Risk Assessment

Content

- Hazard Assessment
- Vulnerability Analysis
- Process of Risk Assessment

Risk

- The probability of meeting danger / suffering harm / loss.
- In relation to Disaster = " The Probability that a disaster will occur"
- To indicate the degree of probability = **High risk, Avg risk, Low risk**

Risk Assessment

- It includes an evaluation of all the elements that are relevant to an understanding of existing hazards & their effect on specific environment.

- Knowledge of Hazards is provided by various physical sciences :-
  Meteorology, Hydrology, Geomorphology, Seismology, Volcanology
- The understanding of vulnerability includes :-
  Physical, Social & Economic aspect

Relationship Between Risk & Vulnerability

- 'Risk' is essentially the level of possibility that an action or activity will lead to lead to a loss or to an undesired outcome, when 'vulnerability' is a weakness that makes one susceptible to an attack, a loss or an undesired outcome.

Risk Assessment

- To turn Risk assessment into a useful planning tool, accurate information must be generated from numerous & diverse sources, ranging from :-
- Remote sensing of crop yield
- Monitoring of volcanic activity
- Historic records of floods & earthquakes
- Social survey of livelihood etc.

Risk Assessment

1. Hazard Assessment

- The first step in taking any mitigation measures is to assess the hazard. It includes;

1. The nature, severity and frequency of the hazard
2. The area likely to be affected
3. The time and duration of impact

1. Hazard Assessment

- Hazard assessment begins with:-

1. Hazard Assessment

- Next step is to analyzed all collected data.

- One effective way to represent hazard assessment is through **hazard mapping.**
- **Hazard maps can be of macro/micro scale; for cyclones, flood, earthquake, tsunami & landslides.**

1. Hazard Assessment

- Data and Maps are analyzed to arrive at the hazard assessment.
- The level of hazard intensity is vary based on type of disasters.
- Tropical cyclones - wind speed
- Floods –return period, duration, inundation levels relative to river
- Earthquakes –magnitude & intensity

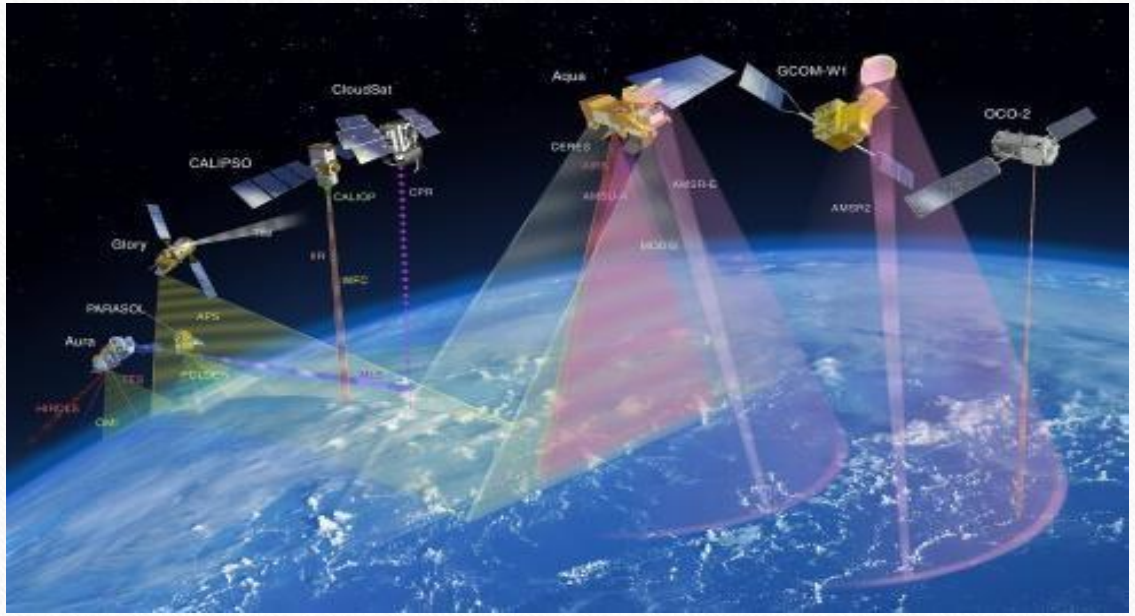
1. Hazard Assessment

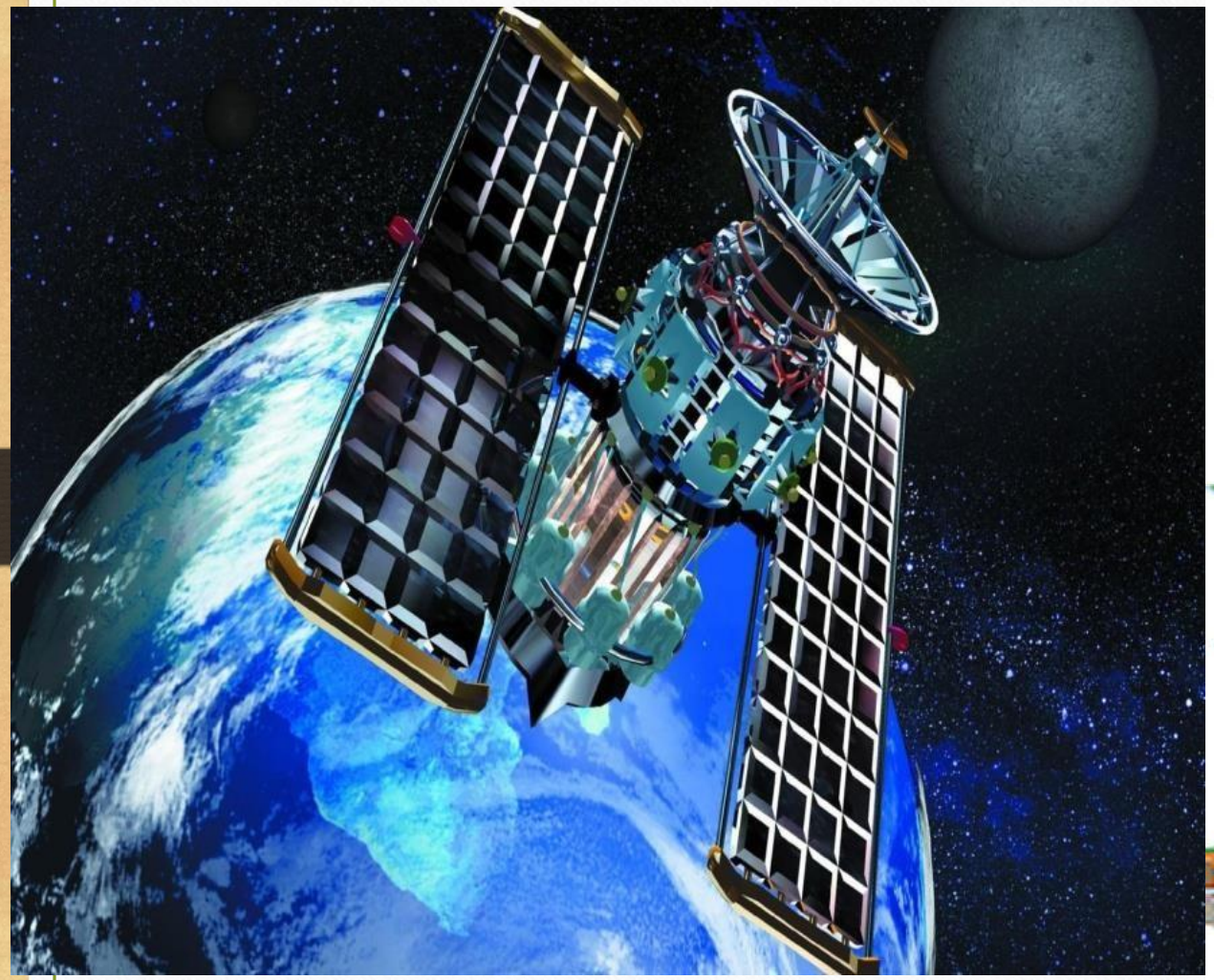
- Based on above data an attempt should be made to express the probability of the event occurring over time.
- Probabilities are assessed on the basis of scientific data and historical records.
- Sophisticated new advanced tools –for hazard mapping & assessment

