Report on Disaster Risk Analysis in Ungheni District

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crismas europe.eu
the community for risk management & assessment

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CHAPTER 1. INTRODUCTION

This report emphasyzes the importance of disaster risk analysis within the risk assessment process in international, national and regional context. The emergency of new risk types and evolutions on international level generate increasingly complex needs in risk management field, as well as implications concerning their management at national and regional level.

In this context, there appears the necessity to use a common language in risk management field and a coherent and sole process of analysis, so that to be possible to identify risks with major impact at regional and national level and an integrated risk management.

1.1 IMPORTANCE AND NECESSITY TO REALIZE DISASTER RISK ANALYSIS

International context

Most of the European Union member states had developed risk assessment methodologies, adopted in national legislation and already today operationalized. These evolutions are registered in the context, when, starting with 2010, in order to improve the capacity of member states to respond through prevention, preparedness and intervention measures to the identified risks, the European Commission has initiated a process for creating a unique methodological frame for risk assessment that might allow the elaboration of some joint European strategies and policies, on the basis of some comparable results at the European Union level. A common European frame has as a goal a better resource management and distribution, for preventing and an effective and efficient management of negative effects made by disasters and other risks at the European Union level.

The Guidelines formulated at the European Commission level creates a common analysis frame to Member States. The objectives of these guidelines, aim, inter alia:

- using the best practices of the international standards in the European Union and developing a joint approach of risk assessment;
- creating an instrument regarding the risk assessment for key stakeholders, especially, those from the disaster management field;

- developing the knowledge referring to the policies regarding the disaster prevention at different administrative levels;
- delivering resource information regarding the modality to prioritize and allot investments in preventing, preparing and establishing rehabilitation measures;
- increasing the awaring level of population regarding the disaster prevention measures;
- delivering information for setting up a database at the European level with capacities to assist in case of disasters.

The European Commission promotes a unitary approach of risk assessment at national level, for:

- a better understanding of the risks that the European Union member states confront;
- facilitating the cooperation and joint the resources of member states in managing some risks that may affect different regions or countries from the European Union (cross border risks);
- unitary risk treating;
- a better assessment of impact by setting up the aspects that may be considered;
- a better transparency of the information regarding the risks and their impact at member states level;
- a greater consistency and comparability of used data, of used indicators, of the information collecting and processing methodology and developed patterns on the basis of on field collected information.

National and regional context

The provisions of regulatory acts in force of the legislation of the Republic of Moldova in risk assessment field contain aspects that may be considered as starting points in elaborating risk assessment methodology at national level. Thus, there may be mentioned elements regarding the definitions of different types of risks and risk calculation methods, including the likelihood. At the same time, the regulatory and procedural frame regarding risk assessment in the Republic of Moldova is not developed in an integrated manner for allowing a unitary approach of risks at national level. The process of risk analysis and assessment should be completed

with more aspects, among them, there are *using risk scenarios, likelihood analysis, impact and global impact analysis*.

According to the recommendations of the European Commission, the public administration institutions should adopt this unitary approach that may contribute to the assessment of different risk types. Both some provisions from national legislation referring to risk assessment and the recommendations of the European Union represent a starting point for elaborating a unitary methodology of risk assessment at national level. This methodology will be able to be implemented to the types of risks recognized at the level of legislation in force in the Republic of Moldova and identified in Ungheni District.

At country/Republic of Moldova level these are:

Natural risks:

- dangerous meteorological phenomena (*floods, drought, hail, storms, frost*);
- geological destructive phenomena (*landslides, earthquakes*).

Technological risks:

- *fires;*
- *accidents*, explosions and fires (*transportation*, industry, storage of hazardous products, transports, nuclear);
- water pollution;
- building, installation or facilities collapses;
- failure of public utilities;
- objects falling from the atmosphere or from space;
- unexploded munitions;

Biological risks:

- epidemics;
- epizootic / zoonoses.

At Ungheni District level these are:

Natural risks:

- dangerous meteorological phenomena (*floods, drought, hail*);
- geological destructive phenomena (*landslides, earthquakes*).

Technological risks:

- *fires;*
- *transport accidents;*

- *unexploded munitions.*

After identified risk assessment, for their management, there will be elaborated risk management plans. These plans will ensure a good coordination at regional level of the institutions involved in minimizing risk effects that are part of emergencies, and a better management and development of capacities to respond to these risks.

Considering the international (especially at the European Union level) and national context, there may be formulated the following problems that support the approach to realize a unitary methodology of risk assessment at national level:
- it is found the existence of a national, non unitary specificity regarding the way different risks generating emergencies are identified, assessed and managed;

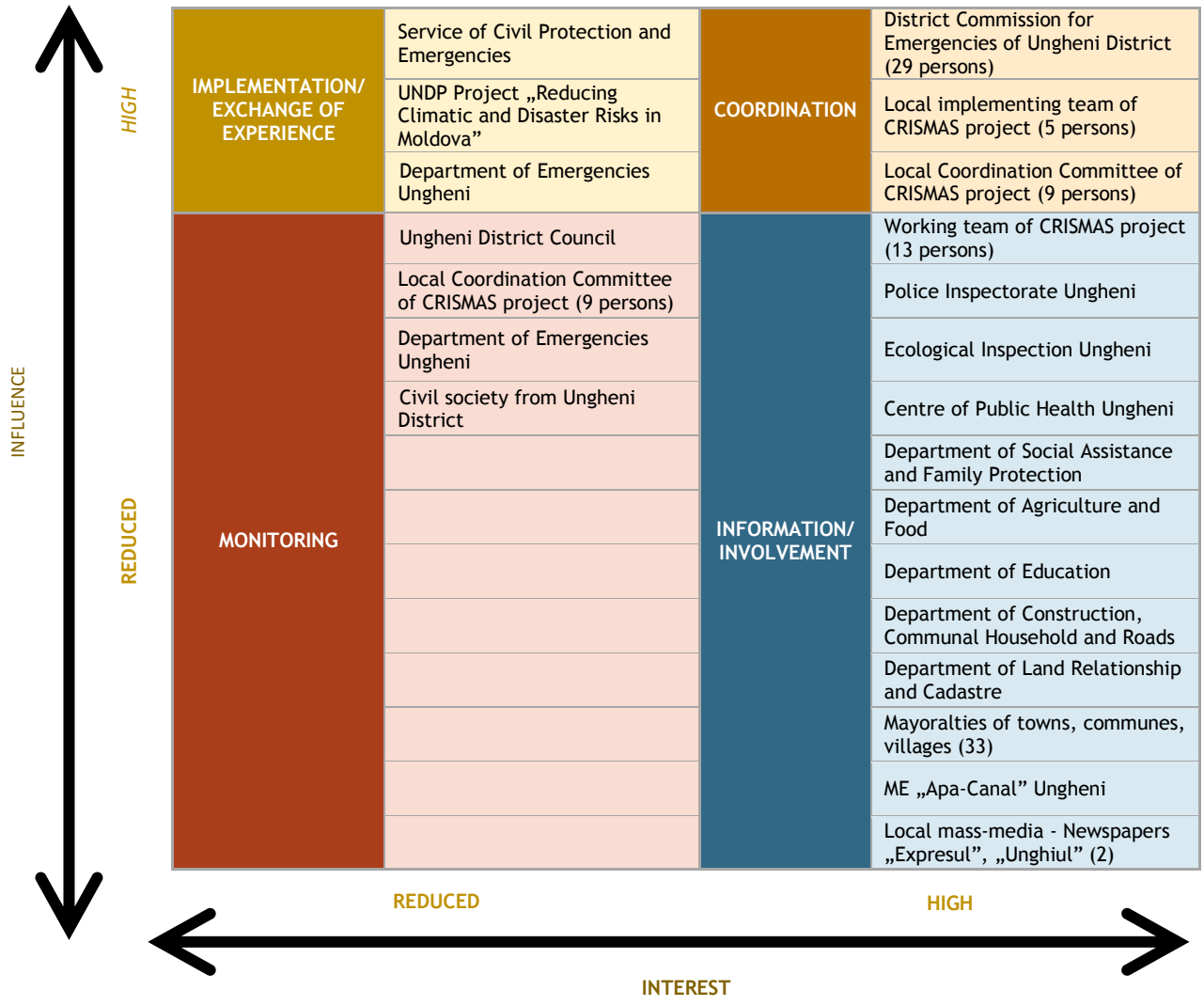
- there are substantial terminological differences in the methodologies used at national level in different risk types management;
- there is a great linguistic and semantic diversity at the European Union level that puts its mark on the profile of the methodologies used by different countries – this situation affects the risk communication between the institutions of different European states;
- there are substantial differences in setting up the criteria that are on the basis of impact assessment of different risk types;
- there are differences at national level regarding the impact assessment of some risks.
In order to mitigate the effects of the pointed problems, in the process of elaborating this methodology of unitary risk assessment, it will be taken into account the existent best practices at European level and existent methodologies at national level on different risk types.

1.2 COMMUNITY INVOLVEMENT IN DISASTER RISK ANALYSIS

The participatory approach of interested parts in the process of disaster risk assessment leads to the improvement of strategic capacities of decision-making factors, appearance of modifications in the perception and conceptualization of the social context, strengthening of democratic practices, citizens' involvement in the public policies elaboration and implementation and especially, contributes to the increase of trust in decision-making factors. The improvement of the informational

base of decision-making processes, realized on the basis of consulting and involving interested factors leads to a better use of information, and a better integration of a larger context determines a range of valuable options for making decisions.

The interested parts from Ungheni District were involved constantly in the proces of identifying and analyzing specific disaster risks for Ungheni District, being consulted and informed through different methods and techniques. The most important consulted and involved stakeholders from Ungheni District may be found in the matrix of interested factors.



MATRIX OF INTERESTED FACTORS

Decison-making factors at district level are represented by both interested parts from decentralized services (district head office, departments of Ungheni District Council, Department of Emergencies Ungheni, etc.), and interested parts at local level (local councils, mayors of towns, communes, villages from Ungheni District, citizens, non governmental organizations of different levels).

The involvement of the interested parts is crucial for identifying disaster risks, adapting and assessing vulnerability. The knowledge and individual and institutional experience of interested factors represent the main resources for adapting to natural and technological hazards. The adaptation capacity may be developed if the interested parts have time for strengthening networks, knowledge and resources.

The success in involving the interested parts means not only informing the interested and affected ones, but, also, their involvement in assessing the viability of adapting measures, in integrating the collected information in the own social, economic, cultural and ecologic context. The interested parts are, also, very important in assessing the future needs for developing policies and adapting measures.

Within the process of analyzing prior disaster risks in Ungheni District there were used different participation levels of interested or involved parts: transmitting simply the information for interested parts, empowering significantly the interested parts in the decision-making process. Actually, the interested parts are those who can set up their involvement degree that is they can wait for or have the direct right to a certain involvement level.

Considering that hazards reduction starts by individual awaring and action, the activities unfolded within the CRISMAS project are based on a constant process of informing and consulting interested factors in order to increase the communities resilience towards specific hazards of Ungheni District. Hazards had always a major impact on the human communities, but, fortunately, with the science and technology progress, their effects may be now more limited.

Therefore, very important are the activities and measures taken before the hazard, that may be directed to hazard/disaster prevention (unfolding some activities and taking measures for preventing a disaster), reduction (the authorities or community are awared that there may occur certain hazards, but they try to limit, as much as possible, their impact by improving the community abilities to absorb this impact) and preparedness. The hazard will occur, therefore, it should be set up the responding measures and a recovery procedure.

The local community of Ungheni District was involved and participated at all stages of the process of identifying and analyzing the disaster risks specific to the district for, finally, to propose measures of disaster risk prevention and reduction in Ungheni District. The entire community shares, as well information regarding the risks and mitigating activities that are ongoing or recommended by public informing and warning capacity. People preparedness, property, infrastructure and economy critical resources protection for resisting or absorbing the impact of a hazard and recovery in a manner that supports their life style make the communities more resilient. **Resilience** of a community means an integrated effort to recognize, understand, communicate, so that the community may develop a set of actions for accomplishing hazards reduction and resilience improvement. Community involvement in the process of disaster risk assessment contributes essentially to the increase of its resilience in disasters.

CHAPTER 2. USED TERMINOLOGY IN RISK ANALYSIS AND ASSESSMENT

The used terminology is harmonized with the vocabulary used in the methodologies of risk analysis and assessment in the EU member states and UN documents and provides coherence to the process of risk assessment at regional and national level.

At the moment of this report elaboration, the national legislation comprises different definitions for the notions used in the process of risk assessment. For ensuring ourselves a joint understanding in the process of risk assessment, we propose the definitions agreed at the level of authorities accountable in risk management generating emergencies for the used notions in risk assessment.

2.1 USED NOTIONS IN RISK ANALYSIS AND ASSESSMENT

The above definitions were formulated as a result of a consulting process between the main institutional stakeholders involved in risk management and assessment. Within this process, there were analyzed the definitions used in the methodologies developed at the level of some EU member states and AELS, definitions adopted at the European legislation level, as well as some recommended definitions at international level, as ISO, European Commission and UNISDR. After identifying definitions, there were discussions within some working meetings where was agreed their content.

1. Hazard

Hazard is a dangerous process or phenomenon, substance, human activity or situation that may cause casualties, injures or may generate other impact on health, harms to properties, loss of living means and services, social and economic disruptions or harms on the environment. The hazard may be classified, from the origin point of view, in two types: natural hazard (natural process or phenomenon) and anthropic hazard (process or phenomenon caused by man).

2. Risk

The risk is the math estimation of the likelihood of producing casualties, material harms and environment harms, social and psychological harms, on a reference period, respectively future and in a given area, for a certain type of risk event. The risk is defined as an outcome between likelihood of a disaster and its impact.

3. Reasonable risk

The reasonable risk represents the level of potential losses that a society or community consider to be bearable, because of social, economic, political, cultural, technical and environmental specific conditions.

4. Risk matrix

Risk matrix represents a graphic instrument for ranking and viewing risks that allow the comparison of different risk types or scenarios and consider the likelihood and impact values.

5. Exposure

The exposure is represented by the totality of people, properties, systems or other

elements present in hazard areas that may suffer certain losses. The exposure has a variable character depending on the moment when the event occurs, this may generate different impact.

6. Vulnerability

The features and circumstances of a community, system or good that make that community to be susceptible to the harmful effects of a hazard. The vulnerability is a gradual measure of exposure, being a dimensionless, overdroven number, with 0 value for the unaffected element and 1 for the elements totally affected.

7. Impact

Represents the negative effects of a hazard expressed in notions of the impact on the population, economic, environmental, social and psychological impact.

8. Impact on the population

Represents a type of impact that refers to the number of casualties, number of injured people, as well as number of displaced people and isolated people.

9. Economic and environmental impact

The economic impact refers to the quantification of all material and economic losses generated by the risk phenomenon, expressed as amount in EURO and percent from GDP. The impact on the environment refers to the area affected after the risk event occurrence, expressed as outcome between the affected area, number of species and number of years needed for recovery.

10. Social and psychological impact

The social and psychological impact refers to the effects on the social stability and considers the interruption of daily activities of the communities/society caused by risk events, as well as the psychological impact on citizens.

11. Likelihood

The likelihood refers to the possibility that a hazard to occur in a predetermined time, considering the available information.

12. Risk assessment

Process of identifying, analyzing and appraising risks for determining the risk reasonability.

13. Risk identification

Represents the process to identify, recognize and describe the risk. Risk identification supposes the identification of risk sources, events, causes and potential consequences. Risk identification may involve the use of historical data, analyses, informed opinions of experts and needs of interested parts.

14. Risk analysis

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

15. Risk appraisal

The process of comparing the results of risk analysis with the risk criteria for determining if the risk and its intensity are reasonable or tolerable.

16. Risk management

Risk management represents the systematic implementation of policies, procedures and practices in management of communication, consultation, context setting up activities, as well as risk assessment, treatment, monitoring and reassessment.

17. Scenario

The scenario is a representation of a risk or multi risk situation that leads to a significant impact, selected for detailed assessment of a certain risk type for which it is representative or may constitute an informative example or illustration.

CHAPTER 3. QUALITATIVE ANALYSIS OF PRIOR DISASTER RISKS IN UNGHENI DISTRICT

3.1 SWOT Analysis of prior disaster risks in Ungheni District

The process of disaster risk analysis and assessment is based on the analysis of both technical features of hazards, as it may be on one side their location, intensity, frequency/likelihood, on another side physical, social, economic, environmental, vulnerability and exposure dimensions, taking into consideration the capacities of risk pertinent adaptation. Risk analysis provides answer to the question "*What may occur in a certain context*?". The risk may be assessed as *likelihood function of producing harm and likely consequences*, being understood as a size measure of a natural "threat". Risk analyses, in this case, constitute the support for decision-

making process for taking some concrete measures, aimed to lead to danger limitation and mitigation (risk management).

Depending on the *relationship hazard – risk*, risk analysis should be:

- **multi-hazard**: the same area may be threatened by different hazard types. According to the category of the occurred hazard, it can be met different scenarios, and each of risk scenarios, also, can have different magnitude. E.g. water depth and speed in floods have a different impact on different risk elements, and need, therefore, different curves of vulnerability and different occurrence likelihood. Therefore, it is important to identify, besides hazard category and their impact on current and future investments, on different socio-demographic groups and their capacities to resist and cope with the impact.
- **multi-sectorial**: hazards will have impact on different types of risk elements and for that, it is important to calculate the total effect on them, including at the level of rural and urban environments. In the rural environment it will be important the impact on the agriculture, population, transport network and natural environment (protected area, forests, wet areas, etc.). In the urban environment, it is important to consider the construction types, transport and communication networks, economic activities, health and education systems, people's living level and awaring and involving degree of the community;
- **multi-level**: risk assessment may be made at different levels. Depending on the risk study objectives, it is possible to make difference between national, regional and local policies, plans and activities for seeing the way they contributed to the risk increasing or mitigation, their strengths and weaknesses in risk management and what resources are available at different levels for mitigating risks;
- **multi-interested parts**: the relevant interested parts, who may be individuals, enterprises, organizations and authorities should be involved in risk assessment activities;
- **multi-phase**: risk assessment should consider responding, recovery and mitigating and preparedness measures.

At the risk analysis and assessment may be used both qualitative methods and quantitative ones. *Qualitative methods* lead to qualitative risk description regarding the high, middle and reduced aspect. These are used when the hazard can't be expressed in quantitative notions and/or when the vulnerability can't be

expressed quantitatively. *The quantitative methods* express the risk in quantitative notions, as likelihoods, or expected losses. They may be deterministic/ bazed on scenarios (considering a certain scenario) or probabilistic (considering the effects of more possible scenarios). The risk may be expressed quantitatively, when there is sufficient information concerning risk individual components, vulnerability and risk elements.

One of qualitative methods is SWOT analysis. The diagnosis analysis helps to identify some strengths, weaknesses, some opportunities and some threats for Ungheni District. These ones will be described further and will provide a basis for defining district needs.

