	-	1	-	-
28	Todirești	2811,06	-	90,2	76,89	-
29	Unțești	981,29	13,3	59	50	-
30	Valea Mare	3155,76	-	12,9	3,32	-
31	Zagarancea	1992,62	3,17	1.27	41,13	0,34
	Total	44797	283,8	1601	3032	0,34

### Unproductive lands

Along with highly productive farmlands, in the district there are also lands with low productivity, subject to various forms of degradation by erosion, hydromorphism or affected by cloughs and landslides. These types of lands are widely spread on slopes and rivers' valleys. According to the analysis made in frame of the survey regarding soil erosion in Ungheni district it was ascertained that in the composition of unproductive lands prevail the degradation form through landslides and cloughs, which is 98% of this category. The spreading of these degradation forms is due to excessive fragmentation of the relief. The lands affected by landslides cover **74**% of an area of 15417 ha, cloughs - **24%**. The remaining types of unproductive land surface is insignificant and constitutes **2%**.

Туре	Măcărești area		Sculer	ni area	Cula area	
of use	Surface,	% of	surface,	%	Surface,	%
	ha	surface	ha	of surface	ha	of surface
Landslides	484,72	93,45	1791,03	92,70	5637,80	98,25
Cloughs	33,96	6,55	140,83	7,29	100,15	1,75
Abandoned	-	-	-	-	-	-

### General characterization of unproductive land divided on areas

quarries						
Mounds	-	-	0,09	0,00	-	-
Thicket	-	-	0,20	0,01	-	-
Old riverbed	-	-	-	-	-	-
TOTAL	518,68	100	1932,16	100	5737,95	100

Fragmented relief and deep valleys are characteristic for Ungheni district. Here prevail long slopes with gradients that favour soil degradation forms emergence and development of through erosion and landslides. Soil degradation within the territory of the district is largely determined by water erosion, which makes up about 24.3% of the total area of land. The total area of soil with different degree of erosion constitutes 23955.22 hectares.

Another serious form of soil degradation in Ungheni are landslides that extend over an area of 13612.96 hectares or 13.82% of the total land. Approximately 61% of the district soils are subjected to various forms of degradation.

Dominant soils structure has not changed essentially. The most significant changes were registered for <u>landslides</u>, which surface increased from <u>13612,96 ha</u> till <u>19806,29 ha</u>. There were identified the lands affected by cloughs on a surface of 683,21 ha. The substantial increase of these lands surface is due to human impact, especially in carrying out agricultural works. It may be noticed the predominance in the composition of the soil cover in Cula area of deep degradation by erosion of 38% of the soils surfaces compared to 2% in Macaresti area and 3,7,% in Sculeni area.



### General characterization of land use per areas



Degradation through erosion within the district reaches a share of 42,47% of the total lands surfaces. One of the causes of soils erosion reduction is the emergence of landslides, so that it is necessary already to transfer them to another category. The various forms of lands degradation covering district's surface is of 54192 ha or 59% of all lands.

Lands affected by deep erosion reach 53,2% of the total surface of weathered area or 22.6% of all soils. In this category predominates active landslides with the share of 75.51%, followed by stabilized landslides with 21.21% and only 3.28% are cloughs.



Map soil degradation in Ungheni

The main form of land degradation within the district is the erosion caused by **Natural factors:** 

- ✓ precipitation in form of showers
- ✓ rugged terrain
- ✓ high degree of slopes inclination

### Anthropic factors:

- ✓ maximum utilization of arable land
- $\checkmark$  destruction of forest protection and anti-erosion belts
- $\checkmark$  soil cultivation from the hill into the valley direction
- ✓ incorrect location of the road network
- ✓ inadequate protection of soils and vegetating
- ✓ exaggerated share of hoe crop in rotation
- ✓ non comply with anti-erosion agro-technics

### Infrastructure lands

Integral part of Ungheni district infrastructure include localities, industrial and agricultural buildings, roads network, dams and valleys. Their total surface is estimated to 13421,37 ha. Over 78% of the infrastructure territory is placed in localities. The maximum surface is 498 ha, while the minimum area is only 0,0023 ha. The network of roads and buildings is of 8% and respectively 7%.

Of 74 localities of Ungheni district, 48 are more or less subject to periodic landslides. In 25 localities, the risk of landslides is characterized by intensity and significant surface. In areas at risk there are placed houses (over 1170 private houses), national and local roads, engineering networks.

No.	Locality	Number of landslides	Surface of landslides (ha)	Number of houses and objects located in landslides area		Number of houses, persons to be displaced (evacuated)	
				Houses	Objects	Houses	Persons
1		1	0.3	2	-	-	-
	Ungheni city						
2	Cornești city	1	0.7	27	4	2	4
3	Romanovca	1	0.4	8	-	-	-
4	Florițoaia Nouă	1	0.9	5	-	-	-
5	Cioropcani	2	1.2	21	-	25	103
6	Cornești	1	1.5	33	-	4	9
7	Cornova	1	1.2	37	-	-	-

### Landslides areas in Ungheni district

8	Costuleni	1	0.4	15	-	-	-
9	Hîrcești	4	1.4	64	2	12	51
10	Măcărești	1	0.5	29	-	12	49
11		2	3	58	-	19	81
	Manoilești						
12	Negurenii Vechi	1	3	48	-	17	78
13	Petrești	1	2.5	8	-	4	12
14	Pîrlița	1	1.9	15	-	8	21
15	Rădenii Vechi	1	1.7	76	5	3	6
16	Todirești	2	1.2	28	-	27	109
17	Zagarancea	2	1.9	10	-	-	-
18	Bumbăta	1	0.3	27	1	-	-
19	Boghenii Noi	2	2.3	67	-	4	14
20	Boghenii Vechi	1	2.4	64		6	21
21	Izvoreni	2	1.7	43			
22	Măgurele	1	0.9	12			
23	Mircești	1	0.9	29		2	5
24	Poiana	1	0.8	7			
25	Sinești	1	1.8	27		3	13
26	Grozasca	1	0.7	16			
27	Chirileni	1	0.8	11			
28	Morenii Noi	1	0.9	9	-	-	-
29	Teşcureni	2	1.7	37	-	-	-
30	Buşila	2	1.2	29			
31	Buciumeni	1	0.9	17		3	14
32	Bulhac	1	0.8	11			
33	Năpădeni	1	0.7	19			
34	Condrătești	2	1.1	27		8	31
35	Curtoaia	1	0.6	14			
36	Frăsinești	1	0.8	67		8	25
37	Mînzătești	1	0.9	18	1	5	17
38	Novaia	1	0.7	24			
	Nicolaevca						
39	Vulpești	2	1.8	46	-	7	32
40	Ţighira	1	0.9	24		6	26
41	Negurenii Noi	1	1.6	17		8	29
42	Zăzulenii Noi	1	0.9	13			
43	Florești	1	1.8	17		6	21
TOTA	AL Ungheni	50	54,8	1176	13	199	771

Economic consequences of land degradation are estimated in millions of MDL each year. The direct damages caused to land resources as consequence of surface erosion in Ungheni are presented in the table below.

