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GOVERNMENT OF
THE REPUBLIC OF MACEDONIA

ЦЕНТАР ЗА УПРАВУВАЊЕ СО КРИЗИ

CRISIS MANAGEMENT CENTER

**GUIDELINES FOR DEVELOPMENT OF METHODOLOGIES
FOR ASSESSMENT OF RISKS AND HAZARDS
AND THEIR IMPLICATIONS**

November, 2009

Disclaimer

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1. INTRODUCTION

01 For the last years, in its efforts to achieve complete compatibility and interoperability with collective safety systems as are NATO, EU and UN, the Republic of Macedonia has undertaken concrete measures and activities aimed at building of institutional capacities for resistance and reduction of risk pertaining to disasters and catastrophes. These measures have been of a system character and have involved organizational, legal and institutional arrangements in this field.

02 A crisis management system is therefore being established in the Republic of Macedonia. Its main function is prevention, early warning and management of all the risks and hazards that might endanger the life and the health of the people, the material, cultural and natural goods as well as the general safety of the state. This system is particularly aimed at enabling some permanent level of consultations and coordination among all competent entities, passing of resolutions at the highest level, permanent evaluation of the risks and hazards, on time response, efficient and appropriate utilization of the available capacities and resources.

03 The starting point in regulating this field is the National Safety and Defense Concept providing attitudes and strategic viewpoints regarding the mode of regulation of the crisis management system in the Republic of Macedonia.

04 The main reasons pointing out the necessity of a unified normative arrangement of this field are the following:

- Diversity in the regulation of this matter, meaning existence of a number of laws and other regulations but non-existence of a special law;
- Non-existence of a special state authority, whose main function will be dealing with this problem;
- Sector approach in evaluation of the situations and absence of a unified assessment of all the risks, threats and dangers;
- Need for rising of the level of coordination and efficiency in the use of resources owned by a number of state institutions.

05 In 2005, for the purpose of complete regulation of this field, establishment of an institutional system and achieving of the necessary standardization of the normative solutions in compliance with those in the member countries of NATO and EU as well as fulfillment of the obligations arising from the Hyogo Framework Agreement, the Republic of Macedonia passed the Law on Crisis Management¹.

06 Noteworthy for these Directions is Chapter 6 of the Law "Assessment of Endangerment of Safety of the Republic of Macedonia" which regulates planned, on time and coordinated passing of resolutions, directions and recommendations for undertaking the necessary measures for Assessment of Endangerment of Safety of the Republic Related to All Risks and Dangers through a hierarchically established process of proposing,

¹ Law on Crisis Management ("Official Gazette of RM" no. 29 dated 2005)

verification and decision making. Article 45 of this Law referring to elaboration of a Methodology for Evaluation of Risks and Dangers is given particular importance. The elaboration of these directions is also based on the recently established “National Platform for Reduction of Risks Pertaining to Disasters and Catastrophes” arising from the Hyogo Action Framework of 2005.

07 The National Platform has been established with the belief that the reduction of the risks related to disasters and catastrophes represents a national and local priority to be based on solid institutional grounds. It provides national mechanisms for the implementation of the International Strategy for Disaster Reduction, while at the same time, it enables the Republic of Macedonia strengthen its capacities for multi-sector cooperation and multi-risk approach in managing different risks and dangers.

08 The expression “*national platform*” is a generic term used for national mechanisms for coordination and policy guidance on disaster risk reduction that need to be multi-sectoral and inter-disciplinary in nature, with public, private and civil society participation involving all concerned entities within a country (including United Nations agencies present at the national level, as appropriate).

09 To strengthen:

- the capacity and capability of established specialized platforms
- the Crisis Management Center (CMC) in anticipating potential natural and man-made disasters
- implementation of appropriate preventive measures, and
- provision of effective and timely response to disasters

a qualitative and quantitative understanding and elucidation of Macedonian disaster environment, risks, vulnerability and of the resilience of competent institutional system is needed.

10 A foundation for deriving expected quantifications is consistent and coherent methodological approach that will integrate probabilities of hazard and risk occurrences in time, space and magnitude and implications they could impose over the lives and health of citizens of Macedonia, material property and environment.

11 Methodologies as foreseen by National Platform for development of various multisectoral assessment scenarios are tabulated in Fig. 1.1.

12 The main output of the study reported herein are the Guidelines for development of methodologies (Fig. 1.1) for assessment of risks and hazards and assessment of their implications over the lives and health of the citizens and the goods of Republic of Macedonia.

The Guidelines consists of:

1. Review of the sections/parts of the national legislation (laws, by-Laws) with focus on

the processes of risks and hazards assessment in relation with the CMS² and its entities;

2. Review of applicable regional and international risks and hazards assessment methodologies;
3. Guidelines and recommendations for preparation of separate methodologies for assessment of risks and hazards that could endanger the lives and health of the citizens, material, natural and cultural goods, and the overall security of the country.

