# SYSTEMS

## What is Ecology?

- **Ecology** is the scientific study of the interactions between organisms and their environment.
- It is the science that seeks to describe and explain the relationship between living organisms and their environment.

## What is Ecology? (Cont...)

- Ecology is describing the relationships between living organisms and their environment.
- Ecology comes from the Greek words
- Οἶκος= House
- -λογία, -logia= Study of Life
- Study of the "house/environment" in which we live.

## Factors of Ecology

- There is two factors that Ecology study:
  - **The Abiotic Factors** (non-living components) are those inert factors of the ecosystem, as the light, the temperature, the chemical products, the water and the atmosphere.
  - **Biotic Factors** (living organisms) are all the living beings in an environment.

## Ecology is study of interactions between

- **non-living components in the environment**...
  - light
  - water
  - wind
  - nutrients in soil
  - heat
  - solar radiation
  - atmosphere, etc.

AND...

- **Living organisms...**
  - Plants
  - Animals
  - microorganisms in soil, etc.

- **Ernst Haeckel**, a German zoologist coined the term Ecology in 1866.

  - After that....

- Danish botanist, **Eugenius Warming** elaborate the idea of Ecology.

## Classification of Ecology

- Ecology is a broad discipline comprising many sub-disciplines. Under this system the subjects studies:
  - **Ecophysiology** examines how the physiological functions of organisms influence the way they interact with the environment, both biotic and abiotic.
  - **Behavioral ecology** examines the roles of behavior in enabling an animal to adapt to its environment.

## Classification of Ecology (cont...)

- **Population ecology** studies the dynamics of populations of a single species.
- **Community ecology** (or synecology) focuses on the interactions between species within an ecological community.
- **Ecosystem ecology** studies the flows of energy and matter through the biotic and abiotic components of ecosystems.

## Classification of Ecology (cont...)

- **Systems ecology** is an interdisciplinary field focusing on the study, development, and organization of ecological systems from a holistic perspective
- **Landscape ecology** examines processes and relationship in a spatially explicit manner, often across multiple ecosystems or very large geographic areas.

## Classification of Ecology (cont...)

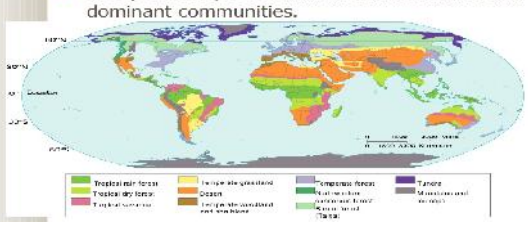
- **Evolutionary ecology** studies ecology in a way that explicitly considers the evolutionary histories of species and their interactions.
- **Political ecology** connects politics and economy to problems of environmental control and ecological change.

## Levels of Ecology

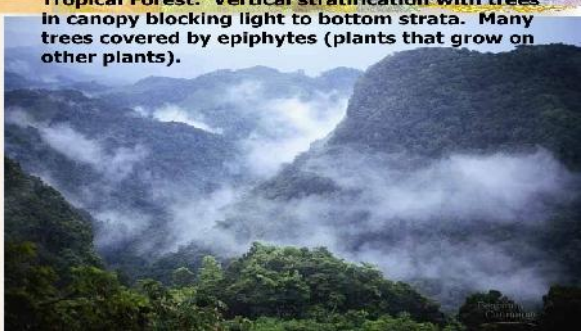
- **Biosphere**
  - Surface of the earth
  - It is the whole portion of Earth colonized by living beings

## Levels of Ecology (cont...)

- **Region**
  - Group of ecosystems with the same climate and dominant communities.



**Tropical Forest: Vertical stratification with trees in canopy blocking light to bottom strata. Many trees covered by epiphytes (plants that grow on other plants).**



Desert: Sparse rainfall (< 30 cm per year), plants and animals adapted for water storage and conservation. Can be either very, very hot, or very cold (e.g. Antarctica)

Coniferous forest: Largest terrestial biome on earth, old growth forests rapidly disappearing, usually receives lots of moisture as rain or snow.

Tundra: Permafrost (Permanent frozen ground), bitter cold, high winds and thus no trees. Has 20% of land surface on earth.

## Levels of Ecology (cont...)

- **Landscape**
  - a group of ecosystems that may or may not interact in a given region

## Levels of Ecology (cont...)

- **Ecosystem**
  - A group of communities and the populations within them embedded in a common physical environment and tied together by physical processes.
  - It refers to all the abiotic factors (physical and chemical constituents) and all the communities that established in a specific area.
  - It is a collection of organisms that live in a place with the nonliving environment.

## Levels of Ecology (cont...)

- **Community**
  - A group of populations of different species occurring in one place; individuals of different species may interact with each other
  - And all the living beings distributed into a specific geographical area. A community includes organisms of different species.

## Levels of Ecology (cont...)

- **Population**
  - A group of individuals of a given species that live in a specific geographic area.
  - A group of organisms, all of the same species, which interbreed and live in the same area.
  - A group of individuals that collectively interact to give birth to new individuals and eventually die

## Levels of Ecology (cont...)

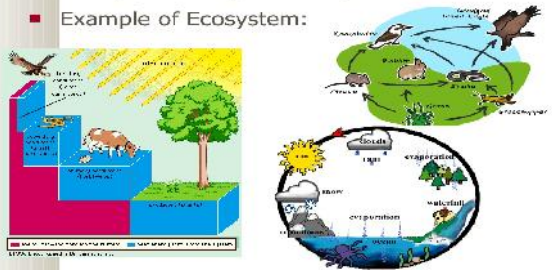
- **Individual**
  - Group of similar organisms that can breed and produce fertile offspring

## Ecosystem

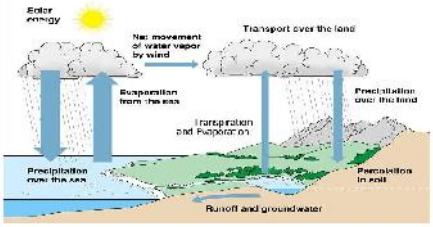
- Ecosystem is a dynamic complex of plant, animal and micro-organism communities and their non-living environment, interacting as a functional unit.
- Every element of the environment have their own ecosystem.
- A dynamic ecosystem makes the balance of nature.

## Ecosystem (cont…)

- Example of Ecosystem:



## Hydrologic (Water) Cycle




## Status of Ecology

- Past Status
  - Calm and Quite
  - Human don't disturb the nature
  - Ecosystem had been going on its natural cycle


## Status of Ecology (cont…)

- Present Status
  - Population increasing
  - Negative Effect
  - Ecological Crisis

## Ecological Crisis

- The main causes of Ecological Crisis are:
  - Over Population
  - Environment Pollution
  - Deforestation

## Environment Pollution

## Environment Pollution (cont...)

## Deforestation

- **Deforestation** is the logging or burning of trees in forested areas.

## Ecological Crisis

- Major Ecological Crisis which are facing the World:
  - Greenhouse Effect
  - Global Warming
  - Climate Changes

## Ecology

- Definition:- Ecology is derived from two Greek words "*Oikos*" & "*Logos*"
- **Ecology= Oikos + Logos**
  - *Oikos means house or dwelling place*
  - *Logos means study of*
- Thus Ecology can be define as *"Study of organisms with respect to their house or dwelling place"*.

## Terminology Used in Ecology

- ***Species:*** A Uniform interbreeding population spreading over time & space is known as species.
- ***Community:*** A group of similar or dis-similar species species living to gather under more or less similar environmental condition.
- ***Population:*** It is a group of similar community living together under similar environmental condition.
- ***Biome:*** The complex of several type of community, at different stages of succession living to gather under similar environmental condition.
- ***Vegetation:*** A collective growth of plants in space is known as vegetation.
- ***Habitat:*** The place where an organism live or the place where one would go to find a particular organism is known as habitat.

## Terminology Used in Ecology

- ***Factor:*** Any external force, substance, or condition that affects the organism in any way is known as factor.
- ***Standing state:*** The total amount of inorganic substances i.e. minerals Such as phosphorous, sulfur, nitrogen, hydrogen, etc. present at any given time in the environment of an ecosystem is known as standing state.
- ***Biomass:*** Biomass is the total amount of living material present in terms of weight/ unit area.

## Classification of Ecology

- Ecology can be classified based upon its sub divisions as:
- ***Based on Taxonomic affinities:***
  - **Plant Ecology.**
  - **Animal Ecology**

  In early days of Ecology, botanist and zoologists engaged themselves in the study of ecology of plants & animals respectively this led to the development of such sub-divisions as **a) Plant Ecology b) Animal Ecology**
- ***Based on Habitat Ecology :*** Some ecologist thought of the study of habitats and their effect upon the organisms. They selected a number of different habitat such as fresh water, grass land, forest etc. this are then studied in detail for their possible relationship with the kind of organisms present there such an approach led to the development of habitat ecology.

- ***Based on level of Organization:-*** In this approach the organisms involved in ecology are either studied individually or in group accordingly they are classified as
- **Autecology & Synecology:**
  - ***Autecology:*** It is also known as ecology of individual organisms.
  - ***Synecology:*** It is also known as ecology of groups of organisms.

## Structure of Ecosystem

- A structure of Ecosystem comprise of
- The Composition of biological community including, species number, biomass, life history, and distribution in space.
- The quantity and distribution of non-living material, such as nutrient water, etc.
- The range of condition for existence such as, temperature, light etc.

## Function of Ecosystem

- Function of Ecosystem includes
- The rate of biological energy flow i.e. production & respiration rates of the community.
- The rate of material or nutrient cycles
- Biological or ecological regulation including both regulation of organism by environment and regulation of environment by the organisms

## Components of an Ecosystem

- Each organisms has two main components
- **Abiotic**
- **Biotic**
- ***Abiotic Component:*** The non living factor or the physical environment prevailing in an ecosystem forms abiotic components.
- ***Abiotic component*** are mainly of two types,
- ***(a) Climatic factors*** It includes, rain, temperature, light, wind, humidity, etc.
- ***(b) Edaphic factors*** (i.e. factors related to soil) : It includes soil, pH, topography, minerals.

## Components of an Ecosystem

- ***Biotic Components:*** The living organisms include, plants, animals, and micro-organisms in an ecosystem forms biotic components.
- Biotic Components are further classified into 3 main groups
- **Producers**
- **Consumers**
- **Decomposers or Reducers**
- ***Producer:*** The green plants have chrophyll with the help of which they trap solar energy and change it into chemical energy of carbohydrates using simple inorganic compound namely, water and carbon dioxide. This process is known as photosynthesis. The chemical energy stored by the producers is utilized partly by the producers for their own growth and survival and the remaining is stored in the plants for their future use.

## Components of an Ecosystem

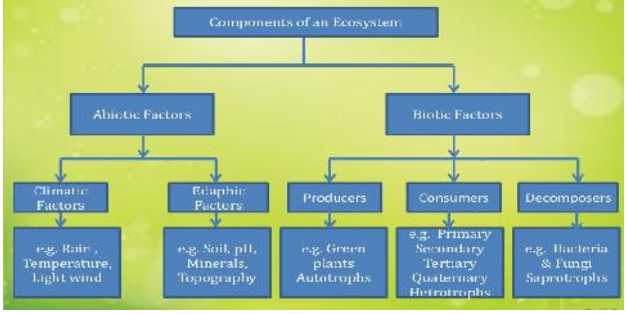
- ***Consumers:*** The animals lack chrophyll and are unable to synthesis their own food therefore they depend on the producers for their food.
- They are known as heterotrophs (i.e. heteros= others, trophs= feeder)
- The Consumers are of 4 types:
- ***(a) Primary Consumer:*** ( Herbivores) i.e. Animal feeding on plants, e.g. Rabbit, deer, goat etc.
- ***(b) Secondary Consumers:*** The animal feeding on Herbivores are called as secondary consumers or primary carnivores. e.g. Cats, foxes, snakes.
- ***(c) Tertiary Consumers:*** These are large carnivores which feed on secondary consumers. e.g. Wolves
- ***(d) Quaternary Consumers:*** They are also called omnivores these are largest carnivores which feed on tertiary consumers and are not eaten up by any other animals.
  e.g. lion and Tiger.

## Components of an Ecosystem

- ***Decomposers:*** Bacteria & fungi belong to this category.

They break down the dead organic matter of producers & consumers for their food and release to the environment the simple inorganic and organic substance. These simple substances are reused by the producers resulting in a cyclic exchange of material between biotic & abiotic environment.

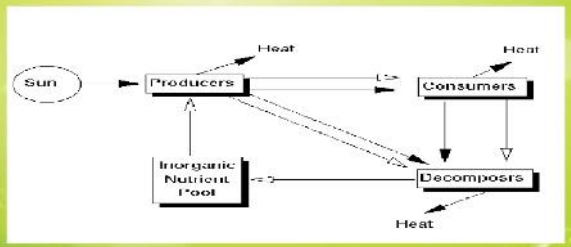
## Components of an Ecosystem




## Energy flow in an Ecosystem

- Biological activities requires energy which ultimately comes from the sun. Solar energy is transformed into chemical energy by a process of photosynthesis this energy is stored in plant tissue and then transformed into heat energy during metabolic activities.
- Thus in biological world the energy flows from the sun to plants and then to all heterotrophic organisms The flow of energy is unidirectional and non-cyclic. This one way flow of energy is governed by laws of thermodynamics which states that:
- (a) Energy can neither be created nor be destroyed but may be transformed from one form to another.
- (b) During the energy transfer there is degradation of energy from a concentrated form (mechanical, chemical, or electrical etc.) to a dispersed form (heat).
- No energy transformation is 100 % efficient, it is always accompanied by some dispersion or loss of energy in the form heat. Therefore, biological systems including ecosystems, must be supplied with energy on a continuous Basis.

## Energy flow in an Ecosystem



## Food Chain & Food Web

- ***Food Chain:*** In food chain each organism eats the smaller organisms and is eaten by the larger one. All those organisms which are interlinked with each other through food to gather constitute the ecosystem.
- The different levels in a food chain are called tropic levels, Each food chain has three main tropic levels:- Producer level, Consumer level, and decomposer level.
- If any of the intermediate stage of the food chain is removed, the succeeding links of the food chain will be affected.
- The arrangement in a food chain can be depicted as :

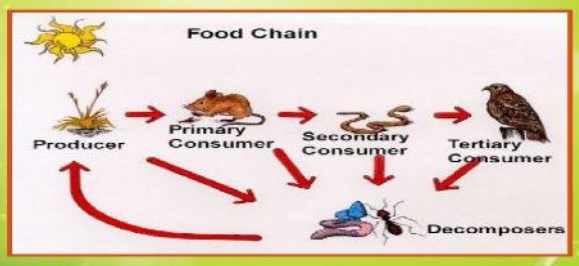
## Types of Food Chains

***Grazing Food Chain:*** This type of food chain starts from living green plants goes to grazing herbivores and onto carnivores. Ecosystem with such type of food chain directly depends upon the solar energy for their food requirements. Most of the ecosystem in nature follow this type of food chain.

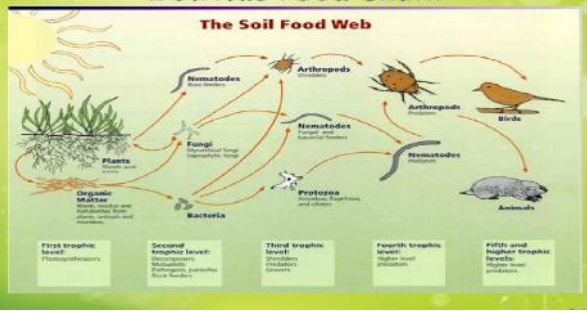
***Detritus food Chain:*** This type of food chain goes from dead organic matter onto microorganisms and then to the organisms feeding on detritus and their predators. Such ecosystem are less dependent on direct solar energy.

***Parasitic Food Chain:*** This type of food chain starts from big hosts and ends with parasitic organisms.

## Grazing Food Chain



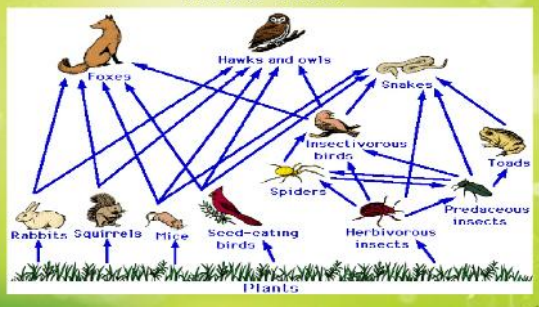

## Detritus Food Chain




## Food Web

- ***Food Web:*** The interconnected, interlocking pattern of food chain is known as food web.
- Under natural condition of the linear arrangement of food chain hardly occurs and they remain interconnected with each other through different types of organisms at different levels Such a interconnected and interlocking pattern of food chain is known as food web..

## Food Web



## Ecological Pyramids

- The different species in a food chain are called tropic levels. Each food chain has 3 main trophic level, producer, consumer, and decomposers.
- Thus Graphical representation of these trophic levels is called as Ecological Pyramids. It was devised by an ecologist " Charles Elton" therefore this pyramid are also called Ecological pyramid or Eltonian pyramids.

## Types of Ecological Pyramids

- Ecological pyramids are of three types:
- Pyramid of Number
- Pyramid of biomass
- Pyramid of Energy

## Pyramid of Number

- They show the relationship between producers, herbivores, and carnivores at successive tropic levels in terms of their number.
- In case of grassland ecosystem the producers are mainly grasses and are always maximum in number this number then shows a decrease towards apex as primary consumers like mice, rabbit are lesser in number than grasses, the secondary consumers like lizard, snake, are even lesser in number than the grasses, finally the top tertiary consumers like hawks are least in number. Thus the shape of pyramid is upright. But in case of forest ecosystem the pyramids is always inverted because the producers are mainly large trees, are lesser in numbers, the herbivores fruit eating birds are more in number than the producers, then there is gradual decrease in number of secondary consumers thus making pyramid upright again. Thus the pyramid of number does not give a true picture of the food chain and are not very functional.

## Pyramid of Number

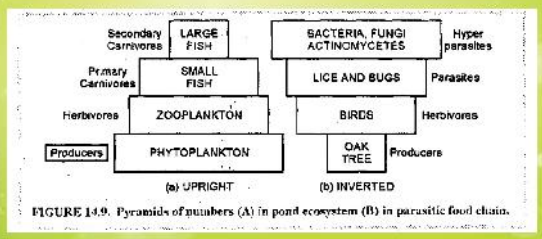
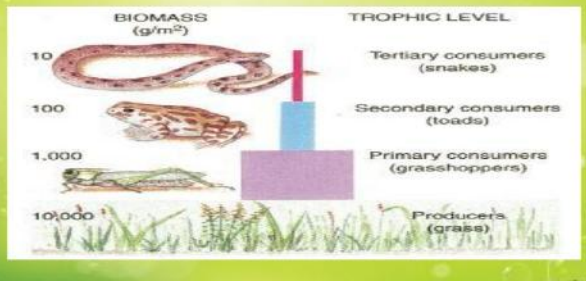



FIGURE 14.9. Pyramids of numbers (A) in pond ecosystem (B) in parasitic food chain.

## Pyramid of Biomass

- The pyramid of biomass represents the relationship between different tropic levels in terms of biomass.
- There is generally gradual decrease in biomass of organisms at successive levels from the producers to the top carnivores. Thus pyramid of biomass is upright for grassland ecosystem.
- However in case of a pond as the producers are algae, are least in number and this value gradually shows an increase towards the apex of pyramid thus making the pyramid inverted in shape.

## Pyramid of Biomass



## Pyramid of Biomass

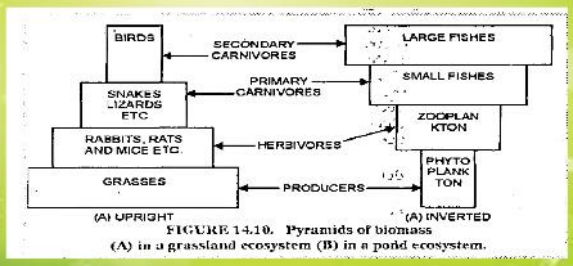



FIGURE 14.10. Pyramids of biomass
(A) in a grassland ecosystem (B) in a pond ecosystem.

## Pyramid of Energy

- Of the 3 types of ecological pyramid the energy pyramid gives the best picture of overall nature of the ecosystem. In this type of pyramid the tropic level is decided depending upon the rate at which food is being produced.
- In shape it is always upright as in most of the cases there is always gradual decrease in the energy content at successive trophic level from producers to various consumers.

## Pyramid of Energy

## Pyramid of Energy

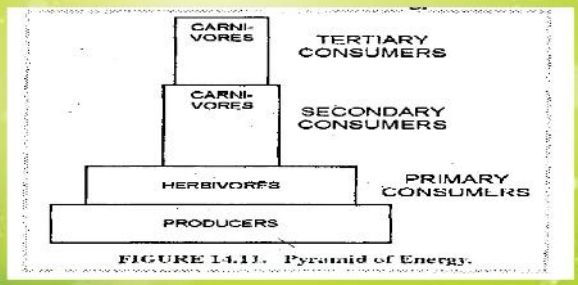
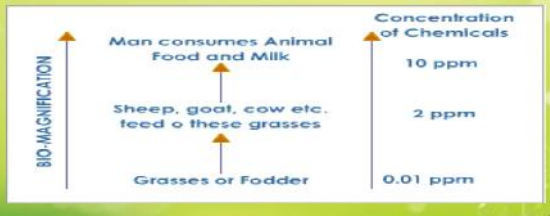


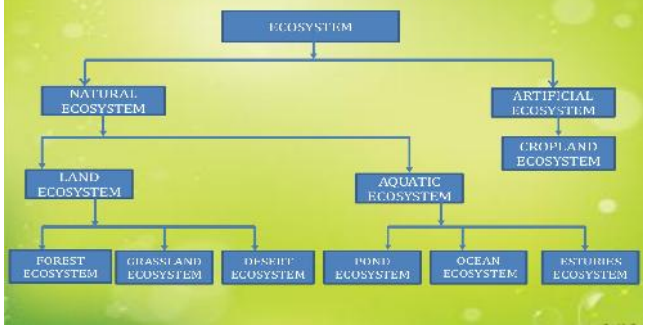

FIGURE 14.11. Pyramid of Energy.

## Bio-Magnification

- Biological magnification is the tendency of pollutants to get concentrated in successive tropic levels. Large concentration of pollutants Could be detrimental if they are toxic.




## Classification of Ecosystem

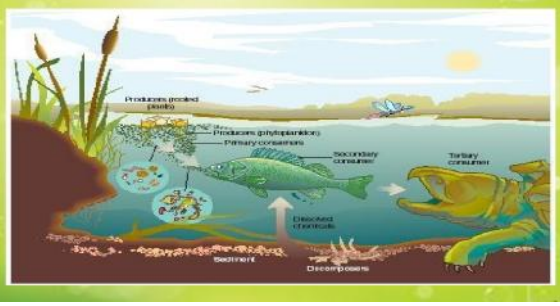


## Classification of Ecosystem

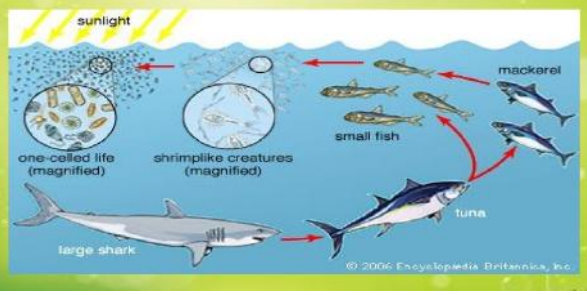
- Different types of ecosystem of biosphere artificially categorized as follows:
- **Natural Ecosystems**
- **Artificial ecosystems**
- **Natural Ecosystems**
- These ecosystems operate by themselves under natural conditions without any major interference by man. Based upon the particular kind of habitat, these are further divided as:
- Terrestrial as forest, grassland, desert etc.
- Aquatic which may be further distinguished as
- Freshwater which may be lotic (running water as springs, stream, river) or lentic (standing water as lake, pond, pools, ditch, swamps, etc.)
- Marine Ecosystems: as an ocean or shallow ones like sea or estuary etc.

- ***Artificial Ecosystems:*** These are maintained by man where, by addition of energy & planned manipulations natural balance is disturbed regularly, for ex , croplands like maize, wheat, rice-fields etc, where man tries to control the biotic community as well as physico-chemical environment are artificial ecosystems.

## Pond Ecosystem



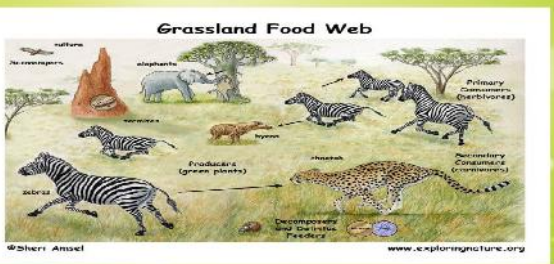

## Ocean Ecosystem




## Land Ecosystem

- ***Grassland Ecosystem:*** Grassland occupy comparatively fewer area roughly 19 % of the earth's surface.
- ***Abiotic Components:*** These are nutrients present in soil, and aerial environment, thus the elements like, phosphates, sulphates, water, carbon dioxide, present in soil and in air. Moreover some trace elements are also present.
- ***Biotic Compoaents:***
- Producers: They are mainly grasses as species of Cynadon, Desmodium, besides them a few shrubs also contribute some primary production.
- ***Consumers:***
- ***Primary Consumers:*** The herbivores feeding on grasses are grazing animals, as cows, goats, rabbit, etc. besides them there are some insects as termites, millipedes that feed on grasses.
- ***Secondary Consumers:*** These are carnivores feeding on herbivores these include, animals like, fox, jackals, snakes, frogs, birds.
- ***Tertiary Consumers:*** Some times hawks, vultures, feeding on secondary consumer, thus occupy tertiary consumers.
- ***Decomposers:*** The microbes active in the decay of dead organic matter of different form are fungi and some bacteria

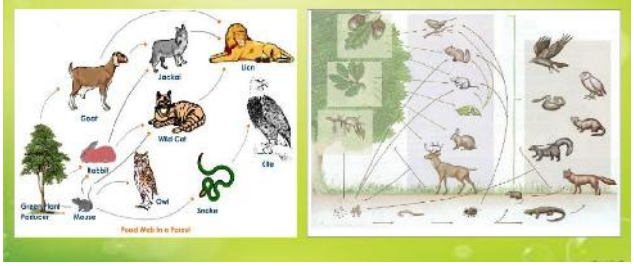
## Grassland Ecosystem



## Forest Ecosystem

- Forest Occupy roughly 40 % of the land. The different components of forest ecosystem are as follows:
- ***Abiotic Components:*** These are organic & inorganic substances present in the soil and atmosphere. In addition to minerals present in forest we find the dead organic debris, moreover light conditions are different due to complex stratification in the plants.
- ***Biotic Components:***
- Producers These are mainly trees that show much species and greater degree of stratification. Besides trees there are also present shrubs, and ground vegetation.
- ***Consumers:*** Primary Consumers: These are herbivores that include animals feeding on tree leaves, ants, beetles, grass hoppers, etc., and large elephants, dears, squirrels, etc.
- ***Secondary Consumers:*** These are carnivores, like snakes, birds, lizards, fox, etc. feeding on herbivores.
- ***Tertiary consumers:*** These are top carnivores like lion tiger, etc. that eat carnivores of secondary level.
- ***Decomposers:*** These are wide variety of micro organisms including, fungi, bacteria.

## Forest Ecosystem




## INTRODUCTION

Aquatic Eco-System:

About 75% of earth surface is covered by water, where 97% of water are salt water, 2% of water are from glaciers, and only 1% of water is available as fresh water.

## DEFINITION

- An aquatic ecosystem is an ecosystem in a body of water. Communities of organisms that are dependent on each other and on their environment live in aquatic ecosystems.
- TYPES:

  Fresh water ecosystem
  salt water ecosystem

Fresh water ecosystem:

- Ponds
- streams
- Lakes
- Rivers

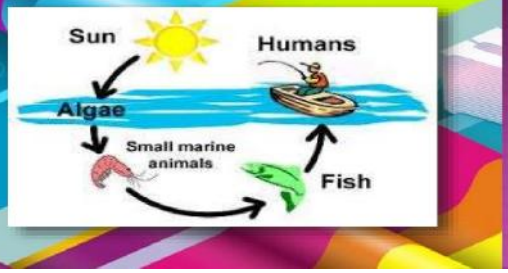

Salt water ecosystem:

- Oceans
- estuaries

## RIVERS (OR) STREAMS

A large natural flow of water that crosses an area of land and goes into an ocean, a lake, etc. Usually well oxygenated, because it absorbs oxygen from air, The number of animal are low in river or stream

## FOOD WEB




## SALT WATER ECOSYSTEM

OCEANS:
The vast body of salt water that covers almost three fourths of the earth's surface. It consist of high concentration of salts and minerals, It also provides us iron, magnesium, phosphorous, natural gas.

## ESTUARIES

An estuary is a partially enclosed costal area at the mouth of river where river joins the sea. Estuaries are abundant of nutrients , they are useful to human beings due to their high food potential

## What is Ecological Succession?

***ECOLOGICAL SUCCESSION IS:***

The observed process of change in the species structure of an ecological community over a period of time

## What is Ecological Succession?

- Ecosystems are constantly changing. ***Ecological succession*** is a gradual process of change and replacement of the types of species in a community.
- Each new community makes it harder for the previous community to survive.

## Types of Ecological Succession

- There are two main types of Ecological Succession:
- **Primary Succession**
  It is the process of creating life in an area where no life existed earlier.

## Primary Succession

- An example of an area in which a community has never lived before, would be a new lava or rock from a volcano that makes a new island.

## Primary Succession

- Begins in a place without any soil, like:
  - * Sides of volcanoes
  - * Landslides
  - * Flooding
- Starts with the arrival of living things such as lichens that do not need any soil to survive.
- They are called ***Pioneer Species***

## Primary Succession

- When lichens die, they decompose, adding small amounts of organic matter to the rock to make soil.
- Simple plants like mosses and ferns can grow on this new soil

## Primary Succession

- The simple plants die, adding more organic material.
- The soil layer thickens, and grasses and other plants begin to take over.

## Primary Succession

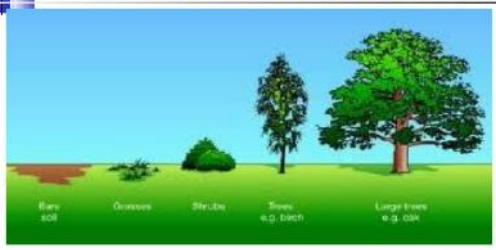
- These plants die, and they add more nutrients to the soil.
- Shrubs and trees can survive now, on this soil.

## Primary Succession

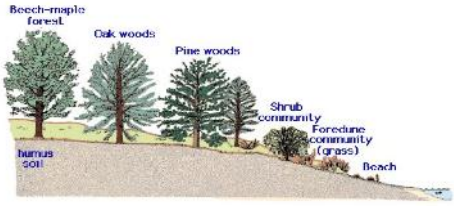
- Insects, small birds and mammals can now begin to move in.
- What was earlier only bare rock, now supports a variety of life

## Primary Succession

## Primary Succession




## Primary Succession




## Secondary Succession

- ***Secondary Succession*** is the process of re-stabilization that follows a disturbance in an area, where life has formed an ecosystem.

## *Types of Ecological Succession*

- **Secondary Succession** occurs on a surface where an ecosystem has previously existed. It is the process by which one community replaces another community which has been partially or totally destroyed, might be by natural process such as floods, earthquake etc.

