
UNIT 10 VULNERABILITY: TYPES AND DIMENSIONS*

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10.0 OBJECTIVES

After reading this Unit, you should be able to:

- Understand the meaning and definition of vulnerability;
- Appreciate the different types of vulnerability;
- Recognise the approaches of vulnerability;
- Ascertain the dimensions of vulnerability in disasters; and
- Bring out the importance of assessing vulnerability to minimise disasters.

10.1 INTRODUCTION

Recent years have seen a huge rise in the literature and studies on disasters. The dangers and costs brought on by disasters are rising along with them. Disasters, rather than being analysed individually, are now being examined holistically. It is not new to talk about vulnerability as a measure of how much a system might be injured by a stimulus; rather, it has been used frequently in literature on risks and climate change. It is critical to lessen infrastructure and population vulnerability in order to lower disaster risks.

Being vulnerable is a relative state. The word “vulnerable,” which comes from the verb “to hurt,” has been used in a variety of contexts to describe how social and natural systems react to disturbances (Timmerman, 1981). The idea of vulnerability “expresses the multidimensionality of catastrophes by concentrating on the sum of relationships in

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a given social situation that generate a condition that, when combined with natural forces, produces a disaster” (Bankoff *et al.*, 2004).

According to Pelling (1997), vulnerability is not a static condition to be determined in response to a particular hazardous occurrence, but rather a continuing state. The British Red Cross has defined “vulnerability” as “those in need in disaster” (Graz, 1997). In understanding the people’s potential and capacities, vulnerability becomes crucial. The idea of vulnerability, which is defined as “the differential susceptibility to loss,” is crucial, but is yet poorly and inconsistently developed. In this Unit, we will try to discuss the concept of vulnerability, its types and its different dimensions.

10.2 MEANING OF VULNERABILITY

Vulnerability indicates the extent to which a community is affected by a disaster. It reflects the measure of ‘resilience’ and ‘coping capacity’ of a community. It is the result of a number of factors that include social, physical, economic, cultural, attitudinal and so on. Generally, social scientists treat vulnerability to be the result of various socio-economic factors. Climate scientists view it in terms of likelihood of occurrence and impact of weather and climate related events. As per Third Assessment Report (TAR) of the Intergovernmental Panel on Climate Change (IPCC, 2001), vulnerability is described as “the degree to which a system is susceptible, or unable to cope with the adverse effects of climate change, including climate variability and other extremes of nature”. A system’s sensitivity and adaptive capacity, as well as the type, scope, and pace of climate variation to which it is exposed, determine its level of vulnerability. It is generally understood to refer to the degree to which a community, structure, service, or geographic area is likely to be damaged or disrupted by the impact of a specific disaster hazard, as a result of their nature, construction, and proximity to hazardous terrain or a disaster-prone area.

Depending on how society is made up, some groups are more vulnerable to harm, loss, and various other dangers. Class, caste, ethnicity, gender, handicap, and age are some variables that affect the impact in a varied manner. Additionally, it should be recognised that comprehending vulnerability has a temporal component, because it involves long-term effects such as diminished capacities and/or increased vulnerabilities.

People who have a harder time rebuilding their lives after a disaster are left more vulnerable because of the harm caused to livelihoods and property. So, we can say that the degree to which a system is vulnerable or unable to handle the negative effects of a disaster is described as vulnerability in disaster management literature. Vulnerability is also understood as relative to a given hazard, which means that the degree of vulnerability will differ with regard to hazards of varying kinds and magnitude.

10.3 TYPES OF VULNERABILITY

Different people hold different perceptions about vulnerability. An engineer or scientist will view vulnerability in terms of risk, whereas a climate scientist will do so in terms of the likelihood and effects of weather- and climate-related occurrences. While the social science perspective defines risk primarily in terms of socio-economic factors. The usefulness of the idea of vulnerability depends on a clear definition of an incident and its surroundings in order to shed light on the unique natural and artificial forces and variables

that contribute to or cause vulnerability. So, it is important to understand different types of vulnerabilities.