RISK & HAZARD ASSESSMENT METHODOLOGIES

(in context with concrete platform, Appendix A)

- **Hazard Assessment Methodologies**
[Objective(s): Formulation and analysis of scenarios for assessment of hazardous events]
- **Community Resilience & Vulnerability Assessment Methodologies**
[Objective(s): Formulation and analysis of scenarios for communal resilience & vulnerability assessment]
- **Methodology for Assessment of Existing & Demanded Competent Institutions' Capacity**
[Objective(s): Formulation and analysis of scenarios for competent institutions' capacity assessment]
- **Post-Disaster/Accident Damage/Loss Assessment Methodologies**
[Objective(s): Post disaster/accident damage&loss assessment]
- **Methodology for Post-Disaster Assessment of Financial Implications**
[Objective(s): Assessment of financial implications]

RISK & HAZARD MAPPING METHODOLOGIES

Methodologies for identifying:

- *Location (where)*
- *Genesis and Evolution (how)*
- *Magnitude of Expected Event (grade)*

[Objective(s): Insight in spatial distribution of risks & hazards]

RISK & HAZARD MONITORING METHODOLOGIES

Methodologies for monitoring of critical factors that individually or in combination aggregate against adverse event/disaster risk

[Objective(s): Regular monitoring and insight in conditions that imply risk and/or hazard]

Fig. 1.1 Foreseen Risk and Hazard Assessment Methodologies

13 The Guidelines refer to the separate methodologies (Fig. 1.1) for assessment of risks and hazards, for the entities of the CMS, and for the specialized platforms within the National Platform. They are providing a basis for:

² CMS – Crisis management system

- Structuring of the profiles of the actual and potential risks and hazards in the country through:
 - Prescribing and establishment of procedures for continuous monitoring and early identification of potential risks and hazards
 - Development of criteria for classification and prioritization of identified risks and hazards
 - Providing information for development of procedures for analysis and assessment of the level of vulnerability of the potential targets which are exposed on identified risks
 - Providing information for development of procedures for analyses and evaluation of measures for preparedness of the institutions within the CMS
 - Providing information for development of directions for establishment of data base for evidence of important findings and their spatial presentation (as a basis for hazard mapping)
 - Providing information for development of procedures for creation of a historical data base concerning the events related to a particular risk, their implications and consequences over the lives and health of the citizens and goods of the country
- Providing guidelines for utilization of research and scientific methods, their methods, techniques and instruments for the process of monitoring, research and analysis of the risks and hazards.

14 Separate methodologies which will be developed as a result to the recommendations provided within these Guidelines shall enable the entities within the CMS and the specialized platforms of the National Platform to:

- Strengthen the capacities for monitoring, assessment and reduction of risks as per the specialized platforms of the National Platform.
- Strengthen their capacities and preparedness for prediction of the possible development of events caused by a potential risk as a basis for development of appropriate scenarios.
- Establish basis for planning of required resources.
- Improve the capacities of the responsible entities for preparation of specific Plans for response to the predicted/assessed development/scenario of the risk, as an integral part of the future National Plan for Crisis Management.

8. CONCLUDING REMARKS

8.1 GENERAL GUIDING PRINCIPLES

01 The main outputs of the study reported herein are the Guidelines for development of methodologies for assessment of risks and hazards and assessment of their implications over the lives and health of the citizens and the goods of Republic of Macedonia.

02 The methodologies to be developed shall provide qualitative and quantitative understanding and elucidate Macedonian disaster environment (hazard), risks, vulnerability and of the resilience of competent institutional system in order to strengthen:

- the Crisis Management Center (CMC) in anticipating potential natural and man-made disasters
- implementation of appropriate preventive measures
- provision of effective and timely response to disasters, and
- the capacity and capability of established specialized platforms.

03 National Platform has been established with the belief that:

- the reduction of risks related to disasters and catastrophes will represent a national and local priority based on solid institutional grounds
- it will enable Republic of Macedonia to strengthen its capacities for multi-sectoral cooperation and multi-risk approach in managing different risks and threats
- it will provide national mechanisms for the implementation of the International Strategy for Disaster Reduction, and
- it will represent national strategy and framework for disaster risk management.

04 A foundation for deriving expected quantifications is consistent and coherent methodological approach that will integrate probabilities of hazard and risk occurrences in time, space and magnitude and adequately assess implications they could impose over the lives and health of citizens of Macedonia, material property and the environment.

05 Methodologies as foreseen by National Platform for development of various multisectoral assessment scenarios are as presented in Table 8.1.

06 The risk management process (Fig. 5.1) includes:

Risk Analysis. The scientific quantification of risk from data and understanding of the processes involved.

Risk Evaluation. The social and political judgment of the importance of various risks by the individuals and communities that face them, which includes trading off perceived risks against potential benefits and balancing scientific judgments against other factors and beliefs. Risk evaluation involves comparing estimated levels of risk with risk criteria defined when the context was established, in order to determine the significance of the level and

