B.TECH. AUTOMOBILE ENGINEERING
DISASTER MANAGEMENT
(Open Elective - I)

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B.Tech. III Year I Sem.				
Course Code: CE511OE	**3**	**0**	**0**	**3**

Course Objectives: The subject provides different disasters,.tools and methods for disaster management.

Course Outcomes: At the end of the course, the student will be able to:

- Understanding Disasters, man-made Hazards and Vulnerabilities
- Understanding disaster management mechanism
- Understanding capacity building concepts and planning of disaster managements

UNIT - I

Understanding Disaster: Concept of Disaster - Different approaches- Concept of Risk - Levels of Disasters - Disaster Phenomena and Events (Global, national and regional)
Hazards and Vulnerabilities: Natural and man-made hazards; response time, frequency and forewarning levels of different hazards - Characteristics and damage potential or natural hazards; hazard assessment - Dimensions of vulnerability factors; vulnerability assessment - Vulnerability and disaster risk - Vulnerabilities to flood and earthquake hazards

UNIT - II

Disaster Management Mechanism: Concepts of risk management and crisis managements - Disaster Management Cycle - Response and Recovery - Development, Prevention, Mitigation and Preparedness - Planning for Relief

UNIT - III

Capacity Building: Capacity Building: Concept - Structural and Nonstructural Measures Capacity Assessment; Strengthening Capacity for Reducing Risk - Counter-Disaster Resources and their utility in Disaster Management - Legislative Support at the state and national levels

UNIT - IV

Coping with Disaster: Coping Strategies; alternative adjustment processes - Changing Concepts of disaster management - Industrial Safety Plan; Safety norms and survival kits - Mass media and disaster management

UNIT - V

Planning for disaster management: Strategies for disaster management planning - Steps for formulating a disaster risk reduction plan - Disaster management Act and Policy in India -

Organizational structure for disaster management in India - Preparation of state and district disaster management plans

TEXT BOOKS:

1. Manual on Disaster Management, National Disaster Management, Agency Govt of India.
2. Disaster Management by Mrinalini Pandey Wiley 2014.
3. Disaster Science and Management by T. Bhattacharya, McGraw Hill Education (India) Pvt Ltd Wiley 2015

REFERENCES:

1. Earth and Atmospheric Disasters Management, N. Pandharinath, CK Rajan, BS Publications 2009.
2. National Disaster Management Plan, Ministry of Home affairs, Government of India (http://www.ndma.gov.in/images/policyplan/dmplan/draftndmp.pdf)

UNIT-I

D → Disruption

I → Induced

S → Situation

A → After

S → Severe

T → Transformation of

E → Ecological

R → Response

Definitions

Disaster:- "A disaster can be defined as any occurrence that cause damage, ecological distruption, loss of human life, deteriotation of health and health services on a scale, sufficient to warrant an extraordinary response from outside the affected community or area." (W.H.O)

" A disaster can be defined as an occurrence either nature (or) manmade that causes human suffering and creates human needs that victims cannot alleviate with out assistance" (American Red Cross) (ARC)

Hazard:-

- Hazard is a dangerous event, natural (or) human induced that could cause injury, loss of life (or) damage to property, livelihood (or) environment.

Concepts of Hazards, Disasters and Hazard Assessment.

Goals

→ To instill an understanding of the concepts of hazards, multiple hazards and disaster

→ To develop the capability for hazard assessment.

Learning outcomes:

After completing this session, you will be able to perform a hazard identification and assessment for a selected community.

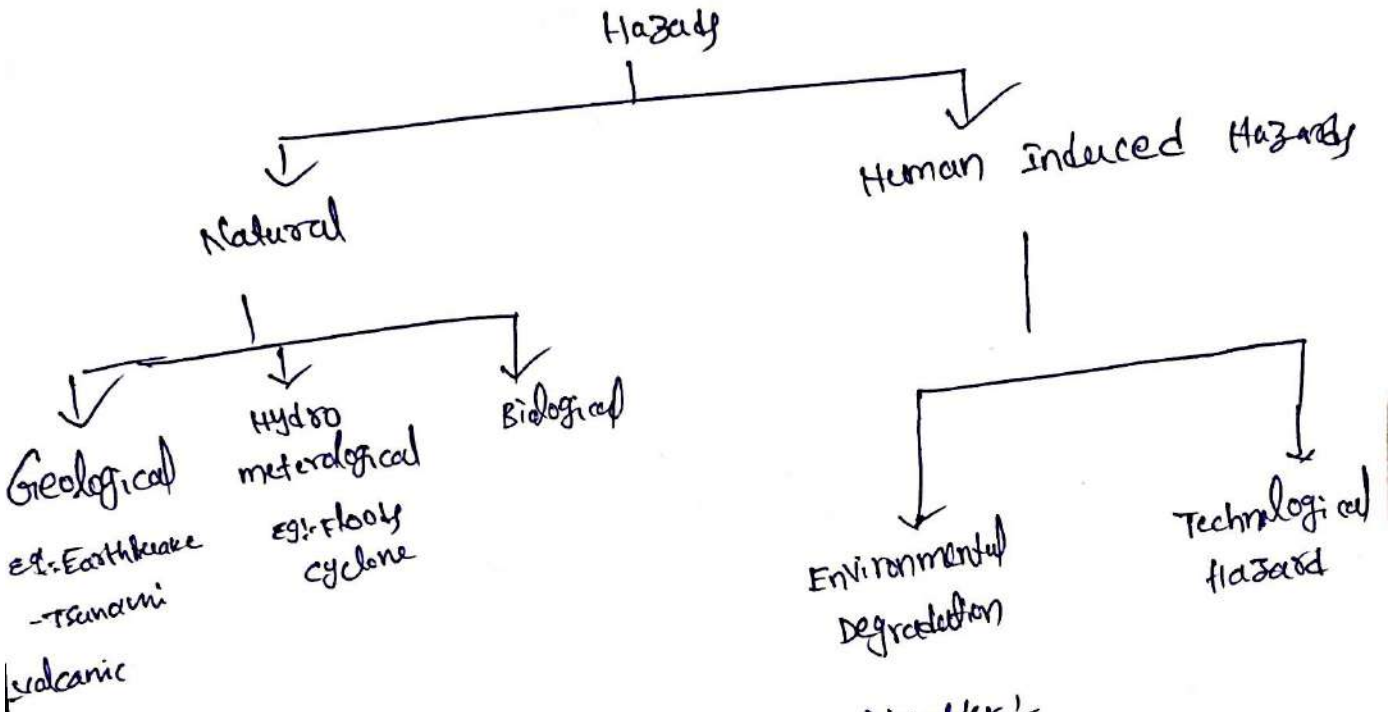
Learning objectives:

As you work through this session you will learn to

1. Distinguish between the concepts of hazard, hazard event, secondary hazards, multiple hazards and disasters.
2. classify and describe types of hazards.
3. Explain hazard characteristics such as magnitude, frequency, intensity and rate of onset and their importance.
4. Conduct hazard identification, hazard assessment and hazard mapping and explain their functional value.

Hazard and Vulnerability

- A potentially damaging physical event, phenomenon (or) human activity, which may cause the loss of life (or) injury, property damage, social & economic disruption (or) environmental degradation)



When does a Hazard lead to a Disaster:-

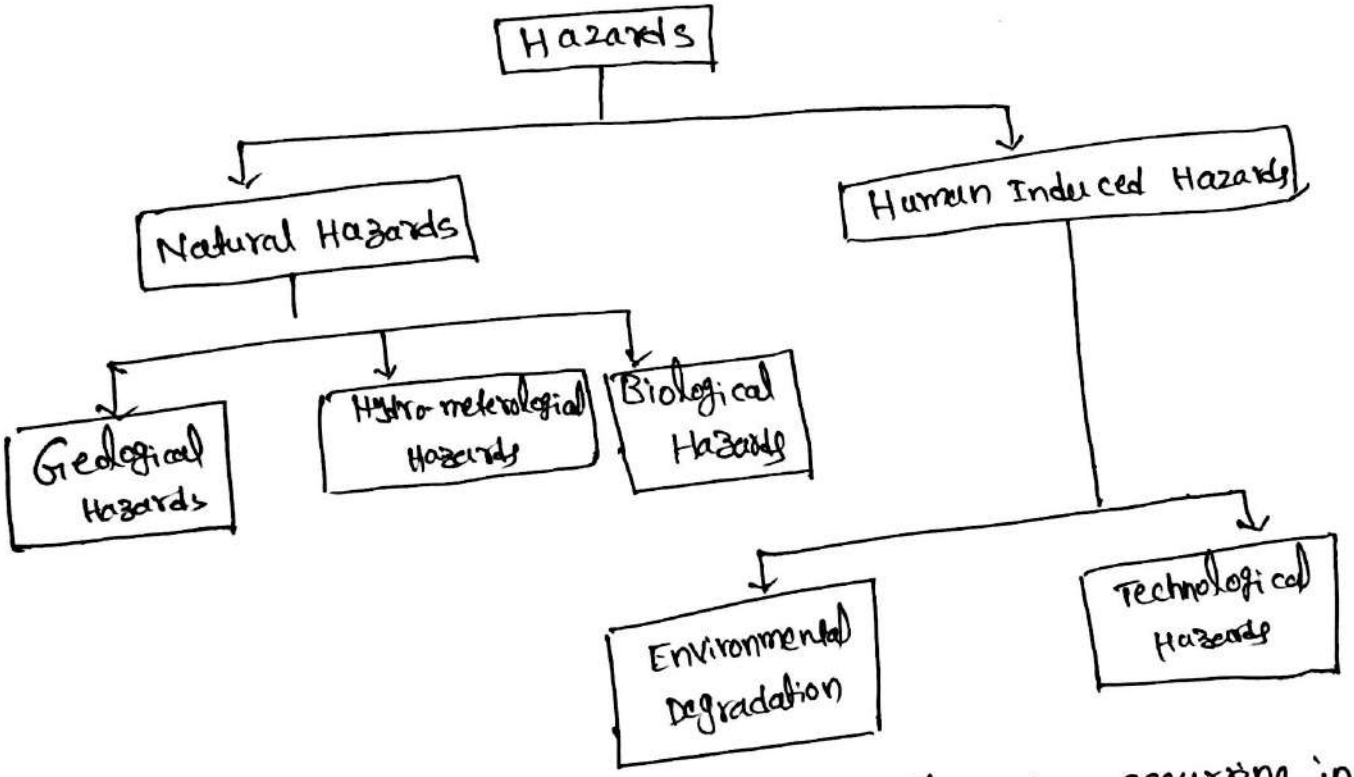
- A disaster occurs when the impact of a hazard on a section of society is such that the people are unable to cope with the event, causing death, injury loss of property and economic losses.

