DISASTER MANAGEMENT

B.Tech VI semester (Autonomous) IARE R-16

By

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S.No	COURSE OBJECTIVES
I	Identify the major disaster types and develop an understanding of modern disaster management.
II	Recognize and develop awareness of the chronological phases of natural disaster response and refugee relief operations.
III	Understand the key concepts of disaster management related to development and the relationship of different disaster management activities.
IV	Categorize the organizations that are involved in natural disaster assistance and relief system.

COs	COURSE OUTCOMES
CO1	Describe the concept of environmental hazards and disasters: meaning of environmental hazards, environmental disasters and environmental stress; concept of environmental hazards.
CO2	Types of environmental hazards and disasters: Natural hazards and disasters.
CO3	Understand the concept of endogenous hazards, volcanic eruption, earthquakes, landslides, volcanic hazards/ disasters, causes and distribution of volcanoes.
CO4	Categorize the organizations that are involved in natural disaster assistance and relief system.
CO5	Understand the concept of Emerging approaches in disaster management i.e pre, disaster stage (preparedness),emergency stage and post disaster stage, rehabilitation.

UNIT	TITLE	CONTENTS
I	**Environmental Hazards & Disasters**	Meaning of Environmental hazards, Environmental Disasters and Environmental stress. Concept of Environmental Hazards, Environmental stress &Environmental Disasters. Different approaches & relation with human Ecology. Landscape Approach- Ecosystem Approach - Perception approach- Human ecology & its application in geographical researches.
II	**Types of Environmental hazards and Disasters**	Man induced hazards & Disasters Natural Hazards- Planetary Hazards/ Disasters - Extra Planetary Hazards/ disasters–Planetary Hazards-Endogenous Hazards - Exogenous Hazards.

UNIT	TITLE	CONTENTS
III	**Endogenous hazards**	Endogenous Hazards - Volcanic Eruption Earthquakes - Landslides - Volcanic Hazards/ Disasters - Causes and distribution of Volcanoes - Hazardous effects of volcanic eruptions - Environmental impacts of volcanic eruptions - Earthquake Hazards/ disasters - Causes of Earthquakes - Distribution of earthquakes - Hazardous effects of - earthquakes - Earthquake Hazards in India - Human adjustment, perception & mitigation of earthquake.
IV	**Exogenous hazards**	Hazards/ Disasters- Man induced Hazards /Disasters- Physical hazards/ Disasters-Soil Erosion.
V	**Emerging approaches in disaster management**	Emerging approaches in Disaster Management. Three Stages 1. Pre, disaster stage (preparedness) 2. Emergency Stage 3. Post Disaster stage, Rehabilitation.

UNIT I

ENVIRONMENTAL HAZARDS AND DISASTERS

DEFINITIONS OF DISASTER

"A disaster can be defined as any occurrence that cause damage, ecological disruption, loss of human life, deterioration 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 without assistance". American Red Cross (ARC)

Phases of disaster

DISASTER MANAGEMENT CYCLE

Disaster management aims to reduce, or avoid, the potential losses from hazards, assure prompt and appropriate assistance to victims of disaster, and achieve rapid and effective recovery.

The Disaster management cycle illustrates the ongoing process by which governments, businesses, and civil society plan for and reduce the impact of disasters, react during and immediately following a disaster, and take steps to recover after a disaster has occurred.

Appropriate actions at all points in the cycle lead to greater preparedness, better warnings, reduced vulnerability or the prevention of disasters during the next iteration of the cycle. The complete disaster management cycle includes the shaping of public policies and plans that either modify the causes of disasters or mitigate their effects on people, property, and infrastructure.

The mitigation and preparedness phases occur as disaster management improvements are made in anticipation of a disaster event. Developmental considerations play a key role in contributing to the mitigation and preparation of a community to effectively confront a disaster.

As a disaster occurs, disaster management actors, in particular humanitarian organizations, become involved in the immediate response and long-term recovery phases. The four disaster management phases

Mitigation - Minimizing the effects of disaster.

Examples: building codes and zoning; vulnerability analyses; public education.

Preparedness - Planning how to respond.

Examples: preparedness plans; emergency exercises/training; warning systems.

Response - Efforts to minimize the hazards created by a disaster.

Examples: search and rescue; emergency relief .

Recovery - Returning the community to normal.

Examples: temporary housing; grants; medical care.

DISASTER PREPAREDNESS

- Nurses are often the first medical personnel on site after disaster strikes
- To facilitate preparation with community
- To provide updated record of vulnerable populations within community
- Nurse leads a preparedness effort
- Nurse(**Nurses** are often the first medical personnel on site after **disaster** strikes) play multirole in community
- Nurse should have understanding of community resources
- Disaster Nurse must be involved in community organization

DISASTER RESPONSE

- Nurse must involve in community assessment
- Once rescue workers begin to arrive at the scene, immediate plans for triage should begin
- Nurse work a member of assessment team
- To be involved in ongoing surveillance

DISASTER RECOVERY

- Successful Recovery Preparation
- Be vigilant in Health teaching Psychological support
- Referrals to hospital as needed
- Remain alert for environmental health
- Nurse must be attentive to the danger

DISASTER-EFFECTS

- Disability
- Increase in communicable disease
- Psychological problems
- Deaths
- Socioeconomic losses
- Shortage of drugs and medical supplies.
- Environmental disruption
- Food shortage

DISASTER DRILL

A disaster drill is an exercise in which people simulate the circumstances of a disaster so that they have an opportunity to practice their responses.

TYPES OF OF DISASTER

TYPES OF OF DISASTER

Natural Disasters

Natural disasters are extreme, sudden events caused by environmental factors that injure people and damage property. Earthquakes, floods, and disease all strike anywhere on earth, often without warning. As examples, we've chosen disasters that have occurred around the world throughout history.

- Floods
- Tsunami
- Earthquake
- hurricane's

TYPES OF OF DISASTER

Man-made Disasters

Human-made disaster is disaster resulting from man-made hazards as opposed to natural disasters resulting from natural hazards. Human-made disaster admits that all disasters are caused by humans. Human-made disaster involves an element of human intent, negligence, or error; or involving a failure of a man-made system.

- Industrial Accidents
- Transportation Accidents
- Nuclear & Chemical Disasters
- Terrorism

DISASTER-EFFECTS

- Disability
- Increase in communicable disease
- Psychological problems
- Deaths
- Socioeconomic losses
- Shortage of drugs and medical supplies.
- Environmental disruption
- Food shortage

DISASTER-EFFECTS

Unlike the West, which is economically better equipped to handle climate change and its repercussions, its countries like India and China which will bear the brunt of disasters caused by rising emissions and a warmer planet. Temperatures in three Indian cities Chennai, Mumbai and Delhi in the last five decades have seen a steady rise.

DISASTER-EFFECTS

DISASTER-EFFECTS

Bhopal Gas Tragedy (1984)

The Bhopal Gas Tragedy is one of the world's worst industrial catastrophes. It occurred on the night of 2-3 December, 1984 at the Union Carbide India Limited (UCIL) Pesticide plant in Bhopal which was the Indian subsidiary of Union Carbide Corporation, USA. The accident occurred due to leakage of Methyl Iso Cynate (MIC) and other chemicals due to ingression of water and the resulting reaction affected a large number of persons. Approximately 2000 people are known to have died in the first 72 hours and large proportion of the survivors suffered acute multi-system morbidities (eyes and lungs were the target organs). The ICMR estimated that approximately 62.58% of the total population in Bhopal suffered from inhalational toxicity. The people who resided in areas close to the carbide factory were exposed to higher concentration of potentially lethal toxic gases.

DISASTER-EFFECTS

DISASTER-EFFECTS

Kutch Earthquake (2001)

The Kutch earthquake of 26th January, 2001 was one of the worst natural disasters to strike in Gujarat. It posed enormous challenges because of its magnitude, intensity and geographical spread for rescue, relief and rehabilitation.

Overall 7633 villages in 21 out of 25 districts of Gujarat were affected to varying degrees. The districts most affected were Kutch, Surendaranagar, Jamnagar, Rajkot, Patan and Ahmedabad.

DISASTER-EFFECTS

Tsunami (2004)

The Dec 26th 2004 Indian ocean tsunami caused extensive damage to the infrastructure including harbours, jetties, roads, bridges, power, telecom, hospitals, schools and other social sector buildings besides human loss of 9395 persons and 3,964 were missing after the disaster. The estimated loss in monetary terms including damage to property was reported at ` 11544.91 crore (Andhra Pradesh- ` 342.67 crore, Kerala- ` 2371.02 crore, Tamil Nadu- `4528.66 crore, Andman & Nicobar Islands ` 3836.56 and Puducherry – ` 466.00 crore). In terms of housing, 86,688 houses were damaged, with 53,192 vulnerable to damage. Approximately 12000 hectares of agricultural land was damaged and 3000 hectares of land was rendered unusable due to salinity in the soil. A total 47 Fishing Landing Centres (FLC) got damaged and approximately 28000 boats were damaged.

Tsunami (2004)

DISASTER DRILL

A disaster drill is an exercise in which people simulate the circumstances of a disaster so that they have an opportunity to practice their responses.

PHASES OF DISASTER MANAGEMENT

- Disaster Preparedness
- Disaster impact
- Disaster Response
- Rehabilitation
- Disaster Mitigation

DISASTER PREPAREDNESS

- Preparedness should be in the form of money, manpower and materials
- Evaluation from past experiences about risk
- Location of disaster prone areas
- Organization of communication, information and warning system
- Ensuring co-ordination and response mechanisms
- Development of public education programme
- Co-ordination with media
- National & international relations
- Keeping stock of foods, drug and other essential commodities.

DISASTER PREPAREDNESS

E.g.: Indian Meteorological department (IMD) plays a key role in forewarning the disaster of cyclone-storms by detection tracing. It has 5 centres in Kolkata, Bhubaneswar, Vishakapatanam, Chennai & Mumbai. In addition there are 31 special observation posts setup a long the east coast of India.

The International Agencies which provides humanitarian assistance to the disaster strike areas are United Nation agencies.

- Office for the co-ordination of Humanitarian Affair (OCHA) World Health Organization (WHO)
- UNICEF
- World Food Programme (WFP)
- Food & Agricultural Organisation (FAD)

E.g.: Non Governmental Organizations

- Co-Operative American Relief Every where (CARE) International committee of Red cross
- International committee of Red cross

DISASTER IMPACT

DISASTER RESPONSE

- Epidemiologic(relating to the branch of medicine which deals with the incidence, distribution, and control of diseases) surveillance and disease control
- Vaccination
- Nutrition

REHABILITATION PHASE

- Water supply
- Food safety
- Basic sanitation and personal
- Hygiene
- Housing

Disaster mitigation

This involves lessening the likely effects of emergencies. These include depending upon the disaster, protection of vulnerable population and structure.

For examples, improving structural qualities of schools, houses and such other buildings so that medical causalities can be minimized. Similarly ensuring the safety of health facilities and public health services including water supply and sewerage system to reduce the cost of rehabilitation and reconstruction. This mitigation compliments the disaster preparedness and disaster response activities.