## Primary Secondary

## Secondary Succession

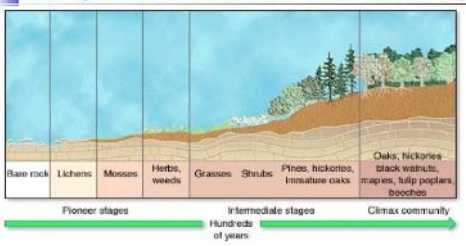
- When an existing community has been cleared by any type of disturbance, such as fire, cyclone etc and the soil remains intact, the area begins to return to its natural community.
- Because these habitats previously supported life, secondary succession begins.

## The Circle of life in Secondary Succession


## Why does Ecological Succession Occur?

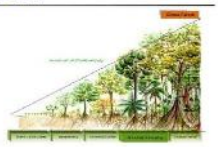
- Because it is the process of life for plants and other living organisms.
- Because organisms alter soil structure and the species communities constantly change over a period of time.
- Succession will continue until the environment reaches its final stage – the ***Climax Community***

## Gradual Change from Pioneer Stages to Climax Community




## How Ecological Succession takes place?

- Succession will continue until the environment reaches it's final stage, ---- the ***Climax Community.***



## Climax Community

- A ***climax community*** is a mature, stable community that is the final stage of ecological succession
- This type of community remains the same through out the time, if it is not disturbed.

## Climax Community

- A stable group of plants and animals which is the end result of succession process, does not always mean only big trees. They could be:
  - * **Cacti** in deserts or
  - * **Grasses** in fields

## These are Climax Communities

## Physical Factors

- The two main physical factors that determine the nature of the community that develops in an area are:
  - 1. Temperature
  - 2. The amount of rainfall.

## Threats to Succession

- The grasses that move in as pioneer species are often thought as ***weeds.***
- The subsequent growth of shrubs are considered undesirable "***brush".***

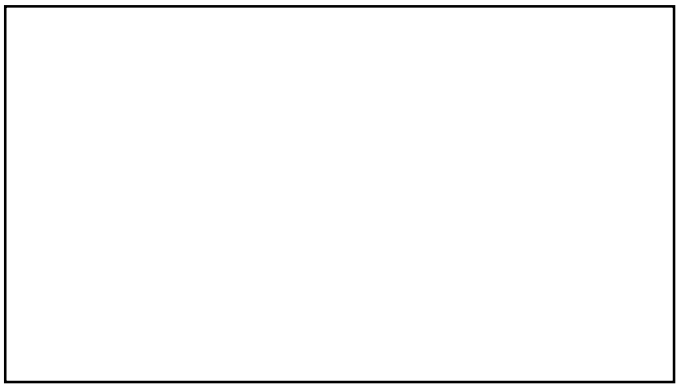


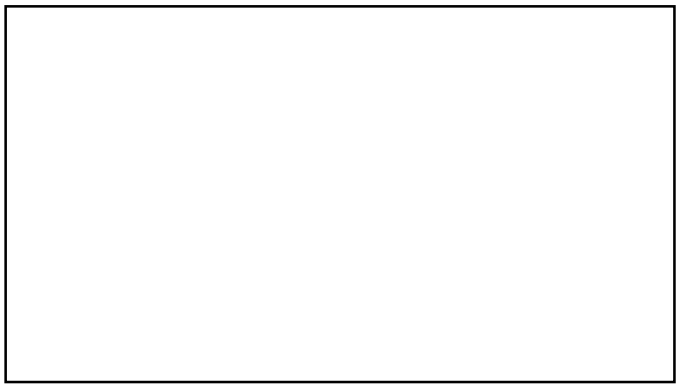
## Threats to Succession

- But, without these intermediate stages, the disturbed habitat can't return to forest.


## How do Humans affect Ecological succession?

- Clearing the land for garden and preparing the soil for planting is a type of major external event that radically re-structure and disrupt a previously stabilized ecosystem.
- This disturbance may immediately begin a process of ecological succession.





# NATURAL RESOURCES

# What are resources?

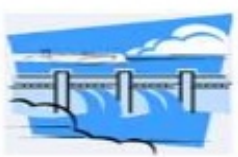
- Any material which is part of earth and satisfy human need and add value is called as resource.
- Example:rocks,minerals,soil,,rivers, plants & animal.
- Human is a resource because developing his skill, he can develop other resource by adding value to the physical material .

# Natural Resources

- **Natural resources includes** air, water, forests, animals, fishes, marine life, biomass, fossile fuels, like coal, petroleum and natural gases, wild life, renewable energy sources like solar energy, wind energy, biomass energy, geothermal energy etc.
- **Prosperity of a nation** is dependent on the natural resources available in the nation.

# Renewable Resource

- Renewable energy is energy which is generated from natural sources i.e. sun, wind, rain, tides and can be **generated again and again** as and when required.
- They are available in plenty and by far most the **cleanest sources** of energy available on this planet.
- **Solar Energy, Wind Energy, Geothermal Energy, Biomass Energy From Plants, Tidal Energy** are the examples of Renewable resources.

|  |  |  |  |  |  |
|---|---|---|---|---|---|
| Solar | Wind | Geo | Hydro | Bio | Tide |

# Non Renewable Resource

- A non renewable resource is a natural resource that **cannot be re-made or re-grown** at a scale comparable to its consumption.
- Non-renewable sources are **not environmental friendly** and can have serious effect on our health.
- They are called non-renewable because **they cannot be re-generated within a short span of time.**
- Non-renewable sources exist in the form of fossil fuels, natural gas, oil and coal.


# Forest Resources


# Forest Resources

- Scientists estimate that India should ideally have 33% of its land under forests. Today we have only about 12%. Thus we need not only to protect existing forest but also to increase our forest cover.


# Uses of Forest Resources

- They stop the rain-bearing winds and **cause the rainfall.**
- They increase the moisture content in the atmosphere and thereby provide additional precipitation**(i.e., rainfall)** in the locality
- They **minimize the extreme variation** in climatic condition and make the climate more equable.
- They **control floods** during heavy rain by absorbing excess rain water.
- They **prevent soil erosion** by checking the force of flowing of water.
- The thick roots of the trees absorb large quantity of water thus, forest **help in the flow of rivers and streams.**

# Uses of Forest Resources

- They offer **hunting grounds.**
- They provide **shelter to wild animals and birds.**
- They **improve the sanitary condition** of a place.
- They are a **source of revenue** to the government.
- They **facilitate human existence** by providing $O_2$ to human beings and absorbing $CO_2$ by human beings.
- They **provide employment** large number of people in different capacities as wood cutters, carriers etc.
- They also provide us **herbal medicines.**

# Reasons for the large scale depletion of forest

- Expansion of agriculture, more forest have been cleared for agriculture.
- Large area of forest lands have been cleared for urbanization and human settlement.
- Commercial exploitation of forest .
- Forest fires.
- Mining activities in forest areas.
- Forest diseases are also partly responsible for depletion forest.

# Adverse effect of depletion of trees

- It has contributed to **rise in temperature.**
- It has contributed to **lesser precipitation.**
- It is responsible for **increased rate of soil erosion.**
- It is responsible for **increase in the frequency and volume of floods.**
- It has lead to **loss of soil productivity.**
- It is responsible for **loss of biodiversity.**
- It has lead to **extinction of several species of plants and animals.**
- It has caused **imbalance in ecosystem.**

# Conservation of Forest

- Agro-forestry.
- Development of national parks and sanctuaries.
- Development of botanical gardens.
- Development of seed banks.
- Forest management.
- Proper role of government in forest conservation

# Deforestation

- Deforestation means reckless or large-scale felling or cutting of trees by man for commercial and other purposes.

# Causes of deforestation

- Desertification.
- Soil degradation and soil erosion.
- Loss of vegetation cover.
- Destruction of natural habitat and loss of wildlife.
- Changes in climatic condition.
- Environmental pollution.
- Damage to ecosystem
- Reduction in soil moisture.

# Control of Deforestation

- Prevention of human settlement in forest areas.
- Check on expansion of agriculture into forest lands.
- Prohibition of setting up of agriculture into forest lands.
- Check on reckless cutting of trees.
- Controlled mining in forest areas.
- Check on construction of large dams in forest areas.
- Control on over grazing in forest areas.

# Water Resources

# Water Resources

While 67% of Earth's surface is covered by water, only less than 2.7% of global water is freshwater. Most of the freshwater (2.05%) are locked in ice caps and glaciers. Only less than 0.7% is available for human use.

# Overutilization and pollution of surface and ground water

- With the growth of human population there is an increasing need for larger amounts of water to fulfil a variety of basic needs. Today in many areas this requirement cannot be met.
- Overutilization of water occurs at various levels. Most people use more water than really needed. Most of us waste water during a bath by using shower or during washing of clothes. Many agriculturists use more water than necessary to grow crops. There are many ways in which farmers can use less water without reducing the yields such as the use of drip irrigation systems.
- Agriculture also pollutes surface water and underground water stores by the excessive use of chemical fertilizers and pesticides. Methods such as the use of biomass as fertilizers and non toxic pesticides such as neem products reduces the agricultural pollution of surface and ground water.
- Industry tends to maximise short-term economic gains by not bothering about its liquid waste and releasing it into the streams, rivers, sea.

# Floods

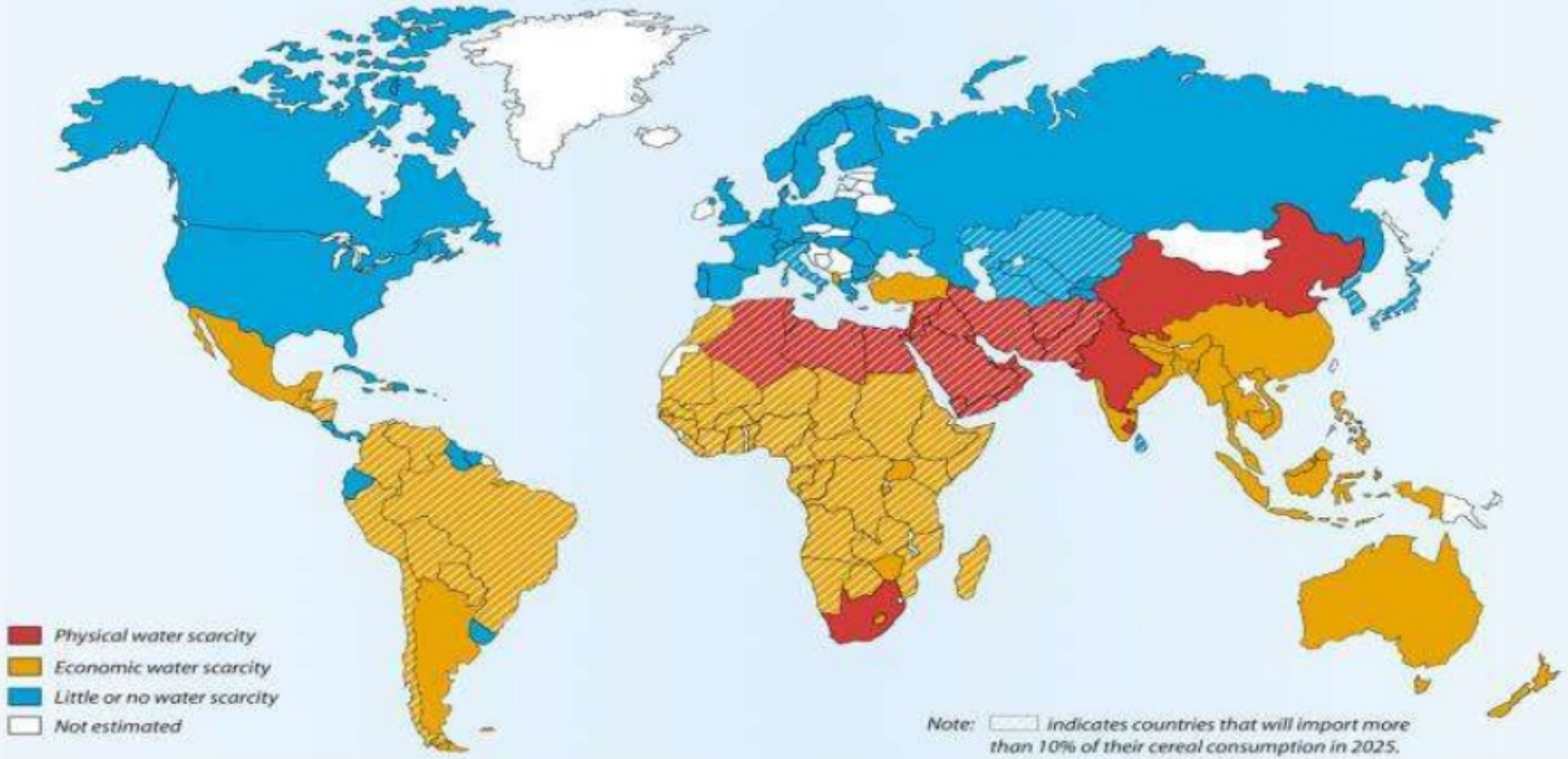
- Floods have been a serious environmental hazards from centuries.
- Deforestation causes flood that kills people, damage crops and destroys homes.
- Rivers changes its course during floods and tons of valuable soil is lost to the sea.
- As the forest are degraded, rain water no longer percolates slowly into the the sub-soil but runs off down the mountainside bearing large amount of top soil.

# Droughts

- In most arid regions of the world the rains are unpredictable. This leads to a periods when there is a serious scarcity of water to drink, use in farm, or provide for urban or industrial use.
- One of the factor that worsens the effect of droughts is deforestation.
- Drought is one of the major problem in our country, due to unpredictable climatic condition or due to the failure of one and more monsoon.

# Distribution of population and water resources

# Projected Water Scarcity in 2025




DTP Unit, IWMI–January, 2000

IWMI
INTERNATIONAL WATER MANAGEMENT INSTITUTE

Prepared by IWMI as input for the World Water Vision, The Hague, March, 2000.

http://iwmi.org

# Water Management

- Building several small reservoirs instead of few mega projects.
- Develop few catchment dams.
- Afforestation permits recharging of underground water.
- Treatment and recycling municipal waste water for agricultural use.
- Preventing leakages from dams and canals.
- Preventing loss in municipal pipes.
- Effective rain water harvesting in urban environments.
- Water conservation measures in agriculture such as using drip irrigation.
- Pricing the water at its real value makes people use it more responsibly and efficiently and reduce the water wasting.


# Mineral Resources

# Mineral Resources

- A mineral is a naturally occurring substances of definite chemical composition and identifiable physical properties.
- Minerals are formed over a period of millions of years in the earths crust.
- Iron, aluminium, zinc, manganese and copper are the important raw materials for the industrial use.
- Important non-metal resources includes coal, salt, clay, cement and silica.
- Stone used for building materials, such as granite, marble, limestone, constitute another category of the minerals.
- Minerals with special properties that humans values such as diamonds, emeralds, rubies. The luster of gold, silver, and platinum are used for the ornaments.
- Minerals in the form of the oil, gas, and coal were formed when ancient plants and animals were converted into underground fossil fuels.

# Mining

- The extraction of the minerals and their ores from the earths interior so that they can be used. This process is known as mining.
- Mines are of two types surface or deep or shaft mines.
- Mining is hazardous occupation, and the safety of the mine workers is an important.
- Surface mining is less hazardous than underground mining.
- Metal mining is less hazardous than coal mining.
- Mining posses several long term occupational hazards to the miners. Dust produced during mining operations is injurious to health and causes a lung disease known as black lung.
- Fumes generated by incomplete dynamite explosions are extremely poisonous.
- Radiation is hazardous in uranium mines.

# Surface mining and Underground mining

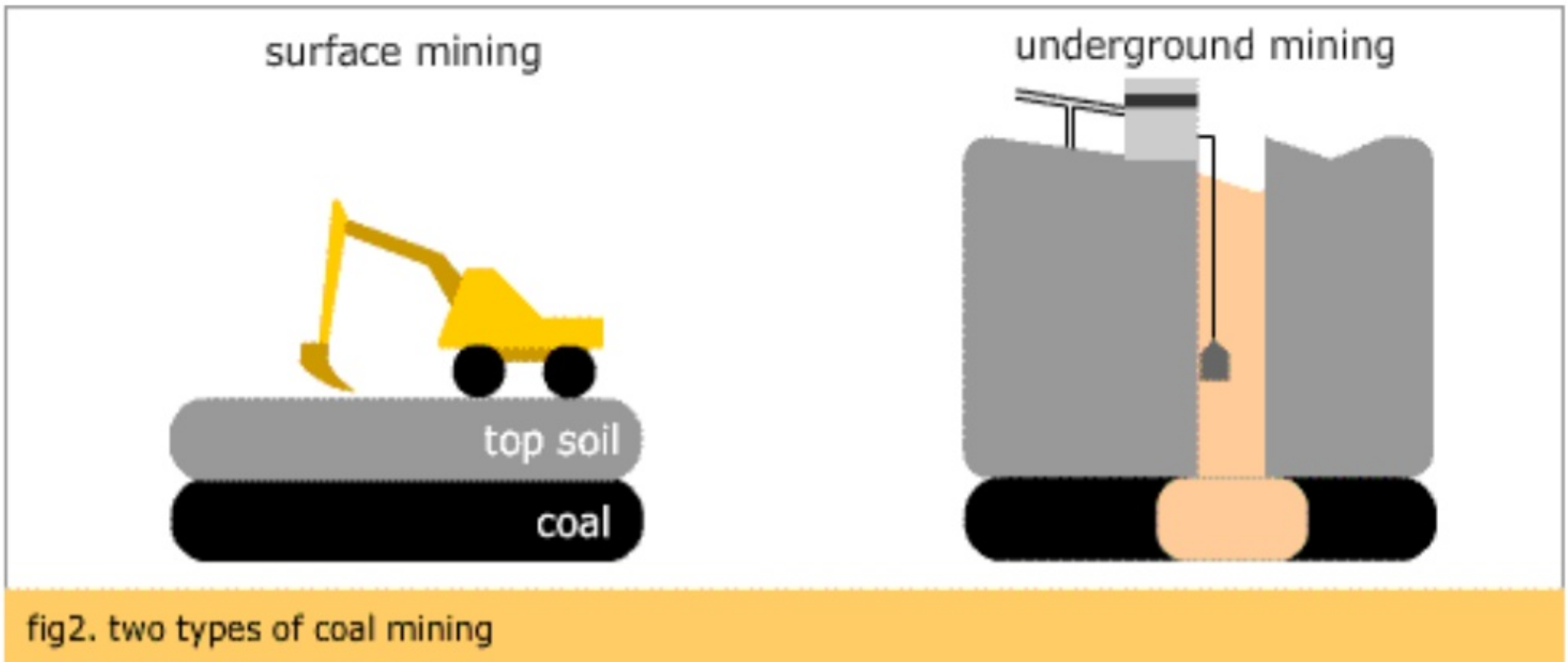



fig2. two types of coal mining

# Food Resources

# Food Resources

- Today our food comes almost entirely from **agriculture, animal husbandry and fishing.**
- Although India is self-sufficient in food production, it is only because of modern patterns of agriculture that are unsustainable and which pollutes of environment with the excess use of fertilizers and pesticides.
- If this crops are hit by the pest , the entire crop can be devastated, leaving the farmer **no income during the year.**

# Major Food Resources

- Wheat
- Rice
- Maize
- Potato
- Barley
- Oats
- pulses
- Vegetables
- Fruits
- Sugarcane
- Milk
- Meat
- Fish

# World Food Problem

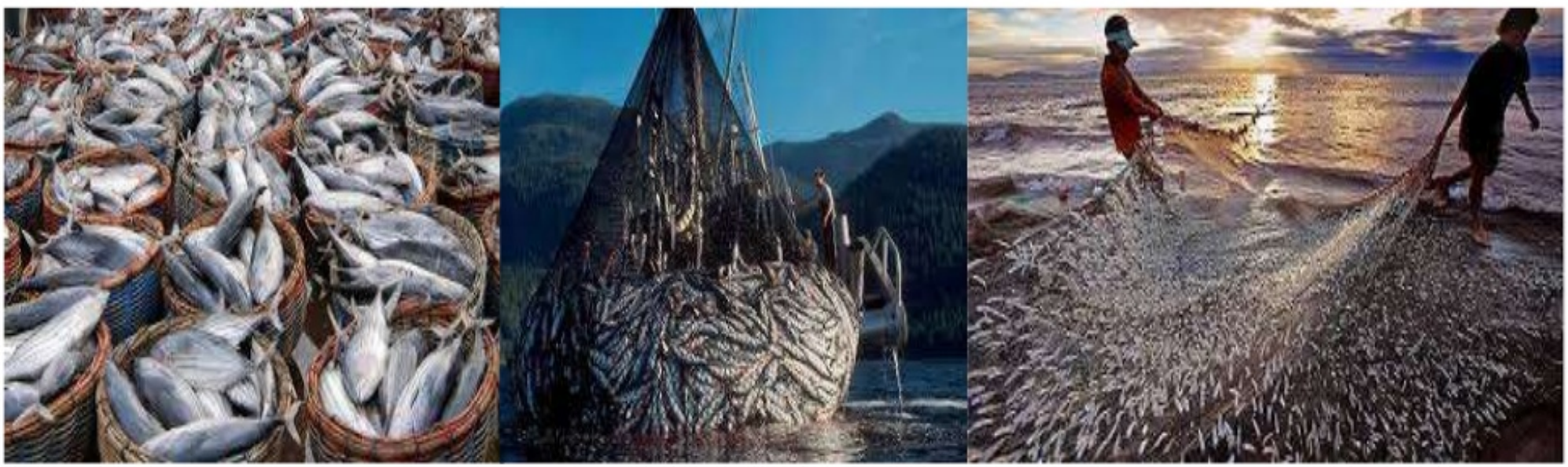
- In many developing countries where populations are expanding rapidly, the production of food is unable to keep pace with the growing demand.
- **Food production in 64 of the 105 developing countries is lagging** behind the population growth levels. These countries are unable to produce more food, or do not have the financial means to import it.
- India is the one of the country that have been able to produce enough food by cultivating its large proportion of land through irrigation. **The Green revolution of 60's reduced starvation in the country.**

# World Food Problem

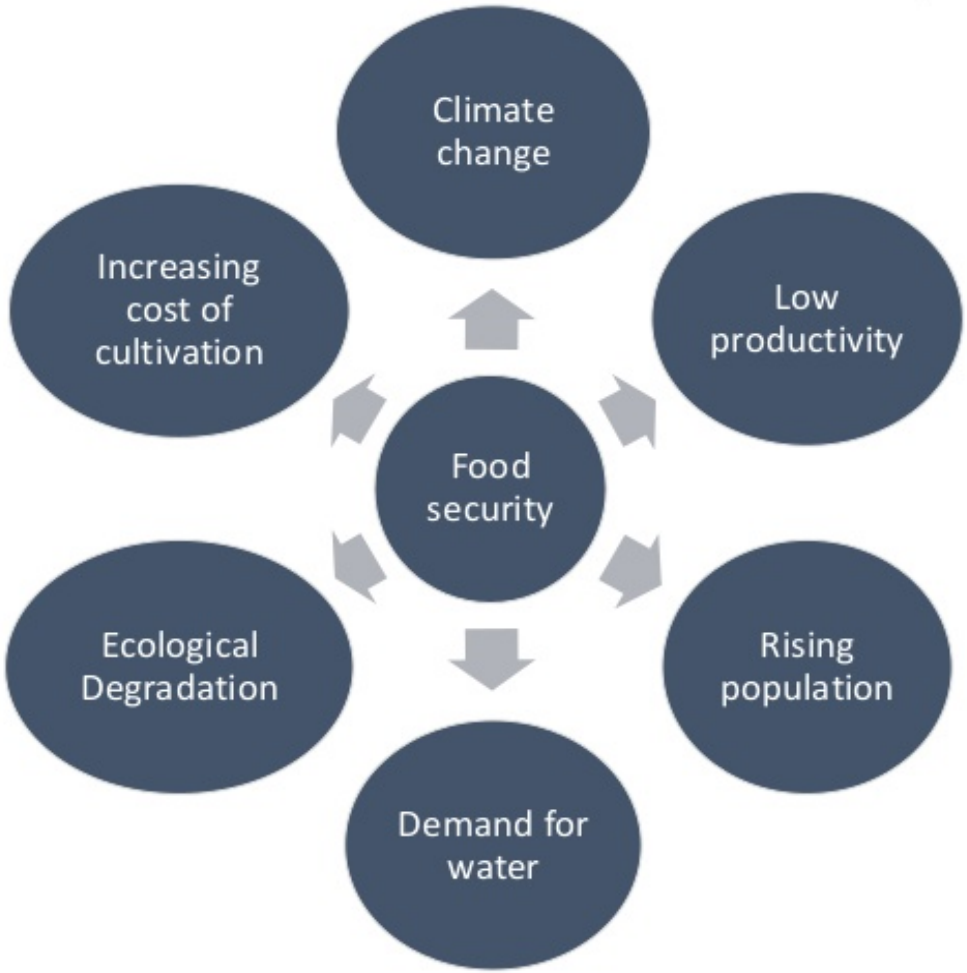
| Country Group | No. of people malnourished |
|---|---|
| World | 848 million |
| Developed Country | 16 million |
| Developing Country | 832 million |
| India | 230 million |

# Fisheries

- Fish is an important protein food in many part of the world.
- This includes fresh water and marine water fish.
- The supply of the food from fisheries has been increased now a days.



# Problem of food security



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# Land Resources


# Land Resources

- Land Resources includes

1. Hills
2. Valleys
3. Plains
4. River basins
5. Wetland.

- Land is a finite natural resources.

# Land Resources

- Man needs land for **building homes, cultivating food, developing industries for providing goods, and for creating towns and cities.**
- Thus a **rational use** of land needs careful planning. One can develop most of these different types of land uses almost anywhere, but it is very important to protect wilderness area in the form of national parks and sanctuaries.
- If land is utilized properly it can be considered as **renewable resources.**
- Land is also converted into a **non renewable resources** when highly toxic industrial and nuclear wastes are dumped on it.

# Land Degradation

- Farmland is under threat due to more and more intensive utilization. Every year, between 5 to 7 million hectares of land world wide is added to the existing degraded farmland.
- The use of more and more chemical fertilizers poisons to the soil so that eventually the land becomes unproductive.
- As urban centers grow and industrial expansion occurs, the agricultural land and forest shinks. This is a serious loss and long term ill effect on the human civilization.
- Soil erosion is also considered as one kind of land degradation.

# Role of Individual in conservation of natural resources

## 1. INDIVIDUALS ROLE IN FOREST CONSERVATION

- The measures to conserve forests ,save trees, and planting new trees include- Not felling the trees in forests ,farms,roads,or houses if they are green.
- Not uprooting the existing trees while constructing a house but planting fast growing plant species in open area of the house.
- Planting herbs,shurbs,or suitable trees in and around the house.
- Maintain lawn and garden in open place in your house ,if possible.
- Participating in community plantation programmes.

- Encourage mass scale tree plantation programmes.
- Cooperate with NGOs engaged in saving trees.
- Plant trees generously in barren fields.
- Tag tree plantation with year ceremonies such as birth day, marriage anniversary etc.
- Observe **July 1-7 as vanmahotsava week**. Encourage 'adopt a tree programme' ie, 'each one tree one'
- Observe **March 21 as forest day.**
- Discourage using paper for correspondence

## 2. INDIVIDUALS ROLE IN WATER ECONOMY

The measures to conserve water resources include

- Not keeping water taps running.
- Check water leak and repair.
- Adopt minimum water use patterns.
- Installing water saving toilets that use optimum water per flush.
- Adopting rain water harvesting devices in your house to conserve water for future use.
- Collect waste water in your home and use it for watering kitchen garden.

- Filling water in washing machine to the level required for the cloths to be washed.
- Watering lawn and kitchen garden plants in the evening to minimise evaporation losses and not watering them in the mid day.
- Save wetlands ,lakes, ponds, wells, etc.
- Observe **March 22nd** as world water day.
- Observe **February 2nd** as world wetland day.
- Join youth water team or any such NGO engaged in water conservation.

## 3. INDIVIDUALS ROLE IN CONSERVATION OF MINERALS

Some of the measures to conserve minerals are

- Minimise the use of minerals which are likely to be depleted or exhausted.
- Minimise use of jewellery to conserve scarce minerals.
- Recycle and reuse minerals and glasses.
- Buy durable products that lasts long.
- Buy efficient vehicles.
- Repair and reuse bicycles.
- Use recyclable utensils

## 4. INDIVIDUALS ROLE IN FOOD SECURITY

Some of the measures to achieve food security are

- Sustainable use of food and not wasting it.
- Eating only as much as required for sustenance of life.
- Consuming local and seasonable vegetables and so as to save energy on their transportation, storage and preservation.
- Buy only organically grown food.
- Discourage packed ,canned and preserved food.
- Shift from non vegetarian to vegetarian.
- Observe **October 16 as world food day and November 21 as world fishery day.**

## 5.INDIVIDUALS ROLE IN ENERGY CONSERVATION AND SAVING ENERGY

Some of the measures are

- Turning off lights ,fans, or other electric appliances when not in use.
- Replacing tube lights with CFLs and LED s.
- Construct buildings in such a way that maximum amount of sunlight can be obtained.
- Try to dry cloths in sunlight instead of drier of washing machine.
- Using solar cookers for cooking food.
- Buying energy efficient appliances, always checking energy consumption figure.
- Minimise use of automobiles by using bicycles, public transport, carpooling etc.

- Trying to reside near the place of work, if possible.
- Keeping vehicles tuned for low consumption of fuel.
- Checking fuel consumption data while buying a new vehicle.
- Following the advice given by petroleum conservation research association
- Wearing adequate woollen clothes during winter instead of using heat convector
- Growing deciduous trees at proper place out side the house,they will cut off intense heat during the summers ,cut off electricity consumption and will provide a cool breeze.
- Observe **December 14 as world energy conservation day.**

## 6.INDIVIDUALS ROLE IN SUSTAINABLE AGRICULTURE AND SOIL PROTECTION

Some of the measures are

- Reducing use of chemicals such as fertilizers and pesticides to check soil pollution.
- Using bio fertilizers.
- Using biological control measures for pest control.
- Avoid over irrigation without proper irrigation to prevent water logging
- Discouraging monoculture practise in agriculture.
- Adopting mix cropping.
- Adopting drip irrigation to avoid washing out soil nutrients.
- Observing December 23 as world farmers day.
- Observing June 17 as a day to combat desertification and deserts.
- Observe November 21-27 as national land resource conservation week.

# Policy gaps

- Lack of policies for protection of wetlands, grasslands and other areas.
- Inadequate enforcement of existing laws
- Inadequate implementation of eco-development programmers
- Need for enhanced role of NGOs and other institutions
- Need for political commitment and good will.
- Need for providing Institutional support like Banks, FI
- Lack of Local community participation

# STANDARD OF LIVING AND QUALITY OF LIFE

Standard of living refers to the consumption of goods and services by an individual. It relates directly to the economic development whereas the well-being or quality of life of a population refers to a combination of attributes that provide physical, mental, spiritual and social wellbeing.

# SUSTAINABLE DEVELOPMENT

SOME DEFINITIONS :

- "Development that meets the needs of the present without compromising the ability of future generations to meet their own needs".

- Sustainable Development (SD) implies economic growth together with the protection of environmental quality, each reinforcing the other. Sustainable Development, thus, is maintaining a balance between the human needs to improve lifestyles and feeling of well-being on one hand, and preserving natural resources and ecosystems, on which we and future generations depend.

# MAIN FEATURES OF SUSTAINABLE DEVELOPMENT

A desirable human condition : a society that people want to sustain because it meets their needs.

A enduring ecosystem condition: an ecosystem that maintains its capacity to support human life and others.

A balance between present and future generations; and within the present generation.

- **INCLUDED:**
  - **SUSTAINABLE GROWTH**
  - **SUSTAINABLE CONSUMPTION**
  - **SUSTAINABILITY**

✓ **SUSTAINABLE GROWTH**

For growth we need resources and the rate of depletion of resources cannot be matched with the regenerating capacity of earth, as it is finite, not-growing and materially closed. Therefore, Sustainable growth is an impossible theorem!