- If an earthquake strikes a desert uninhabited by human beings, it would not cause direct and immediate damage to the society and thus, would not be termed as a disaster.

HAZARDS (Natural and Man made Hazards)

- A potentially damaging physical event. phenomenon (or) human activity, which may cause the loss of life (or) injury, property damage. social and economic disruption (or) environmental degradation)

- They can be categorised in various ways but. based on the origin. They are two types.



Natural Hazards:- Natural processes (or) phenomena occurring in the biosphere that may constitute a damaging event.

[redacted]

(ii) Human Induced Hazards!- These are processes (or) (12) (6) (3)
phenomena caused primarily due to human activities and may lead to loss of life, injury, property damage, social, economic and political disruption and/or environmental degradation. These can be classified in to

a) Technological Hazards and
b) Environmental Degradation

a) Technological Hazards!- Danger associated with technological (or) industrial accidents, infrastructure failures (or) certain human activities which may cause the loss of life (or) injury, property damage. Social (or) economic disruption (or) environmental degradation, sometimes referred to as anthropological hazards, Examples include industrial pollution, nuclear release and radioactivity, toxic waste, dam failures, transport industrial (or) technological accidents (explosions fire spills)

b) Environmental Degradation!-
- process induced by human behaviors and activities that damage the natural resources base on adversely alter nature processes (or) ecosystems. Potentials effects are varied and may contributes to the increase in vulnerability frekuency and the intensity of natural hazards. Examples include land degradation, deforestation, desertification, wild land fire, loss of biodiversity, land water and air pollution climate change, sea level rise and ozone depletion.

① Hydro-meteorological hazards:-	
- Natural processes (or) phenomena of atmospheric hydrological (or) oceanographic nature.	- Floods, debris and mudflows - Tropical cyclones, storm surge, wind, rain and other severe storms - Drought, desertification, dust storm.
② Geographical Hazard	
- Natural earth processes (or) phenomena that include processes of endogenous origin (or) tectonic (or) exogenous origin such as mass movements	- Earthquake, tsunami - Volcanic activity and emissions - Mass movement land slides, rockslides, submarine slides - surface collapse, geographical fault activities
③ Biological Hazards:-	
processes of organic organs (or) those conveyed by biological vectors, including exposure to pathogenic, micro organism, toxins and bioactive substences.	- out breaks of epidemics diseases, plant (or) animal contagion and extensive infestation.

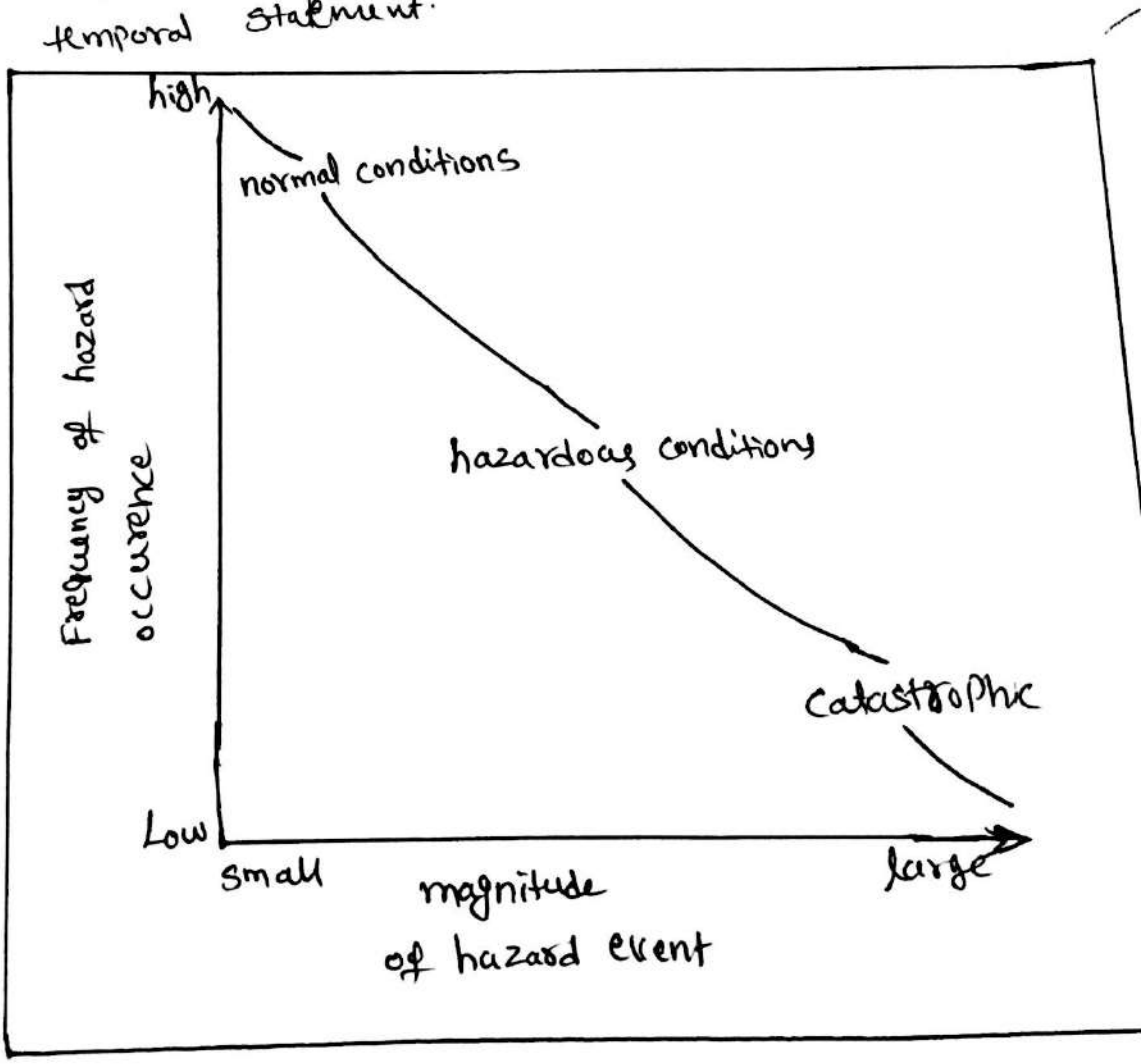
Response time :- The length of time that a hazard lasts for. As a general rule the longer the hazard the more severe it is likely to be. For ex:- and earthquake that last 1minute is likely to be more severe than one that last two seconds and a drought that lasts ten years is likely to be more severe than one that last three months.

- the hazard function of a response time distribution describes the temporal dimension of a response process and completely characterizes the distribution.
- Hazard Response Time is the time taken to the identification of a hazard.

Asset Hierarchy	Response	Hazard Response Time	Emergency Response Time
	Road		
Link	Inspect and provide appropriate warning or rectify if possible (or) provide appropriate warning and notify if asset is the responsibility of a utility, other road authority, private owner, or public transport provider	Within 4 hours of notification (or) receipt Inspection Report	Within 2 hours of notification
Collector		Within 8 hours of notification or receipt of a Hazard Inspection Report	Within 3 hours of notification
Access		Within 24 hours of notification or receipt of a Hazard Inspection Report	Within 4 hours of notification

Frekuency):- the return interval of hazards of certain sizes. For example earthquakes with a magnitude of over 8.0 happen on average once a year, but earthquakes of only 3 or 4 happen many times a day. If the hazard is a less frequent strong event, then it is going to have a bigger impact.

- Risk can be defined as the likelihood (or) probability of a given hazards of a given level causing a particular level of loss of damage. Another definition of risk is the probable frekuency and probable magnitude of future losses
- storms and floods are often classified using a recurrence interval eg:- 100 years flood. this is a probability statement not a temporal statement.



- The laws of probability tell us that everyday events occur often (with high frekuency) and are moderate in size (magnitude)
- Hazard events tend to have a low frekuency but are large in magnitude.
- Hazard magnitude and frekuency are interrelated.
- A river may flood a little every year, but a devastating flood may only occur every 50 years.

Fore Warning levels of different hazards:-

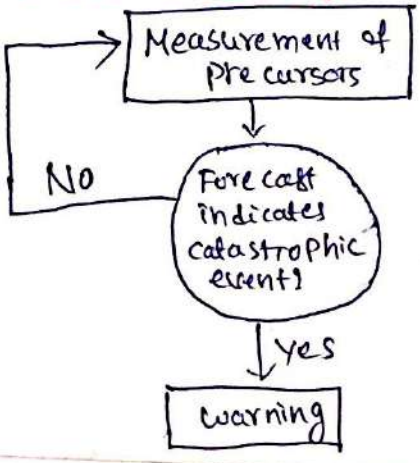
- An Early Warning system (EWS) can be defined as a set of capacities needed to generate and disseminate timely and meaningful warning information of the possible extreme events or disasters (e.g. floods, drought, fire, earthquake and tsunamis) that threatens peoples lives.
- The purpose of this information is to enable individuals, communities and organizations threatened to prepare and act appropriately and in sufficient time to reduce the possibility of harm, loss or risk.