A LANDSCAPE APPROACH FOR DISASTER RISK REDUCTIC

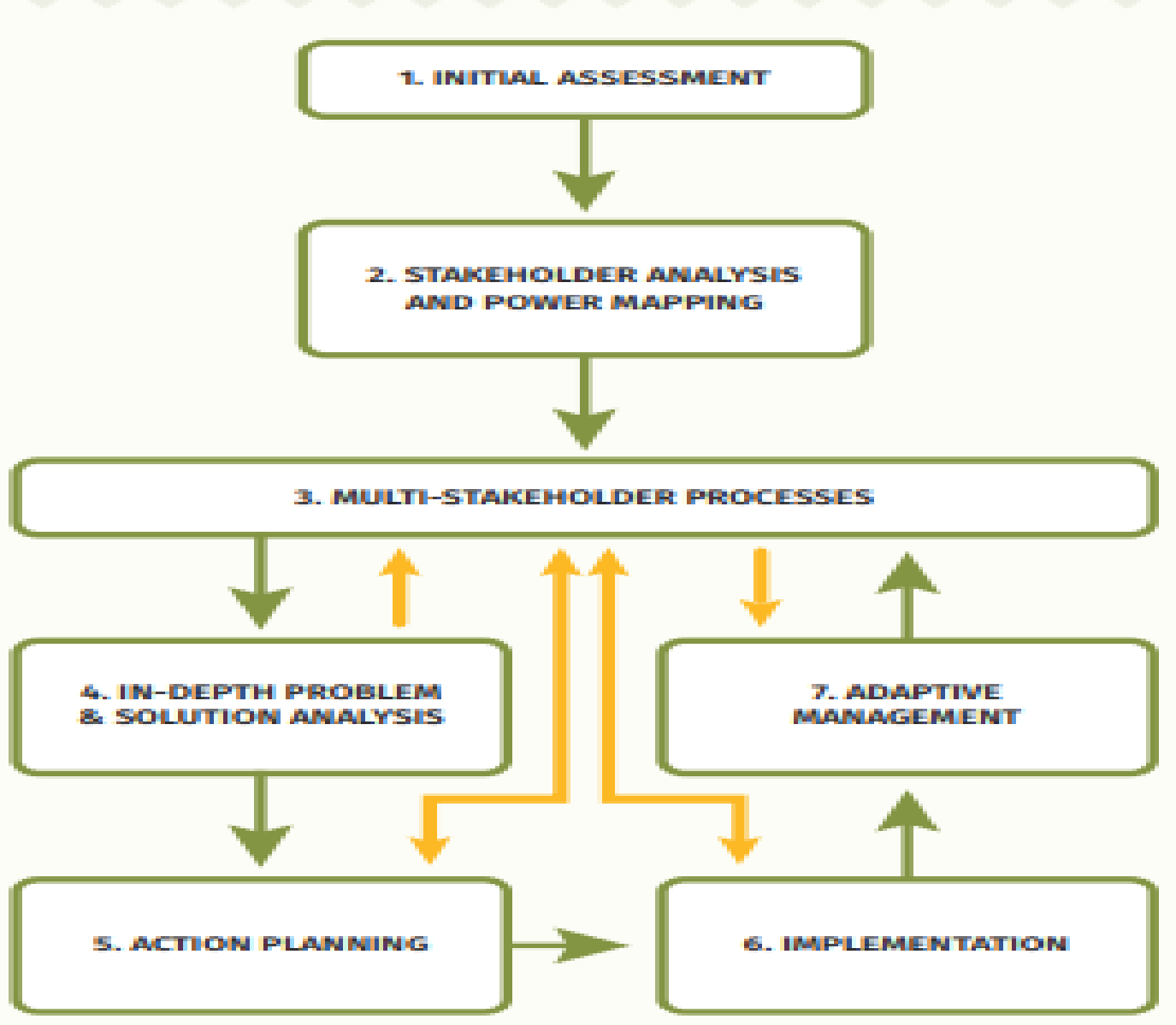
A **landscape approach** is an interdisciplinary, cross -sectoral and holistic approach to help overcome barriers by sector and contribute to effective risk management by connecting all stakeholders involved, starting with the communities at risk in the landscape

Main characteristics of the landscape approach:

- It places communities at the center.
- It takes into account all actors .
- It examines the entire landscape in which risks originate and manifest themselves.

- It examines the entire landscape in which risks originate and manifest themselves
- It includes an analysis of the hydrology
- It integrates ecosystem management and restoration
- It manages trade-offs
- It is flexible to future changes
- It demands for a long-term perspective

STEPS 7 FOR DISASTER RISK REDUCTION



Step1: **Carry out an initial assessment of the risk landscape**

- Find common concerns
- Understand drivers of risk, capacities and assets of communities and their enabling environment
- Conduct organizational self assessment
- Go/no go decision

Step 2: **Conduct an in-depth stakeholder analysis and power mapping**

- Stakeholder analysis
- Explore gender dimension
- Develop business case per key stakeholder

Step3: **Stimulate multi-stakeholder processes and create coalitions of the willing**

- Build on existing initiatives
- Create a coalition of the willing
- Agree on the core problem
- Strengthen stakeholder capacity

Step 4: **Conduct a collaborative, in-depth problem and solution analysis**

- Identify root causes
- Explore stakeholders' roles in relation to the core problems
- Include traditional, local and scientific knowledge
- Identify possible solutions

Step 5: **Carry out collaborative (action) planning**

- Develop landscape scenarios
- Agree on tasks, responsibilities and communication strategies
- Keep funding in mind
- Divide the landscape into manageable units

Step6: **Organise collaborative implementation**

- Implement interventions that address drivers of risk, capacities and assets of communities, and the enabling environment
- Secure quick wins
- Link long-term risk reduction goals to socio-economic benefits
- Make use of synergies
- Promote ownership

Step 7: **PROMOTE ADAPTIVE MANAGEMENT**

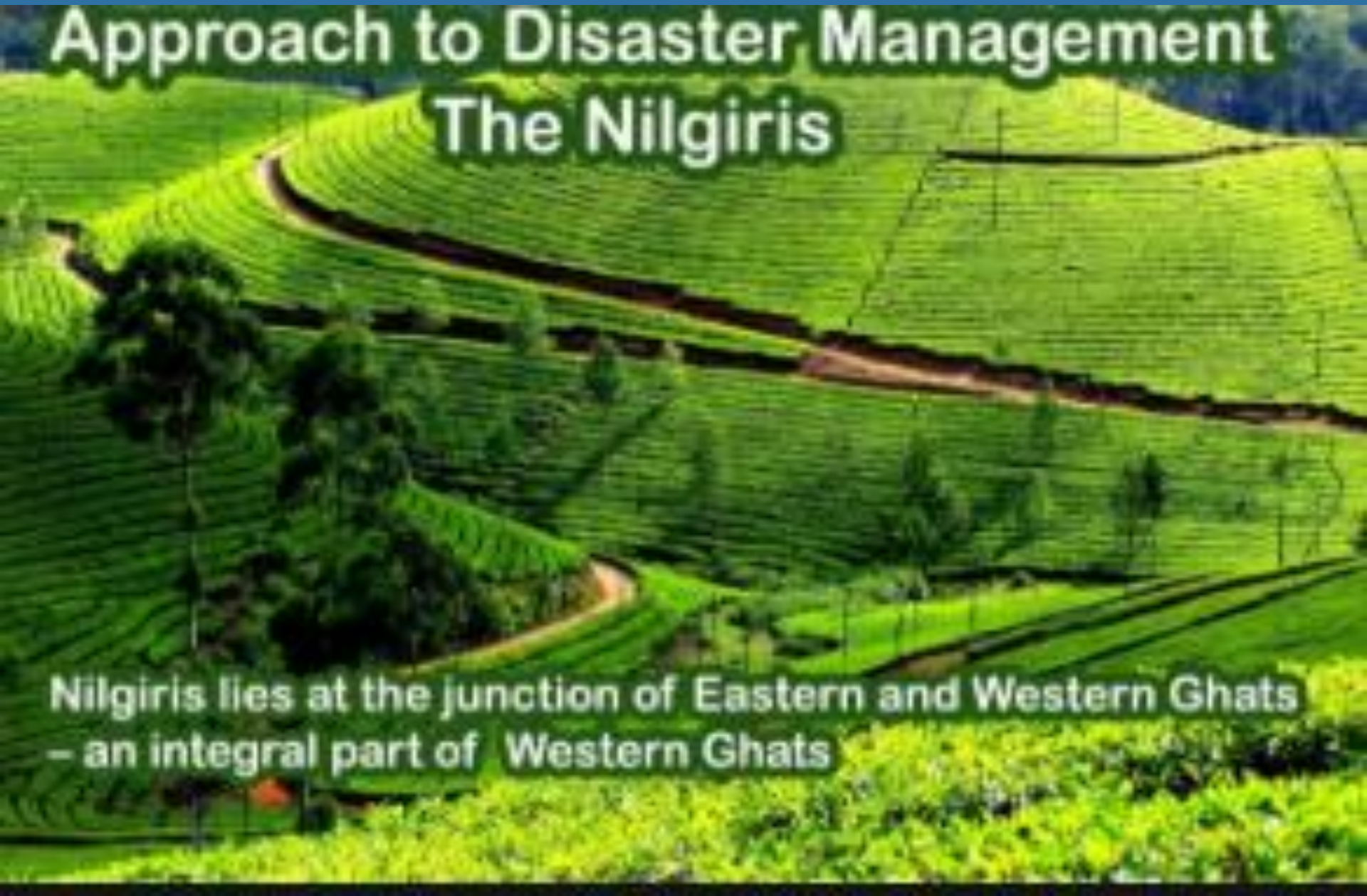
- Track changes in drivers of risk, capacities and assets of communities and enabling environment
- Involve research institutes in M&E
- Use M&E outcomes to improve landscape management
- Ensure flexible project management

District Disaster Management Plans

AIDMI's national campaign on local Disaster Management Planning (including city and department DM plans) reached out to 53 districts; 14 cities and 15 department; in 2016-2017.

Approach to Disaster Management

The Nilgiris



UNIT-2

Types of Environmental hazards and Disasters

Natural Disasters

Importance of natural disasters

- Natural disasters are important, because they don't only effect buildings and land, they affect human beings. They can severely injure or kill. They tare families apart.
- Natural disasters caused the death of 295,000 people in 2010.

Effects of natural disasters

- Natural disasters can effect everyone, everywhere. Even if it didn't happen in your state or area, the cost effects the nation as a whole.

- In 2009, natural disasters cost insurers about $110 billion. In 2010, the cost was double that, at $218 billion.

Effects of natural disasters

- 10,000 people have died in Japan's latest Tsunami/earthquake.
- Katrina caused about $81 billion dollars in property damage alone

- There were about 454,000 living in metropolitan New Orleans in 2001. Only this year has New Orleans recently surpassed 350,000 citizens.

- 80% of New Orleans was flooded, with some parts under 15 feet of water. total property damage was estimated at $81 billion.

How to Prevent

• Natural disaster are something that can not be stopped, or prevented, but we can do some thing's before and after disasters to help reduce the amount of trauma caused by these disasters.

Ways to Help

- Donate to organizations that deal with natural disaster relief .
- Volunteer with these organizations.
- Help rebuild cities.
- Many organizations that are based around helping, supporting, and rescuing victims, are places that you can donate to and where they raise money.

Natural Disasters

- Natural disasters don't just create damage when it hits. The effects after can be worse. Many of them can cause lose ground, creating landslides. Some can start fires in your homes, also it can cause the loss of everything you know.

Man made disaster

We are now living in a civilized society. The days of illiteracy and ignorance have gone. Man has made much progress in the field of science and technology. Man has created wealth out of natural resources for his comfortable living. Man has cut forests recklessly to clear the land for cultivation and along with this ENVIRONMENTAL DEGRADATION has taken place, which also affects his life. Man is becoming his own enemy because he has also created weapons of mass destruction and these weapons are used against humanity, which further brings sorrow, and suffering to mankind. This is just example of manmade disaster which shows in daily news paper and well known

Man made disaster

- NUCLEAR ACCIDENTS
- CHEMICHAL DISASTERS
- BIOLOGICAL DISASTERS
- GLOBAL WARMING
- TERRORIST ATTACKS
- POLLUTION

Man made disaster

natural disasters were not enough, humans have contributed their own share of catastrophic accidents. As new technology develops, unseen risks or improper precautions can result in tragedy. Even when every safety measure is taken, extreme weather can lead to disastrous consequences. Upon the invention of trains, we had train derailments. Upon splitting the atom, we had nuclear disasters. Learn about some of the most (and least) common man-made disasters, some historical examples, and how we try and prevent them.