✓ **SUSTAINABLE CONSUMPTION**

Sustainable consumption is related to production and distribution, use and disposal of products and services and provides the means to rethink our
lifecycle. The aim is to ensure that the basic needs of the entire global community are met, excess is reduced and environmental damage is avoided.

✓ **SUSTAINABILITY**

Sustainability is the action oriented variant of Sustainable Development. There are some principles of sustainability which include the following-

- Protecting Nature
- Thinking long-term
- Recognizing limits

# The Sustainability' model

It was designed in 1994 by the International Union for the Conservation of Nature, IUCN.

It illustrates the relationship between people and ecosystem as one circle inside another, like the yolk of an egg. This implies that people are within the ecosystem, and that ultimately one is entirely dependent upon the other. Just as an egg is good only if both the white and yolk are good, so a society is well and sustainable only if both, people and the eco-system, are well.

Thus according to this model:
**sustainable development = human well-being + ecosystem well-being**

# INDICATORS OF SUSTAINABLE DEVELOPMENT

- Gross National Happiness (GNH)
- Human Development Index (HDI)
- Ecological Footprint (EF)
- The Happy Planet Index (HPI)

## Gross National Happiness (GNH)

Gross National Happiness (GNH) is an attempt to define quality of life in a more holistic and psychological terms than Gross National Product.

GNH is based on the assertion that true development of human society takes place when material and spiritual development occur side by side to complement and reinforce each other

**Four pillars of GNH**

- The promotion of equitable and sustainable socio-economic development,
- Preservation and promotion of cultural values,
- Conservation of the natural environment,
- Establishment of good governance.

## Human Development Index (HDI)

The Human Development Index (HDI) is the measure of life expectancy, literacy, education, and standard of living for countries worldwide.

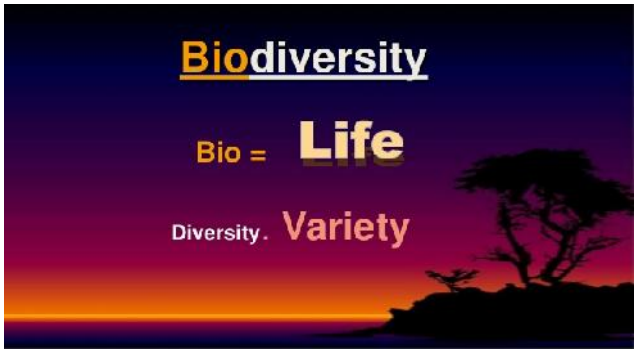
Three basic dimensions of human development:

- A long and healthy life
- Knowledge,
- A decent standard of living

# Measures for Sustainable Development

- Using appropriate Technology
- Reduce, Recycle and Reuse Approach
- Promoting environmental awareness approach
- Resource utilization as per carrying capacity
- Improving quality of life including social, cultural and economic.

# Biodiversity and it's conservation




- **INTRODUCTION:**
- Biodiversity is the variety of life on earth
- It includes all life forms-from the unicellular fungi, protozoa and bacteria to complex multicellular organisms such as plants, birds, fishes and animals.
- Biodiversity is the variety of flora and fauna on this planet earth.

- DEFINITION:
- According to the World Resources Institute-
- "Biodiversity is the variety of the world's organisms, including their genetic diversity and the assemblage they form."

- The concept reflects the inter-relatedness of genes, species and ecosystems.
- Because genes are the components of species, and species are the components of ecosystems. Therefore, altering the make-up of any level of this hierarchy can change the others-species and are central to the concept of biodiversity.
- From the driest deserts to the dense tropical rainforests and from the high snow-clad mountain peaks to the deepest of ocean trenches, life occurs in a marvellous spectrum of forms, size, colour and shape, each with unique ecological inter-relationships.

- **GENETIC DIVERSITY**
- It refers to the total genetic information contained in the genes of individuals of plants , animals and microorganisms.
- The genes found in organisms can form enormous number of combinations each of which gives rise to some variability.
- Genes are the basic units of hereditary information transmitted from one generation to other.
- When the genes within the same species show different versions due to new combinations, it is called genetic variability.
- For example, all rice varieties belong to the species Oryza sativa, but there are thousands of wild and cultivated varieties of rice which show variations at the genetic level and differ in their color, size, shape, aroma and nutrient content of the grain. This is the genetic diversity of rice.

- **New genetic variation arises:**
- by gene and chromosome mutation; and
- by the recombination of genetic material during cell division preceding reproduction.

- Species Diversity:
- A species generally consists of all the individual organisms of a natural population which are able to interbreed, generally sharing similar appearance, characteristics and genetics due to having relatively recent common ancestors.
- A species is a reproductively isolated population that shares a common gene pool and a common niche.
- a **species** is one of the basic units of biodiversity.

- **Measurement of species:**

Species richness is the simplest measure of biodiversity and is simply a count of the number of different species in a given area.

**Species evenness** is a diversity index, a measure of biodiversity which quantifies how equal the populations are numerically.

- So if there are 40 foxes, and 1000 dogs, the population is not very even.
- But if there are 40 foxes and 42 dogs, the population is quite even.

- **ECOSYSTEM DIVERSITY**
- This is the diversity of ecological variations in ecological niches, trophic structure, food-webs, nutrient cycling etc.
- The ecosystems also show variations with respect to physical parameters like moisture, temperature, altitude, precipitation etc.
- Thus, there occurs tremendous diversity within the ecosystems, along these gradients.
- The ecosystem diversity is of great value that must be kept intact.

- This diversity has developed over millions of years of evolution.
- If we destroy this diversity, it would disrupt the ecological balance.
- We cannot even replace the diversity of one ecosystem by that of another.
- Coniferous trees of boreal forests cannot take up the function of the trees of tropical deciduous forest lands and vice versa, because ecosystem diversity has evolved with respect to the prevailing environmental conditions with well-regulated ecological balance.

## Ecological Niche

- The description of a niche may include descriptions of the organism's life history, habitat, and place in the food chain.
- **A niche is the sum total of an organism's use of biotic and abiotic resources in its environment, how it "fits into" an ecosystem.**
- **A niche may apply to species, populations or even individuals.**
- The concept of the ecological niche is an important one; it helps us to understand how organisms in an ecosystem interact with each other.

- **A fundamental niche is the resources of an organism or population is theoretically capable of using under ideal circumstances.**
- **The ecological niche of an organism depends not only on where it lives but also on what it does.**
- **By analogy, it may be said that the habitat is the organism's "address", and the niche is its "profession", biologically speaking.**

## BIOGEOGRAPHICAL CLASSIFICATION OF INDIA

- **Biogeography** is the science which deals with patterns of species distribution and the processes that result in such patterns.
- The patterns of species distribution at this level can usually be explained through a combination of historical factors such as speciation, extinction, continental drift, glaciation (and associated variations in sea level, river routes, and so on), and river capture, in combination with the area and isolation of landmasses (geographic constraints) and available energy supplies.

- Some fundamentals in biogeography are
- Evolution (change in genetic composition of a population)
- Extinction (disappearance of a species)
- Dispersal (movement of populations away from their point of origin, related to migration)
- Range and distribution
- Endemic areas

- India has different types of climate and topography in different parts of the country and these variations have induced enormous variability in flora and fauna.
- India has a rich heritage of biological diversity
- It is very important to study the distribution, evolution, dispersal and environmental relationship of plants and animals in time and space
- Biogeography comprising of phytogeography and zoogeography deals with these aspects of plants and animals.

- In order to gain insight about the distribution and environmental interactions of flora and fauna of our country, it has been classified into ten biogeographic zones.
- Each of these zones has its own characteristic climate, soil, topography and biodiversity.

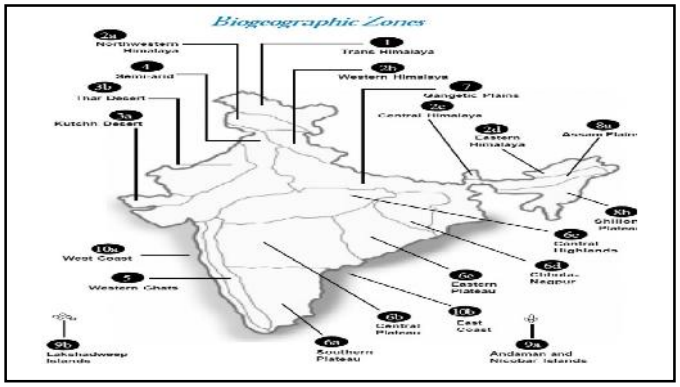
- ***Biogeographic zones:***
- *Major zones representing distinctive units of similar ecology, biome representation, community and species. e.g. Himalaya, Gangetic plain.*
- ***Biotic provinces:*** *Next level of detail within the zones. e.g. Northwestern Himalaya, Western Himalaya.*
- ***Biomes:*** *Major ecosystem groupings found within each province and region. e.g. Alpine, subalpine.*

- Within India the classification recognizes 10 Zones, divided into 26 Provinces

The zones are:

1. Trans-Himalaya with 2 provinces
2. The Himalaya with 4 provinces
3. The Indian Desert with 2 provinces
4. The Semi-Arid Zone with 2 provinces
5. The Western Ghats with 2 provinces
6. The Deccan Peninsula with 5 provinces
7. The Gangetic Plain with 2 provinces
8. The Coasts with 3 provinces
9. North East India with 2 provinces
10. The Islands with 2 provinces

| SR. NO. | BIOGEOGRAPHIC ZONE | BIOTIC PROVINCE |
|---|---|---|
| 1. | Trans-Himalayan | Upper Regions |
| 2. | Himalayan | North-West Himalayas ,West Himalayas Central Himalayas ,East Himalayas |
| 3. | Desert | Kutch ,Thar ,Ladakh |
| 4. | Semi-Arid | Central India ,Gujarat-Rajwara |
| 5. | Western Ghats | Malabar Coast , Western Ghat Mountains |
| 6. | Deccan Peninsula | Deccan Plateau ,Scuth Central Plateau Eastern Plateau, Chhota Nagpur Central Highlands |
| 7. | Gangetic Plain | Upper Gangetic Plain, Lower Gangetic Plain |
| 8. | North-East India | Brahmaputra Valley, North-Eastern Hills |
| 9. | Islands | Andaman Islands Nicobar Islands Lakshadweep Islands |
| 10. | Coasts | West Coast East Coast |




## Biogeographic Zones

**1. Trans-Himalaya:** **Biotic Province:** Ladakh (J&K) and Lahaul - Spiti (Himachal)
**(1). Biome:** Tundra valley, lakes and marshes.
**Wildlife:** Chiru, Black-necked Crane, Himalayan pit viper.

**2. Himalaya:** **Biotic Province:** Northwestern Himalaya (2a), Western Himalaya (2b), Central Himalaya (2c), Eastern Himalaya (2d).
**Biome:** All alpine, temperate conifer, temperate broadleaf, subtropical
**Wildlife:** Ibex, red panda, Monal Pheasant.

**3. Indian Desert:** **Biotic Province:** Kutchh (3a), Thar (3b).
**Biome:** Saltflats,scrublands, desert grasslands.
**Wildlife:** Wild ass, blackbuck, flamingo,desert monitor.

**4. Semi-arid:** **Biotic Province:** Punjab and Gujarat-Rajwara
**(4).Biome:** Scrublands, Bhabar forests, wetlands, dry deciduous, hill and thorn forests. **Wildlife:** Tiger, Asiatic lion, Great Indian Bustard, gharial.

**5. Western Ghats:** **Biotic Province:** Western Ghats
~~**(5). Biome:** Evergreen, moist deciduous, wetlands, Montane forests, grasslands.~~
**Wildlife:** Lion-tailed macaque, Malabar civet, hornbill, draco.

**6. Deccan Peninsula:** Biotic Province: Southern Plateau (6a), Central Plateau (6b), Eastern Plateau (6c), Chhota-Nagpur (6d), Central Highlands (6c).
Biome: Dry deciduous, thorn forests, wetlands, subtropical, moist deciduous.
Wildlife: Swamp deer, Jerdon's Courser, mugger.

**7. Gangetic Plains:** Biotic Province: Lower and upper Gangetic plains (7).
Biome: Alluvial plain, wetlands, rivers.
Wildlife: Rhino, otter, Gangetic dolphin, terrapin.

**8. Northeast India:** Biotic Province: Assam Plains (8a), Shillong Plateau (8b).
Biome: All plain grasslands, woodlands, Bhabar terai, evergreen moist deciduous, wetlands and rivers, subtropical temperate.
Wildlife: Pygmy hog ,serow, Yellow-backed Sunbird.

**9. Islands:** Biotic Province: Andaman and Nicobar (9a), Lakshadweep (9b).
Biome: Evergreen, moist deciduous, subtropical temperate wetlands, coastal habitat. Wildlife: Dolphin, Narcondam Hornbill, olive ridley turtle.

**10. Coasts:** Biotic Province: West Coast (10a), East Coast (10b).
Biome: Mangrove, brackish lakes and lagoons, mudflats, sandy or rocky littoral. Wildlife: dugong, Brahminy Kite, sand skink.

## Trans - Himalaya Zone


Chiru


Black necked crane


Himalayan pit viper

## Himalaya zone


Ibex


Red Panda


Monal Pheasant

## Indian Desert Zone


Wild Ass


Black Buck


Flamingo

## Semi - arid Zone


## Semi-arid Zone

## Semi - arid Zone


Gharial


Great Indian Bustard

## Western- Ghats


Lion Tailed Macaque


Malabar-civet


Horn bill

## Deccan Peninsula


Swamp deer


**Jerdon's Courser (*Rhinoptilus bitorquatus* )**


mugger

## Gangetic Plains


Rhino


Otter


Terrapin

## Northeast India


PYGMY HOG


SEROW


YELLOW BACKED SUNBIRD

## Islands


Dolphin


Narcondam Hornbill


olive ridley turtle

## VALUE OF BIODIVERSITY

- **Consumptive value**: These are direct use values where the biodiversity product can be harvested and consumed directly e.g. fuel, food, drugs, fibre etc.
- **Drugs and medicines:** About 75% of the world's population Depends upon plants or plant extracts for medicines.
- The wonder drug Penicillin used as an antibiotic is derived from a fungus called "Penicillium" .
- Recently vinblastin and vincristine, two anticancer drugs, have been obtained from Periwinkle (Catharanthus) plant, which possesses anticancer alkaloids.
- A large number of marine animals are supposed to possess anti-cancer properties which are yet to be explored systematically.

## Periwinkle (Catharanthus)

## Table 1 . Natural medicinal products

| S. No. | Product | Source | Use |
|---|---|---|---|
| 1. | Aspirin | Willow bark | Anti inflammatory |
| 2. | Allantoin | Blowfly larva | Wound healer |
| 3. | Bacitracin | Bacterium | Antibiotic |
| 4. | Bee venom | Bee | Arthritis relief |
| 5. | Cytarabine | Sponge | Leukemia cure |
| 6. | Cortisone | Mexican yam | Anti-inflammatory |
| 7. | Digitalis | Foxglove plant | Heart stimulant |
| 8. | Diosgenin | Mexican yam | Birth-control drug |
| 9. | Erythromycin | Bacterium | Antibiotic |
| 10. | Morphine | Poppy plant | Analgesic |
| 11. | Penicillin | Fungus | Antibiotic |
| 12. | Quinine | Cinchona bark | Malaria treatment |
| 13. | Reserpine | Rauwolfia | Hypertension drug |
| 14. | Tetracycline | Bacterium | Antibiotic |
| 15. | Vinblastine | Rosy periwinkle plant | Anticancer drug |
| 16. | Vincristine | Rosy periwinkle plant | Anticancer drug |

## Foxglove plant - Digitalis

Cinchona

Rauwolfia

- **Fuel:** Our forests have been used since ages for fuel wood. The fossil fuels coal, petroleum and natural gas are also products of fossilized biodiversity.
- **Productive Values:** These are the commercially usable values where the product is marketed and sold.
- These may include the animal products like
- tusks of elephants, musk from musk deer, silk from silk-worm, wool from sheep, fur of many animals, lac from lac insects etc, all of which are traded in the market.

musk from musk deer

silk from silk-worm

tusks of elephants

lac from lac insects

wool from sheep

- **Genetic Value**: Biological diversity is a valuable genetic resource.
- Most of the hybrid varieties of crops under cultivation have been developed by incorporating useful genes from different species of plants to produce better quality of the product with longer self-life or having better resistance to pests.
- Though such breeding techniques are unlimited in scope; but, for getting better strains in future, it is essential to build-up a gene-pool because the quality, yield, and resistance to pests, disease and adverse climatic conditions mostly depend on genetic factors and combination of genes which may be different in different strains/varieties of species.
- There are hundreds of examples which illustrate how genetic modification helped in improved quality of the product.

- A few of them are mentioned as under

- The genes from a wild variety of melon grown in U.P. helped in imparting resistance to powdry mildew in musk-melons grown in California (USA).
- The genes from the Kans grass (Saccharum spontaneum) grown in Indonesia helped in imparting resistance to red rot disease of sugarcane.
- A wild variety of rice from UP. saved millions of hectares of paddy crop from Grossy-Stunt virus.

Musk-melon

Kans grass

- **Social Value**: These are the values associated with the social life, customs, religion and aspects of the people.
- Many of the plants are considered holy and sacred in our country like Tulsi (holy basil), Peepal, Mango, Lotus, Bael etc.
- The leaves, fruits or flowers of these plants are used in worship or the plant itself is worshipped.
- Many animals like Cow, snake, Bull, Peacock, Owl etc have significant place in psycho-spiritual arena and thus hold social importance.
- The tribal people are very closely linked with the wild life in the forests.
- The biodiversity has distinct social value, attached with different societies.

Peepal

Lotus

Tulsi (holy basil)

## Peepal Tree

- **Ethical value:** It is also sometimes known as existence value.It involves ethical issues like "all life must be preserved". It is based on the concept of "Live and Let Live".
- If we want our human race to survive then we must protect all biodiversity, because biodiversity is valuable.
- **Aesthetic value:** Great aesthetic value is attached to biodiversity.
- No one of us would like to visit vast stretches of barren lands with no signs of visible life.
- People from far and wide spend a lot of time and money to visit wilderness areas where they can enjoy the aesthetic value of biodiversity and this type of tourism is now known as eco-tourism.

- **Option values:** These values include the potentials of biodiversity that are presently unknown and need to be explored.
- There is a possibility that we may have some potential cure for AIDS or cancer existing within the depths of a marine ecosystem, or a tropical rainforest.
- Thus option value is the value of knowing that there are biological resources existing on this biosphere that may one day prove to be an effective option for something important in the future.
- Thus, the option value of biodiversity suggests that any species may prove to be a miracle species someday.
- The biodiversity is like precious gifts of nature presented to us. We should not commit the folly of losing these gifts even before unwrapping them.
- The option value also includes the values, in terms of the option to visit areas where a variety of flora and fauna, or specifically some endemic, rare or endangered species exist.

- **Ecosystem service value:** It refers to the services provided by ecosystems like prevention of soil erosion, prevention of floods, maintenance of soil fertility, cycling of nutrients, fixation of nitrogen, cycling of water, their role as carbon sinks, pollutant absorption and reduction of the threat of global warming etc.
- Different categories of biodiversity value clearly indicate that ecosystem, species and genetic diversity all have enormous potential and a decline in biodiversity will lead to huge economic, ecological and socio-cultural losses.
- Biodiversity value of some selected organisms in monetary terms
- A male lion living upto an age of 7 years can generate upto $ 515,000 due to its aesthetic value as paid by tourists, whereas if killed for the lion skin a market price upto $ 1,000 can be fetched.

- **Biodiversity at Global level:**
- Cellular life has existed on Earth for probably more than 3,500 million years, but for more than half this time consisted only of prokaryotes (i.e. unicellular organisms such as bacteria and blue-green algae).
- Multicellular animals (metazoans) first appeared in the fossil record some 600 million years ago.
- During the earlier part of the Cambrian period (500-580 million years ago) a wide diversity of multicellular forms appeared with relative suddenness.

- The early metazoans inhabited the sea; the land was colonized during the Silurian and
- Devonian periods (340-440 million years ago). In parallel with land animals, the terrestrial vascular plants too appeared.
- But the major radiation occurred among the angiosperms (flowering plants), which diversified enormously during the Cenozoic era(65 million years ago to today).

- The present geological era is perhaps the richest in biological diversity.
- About 2.1 million species have been identified till date, while many more species are believed to exist.
- According to UNEP (1993-94) estimate, the total number of species that might exist on Earth range between 9.0 - 52 million Invertebrate animals and plants make-up most of the species.
- About 70% of all known species are invertebrates (animals without backbones such as insects, sponges, worms, etc.); while, about 15% are plants.
- Following the 1992 "Earth Summit" at Rio de Janeiro, it became evident that there is a growing need to know and scientifically name, the huge number of species which are still unknown on this earth.

- Globally, we have roughly 1,70,000 flowering plants, 30,000 vertebrates and about 2,50,000 other groups of species that have been described.
- The present global patterns in biodiversity indicate that the species richness tends to vary geographically according to a series of fairly well defined rules.

**For example, in case of terrestrial environments:**

- Warmer areas hold more species than the colder areas;
- Wetter areas hold more species than the drier ones;
- Areas of varied climate and topography hold more species than the areas of uniform climate and topography;
- Areas at lower altitude (elevation) hold more species than the high altitude areas; and
- Less seasonal areas hold more species than the highly seasonal areas.

- Similarly, in case of pelagic marine species, there tends to be more species in warmer and less seasonal waters, i.e. at lower latitudes.
- More species, both per unit area and overall/in the tropics than in temperate regions and for more in the temperate regions than in polar regions.
- The moist tropical forests, in general, are the most species rich areas or environments on earth.

## Biodiversity at Global level:

- It is estimated that there exists 5-30 million species of living forms on our earth .Of these only 1.5 million are identified.

| | |
|---|---|
| Green Plants and Fungi | :300,000species |
| Insects | : 8,00,000species |
| Vertebrates | :40,000species |
| Microorganisms | :3,60,000 species |

- **BIOLOGICAL DIVERSITY AT NATIONAL LEVEL : (Indian Biodiversity):**
- Every country is characterized by its own biodiversity depending mainly on its climate.
- India has a rich biological diversity of flora and fauna.
- Overall six percent of the global species are found in India.
- It is estimated that India ranks 10th among the plant rich countries of the world, 11th in terms of number of endemic species of higher vertebrates and 6th among the centers of diversity and origin of agricultural crops.
- The total number of living species identified in our country is 150,000.
- Indian is also one of the 12 mega-biodiversity countries in the world.
- Out of a total of 25 biodiversity hot-spots in the world, India possesses two, one in the north-east region and one in the western ghats.

- **Biodiversity at (Local level) Andhra Pradesh**
- Andhra Pradesh has a rich biological diversity which consist of 4 National parks, and 21 wild life sanctuaries.
- Kasu Brahmananda Reddy National Park, 1994 ,area 1.42 $km^2$
- Mahavir Harina Vanasthali National Park ,1994 14.59 $km^2$
- Mrugavani National Park ,1994, area 3.60 $km^2$
- Sri Venkateswara National Park ,1989, area 353.62 $km^2$

- Kasu Brahmananda Reddy National Park is a national park located in the Jubilee hills in Hyderabad, Andhra Pradesh, India.
- Named after the former chief minister of Andhra Pradesh. Described as 'a jungle amidst the concrete jungle'.
- The park has over 600 species of plant life, 140 species of birds and 30 different varieties of butterflies and reptiles.
- Animals making their home in the park include: pangolin, small Indian civet, peacock, jungle cat and porcupines.

## Kasu Brahmananda Reddy National Park

Pangolin

Porcupines

- **Mahavir Harina Vanasthali National Park** is an Indian national park located in Vanasthalipuram, Hyderabad, Andhra Pradesh, India.
- The park was named after Mahavir, a Jain saint, in commemoration of his 2500th birth anniversary in the year 1975.
- The place where the park is located was once a private hunting ground for former rulers of Hyderabad - the Nizam.
- A deer park was set up in order to preserve this precious heritage and rehabilitate it.
- Animals living in this national park include a few hundred blackbucks (the state animal of Andhra Pradesh), porcupines, water monitors, short-toed eagles, Indian pond herons, egrets, kingfishers, cormorants and several other bird species.

Water Monitors

Short toed eagles

Egrets

Indian Pond Herons

king fisher

## Kawal Wild life Sanctuary

**LOCATION & AREA:** Adilabad District. Area 893 Sq. Kms.
**UNIQUENESS:** One of the richest Teak forests in the State, with dense pristine areas free of human disturbance. The River Kadiam flows through this area.
**FLORA:** Dry Deciduous Teak Forests mixed with Bamboo, Terminalia, Pterocarpus, Anogeisus, Cassias
**FAUNA:** Flagship species is Tiger. Also has Panther, Gaur, Cheetal, Sambar, Nilgai, Barking Deer, Chowsingha, Mouse Deer, Sloth Bear and a variety of Birds & Reptiles.

## Pranahitha Wild Life Sanctuary

- **LOCATION & AREA:** Adilabad District. Area 136.02 Sq. Kms.
  **UNIQUENESS:** Pranahita River, one of the tributaries of mighty Godavari, abuts this Sanctuary on its east. It is the home for the endangered Black Buck, Chinkara, Wolf.
  **FLORA:** Dry deciduous and riverine Forests along river Pranahita with Teak, Bamboo, Terminalias, Anogeisus etc.
  **FAUNA:** Tiger, Panther, Sloth Bear, Cheetal, Black Buck, Nilgai, Chinkara, a variety of aquatic Birds & Reptiles.

## Pranahitha Wild Life Sanctuary

## *NAGARJUNA SAGAR Srisailam Wildlife Sanctuary*

- **LOCATION & AREA:** Guntur, Prakasham, Kurnool, Mahaboobnagar
  **UNIQUENESS:** Largest Tiger reserve in India spreading over 5 Districts with river Krishna flowing through the reserve presenting some breathtaking sights with hills, valleys and deep gorges.
  **FLORA:** Dry deciduous mixed forests along river Krishna with Teak, Bamboo, Terminilias, Hardwickias, Anogeissus and hundreds of medicinal plants.
  **FAUNA:** Tiger, Panther, Sloth Bear, Wild Dog, Jackal, Wolf, Fox, Ratel, Indian Giant Squirrel, Tree Shrew, Cheetal, Mouse Deer, Black Buck, Sambar, Chowsingha, Nilgai, Wild Boar, Mugger Crocodile, Rock Python and Peafowl.

## *NAGARJUNA SAGAR Srisailam Wildlife Sanctuary*

| S.No. | Site | Location |
|---|---|---|
| 1. | Kaziranga National Park | Assam |
| 2. | Keoladeo Ghana National Park | Rajasthan |
| 3. | Manas Wildlife Sanctuary | Assam |
| 4. | Nanda Devi National Park | Uttar Pradesh |
| 5. | Sundarban National Park | West Bengal |

**India's world heritage sites**

| S.No. | Name of the site | Location (State /U.T.) |
|---|---|---|
| 1. | Nilgiri | Part of Wynad, Nagarhole, Bandipur and Madumalai, Nilambur, Silent Valley and Siruvani hills (Tamil Nadu, Kerala and Karnataka) |
| 2. | Nanda Devi | Part of Chamoli, Pithoragarh, Almora Districts (Uttaranchal) |
| 3. | Nokrek | Part of Garo Hills (Meghalaya) |
| 4. | Manas | Part of Kokrajhar, Bongaigaon, Barpeta, Nalbari, Kamprup and Darang district (Assam) |
| 5. | Sunderbans | Part of delta of Ganga and Brahamaputra river system (West Bengal) |
| 6. | Gulf of Mannar | Indian part of Gulf of Manner between India and Sri Lanka (Tamil Nadu) |
| 7. | Great Nicobar | Southern most Islands of Andaman and Nicobar (A & N Islands) |
| 8. | Simlipal | Part of Mayurbhanj district (Orissa) |
| 9. | Dibru-Saikhowa | Part of Dibrugarh and Tinsukia district (Assam) |
| 10. | Dehang Debang | Part of Siang and Debang vally (Arunachal Pradesh) |
| 11. | Pachmarhi | Parts of Betul, Hoshangabad and Chindwara districts (Madhya Pradesh) |
| 12. | Kanchanjunga | Part of Kanchanjunga Hills (Sikkim) |

## THREATS TO BIODIVERSITY

- Extinction, the elimination of a species, is a normal process in nature.
- The rate of extinction, in undisturbed ecosystems, is estimated to be about one species per decade.
- In the last many decades, however, human impacts on populations and ecosystems have accelerated that rate, causing hundreds of species, subspecies and varieties to become extinct every year.
- And, if the present trends continue, millions of kinds of plants, animals and microbes may be destroyed in the next few decades.

- The causes of extinction are broadly grouped into five risk categories

**1.Population Risk**: Random variations in population rates (i.e. birth rates and death rates) can cause a species in low abundance to become extinct. It is a risk especially to species that consist of only a single population in one habitat.

- For example—blue whales. As they swim over the vast areas of ocean, and if in one year most whales were unsuccessful in finding a mate then births could be dangerously low.

**2. Environmental Risk**: Environmental risk means variation in the physical or biological environment, including variations in predator, prey, symbiotic or competitor species. In case of species that are sufficiently rare and isolated, such normal environmental variations can lead to their extinction.

- **3.Natural Catastrophe:** A natural catastrophe is a sudden change in the environment (not as a result of human action). It includes fires, storms, floods, earthquakes, volcanic eruptions, changes in oceanic currents and upwellings, etc. Such a natural catastrophe may cause the local extinction of most forms of life there.
- **4.Genetic Risk:** Detrimental change in genetic characteristics in a small population of a species, due to reduced genetic variation, genetic drift or mutation, makes the species more vulnurable to extinction because it lacks the variety once present or because a mutation that leads to poor health becomes fixed in population.

**5.Human Actions:**

**Human actions cause extinction of species through:**

- **A. Habitat Loss and Degradation:** Habitat loss and degradation are the major proximate causes of species extinction, affecting 89% of all threatened birds, 83% of mammals and 91% of all threatened plants assessed globally .
- The main causes of habitat loss are agricultural activities, harvesting or extraction (including mining, fishing, logging, etc.) and development of human settlements, industry and associated infrastructure.

- B. Habitat Fragmentation: It is a process where a large, continuous area of habitat is both, reduced in area and divided into two or more fragments.
- Habitat fragmention may take place due to the development of roads, towers, canals, fields, industries, etc. in an original large habitat

- C. Diseases: Pathogens, or disease organisms, may also be considered Predators. The incidence of disease in wild species may increase due to human activities.
- D. Genetic Assimilation : Some rare and endangered species are threatened by genetic assimilation because they crossbreed with closely related species that are more numerous or more vigorous

- E. Pollution: Environmental pollution is the most subtle form of habitat degradation.
- The most common causes of which are pesticides, industrial effluents and emissions, and emission from automobiles.
- **F. Poaching:** Poaching is another insidious threat that has emerged in recent decades as one of the primary reasons for the decline in number of species.

- G. **Introduction of Exotic Species:** Organisms introduced into habitats where they are not native are termed as exotics.
- They can be thought of as biological pollutants and are considered to be among the most damaging agents of habitat alteration and degradation in the world

## Man-Animal Conflict

- A major problem associated with the conservation of wild animals especially the herbivores like elephants in India is that of crop depredation and man-slaughter.
- Animals such as elephants, gaur, sambar, wild boar and birds like peacock, cause extensive damage to the crops.
- This phenomenon has registered significant increase in recent years due to habitat fragmentation and degradation of natural forests and corridors.