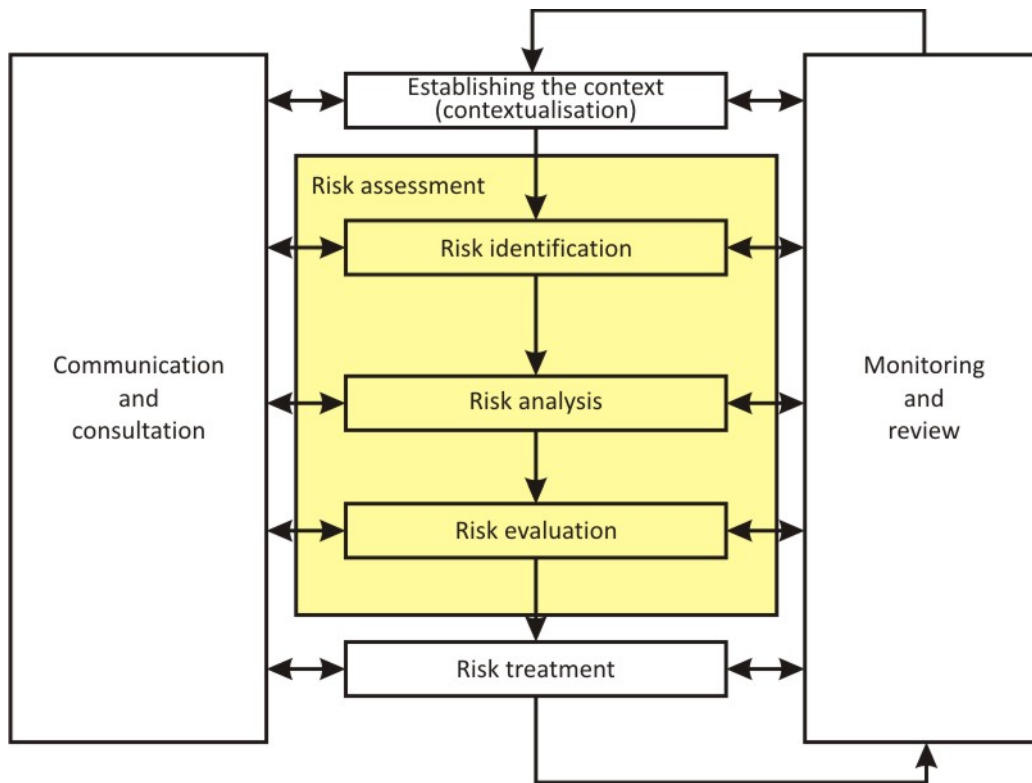


Fig. 8.1 Positioning of Risk Assessment within the Risk Management Process

type of risk. Risk evaluation uses the understanding of risk obtained during risk analysis to make decisions about future actions. Ethical, legal, financial and other considerations, including perceptions of risk, are also inputs to the decision.

Risk Treatment. Having completed a risk assessment, risk treatment involves selecting and agreeing to one or more relevant options for changing the probability of occurrence, the effect of risks, or both, and implementing these options. Risk treatment itself can introduce risks. A significant risk can be the failure or ineffectiveness of the risk treatment measures.

Risk Monitoring and Review. Risk treatment is followed by a cyclical process of reassessing the new level of risk, with a view to determining its tolerability against the criteria previously set, in order to decide whether further treatment is required. Monitoring needs to be an integral part of the risk treatment plan to give assurance that the measures remain effective.

Communication and Consultation. Successful risk assessment is dependent on effective communication and consultation with all stakeholders involved.

Involving stakeholders in the risk management process will assist in: (1) developing a communication plan, (2) defining the context appropriately, (3) ensuring that the interests of stakeholders are understood and considered, (4) bringing together different areas of expertise for identifying and analysing risk, (5) ensuring that different views are appropriately considered in evaluating risks, (6) ensuring that risks are adequately identified, and, (7) securing endorsement and support for a treatment plan. Stakeholders should contribute to the interfacing of the risk assessment process with other management disciplines, including change management, project and programme management, and also financial management.

07 While the risk evaluation, risk treatment and risk communication (Fig. 8.1) are out of the scope of this report, its understanding is crucial for evaluating policies, procedures, organizational and coordination arrangements embedded in existing institutional framework mandated for management of emergencies and disaster risks. This fact shall properly be considered and addressed when developing methodologies/scenarios that include coping capacity and/or resilience.

Table 8.1 Methodologies as Foreseen by National Platform for Qualitative and Quantitative Understanding and Elucidation of Macedonian Disaster Environment

Methodology	General objectives
RISK & HAZARD ASSESSMENT METHODOLOGIES	
Hazard Assessment Methodologies	Formulation and analysis of scenarios for assessment of hazardous events
Community Resilience & Vulnerability Assessment Methodologies	Formulation and analysis of scenarios for community resilience & vulnerability assessment
Methodology for Assessment of Existing & Demanded Competent Institutions' Capacity	Formulation and analysis of scenarios for competent institutions' capacity assessment
Post-Disaster/Accident Damage/Loss Assessment Methodologies	Post disaster/accident damage&loss assessment
Methodology for Post-Disaster Assessment of Financial Implications	Assessment of financial implications
RISK & HAZARD MAPPING METHODOLOGIES	
	Insight in spatial distribution of risks & hazards, including identification and mapping of critical hazardous event's parameters: <ul style="list-style-type: none"> ● Location (where) ● Genesis and Evolution (how) ● Magnitude of Expected Event (grade)
RISK & HAZARD MONITORING METHODOLOGIES	
	Regular monitoring of critical factors that individually or in combination aggregate against adverse event/disaster risk and insight in conditions that imply risk and/or hazard

08 The first and the most essential stage of disaster risk management (Fig. 8.1), infact of risk, vulnerability and capacity assessment, is establishing the context, or contextualization. Technically, contextualization is qualitatively formulated analytical scenario, or simply the risk management framework, which for adopted objectives shall provide quantitative and measurable risk estimates.

09 Contextualization is equally important and shall be made for the system (national disaster management system), parts of the system responsible for risk management process and organizations (institutions mandated to participate in disaster risk management).

10 By establishing the context, the system, parts of the system or organizations articulate their objectives and define the external and internal parameters to be taken into account when managing risk, and set the scope and risk criteria for the disaster risk management process. While many of these parameters are similar to those considered in the design of the risk management framework, when establishing the context for the risk

management process, they need to be considered in greater detail and particularly how they relate to the scope of the particular phase of the risk management process or to the process as a whole.