SWOT analysis of prior disaster risks in Ungheni District

STRENGTHS	S	W	WEAKNESSES Puncte slabe
• Ungheni District has experience in elaborating local public policies, organizing informing, education and citizens participation in decision-making process at local level (public consultations) campaign • Ungheni District has experience in promoting some mass-media awaring and informing campaigns regarding disasters • There exist some efforts at local level to improve the inter-institutional collaboration and coordination • Ungheni District has experience in attracting funds and implementing external funds projects • In Ungheni District it is created a local system for disaster prevention and liquidation • In Ungheni District there exist prepared groups in civil protection (4000 persons and 33 mayoraltiesi) • Ungheni District has a good road and railway accessibility • Ungheni District is attractive by its border position, as a transit logistic center • Specialized services equipped with heavy machinery • Implementing local policy of grounds afforestation • Developed mobile phone network • Developed industry			• Within local public administrations of Ungheni District there are no persons accountable for disaster prevention and liquidation in the locality • Insufficient training of accountable persons in disaster prevention and liquidation • Weak involvement of civil society in disaster prevention and liquidation field • Very small budgetary allocations in disaster prevention and liquidation field • Funding of projects in disaster prevention and liquidation field is made from external sources and, in less cases, from inner resources • The systems warning about the imminent occurence of some emergencies in the localities are morally and functionally obsolete • Lack of legal base for involving volunteers in disaster prevention and liquidation field • Lack, in the district localities, of systems warning about the imminent occurrence of some emergencies • The houses and individual households are not equipped with protection means in case of emergencies • Exodus of qualified population • Lack of educational programs for preparing children for emergencies • Existence of responsibility overlap in environment management or disaster risk informing and prevention activities among some local public services and a relatively poor coordination

			• Weak capacity of first-aid teams to access rapidly in some rural areas • Reduced local accessibility to funds for emergency intervention
OPPORTUNITIES	**O**	**T**	**THREATS**
• Increasing the resilience degree to disasters in Ungheni District • Strengthening the capacities and using of informational and communication technologies in disaster prevention and liquidation field in the district • Continuing the efforts to improve the implementation of disaster management system local level • Reducing substantially the number of persons affected by disasters • Reducing the direct economic losses in disasters • Reducing the disaster impact on the critical infrastructure and basic social services, including health and education • Strengthening the cooperation of local public authorities of levels I and II with civil society (NGOs and population) in disaster prevention and liquidation field • Availability and access of population to warning systems, information and assessments regarding disaster risks • Opening a Center of Mobile Emergency Service for Resuscitation and Extrication (SMURD) in Ungheni			• Disaster prevention is not supported by a long-term national strategy • Seismic risk, landslides, floods in the meadow of the river Prut • Reducing and degrading green spaces • Politicial instability • High coefficient of meandering of the river Prut • Sudden decreasing of phreatic waters • Lack of drinking water in wells in rural localities • Transportation of hazardous substances on raiway • Frequent natural disasters cause the destruction of agricultural crops • Possible increasing of threats regarding climate changes and other natural disasters

3.2 Cause-effect analysis of prior disaster risks in Ungheni District

3.3.1 NATURAL RISKS

1. **<u>DROUGHT RISK</u>**

Causes:

a. Absence of rainfall, increase of potential evapotranspiration

b. Characteristics of active areas (features of relief, soil, depth of groundwater, degree of vegetation covering, etc.)

c. Physiological particularities of the plant (kind and vegetation phase, resistance to dryness degree)
d. Anthropic influence on the environment (ground situation and the used agrotechnics that may facilitate the water depletion in soil).

Effects:

➢ *In agriculture and industry*

- The drought affects agricultural crops, green forages and cereals used in animals feeding;
- Lack of clean drinking water, water for public salubrity and personal hygiene that may lead to some diseases that endanger life;
- Reduced humidity and lack of rainfall may create rapidly dangerous conditions for shuttering fires in forests and grounds with much dry vegetation that may produce injuries, casualties and material harms;

- Loss of harvest/ reduced productivity/loss of venue;
- Lack of water for gardens and animals;
- More pumping of groundwater, increase of costs;
- Need to pass to more resistant to drought crops;
- Reduced fish production in lakes and rivers;
- Increase of water costs;
- Lack of quality and sufficient quantity of industrial water, reduced income.

➢ *In towns and cities*

- Water for household consumption in limited quantities or lack
- Lack of water for washing
- Need to reuse wastewater
- The parks, public spaces are not wet
- Negative impact on the water quality in lakes, pools and water basins
- Increase of water costs for all objectives
- Dirty streets, roads, sidewalks
- Weak activity of sewage systems.

1. HAIL RISK

Causes:

- It is formed when the rain drops cross air lays with low temperatures (below 0 °C).

Effects:

- Major harms to crops;
- Deterioration of building roofs and auto bodies;
- Great harms to farmers and individual households.

2. LANDSLIDE RISK

Causes:

- Areas marked by degraded grounds, with a relief of sharp slope and geological substrates (rocks), with a reduced per cent of covering with forest vegetation that give phreatic levels and springs during heavy rains (as a rule, in January – March)

- Human activity: land cleaning, irrigation, overload grounds with constructions, non maintenance of control works

Effects:

Destructing and affecting agricultural lands, houses and household annexes, communications

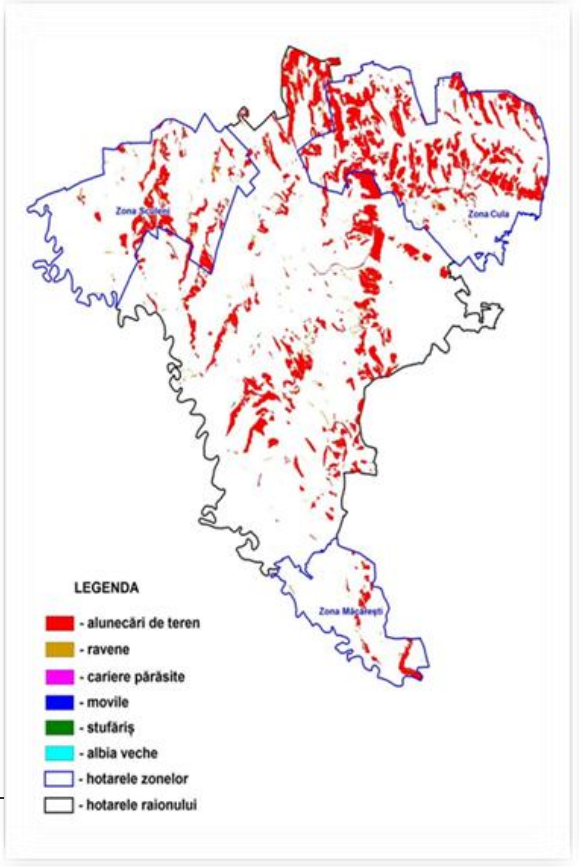
3. EARTHQUAKE RISK

Causes:

- Ungheni District is situated in a seismic area dominated by earthquakes of intermidiary depth that occur in Vrancea region. The epicenter of earthquakes in this area is in Vrancea Mountains, Romania, at a distance of 100 km.

Effects:

- Destruction or damaging of civil constructions (houses, social, cultural, religious buildings, etc.);
- Destruction or damaging of industrial constructions;



- Destruction or damaging of household networks (water, gas, heating, electricity, telecommunications, etc.);
- Generation of fires (generally isolated);
- Shuttering of landslides or land falls, some avalanches;
- Damaging som hydrotechnical constructions;
- Shuttering some epidemics, as a result of quality degradation of environment factors;
- Producing some mass effects (panic, stress, etc.).

4. FLOOD RISK

Causes:

- Heavy rains in spring and summer as showers, with a special intensity, in small hydrographic basins, followed by rapid leaks on slopes (May, June and July);
- High degree of attrition of lakes and rivers dams and dykes;
- Water overflows.

Effects:

- Partial or total destruction of some constructions (buildings, walls, halls, etc.);
- Disfunction of some water, gas, heating, electric, telephone networks by partial destruction or occlusion;
- Infestation of flood area with specific microbes and pathogens, with quick increase in water and wet grounds, with short and long term effects on people and animals;

- Production of material losses as a result of their depreciation and ground sloughing;
- Occlusion or impracticability of some access ways, obstruction of people and technics access to places and points that need special attention for eliminating all kinds of losses (material, overflows, toxic substances, with constant fire, explosion danger, etc.);
- Production of panic, management disruption and all kinds of activities and many ranking levels;
- Training human forces, technics and suplimentary materials for limiting the casualties and material harms.

3.3.2 TECHNOLOGICAL RISKS

1. <u>ROAD ACCIDENT RISK</u>

Causes:

- Speeding of transport unities;
- Fatigue at the frill; difficulty of the routes in certain areas;
- Transport failures;
- Overcrowded roads;
- Driving transport intoxicated;
- Disrespecting traffic rules by autodrivers and pedestrians;

Effects:

- Injures and casualties;
- Harms and destruction of personal and public goods.

2. <u>FIRE RISK</u>

Causes:

- Irresponsible use of open fire;
- Throwing at random lit cigarette butts;
- Children playing with fire;
- Disrespecting the rules of using heating equipments (boilers, furnaces and fireplaces, etc.)
- Burning operating residues without surveillance;

Effects:

- Destruction of industrial and living buildings, public and personal goods;
- Injures and casualties;
- Considerable material harms amd losses.

3. UNEXPLODED MUNITION RISK

Causes:

- Different types of munitions and munition elements (projectiles, cartridges, grenades, bomb pitchers, aviation bombs, etc.) that remained after the military operation Iasi-Chisinau, unfolded during the II World War;

Effects:

- Injures and casualties;
- Harms and destruction of personal and public goods.

CHAPTER 4. BUILDING, PRIORITIZING AND SELECTING RISK SCENARIOS

This chapter defines the stages regarding the scenarios identification, risk scenarios construction, as well as their prioritizing and selecting criteria for setting up the representative scenarios that will be assessed.

Within this stage, a concrete number of scenarios are identified, on the basis of the expertize in the field and some precise elements, considering the existent risk sources in Ungheni District and the Republic of Moldova, hazard analysis, existent hazard maps, etc.

These types of scenarios have a major impact at local, regional and national level. In this regard, there will be used scenarios like *plausible worst case* and *worst case* that provide a grid of analysis suitable for constructing the most relevant scenarios.

After the scenarios are identified and described, they are applied prioritizing criteria that highlight scenarios with major impact at local, regional and national level, representative for the Republic of Moldova.

4.1 WHAT ARE SCENARIOS

The scenarios describe aspects as the event, nature and amplitude of one or more corelated events, with impact at national level, causes and processes that shuttered the event, context the event occurred (stressing on circumstances, vulnerability and people, goods, society resistance), event consequences (considering the amplitude and intervention and consequence limiting actions).

The scenarios represent a descriptive way to create a base of analysis for making some future decisions concerning risk management and prevention. A scenario ***"provides a way of communication concerning the joint image regarding the future uncertainty and factors that may influence decisions that should be taken at present".***

Firstly, the scenarios allow an analysis starting with the reference situation and secondly, it is important the time horizon where the developed scenarios may be situated. These aspects are important because they permit, within the process of scenario construction, to make difference between:

- Scenarios that are based on frequent historical cases that have an important likelihood to occur (floods, dangerous transport accidents, etc.);
- Scenarios that may develop indirect risks and have a longer term for developing: (global warming).

For identifying and describing realistic scenarios, especially at natural risk assessment, there was used the first scenario typology, because the used data presented a greater degree of trust, especially concerning the evolution of events and likely impact.

At scenarios identification, it was necessary to involve specialists in more fields. Besides risk experts, there were involved experts with other specializations. The multidisciplinary character of the team involved in this process allowed the identification and informational construction of scenarios in a most precised manner.

All scenarios were identified on the basis of hazard *likelihood*. Further, it was verified if the scenarios impact is local, regional, national or affects a strategic

sectorial interest of the Republic of Moldova. This thing allowed **selecting** a number of plausible scenarios.

In **construction** phase of scenarios, it was followed the respecting of the **general verification list**:

- The scenario is described reasonable, possible to occur in the future;
- The scenario regarding the incident is described consistently, schematically and introduced in severity impact scale – depending on the availability of data at this phase;
- The scenario to be representative for the risk type;
- The scenario to be structured consistently and logically;
-The scenario to be written clearly and coherently for being understood and accepted;
- The scenario to be sufficiently specific that to allow a rapid assessment of intervention capacities needed in the respective event;
- In the variants of the same scenario, the capacity analysis makes the difference between these ones.
- The scenarios refer to the appearance of the only one risk event or the appearance of more risks, as the events NaTech (*Natural Hazard Triggering Technological Disasters,* natural events that shutter technological disasters) or *events that generate domino effect*. These may be subject of a multirisk analysis for situations when an event shutters more events with different risks (e.g. an earthquake followed by more fires). The multirisk scenarios may be considered in risk assessment at the sectorial level, but in these cases, it is necessary to corroborate the proper information to other involved risk types.

4.2 SCENARIOS CONSTRUCTION

The main detailed elements of the scenarios include:

- general identification and description of the scenarios;
- description of the hypothetical event, likelihood and impact;
- description of intervention capacity.

Scenarios construction consists in applying some specific elements that ensure the analysis consistence and coherence. ***The stages** for **scenarios construction*** are presented below:

General identification and description of scenarios

For selecting the scenarios that are subject of risk assessment at regional and national level, it is important to start from the identification of scenarios, which, depending on the existent historical data and experts opinion, are considered to have a potential major impact.

There may be selected two types of scenarios:

a. The most plausible worst case scenario and

b. The worst case scenario.

The plausible worst case scenario takes into consideration the maximal level of disaster impact, but taking into account a standard level accepted of uncertainty, taking into account the fact that a big part of intervention measures will operate.

The worst case scenario is a scenario that generates the worst possible impact and supposes the necessity of an extraordinary effort on behalf of authorities for managing the post event situation. Using a certain type of scenario from among mentioned above, it is set up depending on the risk specific and political decision.

General description of the scenario (causes, favoring elements, shuttering elements)

After the context was analysed and all available information was considered, after the possible unfolding frame was described, the next step aims the causes' description. Within this step it is described: *the way of appearance, what favors the appearance and what shuttering produces.*

The delivered data are:

- Causes;
- Favoring elements;
- Shuttering elements;
- Scenarios identification, scenarios description;
- Description of intervention capacity.

Description of the hypothetical event, likelihood and impact

The event description is the next step and comprises: the event complete description, time framing, appraisal of likelihood and impact using existent data regarding its severity.

For having a proper analysis of the event, there were considered:

- Complete event description;
- Time framing.

Description of the area

- Historical analysis of the event;
- Event frequency and intensity;
- Reasonability that should comprise certain information, as far as they exist in other studies/analyses, referring to the severity of the impact of event occurring following the use of existent information (historical, statistical, observational):
- Impact on the population;
- Economic and environmental impact;
- Social and psychological impact.

Description of intervention capacity

General description of intervention capacity referred to the following aspects:

- Physical means (equipment, buildings, technical equipment, etc.)
- Infrastructure (ways of access)
- Institutional means (rules, procedures, communication, coordination of public institutions means, etc.)
- Human Resources (Volunteers, NGO, etc.)

Due to the complex nature of what assigns the capacity term, as well as the interdependence of risks and elements involved in risk management, there may be identified capacities that can be approached in case of more scenarios or even in case of more risk types. This stage will comprise a general appraisal as description, based on the *historic and experience in similar events*.

4.2.1 DETAILED DESCRIPTION OF THE AREA WHERE THE NATURAL AND TECHNOLOGICAL HAZARDS MAY OCCUR IN UNGHENI DISTRICT

Detailed description of the area where the event may occur		
Geographical features of the reference area	**Territorial location**	Ungheni District is located geographically in the central-western part of the Republic of Moldova and having as neighbors the Districts Nisporeni, Calarasi, Telenesti, Sangerei and Falesti. In the western part it borders with the river Prut that is the border between Romania and the Republic of Moldova, and from 2007 this is the border with the European Union (EU).
	Relief	The relief of Ungheni District is featured by areas of low hills, broad valleys, meadow of the river Prut middle course that are part of the Central Moldova plateau.

	Soil	The total area of the district is 108,3 thousands hectares, from them: 49,9 thousands ha – agricultural area, 28,8 thousands ha – forests and other grounds with forest vegetation, 4,7 thousands ha – water resources. The main soil types are: chernozem, gray soil types, forest and limestone. Chernozem soils dominate – 75-80%. Average reliability of agricultural grounds according to soil structure is 61 points. The humus reserves in the soil lay have a thickness over 1 meter.
	Water	The hydrological network constitutes 2706 hectares and it is represented, firstly, by the river Prut, that crosses the district on a length of 80,3 km, by 9 affluents and 132 pools. For rural localities, the groundwaters are the main source of drinking and household water. These are surfacing through 6170 wells (70 artesian) and 67 springs. The majority of them are groomed and arranged.
	Air	The pollutants emissions in Ungheni District constitute 4 745 tonnes per year it is an increased level. In Ungheni District, there aren't major hotbeds for air pollution, because the density of industrial capacities is moderate. The only sources of more consistent pollution are autumn and spring bonfires where the population burns the waste from agricultural grounds.
	Climate	The climate is temperate – continental as in the entire republic. Winter is mild and short, summer is hot and long. The annual average temperature is positive and varies between + 8°C – 9°C. The annual average quantity of rains varies between 380-350 mm.
Information regarding the population in the reference area	**Density**	The total population, according to the data of the census from 2014, constitutes 117,4 thousands inhabitants, the average population density per 1 km² being of 108 persons.
	Health situation	The share of working age population constitutes 61,8% from the total. The average age of the population is 34,3 years (men 32,7 years; women 35,9 years). The total number of population in Ungheni District ensured with water from centralized sources is 58.133 (51%), urban population- 31,831 (81%), 49% of the district population is ensured with water from mine wells. The used water in the rural localities (rural aqueduct) does not correspond to the norms with the content of nitrates, ammonia, fluoride and high mineralization. The major socio-biological risks identified in Ungheni District are epidemics and epizooties/zoonoses. In the category of epidemics may be included dangerous contagious diseases of people, especially of children. 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. Contacting with TBC patients is a permanent risk that has a high socio-economic impact on the population.
	Categories of population	According to the ethnic structure, in Ungheni District live in majority Moldovans (99 432 – 89,95%), Ukrainians (7 743 – 7%), Russians (2 766 – 2,5%), Bulgarians (93 – 0,08%), Gagauzians (90 – 0,08%), Romas (68 – 0,06), others (353 – 0,32). In Ungheni District there area 15330 old people, 658 solitary persons, 304 bedridden pensioners, 3949 persons with severe and pronounced disabilities, 1336 families with 3 and more children, 610 unattended children, 128 children without parental supervision, 272 children with disabilities and 3493 vulnerable families.
Information regarding basic services	**Technical infrastructure**	Ungheni has a well developed road network of national and local importance, being an important railway junction and customs point that connects the internal network with the external one. Ungheni railway station is an international passing point, there pass goods and passenger transports and represents the biggest

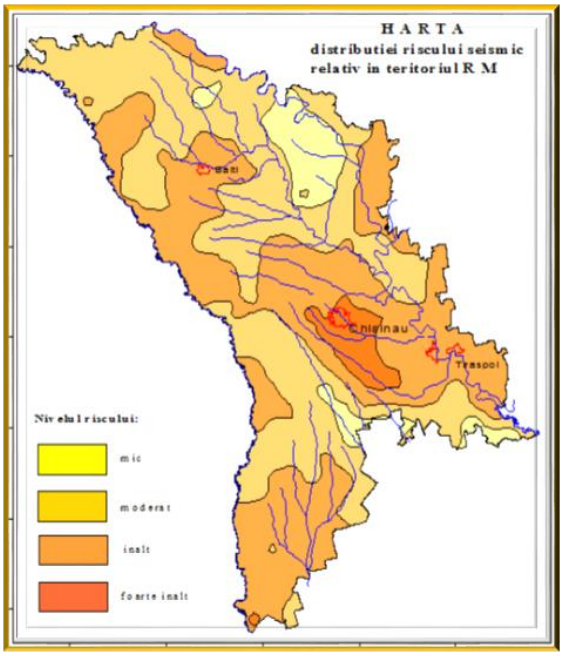
		railway junction in the country center. From 46 local roads, in 11 sectors are possible traffic difficulties if snowy, icy, poachings. In the district exist 129 water sensors, from them only 47 water sensors are operating and from them only 13 (30%) correspond to the sanitary norms as drinking water. From those 74 localities, only 35 have aqueduct, respectively treated drinking water. The total length of the aqueduct networks is 83351 meters. Ony 7% of the district localities are connected to the sewage network. The length of the aqueduct in Ungheni District, managed by ME „APA-CANAL Ungheni" is 81751 m. Due to the old system (many fissures in the network) the localities are at the risk of accidents occurrence. On the territory of Ungheni District there are 11 wastewater treatment plants, from them only 4 are operating. The total length of sewage network in Ungheni District is 63084 m. Ungheni District is crossed by national roads with a length of 104,87 km and local roads with a length of 267,2 km. The most accidents occur on national roads R1 Chisinau-Ungheni-Sculeni and R42 Ungheni-Macaresti-Barboieni. A part of Ungheni District localities are gasified. The length of natural gas networks in Ungheni District is 214,98 km. The gas pipeline Iasi-Ungheni has the length of 43,2 km.
	Social infrastructure	The social services for the categories of population being at risk are ensured by some centers: Regional Resource Center for Youth Ungheni, Center of Community Services „Home for Everyone", Center of Rehabilitation and Social Integration of Old People, Center of Social Integration for Youth „CREDO", Placement Center for Aadults and Old People from Sculeni, Placement Center „Couple Parent – Child" from Cornesti town.
	Economic infrastructure	The district industry comprises a vast spectrum of production: carpets and carpet articles, wood yarns, furniture, paints for cars, shoes, PVC granules, marble and mosaics, stockings, garments, ceramics, alcoholic and soft drinks, sausages, canned food, dried fruit, concentrated feed, bakery and others. The activity of the enterprises of the district industry registers, during last five years, an increasing trend. Only in Ungheni City there are over 2107 enterprises.
	Medical infrastructure	The health services in the localities of Ungheni District are ensured by health offices, GP offices and district hospital (71 medical institutions), where 147 doctors and 482 medical assistants work.
Environment features	**Natural protected areas**	On the district territory there are fields with construction materials: clays, sands, deposits of gravel that are exploited in open pits.
	Natural reservations	For preserving and protecting nature and different species of plants and animals that may disappear, there was conceived the reservation from the old forest of the village Radenii Vechi – Natural Reservation Plaiul Fagului. This one impresses by the landscape abundance and beauty, fascinating glades and lakes. The whole area is a real outdoor museum. Here, there may be met 77 species of rare plants, and the fauna is represented by 200 species.
	Biodiversity	The vegetation (forest areas): 28,8 thousands ha – forests and other grounds with forest vegetation. A few dozen kilometers from Ungheni City, there are two of five natural reservation from Moldova that are under state protection – natural reservation „Plaiul fagului" and natural reservation „Codrii". The area is dominated by the highest hills from Moldova and stripped by the deepest valleys with a rich flora and fauna.
Information	**Industrial sector**	The district industry comprises a vast spectrum of production: carpets and carpet articles, wood yarns, furniture, paints for