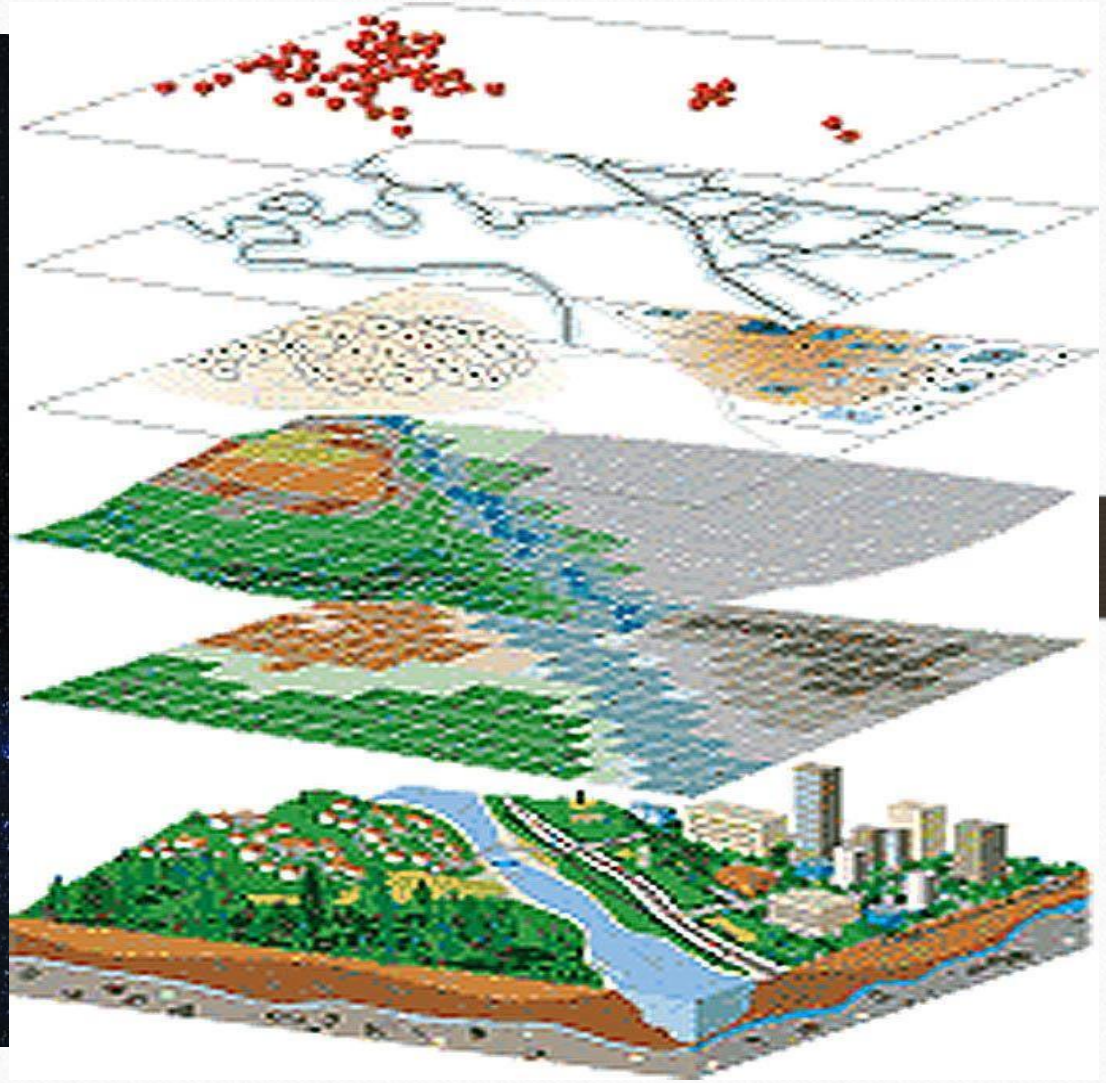
Which are those tools ??????

1. Hazard Assessment

- **Remote sensing & GIS**
- **Aerial Photography**
- **Satellite imagery**
- **Micro Computers**







1. Hazard Assessment

- These tools can provide information about the landscape, flooding, fissures, fault lines etc.
- High speed computers have a growing potential for applications in developing countries as they become more powerful.
- They can be used to store and present geographical data employing GIS techniques in the preparation of hazards map and for hazard modelling.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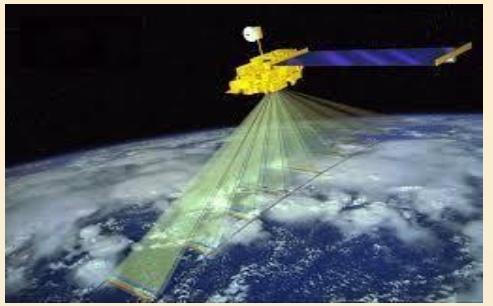