Physical Vulnerability

The physical vulnerability of an area also depends on how close it is to the disaster's source and origin. For example, if it is close to the shore, a fault line, unstable hills, etc., it is more sensitive to catastrophes than an area that is distant from the disaster's source. In the event of a disaster, physical vulnerability includes the difficulty of getting to water sources, communication channels, hospitals, police stations, fire departments, roads, bridges, and exits from a building or/and an area.

Additionally, improper design and execution during the construction of residential and commercial structures makes the buildings weaker and more susceptible to earthquakes, floods, landslides, and other dangers. For instance, wooden houses are more susceptible to fire but less likely to collapse during an earthquake. Physical factors include unrestricted land use planning, poorly designed and constructed structures, etc. As per UNISDR, factors including population density levels, a settlement's remoteness, location, design and materials utilised for key infrastructure and the type of housing can all affect physical vulnerability.

Social Vulnerability

Social vulnerability is the inability of individuals, groups, and societies to tolerate negative effects from dangers as a result of traits present in social interactions, institutions, and cultural value systems. It is related to the degree of societal, communal, and individual well-being. It covers things like literacy and education levels, peace and security, access to fundamental human rights, strong governance systems, social equality, good traditional values, customs and ideologies, and general collective organising structures.

Social vulnerability may be divided into two separate categories: individual vulnerability and group vulnerability. The availability of resources and the variety of income sources affect each person's level of vulnerability. It is also determined by the social standing of people or households within a community. Institutional and market systems, such as the predominance of informal and formal social security, insurance, and stable sources of income, affect the collective vulnerability of a social group. Links between inequality and vulnerability are related to the connections between poverty, income diversification and inequality. In other words, inequality directly influences vulnerability by limiting the alternatives available to families and people in the event of an external shock, and indirectly by being linked to poverty and other issues.

Poor family structures, lack of leadership for decision-making and conflict resolution, unequal participation in decision-making, weak or non-existent community organisations, and racial, ethnic, linguistic, or religious discrimination are all characteristics of socially vulnerable communities. Other social elements that are crucial in establishing a community's social vulnerability include culture, tradition, religion, local norms and values, economic standards, and political accountability.

Social factors, such as poverty and inequality, marginalisation, social exclusion, and discrimination based on gender, social rank, age, and disability determine the social vulnerability. Because poorest people in developing countries lack the knowledge and finances to take the necessary precautions, they are most vulnerable to natural phenomena. Children, women, and the elderly are thought to be the most vulnerable

members of this group. All of the aforementioned aspects must be taken into consideration in order to lessen social vulnerability, but doing so requires local circumstances, knowledge and awareness, which is available typically from local actors.

Fiscal Vulnerability

The degree of vulnerability is strongly influenced by the economic standing of individuals, communities, and countries. The degree of economic vulnerability varies from nation to nation. Diversified economies are less susceptible than economies with a single market system. Additionally, vulnerability has developed as a result of urbanisation and greater resource rivalry. Inequality and vulnerability are related indirectly as uneven accumulation is linked to higher levels of poverty, and consequently, security.

Vulnerability and inequality are related. The poor are typically more vulnerable to them because they lack the resources to construct strong structures and implement other engineering precautions to safeguard themselves from being severely impacted by catastrophes. A community's economic vulnerability can be evaluated by looking at how diverse its sources of income are, how easy it is to access and control the means of production (such as farmland, livestock, irrigation, capital, etc.), the effectiveness of its economic backup plans, and the availability of local natural resources. For instance, the uninsured informal sector, precarious rural livelihoods, reliance on a small number of sectors, etc., pose more economic vulnerability.

Attitudinal Vulnerability

A community that resists change and shows little initiative in daily life will inevitably grow more and more reliant on outside assistance. They are unable to act on their own. Their means of subsistence are monotonous, lacking in entrepreneurship, and in the idea of collectivism. As a result, there is social discord and individualism, which leads to conflicts, hopelessness, and pessimism, lowering their ability to deal with a calamity.

Environmental Vulnerability

Depletion and deterioration of natural resources are significant contributors to environmental vulnerability. Land use/land cover change and climate change, which are both caused by human lifestyles and consumption habits, are significant environmental trends that enhance environmental vulnerability and the detrimental effects of catastrophes. For instance, wetlands are subject to contamination from storm water runoff carrying agricultural pesticides, degraded soils, and other factors such as rising salt from seawater. Ineffective environmental management, over-use of natural resources, reduction in ecosystem services that control risk, climate change, etc; are other environmental factors. To understand environmental vulnerability, we can think of an example of how air pollution affects the lungs of people in developing countries.