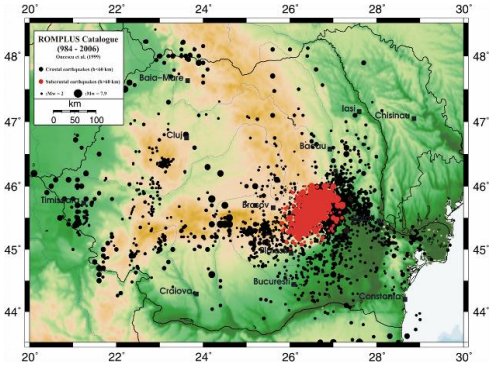
regarding the economic system		cars, shoes, PVC granules, marble and mosaics, stockings, garments, ceramics, alcoholic and soft drinks, sausages, canned food, dried fruit, concentrated feed, bakery and others. The activity of the enterprises of the district industry registers, during last five years, an increasing trend. A special business segment for the district industry is Free Economic Zone (FEZ) „Ungheni-Business", created in 2002, that provides a preferential regime for its residents with facilities like: exemption from customs duties on import and export, taxation at zero VAT, possibility to use the existent infrastructure, promptness in forming procedures of import-export, state guarantees – 10 years. Presently, there are registered 33 residents with different activity types and 2251 employees. In 2016 (9 months), the total volume of investments in FEZ reached 86,22 mln USD. In the same reference period the volume of net sales reached 1 137, 05 mln MDL. FEZ „Ungheni - Business" brings a significant contribution in the local and national budget. Another important share of FEZ „Ungheni-Business" is related to the melioration of the district social situation and in the foreground is creating new jobs. Therefore, during its activity, there were created 2251 jobs.
	Public sector	In Ungheni District there are 7 lyceums (5192 pupils), 37 gymnasiums (6728 pupils), 4 primary schools (515 pupils), 48 kindergartens (4929 children) where 2685 didactic staff work. On the territory of Ungheni District, there are 3 colleges (medical college, agroindustrial college, border police college) and 1 vocational school. During summer there are 3 rest camps where there may rest 645 children (camps „Plus Armonie", „Codreanca", „ProSanatate"). In the cultural field, there are 36 community centers, 22 houses of culture, 1 district house of culture, 1 cultural sport center, 1 palace of culture, 56 libraries, 3 museums. On the territory of Ungheni District there are 9 grounds/ sports complexes.
	Agricultural sector	The agriculture is one of the main branches of the district economy. This is a sector with a big economic potential and large reserves and possibilities determined by soil quality, climate factors and human resources. The basic activities are focused on cropping cereal, technical crops, vegetables, fruits, vine and forages, cattle, pigs and poultry. The agricultural sector is represented, mostly, by small farms (13559), the share of those who have areas more than 10 ha is only 0,8% (regional average – 1,0%). The district is advantaged by a relatively good technical-material base, number of tractors that fall to 1000 ha of agricultural grounds is 12,4, a little bigger than the regional average -11,2 unities. It is worth mentioning that in the population households and farms there are concentrated 100 % of cattle, 100% of sheeps and goats and 74% of swines. The sector development contributes very much to the increase of living level of inhabitants from rural environment.

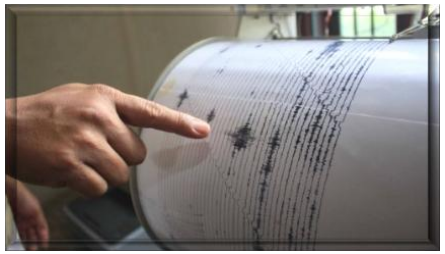
4.3 SCENARIOS OF NATURAL RISKS IN UNGHENI DISTRICT

A. The schematic representation of scenarios development for earthquakes

Scenarios identification

General description of earthquakes in Ungheni District	In Vrancea, Romania area, it occurred a major earthquake, with a magnitude over 7 degree on Richter scale that affected the Republic of Moldova as well, including Ungheni District. The Services of Civil Protection and Emergencies from the entire country were alerted and passed to the intervention plan for very severe emergencies that supposes that all staff to be present at the unity. The staff of the Department for Emergencies Ungheni intervenes in saving operations, population displacement and seism consequences liquidation. The seismologists warn that in the next hours there may occur new replicas. The scenario doesn't fit the most frequent cases of seismic risk in the last 30 years, but taking into account the historical of the area and its features, the scenario should be considered at the elaboration of Risk Management Strategy. Those three scenarios exposed farther take into account all the possibilities of seisms occurrence and their impact on the district.
The historical of the area (recurrence of some risk events)	Moldova was shaken in the last 100 years of numerous earthquakes with a bigger or smaller magnitude, but the strongest were the earthquakes in the years 1940 and 1977 with magnitudes of 7,7, respectively 7,4 on Richter scale. The studies made on the country territory in the last 100 years showed that the majority of earthquakes in Moldova have a tectonic origin, being generated by releasing the potential accumulated energy in certain geological structures in the crust. In Moldova, the strongest earthquakes occur in the eastern curvature of Carpathians, respectively in Vrancea area, seismic area with over permament activity, generating numerous more or less strong earthquakes, in each century. Vrancea area is responsible for seisms occurred within the country, releasing over 95% of seismic energy. These seisms caused by plate tectonics occur at a big depth, but being the most devastating as well, because they may reach magnitudes until 7,8 - 7,9 degrees on Richter scale. The strongest earthquakes in Moldova occurred in years: • 1940 (magnitude of 7,7) • 1977 (magnitude of 7,4) • 1986 (magnitude of 7,1) • 1990, at May 30 and May 31, there occurred two earthquakes with the magnitude of 6,9 and respectively 6,4 • 2004 - magnitude of 6 degree, but didn't have casualties or material harms.  XX century registered a group of earthquakes, that from 1940, from 1977 and that from 1986, but two first ones, with magnitudes of 7,7 and respectively 7,4 had major effects. After 1990, there occurred those two earthquakes from May, at a distance of 12 hours one from another, of 6,9 and 6,4 degrees on Richter scale, and in 2004, there occurred a seism of 6 degrees, that didn't produce harms. In case of Vrancea earthquakes, the harms are produced at magnitudes over 7. As much as the magnitude is lower, there are no harms, but these ones are felt, even those with magnitude of 5. The energy of the Vrancea earthquake, from November 10, 1940 (M = 7,4 degrees) was almost 1000 times higher than the energy of the seism occurred in April 28, 1999 (M = 5,4 degrees), the most important one in the last years and that was felt very well in the Republic of Moldova as well. Ungheni District feels strongly these seisms because it is situated on the shock wave, but also due to the fact that it is situated on a soil formed from alluvia, unstable and with new sedimentary deposits. Vrancea earthquakes produce big accidents, in a very big area, these being another feature of them. The effects are very high on a certain direction towards Vrancea, respectively north-eastern towards Moldova. Ungheni District intersects this direction. In Vrancea, there occur, on the average, one earthquake in two days, that means over 15-20 per month.
Description of causes, favoring elements and shuttering elements	

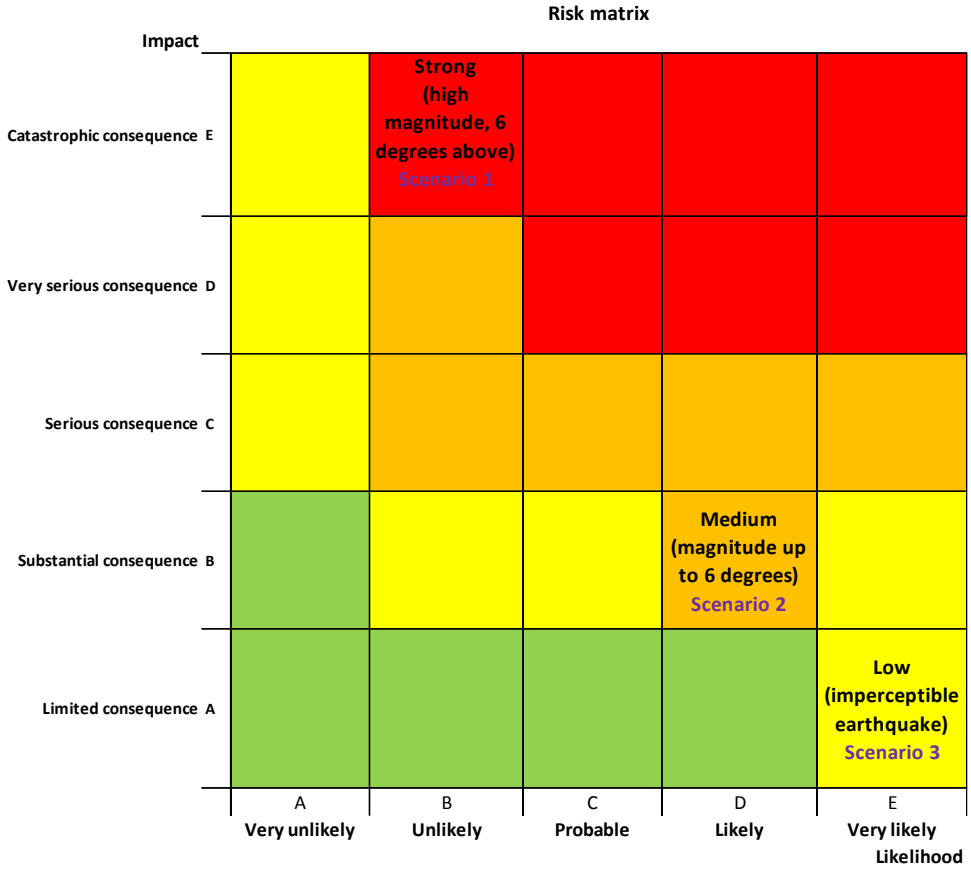
Causes	The seismicity of the Republic of Moldova is determined, especially, by subcrustal earthquakes of intermidiary depth in Vrancea zone, located on Romania territory at the curve of Carpathians. Vrancea zone represents a permanent and active source of earthquakes, known already for a millennium that has features that are practically unique on the Globe (small and isolated volume of the seismogenic zone, directivity of seismic energy spreading, area enormously affected, etc.). According to the conception of some scientists from the Republic of Moldova, the cause of Vrancea zone seismicity is the active continental subduction that occurs with a lower speed than the speed of any other analogical process, registered on the Globe till now.  **Geographical position of Vrancea hotbed**
Favoring elements	The specific regional conditions, factors as the sediment thickness, topography, hydrological factors play an important role in the level of amplitudes and spectral composition of ground movement recordings. From experiments, studies of zoning and numerical modeling there were obtained data referring to the amplifications due to some relief features on the territory of the Republic of Moldova, as well as data regarding the influence of hydrogeological factors on the seismic effects.

Description of the hypothetical event			
The spatial dimension of the event (territorial area where the risk event may shutter)	**Scenario 1** *„The worst scenario"*	**Scenario 2** **„Scenario with middle harms"**	**Scenario 3** **"Scenario resulted with minor harms"**
	Many buidings in Ungheni City were destroyed, houses of the district were badly damaged after the seism with the magnitude of 7,2 degrees, at a depth of 141 km and a duration of 25 seconds. Over 45 persons were imprisoned in ruins, being taken measures for their saving. The number of injured overcomes 120. Other 80 persons needed medical aid. From the infrastructure point of view – there were registered damages at: 20 immobiles, a hospital, 4 schools, headquarters of 12 economic agents, as well as gas transportation pipeline. From safety reasons, the utilities were stopped and will retake their activity only when the responsible institutions will have the certainty that the specific infrastructure can operate in safe conditions. The most affected areas of the district are: Ungheni City (stone constructions, three-four-staged buildings, built before 1960 that were built before the elaboration of seismic safety norms). Thus, there were badly damaged 12 blocks of flats. The district localities suffered less, the most vulnerable being the houses built in 70's, where there were used widely adobe, unburnt brick, broken stone). Local and national road portions, bridges were damaged and the areas affected by the disaster were isolated and needed urgent intervention measures. According to the specialists, the most important seisms occurred, between 80-170 km of depth, even the deepest Vrancea earthquake occurred at a depth of 210-220 km. Statistically, the strongest earthquakes in Vrancea with magnitude of 7,5 degrees have a repeatability of 80 years.	The most important and numerous earthquakes have their origin in the highlands and sub-Carpathians of Curbur, in Vrancea and Buzau Mountains, as well as the sub-Carpathian areas adjacent to these mountains. These are earthquakes of intermediary or subcrustal depth, generated in hotbeds situated at depths between 60-220 km. The seisms with magnitude of 6 degree have a repeatability of 10 years. Only 8-12 seisms with magnitude of 4-5 registered annually are sometimes felt in the zones more distant to the earthquake epicenter and, as a rule, do not have consequences. 	In years of "calm" seismic activity of Vrancea zone, there occur 50-120 seisms, and in case of some earthquake clusters – over 200-300 seisms annually.  Besides these earthquakes (named subcrustal or intermediary seisms), in Vrancea there occur normal crustal or superficial earthquakes, at depths smaller than 60 km, with a higher frequency at over 15-40 km depth that because of big depths they occur, they are imperceptable.
Time position (e.g.: during the week, in summer after 18.00)	The seism with the magnitude of 7,2 degrees on Richter scale occurred in May 5, at 19:06, having bad effects on the district.	The seisms may occur at any time and season, without having a timing position for them.	The seisms may occur at any time and season, without having a timing position for them.
Event duration (e.g.: between 2 and 8 days)	The seism lasted 25 seconds.	As a rule, the Vrancea seisms last from 10 seconds to 1 minute.	As a rule, the Vrancea seisms last from 10 seconds to 1 minute.
Evolution of the	Damages and distructions that may be caused by strong	The tectonical earthquakes that occur in the	These earthquakes are not felt by the

hypothetical event (the extent to which the hypothetical event may shutter other events)	earthquakes may lead to: • destructing or damaging civil constructions (houses, special, cultural, religious buildings, etc.) and industrial constructions, factories, communal services networks (water, gas, heating, electricity, telecommunications), some hydrotechnical constructions and works or waterproofings with respective consequences (action of flood wave, floods, etc.); • appearing fires, an important factor of aggravation of seism consequences; • shuttering some landslides or land falls; • producing some atmospheric disturbances (storms, dust clouds, etc.); • producing some psychical effects that may have bad consequences in people or human groups behavior (stress, panics); • the possibility of some epidemics or deseases appearance as a result of the quality degradation of environmental factors and conditions of individual and collective hygiene; • destructing bridges and dams; • land flooding, as a result of some grounds being on the bank of some waters.	Republic of Modova and, implicitly, in Ungheni District may generate the following effects: • shuttering landslides and land falls; • producing some mass effects (panics, stress, etc.).	population, being registered only by seismographs and produce no harms.
Description of intervention capacities			
Intervention capacities	• there are realized specialized research actions for setting up: - the place and volume of casualties, destructions of civil and industrial buildings; -the existance, place of survivals under ruins - the damages of communal services networks (water, gas), electrical and telecommunication networks; - the zones with flood and fire danger; - the fires in calamity areas; - the communication ways blocked by ruins or by shifting earth layers; - the zones where appeared or may appear new risk sources (zones of chemical, biological danger, etc.); - the economic unities out of work; other material goods harms and destructions. • unfolding releasing – saving actions of survivals under ruins, hindering of harms extent, intervention in communal services network, retrieving damages, etc.; • organizing and unfolding first aid actions, transporting the injured to hospital unities, ensuring emergency care, injured treatment and hospitalization.	In case of earthquakes with the magnitude till 6 degrees, the intervention of specialized teams is not necessary. In case of panic, the emergency services intervene.	In case of earthquakes with low magnitude, the intervention of specialized services is not necessary.

Recommendations for strengthening/ improving the capacities	• Study of seismic zone and geological conditions • Watching to avoid destructive effects: - Analysis of existent locations and conditions; - Restrictions on activities in risk areas; - Interdictions for new locations; - Watching to respect the legal frame in projecting, executing, behaving and exploiting; - Completing notification systems – informing, supervising, controlling. • Risk assesment and disaster effects - Analysis of frequency and features of possible/likely disasters, setting up /determining the vulnerability in the fields: employees, resources, goods, values - material, environment, involved costs; - disaster foreseeing, their consequences by the analysis of geographical, geological, meteo (weather), resources (necessary and possibilities) conditions • Elaborating the conception for realizing protection-intervention actions - Identifying protection-intervention actions; - Elaborating the conception for unfolding conducting actions and documents; - Elaborating measures for ensuring the logistics of the actions; - Setting up the responsibilities and measures for the entire organizational structure; - Setting up measures and actions for protecting people, resources, material goods and values • Ensuring the necessary material and financial resources for the protection – intervention system operation • Ensuring the training/preparedness/of rescuer teams, execution bodies dealing with interventions in emergencies and employees • Respecting the criteria regaridng the location and construction in the risk area, respecting the projection, execution, exploitation norms; • Elaborating protection and intervention plans • Ensuring the warning and informing in emergencies		
Risk scenarios prioritization and selection	**Scenario 1** ***„The worst scenario”***	**Scenario 2** **„Middle scenario”**	**Scenario 3** **”Scenario that produces no adverse effects”**

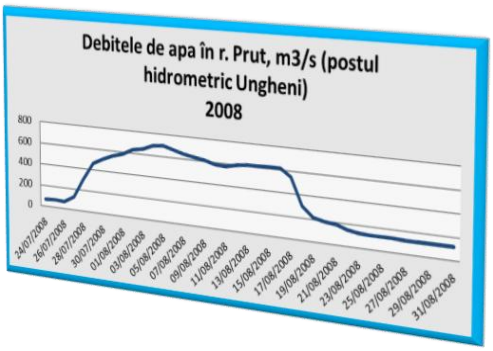
Risk matrix for earthquakes



B. The schematic representation of scenarios development for floods

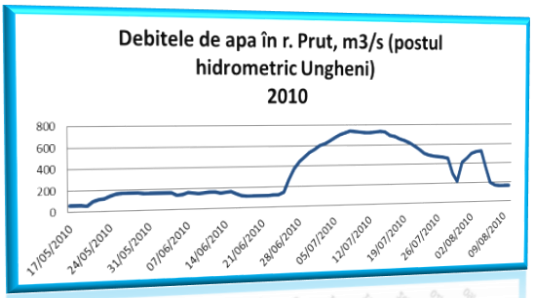
Scenarios identification	
General description of floods in Ungheni District	More persons were displaced, others were injured and needed medical care, another person was in drowning danger, and the water level overcame flood rate, being necessary to build additional dams. At the beginning of July, there were rainfalls over the critical sills in the superior area of the dam on the river Prut and in Ungheni City area (Quarter Ungheni - Vale), being introduced the red code for this area. As a result of heavy rainfalls in the last hours, the runnel Delia increased its flow and overflew with 220 cm the flood rate. The scenario presented above is the worst possible, being a very special one from similar phenomena registered in this area, but, according to the most recent experts'appraisal concerning the infrastructure of those two quarters (dams situation), as well as the effects of climate changes that bring to the occurrence of the extreme phenomena, as well as heavy rains, this scenario should be taken into account as likelihood. Different impacts and likelihoods determined the analysis of three types of possible flood scenarios in Ungheni District that are described in this chapter.
The historical of the area (recurrence of some risk events)	Ungheni City and District are situated across the left bank of the river Prut and the city is crossed by the runnel Delia. In the city borders there may be formed a flood flow from heavy rainfalls – at ensuring 1% – at the entrance 92 m3/sec, at the exit – 103 m3/sec. Considering the location of the houses at the borders of the rivers Prut and Delia meadows and the results of calculations made after floods from years 2008 and 2010, it was set up that the main stream (r. Prut) may flood 400 houses and the secondary stream (r. Delia) may flood 51 houses. A part of houses of the city is located in the stream meadow, at a height of 0,5-1,5 m from meadow base. The meadow has a total area of 41,6 ha. The possible height of the flood in the meadow may be of 2,2 m. The meadow area that may be flooded with transit floods may take 60,4 ha, with 157 houses. The material harm may be of 23 million MDL. The lake Delia has an area of 1,2 km2, in case of dam break, it may flood the sector Ungheni-Vale, with the area of 1 km2. In the flood area can be 51 private houses, with 255 inhabitants.