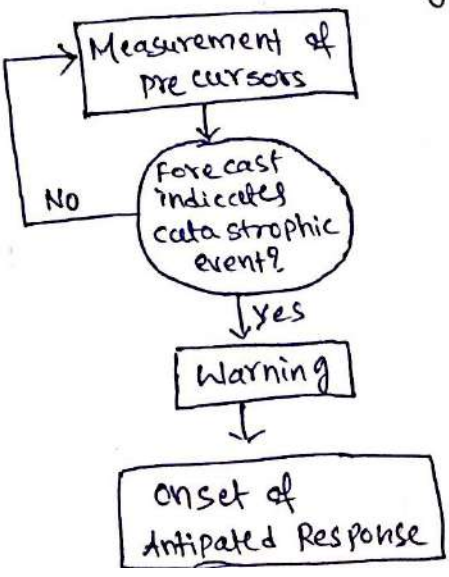
Characteristics of Early warning system:-

- Effective early warning systems require strong technical foundations and good knowledge of the risks.
- But they must be strongly people centered - with clear messages, dissemination systems.
- public awareness and education are critical; in addition, many sectors must be involved.
- Effective early warning systems must be embedded in an understandable manner and relevant to the communities which they se

Serve.

Three Phases of early warning systems:-





Agencies for forecasting

Disasters	Agencies
cyclone	Indian Meterological Department
Tsunami	Indian national centre for oceanic information services
Floods	central water commission
Earthquakes	Indian Meterological Department

Earthquake Early warning system:- The message alerts the user to how many seconds before the shaking waves arrives at their location and the expected intensity of shaking at that site.

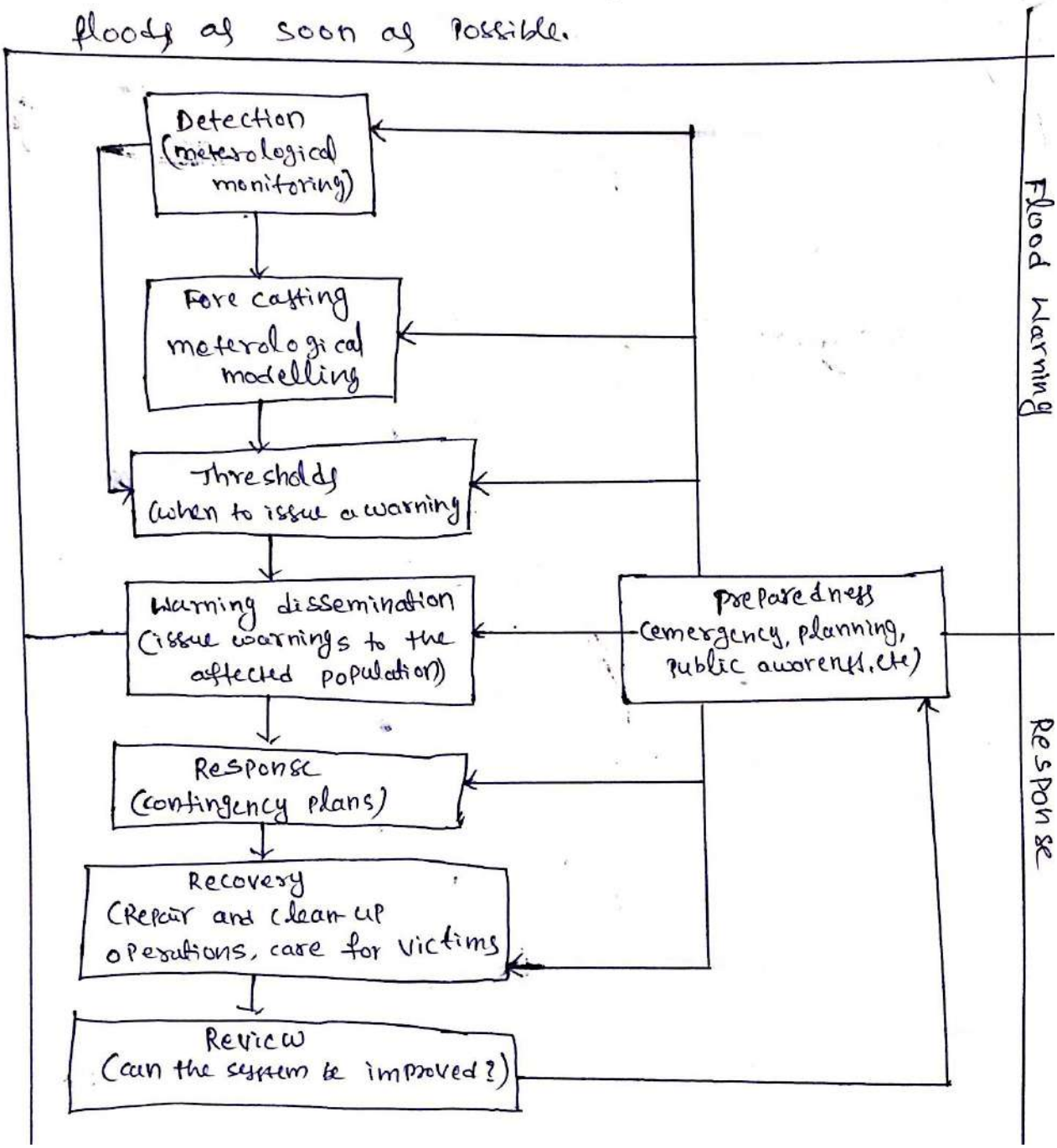
- The warning message also displays a map with the location of the epicenter, the magnitude of the earthquake, and the current position of the P and S waves.

Earthquake Early Warning Basics:-

1. In an earthquake, a rupturing fault sends out different types of waves the fast-moving P-wave is first to arrive, but damage is caused by the slower S-waves and later arriving surface waves.
2. Sensors detect the P-wave and immediately transmit data to an earthquake alert center where the location and size of the quake are determined and updated as more data become available.
3. A message from the alert center is immediately transmitted to your computer (or) mobile phone, which calculates the expected intensity and arrival time of shaking at your location.

Flood warning system:- A typical flood warning syst includes a number of items, including automated sensors which are placed in or beside rivers and reservoirs thro a designated area.

- Data is then collected and sent immediately to a base s or personal computer.
- In this way, appropriate forecasts are sent to authoritie communities of those potentially affected by the develop floods as soon as possible.



- The scope of a disaster is determined if at least one of two criteria is met, relating to either the number of displaced / injured / killed people or the adversely affected area of the event. We classify disaster types being of scope I to V according to the scale depicted in the following table.

Disaster scale according to number of causalities and/or geographic area affected.

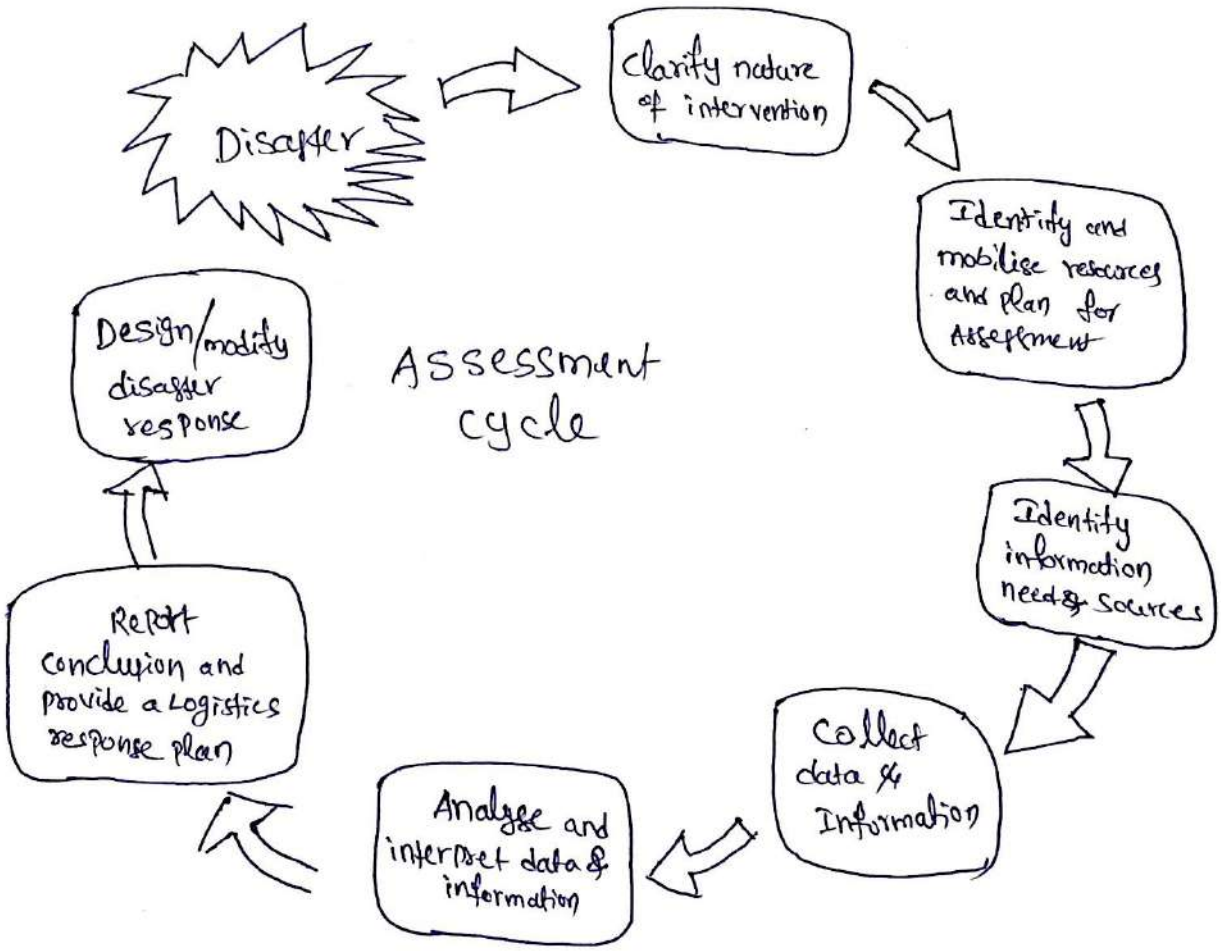
Scope I	small Disaster	< 10 persons	or	$< 1 km^2$
Scope II	Medium Disaster	10 - 100 persons	or	$1 - 10 km^2$
Scope III	Large Disaster	100 - 1000 persons	or	$10 - 100 km^2$
Scope IV	Enormous Disaster	$1000 - 10^4$ persons	or	$100 - 1000 km^2$
Scope V	Gargantuan Disaster	$> 10^4$ persons	or	$> 1,000 km^2$.