Check Your Progress 1

Note: i) Use the space given below for your answers.

ii) Check your answers with those given at the end of the Unit.

1. Explain the concept of vulnerability.

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2. What are the various types of vulnerability?

10.4 ELEMENTS OF VULNERABILITY

Different techniques and concepts have been developed as a result of the diversity of efforts made across disciplines to address vulnerability. Some assistance is offered by the related notions of “exposure” (the existence of a threat to a group or region), “resistance” (the capacity to withstand harm and continue functioning), and “resilience” (the capacity to sustain a system and recover after damage). The majority of the themes covered within the overall framework of vulnerability centre on these three characteristics. Although precise names, ideas, and standards for addressing vulnerability vary, fundamental ideas remain the same. The resistance or resilience - the features of exposure encountered by a system - may be considerably altered by the interaction of economic, political, or biophysical changes, though. A system’s sensitivity, adaptive capability, and the type, scope, and pace of climate variation to which it is exposed determine its susceptibility to climate change.

Social Protection: Caste and class divisions are more pronounced in some countries than others. How inclusive or otherwise a society is could be determined by the degree of such segmentation. It is the foundation upon which the degree of societal protection granted to individuals or the basis of positive social capital is evoked during crisis.

Livelihood Resilience: This measures a community’s capacity to recover from challenging circumstances brought in by disasters. The ability of subject communities to weather economic hardship depends on livelihood resilience.

Social Capital: It is critical to determine how much cooperation or conflict is anticipated from a community during catastrophes in order to conduct a realistic risk and capacity analysis.

10.5 APPROACHES TO VULNERABILITY

There are often *two* methods used to comprehend vulnerability. The *Approach to Hazards and Impacts*; and the *State of Vulnerability*.

According to the Hazard and Impact Approach, “the combined vulnerability, a function of risk, and the degree of human exposure, may be referred to as biophysical or physical vulnerability.” The State of Vulnerability Approach, on the other hand, sees vulnerability as developing as a result of the system’s underlying social features or attributes, which may be inherent or coming from external stimuli. The interaction between the social, economic, and physical elements—which are crucial to the health of the society or group in question—is what is meant by the structural aspect of vulnerability. The first

perspective emphasises natural causes, whereas the second links the effects of hazards to human activities.

According to Bohle (2001), there are external and internal aspects to vulnerability. The external side is associated with exposure to risks and shocks and is influenced by Human Ecology Perspectives (population dynamics and environmental management capacities), Political Economy Approaches (e.g., social inequities, disproportionate division of assets), and the Entitlement Theory (relates vulnerability to the incapacity of people to obtain or manage assets via legitimate economic means). The ability to anticipate, deal with, resist, and recover from the effects of a hazard is referred to as the internal side, and it is influenced by the Crisis and Conflict Theory (control of assets and resources, capacities to manage crisis situations and resolve conflicts), Action Theory Approaches (how people act and react), and other factors.

10.6 DIMENSIONS OF VULNERABILITY

Both internal and external vulnerability have two sides: the exterior side, which includes hazards, shocks, and stress that a person is exposed to, and the interior side, which is defenceless and refers to lack of resources to deal with stress without suffering harm.

Exposure, sensitivity, and adaptive capability are the *three* dimensions of vulnerability that we shall discuss now:

- a) **Exposure:** It is the degree to which people and the things they value could be affected or “touched” by the disaster. This phrase also includes references to locations and to cultural, spiritual, and individual values in addition to explicitly referring to people’s lives, livelihoods, and items of economic worth. Critical physical infrastructure including buildings for the police, emergency, and health services, communication and transportation systems, public utilities, as well as schools and childcare facilities, are also included. Additionally, it alludes to social support systems including large families, neighbourhood watch programmes, fraternal organisations, and more. Even societal aspects like economic growth rates and economic vigour are included in the statement.