Type of land / soil	Surface,	Annual	Cost per	Cost per	Total losses
	ha	damages,	m³/ha,	ha, MDL	(thousand
		m³/ha	MDL		MDL)
Low eroded soil	10982,15	10	107	-	11750,9
Mild eroded soil	6571,43	15	93	-	9167,1

Highly eroded soil	720,031	20	77	-	1108,8
Total surface eroded soils	18273,611	45	-	-	22026,8
Active landslides	15697,34	-	-	463248	7271761,4
Stabilized landslides	4408,95	-	-	463248	2042437,3
Cloughs	683,209	-	-	463248	316495,2
Total deep eroded soils	20789,499	-	-	463248	9630693,8
TOTAL	39063,1	-	-	-	965720,6

Along with direct losses there are also the indirect ones expressed by reduced harvest. The most vulnerable at degradation through erosion are the farmlands. These ones are subject to degradation process through erosion on a surface of 13028 ha. The damage caused by crop losses annually makes up 5 million 220 thousand MDL.

Type of land / soil	Surface, ha	Harvest reduction %	Cost of annual losses per 1 ha, MDL	Total losses (thousand MDL)
Low eroded soil	8113	30	300	2433,9
Mild eroded soil	4564,4	50	500	2282,1
Highly eroded soil	350,7	70	700	504
Total	13028,1	-	-	5220

**D.** Heavy snows are the precipitations of 20 mm and more during then 12 hours and less, as consequence the whole or a part surface of district's area, of roads and communication networks are covered by a significant layer of snow. This phenomenon leads to stopping the movement of transport up to 12 hours and, as a result the suspension of supply to the population and enterprises. In Ungheni district the biggest snow-drifts are possible in the localities Todirești, Petrești, Rădenii Vechi mainly caused by the roads' poor conditions. The same risk is also peculiar to villages Poiana, Mircești și Boghenii Noi which roads have been considerable affected by heavy rains. In Ungheni city, the most affected areas due to snow-drifts are the streets Bernardazzi, Decebal, Creangă, Berești. The material losses may reach 500 thousand MDL.

**E. Glazed frost** may fall heavily on the roads, on communication cable lines and electricity transmission, on perennial plantings. Glazed frost occurs during wintertime at temperatures below zero and atmospheric liquid precipitation deposition. This phenomenon make the traffic difficult and strong rise cause a large number of road accidents. Trees, shrubs, lines of electricity transmission and communication cable lines can be covered with a layer of ice with a thickness of 20 mm, which leads to damage of perennial plantations, breakage, interruption of power supply and communications. On average, during the winter, the glazed frost can last for 10-15 days. Material losses may be of 200 thousand MDL.

**F. Strong wind** with a higher speed then 25-34 m / sec is a possible phenomenon throughout the district, with a probability of 3-5% and can damage trees, roofs, breaking electricity transmission lines and communication cables. According to the registered statistics, the material losses may be up to 400 thousand MDL.

Years		Consequences						
	Number of	Decesead	Number of	Material loss				
	emergencie		affected localities	(thousand MDL)				
	S							
2006	1	0	5	63				
2007	1	0	14	87				
2009	1	0	5	90.8				
2011	1	0	1	80.3				
2012	1	0	3	382.3				
Total	5		28	703.4				

G. Large hail happens during high heat and torrential rains, occurs almost every year, and covers considerable territory by coating the soil with grains having a diameter of over 20 mm. The average duration of hail is from few minutes up to 15 minutes, being noticed a differentiation on relief steps of maximum duration. Hailstorms begin suddenly. Duration of hailstorms is inversely proportional to the hails grains size. As the shorter is the duration, as the dimensions are larger and its mechanical influence. On average, hailstorms may occur 4 times per year. In the affected by hail area it is possible to fully or partly loose the harvest, to injure people, animals, break roofs, buildings' and cars' windows. Zagarancea locality is yearly affected by hailstorms. The anti-hail Service can't interfere because the village is on the border with Romania.

## District's area protected of hail:

No.	Town Hall	Protected area	Surface protected from hail	
	1	(%) 	Total (ba)	Farmlands (ha)
1.	Agronomovca	100	2052	1516
2.	Alexeevca	100	2318	1933
3.	Boghenii Noi	100	3333	2199
4.	Buciumeni	100	2033	1245
5.	Bumbăta	100	2504	1781
6.	Buşila	100	2475	2064
7.	Cetireni	100	3356	2351
8.	Chirileni	100	2868	2454
9.	Cioropcani	50	1781	1508
10.	Condrătești	100	2215	1699
11.	s.Cornești	100	4300	2419
12.	Cornova	100	1948	1405
13.	Costuleni	50	1498	1030
14.	Florițoaia Veche	100	2917	2231
15.	Hîrceşti	100	4389	2614
16.	Măcărești	50	2123	1589
17.	Măgurele	100	2051	1320
18.	Mănoilești	100	3726	2498
19.	Morenii Noi	80	1026	772
20.	Năpădeni	100	2956	1781
21.	Negurenii Vechi	100	4786	3506
22.	Petrești	80	3500	2470
23.	Pîrlița	100	4637	3814
24.	Rădenii Vechi	100	8773	2665
25.	Sculeni	65	3660	2850
26.	Sinești	100	3120	1912
27.	Teşcureni	100	2226	1533
28.	Todirești	100	4527	3794
29.	Unțești	100	1829	1570
30.	Valea Mare	50	2588	1974
31.	Zagarancea	80	3001	2217
	Total:		94516	64714

## Placement of anti-hail missiles special units:

No.	Special unit name	Locality of missiles release	Protected area (%)
1.	Cornesti-20	city Cornesti №1	100% of farmlands
2.	Cornesti-20	Village Condratesti №2	100% of farmlands
3.	Cornesti-20	Village Graseni №7	100% of farmlands
4.	Cornesti-20	Village Untesti №8	100% of farmlands
5.	Cornesti-20	Village Cioropcani №11	70% of farmlands
6.	Cornesti-20	Village Petresti №12	60% of farmlands
7.	Cornesti-20	City Ungheni №14	50% of farmlands

The hail may produce serious losses under the following conditions:

- when it occurs in the full growing season, when fruit trees are blossoming, the vine grains are in the formation phase, cereals during formation of wheat ear;
- when it is accompanied by strong winds;
- when the hail grains size exceed 10 mm in diameter;
- when phenomena duration is long;
- when hail grains density on 1 m<sup>2</sup> very high;
- during long lasting ice layer (from several hours to several days), which causes



cellular juice freezing, stopping of sap movement, foliar system destruction and compromising crop;

- when occurring after long dry periods with dry soil that lacks cohesion, favouring intense erosion processes;
- when affecting the slopes with dry soil;
- when sizes are small (<</li>
  10 mm), but the

duration is higher (10 -15 min.) etc.

The damages of large hail produce material losses, such as: destruction of harvest, infrastructure (roofs, cares, etc.). Material losses may exceed the amount of 10 million MDL.

Years	Consequences						
	Number of	Deceased	Number of affected	Material loss			
	emergencie		localities	(thousand MDL)			
	S						
2006	4	0	8	2663.3			
2007	1	0	8	12147			
2008	3	0	4	1130			
2009	1	0	1	336			

2014	1	0	1	183
2016	2	0	16	13363,7
Total	10	0	38	29823

It must be stated that the total losses caused by strong hail for the period of reference is much higher, being associated with other phenomena (heavy rains, strong winds). The tables below include additional costs related to the falling hail.