11 For a specific risk assessment, establishing the context should include the definition of the external, internal and risk management context and classification of risk criteria.

12 Establishing the external context involves familiarization with the environment in which the system and the organization operates. Understanding the external context is important in order to ensure that the objectives and concerns of external stakeholders are considered when developing risk criteria. It is based on the system/organization-wide context, but with specific details of legal and regulatory requirements, stakeholder perceptions and other aspects of risks specific to the scope of the risk management process.

13 The external context shall include, but is not limited to:

- the social and cultural, political, legal, regulatory, financial, technological, economic, and natural environment, whether international, national, regional or local;
- key drivers and trends having impact on the objectives of the system/organization; and
- relationships with, perceptions and values of external stakeholders.

14 The internal context is the internal environment in which the system/organization seeks to achieve its objectives. It is anything within the system/organization that can influence the way in which the system or an organization will manage risk. It should be established because:

- risk management takes place in the context of the objectives of the system/organization;
- objectives and criteria of a particular process or activity should be considered in the light of objectives of the system/organization as a whole; and
- segments of the system and/or organizations failing to recognize opportunities to achieve their strategic and/or mandatory objectives will affect ongoing commitments, credibility, trust and value.

15 The understanding and establishment of the internal context is necessary and shall include, but is not limited to:

- governance, structure, roles and accountabilities of the system/organization;
- policies, objectives, and the strategies that are in place to achieve them;
- capabilities of the system/organization in terms of resources and knowledge, (e.g. capital, time, people, processes, systems and technologies);
- information systems, information flows and decision making processes (both formal and informal);
- internal stakeholders;
- standards, guidelines and reference models adopted; and

- form and extent of managerial relationships and coordination.

16 Contextualization of the risk management process assumes establishment of objectives, strategies, scope and parameters of the activities of the system, parts of the system and/or organizations. The context of the risk management process, in particular the risk and vulnerability assessment aspects and methodologies, will vary according to the needs of a system, parts of the system or organization. The contextualization can involve, but is not limited to:

- defining the goals and objectives of the risk management activities;
- defining responsibilities for and within the risk management process;
- defining the scope, as well as the depth and breadth of the risk management activities planned to be carried out, including specific inclusions and exclusions;
- defining the activity, process, function, service or asset in terms of time, location and value;
- defining the relationships between a particular process or activity and processes or activities of the system/part of the system/organization;
- defining the risk assessment methodologies;
- defining the way performance and effectiveness is evaluated in the management of risk;
- identifying and specifying the decisions that have to be made; and,
- identifying, scoping or framing studies needed, their extent and objectives, and the resources required for such studies.

17 Attention to these and other relevant factors should help ensure that the risk management approach, current or to be adopted, is appropriate to the circumstances, to the system and to the risks affecting the achievement of its objectives.

18 Defining risk criteria involves deciding:

- the nature and types of consequences to be included and how they will be measured;
- the way in which probabilities are to be expressed;
- how a level of risk will be determined;
- the criteria for deciding when a risk is acceptable and/or tolerable; and
- the criteria by which it will be decided when a risk is unacceptable and needs treatment;
- whether and how combinations of risks will be taken into account.

19 The contextualization shall, to maximum possible extent, involve factors, parameters and data that might be expected to vary over time and which could change or even invalidate the risk assessments. These factors, parameters and data should be specifically identified by each hazard-specific risk-assessment methodology and monitored.

20 Monitoring methodologies shall adequately account and assure for on-going monitoring and review of these factors, parameters and data, so that

systems'/organizations' risk management frameworks, policies and plans can be refined or, if necessary, improved in order to assure effective and updated national risk management framework.

21 Irrespective of the hazard or exposure involved, the generic risk assessment process comprise the following five basic steps:

1. Hazard identification
2. Hazard characterization
3. Exposure assessment
4. Exposure vulnerability characterization
5. Risk characterization

22 The objectives and the scope of single hazard risk assessment, i.e. single hazard risk contextualization, dominantly depends and is governed by exposure formulation and assessment. The multi hazard risk assessment, i.e. multi hazard risk contextualization is governed by hazard typology involved and the assessment of the exposure susceptible to significant transformation when interacts with decided hazard typology.

23 Methods used in assessing risks are:

- Qualitative
- semi-quantitative, or
- quantitative.

The degree of detail required shall depend upon the particular application, the availability of reliable data and the decision-making needs. Some methods and the degree of detail of the analysis may be prescribed by legislation.

Qualitative risk assessment methods defines consequence, probability and level of risk by significance levels such as “high”, “medium” and “low”, may combine consequence and probability, and evaluate the resultant level of risk against qualitative criteria.

Semi-quantitative risk assessment methods use numerical rating scales for consequence and probability and combine them to produce a level of risk using a formula. Scales may be linear or logarithmic, or have some other relationship; formulae used can also vary.

Quantitative risk assessment methods estimate practical values for consequences and their probabilities, and produce values of the level of risk in specific units defined when developing the context.

24 Levels of risk should be expressed in the most suitable terms for that type of risk and in a form that aids risk evaluation. In some instances, the magnitude of a risk can be expressed as a probability distribution over a range of consequences.