Nuclear & Chemical Disasters

Though they've been infrequent since the discovery of nuclear fission in the 1930s, there have been a few instances where attempts to harness nuclear power have gone horribly awry. These disasters can leave miles of land uninhabitable for decades, or even centuries. Leaks of dangerous chemicals can have a similar effect, though these are generally less severe.

Bomb Threats

If you receive a bomb threat, get as much information from the caller as possible. Keep the caller on the line and record everything that is said. Then notify the police and the building management if applicable.

If you are notified of a bomb threat, do not touch any suspicious packages. Clear the area around suspicious packages and notify the police immediately. In evacuating a building, don't stand in front of windows, glass doors or other potentially hazardous areas. Do not block sidewalk or streets to be used by emergency officials or others still exiting the building.

Suspicious Parcels & Letters

Be wary of suspicious packages and letters. They can contain explosives, chemical or biological agents. Be particularly cautious at your place of employment. Some typical characteristics postal inspectors have detected over the years, which ought to trigger suspicion, include parcels that:

- Are unexpected or from someone unfamiliar to you
- Are marked with restrictive endorsements, such as "Personal," "Confidential" or "Do not x-ray"
- Have protruding wires or aluminum foil, strange odors, or stains
- Show a city or state in the postmark that doesn't match the return address
- Are of unusual weight, given their size, or are lopsided or oddly shaped
- Are marked with any threatening language
- Have inappropriate or unusual labeling

Suspicious Parcels & Letters

With suspicious envelopes and packages other than those that might contain explosives, take these additional steps against possible biological and chemical agents:

- Refrain from eating or drinking in a designated mail handling area.
- Place suspicious envelopes or packages in a plastic bag or some other type of container to prevent leakage of contents. Never sniff or smell suspect mail.
- If you do not have a container, then cover the envelope or package with anything available (e.g., clothing, paper, trash can, etc.) and do not remove the cover.
- Leave the room and close the door, or section off the area to prevent others from entering.
- Wash your hands with soap and water to prevent spreading any powder to your face.

Nuclear disaster

- One of the scariest things about nuclear power is when something goes wrong and an accident occurs. Radiation is released into the environment and people get hurt. Two of the most famous nuclear accidents occurred at the Three Mile Island reactor 2 in the United States and the Chernobyl reactor 4 in the former Soviet Union. In this text we will discuss these two disasters, along with correcting a few common misconceptions about nuclear accidents.
- Nuclear weapons are thus, far more destructive and harmful to the society than any other weapon. Many countries in the world have developed nuclear energy. The developed countries reiterate that nuclear energy will be used only for
- Nuclear radiation keeps on showing its effect for a considerable period of time even after its explosion, and those who survive become mental and physical wrecks due to the impact of nuclear radiation.
- In case of a nuclear explosion, nothing much can be done. Some precautions however may be taken.
- We should stay inside keeping doors and windows shut to protect ourselves against nuclear radiation.
- We should keep ourselves informed about the government plants and should act in accordance with official communication.
- Nuclear activity may affect our health and cause nausea, giddiness, vomiting etc., and for that medical help should be taken

Natural Disaster

Disaster Database

- Avalanche
- Earthquakes
- Hurricanes
- Landslides
- Thunderstorms
- Tornados
- Tsunami
- Volcanoes

Avalanches

- Avalanches Happen on every continent.
- A large scale can release up to 300,000 cubic yards of snow.
- The biggest factor of avalanche possibility is the accumulation snow over the winter season .
- More snow - bigger avalanche.

Earthquakes

- Earthquakes are caused by the release of built up pressure caused by the shifting of tectonic plates.

- Earthquakes usually occur on fault lines, or areas where tectonic plates meet.

- The size of an earthquake is measured using the logarithmic based Richter scale

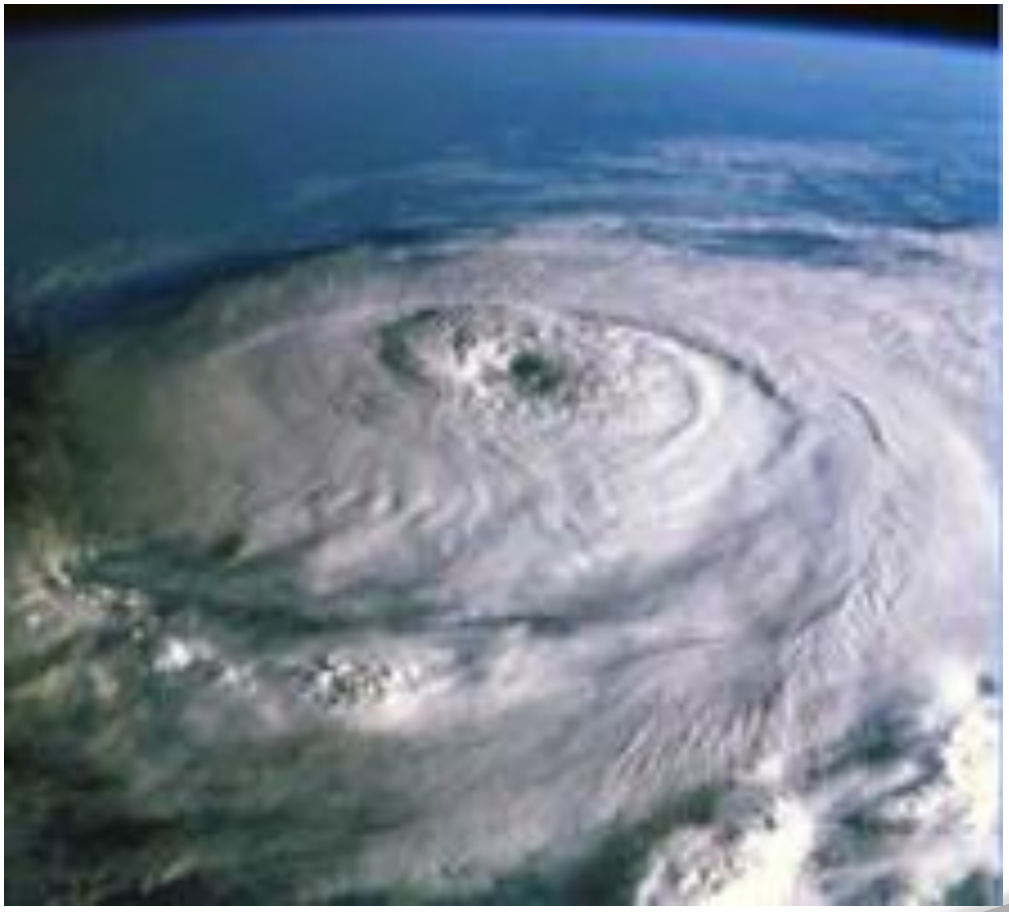
Hurricanes

- A hurricane is a tropical storm with winds over 74mph.

- Hurricanes occupy the most intense level of the three levels of tropical storms.

- Hurricanes rotate or circulate counter-clockwise in the northern hemisphere.

- Hurricanes can only occur over the Atlantic ocean, Caribbean sea, and gulf of Mexico



Landslides

- Landslides are the movement of land down a slope by gravity.
- They can be triggered by rain, floods, and earthquakes as well as man- made factors such as slope grading or mining.
- Landslides have the potential to happen anywhere a steep slope is present.

Thunder Storms

- Every Thunderstorm produces lightning.
- There is wet thunder and dry thunder, the difference being whether or not rain in produced.
- Warm humid conditions favor thunderstorms.
- Only 10% of thunderstorms are classified as severe.
- Your chance of being struck by lightning is 1 in 600,000

Tornados

- A tornado is defined as a violently rotating column of air extending from a thunderstorm to the ground.

- Tornados are found in almost every part of the world.

- Tornados are most common in the United States, just east of the Rocky Mountains in an area called Tornado Ally.

- Waterspouts are weak tornados over water and can move inland and become tornados.

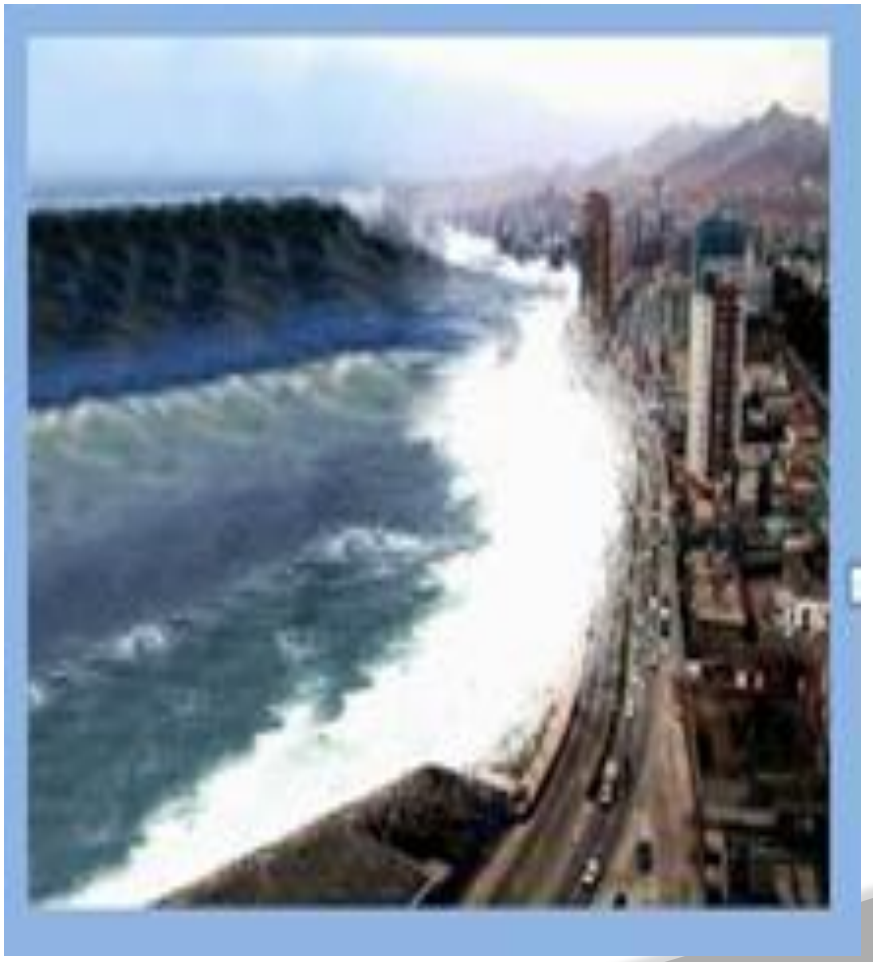
Tsunamis

- On the seafloor, volcanic eruptions, earthquakes, and even landslides can lead to tsunamis.

- Tsunamis can travel over 300mph.

- Tsunamis can have an amplitude of up to 32ft.