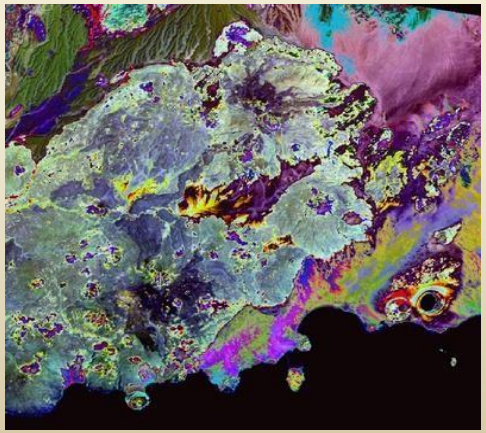

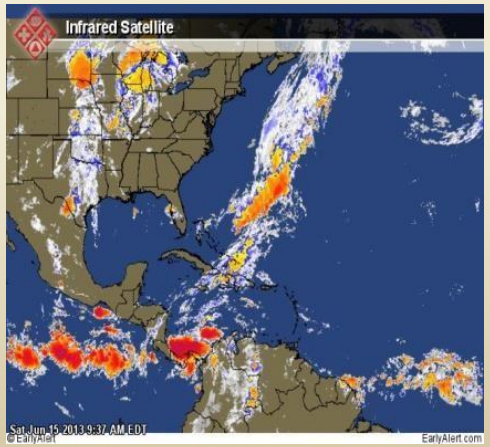
Infrared Satellite
Sat Jun 15 2013 9:37 AM EDT
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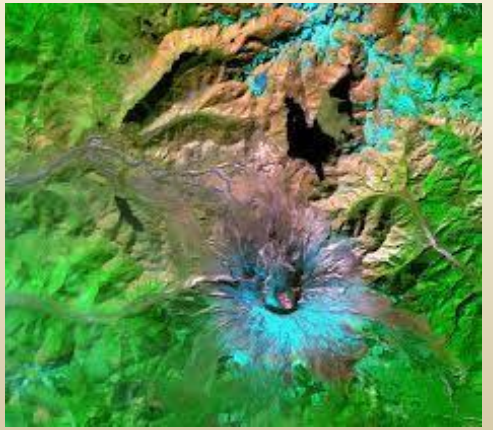