The components one needs to consider when assessing exposure are as follows:

1. Hazard frequency and intensity.
2. Location and landscape.
3. Density of people and property.

- b) **Sensitivity:** The degree to which people and infrastructure could be damaged by the exposure to disasters is called sensitivity. For example, people from disadvantaged groups are more likely to experience coastal risks than others. The underprivileged, the elderly, the ill, and those with mental or physical disabilities are often more vulnerable.

We must take into account both the elements of sensitivity to comprehend its impact. The demography of the people and the infrastructure are the two characteristics of a community’s sensitivity. Infrastructure is easier to evaluate of these two. Knowing the state and calibre of infrastructure helps to evaluate

its susceptibility to risks, and as a result, the susceptibility of people who depend on the infrastructure. Considering socio-economic class, ethnicity, and gender as well as other demographic aspects might be crucial for determining how vulnerable a region is to disasters. These elements can interact with one another, but they are also quite context-specific. It is conjointly important to assess sensitivity once an event has occurred to find wherever the worst effects were felt and to spot lessons that may be applied to future hazard events.

- c) **Adaptive Capacity:** The degree to which the community could lessen the possibility of damage by taking steps to limit exposure or sensitivity is known as its adaptive capacity. Grasp the adaptive capacity component of susceptibility to hazards requires an understanding of the notion of resilience. A community's resilience is its capacity to employ available resources to recover and flourish from unfavourable events. Communities that are resilient are able to draw lessons from the past and apply them to current issues. Therefore, resilient systems that have a high capacity for adaptation are able to adjust in order to deal with coastal risks. Low adaptive capacity systems are much less robust and considerably more susceptible to coastal disasters. We could look at numerous instances of how communities with weak resilience and limited adaptive ability cope with disasters.

Disasters can result in highly variable impacts because of the variations in vulnerability in time and space. In 2011, a 9.0 magnitude earthquake off the Pacific coast of the Japanese island of Tōhoku caused a massive tsunami that killed more than 15,000 people and destroyed or damaged hundreds of thousands of buildings. It also caused a nuclear disaster in the form of meltdowns at three reactors of the Fukushima Daiichi Nuclear Power Plant. However, other nuclear reactors within the path of the tsunami waves were essentially unaffected. Why did the Fukushima Daiichi plant experience catastrophic meltdowns while other reactors exposed to the tsunami did not? One explanation is that Fukushima Daiichi reactors were more sensitive to tsunamis than other reactors.

10.7 IMPORTANCE OF VULNERABILITY ANALYSIS

To help with mitigation and preparedness planning, it is crucial for development planners to make an effort to quantify the concrete dimensions of risk and loss. In an effort to provide tailored policies to lessen vulnerability, an endeavour could be made to quantify it. Vulnerability is multi-dimensional in nature. In order to identify the precise causes in each situation and develop effective remedies, research into the causes of vulnerability in populations at risk needs to be strongly promoted.

By including vulnerability into our understanding of disaster risks, enables us to recognise that disaster risk is a reflection of how susceptible people and economic assets are at experiencing loss and destruction, in addition to how severe the hazard is and how many people or assets are exposed to it. The difference between some non-extreme risks and the extreme consequences and catastrophes they can cause can be explained in part by levels of vulnerability and exposure. People's susceptibility is frequently the main determinant in assessing their risk, especially in the setting of substantial risk.

Some groups are more prone than others to harm, loss, and suffering, when various risks are present, and (within these groups), some individuals are more vulnerable than

others. After a disaster, vulnerable populations have the toughest time rebuilding their lives, which renders them more susceptible to the consequences of future hazard occurrences. As a result, we must lessen vulnerability in order to lower the danger of tragedy. This can only be done by deeper understanding and analysis of vulnerability.

Vulnerability assessment cannot be done in a single way due to its complexity. Any evaluation should, ideally, evaluate vulnerability holistically. Actually, there are two types of methods: one that takes into account socio-economic vulnerability and the other that takes into account physical (or built environment) susceptibility.

Check Your Progress 2

Note: i) Use the space given below for your answers.

ii) Check your answers with those given at the end of the Unit.

1) Bring out the different dimensions of vulnerability.

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2) Why is vulnerability assessment important?

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3) Mention the various indicators of vulnerability.