- Hawaii is the most vulnerable place in the world for tsunamis

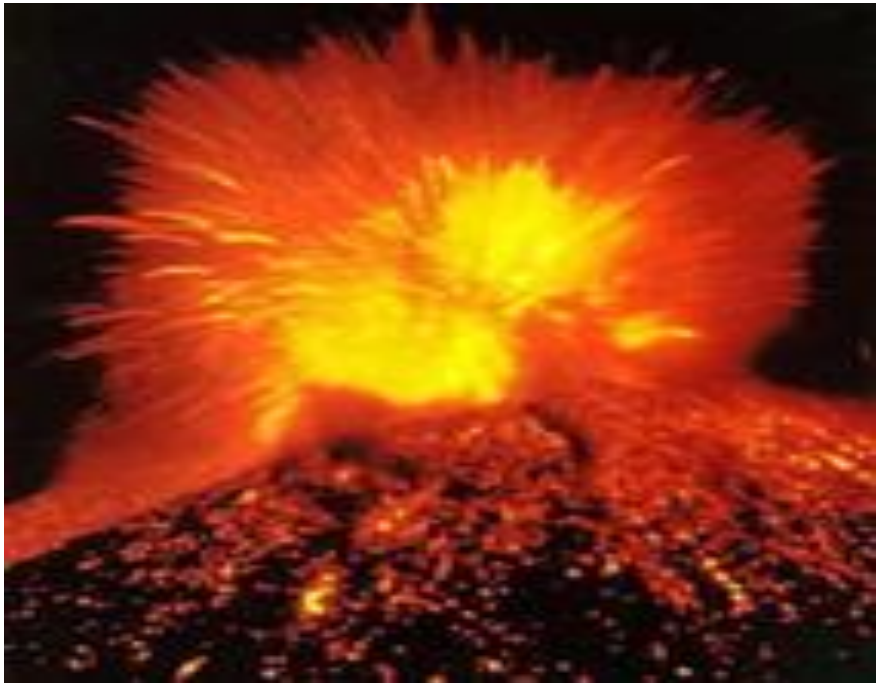


Volcanoes

• Volcanoes are lava filled mountains that erupt when the pressure becomes to great for them to hold it inside.

• The contents that a volcano spews forth is called magma.

• Indonesia has the most volcanoes of all the countries in the world.



UNIT-3

Endogenous Hazards

Earthquakes constitute one of the worst natural hazards which often turn into disaster causing widespread destruction and loss to human life.

The effects of earthquake vary upon the magnitude and intensity. Earthquakes occur every now and then all round the world, except in some places where earthquakes occur rarely. The devastation of cities and towns is one of the effects of earthquake.

What is an Earthquake

An Earthquake is the result of a sudden release of energy in the earth's crust that creates seismic waves.

The seismic activity of an area refers to The frequency, type and size of arthquakes experienced over a period of time

For example:

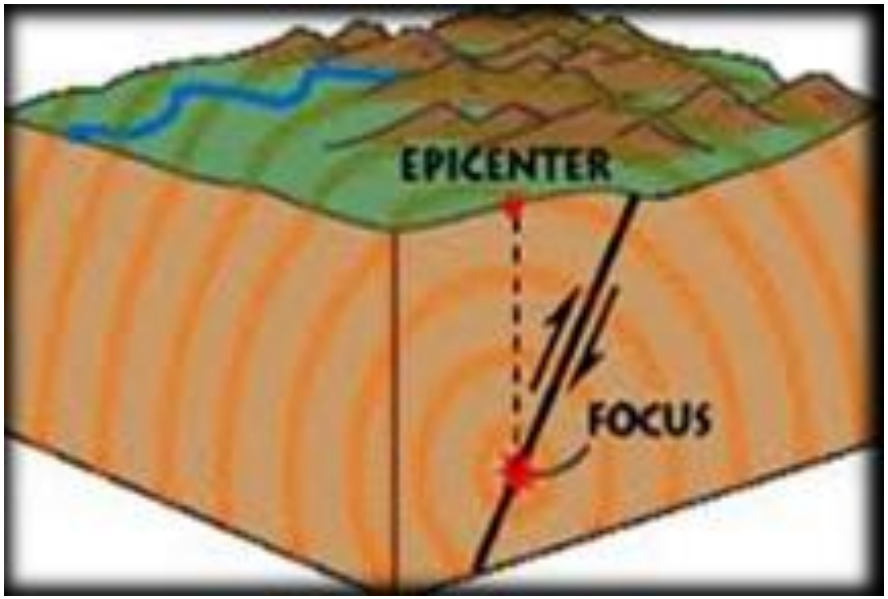
If you throw stone in a pond of still water , series of waves are produced on the surface of water , these waves spread out in all directions from the point where the stone strikes the water.

similarly, any sudden **disturbances in the earth's crust may produce vibration in the crust which travel in all direction from point of disturbances.**

Terms related to earthquake

Focus(Hypocenter):

Focus is the point on the fault where rupture occurs and the location from which seismic waves are released.



Epicenter:

Epicenter is the point on the earth's surface that is directly above the focus ,the point where an earthquake or underground explosion originates.

Fault Line:

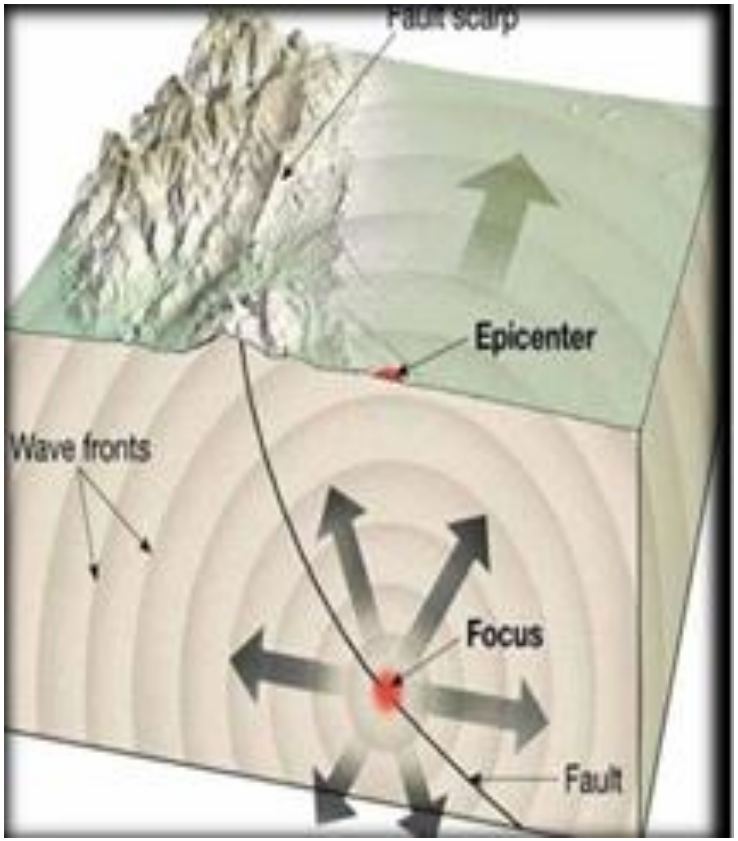
A Fault line is the surface trace of a fault, the line of intersection between the earth's surface.

Fault plane:

Fault plane are the crackes or sudden slips of the land .

Fault Scrap:

A Fault scrap is the topographic expression of faulting attributed to the displacement of the land surface by movement along faults.



Causes Of Earthquake

The primary cause of an earthquake is faults on the crust of the earth.

“A Fault is a break or fracture b/w two blocks of rocks in response to stress.”

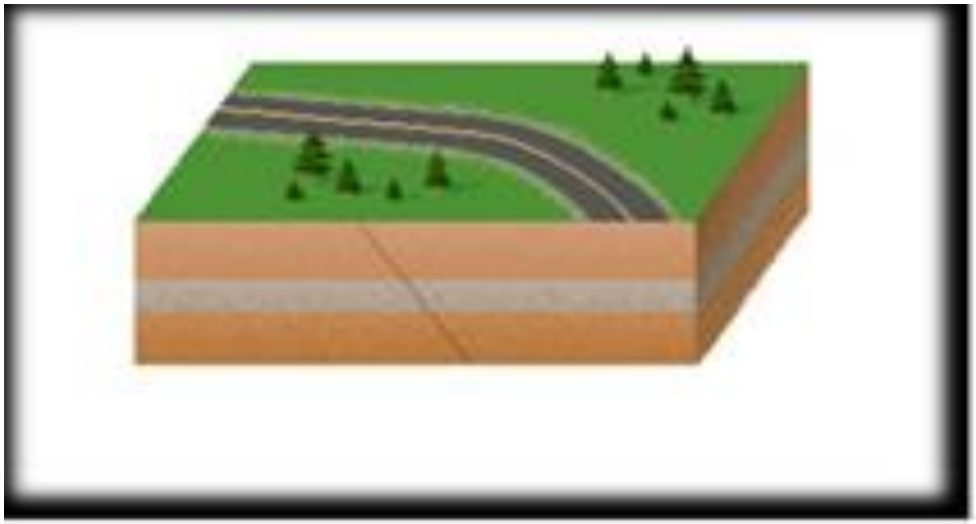
This movement may occur rapidly, in the form of an earthquake or may occur slowly, in the form of creep.

Earth scientists use the angle of the fault with respect to the surface (known as the dip) and the direction of slip along the fault to classify faults.

Classification Of Faults

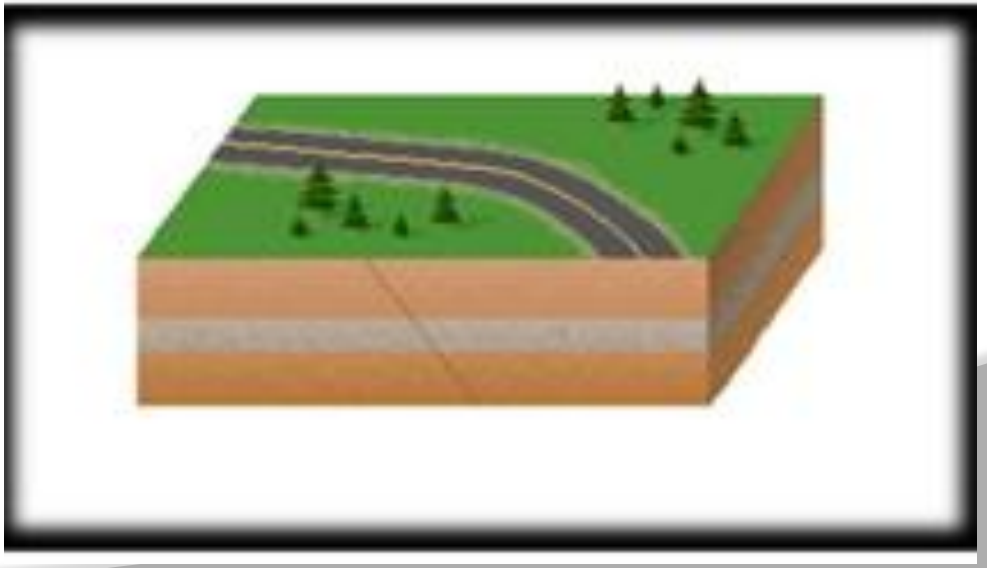
Normal fault:

A dip-slip fault in Which the block above the fault has moved downward relative to the block below.



Thrust (reverse)fault:

A dip-slip fault in which the upper block, above the fault plane, moves up and over the lower block.



Strike-slip fault:

A left-lateral strike-slip fault :
It is one on which the displacement of the far block is to the left when viewed from either side.

A right-lateral strike-slip fault:
It is one on which the displacement of the far block is to the right when viewed from either side.