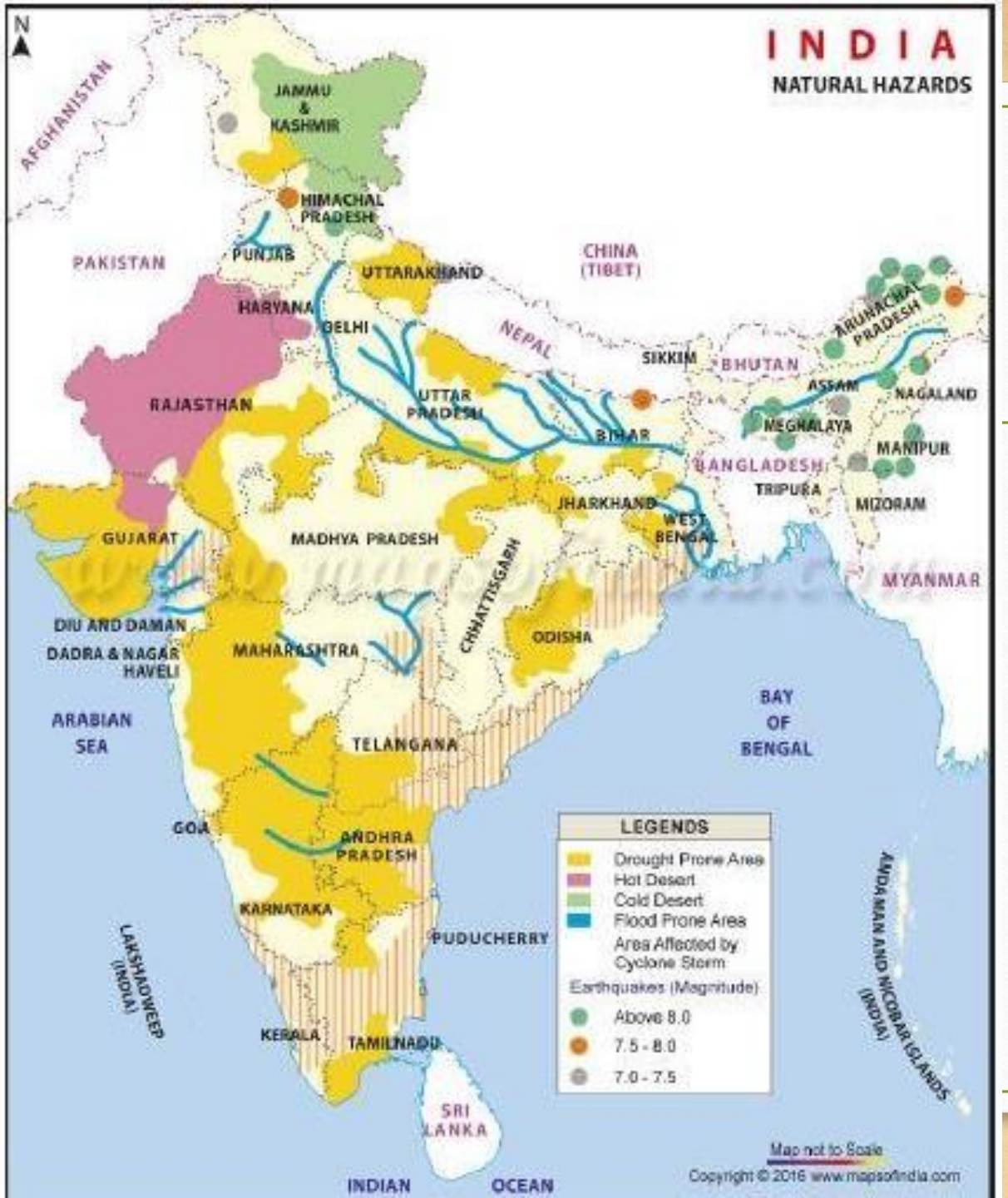
INDIA
NATURAL HAZARDS
N
AFGHANISTAN
PAKISTAN
CHINA (TIBET)
NEPAL
BHUTAN
BANGLADESH
MYANMAR
SRI LANKA
JAMMU & KASHMIR
HIMACHAL PRADESH
PUNJAB
UTTARAKHAND
HARYANA
DELHI
RAJASTHAN
UTTAR PRADESH
BIHAR
SIKKIM
ARUNACHAL PRADESH
ASSAM
NAGALAND
MEGHALAYA
MANIPUR
TRIPURA
MIZORAM
JHARKHAND
WEST BENGAL
GUJARAT
MADHYA PRADESH
CHHATTISGARH
ODISHA
DIU AND DAMAN
DADRA & NAGAR HAVELI
MAHARASHTRA
ARABIAN SEA
BAY OF BENGAL
TELANGANA
GOA
ANDHRA PRADESH
KARNATAKA
PUDUCHERRY
LAKSHADWEEP (INDIA)
KERALA
TAMILNADU
ANDAMAN AND NICOBAR ISLANDS (INDIA)
INDIAN OCEAN
LEGENDS
Drought Prone Area
Hot Desert
Cold Desert
Flood Prone Area
Area Affected by Cyclone Storm
Earthquakes (Magnitude)
Above 8.0
7.5 - 8.0
7.0 - 7.5
Map not to Scale
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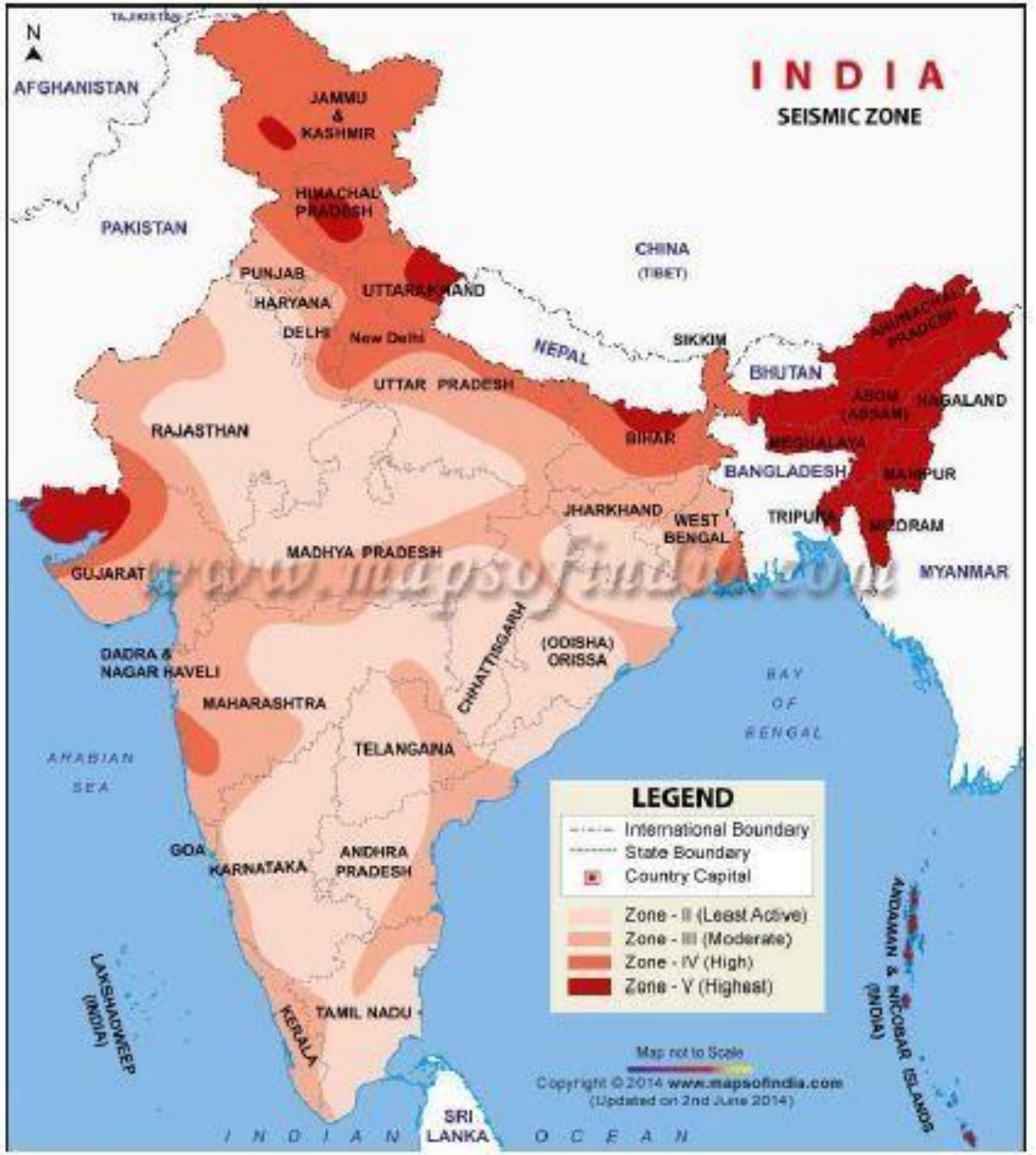
INDIA