25 Whenever possible, quantitative risk assessment methods shall be used in order to come up with estimates/ parameters reliable for policy/decision making process, prevention, mitigation, preparedness and other emergency/disaster management needs.

26 Full quantitative analysis may not always be possible or desirable due to insufficient information about the context (exposure system, element of the system, or activity) being analyzed, lack of data, influence of human factors, etc. or because the effort of quantitative analysis is not warranted. In such circumstances, a comparative semi-quantitative or qualitative ranking of risks may be effective.

27 In the case the full quantification has been carried out, it must be recognized that the levels of risk calculated are estimates. Care should be taken to ensure that they are not attributed a level of accuracy and precision inconsistent with the accuracy of the data and methods employed.

8.2 SPECIFIC GUIDING PRINCIPLES

Expected Accomplishment	Guiding Principles
<p><u>Hazard/Risk identification</u></p> <p>Identification of comprehensive national hazard/risk profile is imperative and precondition for deciding prioritization which hazards shall be considered for NRA/LRA risk assessments.</p> <p><u>Development of:</u></p> <ul style="list-style-type: none"> • National Disaster Register • National Risk Register 	<p>Identification and prioritization of National hazard and risk profile shall efficiently be assessed based on historic evidence and in some cases (unavailability of data, low data quality), on sound expert judgments.</p> <p>Disaster record of Macedonia, with all its natural/technogenic hazard characteristics and generic parameters, is with amenable institutions.</p> <p>Disaster impact, i.e., the consequences, expressed in terms of natural (physical damage: level, extent, etc.) and financial (loss) parameters for a period over last three decades are accumulated and achieved in the Ministry of finances.</p> <p>Cross linking of phenomenon and impact data, for a period of over three decades is an excellent base for establishment of National Disaster Register as a reliable basis for all subsequent risk assessments.</p> <p>The National Risk Register shall be developed by cross linking probabilities (maximum likelihood) and potential impact of a range of different risks that may directly affect Macedonia. A basis for development of National Risk Register shall be the National Disaster Register.</p> <p>The National Disaster/Risk Registers shall provide information on the most significant emergencies/disasters Macedonia and its citizens had witnessed or could face over the period of next (TBD¹) years. The following events shall be represented in both registers:</p> <ul style="list-style-type: none"> • natural events (collectively known as hazards) • technogenic events (accidents, technogenic hazards), and • other events (frequently termed as malicious actions or threats).

¹ (TBD) = To Be Defined (Decision to be made by the Extended Steering Committee)

<p><u>Hazard characterization</u></p> <p>The most desirable output is complete set of probability density functions for each hazard, i.e. the probabilities of occurrence of:</p> <ul style="list-style-type: none"> ● a specific hazard ● for a range of severities or intensities ● in a specific future time period. 	<p>The optimal solution for Macedonia is that for prioritized range of hazards (risks) that had, or might have a major physical (damage) and/or financial (loss) impact on all, or significant part of the territory of Macedonia, the competent institutions develop needed hazard specific probabilistic data.</p> <p>Hazard characterizations of different hazards shall be based on probability models that fit the generic characteristics of the hazard occurrence and the record of the past occurrences.</p> <p>For each hazard relevant data shall be collected. Based on parameters included in event record, the adequate parameters shall be selected and criteria developed for deriving hazard dependent probability/ies.</p> <p>Uniform data do not yet exist to produce a justifiable measure of hazard severity that can be applied consistently across multiple hazards. Consequently, severity metrics appropriate for each of the hazards to be studied shall be adopted.</p>
<p><u>Exposure assessment</u></p> <p>Contextualization of a risk assessment.</p> <p>Spatial and temporal discretization of a general set of assets, or of a system/sub-system comprising</p> <ul style="list-style-type: none"> ● people, ● infrastructure, and ● economic activities <p>into specific elements, so called elements-at-risk.</p>	<p>Exposure and the vulnerability of the exposure are elements that primarily controls all risk assessments.</p> <p>Formulation of the exposure and its spatial and temporal discretization into elements-at-risk contextualizes and governs the entire risk assessment process.</p> <p>Technical risk assessments, so called RH (Risk-Hazard) assessments, are primarily focused on potential losses of physical assets (buildings, other structures, infrastructure, etc.) and first-order consequences (human casualty, direct and/or indirect losses), requiring adequate risk assessment contextualization and definition and discretization of the exposure.</p> <p>Community vulnerability, national/local coping capacity or resilience risk assessments (assessments of coupled human-environment systems) needs more complex assessment and discretization of the exposure including elements (indicative but not exhaustive): vulnerable population (gender structure, income, etc.) groups, mandates, structure, organization and coordination of emergency/risk management and aid providing institutions, etc. For such assessments the PAR (Pressure and Release) modelling and assessment are recommendable.</p> <p>Contextualization of the risk assessment and assessment of the exposure shall consider the following aspects (indicative, not exhaustive):</p> <ul style="list-style-type: none"> ● protection of population health and safety, as well as of the environment ● improvement of loss prevention and incident management; ● minimization of losses; ● protection of national / local / community / individual economy(ies) against losses