Major causes of Earthquakes

Some major causes of earthquakes on basic of its causes are:

1. Surface causes
2. Volcanic causes
3. Tectonic causes

Surface cause:

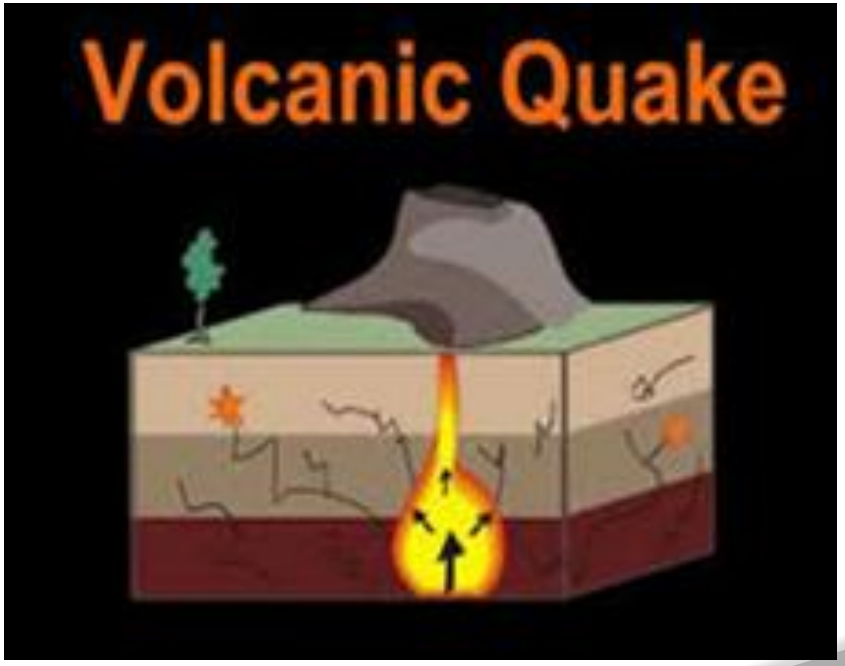
Great explosions, landslides, slips on steep coasts, dashing of sea waves , avalanches , railway trains, heavy trucks, some large engineering projects cause minor tremors. some of them are man made, other are natural.

Volcanic cause

Volcanic eruptions produce earthquakes. Earthquakes may precede, accompany and frequently follow volcanic eruptions.

They are caused by sudden displacements of lava with in or beneath the earth crust.

There are two general categories of earthquakes that can occur at a volcano:

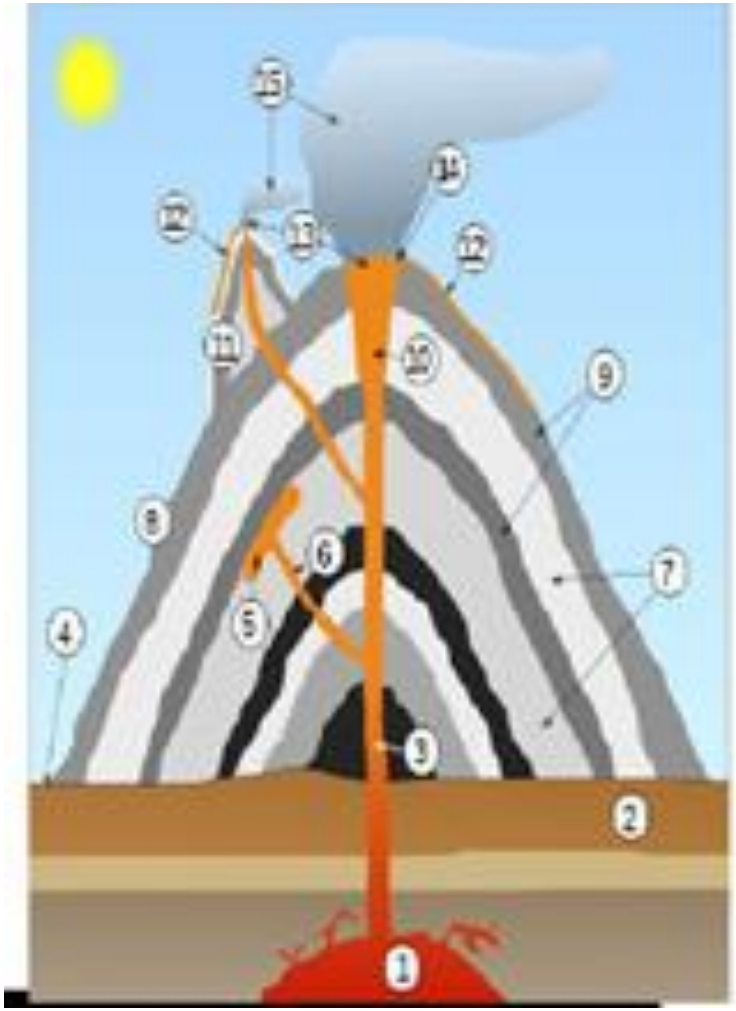


Tectonic cause:

Structural disturbances resulting in the parts of the lithosphere is the main cause of this type of earthquake.

Most of the disastrous earthquakes belong to this category and occur in areas of great faults and fractures. Sudden yielding to strain produced on the rocks of accumulating stress causes displacements especially along old fault zones known as great transform faults.

Cross-section



Cross-section through a Stratovolcanoes (vertical scale is exaggerated):

1. Large magma chamber
2. Bedrock
3. Conduit (pipe)
4. Base
5. Sill
6. Dike
7. Layers of ash emitted by the volcano
8. Flank
9. Layers of lava emitted by the volcano
10. Throat
11. Parasitic cone
12. Lava flow
13. Vent
14. Crater
15. Ash cloud

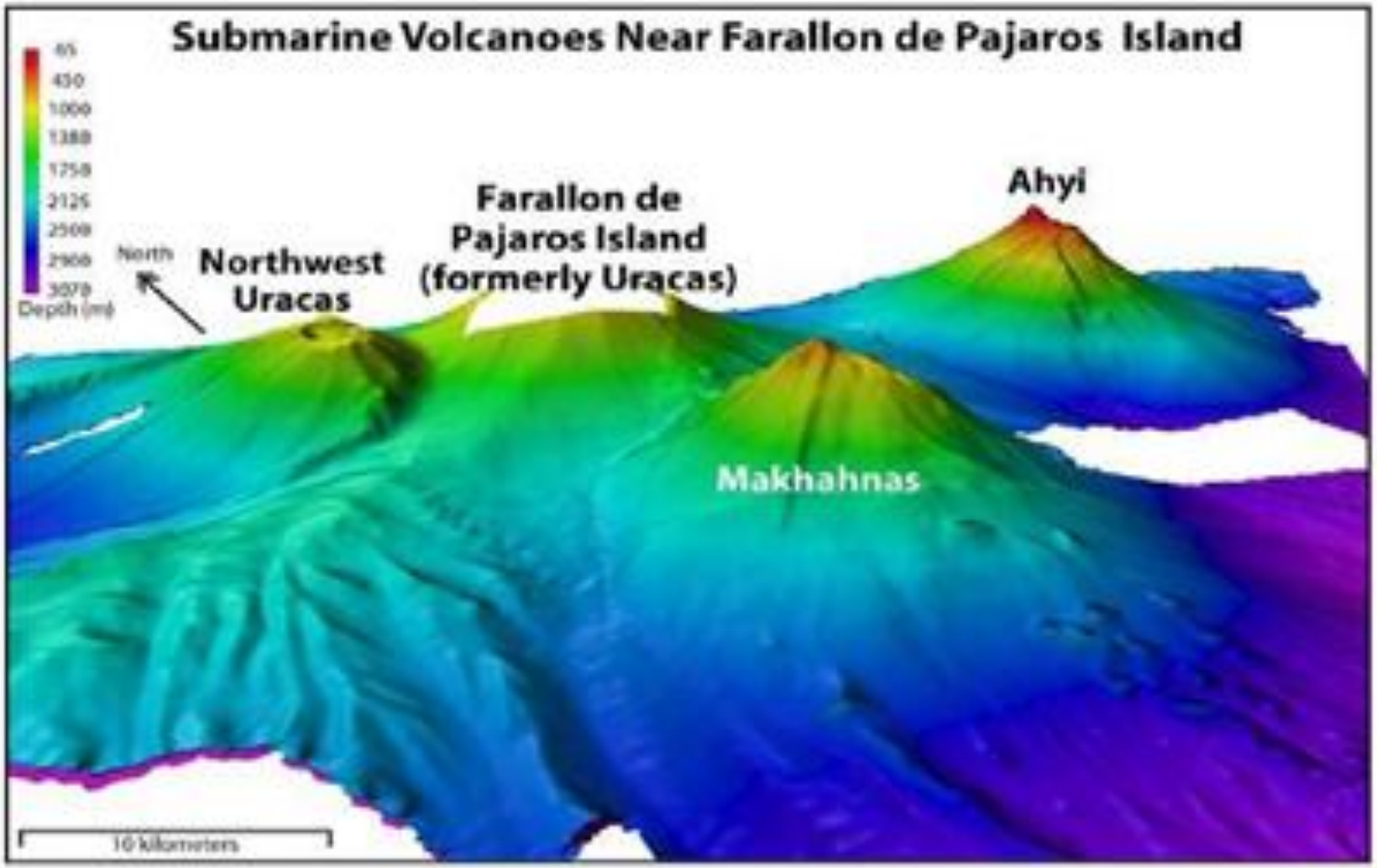
Super volcano

A super volcano is a large volcano that usually has a large caldera and can potentially produce devastation on an enormous, sometimes continental, scale. Such eruptions would be able to cause severe cooling of global temperatures for many years afterwards because of the huge volumes of sulfur and ash erupted. They are the most dangerous type of volcano.

Submarine volcanoes

Submarine volcanoes are common features on the ocean floor. Some are active and, in shallow water, disclose their resence by blasting steam and rocky debris high above the surface of the sea. Many others lie at such great depths that the tremendous weight of the water above them prevents the explosive release of steam and gases, although they can be detected by hydrophones and discoloration of water because of volcanic gases. Pumice rafts may also appear.

Even large submarine eruptions may not disturb the ocean surface. Because of the rapid cooling effect of water as compared to air, and increased buoyancy, submarine volcanoes often form rather steep pillars over their volcanic vents as compared to above-surface volcanoes.


Submarine Volcanoes Near Farallon de Pajaros Island
65
430
1000
1388
1758
2125
2509
2906
3078
Depth (m)
North
Northwest Uracas
Farallon de Pajaros Island (formerly Uracas)
Ahyi
Makhahnas
10 kilometers

Subglacial volcanoes

Subglacial volcanoes develop underneath icecaps. They are made up of flat lava which flows at the top of extensive pillow lavas and palagonite. When the icecap melts, the lavas on the top collapse, leaving a flat-topped mountain. These volcanoes are also called table mountains, tuyas or (uncommonly) mobergs. Very good examples of this type of volcano can be seen in Iceland, however, there are also tuyas in British Columbia.

Mud volcanoes

Mud volcanoes or mud domes are formations created by geo-excreted liquids and gases, although there are several processes which may cause such activity. The largest structures are 10 kilometers in diameter and reach 700 meters high.

Lava composition

Another way of classifying volcanoes is by the composition of material erupted (lava), since this affects the shape of the volcano. Lava can be broadly classified into 4 different compositions (Cas & Wright, 1987)

Because siliceous magmas are so viscous, they tend to trap volatiles (gases) that are present, which cause the magma to erupt catastrophically, eventually forming Stratovolcanoes. Pyroclastics flows (ignimbrites) are highly hazardous products of such volcanoes, since they are composed of molten volcanic ash too heavy to go up into the atmosphere, so they hug the volcano's slopes and travel far from their vents during large eruptions. Temperatures as high as 1,200 °C are known to occur in pyroclastics flows, which will incinerate everything flammable in their path and thick layers of hot pyroclastics flow deposits can be laid down, often up to many meters thick. Alaska's Valley of Ten Thousand Smokes, formed by the eruption of Novarupta near Katmai in 1912, is an example of a thick pyroclastics flow or ignimbrite deposit.

Lava texture

According to the surface texture: a (pronounced [ˈʔaʔa]) and āhoehoe ([paːˈhoˌeˈhoˌe]), both Hawaiian words. ‘A‘a is ōharaōterized Ōy a rough, clinkery surface and is the typical texture of viscous lava flows. However, even basaltic or mafic flows ōan Ōe erupted as ‘A‘a flows, particularly if the eruption rate is high and the slope is steep.