SEISMIC ZONE
N
AFGHANISTAN
PAKISTAN
CHINA
(TIBET)
NEPAL
BHUTAN
BANGLADESH
MYANMAR
SRI LANKA
JAMMU & KASHMIR
HIMACHAL PRADESH
PUNJAB
HARYANA
DELHI
New Delhi
UTTARAKHAND
UTTAR PRADESH
SIKKIM
ARUNACHAL PRADESH
ASSAM
NAGALAND
MEGHALAYA
MANIPUR
TRIPURA
MIZORAM
RAJASTHAN
BIHAR
JHARKHAND
WEST BENGAL
MADHYA PRADESH
GUJARAT
CHHATTISGARH
(ODISHA) ORISSA
DADRA & NAGAR HAVELI
MAHARASHTRA
TELANGANA
GOA
KARNATAKA
ANDHRA PRADESH
TAMIL NADU
KERALA
LAKSHADWEEP (INDIA)
ANDAMAN & NICOBAR ISLANDS (INDIA)
ARABIAN SEA
BAY OF BENGAL
INDIAN OCEAN
LEGEND
International Boundary
State Boundary
Country Capital
Zone - II (Least Active)
Zone - III (Moderate)
Zone - IV (High)
Zone - V (Highest)
Map not to Scale
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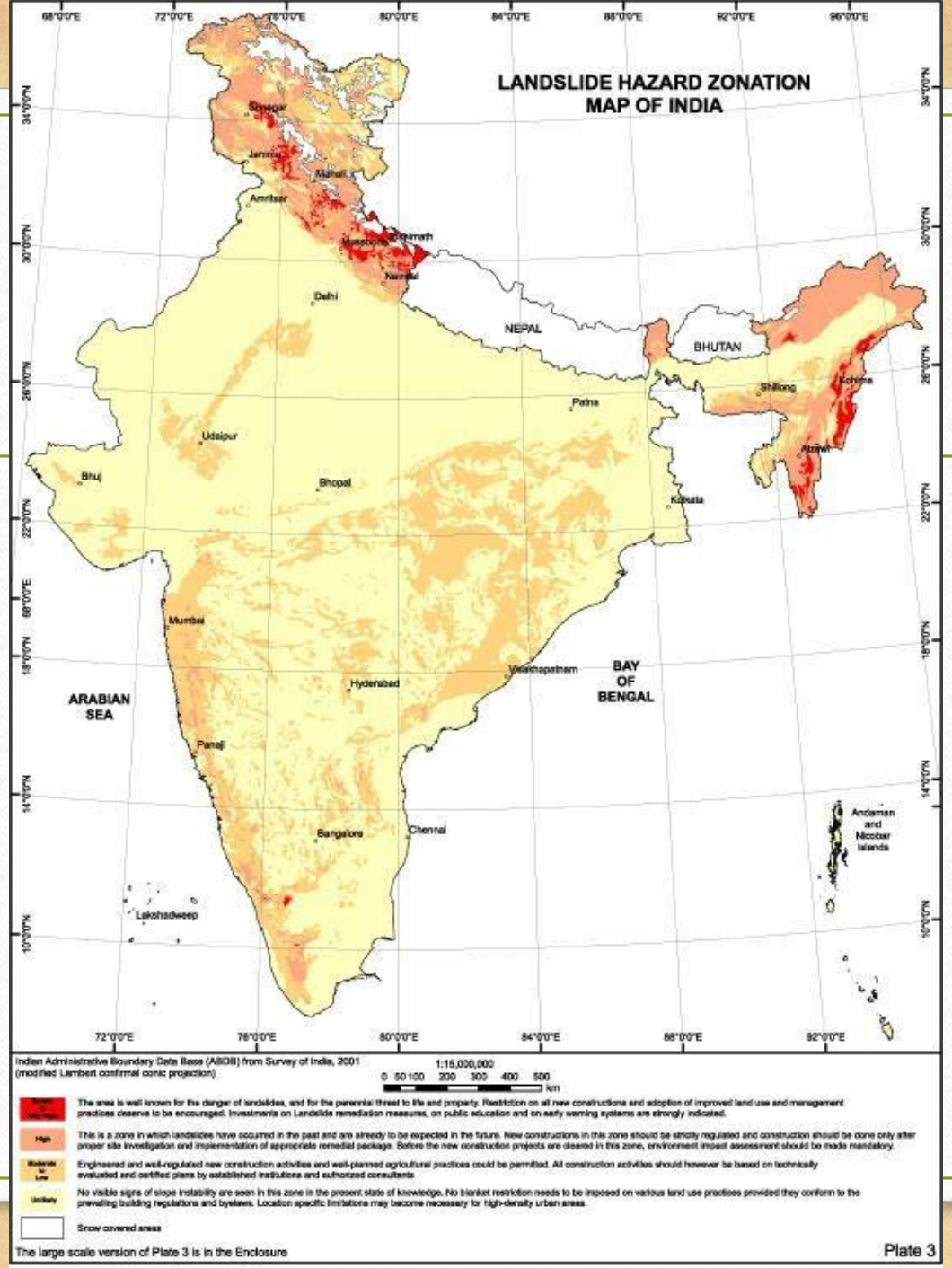
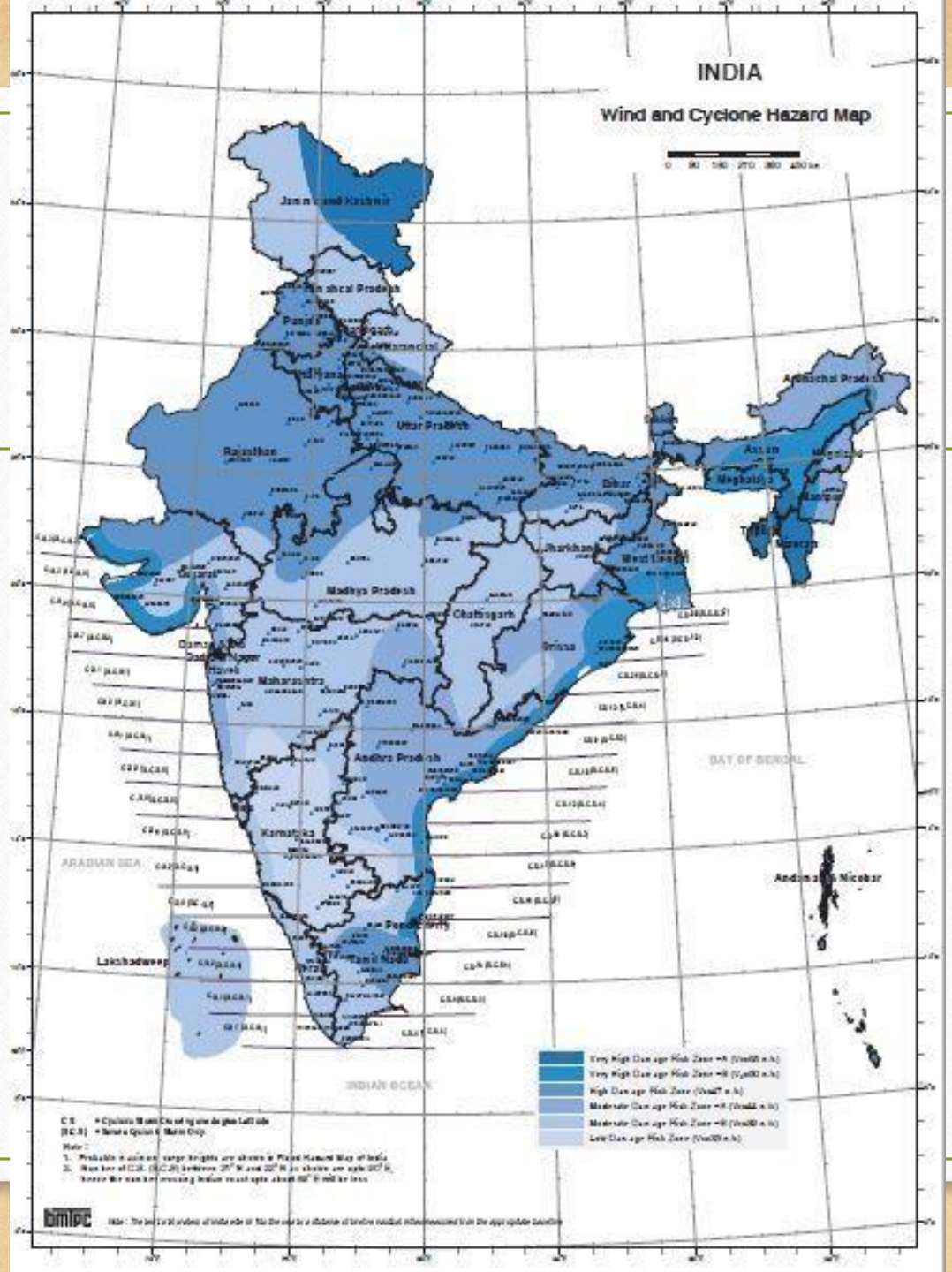
(Updated on 2nd June 2014)




