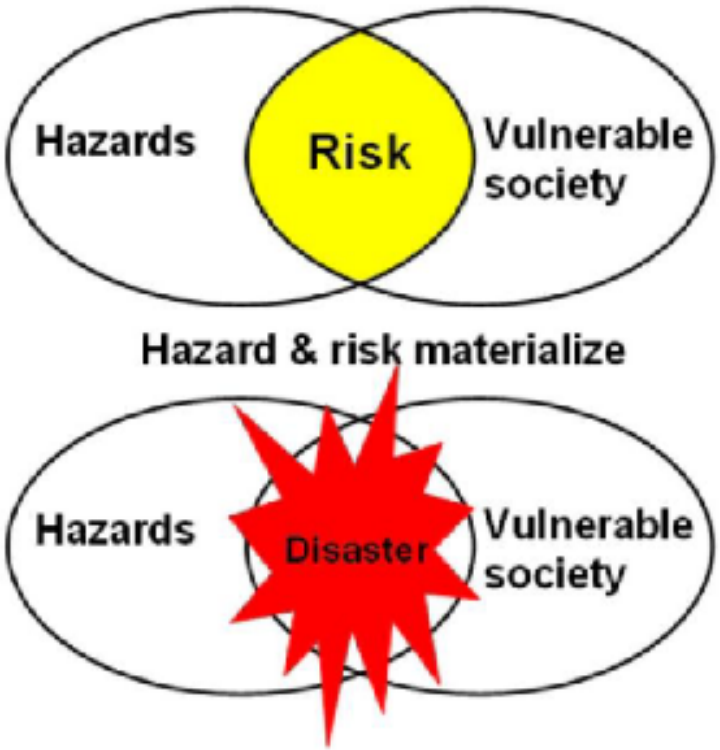
Disaster Risk Assessment

Disaster risk

- It is the probability of serious damage, deaths and injuries occurring as a result of a potentially damaging hazard interacting with vulnerable elements such as people and properties.



Disaster Risk Assessment

- It is a methodology to determine the likelihood and magnitude of damage or other consequences by analysing potential hazards and evaluating existing conditions of vulnerability that jointly could likely harm exposed people, properties, services, livelihoods and the environment they depend on.

Components of Risk Assessment

There are two main components:

- Risk analysis: The use of available information to estimate the risk caused by hazards to individuals or populations, property or the environment. It contains the following steps: Hazard identification, hazard assessment, elements at risk/exposure, vulnerability assessment and risk estimation.
- Risk evaluation: This is the stage at which values and judgement enter the decision process by including the importance of the risk and associated social, environmental,

Contemporary approaches to risk assessments

Multi-hazard:

- The same area may be threatened by different types of hazards.
- Each of these hazard types has different areas that might be impacted by hazard scenarios.
- Each of the hazard scenarios also might have different magnitudes.

Multi-sectoral:

- Hazards will impact different types of elements at risk.

Multi-level:

- Risk assessment can be carried out at different levels.
- Depending on the objectives of the risk study, it is possible to differentiate between national, regional, district and local policies, plans and activities to see how they have contributed to increased or reduced risk, their strengths and weaknesses in dealing with risks, and what resources are available at the different levels to reduce risks.

Multi-stakeholder:

- Risk assessment should involve the relevant stakeholders, which can be individuals, businesses, organisations and authorities.

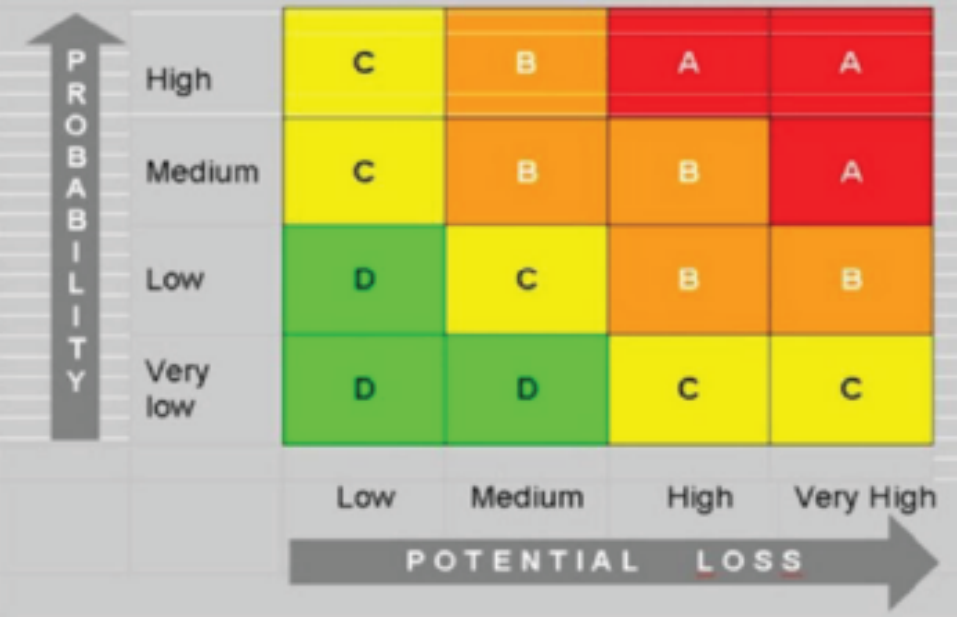
Multi-phase:

- Risk assessment should consider actions for response, recovery, mitigation and preparedness.