Disaster scope

Scope I	Scope II	Scope III	Scope IV	Scope V
small Disaster	Medium Disaster	Large Disaster	Enormous Disaster	Gargantuan Disaster
< 10 persons	10 - 100 persons	100 - 1000 persons	$1000 - 10^4$ persons	$> 10^4$ persons
		(or)		
$< 1 km^2$	$1 - 10 km^2$	$10 - 100 km^2$	$100 - 1000 km^2$	$> 1000 km^2$

Hazard Assessment:-

A hazard assessment is a through check of the work environment. The purpose of a hazard assesment is to identify potential risks and hazards in the area, as well as to identify appropriate safety measures to be used to mitigate the identified hazard.



Disaster scope according to number of casualities and/or geographic area affected

Hazard assessment

Sope I	Small Disaster	< 10 persons	or	$< 1 km^2$
Sope II	Medium Disaster	10 - 100 persons	or	$1 - 10 km^2$
Scope III	Large Disaster	100 - 1,000 persons	or	$10 - 100 km^2$
Scope IV	Enormous Disaster	$1000 - 10^4$ persons	or	$100 - 1,000 km^2$
Scope V	Gargantuan Disaster	$> 10^4$ persons	or	$> 1000 km^2$

You control the situation..

... the situation doesn't control you.

Hazard & Disasters are closely related terms

- However, a hazard is a natural event while the disaster is its consequence.

- Hazard refers to the event which may cause disaster.

- They could be either man-made (or) naturally occuring hazards in our environment.

When does Hazard lead to a Disaster?

- A disaster occurs when the impact of a hazard on a section of society is such that the people are unable to cope with the event, causing death, injury, loss of property and or economic losses.

- If an earthquake strikes a desert uninhabited by human beings, it would not cause direct and immediate damage to the society and thus, would not be termed as a disaster. on the other hand, the earthquake that struck Bhuj (Gujarat) in 2001 and killed more than 10,000 people, became a disaster owing to its immediate impact on the society.

- These classifications are pictorially illustrated in the above figure. For example, if 70 persons were injured as a result of a wild fire that covered 20 km² this would be considered scope III, large disaster (the larger of the two categories II and III).
- However, if 70 persons were killed as a result of a wild fire that covers 2km², this would be considered scope II, medium disaster.
- An unusual example, at least in the sense of even attempting to classify it, is the close to 80 million citizens of Egypt (area slightly larger than 1 million km²) who have been tormented for more than a half-century by a virtual police state. This manmade cataclysm is readily stigmatized by the highest classification, Scope V, Gargantuan disaster.

In the case of certain disasters, the scope can be predicted in advance to a certain degree of accuracy; otherwise the scope can be estimated shortly after the calamity strikes with frequent updates as warranted. The magnitude of the disaster should determine the size of the first-responder contingency to be deployed. which hospitals to mobilize and to what extent; whether the military forces should be stockpiled and delivered to the stricken area; and so on. predicting the scope should facilitate the subsequent recovery and accelerate the return to normalcy.

- Disaster Management

It is action taken to prevent hazard converting in to Disaster

- It is a methodology to understand and face Disaster and take appropriate measures to minimize the losses of life, property and environment.

INDIA'S KEY VULNERABILITIES

- over 58% of the land area is vulnerable to earthquakes,
- 12% to floods
- 8% to cyclones
- 68% of the land under cultivation is prone to Drought.
- The entire coastal area, particularly the east coast is vulunarable to Tsunamies.

Vulnerability :-

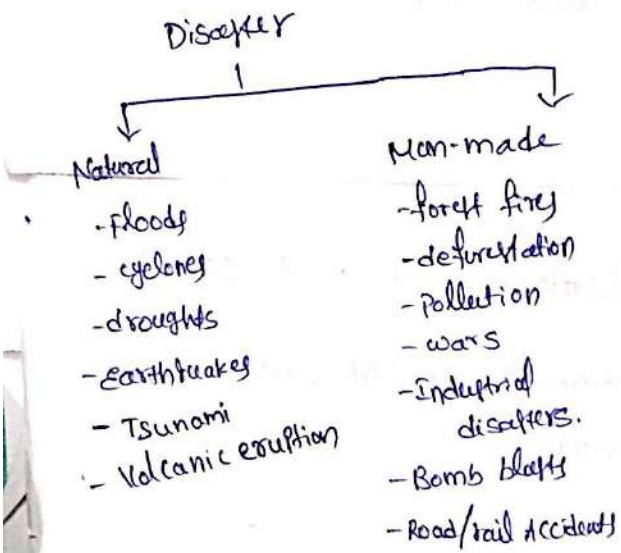
- vulnerability basically means susceptibility of a population or system to the effects of the hazard.
- vulnerability is the condition determined by physical, social, economic and environmental factors (or) processes, which increases the susceptibility of a community to the impact of hazards (Source: Living with Risk, UNISDR 2002)

Disaster

Disaster is a sudden, catastrophic event that causes widespread and immeasurable damage, loss, destruction and devastation to life, property, livelihood, economy and environment

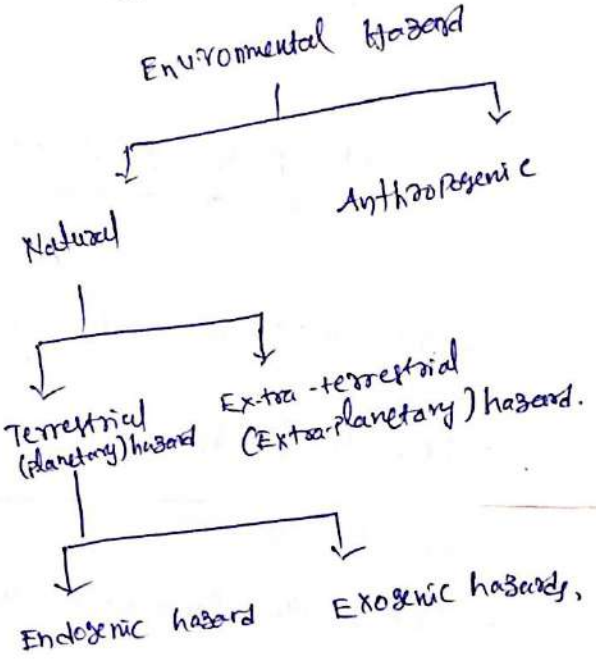
Based on the origin of disasters

1. Natural disasters
2. Man-made disasters.



Hazard

- A potentially damaging physical event, phenomenon (or) human activity, which may cause the loss of life (or) injury, property damage, social and economic disruption (or) environment degration.



Hazard x Vulnerability = Disaster

Aims of Disaster Management

- Reduce (Avoid, if possible) the potential losses from hazards.
- Assure prompt and appropriate assistance to victims when necessary.
- Achieve rapid and durable recovery.

Dimensions of vulnerability factors:

- Multi-dimensional (Eg:- physical, social, economic, environmental, institutional and human factors define vulnerability) dynamic i.e vulnerability changes over time: scale-dependent (vulnerability can be expressed at different scales from human to household to community to country resolution; site specific.

Dimensions of vulnerabilitiy factors:-

- The characteristics determined by physical, social, economic and environmental factors (or) processes which increase the susceptibility of an individual, a community, assests or systems to the impacts of hazards. vulnerability is one of the defining components of disaster risk.