INDIA
Wind and Cyclone Hazard Map
Jammu and Kashmir
Himachal Pradesh
Punjab
Uttaranchal
Haryana
Delhi
Rajasthan
Uttar Pradesh
Bihar
Arunachal Pradesh
Assam
Meghalaya
Jharkhand
West Bengal
Sikkim
Madhya Pradesh
Chattisgarh
Orissa
Gujarat
Daman and Diu
Dadra and Nagar Haveli
Maharashtra
Andhra Pradesh
Karnataka
Goa
Tamil Nadu
Pondicherry
Lakshadweep
Andaman & Nicobar
ARABIAN SEA
BAY OF BENGAL
INDIAN OCEAN
imtpc

2. Vulnerability Analysis

- This is the process used to identify vulnerable conditions which are exposed to natural hazards.
- If an area is exposed to multiple hazards, vulnerability analysis should be carried out for each type of hazard.
- Vulnerability analysis provides information on:

1. The sectors at risk; physical, social, economic
2. The type of risk

2. Vulnerability Analysis

- Vulnerability analysis results in an understanding of the level of exposure of persons and property to the various natural hazards identified.
- Vulnerability relates to buildings, infrastructures, agricultural crops, trees, livelihood damages etc.

Disaster Risk Assessment

- It is a process of **collecting and analyzing information** about the **nature, likelihood and severity** of disaster risks.
- Risk assessment is a **management activity** that involves defining and analyzing a problem before initiating the process of decision-making.

Phases in Disaster Risk Assessment

1. Defining a problem means determining what needs to be assessed and planning to undertake that assessment.
2. Research and analysis involve generating information on the various aspects of risk, such as those of occurrence, probabilities and impact.
3. Decision making is the process of ranking risks or outcomes on the basis of specific criteria and then assessing risk reduction options.


NATURAL
DISASTERS
HEALTH
MOVEMENT
LAHARS
GAMMA
RAY
WATER
VOLCANOES
DISASTER
STORMS
WALL
AREAS
PEOPLE
LANDSLIDES
BLIZZARDS
HYPERNOWAE
TECTONIC
VIOLENT
TSUNAMIS
HAZARDS
UNDERSTANDING
THUNDERSTORMS
LOST
EARTHQUAKE
HAZAR
WAVES
EVEN
LOSS
FIRE
VOLCANIC
ACTUALLY
BASE
OFTEN
CONTINUOUSLY
EARTH'S
LOSSES
VIBRATIONS
EVENT
SHAPE
TRIGGER
ERUPTION
DISEASE
FLOOD
RELATING
INVOLVEMENT
UNNATURAL
PRODUCE
NEIGHBORED
LEADS
SHAFTS
LOW-HANGING
AFFECTS

1. Problem Identification

- It is a first phase in Disaster Risk Assessment.
- It involves determining the goal of the risk assessment process.
- Input and partnership with a variety of development sectors and disciplines are required for effectively defining a problem.

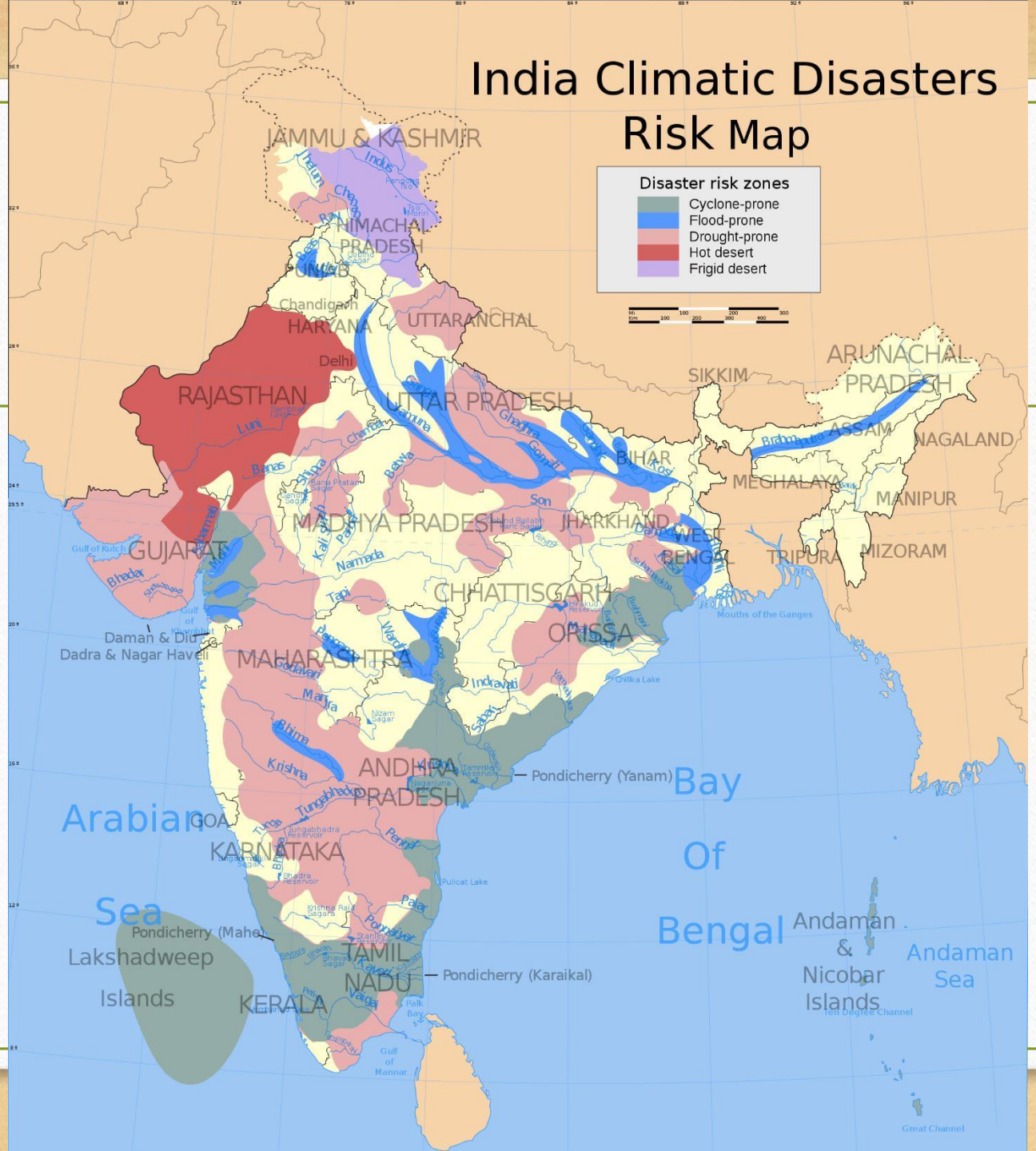
2. Research and Analysis

- It is a second phase of Disaster Risk Assessment.
- Research methodology must be transparent and carefully planned.
- Well research planning reduce the risk and also helpful in good co-ordination across services and minimize long-term resources wastage.