- Instances of man animal conflicts keep on coming to lime light from several states in our country.
- In Sambalpur, Orissa 195 humans were killed in the last 5 years by elephants.
- In retaliation the villagers killed 98 elephants and badly injured 30 elephants.
- Several instances of killing of elephants in the border regions of Kote - Chamarajanagar belt in Mysore have been reported recently.

## MAN AND WILD LIFE CONFLICT

## ENDANGERED SPECIES OF INDIA

- The International Union of Conservation of Nature and Natural Resources (IUCN) maintains what may be called a 'Red Database' at the World Conservation Monitoring Centre (WCMC) in which information on endangered and vulnerable species of plants and animals is kept.
- From time to time, this database is translated into popular form and published as **'Red Data Books'.**
- The red data symbolizes the warning signal for those species which are endangered and if not protected are likely to become extinct in near future.

- In India, nearly 450 plant species have been identified in the categories of endangered, threatened or rare.
- Existence of about 150 mammals and 150 species of birds is estimated to be threatened while an unknown number of species of insects are endangered.
- It may not be of direct relevance here to give a complete list of endangered flora and fauna of our country.

- However, a few species of endangered reptiles, birds, mammals and plants are given below:
- **(a)Reptiles:** Gharial, green sea turtle, tortoise, python
- **(b)Birds:** Great Indian bustard, Peacock, Pelican, Great Indian Hornbill, Siberian White Crane
- **(c)Carnivorous:** Indian wolf, red fox, Sloth bear, red panda, Mammals tiger, leopard, striped hyena, Indian lion, golden cat, desert cat, dugong
- **(d)Primates:** Hoolock gibbon, lion-tailed macaque, Nilgiri langur, Capped monkey, golden monkey
- **(e) Plants:** A large number of species of orchids, Rhododendrons, medicinal plants like Rauwolfia serpentina, the sandal wood tree Santalum, Cycas beddomei etc.

**Reptiles- Gharial**

peacock

Pelican

Pelican

## Rhododendrons

- **(i) Endangered Species :** A species is said to be endangered when its number has been reduced to a critical level or whose habitats, have been drastically reduced and if such a species is not protected and conserved, it is in immediate danger of extinction.
- **(ii) Vulnerable Species :** The species that are under threat such that they may have to be classified as endangered in the near future if causal factors continue to operate.
- These include species whose populations have been seriously depleted and whose ultimate security is not assured, as well as those species whose populations are still abundant but are under threat throughout their range.

- **(iii) Rare Species :** These are species with small total population size in the world. In their distribution, they are usually localized within restricted habitats or geographical area or are thinly scattered over an extensive range.
- It is necessary to mention here that a species that is rare is not necessarily in danger of becoming extinct ; some species, like the whooping crane, are naturally rare.
- However, rarity does raise concerns about the possibility of extinction. Rare species, thus, are not at present endangered and , vulnerable but are at risks.
- **(iv) Threatened Species** : The term 'threatened' is used in the context of conservation of the species which are in any one of the above three categories.
- These are species that have declined significantly in total numbers and may be on the verge of extinction in certain localities.

## CONSERVATION OF BIODIVERSITY

- The enormous value of biodiversity due to their genetic, commercial, medical, aesthetic, ecological and optional importance emphasizes the need to conserve biodiversity.

- **Definition** : The act or process of conserving. The protection, preservation, management, or restoration of wildlife and of natural resources such as forests, soil, and water.
- **Conservation** is **defined** as 'the management of human use of the biosphere so that it may yield the greatest sustainable benefit to present generation while maintaining its potential to meet the needs and aspirations of future generations'.

- There are two approaches of biodiversity conservation:
- **In situ conservation (within habitat):** This is achieved by protection of wild flora and fauna in nature itself, e.g. Biosphere Reserves, National Parks, Sanctuaries, Reserve Forests etc.
- **Ex situ conservation (outside habitats)** This is done by establishment of gene banks, seed banks, zoos, botanical gardens, culture collections etc.

## Causes and Issues related to Threats to Biodiversity:

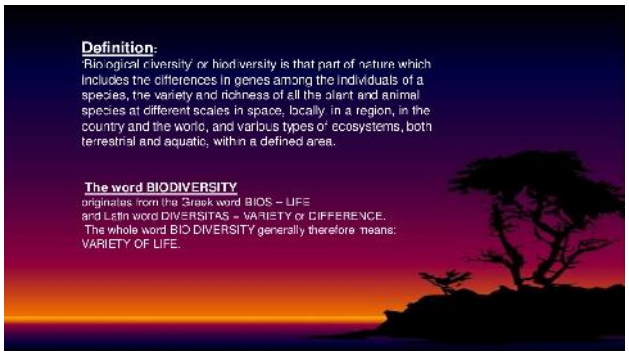
- **Loss of Habitat:**
  - Destruction and loss of natural habitat is the single largest cause of biodiversity loss
- **Poaching (over harvesting):**
  - Illegal trading of wildlife products by killing prohibited endangered species
- **Man – Wildlife Conflicts:**
  - It arises when wildlife starts causing immense damage and danger to man.

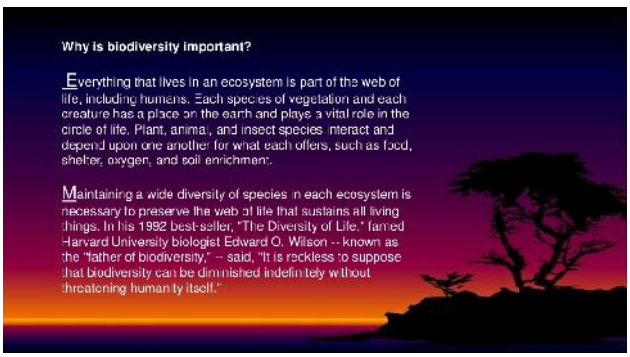
## Man – Wildlife Conflicts:
### Factors influencing Man – Wildlife Conflicts:

- Shrinking of forest cover
- Human encroachment
- Injured animals
- Cultivations of food and elephants search for food
- Electric wiring injure elephant and start violence
- Compensation is not enough and farmers kill wild animals
- Garbage near human settlement or food crops near forest area attracts wild animals

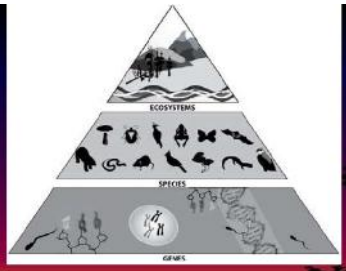
## Remedial measures for Man – Wildlife Conflicts:

- Crop and cattle compensation scheme must be started
- Solar powered fencing with electric current proof trenches must be provided to prevent animals
- Crop patterns must be changed
- Adequate food and water should be available for wild animal in the forest
- Developmental and construction work around the forest must be stopped



**Ecosystem diversity** refers to the diversity of a place at the level of ecosystems. The term differs from biodiversity, which refers to variation in species rather than ecosystems.




**Species diversity** is the effective number of different species that are represented in a collection of individuals.

**Genetic diversity**, the level of biodiversity, refers to the total number of genetic characteristics in the genetic makeup of a species.

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ECOSYSTEM DIVERSITY

- Includes diversity above the species level. Biologists have viewed diversity above the species level in various ways. Some alternative ways to categorize it include:
  - Community diversity
  - Habitat diversity
  - Landscape diversity

SPECIES DIVERSITY

- **species** – a particular type of organism; a population or group of populations whose members share certain characteristics and can freely breed with one another and produce fertile offspring
- **Species diversity** – the number of variety of species in a particular region
- *Species richness* – number of species
- *Evenness*, or *relative abundance* – extent to which numbers of different species are equal or skewed

GENETIC DIVERSITY

- Includes the differences in DNA composition among individuals within a given species.
- Adaptation to particular environmental conditions may weed out genetic variants that are not successful.
- But populations benefit from some genetic diversity, so as to avoid inbreeding or disease epidemics.

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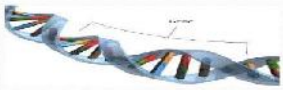
## 1. Genetic Diversity, genetic variation within a species



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## 2. Species Diversity ,diversity among species

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## Ecosystem Diversity, diversity of habitats

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## Threats To Global Biodiversity

- Habitat loss/degradation
- Over-hunting /Poaching
- Climate change
- Resource mismanagement
- Invasion of non-native /exotic species
- Natural Calamities
- Pollution
- Overgrazing

# Progammes on Conservation of Biodiversity

## In–situ Conservation

- Conserving the animals and plants in their natural habitats
  - National parks
  - Sanctuaries
  - Biosphere reserves
  - Reserved and protected forests
  - Project Tiger, Project Elephant, Save campaign

## Ex–situ Conservation

- Conserving the animals and plants away from their natural habitat
  - Seed banks
  - Germplasm
  - Botanical gardens
  - Zoological parks



## Legislation

- Environment Protection Act, 1986
- Fisheries Act, 1897
- Forest Act, 1927
- Forest (Conservation) Act, 1980
- Wildlife (Protection) Act 1972
- Wildlife (Protection) Amendment Act 1991

- National Forest Policy amended in 1988.
- National Conservation Strategy and Policy Statement for Environment and Sustainable Development
- National Agricultural Policy
- National Land Use Policy
- National Fisheries Policy
- National Policy and Action Strategy on Biodiversity
- National Wildlife Action Plan
- Environmental Action Plan.

## ❑Consumptive Use Value:

- Direct use values
- Harvested and consumed directly
  - **Food** – 80 – 90% tropical wild plants
    - Ceropegia bulbosa
    - Codonopsis
    - Cicer microphyllum
  - **Drugs** – 70% of modern medicines from plants
    - Traditional systems – Ayurvedha and Sidha.
  - **Fuel** – firewoods – fossil fuels like coal, petroleum and natural gases

## ❑Productive Use Value:

- Obtain commercial value
- Products are marketed and sold
- Derived from animal and plants

| Animal | Animal Products |
|---|---|
| Silk - worm | Silk |
| Sheep | Wool |
| Elephants | Tusk |
| Fish and animal | Food |

| Plant & Animal Product | Industry |
|---|---|
| Wood | Paper and pulp industry |
| Cotton | Textile industry |
| Fruits, vegetables | Food industry |
| Leather | Leather industry |

## ❑Social Use Value:

- Bio – resources are used to society
- Value associated with social life, religion and spiritual aspects.
  - **Holy Plants**: Tulsi, lotus, etc.
  - **Holy animals**: Cow, snake, bull, peacock, rat, etc,.

## ❑Ethical Values:

- Ethical issues must be preserved
- India has great cultural and religious basis
- May or may not be used but gives pleasure
  - River Ganga
  - Vembu, tulsi, etc.
  - Kangaroo, zebra, giraffe,etc,.

## ❑Aesthetic Values:

- Beautiful nature of plants and animals is the most important value of biodiversity is eco – tourism.

## ❑Option Values:

- Biodiversity that are unknown and need to be known
- Suggested that any species maybe proved valuable

## ❑Marine Diversity:

- It is much higher than terrestrial biodiversity but it is less known and described.
- Estuaries, coastal waters and oceans are biologically diverse.
- Sea is a cradle of every known animal phylum
- 35 existing phylum of multicellular animals
- 34 marine
- 16 exclusively marine

## Biodiversity at Local Level:

- Based on the spatial distribution the biodiversity at local level is classified as follows,

1. **Point richness**
   - Species found in single point in a given place
2. **Alpha richness or Alpha diversity**
   - Number of species found in small homogeneous area
3. **Beta richness or Beta diversity**
   - Rate of change of species increase as more heterogeneous habitats
4. **Gamma richness or Gamma diversity**
   - Changes across large landscape

# Environmental Pollution

## Types of Pollution

Degradable

Non-degradable

## Definition

"Pollution is the effect of undesirable changes in our surroundings that have harmful effects on plants, animals and human beings".

Degradable: Those can be readily broken down by natural processes

Eg. Discarded vegetables

Non-degradable: Those can not be degraded by natural processes

Eg.plastics

## Pollutant

Any thing (solid, liquid or gas) that cause pollution is called pollutant

Eg. Lead, sulphuric acid, carbon monoxide,

## AIR POLLUTION

### What is Atmosphere

- Atmosphere is the life blanket of Earth.
- It is therefore essential that we know more about the atmosphere and the ways in which it is Polluted.
- Air is considered safe when it contains no harmful dust and gases.

## Air Pollution

Air pollution occurs due to the presence of undesirable solid or gaseous particles in the air in quantities that are harmful to human health and environment

## Sources of Air Pollution

- Vehicles
- Industries
- Dust and storm
- Air crafts, jet

## Types of pollutants

**Primary pollutants**

Pollutants that are emitted directly from identifiable sources – produced by both natural events or human activities

Eg. Dust storms, emission from vehicles

**Secondary pollutants**

When certain chemical reactions take place among the primary pollutants

Eg. Sulphuric acid

## Effects of air pollution

- Prolonged smoking or exposure to air pollutants can overload or break down the natural defenses such as hair in our nose, sticky mucas in the lining of the upper respiratory tract causing diseases like lung cancer, asthma, chronic bronchitis etc.,

## Primary pollutants

- Carbon oxides ($CO_2$ and CO)
- Nitrogen oxides
- Sulphur oxides
- Volatile organic compounds hydro carbons
- Suspended particulate matter

- Cigarette smoking is responsible for the greatest exposure to carbon monoxide.Exposure to air containing even 0.001% of carbon monoxide for several hours can cause collapse, coma and even death.
- CO is attached to blood hemoglobin for a long time, it accumulates and reduces the oxygen carrying capacity of blood. This impairs perception and thinking, slows reflexes and causes headaches, drowsiness, dizziness and nausea and blurred vision.

Nitrogen oxides and suspended particles both can irritate lungs, aggravate asthma or chronic bronchitis and increase respiratory infections.

Many volatile organic compounds such as benzene and formaldehyde and toxic particulates such as lead and cadmium can cause mutations, reproductive problems and cancer, breathlessness and irritation of the eye, nose and throat.

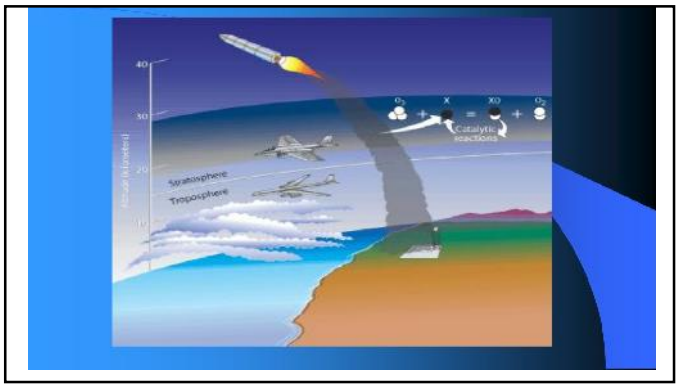

Sulphur dioxide irritates respiratory tissues, chronic exposure causes a condition similar to bronchitis.

It also reacts with water, oxygen and other materials to form sulphur containing acids – The acids can become attached to particles which when inhaled are very corrosive to the lung.

- Chronic exposure of the leaves to air pollutants can break down the waxy coating that helps prevent excessive water loss and leads to damage from diseases, pests, drought and frost.
- It also affects photosynthesis, respiration and other metabolisms.

## Ozone depletion

- The upper stratosphere consists of considerable amounts of ozone which works as an effective screen for UV light.




## Effects of ozone depletion

- On human- sunburn, cataract, skin cancer, weakens the immune system
- Food production – uv radiation causes reduction in photosynthesis – reduces nutrient contents and the growth of plants
- On materials- damages paints and fabrics causing them to fade faster
- On climate- global warming – Green house effect- increase in concentration of certain gases like carbon di oxide, nitrogen oxides, methane, CFCs trap heat in the form of infra red radiation near the earth's surface- Green house effect

- The ozone thus formed is constantly broken down by naturally occurring processes that maintain its balance in the ozone layer. But the presence of certain pollutants can accelerate the breakdown of ozone. (chlorofluorocarbons, halons)
- The Chloro-fluro-carbons (CFCs) are extremely stable, non-flammable, non-toxic and harmless to handle. It is ideal for air conditioners, refrigerators and fire extinguishers etc.
- Halons are similar to the CFCs dangerous to ozone layer.

## Control measures

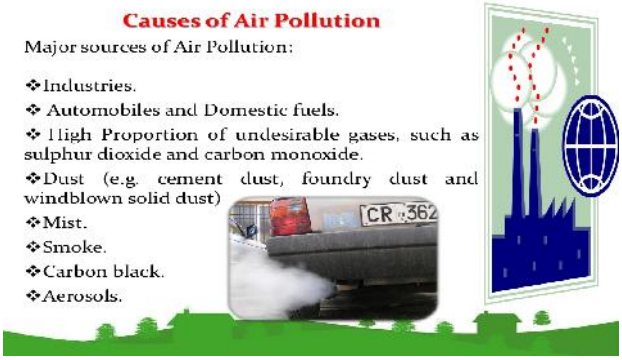
- Proper fuel and exhaust system in vehicles
- Use of dry and wet collectors, filters, electrostatic precipitators.
- Providing greater height to the stacks – discharge pollutants away from the ground.
- Substitution of raw materials that cause more pollution.

- The CFCs and Halons migrate into the upper atmosphere after they are released. As they are heavier than air, they are carried by air currents and reach upper atmosphere. This is a slow process and even take few to many years.
- In the stratosphere unfiltered UV radiation severs the chemical bonds releasing chlorine from CFCs.
- This attacks the ozone molecule resulting in its splitting into oxygen molecule and an oxygen atom.
- Thus leading to ozone depletion.

## Causes of Air Pollution

Major sources of Air Pollution:

- ❖Industries.
- ❖ Automobiles and Domestic fuels.
- ❖ High Proportion of undesirable gases, such as sulphur dioxide and carbon monoxide.
- ❖Dust (e.g. cement dust, foundry dust and windblown solid dust)
- ❖Mist.
- ❖Smoke.
- ❖Carbon black.
- ❖Aerosols.



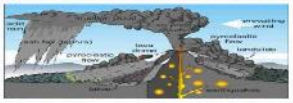
## Effects of Air Pollution

Air Pollution affects???

- Human health.
- Animals.
- Plants.
- The atmosphere as a whole.
- Global warming.
- Ozone depletion(Ozone hole).
- Acid Rain.
- Various respiratory illnesses.

## Air pollution : Effects

- Human health
- Animals
- Plants
- The atmosphere as a whole
- Acid rain

## How to Avoid Air Pollution

Yes, we can avoid pollution As Follows:

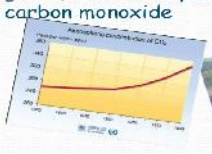
- Use natural Gases, like LPG (Liquefied Petroleum Gas) autos.
- Do not Burst Crackers.
- Use less Amount of Fuel for Vehicles.
- Avoid using and use electric stoves (bio gas).

## How to prevent air pollution ?

- Carpool
- Walk or ride a bicycle
- Connect your outdoor lights to a timer or use solar lighting.
- Wash clothes with warm or cold water instead of hot.
- Plant trees etc.....

## Air pollution : Causes

- - Industries.
- -Automobiles and Domestic fuels
- -Fire
- -High Proportion of undesirable gases, such as sulphur dioxide and carbon monoxide



**Sources of air pollution:**

Natural sources : Volcanic eruption , forest fire , biological decay etc.

Man made activities : Thermal power plant , vehicular emission , fossil fuel burning etc.

**Types of Pollutants:**

Primary air pollution : The pollutants that are a direct result of the process can be called primary pollutants.

Example: Ash from a volcanic eruption

Secondary air pollution: Secondary pollutants are caused by the inter reactions of primary pollutants.

Example: Smog

## Common Air Pollutants and its Sources

| POLLUTANTS | SOURCES |
|---|---|
| Carbon monoxide (CO) | Burning of fossils , Motor vehicles |
| Nitrogen dioxide ($NO_2$) | Burning of fossils , Motor vehicles and power industrial plant |
| Sulphur dioxide ($SO_2$) | Coal burning in power plants and industrial process |
| Ozone ($O_3$) | Chemical reaction with Volatile organic compound and nitrogen oxide |
| Lead (Pb) | Paint , storage batteries , lead manufacture etc |
| Hydro carbons | Agriculture , Decay of plants and Burning of wet logs . |
| Chromium (Cr) | Paint , chromium manufacture , chromium plating |

## Definition

When the quality or composition of water changes directly or indirectly as a result of man's activities such that it becomes unfit for any purpose it is said to be polluted.

## Control measures of air pollution

- The automobiles must be designed with emission control system.
- The wastes must be removed and recycled in the industrial plants and refineries.
- Plants need to be planted to metabolize the pollutants.
- Using alternative energy sources like solar energy, hydroelectric energy, and wind energy.
- Maintaining a healthy distance between the industrial and residential areas

## Types of water

- Surface water- water found in streams, rivers and lakes etc.
- Ground water- that percolates into ground
- Aquifers- porous water-saturated layers of sand, gravel or bedrock through which ground water flows. It is replenished naturally by rainfall.

## Water pollution

- 71% of earth's surface is covered by water-but only a tiny fraction is available as fresh water.
- 97% of total water is found in oceans and 3% is fresh water.
- Out of this 2.997% is locked in ice caps. The only 0.003% of total volume is available as soil moisture, ground water, water vapour, water in lakes, streams, rivers and wetlands.

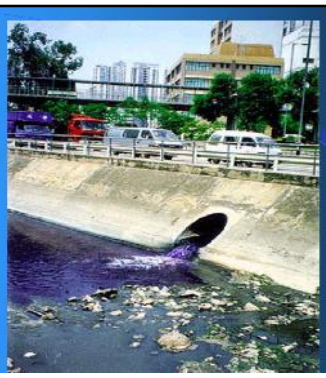
- Point source – source is known- eg. Municipal and industrial discharge pipes
- Non-point source- source is unknown- eg.agricultural runoff, acid rain

## Sources of Water Pollution

- Water soluble radioactive isoptopes – radioactive wastes- ionizing radiation cause birth defects, cancer and genetic disorders.
- Hot water- thermal plants, nuclear power stations, power plants release water-
- Oil-leakage


- Water soluble inorganic chemicals-acids, salts and compounds of toxic metals such as mercury and lead.
- Organic compounds-oil, gaseoline, plastics, pesticides, cleaning solvents, detergents etc.
- Sediment of suspended water- insoluble particles of soil and other solids that become suspended in water

- **Industrial Effluents**
  **Water is discharged from industries after having been used in production processes. This waste water may contain acids, alkalis, salts, poisons, oils and in some cases harmful bacteria.**
- **Mining and Agricultural Wastes**
  **Mines, especially gold and coal mines, are responsible for large quantities of acid water.**
- **Agricultural pesticides, fertilizers and herbicides may wash into rivers and stagnant water bodies.**
- **Sewage Disposal and Domestic Wastes**
  **Sewage as well as domestic and farm wastes were often allowed to pollute rivers and dams.**



- Inorganic plant nutrients-water soluble nitrates and phosphates that cause excessive growth of algae and other aquatic plants- called eutrophication.
- Biomagnification- pesticides- reach water- phytoplanktons-herbivorous fish-carnivorous fish- water birds-animals-human beings.
- At each stage the chemicals are concentrated resulting biomagnifiction. Eg.DDT

## Causes of water pollution

- Disease causing agents – bacteria, viruses, protozoa and parasitic worms enter water from domestic sewage and untreated human and animal wastes.
- Oxygen depleting wastes- large populations of bacteria use up the oxygen present in water to degrade wastes. The amount of oxygen required to break down a certain amount of organic matter is called Biological Oxygen Demand(BOD).

## Control measures

- Prevention
- Setting up treatment plants
- Root Zone Process – using reefs

- If too much organic waste is added, all the available oxygen is used up and causes organisms like fish to die.
- Anaerobic bacteria begin to break down the wastes producing chemicals that have a foul and unpleasant odour.

- **Water Pollution** can be defined as alteration in **physical, chemical,** or **biological** characteristics of water through natural or human activities and making it unsuitable for its designated use.
- Fresh Water present on the earth surface is put to many uses. It is used for drinking, domestic and municipal uses, agricultural, irrigation, industries, navigation, recreation. The used water becomes contaminated and is called waste water.

## Causes of Water Pollution

- About 40% of Deaths worldwide are caused by Water Pollution.
- Water Pollution is Caused by organic and inorganic industrial wastes and effluents discharged into rivers.
- Noise also causes anxiety stress reaction and fright.

## SOURCES OF WATER POLLUTION

- Most of Water Pollution is man made It may also occur naturally by addition of soil particles through erosion animal wastes and leaching of minerals from rocks
- The sources of water pollution can be classified as
  - Municipal Waste Water
  - Industrial Waste
  - Inorganic Pollutants
  - Organic Pollutants
  - Agricultural Wastes
  - Marine Pollution
  - Thermal pollution

## Effects of Water Pollution

- Diseases like Cholera.
- Malaria.
- Typhoid (spread during the rainy season).
- Aquatic life gets destroyed.

## WATER POLLUTION

Any physical (temperature, oxygen), chemical (mercury), or biological (disease, sewage) change to water that adversely affects its use by alive beings.

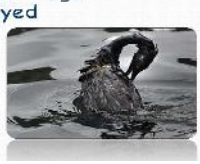
## How to Avoid Water Pollution

- Rivers should not be used for washing clothes or bathing animals in.
- Harvesting of Rainwater to meet water requirements.
- Dams & embankments must be created.
- The rivers must not be contaminated.
- In rivers the dead bodies shouldn't thrown.

## Water pollution : Effects

- Diseases like Cholera
- Malaria
- Typhoid (spread during the rainy season )
- Aquatic life gets destroyed





## Water pollution : Causes

- Marine Dumping
- Industrial Waste
- Sewage, mainly from households
- Nuclear waste
- Oil pollution
- Underground storage leaks




## Water pollution : Solutions

- Turn off running water
- Fertilize correctly
- Organize or participate in a clean up
- Join a special society devoted to the prevention of water pollution


## INORGANIC POLLUTANTS

- They include fine particles of different metals, chlorides, sulphates, oxides of iron, cadmium, acids and alkalies.

## Control measures of water pollution

- The sewage should be treated to make them less toxic by Sewage treatment .
- Thermal pollution can be reduced by employing techniques through cooling or evaporation .
- organic insecticides can be reduced by the use of very specific and less stable chemicals in the manufacture of insecticides.
- Domestic and industrial wastes should be stored in large but shallow ponds for some days to decompose them with microorganisms .
- Suitable strict legislation should be enacted to make it obligatory for the industries to treat the waste water before being discharged into rivers or seas.

## AGRICULTURAL WASTES

- Chemical fertilizers and pesticides have become essential for present day high yielding crops.
- Consequently , they have become a potential source of water pollution. These fertilizers contain major plants nutrients mainly nitrogen, phosphorous, and potassium.
- Excess fertilizers may reach the ground water by leaching or may be mixed with surface water of rivers, lakes and ponds by runoff and drainage.


- **Unskilled irrigation**: Water logging may occur when the drainage system of the agricultural field is not maintained scientifically. Water logging closes the passage of air to the soil, stops the growth of soil organisms and makes the soil barren.
- **Overcrowded landfills**: Each household produces tones of garbage each year. Garbage like aluminum, plastic, paper, cloth, wood is collected and sent to the local recycling unit. Items that can not be recycled become a part of the landfills and hence pollute the soil.

## Causes and Effects of soil pollution

- **Deforestation** : It is the removal of a forest or stand of trees where the land is thereafter converted to a non-forest use . Deforestation also loosens the soil and hence leads to soil erosion , Land that is once converted into a dry or barren land, can never be made fertile again.
- **Agricultural activities**: Farmers often use highly toxic fertilizers and pesticides to get rid off insects, fungi and bacteria from their crops which result in contamination and poisoning of soil .

## Soil pollution

- Soil is s thin covering over the land consisting of a mixture of minerals, organic materials, living organisms, air and water.
- Under ideal climatic conditions soft parent material may develop into a centimeter of soil in 15 years.

- **Mining Activities** : During mining metals like cadmium and lead will be deposited, which are toxic, contaminating the soil. This will leave the mining land barren and unable to use again .
- **Acid rain** : Soil is also affected by acid rain as it converts the neutralized soil to acidic .
- **Soil erosion** : soil erosion leads to loss of top cover of the soil and hence leads to loss of fertile land for agriculture, forest cover etc .
- **Shifting cultivation**: In it, the forest is destroyed to use the land for cultivation, until the soil loses it's fertility. Once the land becomes inadequate for crop production, it is left barren and hence it leads to soil erosion.

## Causes of soil degradation

- Erosion
- By wind and water accelerated by human activities such as farming, construction, overgrazing by livestock, burning of grass cover, deforestation.

## Excess use of fertilizers

- Fertilizers, insecticides, herbicides, pesticides, fungicides, rodenticides
- Soil fertility is lost
- Kill beneficial insects

## Control measures of soil pollution

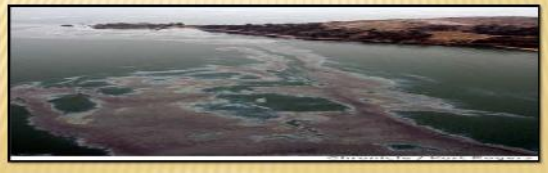
- Make people aware about the concept of Reduce, Recycle and Reuse .
- Reduce the use of pesticides and fertilizers in agricultural activities .
- Use biofertilizers and natural pesticides Shift to biofertilizers .
- People should be encouraged to go for afforestation .
- Proper treatment of liquid wastes from industries and mines must be done.
- Proper treatment of liquid wastes from industries and mines must be done.
- Polluted soil can be treated by bioremediation. It uses microorganisms (yeast, fungi or bacteria) to breakdown, or degrades hazardous substances into less toxic or non-toxic substances

## Integrated Treatment Methods

- Continuous contour trenches or benches
- Live check dams – planting grass, shrubs and trees etc.
- Bund constructed out of stones.
- Earthen check bund- local soil,across the stream

## MARINE POLLUTION

- Ocean are the final sink of all natural and manmade pollutants. Rivers discharge their pollutants into the sea. The sewage and garbage of costal cities are also dumped into the sea. The other sources include, discharge of oils, grease, detergents, and radioactive wastes from ships.



## Integrated Pest Management

- Organic farming
- Use of biofertilzers
- Earthworms- vermicomposting
- Pest control through microbes – Bacillus thrungiensis, Azadirachta indica- Neem

## Marine Pollution

The introduction of substances to the marine environment directly or indirectly by man resulting in adverse effects

## Causes

- Direct discharge of wastes into sea sewage
- Washed off materials- fertilizers, pesticides
- Petroleum, oils washed off from roads
- Spill of Toxic substances from ships
- Offshore oil exploration and extraction

## Control measures for oil pollution

- Process of emulsification through chemical dispersants-sprayed on the oil.
- Biological methods- use of bacteria

## Effects of marine pollution

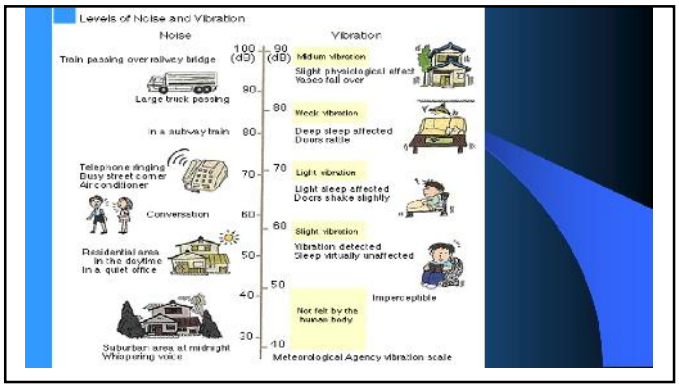
- Eutrophication-phytoplankton blooms
- Oil slick – affect plants and fish
- Destroys flora and fauna

## Noise Pollution

- Noise is unwanted and undesirable sound
- Permitted noise level is 125 decibels

## Control Measures

- Introduction of sewage treatment plants
- Primary treatment-physical process such as screening and sedimentation to remove pollutants that will settle, float etc.
- Secondary treatment- to remove BOD




## NOISE POLLUTION

- ✓Noise can be simply defined as unwanted sound.
- ✓The sound is pleasant or not depends upon its loudness, duration, rhythm and the mood of the person.
- ✓Noise pollution not only results in irritation and anger.
- ✓Noise Levels: Decibels (dB)
  - •Intensity
  - •Frequency
  - •Periods of exposure and
  - •Duration

## Effects of noise pollution

- Physical damage to ear- temporary thresh hold shift-TTS – hearing loss
- Mental fatigue

## Causes of Noise Pollution

- ✓Traffic Noise.
- ✓Aircraft Noise.
- ✓Noise from construction and civil engineering works.
- ✓Noise from the Industries.
- ✓Noise from other sources.