Hazard

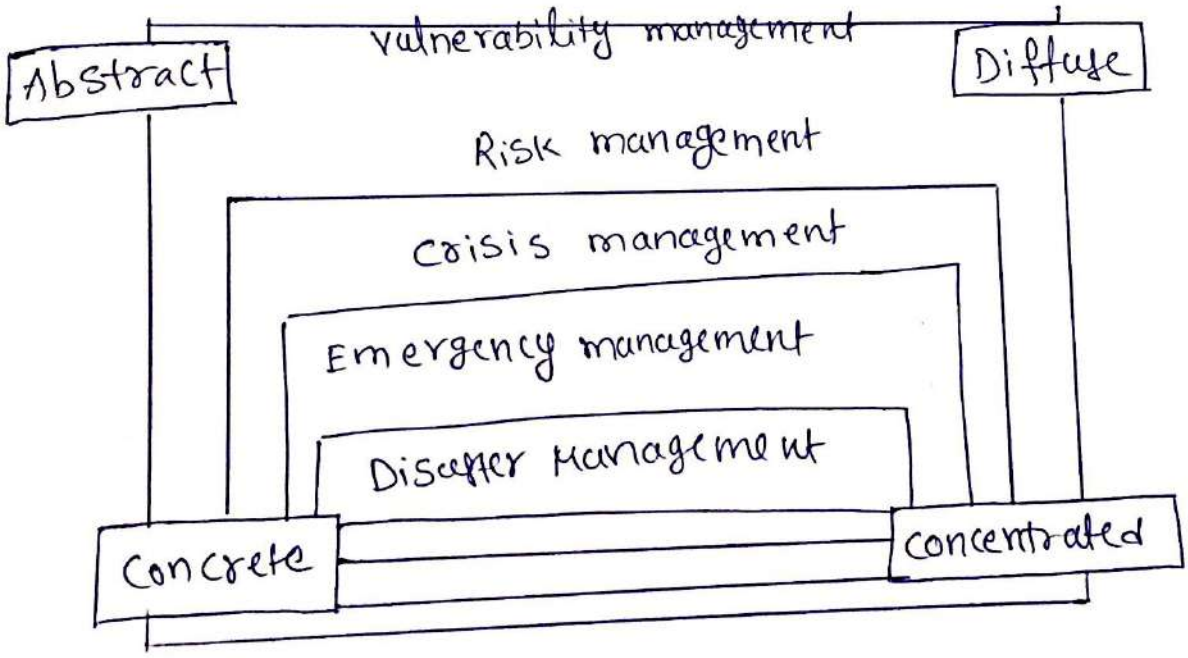
X

vulnerability

= Risk

→ Impact

→ Response



Vulnerability assessment :-

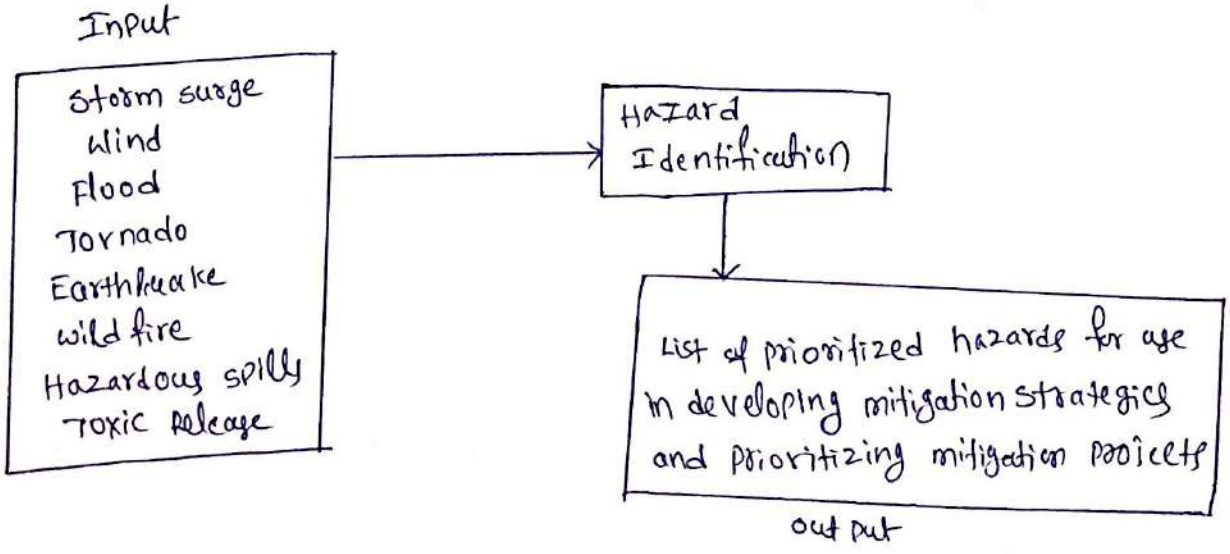
- A vulnerability assessment is the process of identifying, quantifying, and prioritizing (or ranking) the vulnerabilities in a system.
- Examples of systems for which vulnerability assessments are performed include, but are not limited to, information technology systems, energy supply, water supply systems, transport systems and communication systems.

Vulnerability Assessment Methodology:

- Hazard Identification
- Hazard Analysis
- Critical Facilities Analysis
- Social Analysis
- Economic Analysis
- Environmental Analysis
- Mitigation opportunies Analysis.

Hazard Identification:-

What hazards are you concerned about?
How would you prioritize them?



Hazard Identification!-

Step 1a!- Identify hazards

Step 1b!- Apply relative priority scoring system.

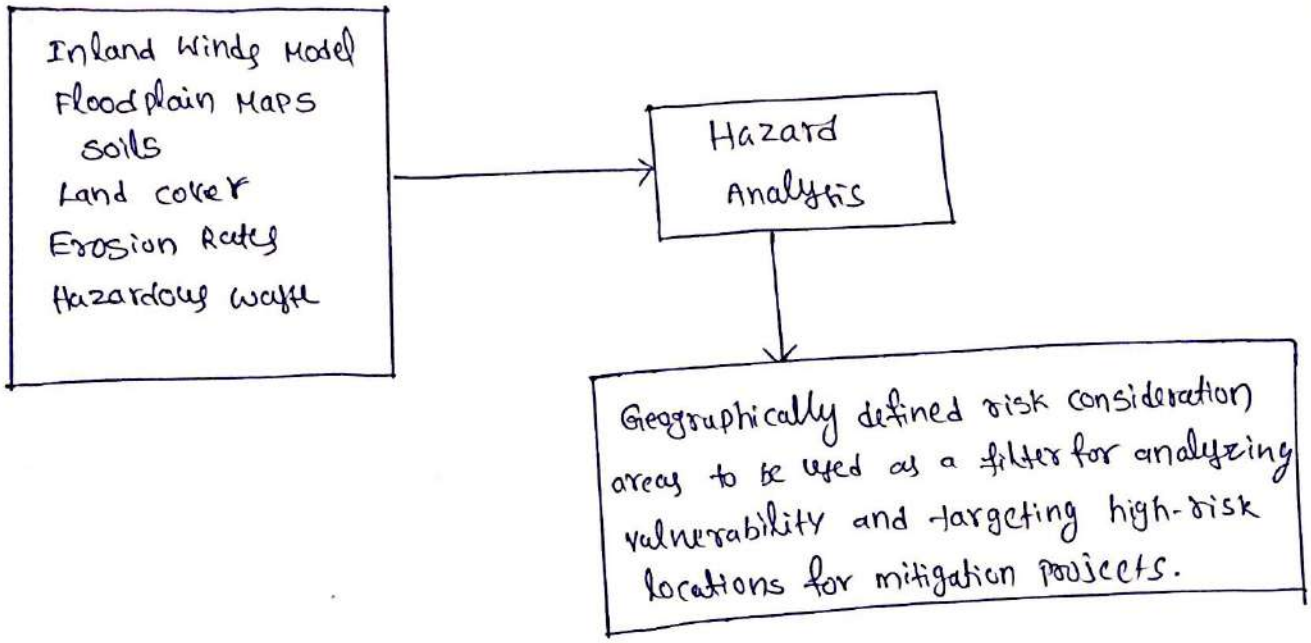
Meteorological	Geological
Hurricanes Storms/Flooding Tornadoes Winter storms	Earthquake Landslide Chronic Erosion
Technological	**Other**
Toxic release Hazardous spills	Wildfires Dam failure Transportation Related Hazards

Hazard	Frekuency +	Area Impact X	Magnitude =	Total
Storm surge	2	4	5	30
Wind	8	5	4	32
Flood	4	4	4	32
Tornado	4	2	3	18
Erosion	4	1	2	10
Earthquake	1	5	5	30
~~Wildfire~~	3	2	8	10
Hazardous Spill	5	1	1	6
Toxic Release	4	2	1	6

Hazard Analysis

Where are your risk consideration areas?
How would you prioritize these risk areas?

Input



out put

Step 2a:-
Map risk consideration areas for Hazards.

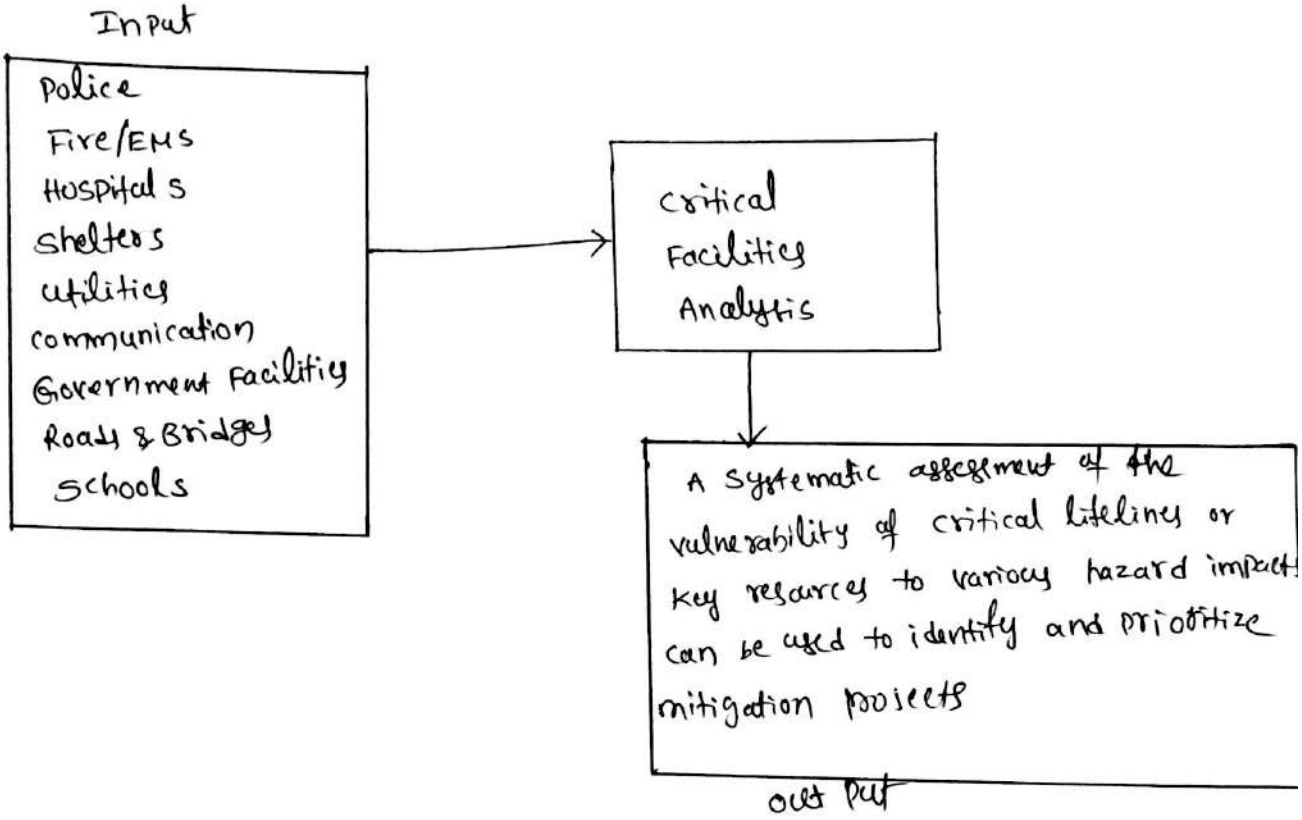
Step 2b:-
prioritize risk consideration areas within each hazard, where possible.

Critical Facilities Analysis :-

3c

What are your critical facilities and where are they locate

How vulnerable are they to physical and operational impacts from hazards?