Torrential rains with strong winds and hail and their consequences:

Years	Consequences						
	Number of emergencie s	Deceased	Number of affected localities	Material loss (thousand MDL)			
2007	1	0	8	12147			
2013	1	0	2	608.3			
2016	1	0	12	11547.7			
Total	3	0	22	24303			

Torrential rains with hail and their consequences:

Years	Consequences						
	Number of emergencies	Deceased	Number of affected localities	Material loss (thousand MDL)			
2008	2	0	5	20946.6			
2009	1	0	6	5814			
2010	2	0	7	8890			
2011	1	0	2	6106.8			
2013	5	0	13	51439.6			
2014	1	0	4	491.6			
2016	1	0	3	1816			
Total	13	0	40	74558			

H. Torrential rains (rain showers) are characterized by the large amount of fallen water in a very short period of time, which involves a high intensity and can have serious consequences on erosion and washing soil nutrients, as well as on slopes modelling processes accelerated of erosion, often determining a range of slope processes, destroying pastures and crops. In Moldova, the main factor contributing to floods are heavy torrential rains that usually occur during May-August. Torrential rains, particularly heavy and abundant fall in the following months: July (40%); in June (36.5%); in August (15.7%). According to the Government Decision No. 1076 from November 16<sup>th</sup> 2010 "Regarding classification of emergencies and to the way of accumulation and presentation of information in the field of population and territory protection in case of emergencies" it is ascertained that the torrential rain is the one when the quantity of rainfall is of 30 mm and more during 1 hour and less.

Years	Consequences						
	Number of emergenci	Deceased	Number of affected localities	Material loss (thousand MDL)			
	es						
2005	2	0	9	6067.5			
2008	1	0	1	1839.2			
2013	1	0	1	26.7			
2014	1	0	1	290.5			
Total	5	0	12	8223.9			

I. Whirlwind (tornado) represents violent atmospheric disturbances, with reduced whirl nature looking like a narrow column spinning with a high speed or a turned funnel, consisting of cumulonimbus clouds and dust, which gives it a grey colour. The wind's speed is between 60 and 300 - 400 km/h. In Republic of Moldova the whirlwind (tornado) is a rare phenomenon. Usually, it occurs during the warm period of time of the year. In its short, but violent evolution, tornado may cause numerous human losses, as well as significant damages. The most disastrous effects are registered in the area with a high density of population. The Cloudy funnel (composed of water droplets) has an average diameter of 150 m and retains its destructive force over a length of about 10 km. It can destroy solid constructions, uproot big trees, lift and transport at great distances different objects.

J. Droughts may be considered the most complex climatic phenomena, to their onset participate several factors, namely: rainfall, soil water reserves available for the plant, moisture and air temperature, evapotranspiration, wind speed, etc., which are the main parameters that define climate dry periods. Additional to these factors there are also those defining characteristics of active surface (relief, soil peculiarities, groundwater depth, vegetation coverage, etc.), factors that determine plant's physiology conditions (such as type of soil and stage of vegetation, degree of resistance to dryness). Also there are factors that highlight the human influence on the environment (land and used agricultural technique's conditions, which can facilitate soil water depletion).

As complex meteorological phenomena, the drought is characterized in general by absence of precipitations as well as by increasing the potential evapotranspiration.

In Moldova, drought is one of the most dangerous phenomena, representing the peculiarity of regional climate, conditioned by the uneven distribution in time and space of atmospheric precipitates on the background of high air temperature.



In Republic of Moldova, the droughts 12,5% represent of total number of hazards. Droughts lead great losses to of agricultural production.

The catastrophic drought from 2007 in Moldova started in

autumn 2006. So that during 01.09.2006 - 06.08.2007 the amount of precipitations on country's territory were of 50% - 70% of the climatic norm. The situation escalated to a maximum period in the period of May to July 2007, when the rainfalls made up only 30% of the norm. Continuous interval without precipitation varied within the mentioned period between 28-73 days, while the number of days with relative air humidity  $\leq$  30% registered in the country 55-78 days, exceeding the climatic norm by 3-4 times.

The harvest of main late crops (maize, sunflower, sugar beet, tobacco, fruit trees) was mostly compromised, and enterprises of the mentioned fields had no raw material. A very serious situation regarding the provision of feed was registered in the livestock sector.

The catastrophic drought from 2007 affected over 80% of the country, the most severe drought for the entire period of instrumental measurements. According to the main agro meteorological this drought exceeded even the drought from 1946, damaging the national economy of over 1 billion US dollars.



The drought from 2012 in Moldova was manifested in the second half of the warm period. Between 1 August - 8 October 2012 throughout the country was registered a high thermal regime (by 2-2.5 ° C higher than the norm) and significant precipitation deficit (10-50% of the norm), which led the onset of the catastrophic drought that has affected over 80% of the country.

Similar high thermal conditions and substantial impairment of precipitations within that period of 2012 was reported for the second time for the whole period of instrumental meteorological observations. A similar year was 1952. Very low productive damp reserves in the soil, emphasized on a large part of the territory have created unfavourable conditions to the preparatory work of land for winter sowing crops in due terms.

In Ungheni district, the two cycles of drought have brought losses amounting to 60% of compromised crops, sugar beets, cereals. Besides the losses of the agricultural field there were affected also the wells, 50% of which have dried up. Most affected was Cula area.

Although, the drought is a phenomenon with a lower frequency, it registers the greatest highest material losses.

Years		Conseq	Note		
	Number	Decease	Number	Material	
	of	d	of	loss	
	emergencie		affected	(thousand	
	s		localities	MDL)	
2007	1	0	31	255032	41% of district's localities affected.
2012	2	0	15	31760	The phenomenon was twice: April-May and June-July.
Total	3	0	46	286792	

K. Frost is a meteorological phenomenon related to lowering the temperature below 0 ° C in the air and on the ground surface. The frost is temperature decrease of air layer near the ground below 0 ° C during the warm season (crop growing season). They typically include large territories and are registered especially in the first half of the spring, being maintained up to 1 to 2-3 days.

The frost determine not only braking and premature closure of the plant growth vegetation cycle, but also their partly or total death. For example, in horticulture damages caused by spring frosts are significant, as they affect blossoming trees, sometimes destroying almost the entire crop. Especially vulnerable to frost are

apricots, peaches, cherries, apples and nuts. Also affected and the vineyards, especially the early varieties.

Field crops are affected to a lesser extent by late spring and early autumn frosts, having a reduced sensitivity to frost in these periods. In most cases, the critical moments of the vegetative cycle (reproductive organ differentiation, blossoming, fructification, etc.) occurring outside frost periods. Only in rare cases, when frosts occur very late, field crops are affected in a significant proportion.

### 3.2.1.2. Statistical analysis of disasters / emergencies in Ungheni district

During 2005 - July 2016, in Ungheni district there were registered 46 emergencies with natural character.



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Statistics show that not always the most frequent natural disasters bring the most significant losses, as it may be noticed from the diagram below.



# 3.2.1.3. Trends: expected evolving of the risk (including new and emerging sources and vulnerabilities)

Dangerous meteorological and agro meteorological phenomenon were the kind of emergencies with natural character that caused the greatest material losses. So that during January 2005 - July 2016 as consequences of these emergencies there were registered material losses in a total value of **461239,1 MDL**, as annual average the costs are estimated to over 38 million MDL.

The most serious emergencies caused by meteorological and agro meteorological phenomenon were the draught, torrential rains with hail, frosts and snowstorms. The number of emergencies is not directly proportional to the damages caused to the district.



Emergencies with natural character are becoming more frequent. This is mostly due to the effects of climate changes. In the last 50 years natural emergencies has been dominated by floods and droughts having the greatest economic impact. On average Republic of Moldova is affected by 4-5 severe draughts at 10 years, the statistics show an increase in their intensity and frequency. Floods are also a frequent phenomenon in Moldova, in the same time Ungheni localities situated near the river Prut are most at risk of being flooded.