3. Decision Making

- It is comprised three part:

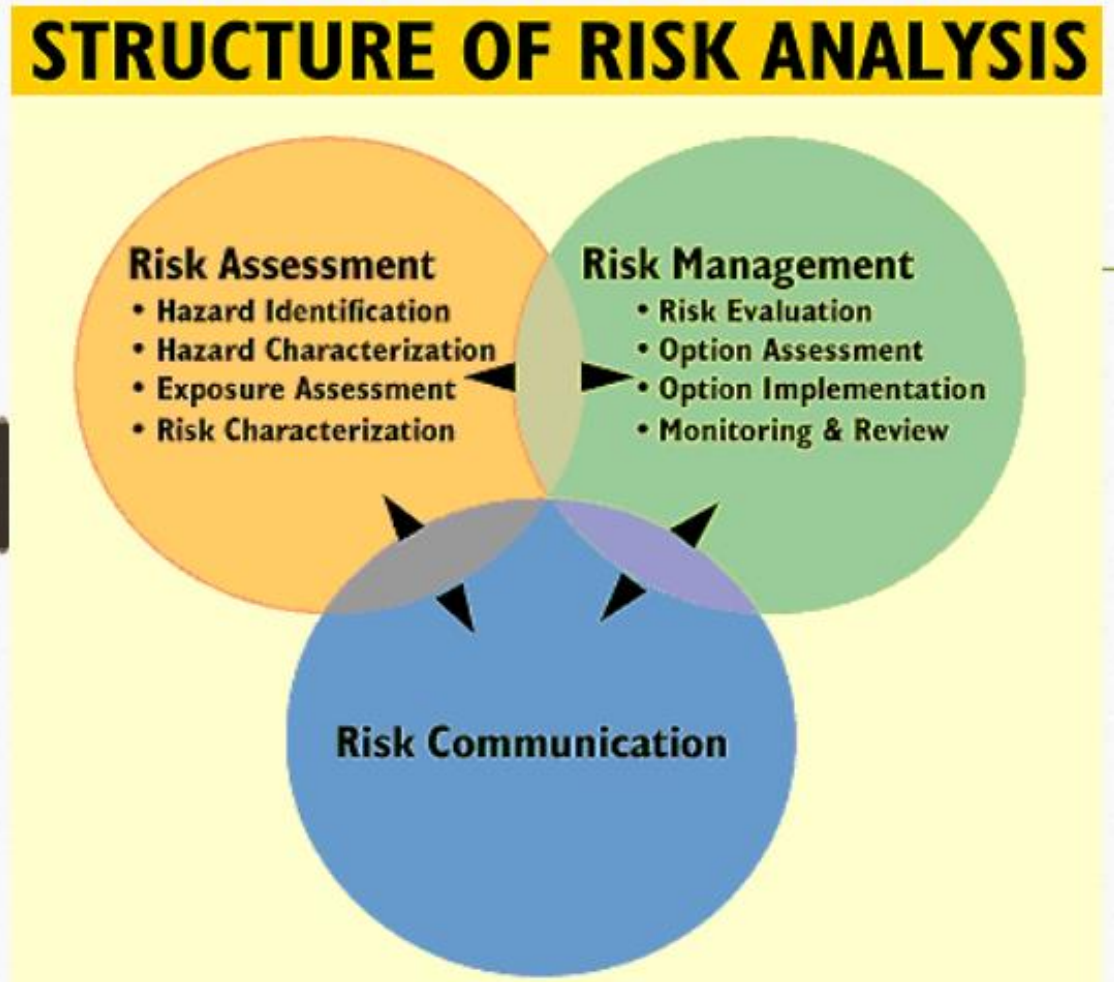
1. Risk Evaluation –setting criteria for cost-benefit analysis
2. Risk Characterization –integrating information from hazard & vulnerability
3. Risk Communication – it is an interactive process of the constant exchange of information


India Climatic Disasters Risk Map
Disaster risk zones
Cyclone-prone
Flood-prone
Drought-prone
Hot desert
Frigid desert
JAMMU & KASHMIR
HIMACHAL PRADESH
PUNJAB
Chandigarh
HARYANA
UTTARANCHAL
Delhi
RAJASTHAN
UTTAR PRADESH
SIKKIM
ARUNACHAL PRADESH
ASSAM
NAGALAND
BIHAR
MEGHALAYA
MANIPUR
MADHYA PRADESH
JHARKHAND
WEST BENGAL
TRIPURA
MIZORAM
GUJARAT
CHHATTISGARH
ORISSA
Daman & Diu
Dadra & Nagar Haveli
MAHARASHTRA
ANDHRA PRADESH
Pondicherry (Yanam)
Arabian Sea
GOA
KARNATAKA
Bay Of Bengal
Pondicherry (Mahe)
Lakshadweep Islands
TAMIL NADU
Pondicherry (Karaikal)
KERALA
Andaman & Nicobar Islands
Andaman Sea
Mouths of the Ganges
Ten Degree Channel
Great Channel
Gulf of Mannar
Gulf of Kutch
Palk Bay
Pulicat Lake
Chilika Lake