	<ul style="list-style-type: none"> ● improvement of risk control ● establishment of a reliable basis for decision making and planning ● effectiveness in allocation and use of resources for risk treatment and emergency/disaster response; ● improvement of systemic / organizational performance ● improvement of national / local / community / organizations resilience ● improvement of operational effectiveness and efficiency ● any other aspect vital for protection of population, built and policy environment <p>The risk assessment contextualization and exposure assessment shall be formulated to meet needs of a wide range of stakeholders, including:</p> <ul style="list-style-type: none"> ● those responsible for developing risk management policies ● those accountable for ensuring that risk is effectively managed within the country as a whole, within a specific administrative area or governmental sector, or activity ● developers of standards, guides, procedures and codes of practice that, in whole or in part, set out how risk is to be managed within the specific context of these documents. <p>The Uniform Methodology for Assessment of Losses from Elementary and Other Disasters (Official Gazette of RM No. 75/01), as presented in Appendix C of this report, to a large extent recognizes relevant physical exposure characteristic to Macedonia (Table C.1). Socio-economic aspects are not incorporated.</p> <p>The methodologies to be developed shall properly address, formulate and incorporate adequate exposure (elements-at-risk) to model and assess socio-economic and institutional risk aspects.</p> <p>Built environment of Macedonia is neither systemized nor mapped. To assure realistic conditions for planned risk assessments, in particular of quantitative ones, relevant databases shall be created, as discussed and recommended in 5.2.2.4.</p> <p>Data bases (elements and their attributization) shall be developed under the postulate that accuracy and precision of quantitative risk estimates are exclusively dependent on the consistency and the accuracy of the data used, as well as risk assessment methods employed.</p>
<p><u>Exposure vulnerability characterization</u></p> <p>Characterization of the extent of the transformation of a system or of any of its components (elements-at-risk) when interact with harmful event.</p>	<p>Vulnerability is an intrinsic characteristic of the exposure (system) that is always there even in quiescent times between events. The extent to which it is revealed is determined by the severity of the harmful event.</p> <p>The concept of vulnerability is applied to any system that interacts with its environment, in particular human systems (e.g., an urban area, a village, a social group, an organization, etc.), natural systems (e.g., a forest ecosystem) and socio-ecological systems</p>

	<p>including human and biophysical components.</p> <p>The vulnerability of a system (community, organization, etc.) is permanent and dynamic feature that comprises a multitude of components (elements-at-risk).</p> <p>Vulnerability is a function of the sensitivity or susceptibility of a system, in fact of its components. It is independent from any particular magnitude from a specific natural event but dependent on the type of the harmful event (stressor) and context in which it occurs.</p> <p>Vulnerability of the exposure shall be characterized:</p> <ul style="list-style-type: none"> • for each element-at risk into which the exposure (system) is discretized, and • for each type of the event that harmful interacts with the system.
<p><u>Risk characterization</u></p> <p>Local- (LRA) and national (NRA) single or multi hazard risk assessments in terms of natural (physical damage) and financial (loss) metrics quantifications.</p>	<p>Risk cannot be assessed in absolute terms. The performance of the system, or of its components, shall be assessed with reference to specific spatial and temporal scales.</p> <p>Hazard and risk characterizations and exposure assessment generate spatially distributed quantities. Methodologies to be developed shall properly account for this aspect by considering spatial discretization (gridding) of the territory of Macedonia.</p> <p>Risk assessments shall be based on the actual geographic distributions of hazardous phenomena and of the exposure, rather than on national or municipal level statistics, that is performed within decided grid.</p> <p>Risks of damages/losses among the elements-at-risk posed by each hazard individually shall be aggregated across varying time scales to arrive at the aggregate LRA and NRA single and/or multi-hazard risk assessment estimates.</p>
<p><u>Community resilience & vulnerability assessment (CRV Assessment)</u></p> <p>Holistic assessment of the vulnerability and resilience of coupled human-environment systems measuring not only the risk but also the risk management conditions. It provides national decision makers understanding and awareness how vulnerability is generated, how it increases and how it accumulates, or vice versa, through a system of established and measurable indicators.</p>	<p>CRV assessment requires proper and refined conceptualization and definition of parameters and factors that accumulate risk (pressure) as well as of parameters and factors that helps society to cope with the consequences and defend itself (release).</p> <p>Assessment of coupled human-environment systems needs complex assessment and discretization of not only the exposure (physical factors), but identification and definition of environmental, economic and social factors that contribute to risk accumulation and release. An indicative, but not exhaustive list of vulnerability and risk accumulation/release factors include:</p> <p><i>Physical Factors</i></p> <ul style="list-style-type: none"> ○ Technical construction, quality <ul style="list-style-type: none"> – Settlements – Quality of buildings – design and material ○ Critical infrastructure