However, the intensity and frequency of natural hazards, such as: droughts, floods, hail and frost have increased significantly over the past few years, having a negative impact on agricultural development. Moldova is prone to natural hazards because of a specific combination between geographical location, climate change and inadequate soil cultivation practices.

Around 90% of all calamitous disasters are related to weather, climate and water. Statistics from the last decade show that total calamitous disasters, including hydro

meteorological have an increasing trend, in both intensity and their frequency. This leads to the increase of material losses for agriculture and infrastructure.

Ungheni district by its geographic location and natural particularities is more frequently affected by such natural phenomenon as: earthquakes, landslides, floods, torrential rains sometimes with hail and storms, long term high temperatures, droughts, early autumn or late spring frosts.

The current period is characterized by an evident trend of annual precipitation increasing (about 5-10% compared to the early twentieth century), accompanied by a significant increase of seasonal and regional climate variability contrasts.

Population density and highly valued landscapes (over 80%) significantly increase the risk of disturbances ordinary natural processes and converting them into extreme processes. The excessive and uncontrolled increasing of human factor involvement has conditioned largely, the obvious acute manifestation of multiple extreme phenomena and processes.

A particularly significant impact have had the severe droughts from 2002, 2003 and especially the catastrophic drought from 2007, which brought to the district of material damages, amounted to **255.032 million MDL or over 15 million Eur.** 

The main natural risks, as diversity for socio-economic system and the natural environment of the Republic of Moldova are conditioned by climatic factors (temperature change, atmospheric circulation, precipitations). The largest natural risks for the economy and population of Moldova come from temperature changes (dryness, late spring and early autumn frosts, droughts), from bad weather (heavy rain, strong winds, frost and ice, fog, snow, hail), from soil erosion (wind, fluid) and landslides, earthquakes.

A broad range of chronological periods and statistical distributions that differ greatly by frequency and intensity characterizes natural hazards specific to geographic area of Ungheni. So that catastrophic droughts and destructive earthquakes are rare (during XX century they have occurred 3-4 times), while hail and storms are very localized phenomena, frost and glazed frost occur roughly annually and regularly with high intensity. Landslides and eminent reduce of soil fertility became permanent processes. The evolution of climate change caused by global warming could be the main trend of intensification and increase of these phenomena, a trend which is observed in the last two or three decades. Analysis of average harvest calculated for the last three decades show a continuous reduce of farmland productivity, associated by an increase of fluctuations caused by different natural and anthropogenic factors.

Droughts have become relatively common and predictable natural phenomenon bearing a chronic character, while every five to seven years occur droughts with a severe character, which cover the entire territory of the country and the district. The losses caused by droughts vary depending of annual climate conditions.

Although these natural hazards cause enormous damages to the national economy, influencing drastically the material wealth and often putting in great danger not only the health, but also people's lives, so far they remain insufficiently studied

### **3.2.2.** Typology of tehnological hazards

The technological hazards have their roots in technological or industrial circumstances, including accidents, hazardous operations, infrastructure accidents or other man-made specific activities that may cause losses of life, injury or other health problems, damages to the property or to livelihood, interruption of services, social and economic disruption or environmental problems. The occurence of a technological hazard can be directly or indirectly linked to losses registered on the territory of the local public authorities, at various commercial entities, warehouses, transport corridors etc., the dispersion of hazardous substances being achieved through specific environments (water, air and land).

The most frequent hazards for Ungheni district out of the 71 technological hazards, grouped into 12 categories included in the general typology of exceptional circumstances described in the Government Decision no. 1076 of 16.11.2010 "On classification of emergency situations and the methodology of collecting and presenting information regarding the population and territory protection in case of emergencies" are transport accidents, fires, explosions, detection of unexploded ammunitions, accidents with (potentially) release of dangerous chemicals, sudden collapse of buildings/constructions, accidents to power systems, accidents to vital utility systems, accidents to connection systems and electronic communications, accidents to industrial cleaning plants, hydrodynamic accidents (broken dams, dykes), emergencies with cosmic character. The technological hazards may present effects even within the chain of events caused by direct impact of natural hazards. The most frequent and common technological risks of Ungheni district are fires, detection of unexploded ammunitions and transport accidents.

The technological risk sources within the territory of Ungheni district are commercial entities or municipal companies that hold industrial toxic substances or use/store hazardous substances within the production process. Once a chemical accident occurs at one of the companies with a chemical source risk, the employees of the industrial entity may be affected as well as the inhabitants of the localities where the industrial companies are located.

### Emergency situations of technological character within Ungheni district

In the period between 2010-2015 in Ungheni district there were 811 registered emergency situations of technological/man-made character. As a result of these emergency situations 113 people died and 377 people were injured and there were registered material losses of about 2.283,7 thousand lei.

The amount of material damage registered within the emergencies of technological character varied depending on the type of emergency situations. The greatest property damages as a result of the emergencies of technological character were recorded in 2011 and amounted to 669.1 thousand lei.

A. <u>Transport accidents</u> represent the kind of emergency situations of technological character where the highest number of casualties is registered. Thus, during 2010-2015 as a result of transport accidents, that are classified as



with Romania; R16 Bălți-Fălești-Sculeni; R17 Fălești - Pîrlița and R42 Ungheni-Măcărești-Bărboieni) with a length of 104.87 km and by 46 local roads with a length of 267.2 km. Ungheni district is the



exceptional circumstances of technological character, 84 people died and another 365 people suffered injuries and were hospitalized.

Transport (of various types: land, railway, etc.) is an activity that presents a source of danger not only for passengers but also for people living near the routes because along the ways flammable substances, chemicals, explosive substances, etc. are transported, which presents, in case of accident, a danger for people's life and health. Such substances constitute a significant part in the overall volume of freight.

Ungheni district is crossed by 4 national roads (R1 Chisinau-Ungheni-Sculeni - border



most important railway customs point on the border with Romania. Ungheni district has a well-developed road network of national and local importance and Ungheni city is an important railway and border customs point connecting the internal network with the outside. Ungheni district is crossed by 64 km of railway and the railway station of Ungheni city is an international point, the place where the transport of goods and passengers is crossing. Ungheni railway station is the largest railway junction of the center part of the country. Ungheni city has a river port on the Prut river, which is managed by the State Enterprise "Ungheni River Port". Ungheni river port is one of the four currently existing river ports in the Republic of Moldova.

Transports have experienced a spectacular development, being correlated with the explosive population growth and with the economic and social development. The existence of road, railway and fluvial infrastructure in Ungheni district implies various risks, that are dangerous for both the environment and the human society. The road transport has experienced an advanced development level among all categories of transport, taking place in Ungheni district on no less than 372.07 km of local and national roads without taking into account the vast street network within localities and unmodernized roads. This type of transport is estimated to be ten times more dangerous than railway or fluvial transport, where the causes of accidents are related to several factors: excessive speed, alcohol consumption, driver fatigue, difficulty routes in certain areas, breakdown of transport means, overcrowding roads, etc.

