RISK ANALYSIS - BRIEF GUIDELINES

Risk analysis consists of hazard analysis and vulnerability analysis, together with analysis of self-protection capabilities. Risk analysis is not a static one-time process, but rather a dynamic process which is constantly adjusting to changing vulnerabilities, hazards and risks.

The risk consists of a combination of hazards and vulnerabilities (risk = hazard * vulnerability). Consequently, the risk analysis should pass through the following steps:

1. Identification and analysis of hazards
2. Identification and analysis of vulnerabilities
3. Finalize the overall risk analysis/assessment based on findings of the hazard and vulnerability analysis

STEP 1: HAZARD ANALYSIS

The most important elements to be considered at this step for the hazard analysis include:

1) Identification of the types of hazards: There are many ways to classify hazard types, e.g. natural events occurring suddenly or gradually, of an atmospheric, seismic, geological, biological and hydrological nature, man-made hazards (mostly linked to human actions, i,e deforestation, construction of dams, technologies, etc.) while others summarise mass movements under the heading of "geomorphological hazards". However, in our case we propose to use as an initial reference the classification shown in the box 1 below:

Box 1. Main hazard types

A. Meteorological causes and origins

- Floods caused by torrential rain and tropical storms
- Storms and torrential rain > damage caused by storms, e.g. damage caused by heavy storms (rain or snow), cyclones, etc.
- Droughts that may have a particularly high potential damage if they cause extensive crop destruction and famine or forest/bush fires
- Hail and frost (if they lead to extensive crop destruction); lightning; sleets, avalanches, etc.
- Mass land/water movements (e.g. landslides as a result of heavy and intensive rainfall) caused among other things by: (a) flooding in mountainous regions; (b) heavy and intensive rain; (c) rivers changing courses
- Erosion, soil degradation caused by water and wind
- Forest/bush fires

B. Geological causes

- Earthquakes and the secondary consequences such as tsunamis, sea/river waves and mass movements
- Mass movements caused by large-scale tectonic movements, slow mountain building and shifting. The resultant changes to the angles of slopes can cause mass movements

C. Other:

- Epidemics, animal and plant diseases and pests

2) Carry out hazard analysis: Depending on the types of hazard identified, the process will be continued on a separate basis for each type of hazard or group of hazard types. Earthquakes, for example, require different instruments and specialisations for analysis than

e.g. landslides or floods. While the analytical methodology and tools must be adapted for the hazard types and data available, it should include the following main elements:

- ***Carry out geographical analysis****:* Identification and characterisation of hazard prone locations for each of the main types of hazards.
- ***Determination of probabilities of occurrence****:* Identification and determination of the probabilities of occurrence on an ordinal scale (high – medium – low).
- ***Carry out temporal and dimensional analysis:*** Estimate or calculate the frequency, duration, scale and intensity (strength, magnitude) of the hazardous event, also on an ordinal scale.
- ***Identification of the main cause(s) of the hazard:*** Identify the main factors influencing the hazards, e.g. long term factors (i.e. climatic change, environmental destruction and resource degradation, etc.) or short term factors (i.e. earthquake, heavy rain/storm, major infrastructural facilities such as dams or river banks, etc.).

STEP 2: VULNERABILITY ANALYSIS

Vulnerability analysis studies the ability of a system (or element) to withstand, avoid, neutralise or absorb the impacts of hazardous natural events. Vulnerabilities are usually created, they are the product of social development or faulty development; they reflect deficits, shortages or disruptions within local development situation (physical, economic, social (including institutional/political actions), environmental). Vulnerability is assessed by the potential loss resulting from a natural event. It expresses the degree of possible loss or damage to an element threatened by a natural event of specific force. Damage can be to the population (life, health, wellbeing), material assets (buildings, infrastructure) or natural assets (woods, forest, agricultural land). Accordingly, the vulnerability analysis should include the following elements:

1) Identification of potentially vulnerable individuals or elements (e.g. people's lives, health, buildings, agricultural production, agricultural land and waters): In this step, basic data is collected on population (age, density, gender, ethnic structure, socioeconomic status), location (buildings, important facilities such as schools, hospitals, emergency centres, environment, economy, structures, history), self-protection capability in terms of capacities for disaster preparedness – emergency response capability, training, prevention programme, early warning systems

2) Identification and analysis of factors influencing or resulting in vulnerability (i.e. vulnerability factors for each hazard type: Analysis of risk perception and the factors determining this (e.g. education, access to information, poverty) and investigation of the vulnerability factors and their linkage and interdependencies.

- ***Physical vulnerability factors***: location, technical construction type and quality of the settlements and buildings, population growth and density.
- ***Social factors***: education, legal reliability, human rights, participation of civil society, social organisations and institutions, legal framework, statutes, politics, corruption, gender aspects, minorities, dependent population (old, young, sick), traditional knowledge systems, power structures, access to information and social networks.

- ***Economic factors***: socioeconomic status, poverty, food insecurity, lack of diversity of seed and economic activities (e.g. monoculture in agriculture), lack of access to basic infrastructure (water, energy, health, transport), lack of reserves and financing.
- ***Environmental factors***: arable soil, usable water, vegetation, biodiversity, land under forest (logging, land degradation), stability of the ecosystems.

3) Development and identification of indicators for identifying vulnerabilities and estimating the degree of vulnerability (quality and location of buildings and basic infrastructure, education, access to information, diversity of agriculture, preventive infrastructure, etc.).
4) Analysis of self-protection capabilities: identification of indicators to show or measure capacity for preparedness (protective and preventive infrastructure, early warning and forecasting systems, etc.). Here, strategies and measures are identified and investigated at the various levels (family, village, community, district, province, country). The following indicators provide a general information on the existence or degree of strength of coping strategies:

- monitoring and early warning systems
- traditional forecasting and early warning systems
- plans for disaster reduction
- plans and fund for disaster protection
- insurance policies
- construction standards
- maintenance of basic infrastructure
- preventive structures, protective infrastructure
- land use planning, spatial planning, zoning
- organisation and communication (emergency committees)
- stability of settlement, social structures
- local local knowledge (of hazards)

5) Estimate of accepted risk (risk level) and hence residual risk. Preventive measures are taken to reduce the risk to a socially and culturally accepted risk

STEP 3: FINALISE RISK ANALYSIS

Risk analysis as a combination of the two analytical stages above. Risk is understood here as the expected value of the loss of human life or damage to objects, infrastructure and the environment. Determining the disaster risk as a result of the risk analysis is analytically based on documenting and assessing the hazard, followed by valuation of the vulnerability of a population or region to this hazard. In determining the overall risk, all the elements at risk (e.g. population, property, infrastructure, economic activities, etc.) are taken into account with their specific vulnerability.

Risk analysis involves estimating damage, loss and consequences arising out of one or more disaster scenarios. It attempts to estimate the probability and magnitude of damage and loss caused by extreme natural events. As already indicated at the beginning of this section, the two analytical stages are not separate procedures, but rather interactive steps.