	<ul style="list-style-type: none"> ○ Population growth and density <p><i>Environmental Factors</i></p> <ul style="list-style-type: none"> ○ Usable soil and usable water ○ Vegetation, biodiversity, forest ○ Stability of the eco-system ○ Natural resource depletion ○ Toxic and hazardous pollutants <p><i>Economic Factors</i></p> <ul style="list-style-type: none"> ○ Socio-economic status ○ Poverty and nutrition ○ Access to credit and loans ○ Access to critical and basic socio-economic infrastructure ○ Structure of income and economy ○ Access to resources and services ○ Reserves and financing opportunities ○ Incentives or sanctions for prevention ○ Research and development <p><i>Social Factors</i></p> <ul style="list-style-type: none"> ○ Traditional knowledge systems ○ Risk perception ○ Levels of literacy and education ○ Legal situation and human rights ○ Domination and power relations ○ Civil participation, social organization ○ Legal framework, norms, legislation ○ Basic human rights ○ Gender aspects, minorities ○ Access to information <p>The IADB/IDEA holistic system of indicators for disaster risk management as detailed in Chapter 3 (Table 3.2) fulfils all requirements for Community resilience & vulnerability assessment. As such, it is recommended that risk assessment conceptualization framework and assessment methodology follow IADB/IDEA concept and principles.</p> <p>The conceptual framework to be adopted shall integrate physical, social, economic and environmental aspects into the vulnerability assessment as well as address the potential intervention tools that could help to reduce vulnerability in the physical, social, economic and environmental spheres.</p>
<p><u>Assessment of existing & demanded competent institutions' capacity</u></p> <p>Identification of the existing & demanded capacity of competent institutions'</p>	<p>Characteristic situations for which assessment of existing & demanded agency's capacity is needed are such states that entail serious disruptions to critical societal functions and which require a co-ordination of responses from several different agencies and organs to be able to deal with these situations and therewith limit the consequences.</p> <p>The study of an agency's area of responsibility and existence of any critical societal function within it is a process that step by step contextualizes its risk and vulnerability assessment.</p> <p>Assessment of existing & demanded agency's (Competent Institutions') capacity is a process that shall:</p> <ul style="list-style-type: none"> ● Identify agencies, their roles and areas of

	<p>responsibility</p> <ul style="list-style-type: none"> ● Identify potential risks (and threats) within their area of responsibility ● Evaluate risks and threats ● Analyze vulnerability and assess capability ● In the case of insufficient capability, define measures to be taken. <p>Identification of agencies, their roles and areas of responsibility shall provide data on:</p> <ul style="list-style-type: none"> ● What is covered by an agency's area of responsibility ● Whether an agency hold one or more roles related to risk and vulnerability work within its area of responsibility ● In case of multi-role responsibility, whether these roles coincide or are distinctly and organizationally separated from one another ● Whether within agency's area of responsibility there are functions that are critical societal functions from an emergency preparedness perspective <p>The capability that is needed to avoid and deal with serious societal emergencies – the emergency preparedness capability – shall consist of three components:</p> <ul style="list-style-type: none"> ● crisis management capability ● operative capability, and ● capability to resist serious disruptions in critical societal functions. <p>Emergency preparedness capability assessment is based on the systematic use of indicators that provides better knowledge of which factors are to be considered. This also makes it easier to compare agencies' capability assessments with one another and over time. Which indicators are relevant vary both between agencies and from scenario to scenario.</p> <p>When relevant indicators have been selected for a particular situation the capability shall be rated according to adopted Capability Assessment Scale.</p> <p>Methodology, developed by SEMA (SEMA Recommends 2008:3 "Risk and Vulnerability Analyses Guide for Governmental Agencies") fulfils all the requirements for assessment of existing and/or demanded capacity of Competent institutions.</p> <p>Alternatives to SEMA methodology are:</p> <ul style="list-style-type: none"> ● The IADB/IDEA system of indicators for disaster risk management as detailed in Chapter 3(Table 3.2); ● A comprehensive Urban Seismic Risk Index (USRI, Carreño at al., 2006, Cardona at al., 2006); and, ● Disaster Risk Management Index (DRMi, Cardona at al., 2006). <p>All listed methods fulfil all the requirements for assessment of existing and/or demanded capacity of Competent institutions. Depending on the policy and</p>
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	<p>the context of the assessment any of methods listed could be used.</p> <p>The consistency of the assessment shall be maintained, i.e., the same assessment method shall be used for assessment of existing and/or demanded capacity of all Competent institutions identified.</p>
<p><u>Post-disaster/accident damage/loss assessment</u></p> <p>Principles and procedures for on-site assessment of:</p> <ul style="list-style-type: none"> ● the nature of the disaster ● damage, including secondary threats, ● effects on the population ● ongoing relief activities and local/regional/national response capacity ● needs for higher level assistance (national, international) ● means of delivering national/international assistance ● expected developments. 	<p>Considering comprehensiveness and completeness, international standards according to which it is developed as well as worldwide referencing and application, the adoption of UNDAC handbook (Field Handbook - The United Nations Disaster Assessment and Coordination (UNDAC), 3rd Edition, 2003), Chapter E, would be feasible. Careful analysis to account for specificities and needs of Macedonian crisis management system and legislation framework is required.</p> <p>The UNDAC handbook is intended as a quick reference guide for members of an UNDAC Team before and during a mission to an area affected by an emergency. The handbook represents an accumulation of institutional memory related to procedures for international emergency assessment and coordination as seen in the scope of the UNDAC terms of reference. Chapter E: Disaster Assessment, in all details fulfils curricula and objectives required for Initial post-disaster assessment.</p>
<p><u>Post-disaster assessment of financial implications</u></p> <p>Assessment of losses of individual assets from small scale disasters occurring at limited territory and/or massive disasters involving the large portion or even the entire territory of the country.</p>	<p>It is recommendable to continue with implementation of the Uniform Methodology for Assessment of Losses from Elementary and Other Disasters (Official Gazette of RM. No. 75/01).</p> <p>The Uniform Methodology was first developed in the early 1970's and has been modified and strengthened (in 1987 [Official Gazette of SFRY. No. 27/87] and 2001 [Official Gazette of RM. No. 75/01]) over more than three decades of application in post-disaster contexts in Macedonia² (Gevgelia 1990, Bitola, 1994), former SFRY (Montenegro, 1979; Kopaonik, 1980; Knin, 1986) and around the world (Algiers, 1980; Mexico, 1985; Iran, 1990).</p> <p>With certain tuning (Official Gazette of SFRY. No. 27/87 and Official Gazette of RM No. 75/01) it is in continuous use since 1976. Its' effectiveness and efficiency has been demonstrated in number of post-disaster loss assessments of various disaster agents (earthquakes, floods, drought, windstorms, etc.) affecting the territory of former Yugoslavia and Republic of Macedonia.</p> <p>The methodology efficiently interlinks physical damage with economic losses as well as direct and indirect losses. It also foresees validation mechanism as well as loss re-evaluation if the event of the same type affects the same territory during the loss</p>

² Listed are only damaging earthquake events followed up with massive damage&loss assessments.