The flood from 2008 occurred in the surroundings of Ungheni City, started in July 26, by a quick increase of flows from 110 m3/s to 26.07 till 480 m3/s in July 30, that means almost 74 m3/day. The maximal was registered in August 05, and was 698 m3/s. The decrease of the flood was as suddenly from 616 m3/s in August 16 till 129 in August 23, it constituted 60 m3/day. The hydrograph form represents a rectangle without a well expressed maximal, a fact that is due to the overflows organized from the hydrotechnical node Costesti -Stanca.



The flood from 2010 occurred in the surroundings of Ungheni City, started in June 24 and ended in August 07. The total duration of the flood was 45 days. The flood increase was slow, as well its decrease. It is worth to mention that the total duration of high waters was much longer than the flood from 2008. The floods with values over 700 m3/s were from July 06 until July 16 and the flows over 600 m3/s lasted from July 02 until July 21.

One of conclusions is that the longer duration of high flows from 2010 in comparison with those from 2008 was one of additional causes of the bigger harms, as well as the failure of some protection constructions.



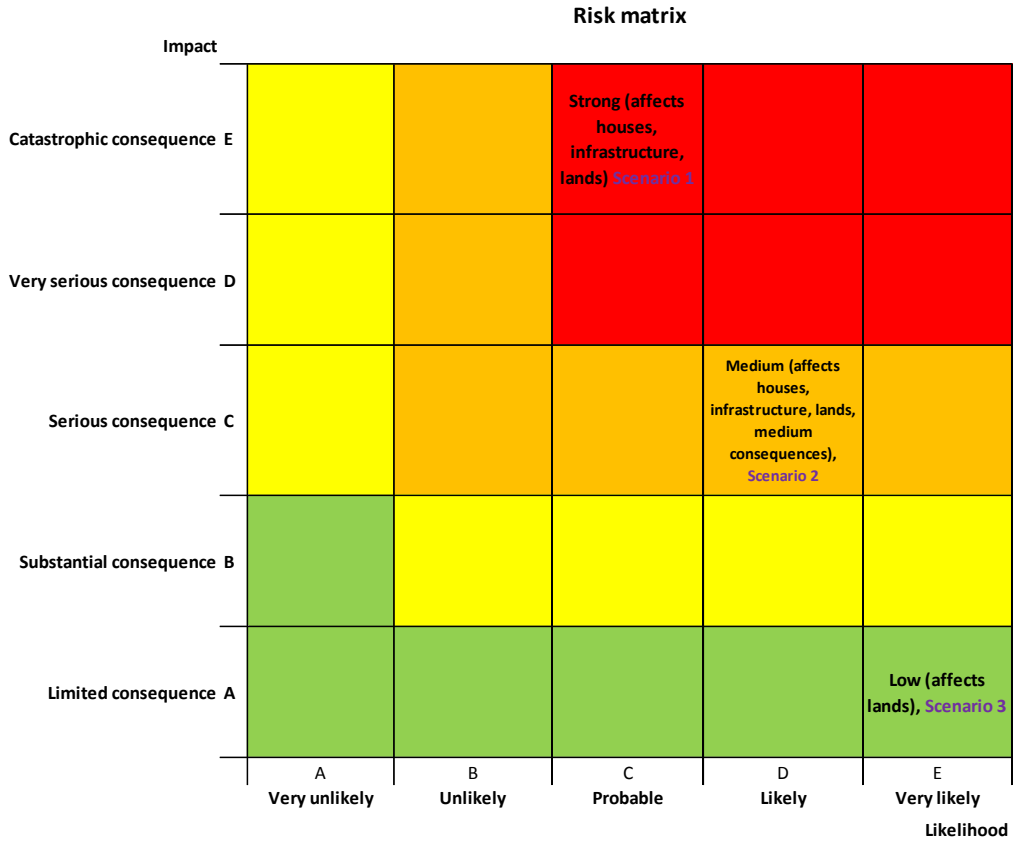
Description of causes, favoring elements and shuttering elements	
Causes	The general causes of floods are: • heavy rains wuth high intensity; • location of houses, agricultural destinations in the flooding meadows of the rivers; • existence of new and old pools build without projects, not being coordinated with the bodies of technical supervision; • unsatisfactory exploitation and failure of installations for water discharging and evacuation; • nonobservance of regulatory provisions in building car bridges, pipes and other installations in the places of surface streams with roads. For the worst scenario described bellow, the main cause is that in May-July, in the Weastern Ukraine, where the superior streams of the river Prut are located, there fell high quantities of rainfalls, overcoming much the annual average for this period of the year. Within the mentioned time period, on the territory of the Republic of Moldova, there fell very high quantities of rainfalls. Within this period, the quantity of the rainfalls on the territory of Ungheni District was 200- 400 l/m2 or 50-80% of annual norm, overcoming 1,5-2 times the multiannual average for this period of time.
Favoring elements	The passing of high atmospheric cyclones, in the hydrographic basins of the river Prut from the Carpathians region and falling of heavy rains that form the maximal wave of the flood. This natural phenomenon in June-July 2008 caused a long-term flood in the river Prut on the territory of the Republic of Moldova, Ungheni District.
Shuttering elements	The falling of some very high quantities of rainfalls in a short period of time, in conditions of reduced soil permeability, makes the water to flow towards the valleys network, generating floods, overcoming the transportation capacity of the major river beds causing floods. The simultanious occurrence of more floods on the river Prut.

Description of the hypothetical event			
The spatial dimension of the event (territorial area where the risk event may shutter)	**Scenario 1** *„The worst scenario"* The impact of the flood in the meadow of the river Prut may be substantial. Big areas may be flooded, as well as houses (over 451), the local road and infrastructure of the quarter Ungheni-Vale. In the vicinity is situated the biggest railway junction of the country center, transit ways and customs towards Central Europe. This passing point is crossed daily by over 600 passengers. Thus, through the railway junction, the state border crossing may be affected. Near the railway junction is the historical monument Eiffel Bridge, a railway bridge over the river Prut. Also here is situated the Regional Resource Center for Youth and the resting camp "Plus Armonie", where rest over 800 chidren of the district in each summer round. At the same time, the building of the National College of Border Police and the Department of Border Police of MIA may be affected. Due to the flood and high quantity of water, it is stopped the quarter electricity and the local road is impracticable. People affected by floods can loose their life. Over 2242 persons who live in the flooded area need to be displaced. The displaced people will not be able to come back to their homes for a long period of time. The repairing and	**Scenario 2** **„Scenario with middle harms"** The heavy rains that don't stop for some days produced flood on the river Prut that caused the dam damage and flooded the localities of the commune Macaresti. 71 houses were partially flooded and 27 houses were badly damaged, being necessary the displacement of 43 persons. The agricultural grounds near the meadow were flooded as well. The local roads were mired and on a portion of the national road the traffic is difficult. Significant damages were produced to the telecommunication and electrical networks, both localities being without energy. The villages Macaresti and Frasinesti are situated in the flood danger area, being located in the basin of the river Prut. Totally, in these localities there are 98 houses being at flood risk. From the verifications made by the DE in the localities situated in the basin of the river Prut and from the analysis of floods in July-August 2008, it was established that the protection dams situation in the village Frasinesti (commune Macaresti) is unsatisfactory: it is necessary to increase the dams	**Scenario 3** **"Scenario resulted with minor harms"** The rainfalls of the last days flooded the agricutural grounds in the localities Zagarancea, Valea Mare, Macaresti of Ungheni District. Over 5 ha of crops were mired, more than 50% of them being compromised. The consequences of the phenomenon are appraised to stranded losses in agricultural grounds and crops on them. The harms registered in such cases are until 500 000 MDL. The scenario is actual for other 25 villages of

	recovery costs are appraised at 4 500 000 Euro. The economic agents from the area will incur economic losses; their recovery will last in time. As a result of flood, there were registered 2242 victims, 120 damaged houses and 20 of them were destroyed completely. Also, the waters flooded 28 ha of private gardens, grasslands. The flood may affect the environment by the destruction of the valey aspect and even the trail of the river Prut as a result of the soil mass accumulated and moved by floods. Generally the flood impact is appraised as significant at the district scale, but at the national level as well, mainly, because of a considerable quantity of valuable goods as infrastructure (houses, local road, summer camp, railway), important historical monument that may be significantly damaged. The risk is immediate because the people may loose theri life, but this thing depends on the intervention reaction of rescue teams and people displacement.	rate and fortify these dams in the village Frasinesti. In the locality there is a pool that according to some data – from DE – needs to be liquidated. From 74 district locaities, in the flood danger areas are 24 localities, so that this scenario is available for the other flooding territories of the district. 	the disctrict that are situated in the risk area.
Time position (e.g.: during the week, in summer after 18.00)	As a result of reduced rainfalls, there were formed flood waves on the river Prut and affluents, registering very big increasings of flows and levels that led, in July 21, in the morning, to the overflowing of flood rate. As a result of the overflowing of a high quantity of water from the accumulation dam Costesti-Stanca, there exist the likelihood that this one to overflow over the dam from neighborhood and flooding economic objectives situated on the river Prut bank of Ungheni City (Quarter Ungheni-Vale).	The constant rainfalls during June 12-16 in Ungheni District produced floods in the commune Macaresti.	The agricultural grounds from 3 localities of Ungheni District were flooded in June 23, the flood being favored by heavy rains.
Event duration (e.g.: between 2 and 8 days)	Between 2 and 8 days.	Between 2-4 days.	Between 2-3 days.
Evolution of the hypothetical event (the extent to which the hypothetical event may shutter other events)	People who live or travel in the areas affected by floods are at the desease risk of leptospirosis. This is a desease caused by a group of microorganisms that develop rapidly in the wet soil and warm water, but resist also at low temperatures preserving for a year in ice. At the same time, as a result of floods, the networks of water, gas, heating, electricity, telephone are out of work by a partial destruction or blocking.	The networks of water, gas, heating, electricity, telephone are out of work by a partial destruction or blocking.	As a rule, in case of such scenario type, there are shuttered no additional events.
Description of intervention capacities			
Intervention capacities	For displacing people and disposing the effects, there intervene the teams of the Department of Emergencies	DE Ungheni and army participate in people displacement from the flooded area, consequence	DE monitors the situation. The Commission for Emergencies of the district and

	Ungheni, volunteers of the Team of Rescuer Volunteers for Emergencies Ungheni and the staff involved in managing these emergencies. In intervention also participated the teams of Electricity Distribution Network North, "Moldtelecom", for verifying the telephone and electricity networks. Also, the Ambulance Service placed a point for injured for providing the first aid. Ungheni City Hall has 26 transport means for people displacement.	liquidation, as well as operations for strengthening the protection dams in the villages Macaresti and Frasinesti. DE will monitor the situation.	Mayoralties of the localities affected appraise the harms and identify the sourcing for alloting compensations to farmers.
Recommendations for strengthening/ improving the capacities	The Team of Routing Point of Ungheni City, local Mayoralties should be equipped with materials/ means for intervening in emergencies generated by floods, as: inflatable dams, filling bags cars, motorized pontoon, metal sheet piling and piling beating device, lighting at night systems, forklift, mobile laboratory, pollution trailers, scraper system, river cat system for measuring speed / flow, etc. For improving the prevention and intervention capacity in floods it should be adopted the following measures: 1) Increasing the safety degree of hydrotechnical constructions, as: • Modernizing the monitoring system of dams by installing sensors for determining some operation parameters of accumulations; • Strengthening the monitoring system of hydrographical networks (liquid, solid rainfalls, flows, etc.), hydrometric stations for affluents and derivations flows; • Software and hardware for controlling and coordinating the exploitation of hydrotechnical constructions; 2) Building the intervention capacity in natural disasters: • Modernizing the monitoring system of water quality by installing automatic stations.		
Risk scenarios prioritization and selection	**Scenario 1** *„The worst scenario"*	**Scenario 2** **„Middle scenario"**	**Scenario 3** **"Scenario that produces no adverse effects"**

Risk matrix for floods



C. The schematic representation of scenarios development for landslides

Scenarios identification	
General description of landslides in Ungheni District	More houses in the commune Boghenii Noi, Ungheni District are in danger because of landslides reactivated as a result of rainfalls in the period March 10-14. The road and a part of the area are bypassed and avoided because of reactivated landslides. The landslide destroyed, on an area of 1,5 ha, the ground with fruit trees. If the forecasts of the meteorologists come true and the rains will continue, its action can be catastrophic, producing important harms. 8 households are displaced, other seven risk to be displaced if the rains don't stop. This is the worst scenario and it is different from the statistic data of the last 10 years, but according to the relief of the zone that is featured by soil erosion and degradation, the mentioned localities are at this risk. The described scenario has a low likelihood. In what follows there will be described 3 types of landslides scenarios, all of them having various likelihood and consequences.
The historical of the area (recurrence of some risk events)	According to the SCPE, the most affected areas with landslides are those of the center of Moldova, including Ungheni District, where these ones comprise 15-27% of the territory. From those 74 district localities, 48 localities are more or less affected, periodically, by landslides. In 25 localities, the risk of landslides is featured by intensity and considerable area. In risk areas there are houses (over 1176 private houses), national, local roads, engeneering networks. The last information related to massive landslides were registered in 70's, being destroyed 77 houses in the village Zagarancea. Other short mentions are related to the landslides in the village Boghenii Noi and Boghenii Vechi, as a result of deforestations at the end of 90 – 2000's. According to the date of DE Ungheni, the 2 villages mentioned above are among the localities at landslides risk. Such that, the number of houses situated in the landslides area is 131.
Description of causes, favoring elements and shuttering elements	
Causes	From the genetical point of view, the relief of Ungheni District belongs to the mixed type,

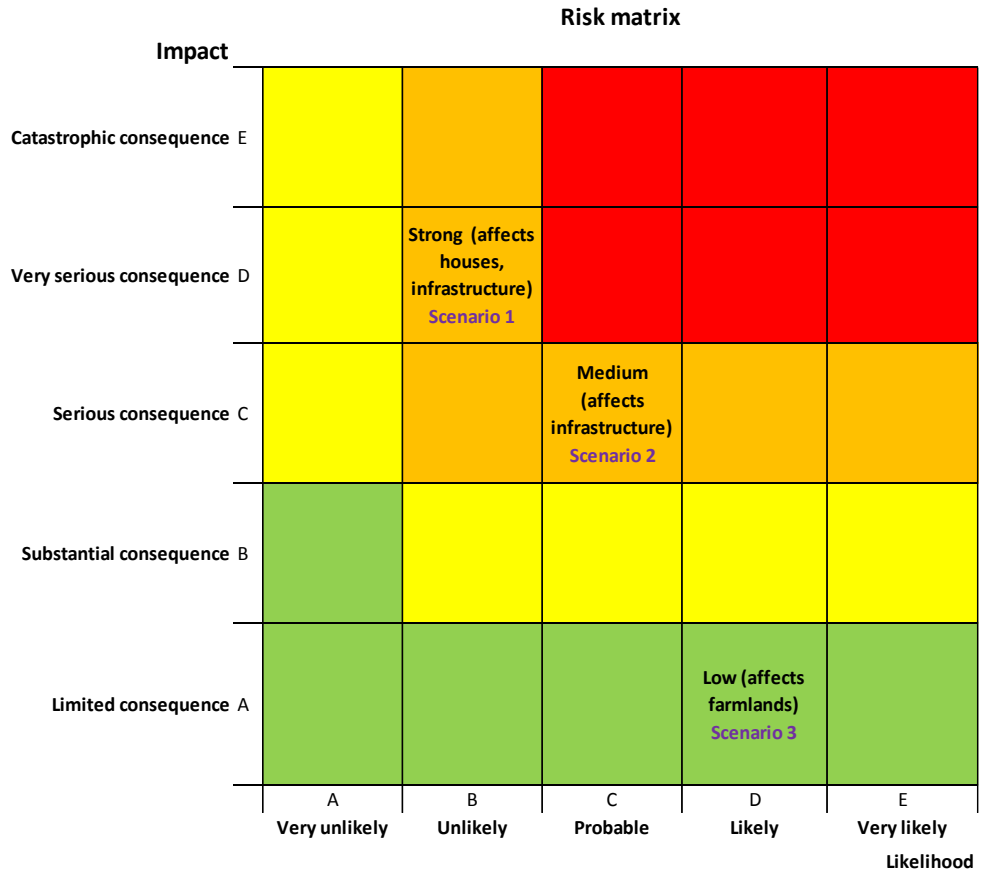
	river deluvial, about 30% of the territory being occupied by accumulation forms, represented by the meadow of the river Prut. The landslides affect significant ground areas, their occurrence being favored by the conditions regarding relief slope and energy, the geological substrate with alternating permeable and impermeable rocks that give groundwater levels and springs, by period of heavy rains, the relative reduced percent of covering with forestry vegetation, by ravines and torrential phenomena, as well as human activity (deforestations, irrigations, ground overcharging with constructions, failure to maintain the combating works). Landslides occur predominantly in January-May, by the reactivation of some old landslides, by the appearance of new ones and they have as effect to destroy and affect agricultural grounds, houses and household annexes and communication networks.
Favoring elements	Massive deforestation from the previous period in the commune Boghenii Noi represents a favoring cause of landslides. When the vegetation stratum is rared or destroyed the possibility of landslides increases.
Shuttering elements	As a result of snowmelt fallen during winter, the surface water accumulated diminished the stability of slopes by land damping, the increase of phreatic water level by infiltration, by ground erosion and ravines formation. Moreover, in Ungheni District, during 6 hours (21:00 – 02:00), the quantity of rainfalls is 60 l per m2.