## Control techniques

- Reduce noise at source
- Block the path of noise
- Increase the path length and
- protect the recipient

## Effects of Noise Pollution

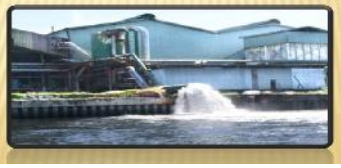
- ✓Hearing Loss.
- ✓High Blood Pressure.
- ✓Stress.
- ✓Sleep Disturbance.
- ✓Colour Blindness.

## How to Avoid Noise Pollution

- ✓ The Government should ensure the new machines that Should be noise proof.
- ✓ Airports must be away from residential area.
- ✓ The Sound horn symbol is to be in School Roads.
- ✓ Control noise at source by proper choice of equipment, design modification, mounting and proper layout.
- ✓ Isolation or use of baffles.
- ✓ Use of ear protection devices.

## THERMAL POLLUTION

- Thermal Pollution of water is caused by the rise in temperature of water. The main source of thermal pollution are the thermal and nuclear power plants. The power generating plants use water as coolants and release hot water into the original source. Sudden rise in temperature kills fish and other aquatic animals.



Decibel levels of common sounds dB

| dB | Environmental condition |
|---|---|
| 0 | Threshold of hearing |
| 10 | Rustle of leaves |
| 20 | Broadcasting studio |
| 30 | Bedroom at night |
| 40 | Library |
| 50 | Quiet office |
| 60 | Conversational speech |
| 70 | Average radio |
| 74 | Light traffic noise |
| 90 | Subway train |
| 100 | Symphony orchestra |
| 110 | Rock band |
| 120 | Aircraft take-off |
| 140 | Threshold of pain |

## Thermal Pollution

- Sources- discharge of warm water into river
- Effects-changes the ecological balance of river
- Death of fish
- Effect on plants

Control- passing the heated water through a cooling pond or cooling tower after it leaves the condenser

## Ambient noise levels dB

| Zone | Day time | Night time |
|---|---|---|
| Silent zone | 50 | 40 |
| Residential zone | 55 | 45 |
| Commercial zone | 65 | 55 |
| Industrial zone | 75 | 70 |

## Nuclear hazards

- Nuclear fission – splitting of the nucleus of the atom – resulting energy is used for a variety of purposes
- Hot water
- Uranium waste – ionizing material

## Effects of nuclear pollution

- Lethal
- Mutation
- Plants and animals
- Marine organisms-fish
- Skin diseases, cancer, eye disorders etc.,

- Masses at present level should determine to consume optimum level of resources, which would lead a comfortable life.
- Waste disposal at personal level should be optimally reduced as waste destruction by any means causes pollution.
- Use of chemical fertilizers should be limited as to avoid water pollution e.g. DDT etc.

*Role of individual in prevention of pollution..*

## Control measures

- Away from the cities
- Proper disposal mechanisms
- Safety measures

- Advocate organic forming
- Avoid use of pesticides
- Reduce fossil fuel – coal, petrol etc. save petrol
- Shut of the lights and fans when not needed- save electricity
- Do not use aerosol spray products
- do not pour chemicals, paints pesticides in the drain

## Role of an individual in prevention of pollution

- Develop respect to all forms of life
- Try to plant trees where ever you can
- Reduce the use of paper and wood products where ever possible – use recycled paper
- Do not buy furniture, doors etc., made from teak – forest based
- Help in restoring a degraded area
- Join in an aforestation program

- Use rechargeable batteries
- Do not use cans, avoid plastics – plastic carry bags
- Recycle paper, aluminum, plastics
- Set up compost bin in your garden
- Start community composting
- Keep you and your place clean

Despite the advantage of nuclear as a clean energy. the big concern is the resulted from nuclear reaction, which is a form of pollution called Radio activity.

# NUCLEAR POLLUTION

- Avoid constructing nuclear power plant.
- Avoid using nuclear weapons.
- Have proper treatment for nuclear waste.

## Control measures..

- Nuclear power plants (Ex. Neyveli, Kalpakkam)
- Nuclear weapon (Ex. Missiles)
- Disposal of nuclear waste.
- Uranium mining.

## Causes..

- The diseases include blood in cough,
- Ulcer,
- Swelling of bone joints,
- Cancer,
- Lung cancer,
- Skin cancer,
- Bone cancer,
- Eye problems.

## Effects..

सत्यमेव जयते

# Village Disaster Management Plan

nidm
Towards a disaster free India

NATIONAL INSTITUTE OF DISASTER MANAGEMENT
MINISTRY OF HOME AFFAIRS, GOVERNMENT OF INDIA

सत्यमेव जयते

# Village Disaster Management Plan

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# TRAINING MODULE on
# VILLAGE DISASTER MANAGEMENT PLAN

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**Dr. SATENDRA, IFS**
Executive Director

# FOREWORD

Development of Village Disaster Management Plan is the most important ingredient in implementing Community Based Disaster Risk Management in any area. It refers to a list of activities a village agrees to follow to prevent loss of life, livelihoods and property in case a disaster .It also identifies in advance, action to be taken by individuals in the community so that each one knows what to do when a disaster strikes or when a warning is received.The main objective is to empower the community to deal with disasters on their own as a way of life.

In this context, National Institute of Disaster Management (NIDM) has developed a training module on "Village disaster Management Plan "to help the trainers working at the grass root level to build the capacity of community to develop village disaster management plan. The training module is the result of the work of many trainers working in the area of community issues and specifically community based disaster risk management. The majority of the activities presented here have been used by trainers all across the globe. Some of the activities have been developed by NIDM faculty; and many more have been used and adapted by so many trainers over the years that it is not possible to trace their original sources. However, wherever we have been able to identify the source, we have always cited it. We would be glad to hear from anyone whose material has not been fully acknowledged; so that omissions can be corrected should the training module be reprinted.

We are thankful to our reviewers Dr. Antony Gnanamuthu, and Mr. M.P Vasimalai, Dhan Foundation for their valuable inputs and suggestions. It surely helped a lot to improve the quality of this training module.

I am also thankful to the authors who developed this module all on their own without seeking external assistance.

I hope this training module will help the trainers to build the capacity of the human resource of the country to make India a disaster resilient nation.

(Dr Satendra)
Executive Director

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# INTRODUCTION

The paradigm shift in approach towards management of disasters accentuates the needs for risk reduction at the community level in India. It focuses on developing the capacity and skills of the community so that they can deal with the disasters as a way of life. In the recent years, a number of initiatives have taken place for reducing the risks of disasters at the community level which have assumed the nomenclature of 'Community Based Disaster Risk Management (CBDRM)'. Making a village disaster management plan is a vital and indispensable component of CBDRM. The CBDRM approach provides opportunities for the local community to evaluate their own situation based on their own experiences initially. Under this approach, the local community not only becomes part of creating plans and decisions, but also becomes a major player in its implementation.

The rationale for involving communities in disaster preparedness and mitigation activities is based on the assumption that community is the real sufferer and the first responder and it has developed its own coping mechanisms and strategy to reduce the impact of disaster. It is imperative to appreciate this local knowledge and resources, and to build on them in order to improve the capacity of the people to withstand the impact of disasters. Moreover, ownership of disaster reduction should not be stripped from local people who would be left even more powerless in case external intervention does not occur. In fact building community leadership and a chain of trained community cadres through participatory approach can help harness the resilience and resourcefulness of the community to cope up with exigencies. Involvement and participation of the communities will ensure a collective and coordinated action during emergencies. Hence, disaster reduction activities should be based on participatory approaches involving local communities as much as possible, considering them as proactive stakeholders and not passive targets for intervention. Furthermore it is not only the "big" disasters that destroy life and livelihoods. Accumulated losses from small floods, droughts and landslides can exceed the losses from big disasters and contribute significantly to increased vulnerability at the local level. These disasters attract little media attention and communities are often left on their own to cope with the destruction. This provides another reason to invest in Community Based Disaster Risk Management.

Realizing the pivotal role played by the community, the National Institute of Disaster Management has developed a training module on "Village Disaster

Management Plan" (VDMP). This module aims to develop the capacity and skill of the community to make and implement plans at the local level for mitigating the impact of hazards and preventing them from becoming disasters. This module can be used by people working in the field of disaster management and development issues to guide the community to prepare and implement a village disaster management plan.

## DURATION

The duration of the training programme will be three days. Since, this is a field based programme involving lot of activities and exercises, therefore, if need arises, the trainer may like to extend the duration of the module depending upon the interest and involvement of the participant group. The trainer is encouraged to utilize one day prior to commencement of this training module on VDMP for orientation of the participants towards basic concepts of disaster management along with adequate management and mitigation of hazards prevalent in their respective geographic areas.

## OBJECTIVES

The objectives of the programme are as follows:

1. To explain the concept of village disaster management plan,
2. To describe the process of development of village level disaster management plan,
3. To describe the main components of the plan,
4. To highlight the Standard Operating Procedure for Disaster Management Committees and Disaster Management Teams in various phases of disasters, and;
5. To discuss the process of updation of the plan.

## WHO SHALL USE THIS MODULE

This training module is developed for local level functionaries like Disaster Management practitioners, Trainers in disaster management, CBDRM, Civil defense volunteers, Elected representatives of the gram panchayat, Community Based Organization (CBO) and Non-governmental Organization (NGO) members. After completing the programme, these participants will be expected to train grass root level /cutting edge workers such as Disaster Management Teams,

Disaster Management workers, ICDS workers, Anganwadi members, ASHA workers, Auxiliary health workers, Patwaris, Religious leaders, NYKS/NSS, Local NGO's working in the area etc.

Since this is more of an exercise based training programme, the ideal number of participation per programme is 20.

## HOW TO USE THE MODULE

The entire module is a process oriented module where the participation of the participants will play a major role. This is a learner centered module where the trainer would be facilitating all the information coming from the participants.

## VENUE

This is a field based programme and so, the venue is the field itself. The training programme can be conducted at either of the following places in the village.

- Community Hall
- Temple premises
- Under the shade of the tree where the villagers usually gather for meetings.
- School Building premise
- Panchayat office

## LANGUAGE OF INSTRUCTION

The medium of instruction can be the local language.

## STRUCTURE OF THE MODULE

The module has been divided into three sub modules. The detailed work plan is as follows:

## Day 1

**Sub module 1:** Village Disaster Management Plan - An overview

| Topic | Time |
|---|---|
| **VDMP** | |
| Introduction of the participants<br>Setting the tone of the training progarmme | 15 Minutes |
| What is Village Disaster Management Plan? | 15 Minutes |
| Village Disaster Management Plan: Need and Utility | 15 Minutes |
| Framework For Village Disaster Management Plan | 15 Minutes |
| Activity | 15 Minutes |
| Process of Development of VDMP | 15 Minutes |
| **Sub Module 2: Situational & Hazard, Vulnerability, Capacity And Risk Analysis** | |
| Steps in Village Disaster Management Plan | 15 Minutes |
| Situational Analysis of Village | 30 Minutes |
| Hazard Analysis: Tools and Techniques | 45 Minutes |
| Vulnerability Analysis: Tools and Techniques | 60 Minutes |
| Capacity/Resource Analysis: Tools and Techniques | 60 Minutes |
| Risk Analysis | 30 Minutes |

## Day 2

**Sub module 2:** Response and Mitigation & Preparedness Plan

| Topic | Time |
|---|---|
| **Response** | |
| Disaster Management Committee: Constitution and Role | 30 Minutes |
| Disaster Management Teams and Types | 90 Minutes |
| **Mitigation and Preparedness** | |
| Standard Operating Procedures of Disaster Management Teams in Pre Disaster Phase | 90 Minutes |
| Identifying Safe Evacuation Routes | 30 Minutes |
| Community level Mitigation Program | 30 Minutes |
| Skill training | 60 Minutes |
| Mock Drills | 30 Minutes |

## Day 3

| Topic | Time |
|---|---|
| **Financial Mechanism** | |
| Community Contingency Fund | 40 Minutes |
| Community Disaster Resilience Fund | 40 Minutes |
| Development Schemes and Disaster Mitigation | 90 Minutes |
| Contact details | 40 Minutes |
| Updation Mechanism | 20 Minutes |
| Family Disaster Preparedness Plan | 90 Minutes |
| Family Disaster Supplies Kit | 40 Minutes |

# Submodule 1

## VILLAGE DISASTER MANAGEMENT PLAN : AN OVERVIEW

### Learning Objectives

At the end of the session, you should be able to:

- Explain the concept of village disaster management plan
- Highlight the need for developing village disaster management plan.
- Devise a framework for the development of the plan

**Materials Needed:**

Flip Charts, Markers, Laptop, LCD/Projector, charts and Blackboard.

### Key Concepts

Topic 1 : Concept of VDMP

Topic 2 : Need for developing VDMP

Topic 3 : Framework & Components of VDMP

Topic 4 : Suggested Activity

Topic 5 : Process of developing VDMP

## Topic 1

***What is Village Disaster Management Plan?***

**Duration: 15 minutes**
**Training Methodology: Brainstorming**

**Training Note:** The trainer can initiate the session by asking the participants to brainstorm and discuss on what they understand about village disaster management plan.

Planning is the process of setting goals, developing strategies, and outlining tasks and schedules to accomplish the goals. Planning will help in forecasting the future, makes the future visible to some extent. By planning ahead, we may be able to save our assets and income for use during emergencies and thus, a VDMP can prove to be beneficial as:

- It outlines the process by which the village should manage the disaster

- It can be used to tap human and material resources in the aftermath of a disaster
- It lists down the contact details of important administrative officials ensuring quick communication with the administrative officials.
- It describes the roles and responsibilities of the concerned officials and teams in the wake of a disaster.
- It can play a vital role in helping to avoid mistakes or recognize hidden opportunities.

Nobody can predict the year and month when a disaster will hit. It is however, possible to minimize the impact of a disaster and reduce the loss of life and property if adequate preparations are made at the household and village level. Development of a village disaster management plan is a process through which every unit in the village is made aware of the various facets of disaster preparedness and response and their capacity is enhanced to meet the exigency.

During times of crisis, contingency plans are often developed to explore and prepare for any eventuality. When we talk of a village disaster management plan, we refer to a list of activities which a village agrees to follow to prevent loss of life, livelihoods and property, in case a disaster strikes. The plan strives for effective coordination of human and material resources which may facilitate a better response thus helping in saving precious lives. It also identifies in advance, actions to be taken by the individuals in the community to prevent hazards from becoming disasters. Every village is different in terms of its inhabitants, geography and resources and its way of arriving at community decisions. Hence, a village disaster management plan will vary from village to village.

## Topic 2

***Village Disaster Management Plan (VDMP): Need and Utility***

**Duration: 15 minutes**

**Training Methodology: Discussion & Interactive session**

**Training Note:** The trainer can ask and discuss with the participants what they want to achieve by preparing a village disaster management plan.

The village disaster management plan is a document which details out the past hazard profile of the village and the present vulnerability status on the basis of which we can prepare our future. The plan is essentially a preparedness tools which can be used during an emergency by the administration as well as the community to have an insight into the location of available men and material

local resources in the village. The VDMP must have the following features:

- Have a clearly stated objective or set of objectives
- Reflect a systematic sequence of activities in a logical and clear manner
- Assign specific tasks and responsibilities
- Offer a benchmark against which actual performance can be measured and reviewed
- Integrate its activities, tasks and responsibilities to enable the overall objective or series of objectives to be achieved

## Topic 3

***Framework for VDMP***

**Duration: 15 minutes**

**Training Methodology: Power Point Presentation & Discussion**

**Training Note**: The trainer can sum up the following points in the form of a power point and present it to the participants.

The development of disaster management plan at the village level aims at building the capacity and resilience of the community to equip them with skills so that management of various hazards becomes a way of life for them. The framework of VDMP is built around the following four pillars.

1. **Development of Village Disaster Management Plan** by the local participants ensures ownership and reflects local conditions. The plan has to be prepared through a participatory approach on the basis of facilitation provided by external resource persons.
2. **Disaster Management Committees and Teams** have to be formed at the village level to facilitate the process of Community Based Disaster Preparedness. The disaster management committees can plan the process of disaster management in the village while teams may be constituted to carry out important tasks. like issuance of warning ,evacuation and response, first aid, damage assessment, water and sanitation, carcass disposal, shelter management, psychosocial counseling, relief management and rehabilitation
3. **Mock Drills** check the response of the community in a mock environment. They have to be conducted at regular intervals on the basis of plan prepared by the community. The mock drills will be a form of rehearsal in which the response of the community and the efficacy of the administration will be

tested. The mock drill will also test the applicability of the village disaster management plan.

4. **Awareness** has to be generated amongst the community through various mediums like televisions, radio and print media. These campaigns are carried out through rallies, street plays, competitions in schools, distribution of IEC materials, wall paintings on do's and don'ts for various hazards. Meetings with key persons of a village such as the village head, health worker, school teachers, elected representatives and members of the youth clubs and women also motivate the villagers to carry forward these plans for a safer living.

## Topic 4

*Activity*

**Duration:** 15 minutes

**Training Methodology:** Group Discussion & Problem Solving

**Training Aid:** Handout No 1

The session can be started with a small exercise. The exercise can be conducted by performing the following steps:

**Step 1:** Distribute handout 1 to all the participants and give them 2 minutes to read it.

**Step 2:** Now ask the participants:

- Why did the facilitator find himself alone on the first day?
- How did he finally solve the problem? Thanks to whom?
- What are the factors (attitude, gestures and words) that can determine whether or not you will be accepted or rejected by a community? List them in two separate columns
- Who are the people that can help you to gain acceptance in your community?
- Have you experienced, or do you know of, cases of facilitators being accepted or rejected by their communities? Explain the reasons for their rejection or acceptance

**Guidelines to the Facilitator**

1. Make the session participatory and interactive by encouraging participants to make comments and come up with the suggestions.
2. By the end of this section, you should be able to:

- Explain the importance of gaining acceptance in a community.
- Describe the different ways of entering and gaining acceptance in a community.

**Learning Points**

1. The facilitator did not realize that he could not simply invite the women of the village to a meeting without respecting the community's customs. **He needs the support of recognized powers of authority to successfully carry out his activities and be recognized and accepted as a member of the community.**
2. In the first example, we found that the facilitator came from a neighboring community but in many cases, facilitators having the required qualifications are selected from within the community. **Whether from the same community or not, it is important that the facilitator respect the local cultural norms.**
3. Facilitators should also clearly **focus on the objectives while remaining flexible in** the way they achieve them, especially when it comes to dealing with people. **It is important that the facilitator know the values and taboos of the community and that s/he avoid breaking them.**
4. The facilitator must be aware that s/he might represent a cultural difference in the eyes of the community members. Therefore, her/his entry into a community will not always be easy.S/he must know that s/he will need to identify the right people in the community who can explain to her/him the codes, taboos and rules of the community. S/he must also identify the people who can introduce her/him to the most influential members of the community

## Topic 5

***Process of development of VDMP***

**Duration: 15 minutes**

**Training Methodology: Focused Group Discussion**

**Training Note:** The participants will already be sensitized about the concept by performing the above mentioned activity. This session will be an offshoot of the previous activity.

Community sensitization and mobilization is important for seeking community support and promoting its involvement in development activities that affect the lives of its members. An analysis of projects that have failed in the past shows that failure occurs because:

- The people concerned were not involved in the planning, implementation and monitoring of programmes which affected their lives;
- There was an insufficient level of participation of the beneficiaries.

Today, it is known that there is an urgent need to involve people in the process of identifying their needs and problems as well as in the choice of the solutions. These solutions should favour the use of local resources. There are various ways of involving people in the analysis of problems, the planning, the implementation and the monitoring of development activities. Therefore, facilitators should be able to:

- Understand the values and norms of the community.
- Obtain information and share it with the community.
- Employ participatory techniques for the collection and use of information.
- Plan and conduct meetings between the different communities.
- Employ different communication techniques.
- Know how to work with adult communities.
- Have different working strategies with the community.
- Understand the local dynamics.
- Mobilize community resources and community actions.

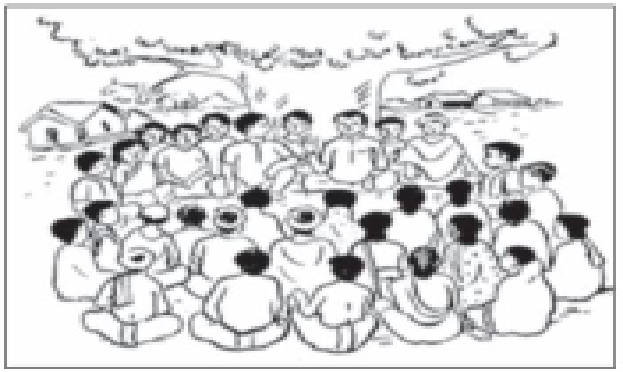
The village disaster management plan, as the name suggests, has to be made by the inhabitants of the village itself. Some of the key considerations that can be kept in mind while interacting with the participants can be:

- **Representation:** The participant group should be represented by key persons, men, women, youth, elderly, challenged population, artisans, fisher folk, marginal farmers, wage labourers. Community based groups like Self help groups, farmers committees etc should form a part of the team engaged in making the plan. Every one in the village should be represented in the meetings so they can share their concerns, experiences and expertise while the plan is being made.

- **Facilitators:** To carry forward the process of discussions and guide the community towards drawing a workable plan, the involvement of NGOs, CBO, community leaders, elected representatives like Sarpanch, members of the co-operative society, key persons like teachers, heads of religious organizations etc is necessary. They possess the necessary authority, skills to motivate the community, conduct theses sessions and make sure that decisions are arrived at through participatory discussions.
- **Timing:** The sessions in the village should be conducted during the hours which are suitable for the community. The meetings should be organized in small groups which are manageable and give everyone a chance to express their opinions and ideas.
- **Parameters for understanding community:** For understanding the community, one needs to gather information about needs and resources of the community. A framework for understanding the community's development position (i.e. the level of development) and the context in which disasters could impact includes the following basic elements

1. ***Social groups:*** What are the main ethnic, class, religion and language-based groups in the community? Who is in the majority, who is in the minority, what is the nature of their relationships?
2. ***Cultural arrangements:*** How are the family and community level structures organized? What hierarchies exist? What are the common ways of behaving, celebrating, and expressing?
3. ***Economic activities:*** What are the major livelihood sources and what are the associated activities that people carry out? What is the division of labor? What is the relationship between livelihood activities and seasonality?
4. ***Spatial characteristics:*** What are the locations of housing areas, public service facilities (e.g. schools, temples, health clinics, and evacuation centers), agricultural land

- **Rapport Building:** Building rapport and trust with the community is an essential in the process for development of VDMP. A relationship of trust, friendship and rapport is the key to facilitation of appropriate participation. If community members have trust in the outsiders who are working with them, then open sharing about issues, problems, concerns and solutions can take place. In addition to gaining the trust of local people, rapport building will also lead to a greater understanding of the local culture, another essential component of the planning process.



Facilitators can take a number of actions in order to build trust with community people. These can include the following:

- Living in the community
- Being transparent and open about who they are and what is being done
- Participating in daily life in the community, as well as community activities and cultural events
- Listening to local people about their life, issues and problems
- Learning new skills from local people
- Performing local tasks

The behavior of facilitators is very important in establishing a proper relationship of trust and openness. Ways in which outsiders should behave include:

- Show humility
- Respect local culture, problems and way of life
- Be patient
- Have interest in what people have to say
- Be observant rather than judgmental

Have confidence that local people can achieve what they set out to do, and transmit that confidence

You caution people against assuming that you will solve the problems but point out that the community has the potential resources to solve its own problems. All it needs is their will and some management skills which you can help them get.

**Resources:**

1. Imelda Abarquez and Zubair Murshed (2004), Community Based Disaster Risk Management: Field Practitioners Handbook, Asian Disaster Preparedness Centre, Bangkok.
2. Oxfam GB (2000), Village Contingency Plan for Cyclones, Bookline Publications, Hyderabad.
3. United Nations Educational, Scientific and Cultural Organization (2006), Handbook for Literacy and Non-Formal Education Facilitators in Africa, UNLD-Life Publication.
4. Local level Risk Management Framework: Indian Experience, An initiative under the GOI-UNDP Disaster Risk Management Programme, Government of India, Ministry of Home Affairs, National Disaster Management Division

# HANDOUT NO 1

*A facilitator arrives in a Muslim village and invites the women to an information meeting. The next day, he finds himself alone at the start of the meeting. He turns to his host, who advises him to go and see the Imam. With his package, as is the custom, and accompanied by his host, the facilitator goes to visit the Imam and tells him his problem. He explains the advantages of literacy programmes for women and requests the Imam's blessings for the meeting. After this visit, the following meeting organized at the learning centre attracted a large crowd. In another near-by village, the start-up activities of the community school were delayed because the Imam was opposed to them. With time, the facilitator was able to gain the respect of the Imam and managed to convince him to open the literacy centre, on the condition that a class of Koranic teaching be organized, under the supervision of the Imam.*

*(Source: United Nations Educational, Scientific and Cultural Organization (2006), Handout for literacy and Non formal Education Facilitators in Africa, UNLD-Life Publication)*

Formal Education
Facilitators in Africa

# Submodule 2

## Part (A)

## SITUATIONAL & HAZARD, VULNERABILITY, CAPACITY AND RISK ANALYSIS

### Learning Objectives

At the end of the session, you should be able to:

- List out the steps involved in making a village disaster management plan,
- Explain the process of undertaking a situational analysis of the village,
- Explain the process of conducting hazard, vulnerability, capacity and risk analysis of the village, and;
- Illustrate the tools that can be used for carrying out the hazard, vulnerability, capacity and risk analysis.

**Materials Needed:**

Flip Charts, Markers, Laptop, LCD/Projector, charts and Blackboard.

### Key Concepts

Topic 1 : Steps in Village Disaster Management Plan
Topic 2 : Situational Analysis of Village
Topic 3 : Hazard Analysis: Tools and Techniques
Topic 4 : Vulnerability Analysis: Tools and Techniques
Topic 5 : Capacity/Resource Analysis: Tools and Techniques
Topic 6 : Risk Analysis

## Topic 1

***Steps in Village Disaster Management Plan***

**Duration: 15 minutes**

**Training Methodology: Free Listing & Discussion**

**Training Note:** The trainer can initiate the session by posing the question to the participants, "What information do you thing is required for making a disaster management plan?" and listing of all the information. The trainer can pick leads from the response of the participants and give his inputs in the discussion.

The following steps are required in making a Village Disaster Management Plan:

1. Situational analysis of the Village
2. Hazard, Vulnerability, Capacity and Risk Assessment
3. Response Plan
4. Mitigation and Preparedness plan
5. Contact Details & Updation mechanism
6. Annexure

## Topic 2

***Situational Analysis***

**Duration: 30 minutes**

**Training Methodology: Free Listing**

**Training Note**: A rough sketch of the map is drawn by the participants and the existing situation of the village is depicted on the map by them with the assistance of the trainer. An updated revenue map of the village can be used as a reference for carrying out this exercise. Trainers may like to keep this in mind that a revenue map would only be depicting the geographic area but, other local details need to be captured by the participants on the sketch to be drawn by them.

The situational profile would include information like population, geographical area, temperature, rainfall, agricultural land, cropping pattern, education, economy, occupation, literacy rate, income, rivers, road, industries, hospitals, schools, temples, sex ratio, families below poverty line, livelihood pattern, drinking water sources, critical establishments and other critical infrastructure.

The participants can be asked to depict the following information on the map of the village. The information which can be depicted on the map can be collated and used as a supplement for assessing the current situation of the village.

- Village surrounded by in the North, South, East, and Western directions.
- Distance to the nearest village
- Hills, hillocks, elevated land, inclines, low lying areas, high tide lines etc
- Nearest water bodies and distance from sea

- Number of Men, women, children, disabled, elderly and Transgender population. Segregated data for aged population, pregnant mothers, those dependent upon specific medications for their survival etc. can also be mapped.
- Housing Type :Kutcha, Pucca, Semi-kutcha houses
- Natural resources in the village, for e.g. Lands and fields, Forests/ Trees, Tanks and ponds / Tube Wells / Wells etc
- Different livelihoods practiced in the village, for e.g. agriculture, fishing, seed collection, weaving, wage labour work and so on
- List of assets of the community, for e.g. Boats, fishing crafts, Nets, Irrigation facilities of farmers, implements, food grain stores and other inventories, implements of artisans etc
- Existing safe and risk prone infrastructure in the village and their location (detailed out in resource mapping)

This information is put up on a map and displayed. The participants study it and suggest any errors or oversights there may have been. The mapping session is important for situational analysis because the following stages to contingency planning depend on the information listed.

## Topic 3

***Hazard Analysis: Tools and Techniques***

**Duration: 45 minutes**

**Training Methodology: Process oriented free session**

**Training Note:** The trainer can initiate the discussion by explaining the concept of hazard and ask the participants to provide their inputs.

### Hazard Analysis

It refers to prioritizing disasters based on its frequency and analysis of the estimated losses. This can be carried out by taking the help of elderly people of the village. The villagers analyze the losses that they had incurred during various disasters and learn the best practices carried out. This is an important activity as it forms the basis for preparedness and mitigation plans.

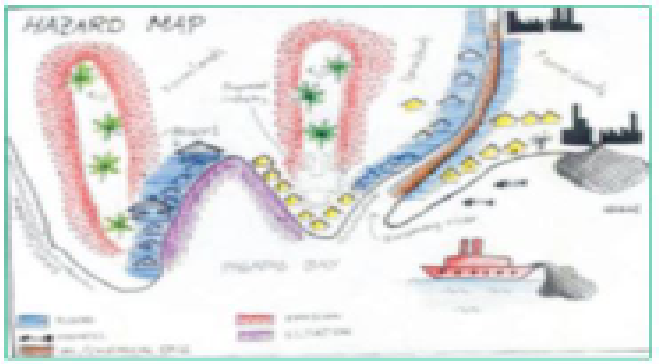
The participants would be asked to review and analyze the occurrence of past disasters and hazards. Group discussions along with the elderly population, teachers and children can be held focusing on the disasters and hazards faced by the community for the past one year to past fifteen years, kind and nature

of disasters and hazards faced, experience in the last hazard faced, warning issued, damage caused, response to the disaster, relief and rehabilitation process, traditional methods of coping of the community, gaps in management of the hazard, lessons learnt. It can be useful in understanding the nature, intensity and behavior of the past disasters and hazards. The elderly population can share vital information and experience about the past while the presence of children in the group discussion would ensure that the experience is passed on to the next generation.

The participants may be asked to identify both natural as well as human made hazards. Natural hazards may include floods, drought, earthquake, cyclone, sandstorm, cloudburst etc. human made hazards for the community may include industrial and chemical accidents, road and railway accidents, fire, epidemic, building collapse, communal violence etc. A seasonal calendar may be developed by the community on the basis of the frequency and time of the occurrence of the hazard.