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10.8 CONCLUSION

A kaleidoscope of names, methodologies, and concepts has been produced as a result of the diversity of efforts made across disciplines to address vulnerability, which denotes the likelihood that someone or something will be harmed by a disaster. Human choices, beliefs, laws, attitudes, and behaviour all contribute to vulnerability, which results in circumstances, where risks may be harmful. Injury may include fatalities, disruption of social and commercial activities, and property damage.

Global patterns indicate rising catastrophic losses, mostly as a result of increased vulnerability among individuals and society. There are many aspects affecting vulnerability, arising from various physical, social, economic, geographic and environmental. Some guidance on exposure, capacity, and potentiality is provided by the related concepts of “resistance” (the capacity to withstand impact and continue

functioning), “resilience” (the capacity to maintain a system and recover after impact), and “exposure” (the existence of a threat to a group or region).

The majority of the conversation that falls under the umbrella of vulnerability often revolves around these three factors. Regions may be particularly sensitive to global change due to high population densities, population growth rates, and strain on scarce food, land, and water resources. Developmental procedures should be established from the ground up and all safety precautions should be done in order to minimise susceptibility in order to decrease the scope of future vulnerability.

One of the key options for lowering catastrophe risk is to minimise vulnerability because we cannot alter the frequency and intensity of natural events. Due to the dynamic nature of many of the variables that affect vulnerability, such as fast urbanisation, environmental deterioration, market circumstances, and demographic change, vulnerability evolves over time. Many of these elements have their roots in shifting local circumstances, but the picture is incomplete if socio-economic and political systems at the national and international levels are not recognised as limiting local growth potential. This means that the stakeholders at local, national, and international levels must all participate in a coordinated effort to combat vulnerability. This Unit explained the concept, types, elements and dimensions of vulnerability. It also brought out the relevance of vulnerability analysis.

10.9 GLOSSARY

Capacity	:	All the assets and strengths that a community has to offer.
Hazard	:	Event or human activity that may cause loss of life or injury.
Risk	:	The likelihood of negative effects or anticipated loss.

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10.11 ANSWERS TO CHECK YOUR PROGRESS EXERCISES

Check Your Progress 1

1. Your answer should include the following points:

- Vulnerability indicates the extent to which a community is affected by a disaster.
- Vulnerability denotes the degree to which a system is exposed to or unable to handle the negative effects of a disaster.

- Vulnerability encompasses the system's sensitivity, adaptive capacity, as well as the type, scope, pace of hazards or disasters to which it is exposed.

2. Your answer should include the following points:

- **Physical Vulnerability:** The vulnerability of physical such as communication channels, residential and commercial buildings, hospitals, roads, bridges etc. to disasters.
- **Social Vulnerability:** Exposure of socially vulnerable communities impacted by social factors such as poverty and inequality, marginalisation, social exclusion, discrimination based on gender, age, disability etc.
- **Fiscal Vulnerability:** It encompasses sources of income, availability of local resources, livelihoods, access to financial resources etc.
- **Attitudinal:** It includes social discord, conflicts, feelings of hopelessness, pessimism that lowers their ability to deal with disasters.
- **Environmental:** Depletion and deterioration of natural resources, climate change, land use/ land cover change etc.

Check Your Progress 2

1. Your answer should include the following points:

- **Exposure:** The degree to which people and things they value could be affected or touched by the disaster.
- **Sensitivity:** The degree to which they could be damaged by that exposure.
- **Adaptive Capacity:** The degree to which the community could learn the possibility of damage by taking steps to limit exposure or sensitivity.

2. Your answer should include the following points:

- Vulnerability analysis is important for development planners to make an effort to quantify the concrete dimensions of risk and loss.
- It helps to identify the precise causes in each situation and develop effective remedies, taking steps to limit exposure or sensitivity.
- It enables to recognise that disaster risk is a reflection of how susceptible people and economic assets are to experiencing loss and destruction resulting due to disasters.

3. Your answer should include the following points:

- **Social Protection:** It determines the degree of social protection granted to individuals or the basis of positive social capital evoked during crisis.
- **Livelihood Resilience:** This measures a community's capacity to recover from challenging circumstances brought in by disasters.
- **Social Capital:** It is critical to determine cooperation or conflict anticipated from a community during a catastrophe.