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No	Numb er of the road	Route (between what localities)	Road surface coverag e	Length on the district territory (km.)	Number of bridges on the road	Memberships (administrator )	Sectors with traffic dificulties (Locality or kilometer of roa are nominated where the possible situation may occu and the road length) Snowy (ope Icy (hil areas) valleys)	
1.	R1	Chişinău- Ungheni- Sculeni- bordering with Romania	asphalt	31,50 (70,30-101.80)	58	State Road Administra tion (SRA)		
2.	R1	Chișinău- Ungheni- Sculeni- bordering with Romania	asphalt	24,07 (104,82- 128,89)	8	(SRA)	116,50- 117,20 119,00- 120,80 121,00- 121,90	116,50-117,20 119,00-120,80 121,00-121,90
3.	R16	Bălți-Fălești - Sculeni	asphalt	6,30	6	(SRA)		
4.	R17	Fălești - Pîrlița	asphalt	14,40	6	(SRA)	18,20-19,00 22,10-22,60	18,20-19,00 22,10-22,60
5	R42	Ungheni- Măcărești- Bărboieni	asphalt	28,60	30	(SRA)	9,00-9,80 12,20-16,10 18,30-19,00 27,20-29,60	9,00-9,80 12,20-16,10 18,30-19,00 27,20-29,60

#### **Transport Network - National Roads**

The increase of train speed (in some cases at 200-300 km/h), the difficulties of crossed routes, the signal errors and other factors make the accidents in the area be very serious, especially since the number of passengers and the amount of freight are very high. The river transport is also included in the list of potential risks that may occur in Ungheni.



No	Route (between what localities)	Length on the district territory	Number and names of stations on the district territory		Number of bridges
		(km.)	For passengers	For loading/unloading goods and equipment	
1.	Bahmut - Cornești		Cornești		
2.	Cornești - Pîrlița		Pîrlița	Pîrlița	
3.	Pîrlița - Unțești		Unțești	Unțești	
4.	Unțești - Ungheni	64 km	Ungheni	Ungheni	7
5.	Ungheni - Berești		Berești	Berești	
6.	Berești - Petrești		Petrești		
7.	Petrești - Buciumeni		Buciumeni		

Information on railways that are crossing Ungheni district

With regard to road accidents, 50% of localities of Ungheni district are at risk of road acccident occurrence. According to the transport accident analysis of the last 6 years, two high-risk road sections have been identified, such as:

- Section R - 1 Chişinău - Ungheni - Sculeni bordering with Romania from km 98 + 33 m up to km 99 where over the last six years 6 serious road accidents took place that resulted in two deceased persons and nine injured persons.

- Section R - 42 Ungheni - Măcăreşti - Bărboieni from km 1 up to km 2 where there were committed five traffic accidents with 4 injured persons and one deceased person. The above-mentioned section intersects Ungheni city at Ștefan cel Mare street, where there is a high transport and pedestrian traffic. Within the Committee on traffic safety under Ungheni district Council of 20.04.2016, it was decided to

install artificial road bumps on that road section as well as artificial lighting for pedestrian crossings on the streets of Ungheni city.

In these sectors there have been taken concrete steps to install warning signs



1.31.2 "Dark Spot" that is used to be installed on a section of road with the length of up to one kilometer where in a period of 5 years there were recorded minimum 5 serious accidents that resulted in at least five victims. On

**section R-1** of the above-mentioned route, the location scheme of restriction indicator 3.27.1 "Maximum limited speed 70 km/h" from both directions has been amended.

At the same time on the route **R-1 Chisinau-Ungheni-Sculeni** a stretch of road with high risk of accidents has been identified from km 106 + 800 m up to km 107 + 650 m, where some measures of installing a warning indicator 1.31.2 "Black Spot" and an indicator of restricting speed should be undertaken.

Index name	Year 2010	Year 2011	Year 2012	Year 2013	Year 2014	Year 2015
Total number of accidents	37	37	37	57	53	42
Total number of accidents with cajualties	12	13	26	13	13	7
Total number of accidents with injuries	40	52	80	77	61	56
Total number of accidents in daylight	17	18	17	36	28	28
Total number of accidents at night	20	19	20	21	25	11
Total number of accidents involving pedestrians including:	11	9	10	21	17	11
-the open sections	10	8	8	18	15	7
-the crossroads	-	-	-	-	-	-
-pedestrian crossings	1	1	2	3	2	4
Number of accidents involving children, including:	1	1	5	9	5	5
- the open sections	1	1	5	9	5	4
- the crossroads	-	-	-	-	-	-
- pedestrian crossings	-	-	-	-	-	1
Number of accidents in which children have died, including:	-	-	-	4	-	-

Profile of road accidents and the places where the accidents took place in Ungheni district 2010 - 2015

-the open sections	-	-	-	4	-	-
-the crossroads	-	-	-	-	-	-
-pedestrian crossings	-	-	-	-	-	-
Number of accidents where children were traumatized, including:	1	1	5	5	5	5
- the open sections	1	1	5	5	5	4
- the crossroads	-	-	-	-	-	-
- pedestrian crossings	-	-	-	-	-	1
Distance from the accident place to the pre-school and school institutions	-	-	-	-	-	1 accident rutier la o distanță de 50 m.
Distance from the crash site to the public or socio- cultural institution	-	-	-	-	-	-

From the conducted analysis it was determined that the majority of road accidents are due to human factor, especially speeding and drunk driving.

At Ungheni district level measures on preventing road accidents are taken (meetings with citizens, information sessions, operations, etc.). Information on road accident situation in Ungheni district is displayed on billboards and annually the contest "Safety in traffic means life" is organized.

**B.** Detection of unexploded ammunitions represents the type of emergencies of technological character that most frequently occur within the territory of Ungheni district.



According to the Ministry of Defence, Ungheni district belongs to the list of

districts with a major risk, where citizens can track ammunitions (Ungheni, Orhei, Criuleni, Noi, Causeni and Stefan Voda) and with the average risk are Calarasi, Nisporeni, Straseni, Chisinau, Hancesti and Jaloveni.

Detection of unexploded ammunitions is due to the fact that through Ungheni district the Iași-Chisinau operation passed during the Second World War.

## The situation regarding the detection of unexploded ammunitions within Ungheni district 2005-2015

Indicator	Year 2005	Year 2006	Year 2007	Year 2008	Year 2009	Year 2010	Year 2011	Year 2012	Year 2013	Year 2014	Year 2015
Detection of unexploded ammunitions	6	9	17	5	15	15	15	13	11	15	20
Ammunition explosion	1	-	-	-	-	-	-	-	-	-	-
People killed	1	-	-	-	-	-	-	-	-	-	-

**C. Accidents with release (with risk of release) of hazardous chemicals.** There are 7 industrial entities that produce, store or transport hazardous toxic substances within Ungheni district territory:

No	Locality	Object name	Substance type, the maximum quantity	Number of employ ees	Administrator
1.	Ungheni City	Water treatment plant	Chlorine 7 tons	18	ÎM "Apă Canal"
2.	Valea Mare Village	Waste water treatment plant	Chlorine, 0,7 tons	16	ÎM "Apă Canal"
3.	Corneşti Town	SA "Ungheni - Vin"	sulfur dioxide, 5 tons	4	SA "Ungheni - Vin"
4.	Ungheni City	Gas distribution station	Methylmercaptan 250 liters	8	SA "Moldova Gaz"
5.	Morenii Noi Village	Gas distribution station	Methylmercaptan 200 liters	8	SA "Moldova Gaz"
6.	Zagarancea Village	Pesticide Storage	Pesticide, 85 tons	1	Artillery battalion "Prut"
7.	Ungheni City	Water treatment plant	Clor, 7 tone	18	ÎM "Apă Canal"

The possible chemical contamination areas are those areas where these business units that store, process, transport, produce or use hazardous or toxic chemicals are situated. A part of these entities represents an increased danger due to excessive wear of the technological equipment and due to the partial or full lack of protection systems. In total, about 30% of staff employed at hazardous industrial chemical entities are provided with industrial means of protection. At many entities the automatic warning systems of toxic substances and the permanent dispatch

service are missing, and the rules of construction 2.01.51-90 are not followed (in Russian,  $CH_{\mu}\Pi$  2.01.51-90). This increases the possibility of accident occurence, accompanied by leakage of toxic substances, and this reduces the possibility of the timely and qualitative detection, localization and liquidation of consequences.