Step 3a

Identify critical facilities categories

Step 3b

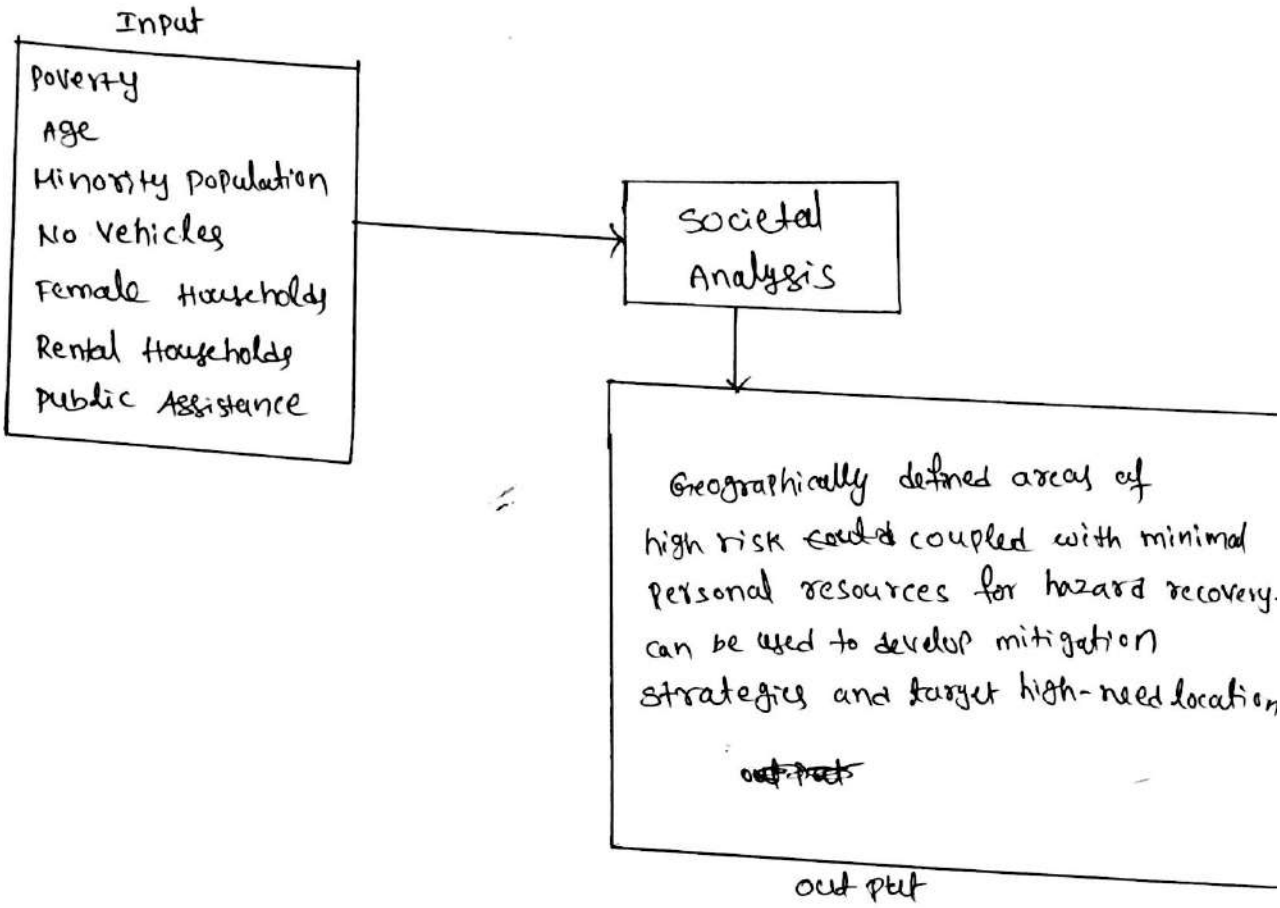
complete a critical facilities inventory.

Step 3C

conduct vulnerability analysis on critical facility.

Societal Analysis

Where are your high-need neighborhoods?
How vulnerable are they to hazard impacts?



Step 4a:-
Identify societal need indicators and collect relevant data.

Step 4b:-
Locate high-need areas.

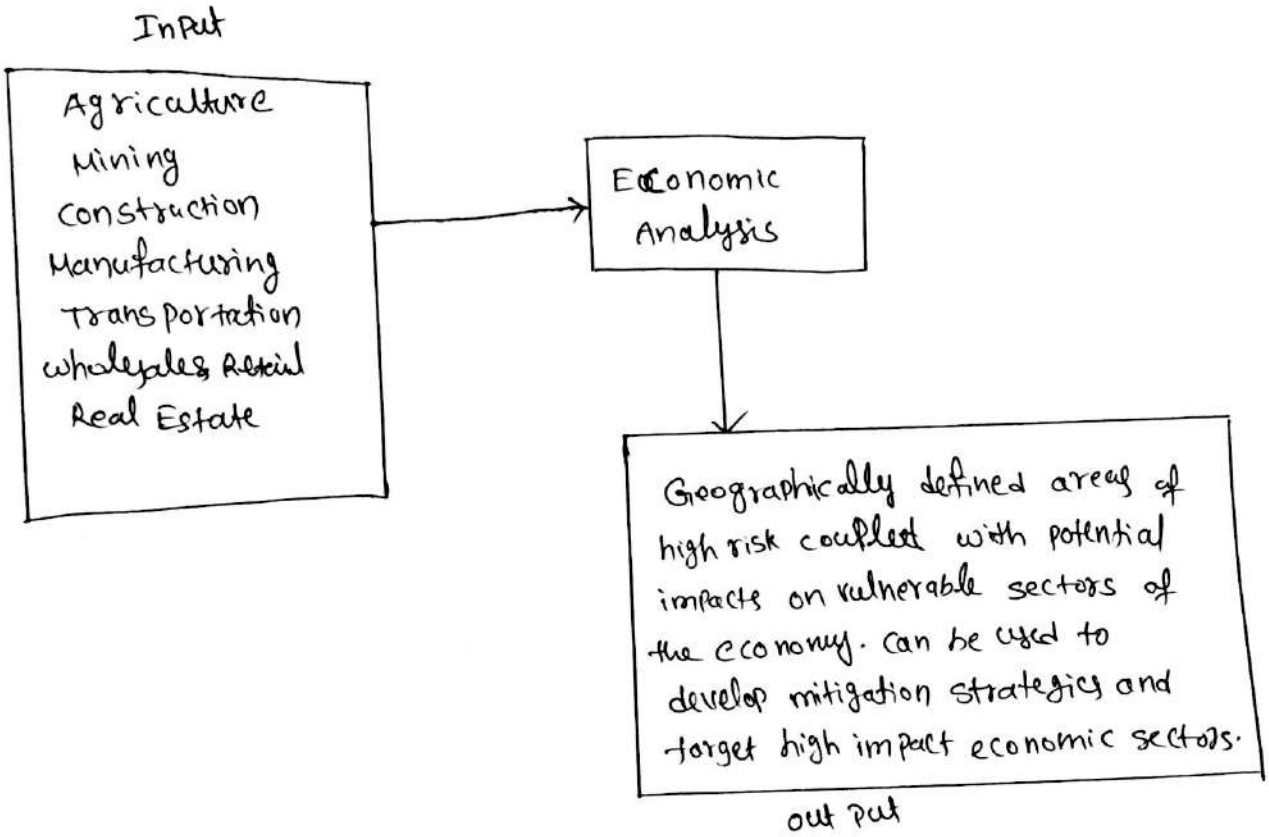
Step 4c:-
Identify high-need areas that intersect with high risk locations

Step 4d:-
- Conduct general inventory of high-need / high risk locations.

Economic Analysis:-

What are your primary economic sectors and how vulnerable are they to hazards?

where are your largest employers and how vulnerable are they to hazard impacts?



Step 5a:-
Identify primary economic sectors and locate clusters or) economic centers.

Step 5b:- Identify intersection of economic centers and high locations.

Step 5c:- conduct general inventory of high risk economic centers.

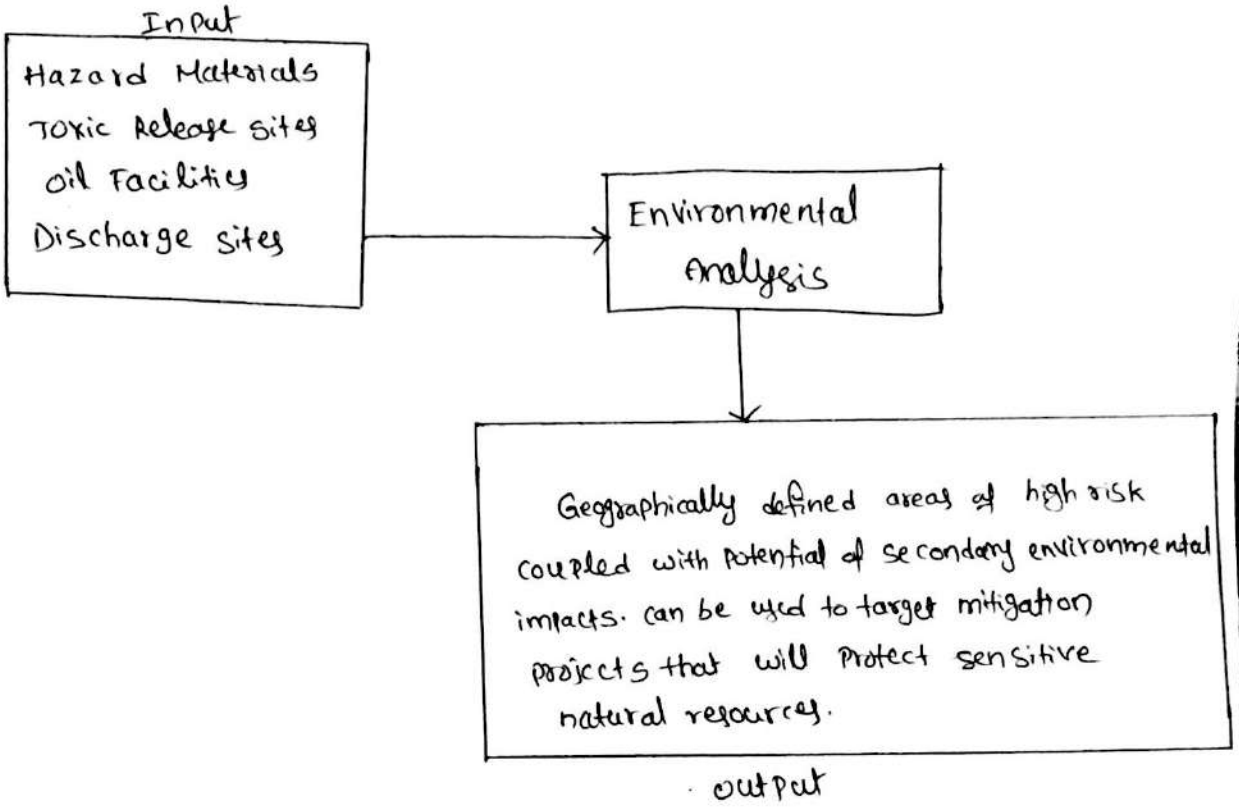
Step 5d:-
Identify large employers

Step 5e:-
conduct vulnerability assessment of large employers (similar to critical facilities)

Environmental Analysis:-

Where are your hazardous materials located and how vulnerable are they to natural hazards?