### Tools for hazard analysis

1. **Hazard Mapping:** It is a visual representation of the village by the community. It is a rough spatial overview and sketches of the area and specific locations which are vulnerable to various hazards or which has been hit by disasters in the past. The main feature of hazard mapping is to facilitate discussion on issues pertinent to hazards. It is made by men and women, who know the area and are willing to share their experiences on large sheets.




**Trainer's Note:** The trainer can keep the following points in mind while guiding the village members in drawing hazard map (rough sketch) of the village.

- Decide about the kind of sketch that should be drawn

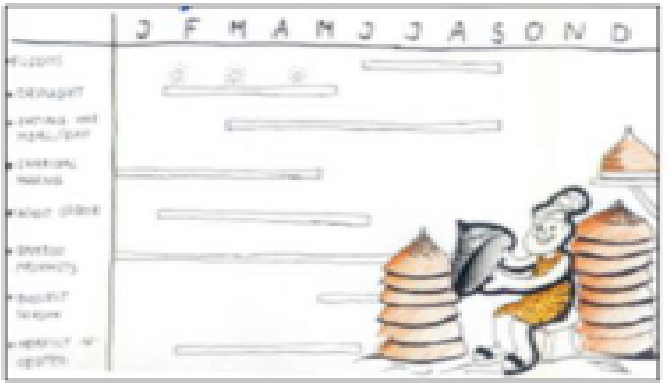
- Choose a suitable place (ground, floor, paper) and medium (sticks, stones, seeds, pencils, chalk) for the map
- Help the community to get started but let them draw the sketch by themselves.

2. **Historical Profile or Timeline:** This tool is used to gather information about what happened in the past. It helps in getting an insight in past hazards, changes in their nature, intensity and behaviour. It helps to understand the present situation in the community and establish the link between hazards and vulnerabilities. The community may also become aware of the changes that have taken place over the pats through historical profile or timeline.


**Trainer's Note:** The trainer can keep the following points in mind while guiding the village members in conducting a historical profile of the village.

- Plan a group discussion and ensure that key informants like old people, leaders and teachers are present
- Invite as many community members as possible, especially the young ones, for them to hear the history of the community.
- Ask the community members if they can recall major events like hazards and its effects, changes in land use, changes in land tenure etc.
- The facilitator can write stories on the blackboard or paper in a chronological order which depicts the history of the specified place.

3. **Seasonal Calendar:** It involves making a calendar showing different events primarily the time of occurrence of hazards throughout the annual cycle. It helps to identify the periods of stress and prepare for the specific stress in normal times before the threat of hazard looms large on the community. The facilitator can arrange sessions for the community members focusing on the issue.




**Trainer's Note:** The trainer can keep the following points in mind while guiding the village members in chalking out a seasonal calendar for analyzing hazards in the village.

- The trainer can arrange separate sessions for men and women members amongst the participants.
- Make a chart of all possible hazards and an annual calendar
- Make a chart stating hazards on y axis (rows) and months on x axis (columns)
- The periods of stress will also help in prioritizing the planning.

**Hazard Matrix:** This tools aims at gathering comphrensive information about the past hazards. It helps in having an insight about the future hazards on the basis of gaps and lacunae in the management of past hazards and disasters. The participants discuss what happened in the last disaster that hit the village. Those villages, who have not faced any disaster , may need to rely on the experiences of other villages located nearby.

**Trainer's Note:** The trainer can focus on the following questions and collate the information gathered in the form a matrix.

**Before the Disaster**

a. Was warning communicated to everyone? If so how? If not why? When did it reach? What did each one do after the warning (individuals - families - community)?

b. What precautions were taken?

c. What could individuals -families - community protect? What would they have liked to protect?

### During the Disaster

a. What was the experience? The weather (severity, duration of the disaster) - where was everyone and what did they do? Individuals -families - community.

b. Did anyone move to cyclone/flood shelters or safe houses or safe buildings after receiving the warning?

### After the cyclone/flood

a. What did everyone do after the disaster subsided?

b. How many deaths and how much damage to property and livelihood? Who faced maximum losses and why?

c. What kind of help was needed? Did help arrive on time?

d. What kind of difficulties was faced? Who had most difficulties? How were the problems solved?

The exercise gives everyone in the community an opportunity to know how each one fared in the cyclone/flood and how the village emerged as a whole after the disaster and how the village emerged as a whole after the disaster. It also gives an idea of how prepared the community was to face the disaster.

Based on the findings of this exercise, the community will decide on the different ways through which the village can be better prepared to respond to the next disaster threat and need based contingency plan can be drawn with priorities listed.

## Topic 4

***Vulnerability Analysis: Tools and Techniques***

**Duration: 60 minutes**

**Training Methodology: Discussion & Process oriented free session**

**Training Note:** The trainer can initiate the discussion by explaining the concept of vulnerability and further collate information provided by the participants.

### Vulnerability Analysis

The process of vulnerability analysis aims to highlight the weakness in the existing scenario of the village in terms of human beings as well as infrastructure. It involves asking the participants two major questions namely; who is vulnerable and what is vulnerable?

The participants would be asked to identify the more vulnerable population, identify the location of women (pregnant, lactating, widows, single),children

,old aged, children, physically challenged, mentally challenged, those dependent on life support systems& medicines, poor people living by the sea or kutcha houses, livestock and cattle etc. The community would also be asked to identify the vulnerable infrastructure like kutcha houses, low lying areas, areas near the water bodies such as the sea and river& direction of wind, livelihood assets such as boats & nets, documents, weak structures, drinking water resources, communication lines, roads, telephone lines etc

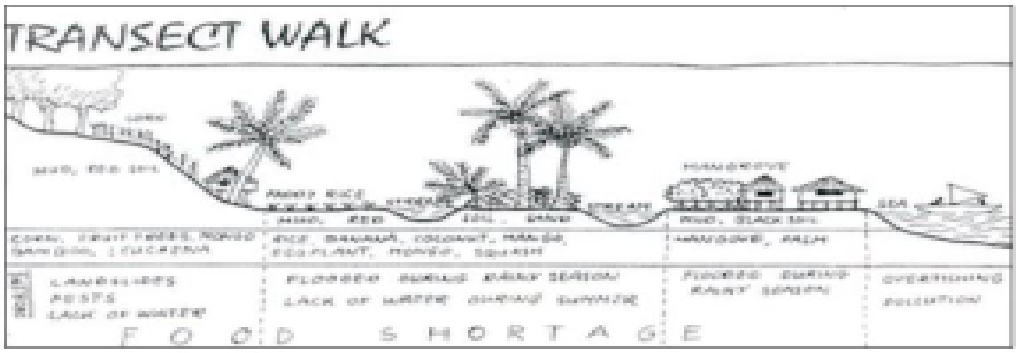
**Tools for vulnerability analysis**

The various tools for vulnerability analysis are as follows:

1. **Transect Walk:** The process involves taking a systematic walk with key informants through the community to explore spatial differences, land use zones by observing, asking, listening, informal interviews and producing a rough sketch of the existing weaknesses in the village which would either lead to a disaster or prevent smooth response to a disaster.

**Trainer's Note:** The trainer can ask the participants to keep the following points in mind while taking a transect walk of the area.

- Team with 6-10 community members representing the cross section of the area.
- Identify danger zones, vulnerable areas, evacuation sites, local resources used during emergency, human activities contributing to vulnerability etc
- During a walk, take time for brief and informal interviews at different places in the transect.

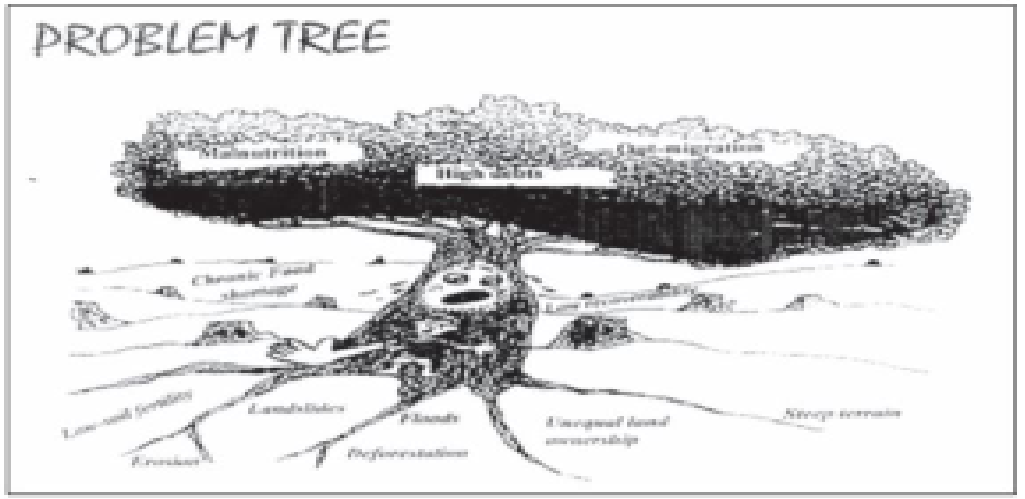



2. **Problem Tree:** The tool involves drawing a tree which shows relationship between different aspects of vulnerability. It involves identifying major

problems and vulnerabilities as well as root causes and their effects. The trunk represents the problems, the root depict the causes while the leaves signify the effects.

**Trainer's Note:** The trainer can demonstrate the usage of this tool by performing the following steps:

- Give the participants small pieces of paper and ask them to write one major problem on each card, and put these on the wall.
- Ask two/three volunteers to group the problems according to similarity or interrelationship.
- Make the problem tree with the trunk as problem, root as causes of the problem and leaves as the effect of the problem.
- Ask "But Why" to arrive at the root causes
- To arrive at effects, ask for consequences of each problem




3. **Livelihood Analysis:** The tool focuses on the studying the vulnerability of the livelihood of the community to various disasters. The tool analyzes the various livelihood activities that are spread over the year and the impact of hazards on the livelihood activities. It also focuses on understanding livelihood strategies, behaviour, decisions and perceptions of risk, capacities and vulnerabilities from different socioeconomic background.

**Trainer's Note:** The trainer can inform the participants to keep the following points in mind while conducting a livelihood analysis:

- Decide beforehand which households you will interview and how many you will interview.
- Before conducting the interview; introduce yourself and reason for the interview.
- Start with getting to know the household members, composition, age, gender followed by questions about livelihood and coping strategies.
- Discuss on how household cope in periods of stress.

4. **Vulnerability Assessment:** The vulnerability assessment would focus on the vulnerable community and the vulnerable infrastructure. It assesses the more vulnerable population and the assets in the village.

**Trainer's Note:** The trainer can sensitize the participants to observe the following steps:

- Ask two simple questions to the participants, who are more vulnerable and what is vulnerable?
- Make a list of the more vulnerable community and the vulnerable assets.
- You can use the following table to tap the weaknesses in the infrastructure of the village which would either; lead to a disaster or pose as a hindrance in responding to a disaster.

| Particulars | Location | Alternate Solution |
|---|---|---|
| Narrow Road | | |
| Electricity transformer | | |
| Chemical Godown | | |
| Industry Plant | | |
| Encroached Land | | |
| Any Other | | |

***Vulnerability mapping*** can also be used a tool for depicting the area of the village which is vulnerable to various hazards. This map can be made separately or clubbed with the hazard map.

## Topic 5

***Capacity/Resource Analysis: Tools and Techniques***

**Duration: 60 minutes**

**Training Methodology: Discussion & Process oriented free session**

**Training Note:** The trainer can initiate the discussion by explaining the concept of capacity and collate information provided by the participants.

## Resource Analysis

Resource analysis focuses on identifying locally available assets and resources that can be utilized for building the capacities of the community during and after disasters. The local community has a lot of inbuilt strength and capacity for handling the disasters. It is important to capture the capacity and strength of the community in resource analysis. Apart from infrastructure and funds, it could be individuals with specific skills, local institutions and people's knowledge as all these have the capacity to create awareness and bring about changes in the community. Resource analysis is therefore not limited to a map depicting the available resources but also plotting of the distribution, access and its use by taking into consideration prevailing sensitiveness within the village. Thus assessment of resources would involve two components:

a. Human Resource Assessment
b. Material Resource Assessment

The process would involve identifying safe houses and buildings for shelter, strong buildings, elevated uplands and structures, safe evacuation routes, health, medical & sanitation facilities, swimmers, doctors, nurses, sources of funds to carry out preparedness activities, volunteers for task force etc

### Tools for Resource Analysis

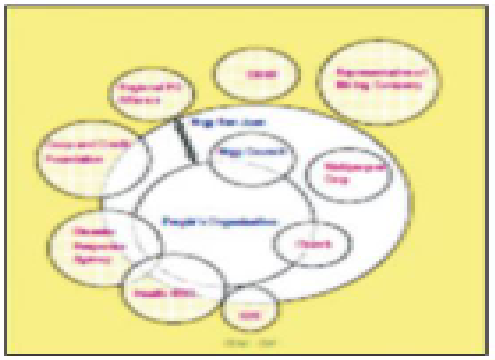
c. **Chapatti Diagram / Venn Diagrams:** Chapattis are round 'circles'. These are used to find out the relationships, unions and intersections that exist in a society/community. The tool focuses on identifying various government, non government and private organizations working in the field of disaster management in the local as well as neighbouring area. Various other aspects can also be studied such as the role played by the institutions, their area of interest, their importance in the management of disasters, capabilities of such institutions and the perceptions people have about them.

The Venn diagrams or chapattis are used :

- To carry out institutional analysis that exists in a community
- Bring out the differences in power relations that exist.

While drawing chapatti/Venn diagrams a chapatti is given to each institution. The size of each chapatti should correspond to the importance of the institution; the more important the bigger the chapatti. Chapattis are placed near or far away from the community, institutions that interact with the community are placed near the community and those that do not closely interact with that

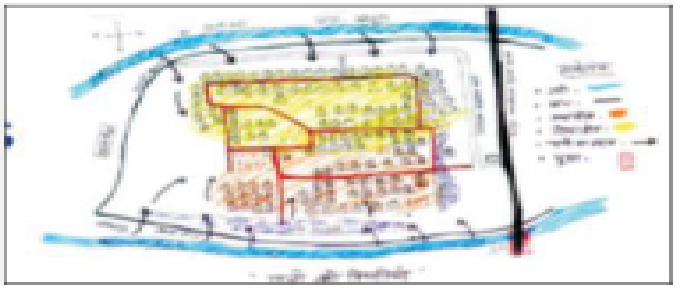
community are placed far from the community. The institutions that work together will have their chapattis touching.



**Trainers Note:** The trainer can keep the following points in mind while the participants prepare the diagram:

- Become familiar in advance with the names of the organizations.
- Ask the community about the extent of linkage between the various organizations and institutions.
- Draw circles to represent each organization or group; size of the circle would indicate the importance.
- Conduct focus group discussions on the history of the organizations, activities undertaken in the community, their performance, level of coordination, important organizations in the time of disasters

b. **Resource Mapping:** The participants can be asked to locate and depict the various kinds of resources on the map of the village. The resources can include roads, pucca households, health units, religious places, water points, schools, clubs and other such resources highlighted in the following resource matrix.



c. **Resource Matrix:** In this tool general information about the material as well as human resources is collected and presented in the form a matrix. The following matrix can be used as a sample for collecting information about resources available in the village.

| Community Resources | | | |
|---|---|---|---|
| Particulars | Total No | Contact person and Telephone Number | Distance from the village |
| Hospitals | | | |
| Public health Centre | | | |
| Dispensaries | | | |
| Veterinary Hospital | | | |
| Private Hospital | | | |
| OPD Facility | | | |
| X Ray facility | | | |
| Ambulance Service | | | |
| Medicine Shops | | | |
| **General Resources** | | | |
| Nearest Police Station | | | |
| Nearest Fire Station | | | |
| Petrol Pumps | | | |
| CNG Depot | | | |
| Cremation Site | | | |
| Power Sub Station | | | |
| Water Pumping station | | | |
| Overhead water Tanks | | | |
| Underground Water Tamks | | | |
| Tube Wells | | | |
| **Communication and Transportation** | | | |
| Nearest Telephone Exchange | | | |
| Nearest Ham radio Station | | | |

| Community Resources | | | |
|---|---|---|---|
| Particulars | Total No | Contact person and Telephone Number | Distance from the village |
| Nearest Railway Station | | | |
| Pucca Roads | | | |
| Kutcha Roads | | | |
| **Search and Rescue Equipments** | | | |
| Crane | | | |
| Bulldozer | | | |
| Gas Cutter | | | |
| Tree Cutter | | | |
| RCC Cutter | | | |
| Dumper | | | |
| Loader | | | |
| Rope | | | |
| Chain | | | |
| Heavy Hammer | | | |
| CrowBar | | | |
| Hand Saw | | | |
| Heavy Axe | | | |
| Heavy jack | | | |
| Shovels | | | |
| Short Ladder | | | |
| Generator | | | |
| Tarpaulin | | | |
| Lamps &Torches | | | |
| **Open spaces/Community Centers/Schools** | | | |
| Parks | | | |
| Play Grounds | | | |
| Sports Complex | | | |
| Community hall | | | |
| Colleges | | | |
| Schools | | | |

| Community Resources | | | |
|---|---|---|---|
| Particulars | Total No | Contact person and Telephone Number | Distance from the village |
| **Skilled Human Power** | | | |
| Doctors | | | |
| Veterinary Doctor | | | |
| ANM | | | |
| Paramedical Staff | | | |
| Trained Midwives | | | |
| Nurses | | | |
| Carpenters | | | |
| Masons | | | |
| Mechanics | | | |
| Others | | | |

## Topic 6

***Risk Analysis***

**Duration: 30 minutes**

**Training Methodology: Discussion& Process oriented free session**

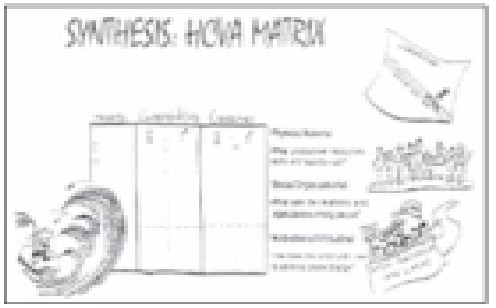
**Training Note:** The trainer can initiate the discussion by explaining the concept of risk and collate the information provided by the participants.

**Risk Analysis**

Risk is a measure of the expected losses due to a hazard event of a particular magnitude occurring in a given area over a specific time period. The tool is based on determining the risk by analyzing the vulnerabilities and capacities of the community related to each hazard. On the basis of analysis the risk is determined for a particular hazard in a ranking order.

**Trainer's Note:** The trainer can keep the following points in mind while conducting the risk Analysis

- Determine the risk by ranking
- Ask the participants about the hazard which poses the highest risk.
- Explore the reasons due to which a particular hazard poses the risk.
- Consider the vulnerability as well as capacity analysis





An extensive hazard, vulnerability, resource and risk analysis would form the basis for development of a village disaster management plan.

**Resources:**

1. Asian Disaster Preparedness Centre (2000), Training module on Community Based Disaster Preparedness, Bangkok, Thailand
2. Delhi Disaster Management Authority, Community Disaster Management Plan, Government of NCT of Delhi.
3. Training Trainers for Development, Conducting a Workshop on Participatory Training techniques, The CEDPA Training Manual Series, 1995, The Centre for Development and Population Activities, Washington Download at: http://www.cedpa.org

*Note:*

The authors wish to acknowledge that a number of pictures used in this section have been taken from the training module on Community Based Disaster Risk Preparedness developed by ADPC.

# Part (B)
# RESPONSE PLAN

## Learning Objectives

At the end of the session, you should be able to:

- Explain the constitution of Disaster Management Committees (DMCs) and Disaster Management Teams (DMTs).
- Highlight the need and importance of Disaster Management Committees (DMC) and Disaster Management Teams (DMTs), and;
- List out the Standard Operating Procedures for DMTs during and post disaster phase,

**Materials Needed:**

Flip Charts, Markers, Laptop, LCD/Projector, charts and Blackboard.

## Key Concepts

The response plan would include the following components:

Topic 1 : Disaster Management Committee: Constitution and Role

Topic 2 : Types of DMTs

Topic 3 : Roles and responsibilities of DMT during and post disaster phase

## Topic 1

***Disaster Management Committee: Constitution and Role***

**Duration: 30 minutes**

**Training Methodology: Brainstorming**

**Training Note**: The trainer can initiate the session by asking the participants about how a disaster management committee is different from a disaster management team and the need for such committees and teams is.

### Disaster Management Committees

There is a strong need for setting up DMCs in the village to carry out the following functions:

1. To take village level decisions
2. To coordinate the activities of the Disaster management Teams,

3. To account for and to maintain the inventory of Community based Disaster preparedness materials
4. To able to ensure a continuous monitoring of preparedness

A suggested membership of the DMC is as follows:

| External Ex-offico Members | No. of Persons | Reasons for being member |
|---|---|---|
| BDO or his representative | 1 | To allow access to the govt. schemes and to act as a arbitrator if conflict arises amongst the members that cannot be settled by consensus. |
| Government Engineer | 1 | To give a technical know how back up to DMT's and to periodically verify the condition of the shelter and other structures. |
| Member Panchayti Raj institution | 1 | To allow access to the DMC to the facilities available |
| Member from a facilitating inst.or NGO | 1 | To allow the community to communicate with the implementing agency and the required feedback. |
| Gram Mukhya or Village head | 1 | Already enjoy a degree of respect and are usually a part of all decision making processes |
| Mahila mandal and women's representative | 1 or more | To specifically represent gender needs |
| Youth representatives like NYKS, NCC, NSS | 1 or more | To present the needs and requirements of the youth |
| Self help group | 1 or more | Groups are already organized and have a large contributory role to the village processes. |
| Other groups | 1 or more | Representation of backward class, or scheduled caste or scheduled group or other ethnic groups. |
| School committee member | 1 or more | To participate in any decision regarding the usage of shelter and to spread awareness through school. Besides, teachers and school committees are usually respected by the community. |

| External Ex-offico Members | No. of Persons | Reasons for being member |
|---|---|---|
| Village members | 2 or more | Chosen by the communities to represent the needs of the community members. |
| DMT member | 1 | Chosen by the DMT members |

The roles and responsibility of the Disaster Management committee are as follows:

- Effective coordination with Disaster management Teams
- Details of rescue material and their periodic checking, maintenance and replacement
- Register of usage of shelters, details of persons or groups using that infrastructure
- Register of Community Based Disaster Preparedness activities, training and drills
- Account books of Village Contingency Funds.

## Topic 2

***Disaster Management Teams and Types***

**Duration: 90 minutes**

**Training Aid**

Distribute Handout No 2 to the participants.

**Training Methodology: Brainstorming, Discussion & Interaction**

**Training Note:** The trainer can ask the participants to brainstorm about the need for disaster management teams, why they are needed and what responsibilities should be discharged by them after a disaster. Based on the discussions, the trainer can list out the types and Standard Operating Procedures of DMTs.

### Disaster Management Teams

The participants list from among themselves motivated and responsible men, women and youth volunteers who can implement and supervise the activities of the disaster management plan for e.g. Members of the village youth clubs, women members of the village self help groups, literate youth of the village, school teachers, Auxiliary Nurse Midwife (ANM), ward members and so on. These individuals then form small action groups of 5 to 10 members each, depending on the convenience of the community. Each group is given a

particular responsibility like, warning dissemination, rescue, relief and so on. Each group will have distinct activities to carry out before during and after a disaster. The different DMT's can be as follows:

1. Warning Team
2. Evacuation and Response
3. First aid
4. Sanitation
5. Shelter management
6. Relief Management
7. Carcass disposal
8. Counseling
9. Damage Assessment
10. Reconstruction and Rehabilitation Team

The DMT's have certain Standard Operating procedures in the three phases of disasters. Let us discuss their roles and responsibilities one by one.

## 1. Warning Team

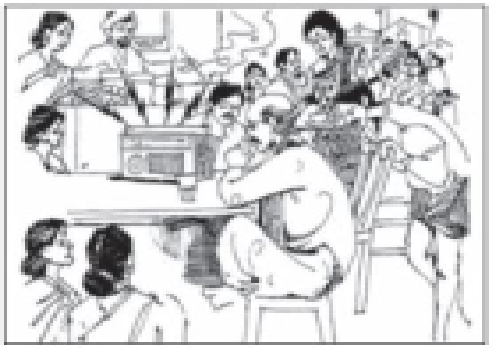
Young groups of the village will be trained to understand radio meteorological warnings and act fast to spread the warning throughout the village in an effective manner.

During Disaster

- Cross checking of the warnings received on the radio with the nearest control room.
- Dissemination of warning throughout the village, especially to those households that have been identified as the most vulnerable by red flag.
- Contact with different shelters and safe houses when the disaster like cyclone/flood is expected to strike.

Post Disaster

- Monitoring the path of disaster on radio and confirm from the tahsildar /BDO's office that the disaster has passed.
- Dissemination of precautionary information on post disaster health hazards and remedies.
- Coordination with other groups like the shelter team and the evacuation team.



## 2. Shelter Team

The members of this team can include both men and women. The team will be at the shelters and safe houses looking after the evacuee's food, water, sanitation and medical needs. The team can also coordinate with the government authorities to ensure that health and nutrition facilities are available for the more vulnerable group like women, children, aged and those dependent on critical facilities.

During Disaster

- Stocks of food, drinking water, utensil and medicines are to be transferred to the affected place.
- Arrangement of sufficient space to house the evacuee family.
- Strict hygiene conditions should be maintained in the shelter camps.
- Special care provisions should be given to the more vulnerable group.
- Every evacuee's name should be registered and identification slips should be produced.
- The team should ensure that the evacuees remain indoors and also that no one leaves the shelter during the disaster.

Post Disaster

- Replenish stocks of food, clothing and fuel wood from the government stores or the "Gramin Bank" of the village or any other source.
- Register the names of new evacuees and provide identification slips when they arrive at the shelter.
- Shelters can act as centers for relief distribution so that supplies are not looted or hoarded by unscrupulous people and the materials can be given against identification slips.

- Environment of the shelter should be kept clean and disinfected throughout the stay and before leaving.
- Ensure that no one cooks individually but eat at the community kitchen and assist in food distribution.
- Team should help other teams in chlorinating wells, spraying bleaching powder, treating injuries and wounds of the injured people in the camp.

### 3. Evacuation and Response Team

The members of this team should include physically strong men and women in the age group of 18-35 years. Gram Rakhi/Chowkidaar should be included in this team. Inclusion of civil defense personnel would be useful if available in the village. The Rescue and Evacuation team can coordinate with the government to avail various services.

During Disaster

- Picking up the vulnerable community from the sea and riverbanks in case of flood or a cyclone.
- Directing the rescue community to the shelters.
- Securing rescue boats and rescue kits.
- Evacuating cattle and livestock.

Post Disaster

- Village inspection and rescuing stranded and injured people.
- Maintaining a "missing persons" register and updating it after each rescue trip and assisting government in enumeration of damaged property.
- Transporting doctors, volunteers and other relief materials.

### 4. First Aid Team

**Training Aid:** Distribute Hand out No 2 under this topic

The team should include both men and women members of the community. The members with some knowledge of nursing and other government functionaries in the village like Auxiliary Nurse Midwife (ANM) and Accredited Social Health Activist (ASHA) should be included in this team.

During Disaster

- Moving medicine stocks and first aid kits to the shelters or safe places.
- Looking after the medical needs of the evacuees.

- The team must be indoors when the disaster strikes and also ensure that no one leaves the shelter during the disaster like cyclone/flood on nay pretext.

Post Disaster

- Attending to injuries of the rescued people.
- Informing the relief group about medical supplies which are running low.
- Helping doctors and paramedics shift the sick and the injured to hospitals.
- Isolating cases with infectious diseases and prevent them from spreading after giving due primary care.
- Providing preventive medication if there is a danger of epidemic outbreak like cholera, dysentery, malaria etc.

## 5. Sanitation Team

Both men and women may look after the sanitation responsibilities at the shelters as well as outdoors.

During Disaster

- Ensuring evacuees maintain sanitary habits in the shelters.
- The sanitation needs of women are taken acre of in the shelter especially pregnant, lactating and menstruating women.

Post Disaster

- Spray bleaching powder and other disinfectants in the village to prevent the spread of infectious disease.
- Ensuring trenches and lavatories are cleaned and disinfected.
- Ensuring that the evacuees use the sanitation facilities properly.
- Checking the quality of water with the water testing kit.
- Informing the affected community about purifying water before drinking ,to prevent stomach infections.
- Carry out the task of purifying water by chlorinating it.
- Carry out the task of water congestion /water clogging.

## 6. Relief Team

The members of the team include both men and women. They collect relief materials such as food supply, utensils, clothes, kerosene, diesel etc and coordinate all relief requirements of other teams. The women members should

be asked to inquire about the specific needs of the affected women. Certain gender sensitive clothes and material should be distributed to the other women only through women. The members should also keep a track of all government provisions related to gratuitous relief works to prevent starvation, deteoriation, migration, health and sanitation measures for both people and livestock so that people do not lose out on their entitlements.

During Disaster

- Moving relief supplies to the respective shelters.
- Monitoring the stocks and make a list of things to be replenished.
- Coordinate between relief supplies from the government sector and the NGO's.
- Conduct a needs assessment and ask the NGO sector to pitch in with the requirements of the affected community.

Post Disaster

- Receiving and distributing stocks of relief material.
- Replenishing the stock which is running low.
- Monitoring and distributing relief from all sources.
- Ensuring that the officials start the enumeration procedure immediately, so that the building material can be arranged through revenue authorities.

The general responsibilities of some of the other teams are as follows:

## 7. Carcass Disposal Team

Carcasses can create unhygienic conditions and have to be disposed of as soon as possible. The members of this group have to physically and mentally strong to carry out this task. If possible, civil defence volunteers, members of NSS/NCC/Scouts can be included in this team. The responsibilities of this team are as follows:

- Collecting dead bodies and record their descriptions for families to identify them.
- Cremating carcasses and bodies and disinfecting the area with bleaching powder.

## 8. Psychosocial Counseling Team

**Training Aid:** Distribute Hand out No 3 under this topic

Emotional problems following disasters often tend to be neglected. This happens because they are relatively invisible when compared to the damage caused to

life, physical health and property. It is important to remember that emotional problems occur very commonly. Distress is intense and leads to helplessness, isolation and apathy. Everyone who witnesses/experiences disaster is affected by it. Hence, early identification of this problem followed by intervention help the survivor to recover. The responsibilities of this team are as follows:

- Allow the people to express their grief.
- Whenever a person is sharing his/her feelings and experiences member should listen to him/her patiently and try to realize what the survivor went through by keeping him/herself in the survivor's position.
- Good listening is an important skill to provide emotional support to the survivor.
- Help the survivors in contacting their relatives so that they can get social support.
- Emphasis on engaging the disaster survivors in some kind of activities that interest them in order to give them a sense of being productive.
- Engaging the disaster survivors in relaxation/breathing exercises help in the healing process. Encourage the survivors to undertake these exercises at least twice a day regularly. This helps to gain control over their anxiety.
- It is necessary to encourage the disaster survivors to practice their religious beliefs and rituals. Practicing religious beliefs help in the recovery process.

## 9. Damage and Loss Assessment Team

The members of this team have to be literate preferably matriculates and above. The responsibilities of this team are as follows:

- Help in assessing damages to infrastructure like roads, water supply, electricity, markets and distribution networks.
- Hastening the government enumeration process to assess the damage and loss incurred by the affected community.
- Helping families with paperwork to follow compensation proceedings especially relating to death certificates, insurance etc.
- Ensuring that the assessment and concerned papers reach the government department which is responsible for compensation to ensure timely assistance.