In case of accidents with leakage of chemicals into the Prut river, the chemical contamination of the river water may occur and the shutdown of drinking water supply of the city and of the rural localities may happen. Undertaking the necessary measures to supply the city and the rural areas with drinking water from mine wells can lead to additional expenses amounting to 200 thousand per day. The municipal entity "Apa-Canal" uses chlorine in the technological process of water treatment. The chlorine reserve is 7 tons. In case of accident with chlorine leakage, the possible chemical contamination area can occupy a surface of 1.71 km2, with a depth of 4 km, affecting a population of 8 399 people. The casualties could be 4 199 people, material damage may be of 3 100 thousand lei.

D. Accidents with release (risk of release) of radioactive substances. The areas of possible radioactive contamination are directly related to the nuclear power plants located in the immediate vicinity of the borders of Moldova, which in case of proportion



accidents can be a source of radioactive pollution. At the same time, as dangerous



population, as well as to the environment pollution.

Seven nuclear plants were built near the Republic of Moldova in the range of 450 kilometers (nuclear power plant in Cernavoda Romania, Chernobyl, radioactive entities are the enterprises where dangerous radioactive substances are extracted, stored, processed, transported or used and they are radiative emission sources. Accidents to these sources, their loss of control can lead to radiation of personnel and



Zaporojye, Khmelnytsk, Rovno, Nikolaev-Iuzhnoukrainsk/Ukraine, Kozloduy/Bulgaria). Three of these are the most dangerous.



At the classification according to risk, it is taken into account **the capacity**, **provision with technology and the distance** where the nuclear plant is situated in relation with the Republic of Moldova. The most dangerous of them is the nuclear plant from **Nikolayev** in southern Ukraine, which

is 180 kilometers away from the Republic of Moldova. It is the largest nuclear plant in Europe. In case of an accident or terrorist attack, due to wind, the radioactive cloud of this plant can reach the territory of the Republic of Moldova within three hours. On second place among the most dangerous nuclear plants is the plant from **Kozloduy**, **Bulgaria**. It has reactors and a very old system of buildings. The nuclear plant from **Zaporojye**, which is also in Ukraine is on the third place among the most dangerous nuclear plants for our country.

The Ukrainian power reactors from Chernobyl were closed but Ukraine still remains on the nuclear risk map of Europe with its nuclear power plant in Zaporojye, the largest in Europe. There are six reactors operating here. In 2015 all reactors were urgently stopped as a result of a dangerous fluctuation of voltage pressure. Some of the oldest reactors in Ukraine are those of the central **lujnukrainsk**, in the south part of the country, at 500 km from the border with Romania.

There is no safe level of exposure to risk and there will always be risk factors. The nuclear industry can not accept this, taking into consideration that the nuclear plants are dependent upon population exposure to "safe" doses of radiation and not only. The major risk for population is represented by those accidents that lead to high emissions of radioactive substances into the environment. The nuclear power plants are designed and built in such a way that the emissions of radioactive elements in case of an accident are minimum. There is no way of obtaining electricity without risk, for example, thousands of people could die in case of a dam breakage at a hydroelectric plant. Nuclear accidents may occur with a higher probability, once the plant components are outdated. Unlike other types of accidents, the nuclear accident effects persist for an extraordinarily long period. In addition, the nuclear industry is also responsible for safety over time of the radioactive waste landfills, which represent another major risk to health and environment. Beyond the possible technical problems, the human error risk can never be excluded.

**E.** Fires, explosions, risk of explosions. These technological disasters have serious consequences: the destruction of industrial and residential buildings, affected personnel and population, considerable material losses. The forecasting calculations show that, in case of major accidents accompanied by explosions and fires at such entities, the evacuation of population and staff may be needed. Thus, so much attention at such entities should be paid to the strict implementation of legal



provisions regarding the construction, reconstruction, production safety and preservation of finished products, compliance with appropriate technologies and special rules.

### Risk of explosion

- For district gas supply a distribution network is required with a length of 198.1 km. Currently, 74.3 kilometers have been built, 102.8 km have been designed and 21 km are necessary to be projected. The low pressure distribution networks constitute of 174.4 km with 15 distribution points and 107 distribution cabinets.
- ✓ There are 18 mini heating systems. A possible explosion of steam boilers of low pressure can cause damage to buildings, equipment and can stop the heating supply system. The damage could constitute 6 mln lei and possible casualties 7 people.
- ✓ At "Danova-Prim" Ltd, the failure to comply with the conditions of processing and storaging the wheat flour can cause the explosion of flour dust and as a result, a fire with damage to buildings and technological lines may occur. The material damage may reach 500 thousand MDL. The are possible victims among employees.

There is a risk of large scale fires to the following companies:

✓ Joint-Stock Company "Covoare-Ungheni". The burning of the raw materials and of the finished products can lead to a fire that would damage and destroy the

industrial equipment and the industrial rooms. Possible damage - 5 mln MDL. There can be recorded casualties (more than 5 persons);

✓ **Ungheni Railway Knot.** The burning of the tanks with flammable substances (petrol, diesel, etc.) can cause explosions, leaks of flammable substances and fire spreading to surrounding entities and residential buildings. The damage could be of 900 thousand MDL. Cajualties could exceed 2 people.

 $\checkmark$  The are **11 gas stations with fuel supply** located in Ungheni City, where, in case of fire, the fire can spread to nearby residential buildings. Material damage may reach 500 thousand MDL.

✓ Since 2002 in Ungheni City **"Ungheni - Business"** Free Economic Zone is functioning on a surface of 42 ha. There are 31 residents with 2251 employees within **"**Ungheni - Business" Free Economic Zone.

 $\checkmark$  There are **11 production companies** in Ungheni City with a staff more than 50 employees:

No	Locality, address	Name of entity	Number of employees
1.	Ungheni City, 2 Oleg Ungureanu street	"Moldabela" Ltd	232
2.	Ungheni City, 54 Ştefan cel Mare street	"Danova-Prim" Ltd	110
3.	Ungheni City, 3A Industrială street	Mixed Entity "Ungheni-Vin" Joint-Stock Company	109
4.	Ungheni City, 2 Oleg Ungureanu street	"Covoare Ungheni" Joint-Stock Company	54
5.	Ungheni City, 13 Vlad Țepeș street	"Ungheni-Gaz" Ltd	243
6.	Ungheni City, 89 Decebal street	CS "Pinto-Mold" Ltd (Austria)	139
7.	Ungheni City, 2 Națională street	Municipal Entity " Apă-Canal"	160
8.	Ungheni City, 4 Ion Creangă, street	"Euroatlant" Ltd	167
9.	Ungheni City, 4 Boico street	ÎCS "Lones-Mol" Ltd	83
10.	Ungheni City, 2 Oleg Ungureanu street	Ltd "Filatura-Ungheni"	144
11.	Ungheni City, 3 Gh. Crestiuc street	Ltd "Lear Corporation"	1659