Description of the hypothetical event			
The spatial dimension of the event (territorial area where the risk event may shutter)	**Scenario 1** *„The worst scenario"*	**Scenario 2** **„Scenario with middle harms"**	**Scenario 3** **"Scenario resulted with minor harms"**
	The heavy rains occurred in Ungheni District led to floods and landslides occurrence, registering high quantities of water over 60 l per square meter. Eight households, respectively 24 persons were displaced, because their households risk to be swept by the big ground bank, reaching a distance of 35 meters to the first houses. Hundred thousands of cubic meters move to houses. Four houses more are now monitored by the members of the local volunteer commission for emergencies. The continuation of landslides on the same trajectory and with the same speed endangers other 7 households where 21 persons live. As a result of the last days monitoring, it was stated that the landslides go ahead daily and after heavy rains there appeared new cracks in the earth's crust. Concomitantly, there was activated the mud wave that goes ahead towards houses. The landslides covered with ground a house in this village and other two ones were badly damaged. In the localities Poiana and Mircesti, but in Boghenii Noi as well, the roads were very badly affected by heavy rains. In Mircesti, the local public road L376 was affected.  The auto drivers don't circulate on a portion of 2,5 of road, that was affected by heavy rains and is not properly signalized. In case that landslide will not be stopped, it is possible to have some irrecoverable losses in agricultural grounds, there will be destroyed houses and there may be casualties.	As a result of rains, landslides occurred in the village Radenii Vechi. The village is situated on a hill and has flowing channels of waters that come from slopes. As a result of floods, one of these channels was clogged and formed a lake with some water tonnes that endanger more houses. The authorities removed a big part of this water, but, afterwards, there shuttered a landslide that affected two streets. A street was closed for traffic. Two houses are in danger as well. For removing water, there were called the rescuer firemen from DE. According to them, the danger didn't pass, even the water was removed. Thus, the area is under monitoring.  In medium, the harms produced by such events are appraised from 500 000 - 750 000 MDL. The village had serious landslides in the south of the locality in 1973 and 1982, after that the productivity of the soil decreased considerably. Salts rise to the surface (the 	The heavy rains of the last period caused the reactivation of a landslide in the village Petresti that affects 1 ha of agricutural grounds. The consequences of the phenomenon are appraised to irretrievable losses in agricutural grounds and the crops on them. The harms registered in such cases are 250 000 MDL.  Such a scenario is featured to other 47 localities of the district that belong to the category of areas at risk of periodical landslides, on small areas.

		reliability is much lower than 40, there are grounds with the reliability of 8 degree). This type of scenario may be asigned to the other 24 localities of the district that are at the risk of landslides of considerable intensity.	
Time position (e.g.: during the week, in summer after 18.00)	As a result of heavy rainfalls during the period of March 10-14 in the area of Ungheni District, in the commune Boghenii Noi there occurred a landslide on a length of about 2,5 km and a width that varies from 10 to 40 meters. As a rule, the landslides occur in January-May, when due to the snowmelt and an increased number of rainfalls, there accumulates an excessive quantity of humidity in soil.	The rains occurred during April 12-15, in the village Radenii Vechi produced a landslide that affected the road traffic on a street and endangered 2 houses. As a rule, the landslides occur in January-May, when due to the snowmelt and an increased number of rainfalls, there accumulates an excessive quantity of humidity in soil.	In the village Petresti, the landslide reactivated because of the rains occurred during May 6-8.
Event duration (e.g.: between 2 and 8 days)	The landslide in the village Boghenii Noi shuttered in March 14, being monitored and taken stopping measures that fall between 4-8 days.	The event duration is 2-4 days, when the specialized services determined that the danger of landslide area extention was over.	The event fell in 2 days.
Evolution of the hypothetical event (the extent to which the hypothetical event may shutter other events)	As a resutl of the landslides, there were partially blocked the national and local roads, there was destroyed a part of communication networks. The agricultural grounds were destroyed for 15%.	The landslides of such demenssion do not sutter other events.	The landslides of such demenssion do not sutter other events.
Description of intervention capacities			
Intervention capacities	For monitoring the on-site situation, as well as for displacing preventively the population, 8 rescuer firemen of DE Ungheni went there with three means under the coordination of the head of DE Ungheni, as well as 5 policemen with 2 transport means. Also, it was decided the continuation of phenomenon monitoring, as well as the expertise of the landslide cause for ordering the measures for mitigating the landslide effects and slope safety. For accomodating the displaced people, the Mayoralty of the commune provided the school of Boghenii Noi. From those 24 displaced preventively persons, 15 accomodated at relatives and 9 in the shelter provided by the Mayoralty.	For liquidating the consequences caused by landslides there were involved 2 teams of rescuers of DE Ungheni. Patrolling Inspectorate participated at traffic regulation in the affected area. DE Ungheni monitored the situation after the consequence liquidation in 4 days.	Local Mayoralty, Ungheni District Council and DE Ungheni appraise the harms and monitor the situation.
Recommendations for strengthening/ improving the	For preventing and protecting the disastrous consequences of landslides it is necessary to take the following consolidation measures: • constituting the commission for protecting against disasters and training the staff in this field; • inventorizing and supervising potential sources for landslides occurrence;		

capacities	• setting up and ensuring the operation of the informational system locally for warning if disasters; • preparing the population, intervention forces and means according to the protection and intervention plan; • executing forestation and grassing works in the potential risk areas or other kinds of works.		
Risk scenarios prioritization and selection	**Scenario 1** *„The worst scenario”*	**Scenario 2** **„Scenario with middle harms”**	**Scenario 3** **”Scenario resulted with minor harms”**

Risk matrix for landslides

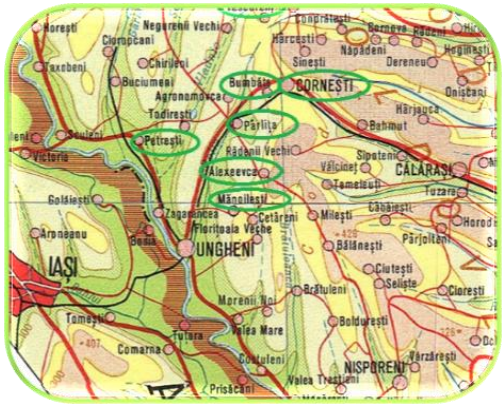


D. The schematic representation of scenarios development for drought and heat

Scenarios identification	
General description of drought in Ungheni District	The entire summer is very hot. Since May, there are registered high season temperatures during the day time in the whole country and continue to register new records of canicular temperatures in June and July. The rainfalls are reduced, until half of July, the soil humidity and groundwaters and decreased. Thus, Ungheni District faces a drought, considered according to its intensity as „very strong". The worst scenario is different from the most frequent drought periods, but basing on a real situation with exceptional abnormal high temperatures registered in Moldova in 2007. It should be mentioned that below there were described only two types of drought scenarios, because this phenomenon in Ungheni District is not local due to the relatively small area of the territory and if it appears, the risk is characteristic to all localities of the administrative territorial unity.
The historical of the area (recurrence of some risk events)	In the Republic of Moldova, the droughts represent 12,5% of the total number of hazards. The most intensive droughts on the territory of Moldova can be considered those from 1896, 1899, 1928, 1946, 2003, 2007, 2012. For the territory of Moldova, in spring dominate vast and catastrophic droughts, in summer more frequently are extreme droughts and in autumn, the catastrophic droughts have a higher frequency. Thus, the droughts from 1994, 2000, 2003, 2007 and 2012 were assessed as the strongest ones due to the intensity and catastrophic ones due to the comprised area. The catastrophic drought from 2007, on the territory of the Republic of Moldova, started in autumn of 2006. Thus, during the period 01.09.2006 – 06.08.2007 the amount of rainfalls fallen on the territory of the republic constituted 50 – 70% of climate norm. The situation got worse at maximum in May-July 2007, when the quantity of rainfalls was only 30% of norm. The uninterrupted range without rainfalls in the mentioned period varied in the limits of 28-73 days and the number of days with relative air humidity ≤ 30% was 55-78 days in the territory, overcoming 3-4 times the climate norm. The drought from 2012, on the territory of the Republic of Moldova, occurred in the second half of the hot period. During August 1 – October 8, 2012, in the whole country, it was signaled a high thermal regime (with 2-2,5°C higher than the norm) and with a significant defficiency of rainfalls (10-50% of norm), which led to shuttering the catastrophic drought that affected over 80% of the country territory. Such a high thermal regime and considerable insufficiency of rainfalls in the mentioned period of 2012 was signaled for the second time within the tool meteorological observations period. s-a semnalat a doua oară pentru toată perioada de observaţii meteorologice instrumentale. A similar year is considered 1952. The much decreased reserves of productive humidity in soil, signaled on a big part of the country, created unfavorable conditions to make preparedness works of crops grounds for autumn cereals in optimal terms. The year 2016 determined one of the most severe hydrologic droughts of the last century half, due to the winter without snow and lack of spring rains. According to the Ministry of Environment, the biggest rivers and lakes within the country, including the river Prut reached only 30% of the quantity of water necessary for the summer period of time. In Ungheni District, those two droughts brought injuries expressed in compromising 60% of crops, white beet, cereals. Besides the harms in agricuture, the wells were affected, 50% of them were dried. Mostly, the wells of the zone Cula were affected.
Description of causes, favoring elements and shuttering elements	
Causes	The strong drought in the Republic of Moldova may be, as a rule, during the warm period. In droughty periods, in spring, 87% of the territory is affected by drought with a degree of a very strong intensity. In summer, the dynamics of hydrothermal conditions contribute to diminishing the area of this phenomenon until 40% of the territory and in autumn months the drought comprises the whole territory. The territory of the Republic of Moldova is liable to drought and with climate change; the frequency of this phenomenon will increase. Mostly, the agricultural sector, the most important economic branch of the Republic of Moldova will be affected. Drought is not anything new for our country. In last 20 years, Moldova suffered from droughts in 1990, 1992 and 2003 that raged during the entire vegetation period and the drought from 2007 broke a quarter of RM GDP. It is forecast that the maximal heating in Moldova will occur in winter and transition seasons. By 2080, the middle spring and autumn temperatures may increase with almost 4-5 °C. The

	minimal relative heating is supposed to occur in summer months: with 1°C at the century beginning and with 3°C to its end. It is anticipated a certain increase of rainfalls during winter and spring, but, the trends for summer and autumn are negative (a diminution with 20-30% to years 2080). Generally, Moldova will face warmer and more humid winters, but hotter and drier summers and autumns. Thus, the climate changes will determine the intensification of aridity phenomenon and increase of maximal duration of non-rainfall intervals.
Favoring elements	The favoring elements that lead to drought in Moldova are highlighted both by the modifications in the general atmosphere circulation, determined by the greenhouse effect and some human causes, uncontrolled deforestations or modifications of landscape with negative effects on the environment and Earth water resource, and also, by soil degradation.
Shuttering elements	The shuttering elements in drought are registered in May-July, when the average air temperature is 21 – 23°C, being with 3 – 4°C higher than the norm (record). The number of days with maximal temperatures ≥30°C constituted 36 – 45 days on the territory, overpassing the norm 3 times and the number of days with maximal temperatures ≥35°C, respectively 10-12 days. Thus, the deviation from the norm is overpassed 10-12 times. The high thermal regime and insufficiency of rainfalls in May-July create unfavorable conditions for autumn crops during the period of grain formation and filling, growth, development and yield formation of weeding crops, vegetables and fruit trees. The reserves of productive humidity in the superior and middle lays of soil on the agricultural crops, in a big part of summer, were insufficient, in some places they missed completely at the end of July.

The spatial dimension of the event (territorial area where the risk event may shutter)	**Scenario 1** *„The worst scenario”*	**Scenario 2** **„Scenario with middle harms”**
	Meteorologists issued a warning of heat Orange Code, valid for July 14-20. The maximal temperatures will reach 38...39 degrees and the thermal discomfort will be particularly emphasized. The most emphasized intensity of the „scorching heat” was hilighted between July 11-20, when the maximal air temperatures where frequently over 35...40¤C, on extended areas in the south and west. In July 12, the maximal air temperatures reached very high values (40...44¤C), including in Ungheni District. The spring-summer period of this year is comparable with that from 1946, but with a higher persistence of canicular days (Tmax >35.0oC). So that this period registered more records, as: overcoming the absolute maximal temperature for July in the whole country (42.5C in July 12, Falesti, neighboring with Ungheni District), overcoming the absolute maximal temperature for June, recording number of daily maximal temperatures >40.0oC, recording number of consecutive canicular days (daily maximal temperatures >35.0oC). The drought and canicular temperatures of the last period dried up hundred of well in the country and compromised the agricutural crops, in some localities the firemen bring water with tanks. The most affected areas of Ungheni District are those situated in the eastern part of the district (Parlita, Magurele, Cornesti, Tescureni, Busila, Petresti, Manoilesti, Alexeevca, Bumbata). Over 1000 households don't have water in wells and the vegetables are badly affected because of the drought, a phenomenon that causes serious problems to the whole district. The farmers are concerned, mentioning that if it is not raining in the next days, the agricultural production will be compromised. The biggest harms were registered for wheat and sunflowers. The administration of the District Department of Agriculture and Alimentation/ Public Safety Ungheni acknowledges the the district faces a heavy drought that affected about 21.485 hectares of crops. At the distirct level, the water defficency in soil differ very much from an area to another and is situated at values of 100-150 liters per square meter. The lack of water in soil is much higher as a result of reduced rainfalls. According to the State	Such scenarios fit the category of strong droughts that take place when the rainfall quantity is 60 – 70% of norm and the average air temperature in this period overpasses the norms with 2°C. the assessments show that atmospheric rainfall defficiency is specific practically for the whole territory of the republic. Thus, the assessment of the territory of the Republic of Moldova, after the aridity degree, according to the indices use the international practice (according to the relation between the rainfalls and potential evapotranspiration), shows that the biggest part of the republic territory according to the refers to subhumid and semiarid regions with a high likelihood of drought appearance and desertification process development.



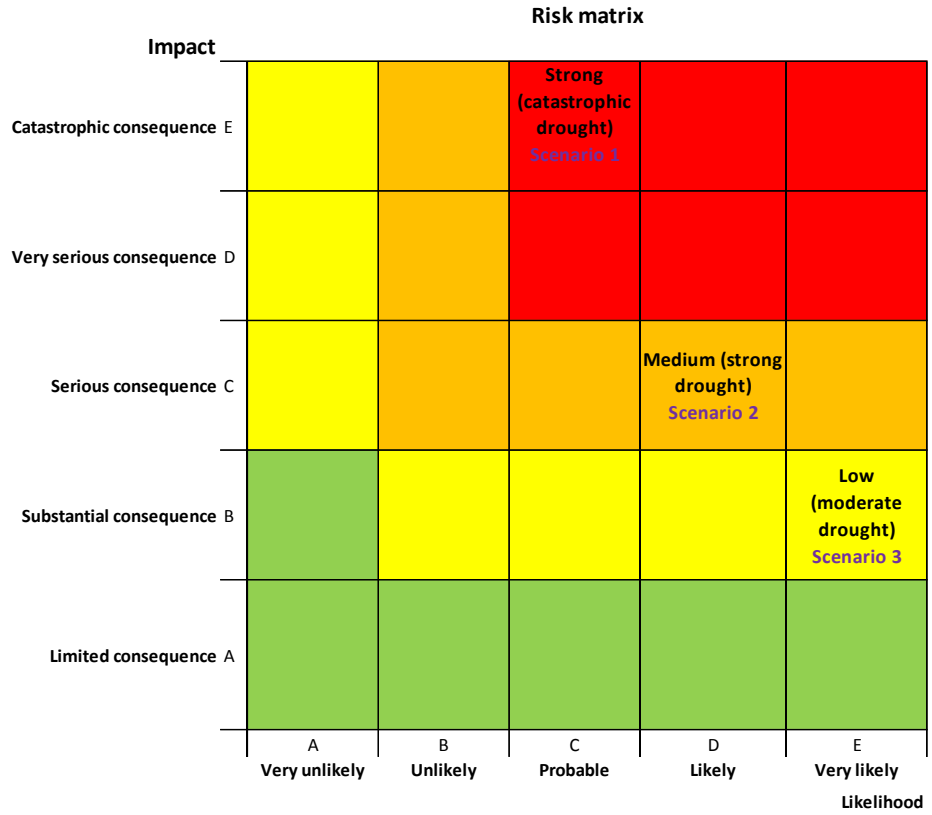
	Hydrometeorological Service of Moldova from September and until now (July) there fell, on average, 200-350 mm of rainfalls. According to the collected data, in Ungheni District, in ten months, there fell only 212 mm, given that the necessary of water for agricultural crops should be at least 600-700 mm. In the next period, the meteorologists do not forecast rainfalls. Furthermore, amid the high temperatures, strong insolation and water defficiency in soil, the drought phenomenon will amplify. The specialists are pesimistic and appraise that the water defficiency in soil will not be covered, even we have rainfalls. In more areas of Ungheni District, the harvest started much earlier and the results are much lower than expected. The farmers think that the crops are almost compromised, getting less than a half of the expected quantities. The direct material losses for agriculture are appraised to over 1 200 000 Euro. At the same time, because of high temperatures, the road traffic is affected, the asphalt being destorted and water supplying is in danger due to the decreased level of water in the river Prut. Moldova and Ungheni District have experience in similar droughts, but this one described in the scenario is an extended one as period of time. 	 In the last years, the drought and heat risk attract an enhanced attention, partially due to the heat waves in last years in Europe, including Moldova. Due to the climate changing, the drought and heat may become usual events, even for northern regions. 
Time position (e.g.: during the week, in summer after 18.00)	The drought installed starting with September of the last year and highlighted during May-July of this year, developing by an acute lack of rainfalls and very hot weather.	For Moldova territory the strong droughts dominate in summer.

Event duration (e.g.: between 2 and 8 days)	The drought started in September of the last year and highlighted in May-July. Due to the phenomenon complexity, it is difficult to fit the phenomenon in a time frame.	In case of moderate droughts, these appear in summer and autumn. Due to the phenomenon complexity, it is difficult to fit the phenomenon in a time frame.
Evolution of the hypothetical event (the extent to which the hypothetical event may shutter other events)	The drought affects green forages and cereals used in animal and poultry feeding. When the drought undermines or destroys feeding sources, people get hungry. In case the drought is severe and lasts a long period of time, starvation may appear. Often the drought creates the lack of clean drinking water, water for sanitation and personal hygiene, and it may lead to a series of deseases that endanger life. The reduced humidity and lack of rainfalls may create rapidly dangerous conditions for shuttering fires in forests and grounds with a lot of dried vegetation that may lead to injury, casualties and material harms. Many old persons are affected by heating, the chronic deseases being aggravated (especially cardiovascular accidents). Certain professional groups that work outdoor are at risk. Regarding environment problems, the drought may lead to plants infestation with deseases and pests, increasing of erosion degree, degradation of natural habitats and landscapes, decreasing of air quality and high risk of fires. The number of road accidents is increasing on very sunny road portions where the asphalt distorts because of heating. The road traffic suffers, being interrupted on certain portions as a result of hot dilation. The heating affects the electrical wires and cables, causing energy interruptions, especially in local networks, with more reduced tension levels..	The reduced humidity and lack of rainfalls may create rapidly dangerous conditions for shuttering fires in forests and grounds with a lot of dried vegetation that may lead to injury, casualties and material harms. Many old persons are affected by heating, the chronic deseases being aggravated (especially cardiovascular accidents). Certain professional groups that work outdoor are at risk.
Intervention capacities	For diminishing the effects of drought and heating, the Commission for Emergencies of Ungheni District orders the implementation of the following measures: • Monitoring areas affected by drought and their inventory. • Operating and keeping some irrigation arrangements. • Streamlining the water consumption in the affected localities, by limiting the water volumes used for garden/ green space wetting. • Taking measures by economic agents for limiting the water loss for preparing additional installations for using groundwater and other water sources. • Determining the water level in wells and permanent monitoring of drinking water quality in the network, making periodical analyzes regarding the potability of water supplying sources for population and hygiene conditions at community level. • Ensuring the supply of drinking water of population and animals, by trasporting it in tanks or other means. • Ensuring some alternative water sources in case the flow in the communal network is reduced significantly or it is destroyed.	• Monitoring areas affected by drought and their inventory. • Operating and keeping some irrigation arrangements. • Ensuring the necessary forage in farms correlated to the existent livestock and daily ratios.. • Prohibiting heavy traffic on certain road sectors. • Ensuring drinking water supply to consumers. Some irrigation systems in the district are operating, as well as those from the villages Petresti, Blindesti and Sculeni, Ungheni District. The system covers 585 ha of land. Another irrigation system in the village Manoilesti ensures with water an area of 160 hectares.

	• Elaborating and updating, at the locality level, the registration of people with social dependence whose health may be influenced negatively by heating. • Placing some first aid and drinking water distribution points. • Intensifying hygiene-sanitary inspections for verifying the quality of food and their storage. • Promoting, among farmers, the measures regarding the amelioration of exploiting and animal sheltering conditions in paddocks and prohibiting keeping animals on pastures, without ensuring minimal conditions for sheltering (sunshades) and watering. • Ensuring medical assistance for supervising the health of affected people, ill treatment in a permanent system. • Verifying the ensurance of some drinking water reserves in households and professional livestock holdings in basins and verifying the restriction of water management in professional livestock holdings. • Ensuring the necessary forage in farms correlated to the existent livestock and daily ratios. • Prohibiting heavy traffic on certain road sectors. • Ensuring drinking water supply to consumers. Some irrigation systems in the district are operating, as well as those from the villages Petresti, Blindesti and Sculeni, Ungheni District. The system covers 585 ha of land. Another irrigation system in the village Manoilesti ensures with water an area of 160 hectares.	
Recommendations for strengthening/ improving the capacities	Water defficiency and drought were, broadly, documented as phenomena that are expected to be worse due to the climate changes and associated reduction of water availability. So that, a special attention should be provided to aspects related to climate changes for integrating them in water management planning. The first step should be focused on the identification of present and future consequences of climate changes, followed by the development of strategies for adapting with action plans and adapting measures. In this regard, for strengthening the intervention capacities, in Ungheni District can be applied the Communication „EU Strategy regarding the adaptation to climate changes." (COM (2013) 216 final) accompanied by the Guidelines regarding the elaboration of adaptation strategies (SWD (2013) 134 final), issued by EU Commission in 2013. The Guidelines was conceived for helping Member States to elaborate a national adaptation strategy. According to the Guidelines, a process of adaptation to climate changes needs to develop and use statistic methods, special indicators and modelling techniques that allow a reliable differentiation between changes caused by climate and those caused by human activities. Also, it is necessary to make a differentiation between „drought" and „water defficiency" for making clear the difference between their causes. The action suggested by the Guidelines are: • Adapting hydrometrical networks for following the impact of climate changes on water resources, providing sufficient dedundancy for getting precised appraisals of the series of naturalized water flow from observations, closing the water balance in each pool. • Setting up a system for monitoring the water consumption and water demand. • Developing a set of indicators at time and spatial scale that can explicit phenomena for anticipating the impact of drought and water defficiency.	