## 10. Reconstruction and Rehabilitation Team

This team would supervise activities for reconstruction and rehabilitation of the property and life after a disaster. The members of the community who

have the experience of planning might become the members of this team. The main aim of the team would be to get government support to carry on reconstruction and rehabilitation. The responsibilities of this team are as follows:

- To make arrangements for Ex- Gratia payments for lives lost compensation and. for wholly and partially damaged houses from the government
- To ensure access of reconstruction materials to the community.
- Accessing government services for rebuilding damaged public infrastructure and following it up till rebuilding is completed.
- To help families in reconstruction of their houses.
- Helping families to initiate livelihood through loans and other financial services.
- Seeking the assistance of government and NGO's in restoration of support facilities.

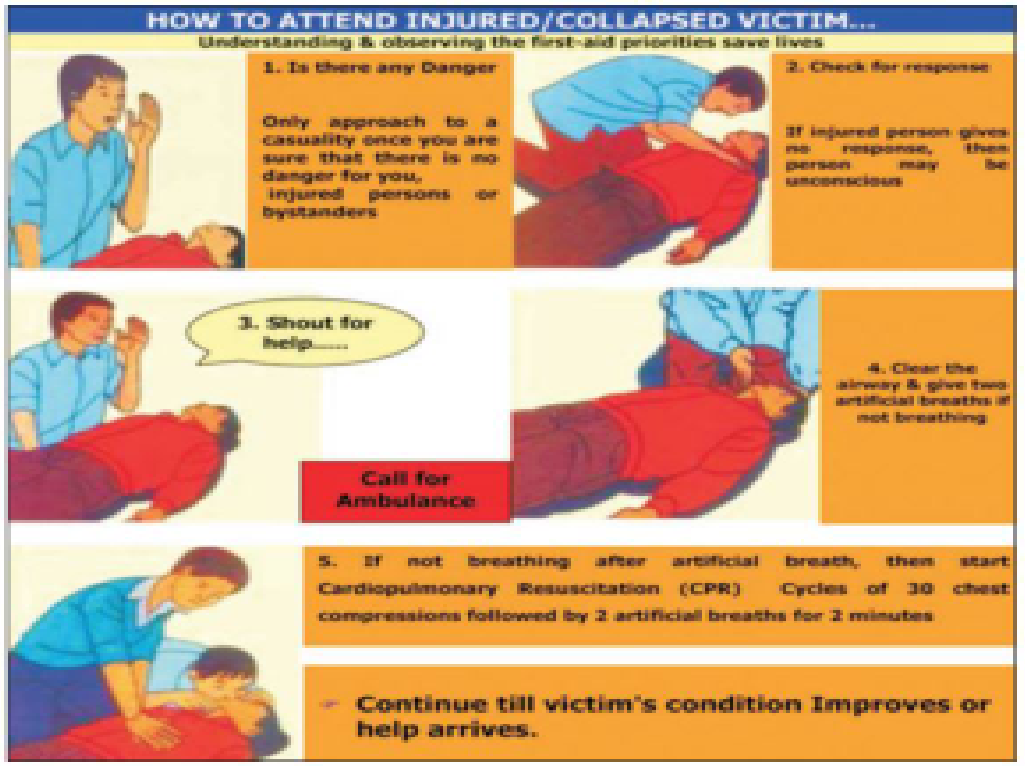
Some of the common activities which all DMTs should be carrying out in a post disaster scenario are as follows:

- Liasoning between the affected community and government as well as non government organizations
- Generating awareness amongst the affected community about the initiatives being undertaken by the government machinery for responding to the disaster.

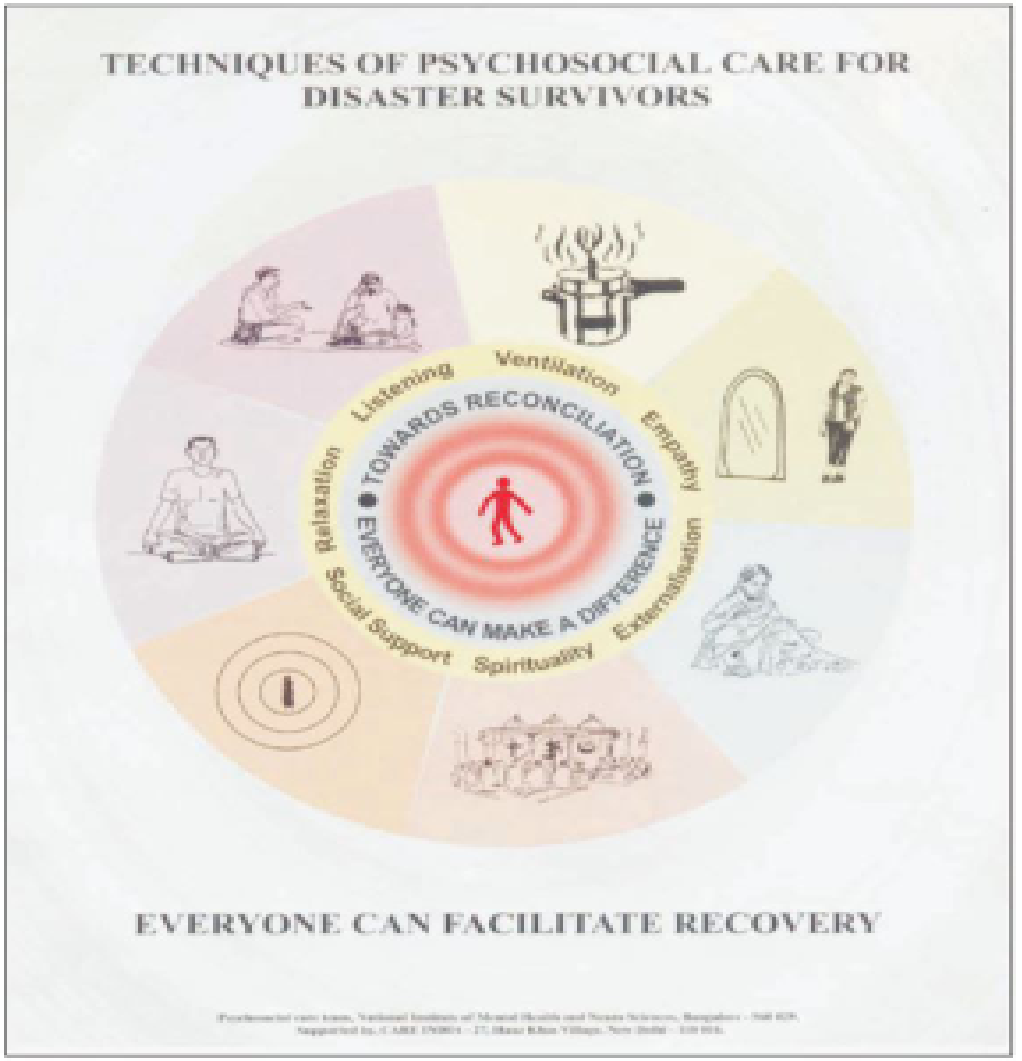
**Resources:**

1. West Bengal Voluntary Health Association (2003).Guidebook: Disaster Preparedness and Response, Ideal Concept Network, Kolkatta.
2. Swiss Agency for Development and Co-operation (2001).Community Based Disaster Preparedness: A Handbook of Concepts and Techniques, Lipiscan, Bhubaneshwar.
3. Delhi Disaster Management Authority, Community Disaster Management Plan, Government of NCT of Delhi.

# HANDOUT NO 2


HOW TO ATTEND INJURED/COLLAPSED VICTIM...
Understanding & observing the first-aid priorities save lives
1. Is there any Danger
Only approach to a casuality once you are sure that there is no danger for you, injured persons or bystanders
2. Check for response
If injured person gives no response, then person may be unconscious
3. Shout for help.....
Call for Ambulance
4. Clear the airway & give two artificial breaths if not breathing
5. If not breathing after artificial breath, then start Cardiopulmonary Resuscitation (CPR) Cycles of 30 chest compressions followed by 2 artificial breaths for 2 minutes
Continue till victim's condition Improves or help arrives.

## HANDOUT NO 3


TECHNIQUES OF PSYCHOSOCIAL CARE FOR DISASTER SURVIVORS
Listening
Ventilation
Empathy
Relaxation
TOWARDS RECONCILIATION
EVERYONE CAN MAKE A DIFFERENCE
Externalisation
Social Support
Spirituality
EVERYONE CAN FACILITATE RECOVERY

# Part (C)
# MITIGATION AND PREPAREDNESS PLAN

### Learning Objectives

At the end of the session, you should be able to:

- List out the Standard Operating Procedures for DMTs in the pre disaster phase,
- Enumerate the short term and long term mitigation measures for the community, and;
- Illustrate various forms of skill training that can be imparted to the community which can prove beneficial in the wake of a disaster.

**Materials Needed:**

Flip Charts, Markers, Laptop, LCD/Projector, charts and Blackboard.

### Key Concepts

The mitigation and preparedness plan would include the following components:

Topic 1 : Standard Operating Procedures of Disaster Management Teams in Pre Disaster Phase

Topic 2 : Identifying Safe Evacuation Routes

Topic 3 : Community level Mitigation Program

Topic 4 : Skill training

Topic 5 : Mock Drills

## Topic 1

***Standard Operating procedures of Disaster Management Teams in Pre Disaster Phase***

**Duration: 90 minutes**

**Training Methodology: Discussion & Interaction**

**Training Note:** The trainer can ask the participants to discuss about the role of DMTs' in preparing for a disaster. While discussing with the participants, the trainer can provide his own inputs on the subject as well.

The DMT's have certain Standard Operating procedures in the pre disaster phase. Let us discuss their roles and responsibilities one by one.

## 1. Warning Team

The warning team would include youth of the village, both men and women, who will be trained to understand radio meteorological warnings and act fast to spread the warning throughout the village in an effective manner. They would perform the following functions in pre disaster phase.

- Monitoring of weather forecasts through wireless, radio bulletins and television without fail.
- Transport and Communication aids are needed to pass on the warnings to the entire village. Hence, cycles, motorbikes, carts, boats and other transport and megaphones, drums and other communication aids should be inspected before each season.
- Update the contact details of the local office and ensure the working of telephonic lines.
- Every group should have a radio and a red flag to mark the more vulnerable houses.

## 2. Shelter Team

The members of this team should include both men and women who will perform the following function in pre disaster phase:

- Shelters and safe houses have been identified and checked by engineers and necessary repairs have been made.
- Food, water, utensils, medicines, milk powder, candles, matchboxes, kerosene etc for usage for at least one week are stocked in sufficient quantities.
- Health and sanitation facilities are usable and properly placed. Separate and private enclosure for women is a must in each shelter.
- Stockpile precooked food or dry food during the period evacuees might have to stay in the shelter.

## 3. Evacuation and Response Team

The evacuation and response team should include both men and women. They would be performing the following functions in pre disaster phase:

- Keeping information about the more vulnerable group and the area in which they work and live. Update the information every year.
- Identify safe routes to reach the vulnerable population and plan their evacuation.

- Keeping transportation ready for use to evacuate people.
- Informing concerned officials for road repair and get it done by liasioning with officials.
- Prepare a rescue kit which contains a rope, iron hooks o tow belongings, rafts, container to bail out water,torches,transistor,afirst aid kit, life jackets, tyres and other floatable objects.
- Keeping some tools handy such as cutting saw and blades, crowbar, hammer, nails etc to cut the fallen trees and to rescue people stuck under fallen houses.
- Identify highlands for evacuating cattle and livestock which had enough fodder for about a week.
- Carry out a mock drill for evacuation to get a fair idea of the kind of problems that need to be tackled at such times.

### 4. First Aid Team

The first aid team would perform the following functions in order to prepare for a disaster:

- Maintaining a list of pregnant women, infants, physically and mentally challenged and ensuring their medical needs.
- Keeping a first aid box with disinfectants,water purifying tablets, antiseptics, medicine, bandages, splint, scissors, blades, iodine, ointmenst, ORS, safe delivery kits, clean cloth etc well in advance.
- Distributing basic medicines like chlorine tablets, ORS packets etc and demonstrating their use, to families in advance.
- Keeping stretchers ready to bring injured people.

### 5. Sanitation Team

The sanitation team would perform the following functions to ensure preparedness for a disaster:

- Stocking bleaching powder in large quantities from the nearest Public Health Centre and other sources.
- Procuring water testing kits from the respective government department.
- Stocking kerosene and fuel wood to dispose of carcasses.
- Ensuring water sources in the village are protected from flood waters.
- Stocking sufficient lime powder bags for purification of bigger water bodies.

- Collecting temporary mobile lavatories and other essential sanitation requirements from the concerned departments.
- Ensuring cleaning of drains and its maintenance.

## 6. Relief Team

The members of this team should carry out the following activities befro a disaster strikes:

- Mobilizing stocks from the government and other sources like water pouches, baby food, food grains, dry rations, medicines, torches, lamps, kerosene, solar cooker, firewood etc for shelters in advance.
- Stocking temporary building material like bamboo, rope, tarpaulin, asbestos sheets and other material.
- Stocking food and medicine for animals.
- Interacting with other teams and assisting in getting their supplies.
- Deciding on the quantity of relief material to be allocated to each shelter according to the number of families the shelter caters to.

## 7. Carcass Disposal Team

The carcass disposal team should keep itself ready before a disaster strikes. They should ensure that they perform the following functions in pre disaster period:

- Maintaining stores of fuel wood, kerosene and sackcloth to cover dead bodies.
- Identifying elevated areas to serve as cremation grounds.

## 8. Psychosocial Counseling Team

The psychosocial counseling team should carry out the following activities in pre disaster phase:

- Mapping of the more vulnerable groups like women, children, aged, people with critical disabilities etc.
- Generate awareness on general psychosocial wellbeing of the community.

## 9. Damage Assessment Team

The responsibilities of this team in pre disaster phase are as follows:

- Help in forecasting damages including lives lost and losses to property and assets like houses, livestock, agriculture, plantations, fishing boats etc

- Sensitizing the families of the village to keep their paperwork intact and keep it in their emergency kit.

## 10. Reconstruction and Rehabilitation Team

The members of the community who have the experience of planning might become the members of this team. The responsibilities of this team are as follows:

- Get the water sources in the village purified.
- Making a list highlighting the various support facilities necessary to restart the economic activity of the community.
- Preparing a reconstruction and rehabilitation plan for the vulnerable community in case they are hit by a disaster.

## Topic 2

***Identifying Safe Evacuation Routes***

**Duration: 30 minutes**

**Training Methodology: Discussion and Interaction**

**Training Note:** The trainer can link this session with the mapping of resource analysis.

The safe evacuation routes can be identified and also be mapped while the participants are doing resource mapping in the village. Some of the things that can be kept in mind while identifying safe evacuation routes for the vulnerable community are as follows:

- Select evacuation route that minimize the exposure to the hazard and other obstacles.
- The evacuation route should lead to a safe area for assembly of people.
- Since, loss of electric power, poles, towers, fire breakout etc may effect the safe route so alternative routes should also be mapped and highlighted in the village mapping process so that the entire community is aware of it.
- Route should be direct.
- Evacuation route should be easily accessible to even the more vulnerable group like women, children aged and people with critical disabilities.
- Some of members of DMT should assemble at the start of safe evacuation routes to assist the more vulnerable group in evacuation.

- Other members of DMT's can guide the rest of the community to such safe routes
- A sign board highlighting the safe evacuation routes should be put so that people can easily spot such routes.



- The trainer should share the evacuation routes plans with communities at risk. The results can be presented even at public meetings in each community. The communities should practice evacuation regularly through drills.
- The evacuation routes should be reviewed and monitored regularly in case significant changes occur to the community population or evacuation pathways. Adjustments have to made and the communicated to the village populace at the earliest.

## Topic 3

***Community level Mitigation Program***

**Duration: 30 minutes**

**Training Methodology: Discussion and Free Listing**

**Trainer's Note:** The trainer can ask the participants to suggest the mitigation measures which are required for preventing the hazard to which the village is vulnerable to. The mitigation measures for some of the major hazards like flood, cyclone, earthquake and drought are listed below. The trainer can sensitize the participants to develop mitigation measures for specific hazards on the above mentioned lines.

One of the important components of mitigation and preparedness plan is to chalk out a community based mitigation plan based upon the vulnerability of the

village towards a specific hazard or more than one hazard. Mitigation measures could be structural (technical) or nonstructural (non technical) in nature.

For example **flood specific mitigation interventions** in a village would include:

- It is necessary to monitor flood embankment (if any) and take precautionary measures so that it may avoid breaching. *Sesbania* and other fuel wood trees can be planted along the bank of an embankment so that it does not get eroded easily by the.
- Construction of a raised platform near the school for shelter of domestic animals: It has been noted that domestic animals like cows and goats are lost in large numbers during flood situations. As soon as the warning is sounded the owners can keep the animals on the raised platform and take shelter with their families in the school and other shelters.
- Construction of a flood shelter cum community centre: It can be built on high land and can be used as a community centre and library during normal times. Training and meetings of the DMC and the DMTs may also be held there, in addition to storage of relief stocks, indigenous relief kits etc.
- The drainage channels need to keep be cleared and desilted before a flood season.
- In areas where people already have built their settlements, measures should be taken to relocate to better sites so as to reduce vulnerability. No major development should be permitted in the areas which are subjected to high flooding. Important facilities should be built in safe areas.
- Farming practices have to be flood compatible. Special varieties of seeds are available which can be harvested during the flood season.
- Sedimentation clearance, reforestation programme, dike and flood wall construction can be taken as part of the community based mitigation programme.
- The community can participate in flood fighting by organizing work parties to repair embankments, pile sandbags and stockpile needed materials.
- **Flood Control** aims to reduce flood damage. This can be done by *Flood Reduction* by decreasing the amount of runoff by treatment like reforestation (to increase absorption could be a mitigation strategy in certain areas), protection of vegetation, clearing of debris from streams and other water holding areas, conservation of ponds and lakes etc.

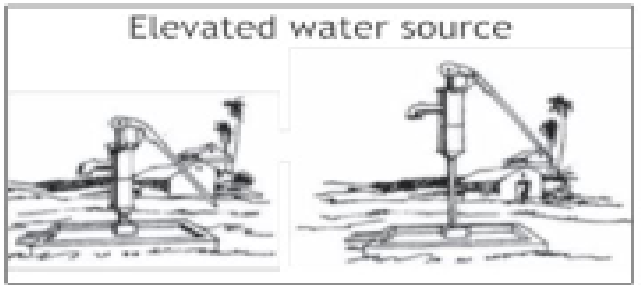
- **Flood Diversion** would *include* levees, embankments, dams and channel improvement. Dams can store water and can release water at a manageable rate.
- **Flood Proofing** reduces the risk of damage. Measures include use of sand bags to keep flood water away, blocking or sealing of doors and windows of houses etc. Houses may be elevated by building on raised land. Buildings should be constructed away from water bodies.

About 60 percent of the area in India is vulnerable to earthquakes. Most of the injuries and deaths in the wake of an earthquake are caused due to falling objects in the houses. Hence, the focus of **earthquake mitigation measures** in a village scenario should be on nonstructural/non technical measures along with few structural measures. Some of the measures are:

- Detailed survey of buildings for assessment of damage and repair/ reconstruction and seismic strengthening or demolition
- Ensuring that the new buildings which are being constructed are earthquake resistant.
- Training the local masons for constructing earthquake resistant structures.
- Preparation of disaster related literature in local languages with dos and don'ts for construction.
- Conducting mock drills in villages for evacuation during an earthquake.
- Inculcate basic know-how amongst school kids on earthquake dos and don'ts along with safety drills.
- Fix all objects that can fall and cause injury or block exits during an earthquake in every household. Glass can also be fixed with a film similar to what is used in cars for sun control on large glass pieces if breakage poses a serious threat.

**Cyclones are generally** a violent storm, often of vast extent, characterized by high winds rotating about a calm center of low atmospheric pressure. Some of the cyclone specific mitigation measures include:

- Local masons can be trained in building cyclone resistant structures.
- Good construction practices like building houses on stilts or on earth mound can be practiced by the villagers.
- Tubewells may have to be elevated above the normal flood level to prevent contamination from seawater.




Improvement of vegetation will increase water infiltration capacity of the soil. The roots of the plants and trees will keep the soil intact and prevent erosion and slow runoff to prevent or lessen flooding which may result form cyclone.

- The communities can undertake coastal shelterbelt plantations like mangroves which will break severe wind speeds and minimize devastating effects of cyclone.
- Construction of multipurpose cyclone shelters can be done in the vulnerable villages. During normal time these buildings can be used as schools or as community centers. In case of cyclones or floods, community can take shelter in these designed buildings. The local community will be responsible for the maintenance and management of these community shelters.
- Other activities that can be taken up as part of the community based mitigation program include construction of saline embankments for protection against sea water ingress, reforestation and conservation of green belt areas.

A drought is defined as an extended period of abnormally dry weather that causes water shortages and crop damage. A drought starts when total rainfall is well below average for several months and is insufficient to meet the demands of human, plant and animal activities.

The drought mitigation measures would include:

- **Drought monitoring** is continuous observation of rainfall situation, water availability in reservoirs, lakes, rivers and comparing with the existing water needs of various sectors of the society. Close monitoring of the emerging drought scenario would help to develop an advance warning system.
- **Water supply augmentation and conservation** through rainwater harvesting in houses and farmers' fields would increase the content of water available. *Water harvesting* by either allowing the runoff water

from all the fields to a common point (e.g. Farm ponds) or allowing it to infiltrate into the soil where it has fallen (*in situ*) (e.g. contour bunds, contour cultivation, raised bed planting etc) would help to increase water availability for sustained agricultural production.

- Expansion of **irrigation** facilities reduces the drought vulnerability. **Land use** based on its capability helps in optimum use of land and water and can avoid the undue demand created due to their misuse.
- The community can plan for livelihood by identifying those livelihoods which are least affected by the drought. The livelihood would include off-farm employment opportunities, collection of non-timber forest produce from the community forests, raising goats, and carpentry etc.
- Generating awareness amongst the village populace on implementing water conservation awareness programs through mass media like television, publishing, distributing pamphlets on water conservation techniques and agricultural drought management strategies like crop contingency plans and rainwater harvesting etc
- Building check dams or diversion weirs across rivers raises the water level of the rivers so that it begins to flow into channels. They are also used to impound water and form a large reservoir of water which would be useful to the community in drought hit times.

Training & Capacity Building of the community can be a general mitigation measure for all kinds of hazards. It is one of the most crucial aspect of a Community based Preparedness program; the better training imparted, more successful is the program. While sensitization of the entire community is needed, specialized and focused training is required for members of the Village Disaster Management Committee and the various Disaster Management teams.

## Topic 4

***Skill Training***

**Duration: 60 minutes**

**Training Methodology: Discussion, Interaction & Demonstration**

**Trainer's Note:** The trainer can lay the foundation of this session by informing the participants that apart from providing knowledge for preparing a plan, certain practical inputs are also needed to implement the plan on the field. This session aims at imparting skills so that the participants are well equipped to respond to the disaster effectively. If required, the trainer can invite local resource persons to impart skill training to the village members For e.g. Doctor

in the village or surrounding area can be invited to demonstrate the skill of providing first aid to those injured in disasters. These skills can also be implemented at the family level.

Also, to build necessary skills of the DMTs', additional following skills are requires. These require training on: a) how to write minutes of any meeting, b) how to follow up the minutes of previous meetings, c) basic accounting and logistic skills, and d) development of leadership qualities and facilitating community to reach on consensus etc. Some of examples of skill training are elaborate below.

### Technique for the Preparation of Water Purifying Packets

In areas highly affected by floods, there is often no alternative except to use the floodwater itself or water contaminated by floodwaters. Floodwaters often contain suspended foreign discrete/colloid matter which cannot be removed by using bleaching powder or liquid chlorine alone. Efforts must be made to collect clean water that is free from suspended foreign matter (sieves may be used) and then disinfect it by using a suitable disinfectant. In this regard the water purifying powder, usually a mix of bleaching powder and a coagulating agent, appears quite handy. This powder helps, when properly mixed with floodwater in a bucket, coagulation of the suspended material to form it heavy floc, which settles on standing in quiescent condition for some time. The chlorine of the powder meanwhile reacts with the pathogens in the water and disinfects the water. The settled sludge on the bottom of the bucket can be discarded by taking off the supernatant water from the bucket and can safely be used for drinking purpose. This is easy to make, carry, and apply, and is cheap and therefore a very popular tool for the public health engineers and voluntary organizations in an emergency situation.

**The Procedure:** *The procedure for preparation of the Purifier Powder is rather simple. The powder is made from ingredients like alum (fitkiree), bleaching powder and lime (chuna); all such ingredients are available in local markets. The following steps should be followed:*

***1st Step*** (For one hundred packets): Weigh 3 kg of alum, 1.5 kg of lime, and 200 gms of bleaching powder (ensure that it must have 33% strength). Keep three packets/pots separately. The alum should be as dry as possible. Try to use best quality lime. The container for bleaching powder should be resistant to sunlight.

***2nd Step*** Grind alum into powder, spread it on a dry sheet of plastic and dry well. Keep ground dry alum in a plastic container. The lumps of lime should be

ground well into fine powder and stored in a separate dry container. Keep the container air-tight to avoid the risk of melting.

***3rd Step*** Mix required quantities of lime and bleaching powder intimately; keep the mixture in a plastic bucket. Do not mix with alum at this stage.

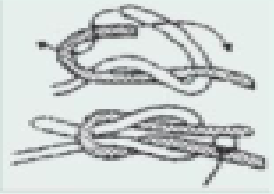
***4th Step*** Prepare 200 plastic sachets with size 5" X 4". In absence of properly sized sachets, take 100 polythene packets that are generally used for germination of pot plants. Write down the mixing instructions on a page (must be legible), make 100 photocopies. The following *instructions* should be written:

- Take one bucket/pitcher full of water (10-12 lit).
- Take ½ teaspoonful of powder from bigger packet (i.e. alum) and pour into the bucket/pitcher (*kolosh*).
- Take ½ teaspoonful of white powder from smaller packet (mixture of lime and bleaching powder), pour into the pitcher, and mix intimately with the water of the bucket/pitcher. Stir the water vigorously for ½ minute and allow it to settle. (Visible flocs will form and settle at the bottom in about 45 minutes to one hour).
- Put a four-folded piece of cotton cloth on the mouth of a second (cleaned) pitcher. Decant the supernatant slowly through the cloth-filter into the second pitcher. Water in the second pitcher should be free from contaminants. Keep the pitcher covered all the time. This water is to be used for drinking purpose only. Please note that the water will smell of chlorine.
- One sachet/packet should weigh about 47 gms, which can treat about 180 to 200 liters of turbid floodwaters depending on turbidity, alkalinity etc. of untreated water. The water purifier packets should be used as quickly as possible. However, it can safely be used within a period of 2/3 months without much reduction of potency. The packets may be stocked in strategic places such as in camps/floodshelters in flood prone areas. Once prepared, packets may be distributed among community people. One family of 6 persons will require one packet per week. For easier distribution schedule, there should be one designated day per week in the locality. The DMT hould maintain a roster for smooth distribution of water purifying packets, and also a register for all inputs and outputs concerning production, storage and distribution of these packets
- In every household, special care must be taken to keep water purifying chemicals out of reach of children. If, by accident, swallowed, immediately the child concerned should needs to taken to the nearest hospital

### Preparation of life Jackets with 1.5 liters plastic bottles

Collect eight 1.5 liters cold drinks bottles with caps. The bottles need to be uncracked and unbroken. Collect required amount of fiber rope (200grams), polythene, cork and strings of thread.

Examine the bottles carefully before starting the preparation. Then block the mouths of the bottles with the cork you have collected. Place the soft polythene around the opening and use the caps. Wrap the soft polythene around the caps in double fold and tie it around the bottle necks using reef knot. Leaving one inch, cut the extra polythene. After sealing every bottle like this, use coconut skin rope in double fold to tie a simple knot. After tying together all the eight bottles like this, the swimmer can tie the belt with bottles facing downward around his waist and easily swim ahead.

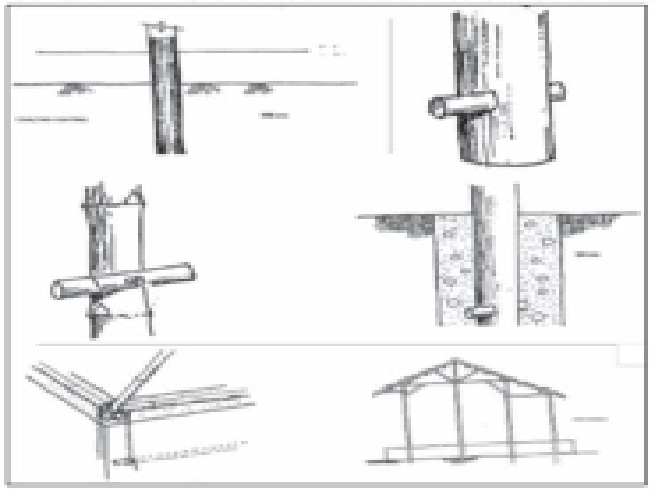


**Reef Knot**

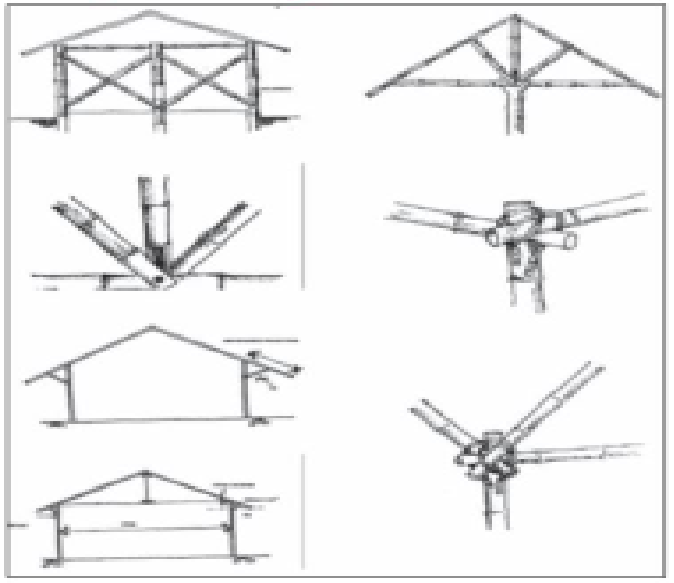
**Plastic bottles being used as life jackets**

*(Source: Community Based Disaster Management: Search and Rescue (2008), Orissa Disaster Mitigation Programme, German Red Cross and KFW, Indian Red Cross Society).*

### Sketches of ways of reinforcing walls and roofs of thatched houses



**Sketches of ways of reinforcing walls and roofs of thatched houses**



*(Source: OSDMA & United Nations, Community Contingency Plan for Floods & Cyclones, Orissa)*

A calendar of various kinds of skill training (on the lines of examples quoted above) can be developed by the community. This calendar can be a part of the mitigation and preparedness plan of the village disaster management plan. The trainer can list out various kinds of skill training that needs to be imparted to the community by discussing it with the community members depending upon the hazard vulnerability of the village.

## Topic 5

***Mock Drills***

**Duration: 30 minutes**

**Training Methodology: Discussion, Interaction and Demonstration**

**Trainer's Note:** The trainer can ask the participants to evacuate as it is predicted that there is going to be an earthquake in about two minutes in the building. The trainer can note down the time taken by the participants to evacuate and note certain issues faced during this drill. After the participants reach outside, the trainer can call them inside the training hall and ask them how they felt during the evacuation.

Mock drill is essential to prepare local communities to respond effectively during an emergency. Carrying out mock drills is necessary for the following reasons:

- It is key instrument for testing the workability of any emergency response plan.
- It will ensure a better and coordinated response during a disaster by making everyone aware of their role and responsibilities.
- Mock drill also helps in preparing responding agencies to determine the kind and number of resources required and also helps them to carry out a capacity/resource assessment.