Pāhoehoe is ōharaōterized Ōy its smooth and often ropey or wrinkly surface and is generally formed from more fluid lava flows. Usually, only mafiō flows will erupt as Pāhoehoe,

Volcanic activity

A popular way of classifying magmatic volcanoes is by the ireruption, with those that erupt regularly called active, those that have erupted in historical times but are now quiet called dormant, and those that have not erupted in historical times called extinct. However, these popular frequency of classifications—extinct in particular—are practically meaningless to scientists.

They use classifications which refer to a particular volcano's formative and eruptive processes and resulting shapes, which was explained above. There is no real consensus among volcanologists on how to define an ctive“volcano. The lifespan of a volcano can vary from months to several million years, making such a distinction sometimes meaningless when compared to the lifespans of humans or even civilizations. For example, many of Earth's volcanoes have erupted dozens of times in the past few thousand years but are not currently showing signs of eruption.

Extinct Volcanoes

Extinct volcanoes are those that scientists consider unlikely to erupt again, because the volcano no longer has a lava supply. Examples of extinct volcanoes are many volcanoes on the Hawaiian - Emperor seamount chain in the Pacific Ocean, Hohentwiel, Shiprock and the Zuidwal volcano in the Netherlands.

Edinburgh Castle in Scotland is famously located atop an extinct volcano. Otherwise, whether a volcano is truly extinct is often difficult to determine. Since "supervolcano" calderas can have eruptive lifespans sometimes measured in millions ofyears, a caldera that has not produced an eruption in tens of thousands of years is likely to be considered dormant instead of extinct.

Four peaked volcano

Dormant

It is difficult to distinguish an extinct volcano from a dormant one. Volcanoes are often considered to be extinct if there are no written records of its activity. Nevertheless, volcanoes may remain dormant for a long period of time. For example, Yellowstone has a repose/recharge period of around 700 ka, and Toba of around 380 ka.[10] Vesuvius was described by Roman writers as having been covered with gardens and vineyards before its famous eruption of AD 79, which destroyed the towns of Herculaneum and Pompeii.

Before its catastrophic eruption of 1991, Pinatubo was an inconspicuous volcano, unknown to most people in the surrounding areas. Two other examples are the long-dormant Soufriere Hills volcano on the island of Montserrat, thought to be extinct before activity resumed in 1995 and Four peaked Mountain in Alaska, which, before its September 2006 eruption, had not erupted since before 8000 BC and had long been thought to be extinct.

Technical classification of volcanoes

5.2.1 Volcanic-alert level

The three common popular classifications of volcanoes can be subjective and some volcanoes thought to have been extinct have announced to the world they were just pretending. To help prevent citizens from falsely believing they are not at risk when living on or near a volcano, countries have adopted new classifications to describe the various levels and stages of volcanic activity.Some alert systems use different numbers or colors to designate the different stages. Other systems use colors and words. Some systems use a combination of both.

5.2.2 Volcano warning schemes of the United States

The United States Geological Survey (USGS) has adopted a common system nationwide for characterizing the level of unrest and eruptive activity at volcanoes. The new volcano alert-level system classifies volcanoes now as being in a normal, advisory, watch or warning stage. Additionally, colors are used to

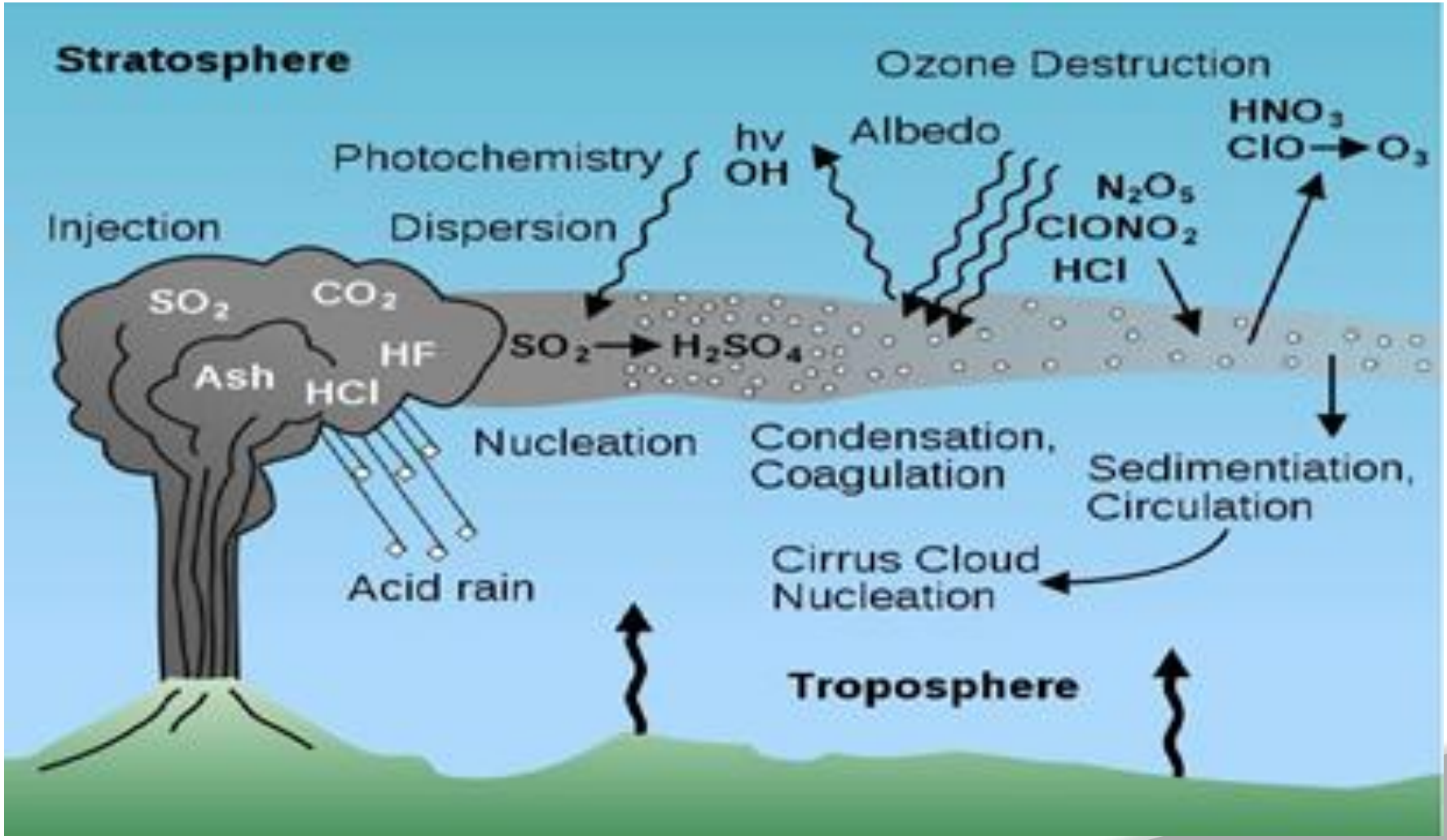
National volcanoes

Avachinsky-Koryaksky, Kamchatka, Russia
Nevado de Colima, Jalisco and Colima, Mexico
Mount Etna, Sicily, Italy
Galeras, Nariño, Colombia
Mauna Loa, Hawaii, USA
Mount Merapi, Central Java, Indonesia
Mount Nyiragongo, Democratic Republic of the Congo

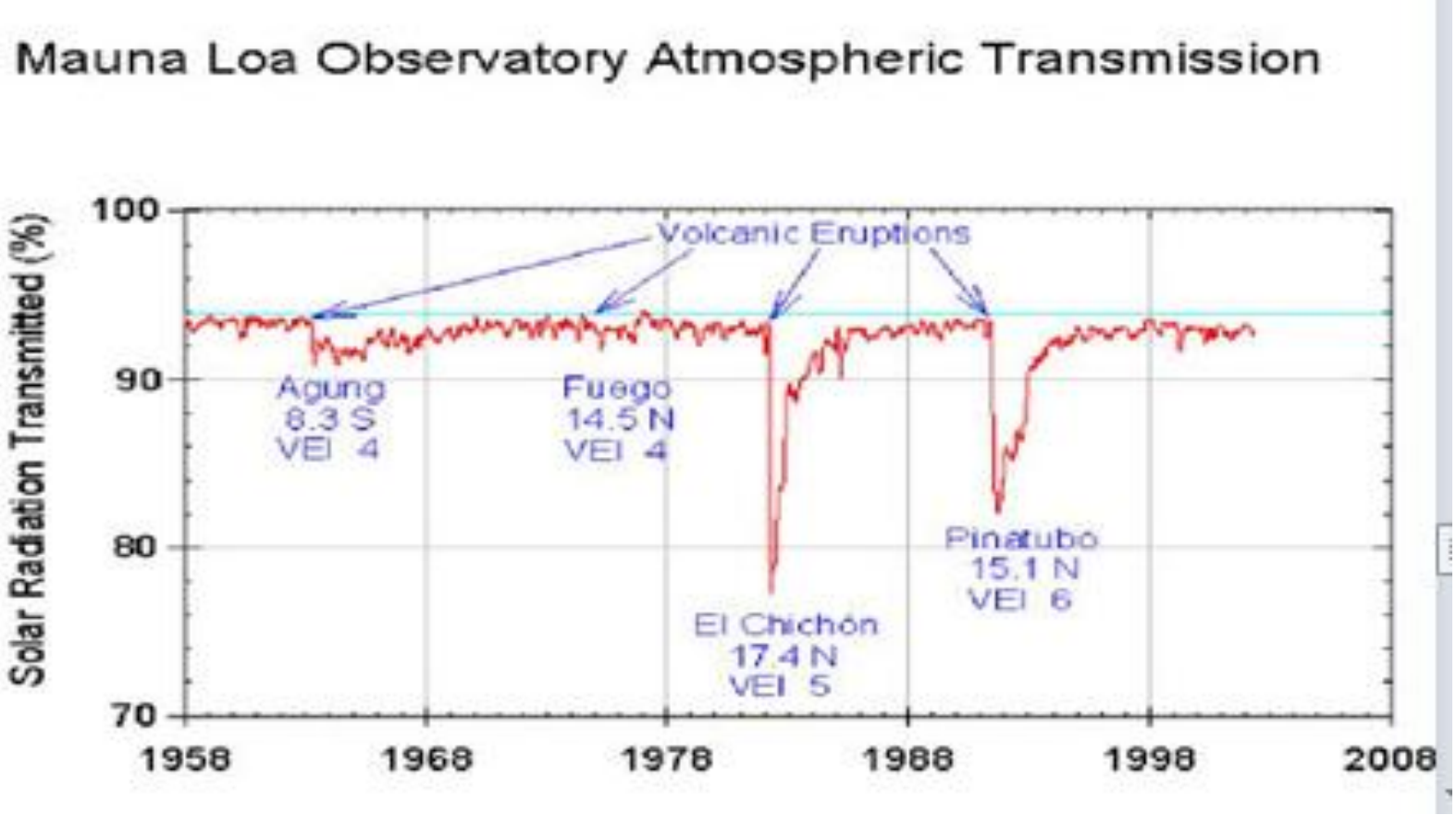
- Sakurajima, Kagoshima Prefecture, Japan
- Santa Maria/Santiaguito, Guatemala
- Santorini, Cyclades, Greece
- Taal Volcano, Luzon, Philippines
- Teide, Canary Islands, Spain
- Ulawun, New Britain, Papua New Guinea
- Mount Unzen, Nagasaki Prefecture, Japan

There are many different types of volcanic eruptions and ssociated activity. phreatic eruptions (steam-generated eruptions), explosive eruption of high-silica lava (e.g., rhyolite), effusive eruption of low-silica lava (e.g., basalt), pyroclastics flows, lahars (debris flow) and carbon dioxide emission. All of these activities can pose a hazard to humans. Earthquakes, hot springs, fumaroles, mud pots and geysers often accompany volcanic activity.