	• Diagnosing water defficiency on the basis of water demand in the past and improving knowledge about previous and present water demand and future trends that comprise projections regarding climate changes. • Analyzing the way the anticipated changes of average annual runoff will modify the supply reliability and analyzing the way these changes will affect the socio-economic system behind the water resources system. For diminishing the effects caused by drought it should be improved the physical means (equipment, technical equipment) of Ungheni District equipment, as: • Rehabilitating the existent iririgation arrangements and realizing new arrangements • Reforestation and curtaining • Renaturing by arranging the Meadow of the river Prut and meadow areas of some inner rivers • Elaborating a warning system, monitoring program • Setting up new networks for data collection	
Risk scenarios prioritization and selection	**Scenario 1** *„The worst scenario"*	**Scenario 2** **„Scenario with middle harms"**

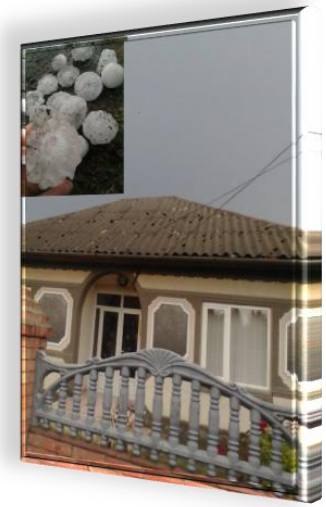
Risk matrix for drought

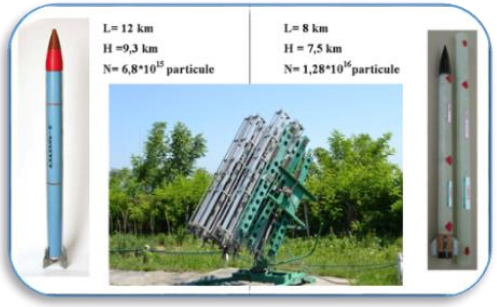
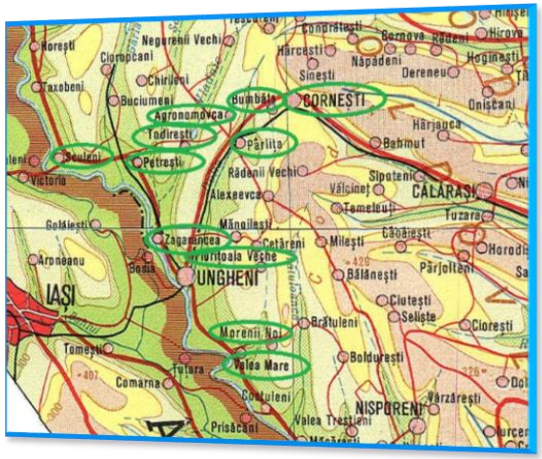


E. The schematic representation of scenarios development for rains with heavy hail

Scenarios identification	
General description of heavy hail in Ungheni District	The heavy rains with hail and strong wind in the afternoon of June 24 destroyed the roofs of over 1900 houses from 14 localities of Ungheni District. Over 500 ha of crops were compromised. The electric energy was stopped because of electric networks destruction in 24 localities of Ungheni District. Due to the rain and wind, many trees were broken on the road between Cornesti town and the locality Bumbata. The worst scenario is different from the most frequent cases of hail falling, but at the basis, has the event of summer 2016, when as a result of the heavy rain accompanied by a heavy hail, with a diameter over 20 mm, there were registered the most significant material harms in the last 15 years. Below, we will present 3 scenarios of rains with hail, with different intensity and impact. Due to the geographical placement and due to the climate changes that determine the occurrence of extreme natural hazards, Ungheni District may have hail falling, so that the described scenario has a middle-high likelihood.
The historical of the area (recurrence of some risk events)	For Ungheni District, the falling of heavy rains with hail are a frequent phenomenon, in each district locality there is this risk, the harms vary from small to significant. The most recent event, registered in summer 2016 produced the biggest economic destructions and losses for the district. In June 18, 2016, as a result of the heavy rain with hail and strong wind on the district territory, there were broken 2112 objectives where there were snached and destroyed 93623 slates, there died 5 bovines, there were affected 24 ha vineyards, 12 orchards and 575 ha of crops. According to the DE Ungheni information, the hail destroyed the houses roofs in 16 localities: Blindesti, Sculeni, Medeleni, Semeni, Busila, Petresti, Cornesti, Parlita, Bumbata,

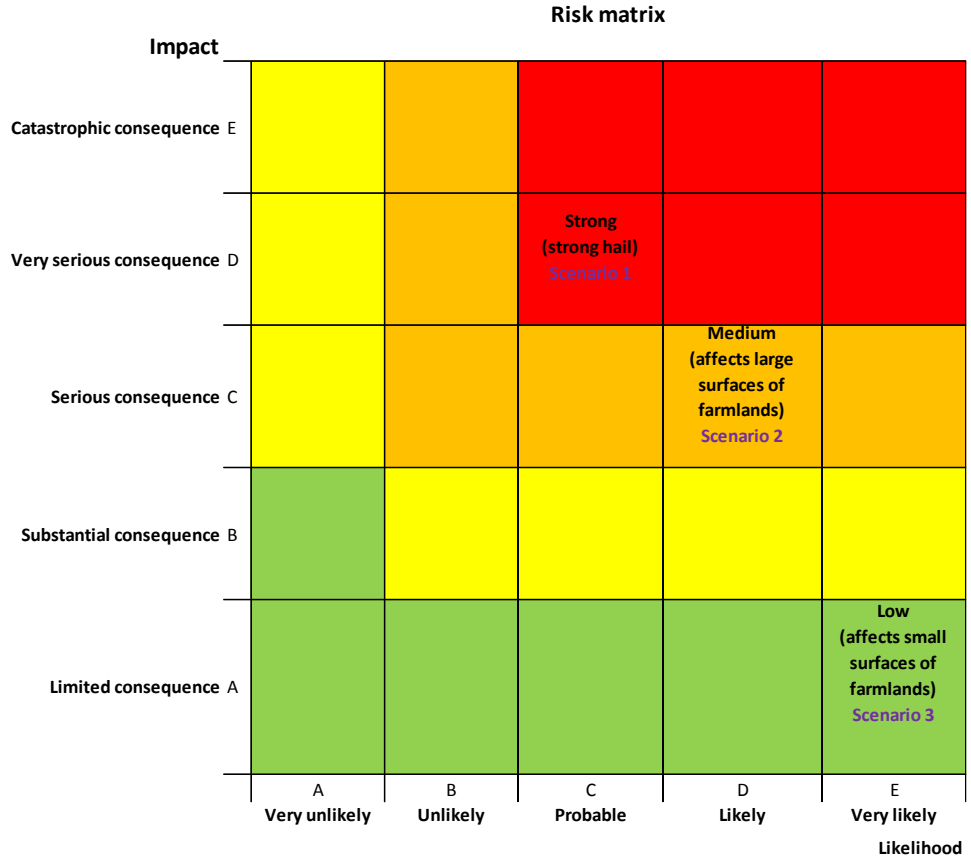
	Romanovca, Poiana, Mircesti, Harcesti, Todiresti, Graseni, Valea Mare. The harms caused by the heavy hail in Ungheni District indicate material losses, as: crop compromission, infrastructure destruction (roofs, cars, etc). The material losses may overpass 10 millions MDL.
Description of causes, favoring elements and shuttering elements	
Causes	The genetic causes of the hail are determined by the features of atmosphere circulation, interacting with those of active areas. The general atmosphere circulation contributes to the hail formation through cold, very active lines that move over overheated territories. The local features of active area have a special role in hail genesis, by intensifying the processes of thermal convection and increasing of air turbulence. The thermal convection develop very well, in serene and quiet weather (anticyclone weather), being advantaged by horizontally grounds and, especially slightly sloping, where the sun rays fall perpendicularly, intensifying local heating processes. These determine ascending air streams, very strong that exalt the overheated air in the atmosphere. The local specifics of the relief (where we can add different forms of relief, slope exposure, degree of vegetation covery, soil color, humidity degree, etc.), contribute to the general heating of active area that determines the local character of hail. Sometimes, this occurs on ground narrow strips (wide for 10 - 15 km and long for some hundred km) oriented parallel to the cloud of hail. The movement speed of the cloud of hail may be, sometimes, very high (60 - 70 km/hour).
Favoring elements	Moldova relief influences significantly on the distribution of days with hail number. The presence of heights contributes to the development of air ascending movement, intensification of turbulence in the air layer on the soil and, accordingly, to the increasing of convective nebulosity. Thus, the central part of the republic is subject to the most hail. Thus, in Ungheni District, in some localities (Cornesti, Zagarancea, Sculeni) it is signaled the biggest number of days with hail, in average twice a year.
Shuttering elements	The hail appears together with heavy rains during a great heat and occurs almost each year and may comprise considerable territories, by covering the soil with grains with a diameter of over 20 mm. The average duration of hail is for some minutes, until 15 minutes, making difference of maximal duration on relief levels.

Description of the hypothetical event			
The spatial dimension of the event (territorial area where the risk event may shutter)	**Scenario 1** *„The worst scenario"*	**Scenario 2** **„Scenario with middle harms"**	**Scenario 3** **"Scenario resulted with minor harms"**
	After some canicular days, a violent storm with hail with a diameter of over 20 mm destroyed the roofs of 1988 houses in 14 villages of Ungheni District (Blindesti, Sculeni, Medeleni, Semeni, Busila, Petresti, Cornesti, Parlita, Bumbata, Romanovca, Poiana, Mircesti, Harcesti, Todiresti). The roofs of 19 social institutions (kindergartens, schools, medical offices) were riddled. Over 85000 slates should be replaced. The rain with hail lasted less than 15 minutes, but it succeeded to wash whole grounds. The gardens in these villages were mired, the vegetable harvest was destroyed.  Because of strong wind, that snatched more trees, 12 persons were blocked in transport means on the road near the commune Cornesti. For deforesting trees and cleaning the road, there intervened rescuer teams. The heavy rains with hail affected 545 hectares of crops in those 14 localities of Ungheni District. The most affected were the crops of sunflower, corn and wheat. The strong wind broke electrical networks, thus, 24 villages of the district remained without power.	The heavy rains with hail compromised tens hectares of crop in more localities of Ungheni District.  According to the operational information of DE Ungheni, in the villages Parlita, Bumbata, Zagarancea, Petresti, Todiresti, Cornesti, there were affected over 100 hectares of crops. The gardens in those 7 localities were partially mired. The most affected were the crops of sunflower, corn and wheat. There were affected badly 12 ha of orchards and 9 ha of vineyards.  The heavy rain broke the electrical networks, so that 3 villages remained without power. In average, the harms produced by such events are appraised from 500 000 - 750 000 MDL. Such a scenario is featured to all district localities.	As a result of a heavy rain with hail, 20 ha of crops in 4 localities of Ungheni District were partially destroyed.  Due to the fact that the hail didn't last more than 10 minutes and had a small diameter, the registered harms are not considerable. The gardens of natives were affected; mostly the vegetable crops were destroyed.  The harms registered in such cases are until 250 000 MDL. Such a scenario is featured to all district localities.

	According to the DE and Anti-Hail Service information, the cloud with hail had passed a distance of 100 km before entering the Republic of Moldova territory at a height of 20 km. The hail layer had a thickness of 10 km. The experts say tha the hail in clouds cannot be destroyed, but it cannot allow the formation of other hail. The hail broght by wind on the territory of the Republic of Moldova should fall on earth, because it was formed at a great height. DE and Anti-Hail Service ensured that in June 24, there were launched rain rockets. Thus, the hail that fell on the protected area could affect an area of over 100 hectares. But near the border, the grounds were destroyed completely because the Anti-Hail Service is not allowed to launch rackets towards the border. Now, there are discussions with the Romanian part to sign an agreement that will allow the launching of rain rackets near the border.  	 *Local map of hail*	
Time position (e.g.: during the week, in summer after 18.00)	A meteo warning was issued by the State Hydrometeorological Service for the evening of June 24. There were forecasted strong showers, thunder, storm and hail. The most affected localities were in Ungheni District. As a rule, the rains with hail fall in May-September.	As a rule, the rains with hail fall in May-September.	As a rule, the rains with hail fall in May-September.
Event duration (e.g.: between 2 and 8 days)	The hail didn't last more than 15 minutes.	The hail lasted between 10-15 min.	The hail lasted less than 10 minutes.
Evolution of the hypothetical event (the extent to which the hypothetical event may shutter other events)	Vthe storm with hail and strong wind favored the tree snatching and blocking a road portion of national importance (Cornesti Town). At the same time, the event causes the damage of electrical networks.	In case of hail with middle impact, that may affect, besides crops, streets as a result of trees collapse the electrical networks.	The hail that produces small harms, but with heavy rains may snatch trees and block streets, it affects the electrical networks.
Description of intervention capacities			

Intervention capacities	The rescuers formed more working sectors in the localities Petresti, Medeleni, Todiresti, Romanovca, Bumbata, Blindesti and Valea Mare of Ungheni District. The team of the Search and Rescue Squad no. 2 of Balti City, with ninety rescuers and seven technical unities were alerted to intervene in liquidating the consequences of rains in the affected localities of Ungheni District. The Service of Civil Protection and Emergencies intervened in force for providing aid to people, whose houses were affected by hail for covering the riddled roofs. The specialized groups of the electricity providers have already worked for reconnecting power. The employees of SCPE intervened for providing aid and unloading construction materials in the households affected by rain with hail. The Service of Civil Protection and Emergencies will monitor further the country situation.	Local Mayoralties, Ungheni District Council and DE Ungheni appraise the harms and monitor the situation. For restoring the power, the specialized teams work on the ground.	Local Mayoralties, Ungheni District Council and DE Ungheni appraise the harms and monitor the situation.
Recommendations for strengthening/ improving the capacities	In case of hail that affects agricutural areas, the broadcasting in time of warning meteorological forecasts, elaborated on the basis of the meteorological radars information and satellite images, permit to take some proper measures. Now, there exist the possibilities to prevent the formation of clouds with hail by spraying, within them, some chemicals that determine the rains before the formation of ice granules. These methods are very expensive and not always provide the expected results. In most countries, affected by hail, for its combating, there are used passive measures and means that are ecologic and consist in: delimiting the areas affected by this phenomenon and croping them with plants that resist at hail; covering the valuable agricultural plantations with nets (fruit trees, vine, etc.); ensuring the agricultural grounds against hail danger.		
Risk scenarios prioritization and selection	**Scenario 1** *„The worst scenario”*	**Scenario 2** **„Scenario with middle harms”**	**Scenario 3** **”Scenario resulted with minor harms”**

Risk matrix for heavy hail



4.4 SCENARIOS OF TECHNOLOGICAL RISKS IN UNGHENI DISTRICT

Asa result of the process of prioritizing the technological risks identified in Ungheni District, there were selected 3 prior technological risks from those 8 technological risks identified in Ungheni District. Thus, for transport accidents, detection of unexploded munitions and fires, there will be identified and build risk scenarios, there will be described their prioritization and selection criteria for setting up some representative scenarios that will be farther assessed.

Disaster risk analysis means the assesment of significant threats scenarios for learning the vulnerability and potential impact of the disruption of the society vital social functions (safety, health, social or economic welfare, environmental impact, etc.). The level of disrupting or distroying impact is quantifiably; on it there are applied some sectorial and intersectorial criteria. Within the joint meetings with the representatives of stakeholders of Ungheni District, there were analyzed the most important social vital functions and selected the impact criteria specific to Ungheni District. That was the base for eleaborating scenarios for prior disaster risks of Ungheni District.

Social vital functions and impact criteria specific to Ungheni Distirct

Social vital functions	Impact criteria
Human impact	Deaths Severly injured or ill people Permanently displaced people People with special needs
Economic impact	Losses and direct costs of aid, relief, repair and recovery Indirect (social) costs and losses Structural damage to economy
Environmental impact	Disruption of ecosystems Environmental pollution Loss of ecological value
Social and political impact	Social psychological impact Disruption of daily life Loss of social cohesion

Scenarios of technological risks in Ungheni District describe the aspects as event, nature and amplitude of one or more correlated events, with impact at regional level, causes and processes that shuttered the event, the context the event occurred (stressing the circumstances, vulnerability and people, goods, society resistance), event consequences (considering the amplitude and intervention and consequence limitation actions).

In the first phase **of risk identification** there are described a series of features for each risk type. In this context, each risk from those three technological ones in Ungheni District will have a schematic representation of scenarios.

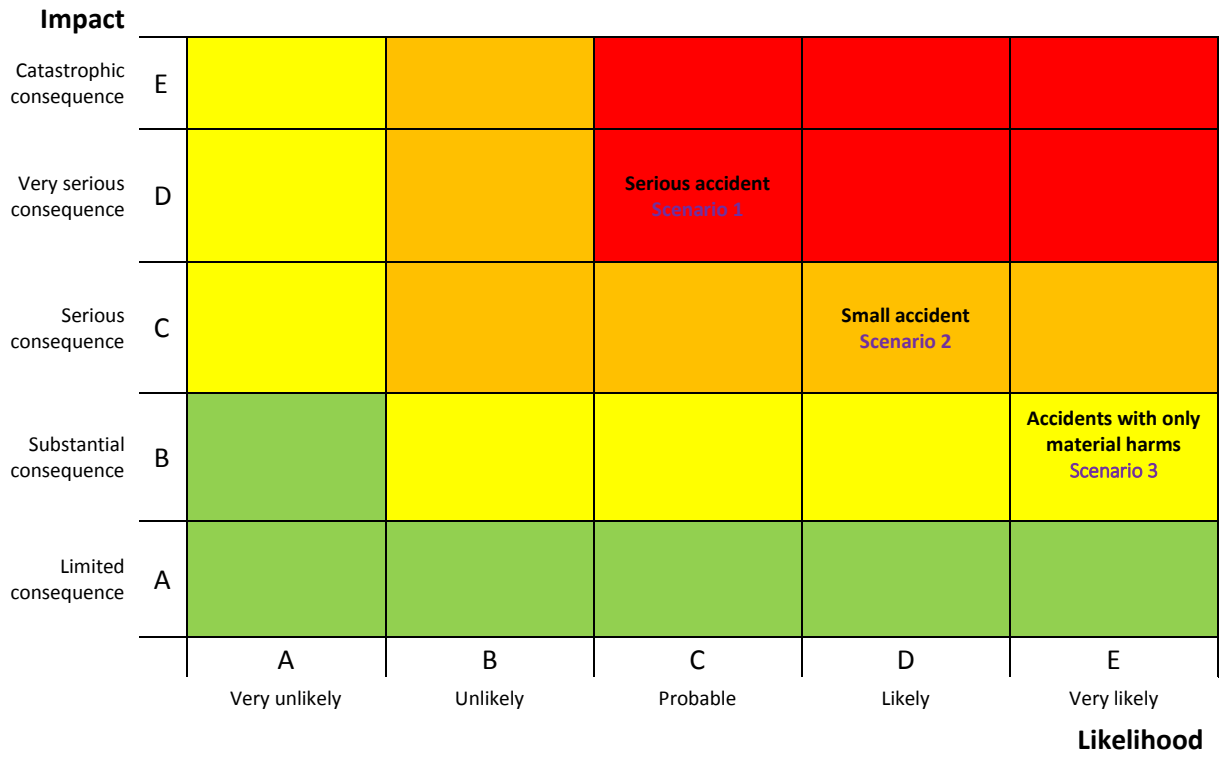
A. The schematic representation of scenarios development for transport accidents