Qualitative methods:

- This involves qualitative descriptions or characterization of risk in terms of high, moderate and low.
- These are used when the hazard information does not allow us to express the probability of occurrence, or it is not possible to estimate the magnitude.
- Risk matrices can be constructed to show qualitative risk.
- A risk matrix shows on its y-axis probability of an event occurring, while on the x-axis potential loss.

A risk matrix



Risk levels

A: Very high. Frequent events causing very high losses, or moderate frequent events causing very high losses

B: High. Frequent events with moderate losses/ moderate & low frequent events causing (very) high losses

C: Moderate. Frequent events with low losses or very low frequent events causing (very) high losses

D: Low. Low frequency events with low losses

Loss

Based on the potential by taking into account elements at risk

- Fatalities
- Injuries
- Impact on facilities, critical services and infrastructure
- Property damage
- Business interruption
- Environmental/ Economic impact

Probability

High	Events that occur more frequently than once in 10 years
Moderate	Events that occur from once in 10 years to once in 100 years
Low	Events that occur from once in 100 years to once in 1000 years
Very Low	Events that occur less frequently than once in 1000 years

Potential hazards

Earthquake	Lightening	Debris Flow	Civil unrest
Flood	Heat Wave	Hazardous materials release	Terrorism
Fire	Drought	Transportation accident	Market fires
Storms	Pandemic (e.g., HIV/AIDS, flu)		
Fire		Water shortage	
Food poisoning	Landslide	Power shortage	

Risk assessment matrix

A. Hazards	B. Hazard Likelihood **0 low – 5 is high**	C. Impact Severity **(Vulnerabilities/ Resources) 0 is low – 5 is high**	D. Risk Score **B x C** E. Priority	E. Priority

In Column A, enter all of those hazards that may affect your community.

In Column B, the likelihood of occurrence of this event (between 0 low to 5 high)

HAZARDS	1	2	3	4	5
B. Likelihood	Very low	Low	Medium	High	Very high

In Column C, enter the severity of the impact you expect. This would be based on your understanding of the various vulnerabilities and the measures your community has already taken to reduce them.

Vulnerability	1	2	3	4	5
C. Impact severity	Minor	Controllable	Critical	Devastating	Terminal

In Column D, Multiply your likelihood by impact rating. Column B x C. This would give you your risk score

Risk score	1-3	4-8	9-14	15-19	20-25
Description	Very low	Low	Medium	High	Very high

In Column E, convert your risk scores into simple priority scores. 3-Low, 2-medium, 1-high

Risk score	1-3	4-8	9-14	15-19	20-25
Priority level	3	3	2	1	1
Description	Low		Medium	High	

- **Semi-quantitative methods:**

- These techniques express risk in terms of risk indices.

- These are numerical values, often ranging between 0 and 1.

- The main difference between qualitative and semi-quantitative approaches is the assignment of weights under certain criteria which provide numbers as outcome instead of qualitative classes.

- **Semi-quantitative methods:**

- The semi quantitative estimation for risk assessment is found useful in the following situations:

➢ As an initial screening process to identify hazards and risks

➢ When the level of risk does not justify the time and effort

➢ Where the possibility of obtaining numerical data is limited

- **Semi-quantitative methods:**

- The semi-quantitative approach could be adapted to cover larger areas.

- Semi-quantitative risk can also be conceptualised as:

  Risk = Hazard * Vulnerability / Capacity

- It allows incorporating the multi-dimensional aspects of vulnerability, and capacity.

- **Quantitative methods:**
- This aims at estimating the spatial and temporal probability of

risk and its magnitude.

- Risk is perceived as follows:

Risk = Hazard * Vulnerability * Amount of elements-at- risk

- The amount of elements-at-risk are characterized the way in which the risk is presented.
- The hazard component in the equation actually refers to the probability of occurrence of a hazardous phenomenon with a given intensity within a specified period of time.
- Vulnerability is limited to physical vulnerability of the

Different ways of expressing risk

General	Type	Principle	
Qualitative	**Qualitative**	Based on relative risk classes categorised by expert judgment. Risk classes: High, Moderate and Low	
	Semi-Quantitative	Based on relative ranking and weights assignments by a given criteria. Risk index: Ranked values (0-1, 0-10 or 0-100). (dimensionless)	
Quantitative	**Probability**	Probabilistic values (0-1) for having a predefined loss over a particular time period	
	Economic risk	Quantification of the expected losses in monetary values over a specific period of time	
		Probable Maximum Loss (PML)	Probable Maximum Loss (PML) The largest loss believed to be possible in a defined return period, such as 1 in 100 years, or 1 in 250 years
		Average Annual Loss (AAL)	Expected loss per year when averaged over a very long period (e.g., 1,000 years). Computationally, AAL is the summation of products of event losses and event occurrence probabilities for all stochastic events in a loss model.
		Loss Exceedance Curve (LEC)	Risk curve plotting the consequences (losses) against the probability for many different events with different return periods.
	Population risk	Quantification of the risk to population	
		Individual risk	The risk of fatality or injury to any identifiable (named) individual who live within the zone impacted by a hazard; or follows a particular pattern of life that might subject him or her to the consequences of a hazard.
		Societal risk	The risk of multiple fatalities or injuries in society as a whole: one where society would have to carry the burden of a hazard causing a number of deaths, injury, financial, environmental, and other losses.