How vulnerable are critical natural resources to secondary hazard impacts?



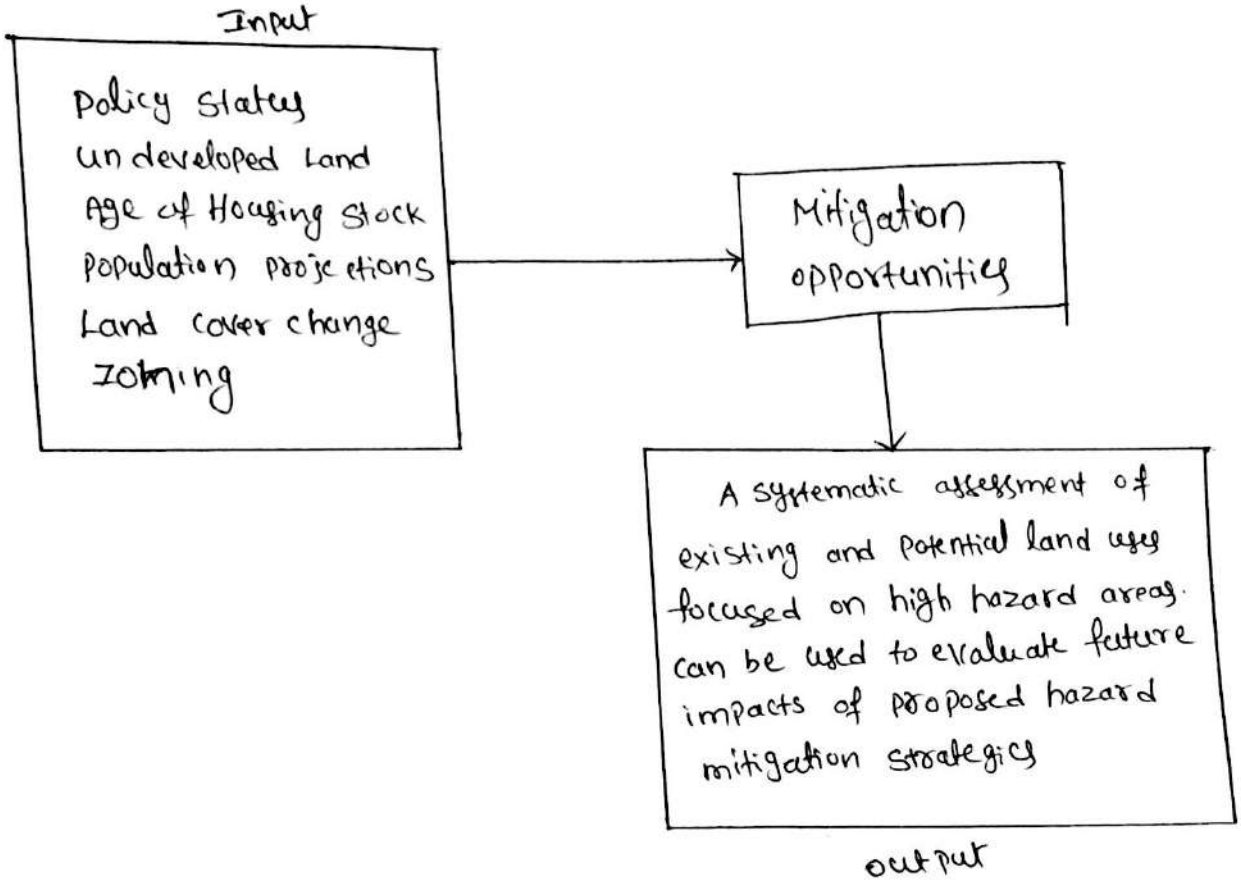
Step 6a:-
Identify secondary hazard risk consideration sites.

Step 6b:-
Identify intersections of secondary risk sites with high natural hazard risk areas and environmentally sensitive areas to identify priority locations.

Step 6c:-
Conduct vulnerability assessments of priority secondary risk sites (similar to critical facilities)

Mitigation opportunities Analysis:-

Where are your best opportunities for mitigation policy changes to have significant impacts on future hazard vulnerability?



Step 7a:-

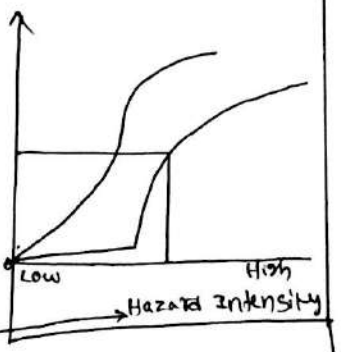
Identify areas of undeveloped land and the intersection with high risk areas.

Step 7b:-

Inventory land for existing policies (zoning, floodplain, regulations) to determine adequacy of existing policies to prevent unwise development.

Vulnerability and disaster risk:

Risk = probability of losses =

Hazard *	* Vulnerability	* Elements-at-risk
Temporal probability of hazard scenio, annual probability = 1/Return period	Degree of loss of a specific type of elements-at-risk given the intensity of a given hazard scenario	(Quantification) of exposed Element-at-risk (e.g.: People / buildings monetary value
• Hazard Type (e.g.: debris flow, flash flood, riverflood • other characteristics (Duration, onset time, hazard interactionete) • Hazard intensity: Spatial distribution of damaging effects	• Focus is here on physical vulnerability 	• Type of elements-at-risk (e.g.: people, building type, type of infrastructure). • Temporal variation of elements-at-risk (e.g.: population scenarios) • Spatial location (e.g.: Points, lines, polygons)

Exposure

Spatial overlay of hazard footprints and elements-at-risk locations

Flood vulnerability: Inadequate capacity of the rivers to contain within their banks the high flows brought down from the upper catchment areas, following heavy rainfall, leads to flooding.

- Central and coastal Andrapradesh spans mainly major river basins of Godakari, Krishna and minor river basins of Nagavali and Vamsadhara on the north and pennar in the south.
- Human systems are vulnerable to floods due to three vital aspects: 1) Exposure
  2) Susceptibility
  3) resilience
- Vulnerability indicators method which adapted to use available data for providing a logical Image of the place vulnerability. This method is widely used in flood vulnerability studies and preferred by policy makers for its clarified vulnerability image over space, a depiction which aims to priorities measures and plan for the risk response in specified region.

Vulnerability assessment methods

Methods	vulnerability index system	Vulnerability curve method	Disaster lose data	Models
characteristics	commonly used in flood vulnerability studies pertain to complex indicates and weighting of their subjective.	Is founded on real damage investigation should be fairly precise Takes a lot of time and resource Not valid for other areas	Simple Imprecise	Intelligible for public Low validity in data shortage condition.

Vulnerabilities to earthquake hazards:-

. With in minutes of shaking, the earthquake ~~reveal~~ reveals the vulnerabilities of buildings, households, communities, and of a coun the consequences expose flaws in governance, planning, siting of physical structure, design, construction, and use of the built environment in country with seismic hazard.

- It reveals the influence of prevailing culture and way of life, on the capacity of the community to be preparedness for an earthquake hazard. The scale of physical damage and social disruption inflicted up on a community or a nations by an earthquake event is the measures of how vulnerable the community or the nation is.

- vulnerability is a set of prevailing or consequential conditions, which adversely affect an individual, a household or a community's ability to mitigate, prepare for or respond to the earthquake hazard.

- vulnerability can also be defined as the degree of loss to a given element at risk, or set of such elements, resulting from an earthquake of a given magnitude (or) intensity, which is usually expressed on a scale from 0 (no damage) to 10 (total loss).

- Earthquake vulnerability is thus a function of the potential losses from earthquakes (death and injury to people, damage and other physical structures) and the level of preparedness (the extent to which a society has been able to translate mitigation measures into practice). It reflects the unattended weakness in the built environment of a community and the constraints in the society that affects ability (or inability) to absorb losses after an earthquake and to recover from the damage. vulnerability condition precedes the earthquake event and contributes to its severity, impedes emergency response, and usually continues long after the earthquake has struck.