# Data on losses caused by fires in Ungheni district wihin the period 2005 - 2015

Index name	Dinamics of basic indices of fires produced in Ungheni district within the period between 2005 - 2015										
	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015
Number of fires	101	74	108	82	89	77	83	84	79	75	61
Material damage (thousand lei)	456,7	320,6	1 503,4	317,4	473,7	312,00	669,1	491,5	281,6	230,6	298,9
Deceased persons	15	5	12	8	2	6	4	5	5	6	3
Including children	2	-	2	-	-	-	-	-	-	-	-

Injured people	2	6	12	4	4	1	1	2	2	2	3
Rescued people	2	6	12	5	3	4	8	4	12	2	38
Rescued goods (thousand lei)	4 064,00	4 883,00	7 061,00	36 193,00	3 936,00	4 941,00	5088,00	3 950,00	3 895,00	2 946,00	5 036,00

**F. Sudden collapse of buildings, constructions.** In 2012 in Todireşti village, due to the weight of the snow, the roof of the House of Culture crashed. They were 360 m2 of metal roofing and 5 m3 of timber damaged. The material damage amounted to approximately 30,6 thousand MDL. Generally, in Ungheni Emergency Department records there are no constructions, installations or other territorial arrangements in bad conditions and with a risk of collapse.

### G. The risk of failure of public utilities

Across Ungheni district there is a risk of failure of public utilities in any locality. The distribution networks of water, electricity, gas, thermal energy (in cold weather) could be affected. These disorders may suddenly occur, as a result of a breakdown or they may occur in ascheduled way, due to some revisions made by the supplier/user. Another risk could be the special communication failures, communications of population - mobile and landline phone operators, Internet, broadcast media, etc. In principle, delimited neighborhoods in urban areas and some rural villages of rural areas could be affected. The failures can occur in distribution networks and as a result of emergency situations (floods, earthquakes, landslides and land collapses, dangerous meteorological phenomena, etc). In that case the intervention is performed by specialized teams that serve the economic operator's distribution networks.

### H.The risk of object falling from atmosphere or from space

In Ungheni district the areas are not inventoried where such events would have occurred, but there is the possibility of object falling from atmosphere, as well as from space (components of satellites, etc). In case of an emergency of this kind, Ungheni Department of Emergencies plays an important role.

### General conclusions from the analysis of the emergency profile of technological

### <u>risks</u>

In the period of 2010-2015 in Ungheni district, there were 811 emergencies of technological character registered:

- Explosions in public and private buildings/fires - 459

- Car accidents - 263

- Detection of unexploded ammunitions - 89.

The number of emergencies during 2010-2015 varied and averaged 135 cases annually.

In the years 2010-2015 in Ungheni there were 459 fires registered, which caused material damage amounting to 2 283 700 MDL.

The list of potential risks of technological character that could affect Ungheni district is much more complex than the risks identified according to the information and statistical data and this should not be ignored. These risks and threats should be taken into account particularly at the stage when prevention and risk reduction measures for Ungheni district would be developed:
No	Hazards / emergencies of technologic character	Characteristics		
	identified in Ungheni district			
1.	Accidents of passenger/goods trains	64 km of railway crossing Ungheni district		
2.	Detection of unexploded ammunitions	The detection of unexploded ammunitions is due to the fact that on the territory of Ungheni district the Ungheni lasi- Chisinau operation went during the Second World War.		
3.	Accidents with release (risk of release) of dangerous chemicals	There are 7 industrial enterprises located in Ungheni district that produce, use, store or transport hazardous toxic substances.		
4.	Accidents with release (risk of release) of radioactive substances	Seven nuclear plants were built near the Republic of Moldova at the distance of 450 kilometers (nuclear power plant in Cernavoda/Romania, Chernobyl, Zaporojhye, Khmelnytsk, Rovno, Nikolaev-Iujhnoukrainsk/ Ukraine, Kozloduy/Bulgaria).		
5.	Fires, explosions, risk of explosions	In the period between 2010-2015 in Ungheni district 459 fires took place, where 29 people died and 11 were hospitalized.		
6.	Sudden collapse of buildings and constructions	Between 2010 - 2015 one case of collapse of the roof of a cultural institution ocurred (in 2012 in Todireşti village due to the weight of the snow the roof of the House of Culture crashed.		
7.	The risk of failure of public utilities	There is a risk of failure of public utilities that may occur in any rural or urban locality from Ungheni district.		
No	Potential hazards/	Characteristics		
	emergencies of technologic character that may affect Ungheni district			
1.	River accident	Ungheni City has river port on the Prut river which is managed by the State Enterprise "Ungheni Fluvial Port". Ungheni river port is one of four currently existing river ports in the Republic of Moldova.		
2.	Dangers and threats to critical infrastructure	<ul> <li>Natural (global warming, falling of meteorites, increase of solar radiation, earthquakes, storms, heavy rainfall, flooding)</li> <li>Products (irrational exploitation of soils and creation of severe imbalances, terrorism)</li> </ul>		
3.	Accidents at sewage systems with massive release of pollutants	The length of the sewage system in Ungheni district is 63 084 m.		
4.	Acciedents at drinking water supply systems	The length of the water supply system in Ungheni district (which is managed by IM "APA-CANAL Ungheni") is 81 751 m. Due to the outdated system (multiple cracks exist in the network) the district localities are exposed to the risk of accidents ocurrence. The total length of the water pipelines in the villages of Ungheni district is 245.71 km.		
5.	Accidents to wastewater treatment plants of the industrial entreprises with a massive release of pollutants	Ther are 11 wastewater treatment plants within Ungheni district but only 4 of them are functioning. The total length of the sewerage networks in Ungheni district is 63084 m.		
6.	Hydrodynamic accidents (breaking of dams, dykes)	The state of protection dams of Ungheni city and Frăsinești village/Măcărești is deplorable. The dams of 13 water bains from Ungheni district localities require to be repaired.		
7.	The risk of falling objects from atmosphere or from space	There is the possibility of falling cosmic objects from atmosphere, as well as those from space		

# MATRIX OF RISKS OF TECHNOLOGICAL CHARACTER

Likelihood	Impact/Consequences					
	Negligible	Minor	Moderate	Significant	Severe	
Almost certain	M	R	R	E	E	
Likely	M	M	R	R	E	
Possible	S	M	M	R	E	
Unlikely	S	M	M	M	R	
Rare	S	S	M	M	R	

MATRIX OF RISKS OF TECHNOLOGICAL CHARACTER IN UNGHENI DISTRICT

Likelihood	Impact/Consequences				
	Negligible	Minor	Moderate	Significant	Severe
Detection of unexoploded ammunitions	Medium	High	High	Extreme	Extreme
Accidents with release (with risk of release) of dangerous chemical substances	Medium	High	High	High	Extreme
Accidents with release (with risk of release) of radioactive substances	Medium	High	High	Extreme	Extreme
Fires, explosions, risk of explosion	Medium	High	High	Extreme	Extreme
Sudden collapse of buildings and constructions	Medium	High	High	High	Extreme
The risk of failure of public utilities	Medium	Medium	Medium	High	High
Fluvial accidents	Medium	Medium	Medium	Medium	High

Dangers and threats to critical infrastructure	Medium	Medium	Medium	High	High
Accidents to sewerage systems with massive release of polluting substances	Medium	Medium	Medium	High	High
Accidents to drinking water supply systems	Medium	Medium	Medium	High	High
Accidents to wastewater treatment plants of industrial entities with a massive release of polluting substances	Medium	Medium	Medium	High	Extreme
Hydrodynamic accidents (breakage of dams, dykes)	Medium	Medium	Medium	High	High
The risk of falling of atmosphere or space objects	Low	Low	Medium	Medium	High
Accidents of passenger / goods trains	Medium	Medium	Medium	Medium	High

#### 3.2.3. Social-biological risks

The major socio-biological risks identified in Ungheni District are epidemics and epizooties/zoonoses. The aim of identifying these risks is to reduce and avoid, as far as possible, loss, to ensure a prompt and qualified assistance to the affected ones and realize prevention and intervention measures.