	<p>assessment period.</p> <p>The assessment of losses is based on field inspection and detail assessment of physical damage on:</p> <ul style="list-style-type: none"> • Buildings and civil engineering structures, public utilities and infrastructure included • Equipment • Other assets and goods (land, plants, forests and wildlife, livestock,, as detailed in article 65, line 3) • Immovable cultural heritage • Movable cultural heritage • Other assets, indirect losses including the cost of assessment. <p>The assessment process analyzes three main aspects:</p> <ul style="list-style-type: none"> • Damage (direct impact) refers to the impact on assets, stock, and property, valued at agreed replacement (not reconstruction) unit prices. The assessment considers the level of damage (whether an asset can be rehabilitated/repaired, or has been completely destroyed). • Losses (indirect impact) refer to flows that will be affected, such as reduced incomes, increased expenditures, etc. over the time period until the assets are recovered. These are quantified at disaster-impact time value. • Economic effects (sometimes called secondary impacts) include fiscal impacts, implications for GDP growth, etc. <p>To the knowledge of the authors, the Uniform Methodology for Assessment of Losses from Elementary and Other Disasters (Official Gazette of RM. No. 75/01) is worldwide the most comprehensive and advanced one in the field and the only one legally enforced by the power of Law.</p>
<p><u>Risk&hazard mapping</u></p> <p>Identification and mapping of:</p> <ul style="list-style-type: none"> • location (where) • genesis and evolution (how), and • magnitude (grade) <p>of expected hazardous events, their consequences and the results of scenario assessments.</p>	<p>Hazard&Risk mapping shall systemize and visualise:</p> <ul style="list-style-type: none"> • The territory of R. Macedonia with all topographies, hydrographical, demographic and other elements indispensable for disaster management needs • All data bases related to National Hazard Register • All data bases comprising various elements of the exposure • Results of various hazards scenario analyses <p>The principle requirement of Hazard&Risk mapping consistent and uniform discretization of the territory of Macedonia into smaller territorial units of a size appropriate for reasonable tracking of variations of all variables pertinent to distribution and concentration of hazards and the exposure. It is implicitly assumed that the results of all assessments shall be presented accordingly.</p>
<p><u>Risk&hazard monitoring</u></p> <p>Monitoring relevant factors, parameters and data for identifying effectiveness of existing risk management</p>	<p>Risk is not a constant factor, but changing over time. Risk assessment and risk management framework, providing a static, momentary picture of risk at a</p>

<p>frameworks, policies and plans as well as needs for refinement and improved.</p>	<p>certain time and place must be improved by monitoring hazards and dynamics of risk changes.</p> <p>Risk management framework contextualization and the risk and vulnerability assessment process shall identify organizations and services playing the significant role in risk management process, highlight context, area and objectives of their involvement and identify factors that may affect their risk management performance and effectiveness. These organization-dependent factors to be monitored should be specifically identified by each risk-assessment methodology.</p> <p>Monitoring methodologies shall be developed for:</p> <ol style="list-style-type: none"> 1. Hazard monitoring and early warning 2. Monitoring and reviewing of vulnerability and risk assessments 3. Monitoring and review of the risk management framework <p>Hazard and/or risk monitoring is strictly hazard dependent. The methodologies and procedures are hazard dependent, as well. They are highly specialized and aimed in monitoring of characteristic indicator or group of characteristic indicators which, as precursors, shall recognize and indicate conditions that with high probability may cause realization of particular hazard and materialization of related risk.</p> <p>As a part of the risk management process, vulnerability and risks should be monitored and reviewed on a regular basis to verify that:</p> <ul style="list-style-type: none"> ● assumptions about risks remain valid; ● assumptions on which the risk assessment is based, including the external and internal context, remain valid; ● expected results are being achieved; ● results of risk assessment are in line with actual experience; ● risk assessment techniques are being properly applied; ● risk treatments are effective. <p>To ensure that risk management framework is effective and continues to support performance of the system and/or organizations involved in risk management, the system/organizations in charge shall:</p> <ul style="list-style-type: none"> ● measure risk management performance against indicators, which are periodically reviewed for appropriateness; ● periodically measure progress against, and deviation from, the risk management policies and plan; ● periodically review whether the risk management framework, policy and plan are still appropriate, given the organizations' external and internal context and objectives; ● report on risk, progress with the risk management plan and how well the risk
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	<p>management policy is being followed; and</p> <ul style="list-style-type: none">• review the effectiveness of the risk management framework. <p>Monitoring methodologies shall be developed to adequately account and assure for on-going monitoring and review of relevant factors, parameters and data so that risk management frameworks, policies and plans can be refined and, if necessary, improved in order to assure effective and updated national risk management framework.</p>