List of Various Disasters

I. Water and climate related disasters
- a) Floods and drainage management
- b) cyclones
- c) Tornadoes and hurricanes
- d) Hail storm
- e) cloud burst
- f) Heat Wave and cold wave
- g) Snow avalanches
- h) Droughts
- i) Sea erosions
- j) Thunder and lightening
- k) Tsunami

ii) Global related Disasters
- a) Landslides and mudflows
- b) Earthquakes
- c) Dam failures / Dam bursts
- d) Minor fires

iii) chemical, Industrial and nuclear related disasters
- a) Chemical and industrial disasters
- b) Nuclear disasters

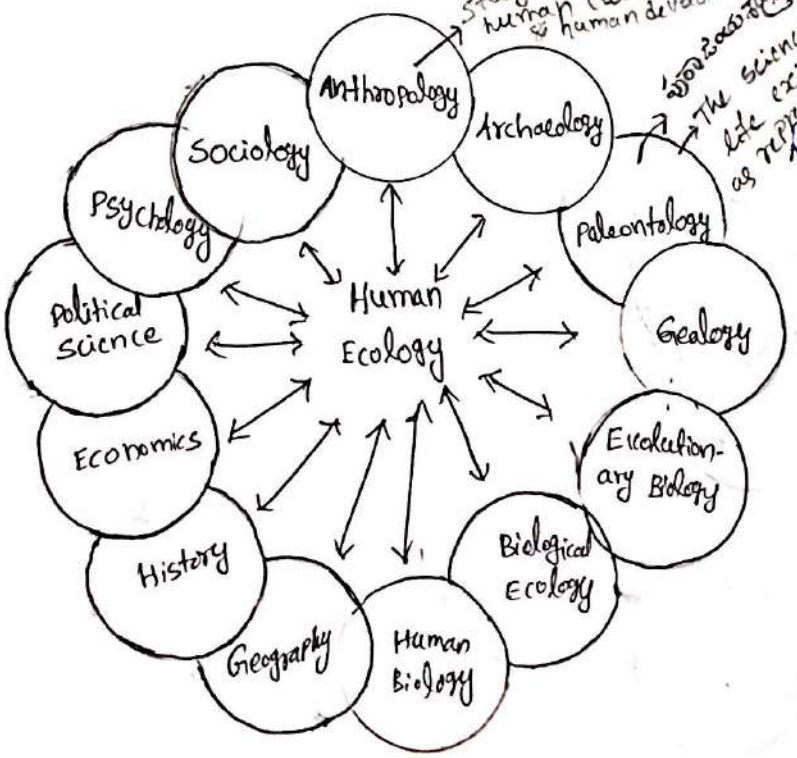
iv) Accident related disasters
- a) Forest fires
- b) urban fires
- c) Mine flooding
- d) Oil Spills
- e) Major building collapse
- f) Serial bomb blast
- g) Festival related disasters
- h) Electrical disasters and fires
- i) Air, road and rail accidents
- j) Boat capsizing
- k) village fires

v) Biological related disasters
- a) Biological disasters and epidemics
- b) Pest attacks
- c) Cattle epidemics
- d) Food Poising

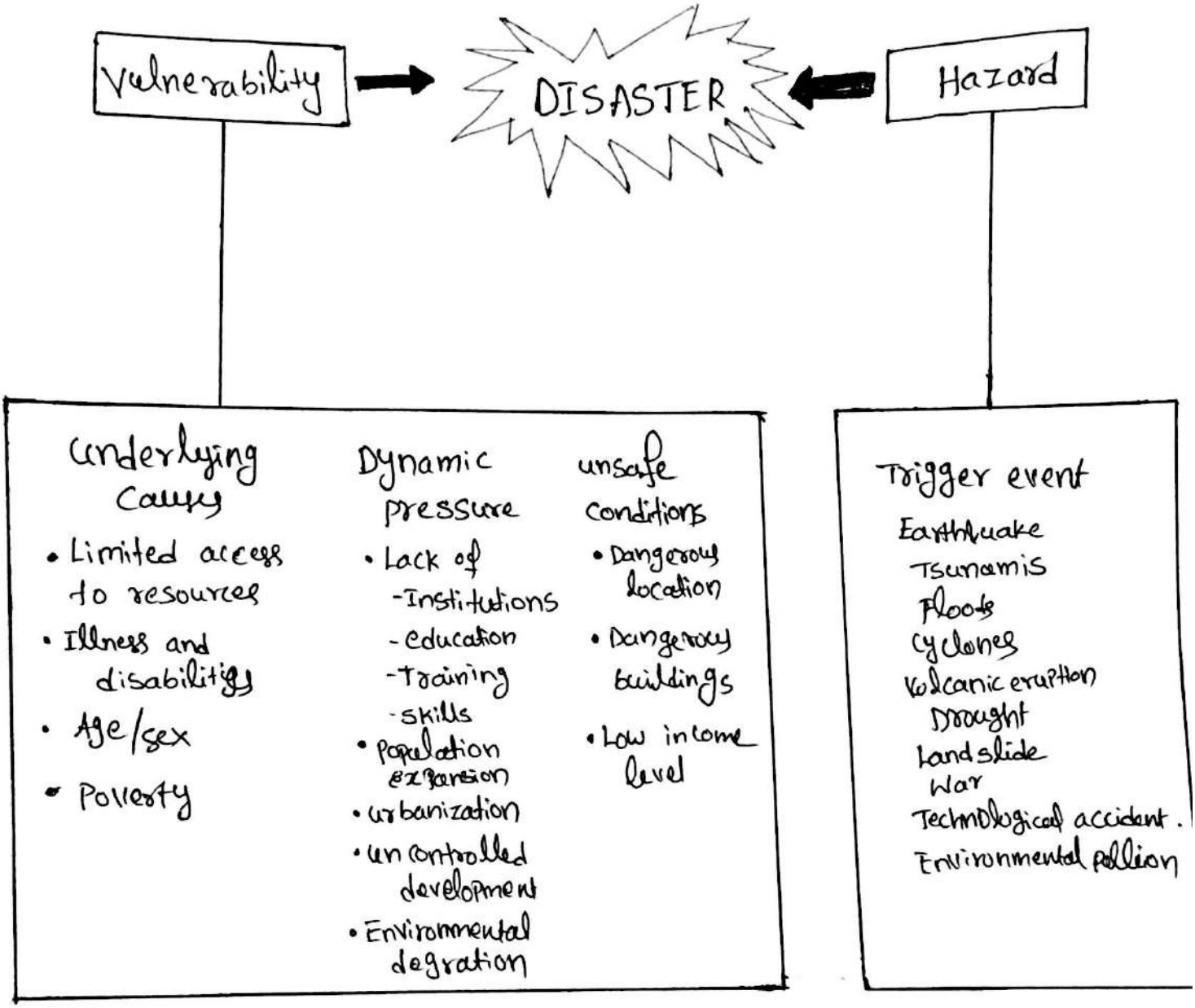
Different approaches & relation with human Ecology

Human Ecology :- Human ecology is the study of the interactions of humans with their environments, or the study of the distribution and abundance of humans. This definition is based directly on conventional definitions of biological ecology.

- Ecology is usually defined as the study of interactions of organisms with their environments and each other. More pointedly, it can be defined as the study of the distribution and abundance of organisms. This definition is deceptive. It implies much more than it says explicitly because virtually everything that humans are or do (and the same goes for any species) affects their distribution and abundance. Thus, using the term 'human ecology' actually expresses a board ambition to understand human behaviour



Relationship of Human Ecology to the tradional academic disciplines.



Concept of Risk:-

- Is the combination of probability of an event to happen and its negative consequences.

$$\text{Risk} = \frac{\text{HAZARD} \times \text{vulnerability (exposure)}}{\text{Capacity}}$$

Capacity:- Strengths, attributes and resources available with in a community, society, or organization that can be used to achieve agreed goals.

Disaster risk reduction:-

- The concept and practice of reducing disaster risks through systematic efforts to analyse and manage the causes of disasters. includes:
  - reducing exposure to hazards
  - lessening vulnerability of people and property.
  - wise management of land and the environment.
  - improving preparedness for adverse events.

Disaster risk Management:-

- using administrative directives, organization, and operational skills and capacities.
- To implement strategies, policies, and improved coping capacities.
- And so lessen the adverse impacts of hazards and the possibility of disaster.

Risk:- The probability that a community's structure or geographic area is to be damaged or disrupted by the impact of a particular Hazard, on account of their nature, construction, and proximity to a hazardous area.

Hazard Assessment:-

(Levels of Disaster)

- Hazard Assessment is the process of estimating, for defined areas, the probabilities of the occurrence of potentially damaging phenomenon of given magnitude within a specified period of time.

- The severity of a natural hazard is quantified in terms of the magnitude of occurrence, which is an event parameter. It can also be done in terms of the effect of the occurrence at a particular location. This is called site parameter. Both parameters may be combined in certain situation. Parameters for selected hazards are listed below.

Event and site parameters of selected Hazards

Natural Hazard	Event Parameter	Site Parameter
cyclone	Wind Speed - Km/h	Area affected
Earthquakes	Magnitude- Richter scale	Intensity Modified Mercalli scale
Flood	Area flooded - Km^2 volume of water - m^3 speed	Depth of flood water meters
Land slide	volume of material dislodged Area affected	Ground displacement meters.
Tsunami	Height of wave crest	Depth of flood water
Volcano	Eruption size and duration	Ash fall - meter Lava flow - area.

Disaster Phenomena and Events (Global, national and regional) :- (8)

- Natural hazards are naturally occurring physical phenomena caused either by rapid or slow onset events which can be geophysical (earthquakes, land slides, tsunamis and volcanic activity),
- hydrological (avalanches and floods), climatological (extreme temp, drought and wildfires)
- meteorological (cyclones and storms/wave surges) or biological (disease epidemics and insect/animal plagues).

What is vulnerability?

- vulnerability may be defined as "the extent to which a community, structure, services or geographic area is likely to be damaged or disrupted by the impact of particular hazard, on account of their nature, construction and proximity to hazardous terrains or a disaster prone area.
- vulnerabilities can be categorized in to physical and socio-economic vulnerability.

① Physical vulnerability :- It includes notions of who and what may be damaged or destroyed by natural hazard such as earthquakes (or) floods.

- It is based on the physical condition of people and elements at risk. such as buildings, infrastructure etc. and their proximity, location and nature of the hazard.
- It also relates to the technical capability of building and structures to resist the forces acting up on them during a hazard event.

Socio-economic vulnerability :- the degree to which a population is affected by a hazard will not in the physical components of vulnerability but also on the socioeconomic conditions.

- The socio-economic condition of the people also determines the intensity of the impact.

For example people who are poor and living in the sea coast don't have the money to construct strong concreate houses