The concentrations of different volcanic gases can vary considerably from one volcano to the next. Water vapor is typically the most abundant volcanic gas, followed by carbon dioxide and sulfur dioxide. Other principal volcanic gases include hydrogen sulfide, hydrogen chloride, and hydrogen fluoride. A large number of minor and trace gases are also found in volcanic emissions, for example hydrogen, carbon monoxide, halocarbons, organic compounds, and volatile metal chlorides.


Stratosphere
Ozone Destruction
Photochemistry
hv
OH
Albedo
HNO_3
ClO → O_3
N_2O_5
$ClONO_2$
HCl
Injection
Dispersion
SO_2
CO_2
HF
Ash
HCl
SO_2 → H_2SO_4
Nucleation
Condensation,
Coagulation
Sedimentiation,
Circulation
Cirrus Cloud
Nucleation
Acid rain
Troposphere

Atmospheric Transmission



It has been suggested that volcanic activity caused or contributed to the End- Ordovician, Permian-Triassic, Late Devonian mass extinctions, and possibly others. The massive eruptive event which formed the Siberian Traps, one of the largest known volcanic events of the last 500 million years of Earth's geological history, continued for a million years and is considered to be the likely cause of the "Great Dying" about 250 million years ago, which is estimated to have killed 90% of species existing at the time.

The sulfate aerosols also promote complex chemical reactions on their surfaces that alter chlorine and nitrogen chemical species in the stratosphere. This effect, together with increased stratospheric chlorine levels from chlorofluorocarbon pollution, generates chlorine monoxide (ClO), which destroys ozone (O3). As the aerosols grow and coagulate, they settle down into the upper troposphere where they serve as nuclei for cirrus clouds and further modify the Earth's radiation balance.

Rainbow and volcanic ash

UNIT-4

Hazards and Risks

Major Types of Hazards

Cultural Hazards

Chemical Hazards

Physical Hazards

Biological Hazards

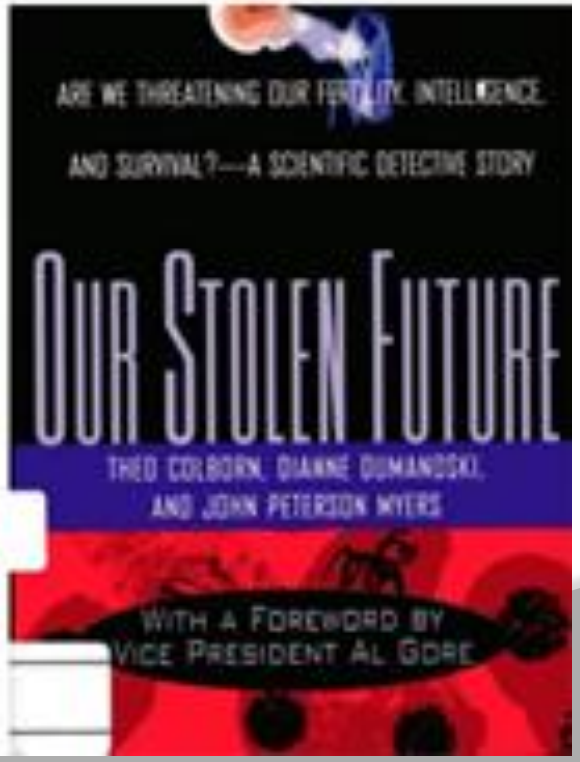
Endocrine-Disrupting Compounds (EDC) in wastewater are a concern

An environmental endocrine disruptor is defined as an *exogenous agent* that interferes with the synthesis, secretion, transport, binding, action, or elimination of *natural hormones* in the body that are responsible for the maintenance of *homeostasis, reproduction, development, and/or behavior*." **(EPA 1997)**

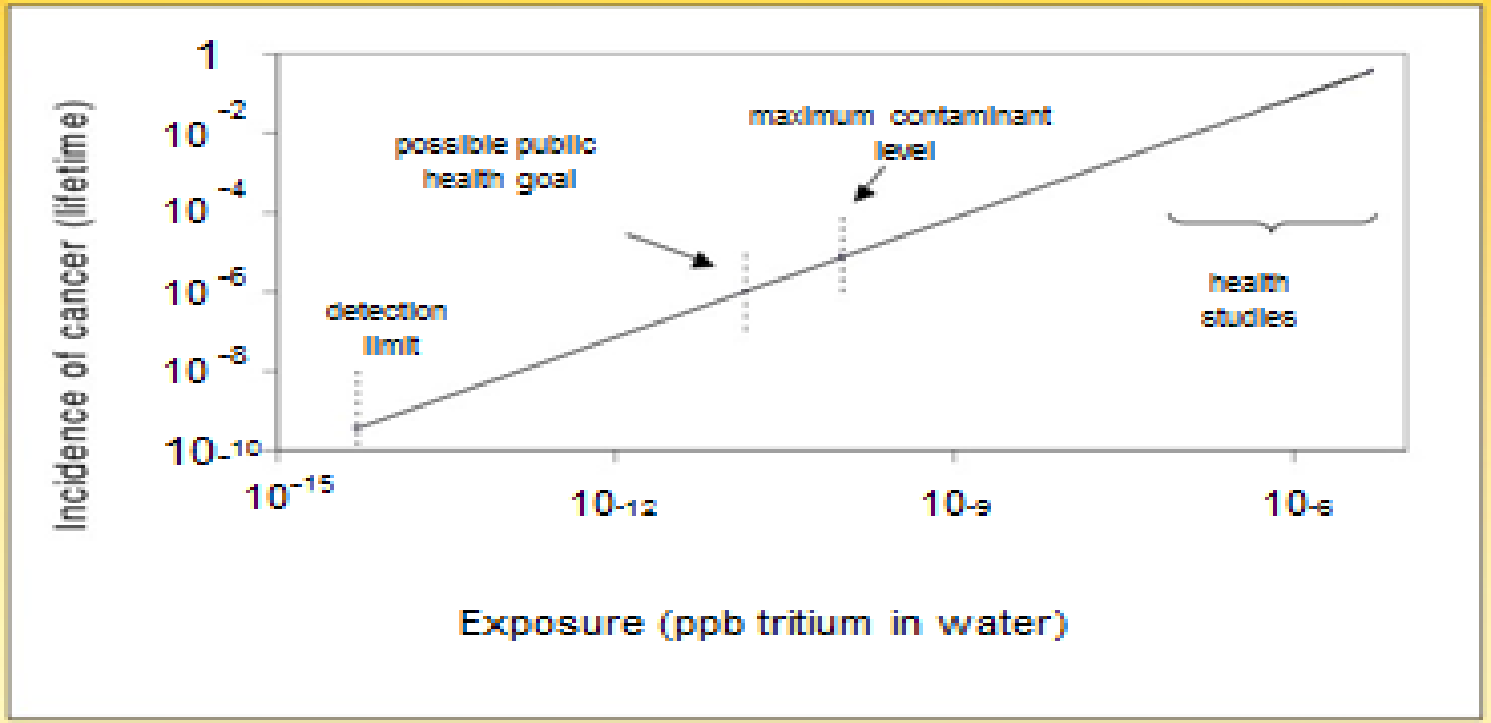
Salmon puzzle: Why did males turn female?

Every year, rivers of chinook—the Pacific's largest salmon—leave the ocean for an upstream trek into the streams of

During an analysis of adult salmon gonads performed last year, Nagler identified 50 males and 50 fish that appeared



Radioactive tritium (^3H) is of concern at very low concentration and is present in the environment at exceedingly low concentration



Chemical Hazards

Hazardous Chemicals

Mutagens

Teratogens

Carcinogens

Endocrine disruptors

Common Chemical Agents with Adverse Health Affects

Arsenic
Asbestos
Benzene
Chlorine
Formaldehyde
Lead
Mercury
Dioxins

Biological Agents

Pathogenicity
Route of transmission
Agent stability
Infectious dose
Concentration
Origin
Data from animal studies
Prophylaxis

Common Human Diseases

TB
Dengue Fever
Malaria
Yellow Fever
Cholera
Trypanosomiasis
Cryptosporidosis
Anthrax
Encephalitis
Lassa Fever
Leprosy
Giardiasis
Salmonella
Plague
Encephalitis
Ebola
Influenza
Hepatitis

UNIT-5

Emerging approaches of disaster management

Natural Disaster and Problem

- A natural disaster is the consequence of an event, which causes significant loss to human lives and property
- A Disaster is defined as the interaction between an event and human activities
- A Disaster is often described as a function of hazard, risk and vulnerability

Problem

- Environment and disasters are interlinked
- Environmental concerns are not incorporated in disaster management practices and vice versa
- Decisions and actions on environment and disasters are taken separately
- The main issues are:
  - Lack of coordination and inter-linkage of policy and plans
  - Lack of perception and understanding

Elements of Risk

Hazard	X	Vulnerability	=	Risk
(Mostly Natural)		(Man and Built Env.)		(Consequence)
Geological		Physical		Death/Injury
Hydrological		Social/ Cultural		Financial Loss
Meteorological		Economic		Social Loss

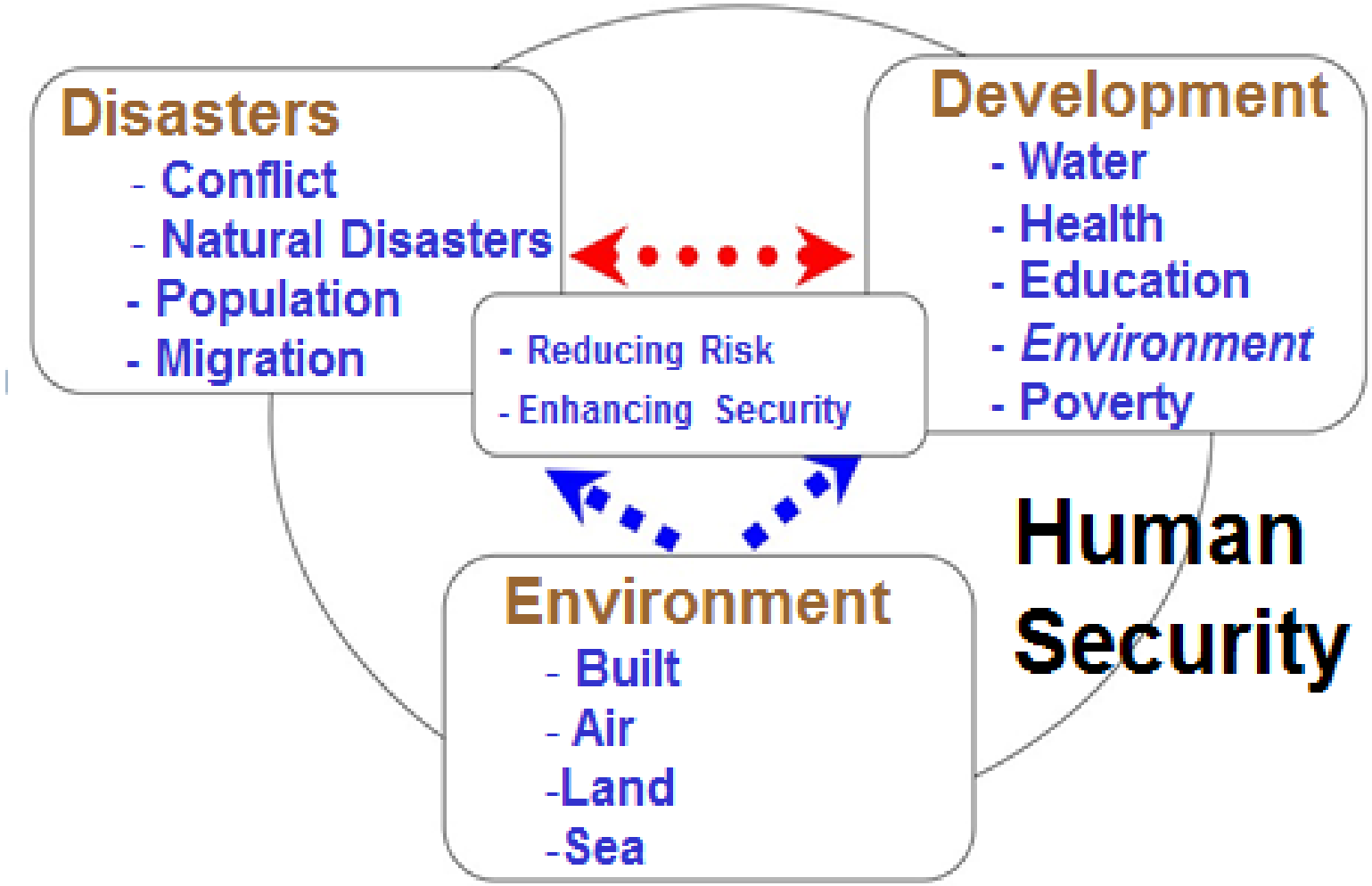
Goal of Environment and Disaster Management