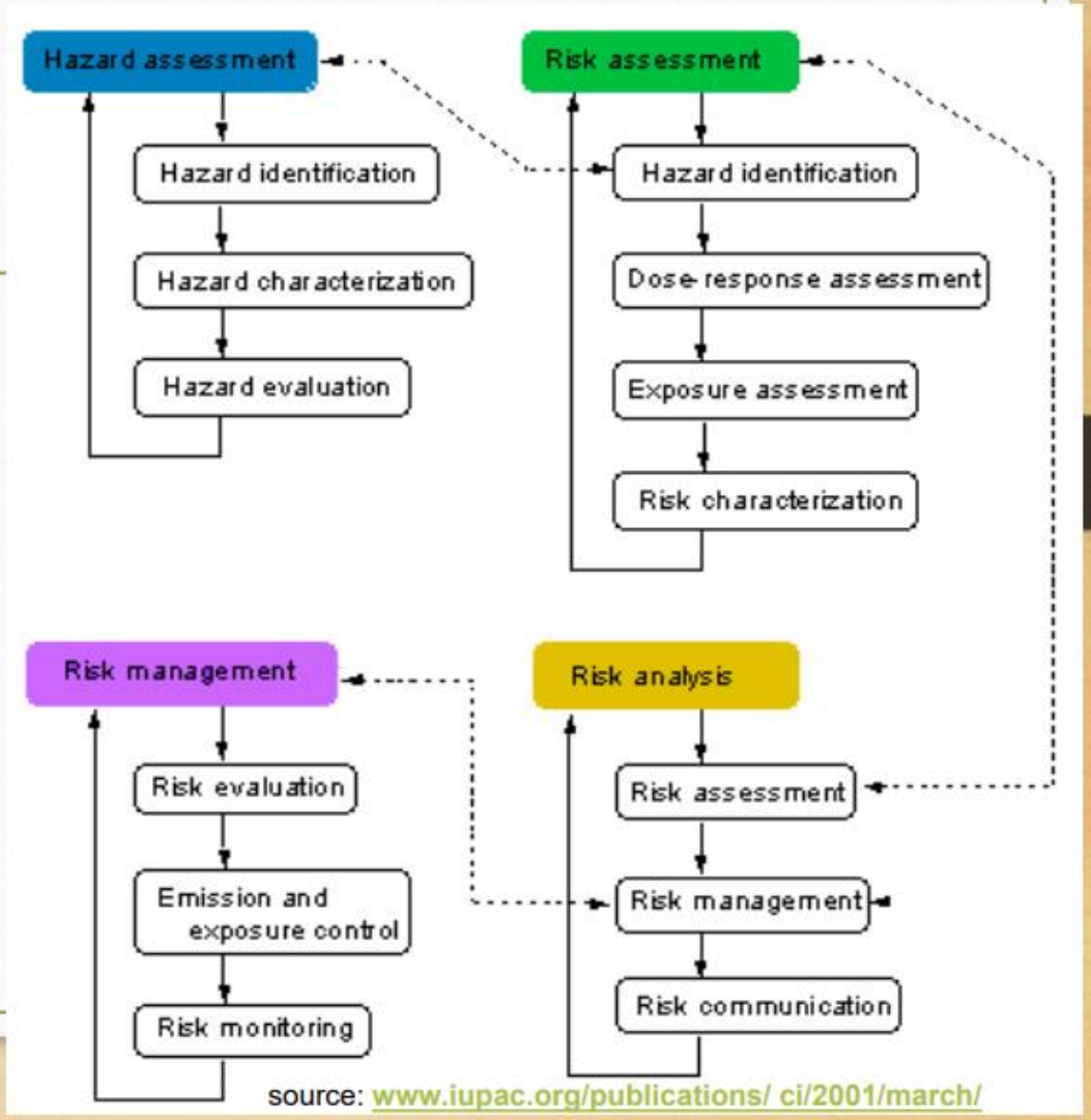
Disaster Risk Assessment, supported with good monitoring systems, are essential for:-

- Effective Disaster Risk Management and Risk reduction planning
- Sustainable development planning
- Identifying the potential threats that can undetermined a development's success and sustainability
- Identifying high risk periods and conditions
- Activating preparedness and response actions.

How Risk Management fits into the process



: www.fao.org/WAICENT/faoinfo/economic/ esn/risk/risktext.htm



source: www.iupac.org/publications/ ci/2001/march/

Types of Risk

Background risk

- This is the risk what people are exposed to from given medium (such as water, air, soil, etc.)

Incremental risk

- This is the risk due to addition of an external pollutants in the medium or occurrence of any event (events such as oil spill, contamination of water with poison, release of carbon monoxide gas in a closed room

Total Risk

- This is the total risk a person or any receptor is exposed from a given medium
- It represents both background and incremental risk

Acceptable Risk

- This is the allowable risk a particular contaminant can result in on any receptor.

Problem

- In U.S. excess lifetime risk of getting a cancer is 1×10^{-6} (i.e., acceptable risk) and background risk of getting a cancer is say 1×10^{-5} .

– Calculate total risk of getting a cancer?

– Calculate risk ratio?

Solution:

(1) Here, Incremental risk of getting a cancer = 1×10^{-6}

Background risk of getting a cancer = 1×10^{-5}

So, total risk of getting a cancer (using Eq. 2)

$= (1\times10^{-5}) + (1\times10^{-6}) = 10^{-5}(1+10^{-1})$ ***$=1.1\times10^{-5}$***

2) *Risk Ratio* = r= $(1.1\times10^{-5})/(1\times10^{-6}) = 11 > 1$ (=> concern)

Problem 2

- The WWTP discharges 103 virus particles/100 mL after Ghat 1 (which are pathogenic). Say, a person baths at Ghat 1 (upstream of a discharge point) and also baths at Ghat 2 (downstream of the discharge point). Background risk of getting a waterborne disease = 1:10,000 (i.e., 10^{-4})
- Which ghat can pose higher total risk to a person?

Solution

Demand type	GHAT 1	GHAT 2
Background Risk water borne disease		
Incremental Risk water borne disease		
Total Risk water borne disease		
COMMENT		

STAGES of RISK ASSESSMENT

Hazard Identification-

Defining hazard and nature of harm

•Exposure assessment-

Determination of concentration in environment and estimation of ingestion or inhalation rate of a contaminant

Dose-response assessment-

Quantification of effect due to exposure of a particular contaminant.

A relationship between dose and response is used.

Risk characterization-

Estimating of the potential impact of a hazard based on the severity of its effects and the amount of exposure.

Steps involved in Disaster Risk Assessment

- Step-1 Identify the specific Disaster Risk
- Step-2 Analyze the Disaster Risk
- Step-3 Evaluate the Disaster Risk
- Step-4 Monitoring and communication of Disaster Risk Information

Step-1 Identify the specific Disaster Risk

- Identify and describe the hazard, keeping in mind the frequency with which it occurs, its magnitude, the affected area and duration
- Describe and quantify vulnerability to determine susceptibilities and capacities.
- Estimate the loss consequent to a hazard on those that are vulnerable

Step-2 Analyze the Disaster Risk

- Estimate the level of risk associated with a specific threat to determine whether the resulting risk is a priority matter or not.
- Estimating the level of risk is done by analyzing the impact or consequences that a disaster is likely to have.

Step-3 Evaluate the Disaster Risk

- This stage involves the evaluation of the disaster risk being assessed in relation to other risk.
- It involves undertaking a much more comprehensive assessment of specific threats and establishes priorities for action.
- The priority at-risk people, areas, communities, households and developments identified during this stage.

Stage-4 Monitoring and communication of Disaster Risk Information

- This stage required to inform ongoing disaster risk assessment and planning.
- It involves monitoring disaster risks and the effectiveness of risk reduction initiatives.
- It also involves updating and disseminating disaster risk assessment information to all stakeholders.

Thank You