## A. Epidemics (mass spreading of a transmitted disease to people).

The epidemic represents the appearance of a bigger number of transmitted diseases cases to the expected one in a certain period of time and to a certain category of population.

In the category of this risk type identified in Ungheni District may be included people with dangerous contagious diseases, especially of children.

<u>Causes of this risk</u>: poor sanitary conditions, poverty, water and aliments contamination.

<u>General features</u>: high possibility of spreading, existence of some social and economic imbalance.

<u>Predictability:</u> epidemiologic studies and reports may increase the diagnosis and forecast capacity, including diseases with great incubation periods.

<u>Vulnerability factors:</u> lack of immunization to diseases, lack of qualitative water. <u>Effects</u>: many patients among population and especially among children.

<u>Risk reduction measures</u>: monitoring the reduction of emergency medical risk factor, elaborating a protection plan with necessary resources allocation.

<u>Specific preparation measures</u>: diagnostic verification and confirmation, case identification, epidemic sources finding, case evolution control, etc.

According to the reports of District Public Health Centre, in Ungheni District the epidemic process of VH,,A" is activated once in 5-6 years, by registering disease cases more among children, who previously did not have diseases. It was found that the appearance of group infection cases of contagious diseases and shutter of VH,,A" epidemic among population, especially children who attend kindergartens and schools, is due, in much extent, to droughts, noninsurance of the population of Ungheni District with the necessary quantity and quality of drinking water.

The statistic data show that only 58.133 (51%) of Ungheni District population is ensured with water from centralized sources, from them 31,831 (81%) is urban

population. Other 49% of district population is ensured with water from mine wells. Water used in rural localities (rural aqueducts) do not correspond to normatives and indicators regarding the content of nitrates, ammonia, fluorine and contain high level of а mineralization.



A study regarding the assessment of ensuring children with drinking water and sanitation realized in 2015 by the District Public Health Centre showed that from 53 functional kindergartens in rural and urban localities, only 32 (or 60%) have water from centralized sources, the other 21 kindergartens (or 40%) are ensured with water from decentralized sources/ mine wells.

Annual accumulation of about 25 tons of different hazardous medical waste and noninsurance of their inactivation through autoclaving, presents a real and imminent risk of Nosocomial Infections appearance. This medical waste comes from current activities of those 90 medical institutions/ IMSP, from them <u>71 are public</u> (1 District Hospital; 14 Autonomous Health Centres; 26 GP Offices; 29 Health Offices; 1 District Centre for children with tuberculosis/ Cornesti; 1 Emergency Medicine Station and 2 substations) <u>and 19 private</u> (12 private Dental Offices; 1 Diagnostic Laboratory; 5 private Medical Offices; 1 private Medical Centre).

Lack of anti-epidemic conditions in the activity of trade markets from Ungheni District, placed in Ungheni City and Cornesti Town, communes Pirlita and Sculeni, endangers the safety of population health (there are 14 functioning markets, from them 3 are mixed, 3 are agrifood, 8 trading of closed type).

The population of Ungheni District is exposed in mass to tobacco smoke in public places, open spaces/ stadiums, markets, bus and railway stations, public alimentation objectives, entertainment and recreation places; blocks of flats, public transport, adjacent territories of public health, education and training institutions. This thing happens because there are not fully applied the measures that are necessary to be respected by the responsible persons who administrate nominated objectives.



Contacting with TBC patients is a permanent risk that has a high socio-economic impact on the population. Only during 2015, in Ungheni District, there were registered 120 new TBC cases, from them 117 are pulmonary: 30 cases in urban localities, 87 in rural localities, including 11

cases among children.

It is important to notice the social statute of TBC patients that is presented in this way: 72 persons/ or 61,6% are not employed, 17 persons/or 14,5% - employed, 12 persons/or 0,2% are pensioners, 5 persons/ or 4,3% are disabled, 11 persons / or 9,4% are children.



# **B. Epizootics/zoonoses** (mass spreading of a transmitted disease to animals)

In the category of this risk type identified in Ungheni District are included contagious diseases of farming animals.

The flock of animals and birds exists more in the peasant households sector. Inadequate administration of animal waste, improper storage or spreading manure agricultural fertilizer, as without being bio sterilized, constitute infection and generating epizootics sources.



<u>General features</u>: combination of more factors/high temperature, pesticides use, non processing of animal waste, water quality, animals migration

<u>Predictability:</u> systems for examining the stage of animals' development

<u>Vulnerability factors</u>: big and various number of animals, lack of control on imports <u>Effects</u>: mass sickness at community level, starvation

A potential risk source for an epizootics outbreak are the animal fairs, whereas to these objectives are gathered animals with different epizootological situations, from flocks with uncertain and unknown health statute.

Another potential risk source is wild animals, carriers of the rabies virus. During 2013-2015, there were registered 29 rabies cases, from them 24 cases at domestic animals (bovines, dogs, cats) and 5 cases at wild animals (foxes).

At this moment, in Ungheni District there are no major epidemics or epizootics, the epidemiological situation is stable.

#### 4. Conclusions

Risks identification in district of Ungheni was a complex and continuous process that included assessment of hazards and vulnerabilities of district's localities, being identified peculiarities of risks of disaster with natural, technological and biologicalsocial character, which are mostly characteristic for Ungheni district communities. We are aware that the factors affecting climate changes and economic development of localities can increase the incidence and magnitude of disasters (whether caused by extreme weather events or industrial accidents). That is why we cannot treat any more the sustainable development of Ungheni district without making an association this development with disasters prevention, specifically identifying risks and vulnerabilities, population awareness and involvement in prevention, environmental preservation in good conditions etc. In this context, the public participation process is essential, taking into account the quality of life and environment, economic vitality, social equity and resilience to disasters. This holistic approach will be assured by public policies that will first of all meet the need to create a culture of prevention, while transforming the society into an environmentally responsible one, which represent a priority for these policies.

During the risks of disasters identification process in Ungheni district there were identified and described 11 natural hazards (earthquakes, floods, landslides, heavy snows, glazed frost, strong wind, heavy hail, whirlwind, droughts, frost); 8 technological hazards (transportation accidents, unexploded ammunitions, accidents with release (with risk of release) of hazardous chemicals, accidents with release (risk of release) of radioactive substances, fires, explosions, risk of explosions, sudden collapse of buildings, constructions, risk of failure of public utilities, risk of object falling from atmosphere or from space); 2 socio-biological risks (epidemics and epizootics / zoonosis). As a result of prioritization of risks of disasters in Ungheni district being focused on various criteria such as intensity, frequency, impact and likelihood there were selected for the next phase of risks analysis 5 natural hazards (landslides, floods, large hail, torrential rains and droughts) and 3 technological hazards (transportation accidents, detection of unexploded ammunitions and fires), while socio-biological risks will not be analysed due to the fact that there are no statistics in Ungheni district proving that these occurred frequently in the last 10 years.

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