

**6th sem. Hons., CC-14,
Vulnerability Assessment
Study material prepared by SurajitLet**

Vulnerability

Vulnerability of a certain system is generally defined as the degree of susceptibility to damage from a hazardous phenomenon or activity. In most of the cases quantification of vulnerability is a very difficult task. However some kind of assessment of vulnerability is required in order to estimate the real threat from an existing source of hazard. Therefore in most of the cases quantitative approaches could be implemented for assessing vulnerability.

A common characterisation of vulnerability is with the scale “low, moderate, high”.

In a more detailed approach vulnerability may be characterised as related to the anticipated damages as follows:

1. Negligible or slight damage
2. Moderate damage
3. Substantial to heavy damage
4. Very heavy damage
5. Destruction

As it can be easily understood vulnerability of a system comprises of two components: the coping capacity of the system to withstand the hazardous event and the exposure of the system to this event. The assessment of vulnerability based mainly on the capacity of the system has a meaning only if the system is exposed to the hazardous event.

In general vulnerability of a system related to a hazardous phenomenon is dependent upon a large number of factors most of which are listed below:

1. Exposure

2. Capacity of the System

- Infrastructure
- Condition of the system
- Institutional set up
- Quality of governance
- Motivation to react
- Skills and education of people
- Resources available
- Preparedness status
- Monitoring capabilities
- Existence of an emergency plan
- Development status

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- Resilience / time of recovery
- Initial conditions of the system
- Interaction of interrelated components

3. Characteristics of the hazardous event

- Magnitude of the event
- Duration of the stress
- Timing of the event
- Conditions which may influence the destruction capacity

ASSESSING RISK AND VULNERABILITY

Quantification of the level of risk is an essential aspect of both preparedness planning and mitigation planning

By UN definition, the term risk refers to the expected losses from a particular hazard to a specified element at risk in a particular future time period. Loss may be estimated in terms of human lives, or buildings destroyed or in financial terms.

There are 3 essential components to the quantification of risk:

Hazard occurrence probability, defined as the probability of occurrence of a specified natural hazard at a specified severity level in a specified future time period

Elements at risk, an inventory of those people of artifacts which are exposed to the hazard and

Vulnerability, the degree of loss to each element should a hazard of a given severity occur.

- ❖ The probability of occurrence of the extreme levels of natural hazards which may cause a disaster may be estimated by statistical extrapolation from data on the normal levels of occurrence. The accuracy of such estimates depends on the amount and completeness of data and the period of time over which it has been collected. Historical records can be an invaluable source of information.
- ❖ Recurrence frequency and intensity of most natural hazards varies from place to place – hazard mapping may be used to show this variation. For some, notably geological hazards, detailed local mapping (micro- zoning) can be used to establish local variations and assist land-use planning decisions. For others only coarse mapping of geographical areas at risk is possible.
- ❖ Vulnerability assessment involves first identifying all the elements which may be at risk from a particular hazard. Local knowledge may be used to complete the inventory, and census data to enumerate the elements at risk

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- ❖ Loss functions in the form of vulnerability curves or damage probability matrices may be obtained for some elements at risk (buildings, people) based on past experience elsewhere.
- ❖ Many aspects of vulnerability are unquantifiable, and these should not be overlooked.
- ❖ Because hazards tend to be uncontrollable, much mitigation work is centered on reducing vulnerability. Improved economic conditions reduce many aspects of vulnerability and a sound economy may in many cases be the best defense against disaster.
- ❖ Risk is compiled from hazard and vulnerability data and from the inventory of elements at risk. A variety of ways of presenting risk are available such as f:N curves, scenario mapping, potential loss mapping and annualized risk.