Scenarios identification	
General description of transport accidents in Ungheni District	In Ungheni District, 50% of localities can be affected by the risk of road accidents. The most accidents occur on national roads R1 Chisinau-Ungheni-Sculeni and R42 Ungheni-Macaresti-Barboieni. The length of national roads is 104,87 km, and the length of local roads is 267,2 km. On the section R1 Chisinau – Ungheni – Sculeni, at the border with Romania, in the last 6 years, there occurred 6 serious road accidents resulting with 2 casualties and 9 injured. On the section R42 Ungheni- Macaresti – Barboieni, in the last 6 years, there occurred 5 road accidents resulting with 4 injured and one casualty. This section crosses Ungheni City, Stefan cel Mare Street, where there is a major transport and pedestrian traffic. The statistics indicate that the road accident is the cause number 1 of casualties registered at the age between 6-24 years old, having the 3 place in the world for all age groups. Road accidents may be considered a real desease of modern civilization and that supposes a serious approach of the phenomenon and implementation of prevention methods for reducing their number and consequences. The practice shows that each violation of traffic rules has the possibility of accident occurrence; it is proved that all traffic accidents occur because one or more traffic rules are not complied. The scenarios of transport accidents represent events that comprise cumulatively the following conditions: a) they occur on an road open to public traffic or they had origin in a such place; b) they had as result casualty, injury of one or more persons or damage to, at least, a vehicle or other material harms; c) in the event there was involved, at least, a moving vehicle. The actions or inaction of drivers that had socially dangerous consequences occur on **a public road, that means on a ground communication way, less railways, arranged for vehicle traffic, being administrated by local or national public authorities.** The description of an accident scenario contains data and the public information document. In the absence of these documents, the competent authority may request the following information: accident typology; involved subjects; consequence assessment: risk zones and protection measures for identifying the vulnerable elements.
The historical of the area (recurrence of some risk events)	The territory of the Republic of Moldova and, implicitly, Ungheni District, by its geographical position and natural specifics is affected more frequently by the following hazards: earthquakes, landslides, floods, heavy rains with hail and storms, canicular temperatures of long duration in summer or very low in winter, droughts, heavy snows, early frost in autumn or late frost in spring, cases of excessive hoar-frost, epidemics, epizooties and invasions. In the category of techological disaster risks, the most frequent and with negative impact are transport accidents, detection of unexploded munitions and fires. In the last 5 years, in Ungheni District, there were registered 811 technological emergencies. As a result of these emergencies there died 113 persons, injured 377 persons and there were registered material harms of total value of 2283,7 thousands MDL.
Description of causes, favoring elements and shuttering elements	
Causes	- speed unadapted to traffic conditions - irregular crossing by pedestrians - driving under alcohol - incautious driving - failure to give priority to pedestrians who are crossing regularly - failure to give priority to vehicles - use of cell phone - speed excess and driving intoxicated transport means - inadequate techinical situation of vehicles; - inadequate situation of some roads and lack or improper placement of some road signs; - misassessment of some situations, because of lacking experience in driving, because of fatigue, alcohol consumption, medicines, etc. - meteorological conditions and visibility situation
Favoring elements	- mixed traffic and lack of separating the traffic flow with low speed and standard motorized traffic;

	- excessive speed on renovated road sectors; - massive obstacles on the road verge, as, for example, trees, footbridges crest ; - dangerous transversal sections on newly renovated roads; - neglecting pedestrians needs, especially in linear villages; - faulty elements of roads on existent or renovated road sectors; - lack of turn lanes to left in crossroads; - lack of optical guiding elements that may help the drivers to orient, especially at night.		
Shuttering elements	- **Human factor** From all factors that lead to traffic accidents, the man is responsible for 80-90% of their number. The man appears in a double role: he produces and at the same time he suffers the accident consequences. This factor represents the most important element in preventing road accidents. It comprises situations that influence positively or negatively his behavior, during driving a vehicle, situations that are specific by temperament, aptitudes, physical and mental constitution, lifestyle, education, etc.The high percent of accidents committed by young drivers is closely related to the degree of professional training, education and driving experience. Fatigue as inattention play a particular role, being incriminated in 10-20% of serious road accidents. In critical circumstances, the drivers of vehicles respond differently, depending on the ability, reaction speed, experience, etc. - **Road factors, belonging to communication ways** Arranging a network of modern roads ensures fluid and pleasant traffic conditions, as well as, important conditions for preventing road accidents. As the pedestrians are or not bewared from traffic through protection panels, pedestrian tunnels, etc. influence the number and consequences of road accidents. The road network, with its construction features, should provide optimal conditions for vehicles and pedestrian movement. Thus, it is possible to move in a uniform rythm, reducing speed variations.		
Description of the hypothetical event			
The spatial dimension of the event (territorial area where the risk event may shutter)	**Scenario 1** ***„Serious accidents"***	**Scenario 2** ***„Small accidents"***	**Scenario 3** **"Accidents with only material harms"**
	„Serious accidents" - road events after which there may result casualties or injury of one or more persons. They may occur both on national and local roads that cross Ungheni District. 	***„Small accidents"*** - road events after which there may result a minor injury of one or more persons. They may occur both on national and local roads that cross Ungheni District. In last 5 years, the most frequent accidents occured in Ungheni City totally-81 accidents, commune Macaresti-10 accidents, commune Parlita-7, commune Petresti-6 accidents, village Radenii-Vechi-6 accidents.	***„Accidents with only material harms"*** - road events in which one or more involved vehicles may be damaged or may cause only material harms. They may occur both on national and local roads that cross Ungheni District. 
Time position (e.g.: during the week, in summer after 18.00)	Serious accidents may occur whenever. E.g.: the serious accident in Morenii Noi from 09.08.2012, that resulted with 11 casualties and 39 injured persons.	Small accident may occur whenever. After week days, the most accidental are Monday-43 accidents, Saturday-42 accidents and Sunday-44 accidents (according to the data of the last 5 years in Ungheni District). According to the same statistical data, after time occurrence, the most accidents occurred in the second half of the day -178, between 12:00-24:00.	Accidents with only material harms may occur whenever.
Event duration (e.g.: between 2 and 8 days)	At night or in reduced visibility conditions	At night or in reduced visibility conditions	At night or in reduced visibility conditions
Evolution of the hypothetical event (the extent to which the hypothetical	A serious accident may be followed by a fire or explosion. A serious accident may occur near a school,	A small accident may occur in circumstances that create impediments to firemen services and medical first aid.	The accidents with only material harms and the vehicles will not be able to be repaired.

event may shutter other events)	kindergarten, or socio-cultural institution.		
Description of intervention capacities			
Intervention capacities	- Operativity of emergency services for solving problems specific to emergencies - Proper equipment of firemen service and emergency medical service - Involvement of coroner service	- Operativity of emergency services for solving problems specific to emergencies - Proper equipment of firemen service and emergency medical service	- Operativity of emergency services for solving problems specific to emergencies - Proper equipment of firemen service and emergency medical service
Recommendations for strengthening/ improving the capacities	• tougher sanctions for those who do not comply with rules and endanger other people's life or harm the environment • use of seat belts that represent an important mean in accidents prevention • introduction of traffic control system and video supervision, speed measuring devices • monitoring and prevention in risk situations • street lightening, especially, in dangerous areas • arrangement and modernization of main crossroads • one-way street arrangement for avoiding outrunning accidents.		
Risk scenarios prioritization and selection	**Scenario 1** ***„Serious accidents"***	**Scenario 2** ***„Small accidents"***	**Scenario 3** ***"Accidents with only material harms"***

Risk matrix for transport accidents



B. The schematic representation of scenarios development for detecting the unexploded munitions

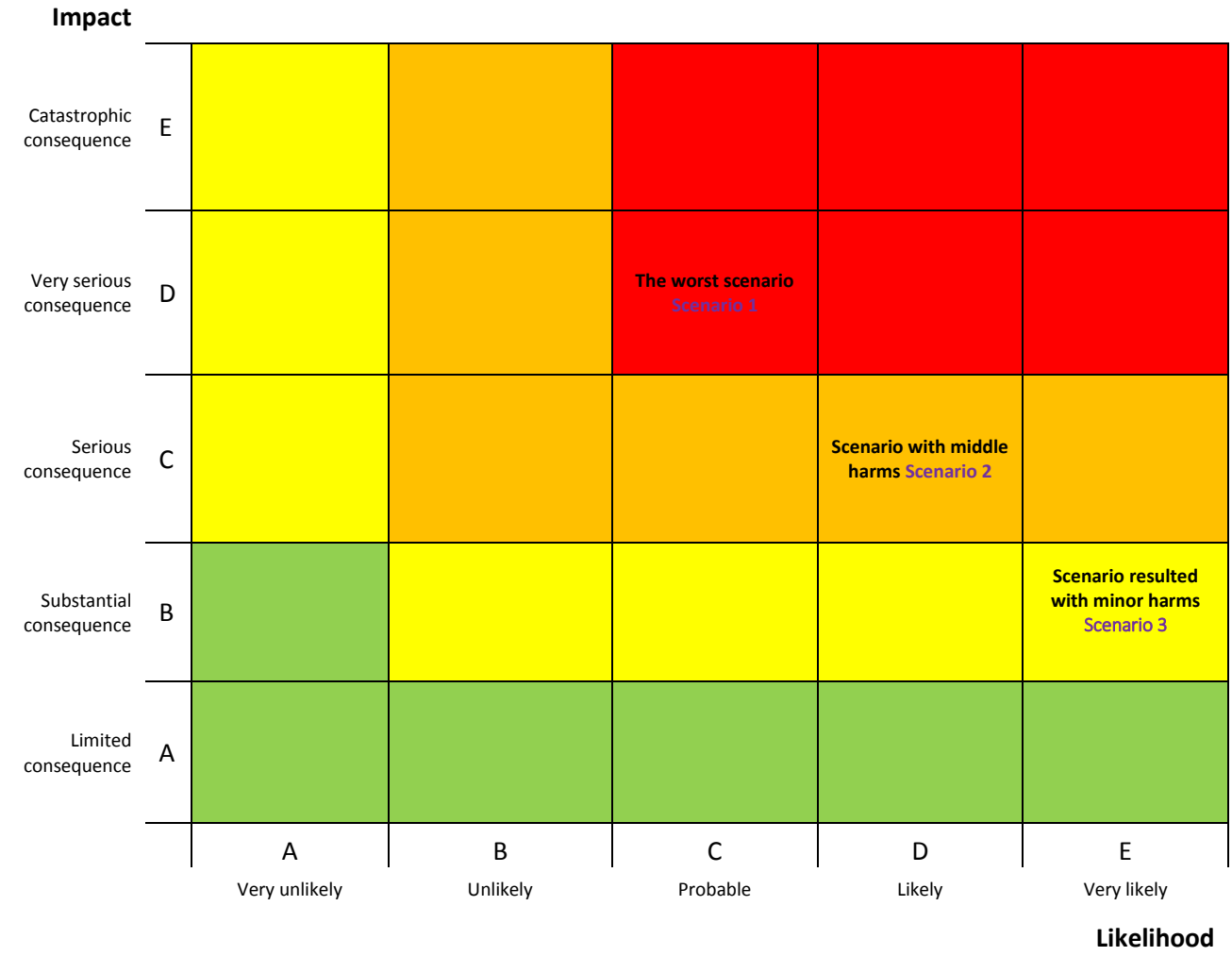
Scenarios identification	
General description of scenarios for detecting unexploded munitions in Ungheni District	The unexploded munitions represent all categories of munitions used for military goals, passed through fire, launched or initiated that didn't have a final effect because of inoperation or those unused and not destroyed. Cleaning up of the ground and neutralizing the unexploded munitions remained from military conflicts are realized by specialized unities and pyrotechnical specialists from professional emergency services.

	According to the Ministry of Deffence of the Republic of Moldova, the districts with major risk where the citizens can detect munitions are **Ungheni**, Orhei, Criuleni, Anenii Noi, Causeni and Stefan-Voda, and those with middle risk are Calarasi, Nisporeni, Straseni, Chisinau, Hancesti and Ialoveni. Although the majority of districts where the most often are detected munitions are situated at the „border" with the self-proclaimed Transdniestrian Republic, the detection of unexploded munitions is not due to the war from 1992. Ungheni District was crossed by the Iasi-Kisinau Offensive during the Second World War. In case of detecting unexploded munitions, the sappers go into research, make risk assessment, identify the detected explosives, after that return, take precautions, after that the explosive is evacuated and transported to a safe place for being destroyed." The places where these types of munitions can be detected are, generally, the following: ¬ above ground (on agricultural grounds, in forests and bushes) ¬ buried underground, descovered during agricultural digging and plowing, excavations for building foundations, deforestations, irrigation works, etc. ¬ in old buildings remained unobserved during the war ¬ underwater, in rivers, lakes or ponds, descovered during the hydrotechnical works or at random during swimming.		
Description of causes, favoring elements and shuttering elements			
Causes	Today, it can be detected munitions from the First World War (1914-1918) where the warheads and explosive work perfectly, although, at first sight, they are apparently eaten by rust. Dangerous are both munitions remained from the Second World War and the new granades that appeared in the last period of time. From the point of view of danger tha they represent, the most dangerous are used munitions, but unexploded by artillery or aviation bombs fallen in the ground. Netherveless, the warheads are working, but can be blocked by a speck of dust or lint, this can make in case of their movement or impact, the warhead can work and the munition can explode. Once the hostilities are finished, the unexploded munitions continue to kill and maim without discrimination, even when the military reasons for which they were made, stop existing. The cleaning up means to discover and taking the unexploded munitions from their places and transporting them to special arranged places where they are destroyed. Discovering or finding unexploded munitions is made usually at random by workers or farmers when working.		
Favoring elements	Detecting unexploded munitions are due to the fact that on the territory of Ungheni District crossed the Iasi-Kisinau Offensive during the Second World War.		
Shuttering elements	The unexploded munitions are explosive or toxic fighting charges remained from the First and Second World Wars as a result of fighting offensives, storing or transporting made by army on the whole territory of the country. In the same category can be comprised current munitions of the own army or of some neighboring countries, "misplaced" on different grounds or trash containers, as well as those comertialized with "amability" clandestinely, by different traffickers.		
Description of the hypothetical event			
The spatial dimension of the event (territorial area where the risk event may shutter)	**Scenario 1** *„The worst scenario"*	**Scenario 2** **„Scenario with middle harms"**	**Scenario 3** **"Scenario resulted with minor harms"**
	Unexploded munitions can be detected on the whole territory of Ungheni District. The scenario with high negative impact on the population may occur whenever and in any locality of Ungheni District, followed by munition explosion, as a result, there may be casualties (1-5) and injured (1-10). E.g.: in 2015, in Ungheni	Unexploded munitions can be detected on the whole territory of Ungheni District. According to the statistical data for the years 2005-2015, the annual average of detecting unexploded munition cases is 12. A scenario with middle harms may include 12 detections of unexploded munitions in a year with potential 1-2 easily	Unexploded munitions can be detected on the whole territory of Ungheni District. An easy scenario may include 5 annual detections of unexploded munitions (as an example may be 2008 when there were only 5 cases of detecting unexploded munitions in Ungheni District), without affecting any person.

	District, there were registered more cases (20) of detecting unexploded munitions, but the worst case occurred in 2005, when in Ungheni District there were registered 6 cases of detecting unexploded munitions (2 aviation bombs of 50 kg, 2 pitcher bombs of caliber 82 mm, an artillery projectile of 76 mm, an artillery projectile of 122 mm, a pitcher bomb of 82 mm, an artillery projectile of 100 mm) and there occueed a munition explosion, where a person died.	injured persons.	
Time position (e.g.: during the week, in summer after 18.00)	Whenever the unexploded munitions can be detected, but more frequently in summer (during the week working days) during the agricultural works or construction works.	Whenever the unexploded munitions can be detected, but more frequently in summer (during the week working days) during the agricultural works or construction works.	Whenever the unexploded munitions can be detected, but more frequently in summer (during the week working days) during the agricultural works or construction works.
Event duration (e.g.: between 2 and 8 days)	The detection of unexploded munitions can last some days.	The detection of unexploded munitions can last some days.	The detection of unexploded munitions can last some days.
Evolution of the hypothetical event (the extent to which the hypothetical event may shutter other events)	The detection of unexploded munitions can cause explosions, after them some persons may be injured and in the worst case there may be registered casualties. In case of detected unexploded munitions near the polygon from Zagarancea where a central store with 70 tonnes of pesticides may have a negative impact on people's life and nature. The dissolution of pesticides reaching the environment may last over 200 years and affect ten human generations.	Detecting unexploded munitions in the process of construction works causes deviations from the planned processes and needs the involvement of local responsible services for ensuring people safety. When informing the competent bodies, the pyrotechnic specialists of the Inspectorate come on the ground and identify the munition type and take and transport them for destroying, in case the munition cannot be taken and transported immidiately, the police ensures the safety of this place. The mayoralty ensures the place marking and it is prohibited the circulation or access of strangers. The detected unexploded munition is taken and transported by the pyrotechnic specialists to special arranged polygons for its destruction, applying all	Detecting unexploded munitions, without explosions and affected persons may distort ongoing construction works and involve public services responsible for emergency management that can be requested, at the same time for worse emergencies.

		the time special safety measures.	
Description of intervention capacities			
Intervention capacities	It is requested that all citizens who know about the existence of unexploded munitions to inform immidiately the local public authority bodies, police, firemen or nearby military unities. The population is informed that in the regions where there are or it is supposed that there are unexploded munitions it is prohibited: the access of any person, to make hand or mechanical diggings, to light a fire, to make some land improvment works, circulation of vehicles, people or animals. The main safety measures that are applied when transporting unexploded munitions consist of: verification of transport mean for working perfectly; inscription on vehicles with the sign "P" with white letters in a black square in front and rear; - covering the vehicle platform with wet sand with thickness of 1030 cm where the munitions are put; accompanying the vehicle during transportation with police car or motor teams (one in front at 2030 m and one at rear); avoiding the street with dense traffic or crowded localities. 2 hours before exploding the munitions, the population in the area is warned and displaced at a distance of 23 km around the polygon. After destroying the munitions, the area is researched very well, after that the work is considered to be done. As far as is the war, FOR PYROTECHNICIANS IT IS NOT OVER, these ones are acting permanently for driving away its tracks and being permanently awared that THEY CAN FAIL ONLY ONCE.		
Recommendations for strengthening/ improving the capacities	In case of detecting unexploded munitions, it is recommended that the citizens comply with the following safety rules and measures: • to announce urgently the service 901, police or local public authorities about the detection of unexpoded munitions • not to move the detected unexploded munitions • not to loose or deliver to the specialized economic agents, unexploded munitions for using them as metallic waste • not to use the detected unexploded munitions for making some tools or ornaments • not to strike, cut or disjoint the unexploded munitions • not to light a fire or use open fire near the detected unexploded munitions • to comply with the settled up rules and measures for risk areas, when detecting unexploded munitions • with local public authorities support to ensure the marking of the place and prohibiting the circulation or access of strangers		
Risk scenarios prioritization and selection	**Scenario 1** **„The worst scenario”**	**Scenario 2** **„Scenario with middle harms”**	**Scenario 3** **”Scenario resulted with minor harms”**

Risk matrix for detecting unexploded munitions



C. The schematic representation of scenarios development for fires

General description of scenarios	**The fire** is a complex process, with undetermined evolution that needs 4 defining elements: - existence of fuel and action of a firing source - initiating and developing in space and time of the uncontrolled burning process - burning process to be socially unjustified, needing an organized intervention for liquidation - production of material losses during the burning. Therefore, not any burning may be considered to be a fire. For example, there are not fires: - under control burning of garbage, herbage, etc. - burning of goods in stoves or other similar installations - fumigations that don't need damping interventions. The scenarios for fires represent the interaction of this event with the territory and its territorial components. The fire is a self-sustaining combustion that is unfolding without control in time and space that produces casualties and/or material harms and which needs an organized intervention for interrupting combustion process. In site, the fires can be occureed by igniting emissions and igniting leaks in the area being in contact with a fire source or spark. Also, the fires can follow explosions by igniting the product released in the explosion. Relevant for such events are the types of fires: - **„Pool fire"** – when liquid pools are burning; - **„Flash fire"**- flash fires characteristic to the burning of vapors and flammable gases in atmospheric dispersion. This type of fires accompanies explosions of vapors or flammable gases mixture with the air. In case of flash fires, although the exposure duration is very short (from some seconds to tens of seconds), the staff who is in the explosive cloud can be affected by thermal radiations being in direct contact with the fire produced by the burning of vapors and flammable gases. The effects of a flash fire, depending on the explosion features may occur on bigger distances that the explosion blast. - **„Jet fire"**- are characteristic to the ignition of gas leaks or under pressure vapors. The fires can cause, by their amplitude, many casualties and material harms. The factors as the long time for detecting a fire, the delayed moment for warning people being in danger, not knowing the location and how the persons should behave, can delay the displacing.
Description of causes, favoring elements and shuttering elements	
Causes	<u>Ignition with flame sources</u>: - **The match -** thrown negligently may initiate the ignition of slightly lighter materials (wheat land, scrap paper – including from trash bins, flammable liquids – including hot oil in the kitchen, etc.). A special risk represents the ignition of a match in the explosive atmosphere (even gas leaks in the appartment). The fires that are caused by the smokers are due to the flame of the match that is used to light the cigarette. A high social danger phenomenon represents the children's game with flame ignition sources, especially with matches. - **Open fires -** lit voluntarily for different goals (destructive, cooking, heating), as may be camping fires, stubble fires, waste burning fires, left unsupervised and unruly in forests, yards, sites, stores and in inner spaces (heating fires in industrial halls, buildings under construction, etc.) can propagate to combustible materials and construction elements nearby, initiating developed fires. The favoring factors are the wind and presence of combustible materials nearby (herbs, household waste, wood construction, etc.) - **Cutting, pasting devices** - the flames of these devices can reach high temperatures and cause fires by direct acting on the combustible materials nearby or by thermal conduction – when the metal beams are welded. <u>Thermal ignition sources</u>: - **Cigarette** – fires due to the smoking have a high rate (10-11% of the total). The sigarette butt can initiate the firing of woven fabrics of fibrous materials (cotton, etc.) sawdust, scraps of paper, straw - hay (dry), etc. The fires caused by the lit cigarettes of sleepy smokers represent a worst social danger, with often tragic consequences. - **Incandescent bulbs, floodlights** – the fires can initiate in case of high power