The goal of Environment and Disaster Management is the safety and sustainability of human lives

- **Safety** is related to avoiding death and injuries to human lives during a disaster

- **Sustainability** is related to livelihood, socio-economic, cultural, environmental and
psychological aspects

Disaster, Environment, Development



Disasters and Poverty

- Low-income groups are more vulnerable to natural disasters

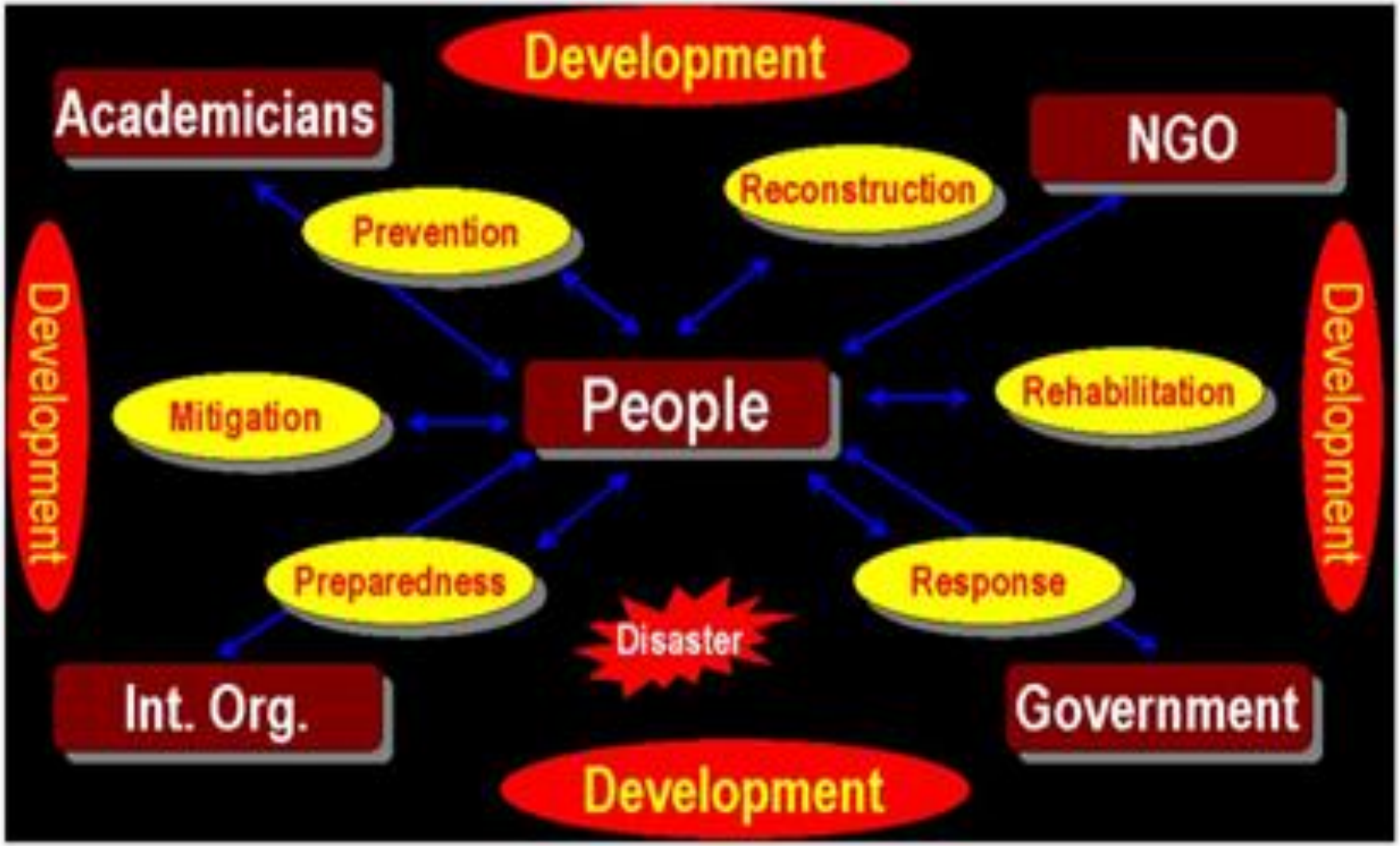
- In general, floods and cyclones cause maximum damages and casualties in low-income groups, while earthquakes cause more casualties in middle-income groups

- Drought and flood affect most people in low and middle income groups

- Lower income groups are more dependent on the immediate environment

- Understanding how humans use environmental assets is important for good disaster risk mitigation.

Disaster and Development Cycle



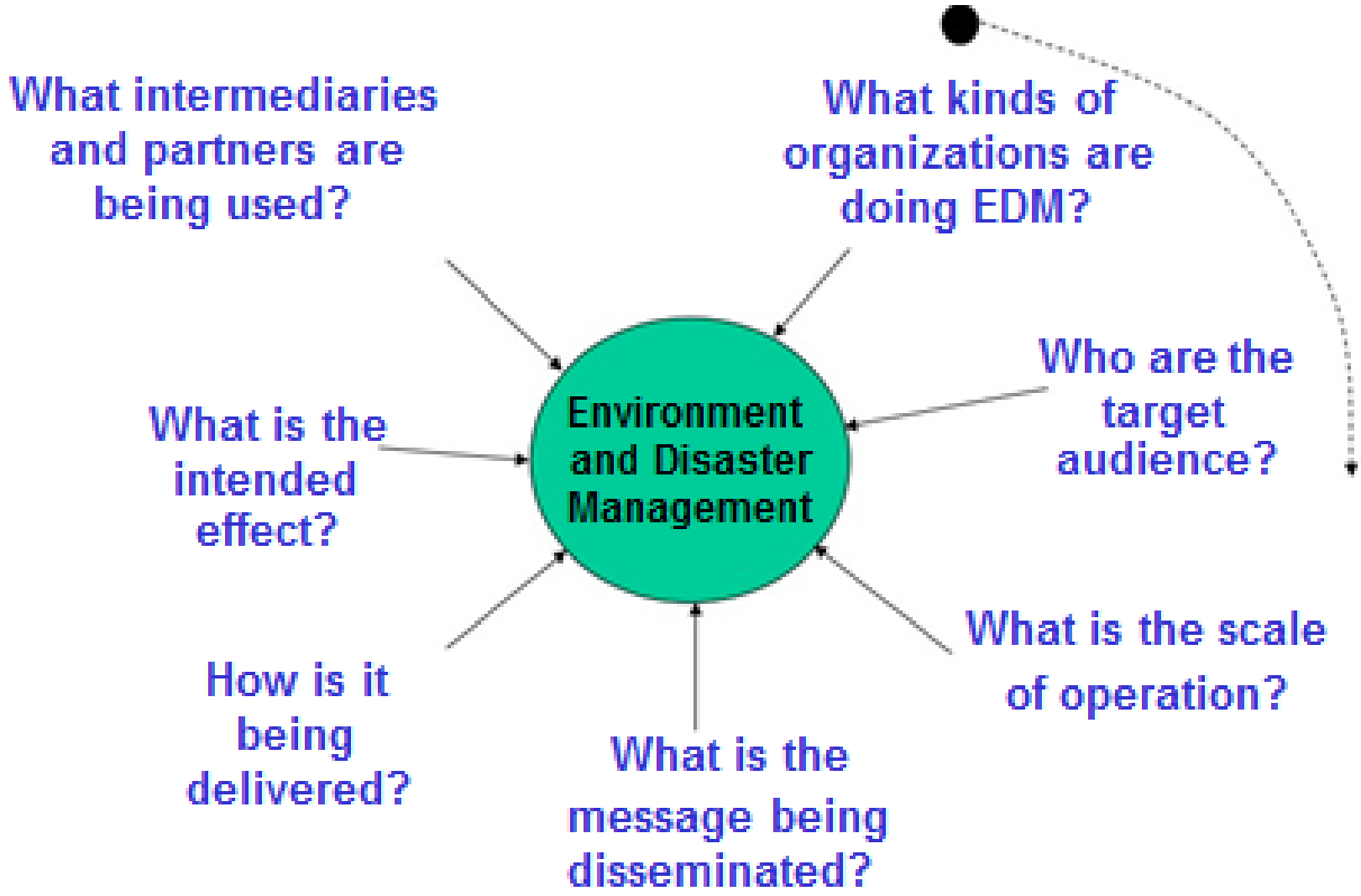
Coastal Zone Management and Disaster Preparedness

- Indian Ocean Tsunami of 26th December 2004.
- Green belt and mangrove in the coastal zone, coral reef protection and coastal regulatory zones are considered as environment protection measures
- However, these elements are strongly linked to tsunami protection in the coastal areas.
- Livelihood support to the fisherman, protection of environment in the coastal area, and disaster prevention interface was lacking in most of the places

Climate Change Impacts

- Climate change is considered as an environmental phenomena.
- Climate change impacts are seen in the form of natural disasters like drought, flood etc.
- Livelihoods of the rural communities are directly affected by the climate change impacts
- Adaptation to climate change is becoming increasingly recognized as the key issue (as opposed to mitigation), and it is considered as the pre-disaster preparedness measures.

Issues in Environment and Disaster Management (EDM)



Rehabilitation, Reconstruction, and Recovery Phase

The government planned the reconstruction and rehabilitation phase to be spread over three to five years (GOSL, 2005c). Nevertheless, there were pronouncements at the political level that all permanent housing needs would be met within a year. Over time, it has become clear that these were optimistic pledges. In fact, housing needs, for example, had not been met fully even by the end of 2006, while reconstruction of damaged schools and hospitals, and rehabilitation of roads, bridges, etc. is likely to take longer than envisaged.

Infrastructure

Infrastructure

A total of 182 schools and 222 health institutions were affected by the tsunami. Targets in the education and health sectors included the reconstruction and renovation of 183 schools, four universities, seven Vocational Training Authorities, 444 internally displaced person (IDP) schools (schools used as refugee camps), and the reconstruction and renovation of 102 health institutions.

The pace of recovery, particularly of larger scale infrastructure projects, has been slow with an estimated 50 per cent of construction projects yet to commence by end 2006 (GOSL, 2006). By end 2006, 57 per cent of damaged schools were estimated to be in various stages of construction with only 10 per cent of projects completed and handed over (GOSL, 2006). Similarly, in the health sector only 55 of a total of 102 damaged buildings have been completed

Housing

The immediate requirement in housing was to provide “transitional” shelters where a total of 57,057 transitional shelter units were estimated to be needed to accommodate 50 per cent of the 500,000 internally displaced (GOSL, 2005a). The remainder of the displaced were assumed to have received shelter from friends, relatives, etc. Progress on providing transitional shelters, by and large, was fairly good; by end-2005 over 56,000 units had been completed.