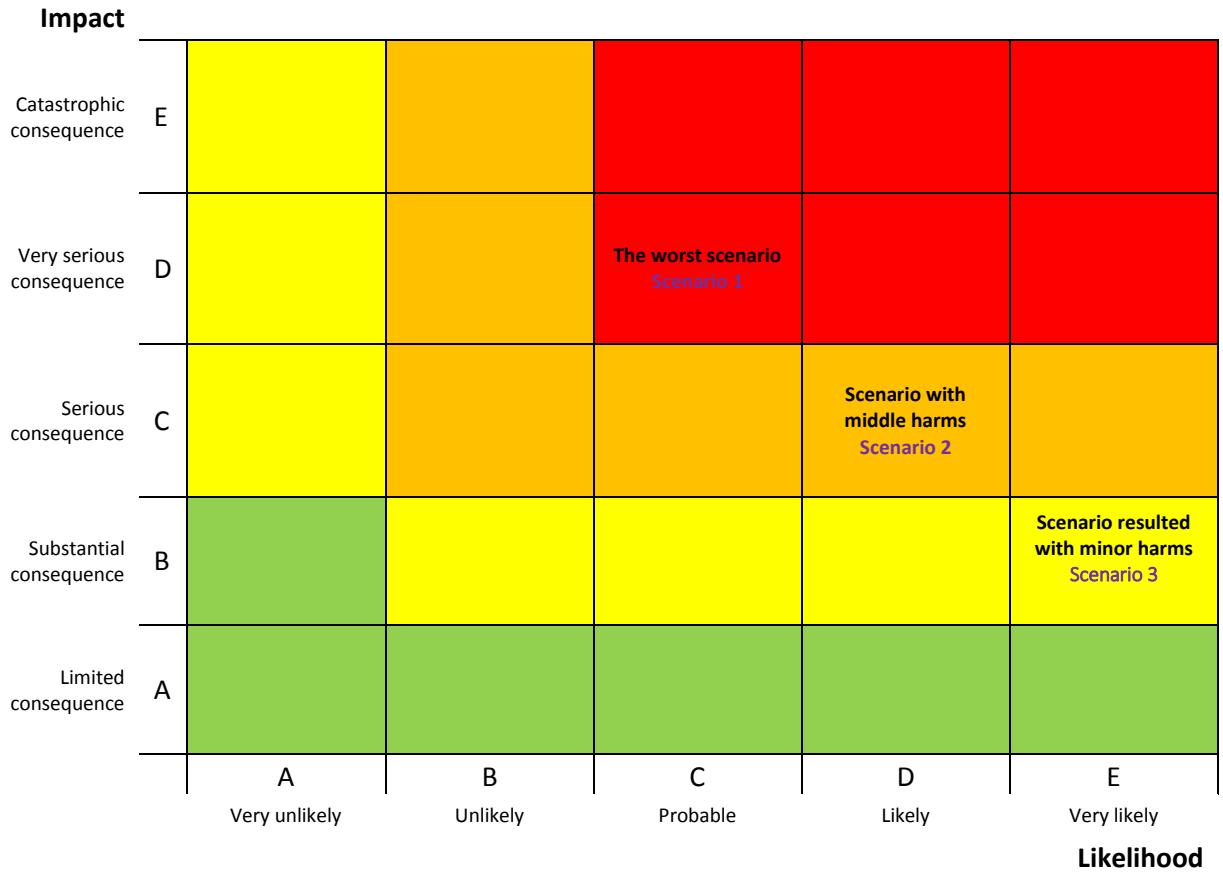
	bulbs, over 150 W and in case of direct contact with combustible materials (curtains, paper, shelves, goods in high stacks, lampshades of combustible materials). - **Blocks from welding and incandescent particles** – these particles fall quickly (preserving a high thermal potential) and can penetrate in the smallest fissures or cracks. Such a block can reach a distance of 10 m from work point, with a temperature above 500 - 800 ^{o}C. - **Metal stoves** – especially those with liquid fuel, can be a high danger in a fire during the winter and, as a result, of some abnormal operating situations: flame running phenomenon, immidiate access of fuel in the burner (contrary to the manufacturer's instructions) lead to its evaporation and, at the reignition, the explosion occurs, inversions of stoves by unskilled, intoxicated persons, children; inadequate fuel supply, use of fuel with impurities, with water and, especially a fuel that is not suitable to the stove type, etc. In case of stoves with solid fuel, as burning sources are embers and ashes from burning, sometimes stored improperly, as well as the sparks and lit particles that go out through the opened door of the furnace. In case of metal stoves, especially the stoves with heating accumulation, storing combustible materials in direct contact with stove walls or nearby cause fires even after stopping the work. - **Defective smoke chimneys, overheated pipes -** the smoke chimneys are a burning source by the sparks and incadescent particles that go out through the chimney mouth or existant fissures, as through the temperature of their walls in direct contact with combustible construction elements (beams, wood, etc.) - **Electric heating devices** - heaters and radiators constitute a burning source by the improper placing – under tables, counters and shelves, etc., where there exist a high likelihood to contact with combustible materials (wood, textiles, etc.). A high risk is the improvised heaters, of great power, manufactured, due to the overheating heating of improvised plugs. **Electrical ignition sources:** - **Arcing, electrical sparks** – constitute important burning sources in fires and explosions, generally, in case of flammable mixtures - **Short circuit -** may become a burning source in certain favoring conditions - **Fluorescent lighting installations -** may cause fires if they are made of thermoplastic materials that are featured by a flame burning, accompanied by the appearance of burning drops. The phenomenon appears after some operating defects, especially in long working conditions. - **Static electricity -** the electric discharges are frequent, but they become potentially dangerous and can generate fires or explosions when they are in an explosive atmosphere or when there are flammable materials nearby. **Auto-ignition sources** (flash fire) – it is necessary to give attention to pyrophoric substances that are burning in contact with the air (phosphorus, alkali metals, hydrides of silicon, iron sulfide, aluminum, zinc powder), substances that can ignit spontaneously, in contact with water and substances that ignit spontaneously in contact with oxidants (sodium peroxide, potassium permanganate, chlorate). Exothermic chemical reactions may occur during manufacturing, transporting, manipulating and storing the substances that react mutually when they contact. The contact may be accidental (earthquakes, shocks, etc.) or by negligence (ignoring markings on the packages or existing lists of incompatible substances, including at deposits). A factor that shouldn't be neglected is the flash fire of paint and varnish deposits, materials soaked with oils and fat (cotton cloth, fabrics, etc.) **Mechanic ignition sources** – may be initiated as a result of improper lubrication or the seize lubricant of some pieces with a high rotation speed, presence of some foreign bodies (sand, dust) between two moving surfaces, presence of mechanic shock or abrasion sparks at vehicles.
Favoring elements	**Fires are favored by**: - Burning different combustible substances or materials; - Igniting, auto-igniting or inflaming combustible or flammable materials or products; - Physical explosion (increasing of vapors or gases pressure after temperature increasing) or chemical explosion (chemical reactions that result in quick transformation of reactants, accompanied by heating emission); - Static electric phenomena (resulted from: crushing and grinding solid materials, transportation of grinding materials through pipes or gutters; - Dust-laden air filtration; - Spraying liquids and their hitting to metal surfaces; - High speed transportation of liquids or gases through pipes.

Shuttering elements	**Arsons** – the causes that determine this phenomenon are: - Unfavorable economic situation due to the transition period to market economy (big number of unemployed, high prices, etc.) - Increase of homeless people number (vagrants, street children, etc.) - Amplification of vandalism. The places selected by the firer for causing a fire are, as a rule, not guarded, less traveled, crowded with materials (old furniture, waste, etc.) that allow, in the first phases of the fire, to develop slowly and without visible actions (flame, dense smoke). The isolated objectives, not guarded and secure fencing, without fire protection installations is real targets for a firer.		
Description of the hypothetical event			
The spatial dimension of the event (territorial area where the risk event may shutter)	**Scenario 1** **„The worst scenario"**	**Scenario 2** **„Scenario with middle harms"**	**Scenario 3** **"Scenario resulted with minor harms"**
	The worst scenario includes an area, "with sure impact" (high degree of mortality) that represents a contiguous area of the location. This scenario is featured by effects that lead to a high degree of mortality. According to the statistic data of last 10 years, it is stated that in Ungheni District, most of fires occurred during 2007 – 108 cases, but most of cases of casualties caused by fires were in 2005 (15 casualties, including 2 children).	The scenario with middle harms includes a „danger" area (where there can be produced irreversible injuries) and it is featured by possible injuries, some of them bad and irreversible for people who do not take the correct protection measures and even by fatal injuries, in case of vulnerable persons as minors and old people. E.g.: An example of a scenario with middle harms may be taken 2009, when in Ungheni District there were registered 89 cases of fires with the smallest number of casualties (2 dead persons and 4 injured people), and the material harm being of 473,7 thousands MDL.	The scenario resulted with minor harms includes, however, an "attention" area that is featured by a reduced likelihood of producing injuries to people that are, generally, light even for vulnerable people, but by panic reaction that can determine social turbulence situations, so that to be necessary the intervention of public order authorities. E.g.: as an example of scenario resulted with minor harms may be taken 2015 and 2014, when in Ungheni District there were registered the fewest cases of fires (2015 - 61) and the smallest material harms of value of 230,6 thousands MDL registered in 2014, thus, there were saved goods of value of 2 946,00 thousands MDL.
Time position (e.g.: during the week, in summer after 18.00)	The most fires caused by open fire occur in the rural area: in households, forests (especially in spring), in lands with agricultural crops (during the agricultural works in summer and autumn). The majority of fires caused by smoking resulting with casualties occurred during the night, when the guilty persons slept with lump cigarette, being many times intoxicated. Statistically, the majority of fires occur on the night of Friday to Saturday, when vigilance is more reduced. The fires are dangerous hazards for environment and human activities and determine the destruction of crops, forest areas and constructions. Fires can be shuttered by natural causes as lightnings, volcanic eruptions, auto-ignition of vegetation phenomena and man's activities (negligent use of fire, arson, technological accidents). During droughty periods, the fires are often favored by strong winds associated with high temperatures that contribute to the quick extension of fire. In our country as well, there occur fires in localities, forests and agricultural grounds.		
Event duration (e.g.: between 2 and 8 days)	However, it is possible to consider that there are five phases in the evolution of a fire inside a room: · ***Appearance of the initial hotbed*** - the phase in which, due to some favorable conditions, the combustible matierial and ignition source are in contact, the energy of ignition source, accumulated during the contact period, leads to fire initiation. · ***Phase of slow burning*** - it has an extremely varied duration. In many cases the absence can last some minutes, hours and in some situations, days and weeks (in case of smoldering). The duration of this phase depends on the kind, quantity and		

	distribution of the combustible materials, dimensions and location of ignition sources and their heating quantity. The more the combustible material ignits easier, the more the generated heating is higher and the spreading is more rapid. The combustion area is limited at hotbed area (local fire). · ***Phase of fire development*** - in this phase, the burning is spread to all objectives neighboring with the hotbed, having the necessary air still in sufficient quantity. The burning phase can evoluate in more directions: if the necessary air is in a sufficient quantity, there appears the phenomenon *flash-over* (untranslatable Anglo-Saxon term over specialized in European literature, including in the standard terminology SR-ISO 8421/1). Flash-over is not a sudden phenomenon where the generalized burning of all combustible areas inside is suddenly installed. As a result, the quantity of comburent is suddenly decreasing (oxygen in the air) and the percent of carbon monoxide reaches the maximal value (until 20%) being the most dangerous moment of intervention for firemen. The flash-over phenomenon is featured by the rapid, exponential increasing of temperature and by a wide and rapid smoke generation, especially when the walls finish is combustible. If the inside is closed, the quantity of air necessary for burning becomes insufficient. That means a slowdown, then a regression in fire development, that may fade spontaneously. This phenomenon is possible in case of a relatively greater distance between combustible masses, the heating transfer through conduction being impossible. If in fire regression, there is a sudden air induction (by breaking the window, opening the door, scraps under the neutral plan, etc.) there occur a sudden induction of fresh air and there occur the *backdraft* phenomenon that is similar to the flash-over one: sudden increasing of areas in combustion, inside, by reducing the percent of oxygen and increasing the carbon monoxide one, quick increasing of temperature, wide smoke generation. · ***Phase of generalized fire*** - after the flash-over phenomenon (or, much rarer, backdraft) the burning is generalized inside. The temperatures come out uniformly towards maximal values, the heating transfer through radiation becoming mainly net. During this phase the resilience structures are mostly affected by the fire: walls crack and destroy, the openings widen, etc., having, as a result, the spreading of fire in the neighboring rooms and then in the entire building. The burning regime stabilizes and it is conditioned by the area of combustible materials and openings dimensions that means the regime of air induction. In the first case the burning speed is limited by the size of fuel area, when the air circulates excessively in relation to the contact area between fuel and air (*ventilated fires* – that are intensive and have low duration). In the second case, when the air quantity inside is smaller than the critical value necessary for combusting (*unventilated fires*) the burning speed depends on the opening dimensions (windows) inside. Not only the window area influences the burning regime, but its form as well. A high window ensures a higher influx of air than a low one with the same area. · ***Phase of regression*** – during this phase the temperature stopps increasing, then starts decreasing, due to the fuel depletion, but the decreasing is not sudden, acting further by destroying the structures.		
Evolution of the hypothetical event (the extent to which the hypothetical event may shutter other events)	A fire can burst very easy and can extend with a frightening speed. A fire can block the access, displace and intervention ways. That's why it is necessary that each citizen knows how to act and displace in case of a fire bursting and the constructions to be built according to the technical regulation *"General rules for defending against fires in the Republic of Moldova" TR DE 1.01-2005* (Government Decision no.1159 from 24.10.2007). A fire can affect the critical infrastructure of a locality, thus distorting the activity of public service providing system to population.		
Description of intervention capacities			
Intervention capacities	In case of scenario 1, the intervention measures are to sheltering the population in a closed space. Only in certain cases (imminent accident, but not occurred yet, or long toxic emission, thus the population sheltering in close spaces is inefficient), it should be foreseen the spontaneous or assisted displace of the population. Such an	In case of the scenario 2, the protection measures, consist, in case of toxic substances emission, in sheltering people who may be affected, in a closed space. In this case, the displacement is difficult to be realized due to the extension of the affected area. Thus, the sheltering in a closed space is a more efficient solution	The extension of the attention area in the scenario 3 should be identified on the basis of local public authorities' assessment. In case of toxic substances emission that may affect immidiately the senses, and, particularly, of very irritating substances, it should pay a special attention to the consequences that the

	extreme measure should be considered with great care and only in favorable circumstances. Indeed, a displacement may lead, excepting some exceptional cases and for a smaller number of persons, to consequences that can be less efficient than the realized effect by sheltering in a closed space. Due to the special importance of the population behavior in this area, for its protection, it should be realized a warning system that warns the population on the imminent danger. Also, it is necessary to unfold a continuous campaign for informing preventively the population. For this, it should be identified: - Connecting point, where the traffic should be diverted or stopped, by locating some checkpoints that may intervene in stopping the traffic in risk areas and allow the interventions unfolding with promptitude; - Alternative routes if there are traffic jams caused by the influx of intervention means; - Settled the ways for directing displaced population.	than its implementation in scenario 1. 	panic reactions may generate in very crowded places (stadiums, performance halls, etc.). The type of intervention in scenario 3 also remains sheltering in a closed space (there should be organized interventions oriented to vulnerable people). Besides this, it should be realized traffic control actions. 
Recommendations for strengthening/ improving the capacities	The local public authorities are those who: - ensure the fulfillment of defending measures against fires on the subordinated territory, establish the labor remuneration fund and other funds for maintaining the territorial rescuers and firemen service, contribute to the creation of the technical-material base of this service, as well as social conditions for its employees; - verify the safety degree if a fire, localities and objectives capacity to prevent and damp the fires, train the economic unities to fulfill the defending measures against fires; - mobilize the citizens in preventing and damping the fires, contribute to the creation of volunteering firemen teams, training and their technical-material ensurance. A high attention should be provided to the continuous informing process of the population regarding the careful use of flammable objects and avoiding the fire ignition in risk areas. It is recommended that the local public authorities ensure the implementation of measures regarding the defending activities against fires, included in risk analysis and covering plans that should be drawn up at the locality and district level. These risk analysis and covering plans are recommneded to be annually updated.		
Risk scenarios prioritization and selection	**Scenario 1** **„The worst scenario”**	**Scenario 2** **„Scenario with middle harms”**	**Scenario 3** **”Scenario resulted with minor harms”**

Risk matrix for fires



CONCLUSIONS

The risk analysis allows the Local Authorities to identify, prioritize, plan and implement measures that help to reduce the vulnerability and natural and technological disaster risks. In the previous chapters, there were exposed the basic components of risk analysis and there were elaborated 8 types of scenarios (5 scenarios – for natural risks and 3 scenarios – for technological risks). The report describes the general approach for risk analysis that is concentrated more on the key stages than on the distinctive methodologies or technical instruments. These ones are different from state to state depending on the prevalence of hazards and risks, legislation and governing context, technical capacities, as well as the availability and format of relevant data. Considering the shortage of informational resources and a systematized database at local level of Ungheni District, the report analyzed the existent data and the likelihood of disaster risks according to their frequency.

The Republic of Moldova, including Ungheni District, as it can be noticed during the last years, has a rich history in natural, technological calamities and catastrophic events caused by human activity. The causes of the first phenomena, the natural ones, should be sought in the geomorphological structure of the country. The geographical

area where the district is featured, in the last years, by a process of modifications of some geo-climatic features that lead to the appearance of some risk factors which evolved towards disasters. It was stated that, in the last years, these phenomena changed their probabilistic structure and intensity in relation with the same type of phenomena registered a decade ago. The harmful effects that these phenomena have on the population, environment and material goods make necessary to know these phenomena and the way we can prevent or can defend in emergency. From the database analysis, it may be concluded that the magnitude and frequency of natural disasters will increase amid global climate change. On the other side, the technological risks will be driven by the human factor, thus the fires and road accidents are mostly shuttered by the man.

There is no regulatory document that approaches specifically the disaster risk analysis in the Republic of Moldova. In addition, DRA is mostly regulated by the provisions of sectorial legislation (e.g., the Regulation regarding the flood risk management), while the first attempt to introduce DRA in the national legislation was made by SCPE through "Recommendation for disaster risk assessment for districts". The risk analysis is in a different stage for each risk type of the country and at local level it is completely missing. A multi-risk methodology for risk analysis is reported in the Recommendation of SCPE; nevertheless, being mostly developed for emergency planning, its implementation is at early stage. Ungheni District is the first Local Public Authority that elaborated such document.

The report regarding the disaster risk analysis specific for Ungheni District is important for the measures necessary both for prevention and intervention for population, material goods and environment protection. From the analysis of disaster risks present and potentially active on the territory of Ungheni District, with all their connections of causal interdependence, it is easy to deduct that the territory is under the incidence of a middle natural vulnerability factor by the presence of, at least, two or three risk factors that can generate primary disasters. The value of the combinatory operation that determines this factor of vulnerability increases directly proportionally to possible secondary risks that can be activated by the main risks. Ungheni District is situated in the western part of the country, the exposure to natural risks of the distirct inhabitants is higher in earthquakes, drought, heavy rains, hail, landslides and in technological risks, the district is vulnerable to transport accidents, detection of unexploded munitions, fires. In case of such events occurrence, a special importance is to know possible risk scenarios, intervention capacities and measures for consequence liquidation.

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