Organizing a mock drill requires detailed planning about the event and role of each stakeholder participating. After a drill is conducted, it is imperative to carry out a 'debriefing' after the mock drill. While organizing a mock drill, some times we loose momentum and jump the steps originally planned. Some actors "overact" while encroaching upon the role of others. That is the reason it is imperative to have a 'debriefing' after the mock drill to asses:

(i) Which parts went as planned,

(ii) Which parts went wrong and

(ii) What modifications are required?

Such documentation would help us in fine-tuning future mock drills. An independent observer can also be deputed to help in identifying gaps in the drill. The community can thus learn from the gaps and try to fill it through better preparedness. Hence, it is necessary to create an environment which looks like a real disaster and not just a drama/ rehearsal.

It is generally felt that the essence of mock drill would be diluted, if prior intimation is given to the vulnerable community. However, an uninformed drill might bring unforeseen consequences. In such situations, it is suggested that the drill might be conducted in a phased manner. The phases can include:

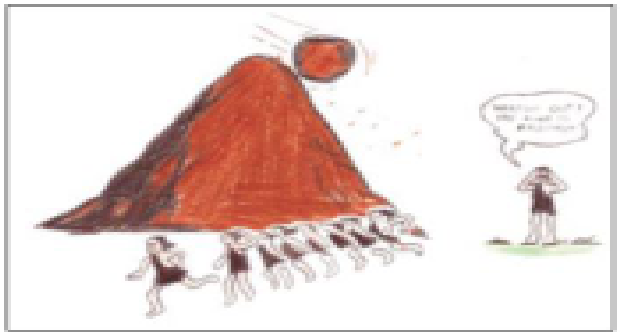
1. Orientation-cum-coordination workshop of various stakeholders
2. Presentation of plans by the key stakeholders,
3. Actual mobilization of resources

Different kinds of drills are required for different emergencies. Some of the things that need to be remembered are:

**Before the Drill**

- Conducting different drills for different emergencies based on the vulnerability so the community can find out gaps in their preparation and response and take the necessary steps

- Making available "do's and don'ts" lists for various emergencies to stakeholders before planning a drill
- Involving the community and using local resources and knowledge, so they are able to relate to the drill process
- Keeping the key personnel in the village informed of any planned drill
- Preparing a detailed event chart with time and activities (i.e. information of the event, warning dissemination, place of occurrence, effect/impact of disaster, de-warning and de-briefing)
- Preparing a safety plan before the drill (Route Chart, First Aid box at the site, proper search and rescue equipment/information for any emergency contract number, police, fire, health system, revenue control room, and the skilled manpower immediately available in case of a real emergency)
- Ensuring "manageable" community participation, to prevent a real time disaster.



**During the Drill**

- Bringing in the media as part of the mock drill team to disseminate messages on the purpose of the drill
- Monitoring response time, to enable the community to learn how to minimize loss
- Ensuring proper coordination among various stakeholders during the drill
- Having a skilled safety team on standby for any emergency support
- Ensuring proper security arrangements are in place at the mock drill location

Finally, the village disaster management plan can plan for about four mock drills in a year and use the following matrix to prepare a calendar for conducting the drills.

| | | |
|---|---|---|
| Date of First Mock Drill | Gaps Identified | What needs to be in the second Mock Drill |
| Date of Second Mock Drill | Gaps Identified | What needs to be in the third Mock Drill |
| Date of Third Mock Drill | Gaps Identified | What needs to be in the fourth Mock Drill |
| Date of Fourth Mock Drill | Gaps Identified | |

**Resources:**

1. Community Based Disaster Management: Search and Rescue (2008), Orissa Disaster Mitigation Programme, German Red Cross and KFW, Indian Red Cross Society.
2. California Tsunami Hazard Mitigation and Preparedness Program Guidance for Local Jurisdictions to Develop or Review Tsunami Evacuation: Plans for a Post-Earthquake, Local- Tsunami, Available at http://nthmp.tsunami.gov/doc uments/StateofCaliforniaGuide linesforTsunamiEvacuationPlan_final.pdf
3. Hazard, Disasters and your Community: A Primer for Parliamentarians, *Version 1.0*, Government of India, Ministry of Home Affairs, National Disaster Management Division
4. Manual for Community-Based Flood Management, Bangladesh, Asia Pacific J. Env. Dev., 11(1&2), 2004, pp. 41-98)
5. Solution Exchange for the Disaster Management Community, 3 April 2008, Query: Conducting Successful Mock Drills - Experiences, Compiled by G Padmanabhan, and Nupur Arora.
6. West Bengal Voluntary Health Association (2003), Guide Book: Disaster preparedness and Response, Kolkatta.

# Part (D)

# FINANCIAL MECHANISM

**Learning Objectives**

At the end of the session, you should be able to:

- Explain the need for a financial mechanism for village disaster management plan,
- Illustrate the concept of community contingency fund and community disaster resilience fund, and;
- Provide an overview of various developmental schemes that can be linked with disaster mitigation and preparedness at the village level.

**Materials Needed:**

Flip Charts, Markers, Laptop, LCD/Projector, charts and Blackboard.

**Key Concepts**

The key concepts would include the following components:

Topic 1 : Community Contingency Fund

Topic 2 : Community Disaster Resilience Fund

Topic 3 : Development Schemes and Disaster Mitigation

## Topic 1

***Community Contingency Fund***

**Duration: 40 minutes**

**Training Methodology: Brainstorming**

**Trainer's Note**: The trainer can asking the participants to brainstorm on the various sources of funding for carrying out the various activities of village disaster management plan. The trainer can then list out all the possible sources of funding on a flip chart. He can start his topic by highlighting the need for arranging finances to carry pout the plan. He can then lead the discussion to creation of a community contingency fund.

In order to sustain community level disaster reduction activities, the development of a continuous source of funds is very important. This will enable the families and community groups to implement disaster risk reduction and preparedness activities, which were identified in the village disaster management plan. The

local authorities can also help the most vulnerable community to establish a fund through providing seed money The development of this fund would also allow the local community to use this seed money to mobilize further funds from other agencies.

The rationale behind constituting a community contingency fund is :

- To sustain existing community based disaster reduction activities
- To strengthen the resilience of most vulnerable social groups
- To develop an ownership of disaster reduction activities
- To organize immediate relief and rescue activities so that lives and property can be protected without waiting for external aid.

To meet this contingency, each household in the village can be motivated to contribute resources which could be in the form of funds and/or food grains, which becomes the grain bank for the village. For e.g each household in a village saves a handful of rice every week to be used in the time of disasters. If there is no calamity, the collected rice is sold and the money credited to an Emergency Fund or as revolving fund by the women thrift group. A very nominal amount based on the affording capacity of the inhabitants (households) can also be collected and kept as the Community Contingency Fund or village emergency fund. In the annual meeting the village members or the Disaster Management Committee can decide how to use this fund or material as per the need and developmental plan of the village. The community members should be able to borrow micro-credits from this fund in order to undertake disaster reduction measures; e.g. raising the foundation of the house, retrofitting of the house or school, purchase of drought resistant seeds and plants etc.

In *Rajas*, a village in the Khurda district, each family contributes a sum of Rs.100/- for the village can purchase relief stocks of grains, fuel, disinfectants, and basic medicines in advance, during the cyclone/flood season.

*Source: Oxfam GB (2000), Village Contingency Plan for Cyclones, Bookline Publications, Hyderabad.*

## Topic 2

***Community Disaster Resilience Fund***

**Duration: 40 minutes**

**Training Methodology: Discussion and Interaction**

**Trainer's Note:** The trainer can connect the above topic with the present topic by informing them about certain initiatives that have been undertaken at the

national level regarding the funding mechanism for village level disaster risk reduction activities.

Piloted at the end of 2008, the Community Disaster Resilience Fund (CDRF) is a national initiative which is demonstrating the effectiveness of channeling funds directly to communities to address their own resilience by building priorities through community and primarily women-led initiatives. Eight committed organizations operating in 88 villages of 11 multihazard prone districts of eight Indian states are facilitating the local implementation of the fund by partnering with and transferring funds to community based groups which have mapped the vulnerabilities and capacities of their communities, created local institutions to manage community funds and link with government, and are currently planning and implementing resilience building initiatives.


The CDRF has been conceived as a fund to channel resources directly to at-risk communities, particularly grassroots women, to support them in initiating and scaling up effective grassroots DRR practices and in developing the necessary relationships with local and national authorities to effectively address community disaster risk. The Fund is also expected to demonstrate to national governments and donors the benefits of enabling community groups to plan, design, implement and appraise resilience building initiatives. The year 2008-2009 marked the first year for the implementation of the CDRF. The Fund is being implemented by National Alliance for Disaster Risk Reduction (NADRR) with the support of GROOTS International and ProVention Consortium and the partnership of the National Disaster Management Authority (NDMA), India. Swayam Shikshan Prayog (SSP) and Knowledge Links are the implementing organizations on behalf of NADRR, and are therefore responsible for overall facilitation and monitoring of the fund as well as knowledge management and advocacy throughout the process engagement with disaster prone communities who are using the funds to strengthen their resilience to disasters

## Topic 3

***Development Schemes and Disaster Mitigation***

**Duration: 90 minutes**

**Training Methodology: Discussion and Interaction**

**Training Note:** The trainer can initiate the session by asking the participants to discuss the different schemes and programmes run by government on rural development. Trainer may then start discussing the following developmental projects one by one with the participants based on their awareness level and experience with these schemes.

### 1) National Rural Employment Guarantee Act' 2005 (NREGA)

The programme was launched in 2005 and the Act guarantees 100 days of employment in a financial year to every household providing social safety for vulnerable groups and the opportunity to combine growth with equity. The assets so created will result in sustained employment for the area for future growth employment and self-sufficiency. NREGA was operationalised from 2nd February, 2006 in 200 selected districts across the country and was then extended to 130 more districts in 2007-08. The remaining districts (around 275) of the country under the ambit of NREGA were covered from 1st of April, 2008

### 2) Sampoorna Grameen Rozgar Youjana (SGRY)

The Programme was launched in 2001 with the objective of providing additional wage employment ensuring food security while creating durable community, social & economic infrastructure and assets in the rural areas. SGRY along with National Food for Work Programme (NFFWP) have been subsumed in the NREGA districts

### 3) National Food for Work Program (NFWP)

This was started in November 2004 to provide additional resources apart from the resources available under the SGRY to 150 most backward districts of the country for generation of supplementary wage employment and provision of food security.

### 4) Swarnjayanti Gram Swarozgar Yojana (SGSY)

This programme was launched in April 1999 and is valid upto July 2011 aimed for developing self employment programme for the rural poor. This programme is implemented by the District Rural Development Agencies (DRDAs) with the

active participation of PRI's, Banks, the line Departments, and NGO's. The programme aims at establishing a large number of Micro-enterprises in the rural areas and is a credit cum subsidy programme. It organizes poor into self-help groups for providing training, credit technology, infrastructure and marketing. SGSY is a centrally sponsored scheme and funding shared by the Central and State Government in the ratio of 75:25.

**5) Pradhan Mantri Gram Sadak Yojana (PMGSY)**

The programme was launched in December 2000 and is a 100% centrally sponsored scheme to provide connectivity to unconnected habitations by providing road connectivity to all habitations with a population of thousand (500 in case of hilly or tribal areas) with all weather roads by 2009. This Will lead to rural employment opportunities, better access to regulated and fair market, better access to health, education and other public services.

**6) Indira Awas Yojana (IAY)**

Started since May 1985 to assistance to rural people under BPL for the construction of dwelling units and upgradation of existing unserviceable kutcha houses. Indira Awas Yojana is a centrally sponsored scheme funded on cost sharing basis between the Government of India and the State Govt. in the ratio of 75:25. 60 lakh houses are to be constructed in a period of 4 year from 2005-06 and against this overall target, 15.52 lakh were built in 2005-06 and 14.98 lakh homes in 2006-07

**6) Jawahar Gram Samridhi Yojana (J.G.S.Y.):**

Jawahar Gram Samridhi Yojana( JGSY) is the restructured streamlined and comprehensive version of Jawahar Rojagar Yojana, designed to improve the quality of life of the poor, JGSY was launched in April,1999 with the primary objective to create demand driven community village infrastructure including durable assets at the village level and assets to enable the rural poor to increase the opportunity for sustained employment. The secondary objective is the generation of supplementary employment for the unemployed poor in the rural areas. The wage employment under the programme shall be given to Below Poverty line ( B.P.L.) families. ***JGSY is being implemented entirely at the village Panchayat level***. Village Panchayat is the sole authority for preparation of the Annual Action Plan and its implementation. The programme will be implemented entirely as a centrally sponsored scheme on cost sharing basis between the Centre and the State Government in the ratio of 75:25.

### 7) National Social Assistance Programme (NSAP)

This programme was initiated in 1995 to provide public assistance to its citizens in case of unemployment, old age, sickness and disablement within the limit of the economic capacity of the State

### 8) Accelerated Rural Water Supply Programme (ARWSP)

Central government supplements States' effort for providing safe drinking water and sanitation by providing financial and technical assistance under two centrally sponsored programmes namely **"Accelerated Rural Water Supply Programme" and "Central Rural Sanitation Programme (CRSP)".**

ARWSP was launched in 1972 to cover all rural habitations with 100 and above, ensure sustainability of the systems and sources of drinking water and its quality. CRSP was launched in 1986 with the aim at improving the quality of life of the rural poor and to provide privacy and dignity to women in rural areas. By 2009, 55,067 uncovered, 3.31 lakh slipped back and 2.17 lakh quality affected habitations are to be addressed and also, approximately 6 lakhs habitations where water supply is a problem will be covered.

### 9) 'Total Sanitation Campaign' (TSC)

The programme was started in 1999, under restructured CRSP to promote sanitation in rural areas and it follows participatory demand-responsive approach, educating the rural households about the benefits of proper sanitation and hygiene.

**10) Employement Assurance Scheme (E.A.S.):** The Employment Assurance Scheme (E.A.S.) was launched in October 1993 and aimed at providing wage employment in unskilled manual works to the rural poor. The secondary objective is to create economic infrastructure and community assets for sustained employment and development. ***The scheme is the single wage employment programme implemented at the district/block level through out the country.*** A maximum of two adults per family are provided 100 days employment on an assured basis, who need and seek wage employment during the lean agriculture season. The resources under the scheme would be shared between the Centre and the State in the ratio of 75:25 respectively.

**11) Rural Connectivity Programme ( R.C.P):** The scheme is implemented since 1996-97. RCP funds received for connectivity under 10th Finance Commission Award (T.F.C.) will be utilized for construction of all weather roads as per action plan approved by the Zilla Parishad.

13) **Drought Prone Area Programme (D.P.A.P.):** The Drought Prone Area Programme(DPAP) was started in 1973 with the aim to mitigate the adverse effect of drought on the production of crops and livestock ,productivity of land, water and human resources. There is a specific arrangement for maintenance of assets and social audit by Panchayati Raj institutions. Allocation is to be shared equally by the Centre and State Government on 50:50 basis and Watershed Committees is to contribute for maintenance of the assets created.

Village community including self help groups undertake area development by planning and implementation of projects on watershed basis through Watershed Associations and Watershed Committees constituted from among themselves. The Government supplements their work by creating social awareness imparting trainings and providing technical support through the Project Implementation Agencies.

14) **Desert Development Program (DDP) was initiated in** 1977 to mitigate adverse effects of desertification.

15) **Integrated Wastelands Development Program (IWDP)** was sanctioned in 1989 to the areas not covered under DPAP or DDP.

16) **Hariyali was started** in April 2003 to empower Panchayati Raj Institutions both financially and administratively in implementation of Watershed Development Program.

17) **Swajaldhara** was initiated in December 2002 so as to formulate, implement, operate and maintain drinking water projects by the village community.

**Note*** INTEGRATED RURAL DEVELOPMENT PROGRAMME (IRDP), TRAINING OF RURAL YOUTH FOR SELF EMPLOYMENT (TRYSEM), DEVELOPMENT OF WOMEN AND CHILDREN IN RURAL AREAS (DWCRA), SUPPLY OF IMPROVED TOOL-KITS TO RURAL ARTISANS (SITRA), GANGA KALYANA YOJANA (G.K.Y.) AND MILLION WELLS SCHEME (M.W.S.) PROJECTS HAVE BEEN MERGED UNDER THE SWARNJAYANTI GRAM SWAROZGAR YOJANA (SGSY) PROGRAMME.

### *Suggested Integration Measures*

**Training Note:** Trainer can initiate the session by discussing on the need to promote peoples' participation for development by building awareness on critical developmental issues and integrating disaster mitigation and preparedness measures.

The 9th Five Year Plan (1997-2002) had emphasized on district level planning and to initiate Rural Development Programmes, use of individual, social, local

and indigenous knowledge, facilitate community development and formulate sustainable developmental plans. It also encouraged the formulation of Self Help Groups (SHG). Now, during the current 11th Five Year Plan (2007-2012), major thrust is laid on developing the untreated areas and conservation measures. Some measures are suggested below and the group can discuss other similar integration measures.

- Reviving ancient water systems, with low chemical-input agriculture, which can be a mix of traditional knowledge and "newer" methods can be linked with preparedness measures for hydro-metrology related hazard management and will help poor farmers devise an effective strategy to cope with the changing monsoons.
- Some amount received from government schemes can be kept drought/ flood/cyclone-relief, soil and water-conservation, inter-cropping patterns and alternative livelihood programmes.
- The introduction of community schools and extended classrooms in villages must be increased and these can be utilized to educate and sensitize the community on various disaster risk reduction measures.
- Non-formal literacy programmes are actively attended by women and this can enable them to gain a better understanding of health and hygiene and other important family and community concerns.
- Broadening of rural credit programmes to ensure women's access and encourage formulation of Self Help Groups to take up livelihood programmes.
- Government Sanitation projects must have community involvement, train some community members to do maintenance and repair. In such programmes, disaster shelter and relief management initiatives associated with health and sanitation can be co-coordinated.

**Resources:**

1. Shesh Kanta Kafle and Zubair Murshed (2006) Community-Based Disaster Risk Management For Local Authorities :Participants Workbook, Asian Disaster Preparedness Centre, Bangkok, Thailand
2. Proceedings of Community Disaster Community Resilience Fund (CDRF) :Indian Grassroots Women Build Disaster Resilience through Community Led Planning, Mapping, Institution Building and Risk Reduction Initiatives, June 3-5, 2009,CYSD Hall, Bhubaneswar, Orissa
3. Oxfam GB (2000), Village Contingency Plan for Cyclones, Bookline Publications, Hyderabad.

# Part (E)

# CONTACT DETAILS AND UPDATION MECHANISM

## Learning Objectives

At the end of the session, you should be able to:

- List out the important personnel whose contact details have to be attached with the village disaster management plan, and;
- Illustrate the mechanism for Updation of village disaster management plan.

**Materials Needed:**

Flip Charts, Markers, Laptop, LCD/Projector, charts and Blackboard.

## Key Concepts

The key concepts would include the following components:

Topic 1: Contact details

Topic 2: Updation Mechanism

## Topic 1

***Contact Details***

Duration: 40 minutes

Training Methodology: Interaction & Free Listing

Trainer's Note: The trainer asks the participants to list out the important personnel who need to be contacted immediately after a disaster for rendering their services. The trainer can chalk out a list of such persons by discussing it with the participants.

The village disaster management plan should end with the contact details of the personnel who may be skilled to save the lives of people who are hit by disasters. At the same time, the community may also need to contact people in the local administration so that they can respond to the disaster as soon as possible. It would be helpful to identify a nodal person in the neighboring village and add his contact detail as well. The list may contain the names of such people, their designation/position along with their residence, official and mobile phone number. The list may include the following people:

1. District Collector
2. Sub Divisional Magistrate
3. Nodal Officer in the Department of Health, Forest, Fire, Revenue/Disaster Management etc
4. Block Developmental Officer/Mandal Parishad Development Officer
5. Tehsildaar
6. Panchayat President
7. Village Head if any
8. Ambulance Service
9. Boat owners in the village
10. Bus owners
11. Tractor owners
12. Truck owners
13. Fair Price Shop owner
14. Doctor
15. Health worker
16. Engineer
17. Anganwadi worker
18. Carpenter
19. Swimmer
20. Nodal person from neighboring village
21. Other important item owners like crane, bulldozer gas cutter, tree cutter, RCC cutter,crowbars,axe,generators,tarapaulin etc

The contact details of the above mentioned personnel will help to locate the resources as soon a possible in the aftermath of disaster.

## Topic 2

***Updation Mechanism***

**Duration: 20 minutes**

**Training Methodology: Discussion**

**Trainer's Note:** The trainer can initiate the topic by asking the participants "Whose responsibility is it to update the plan? What is the tenure after which the plan has to be updated?"

Once a village disaster management plan is prepared by a village, it has to be written down and members of the disaster management teams have to be responsible to spread the information to the community about decisions that have been taken.

**Any Disaster Management Plan should be**

| | | |
|---|---|---|
| • Written | *Otherwise* | It will not be REMEMBERED |
| • Simple | *Otherwise* | It will not be UNDERSTOOD |
| • Disseminated | *Otherwise* | It will not REACH THE NEEDFUL |
| • Tested | Otherwise | It will not be PRACTICAL |
| • Revised | Otherwise | It will not be UP TO DATE |

**Resources:**

1. Delhi Disaster Management Authority, Community Disaster Management Plan, Government of NCT of Delhi.
2. Oxfam GB (2000), Village Contingency Plan for Cyclones, Bookline Publications, Hyderabad.

# Part (F)
# FAMILY DISASTER MANAGEMENT PLAN

## Learning Objectives

At the end of the session, you should be able to:

- Discuss the important components of family disaster management plan, and;
- List out the material required for preparing family disaster supplies kit.

## Key Concepts

The key concepts would include the following components:

Topic 1: Family Disaster Preparedness Plan

Topic 2: Family Disaster Supplies Kit

## Topic 1

***Family Disaster Preparedness Plan***

**Duration: 90 minutes**

**Training Methodology: Discussion and Interaction**

**Trainer's Note:** The trainer can ask the participants what will happen if there is an earthquake in the afternoon in the village. Where will their family members be? Where would the children be? How would they feel?

The trainer can connect the above questions by accentuating the need for preparing a family disaster preparedness plan. Each household in the village should prepare a family disaster preparedness plan.

For making a family disaster preparedness plan, you have conduct a hazard, vulnerability and capacity analysis of your home. You can carry out the following steps:

- Look at each room in your home with "Disaster Eyes" from the level of the shortest member of your family.
- Take some time and sit in each room and think "if a major disaster hit right now, what would injure us". Then fix the hazard.
- To prevent injury and reduce damage, each room of your home should be carefully examined.
- This will be the starting point in the preparing your home disaster preparedness plan.

You can take a walk through some rooms of the house and ponder over the following points :

1. **Living rooms:** Ask them what hazards one normally finds in living rooms. (Tell them how dangerous TVs can be for little children).
2. **Bedrooms:** We spend a lot of time in bedrooms, but this would be the place we will be caught in when there is a night time earthquake. So take special care for things that can fall on us and those that can block our exit.
3. **Kitchens:** Kitchens are among the most hazardous rooms in the house - they contain a lot of glass, fire, cooking gas, etc. One needs to ensure safety here. Install mechanical latches on cupboards. Tie gas cylinders so that they don't fall down and start a gas leak. Make it a habit to turn off the gas cylinder at night.

Family preparedness planning should involve all members of the family sitting together and discussing the scenario of a disaster. If a damaging earthquake happens during the daytime, family members will be in different parts of the city. It is important that each person in the family discuss and decide on their roles and responsibilities in getting the family back together after such an event. Family disaster preparedness planning would involve the following steps:

- Take a few minutes with your family to discuss a home evacuation plan. Sketch a floor plan; walk through each room and discuss evacuation.
- Plan a second way to exit from each room or area, if possible.
- Prepare the Family Emergency Kit to sustain your family for 72 hours. Refurbish every 3 to 4 months.
- Make sure your neighbours do so too! (or else be prepared to share your kit with them)
- Know where your emergency kits are located.
- Mark where the "Main" switches or valves are located so that they can be turned off to prevent sparks that could cause an explosion if there is a gas leak, water to prevent flooding from broken pipes, gas (if you have piped in gas) to prevent fires and explosions.
- Indicate the location of your family's emergency outdoor meeting place.
  - Where and how
  - Plan responsibilities
  - External contact point

Get trained in First Aid as basic first aid is important because you can help yourselves and your neighbours if anyone has minor injuries. You can help ease the pressure on the hospitals and doctors by treating minor injuries yourself

- Do a preparedness drill (everyone!) and everyone should participate in preparedness drills, especially the very old, children, women and challenged populace. These people will be the most vulnerable during and after a disaster.

The community is better prepared to deal with any disaster when every household in the community has a preparedness plan in place.

## Topic 2

***Family Disaster Supplies Kit***

**Duration: 40 minutes**

**Training Methodology: Discussion and Free Listing**

**Trainer's Note:** The trainer can ask the participants:

- Can you imagine you or your family members queuing for relief?
- What is the earliest that you feel that relief will be distributed to everyone?

The most optimistic estimates are that it will take 72 hours. For your family to survive these 72 hours, it is important that you prepare a family emergency preparedness kit. A sample list of contents is given in the slide

- Non-perishable food to last 72 hours
- Water (10 lit/ day/person)
- First aid kit + prescription medicine+ sanitary items
- Torch +spare batteries
- Radio + batteries
- Emergency cash
- List of emergency telephones
- Copies of valuable documents

Items such medicines and batteries should be checked for expiry date and the stock should be updated from time to time.

**Resources:**

1. Delhi Disaster Management Authority (2009), Brochure developed on Family Disaster Supplies Kit, Government of NCT of Delhi, Delhi.
2. GeoHazards International (2008), Instructor Guide for Teacher Sensitization Sessions, Training material for School Earthquake safety.

# ANNEXURE

# Annexure 1

## Dos' and Don'ts of hazards

### 1. EARTHQUAKE

An earthquake is a series of underground shock waves and movements on the earth's surface caused by natural processes occurring within the earths crust.

**Before and earthquake**

- Develop a family emergency plan and practice it regularly
- Identify an out-of area phone contact person to call and check about you & family welfare.
- Choose a couple of family meeting places; pick easy to identify, open and accessible places that you can easily reach.
- Prepare to be self-sufficient for a minimum of three days.
- Assemble an emergency supply kit; include food, water, prescription medications and first aid supplies, a battery operated radio, flashlight, extra batteries, shelter, clothing, sturdy shoes, and personal toiletries.
- Take an approved first aid course.
- Make your house earthquake resistant and secure heavy furniture and objects.

**During and Earthquake**

- Remain calm! The shaking usually lasts no more than a minute.

If inside,

- Stay inside. "DROP, COVER, and HOLD!" Drop under sturdy furniture. Cover as much of your head and upper body as you can. Hold onto the furniture, if you cannot get under sturdy furniture, move to an inside wall or archway and sit with your back to the wall, bring your knees to your chest and cover your head.
- Stay away from mirrors and windows.
- Do not exit the building during the shaking.

If outdoors,

- Move to an open area away from all structures, especially building, bridges, and overhead power lines.

**After an earthquake**

- STAY CALM! Count to 60 to allow time for objects to fall before moving.

- Move cautiously, and check for unstable objects and other hazards above and around you.
- Check yourself for injuries.
- Help those around you and provide first aid, if you are qualified.
- Inspect gas, water and electric lines. If there are leaks or if there is any doubt about leaks, shut off mains; evacuate immediately
- Anticipate aftershocks, especially if the shaking lasted longer than two minutes.
- Stay out of damaged buildings.
- Listen to the radio or watch local TV for emergency information and additional safety instructions.

**Rules to remember in an earthquake**

1. Protect Yourself and your Family.
2. Turn off gas, electric heaters, etc. the moment you feel the earthquake, and in case a fire breaks out, put it out quickly.
3. Avoid rushing out of your house during the earthquake.
4. Open the door to secure an exit.
5. When outside protect your head and keep away from dangerous objects.
6. Evacuate on foot rather than by any vehicle, and carry only what you need.
7. Avoid being misled by false rumors and try to obtain and act on correct information.

## 2. FLOODS

Flood is a temporary inundation of large regions as the result of an increase in reservoir, or of river flooding its banks because of heavy rains, high winds, cyclones, storm surge along coast, tsunami, melting snow or dam burst.

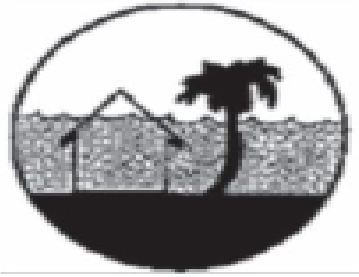
### Before Flooding Occurs

- All your family members should know the safe route to nearest shelter/ raised pucca house.
- If your area is flood-prone, consider alternative building materials. Mud walls are more likely to be damaged during floods.
- Have an emergency kit on hand.

### When you hear a flood warning or if flooding appears likely

- Tune to your local radio/TV for warnings and advice.

- Don't give any importance to rumors and don't panic.
- Keep dry food, drinking water and clothes ready.



**During Floods**

- Drink boiled water.
- Keep your food covered, don't take heavy meals.
- Drink, rice-water, tender coconut-water, etc.
- Do not let children remain on empty stomach.
- Use bleaching powder and time to disinfect the surrounding.
- Be careful of snakes as snake bites are common during floods.

**If you need to evacuate**

- Firstly pack warm clothing, essential medication, valuables, personal papers, etc. in waterproof bags, to be taken with your emergency kit.
- Inform the local volunteers (if available), the **address** of the place you are evacuating to.
- Raise furniture, clothing and valuables onto beds, tables and in attic (electrical items highest).
- Turn off the main power supply.
- Whether you leave or stay, put sandbags in the toilet bowl and over all laundry / bathroom drain-holes to prevent sewage back-flow.
- Lock your home and take recommended / known evacuation routes for your area.
- Do not get into water of unknown depth and current.

**If you stay or on your return**

- Stay tuned to local radio for updated advice.
- Do not allow children to play in, or near flood waters.

- Avoid entering floodwaters. If you must, wear proper protection for your feet and check depth and current with a stick.
- Stay away from drains and culverts.
- Do not use electrical appliances, which have been in floodwater until checked for safety.
- Do not eat food, which has been in floodwaters.
- Drink boiled water.
- Check the safety of your neighbours and help each other. Pay special to women, infants, elderly people & people with disabilities.

## 3. TSUNAMI

Tsunamis, also known as seismic sea waves (also called "tidal waves"), are a series of enormous waves created by an underwater disturbance such as an Earthquake. A tsunami can move hundreds of miles per hour in the open ocean and smash into land with waves as high as 100 feet or more, although most waves are less than 18 feet high.

### What to do before tsunami

a. Find out if your home is in a danger area

b. Know the height of your street above sea level and the distance from the coast. Evacuation orders may be based on these numbers

c. Tsunamis can be caused by an underground disturbance such as earthquakes, landslide or volcanic eruption; people living along the coast should consider an earthquake or a sizable ground rumbling as a warning signal. A noticeable rapid rise or fall in coastal waters is also a sign that a tsunami is approaching.

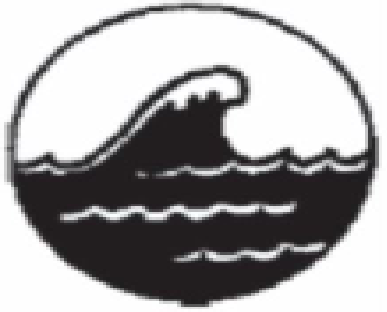
d. If you are feel the danger of tsunami ,tray and climb a raised platform or climb the highest floor of nay house or building which you might see.

e. Make evacuation plans. Pick an inland location that is elevated. After an earthquake or any other natural disaster, roads in and out of the vicinity may be blocked, so plan more than one evacuation route.

### During tsunami

- Stay away from the beach..
- Never go down to the beach to watch a tsunami come in. If you can see the wave you are too close to escape it.
- Listen to a radio or television to get the latest information and be ready to evacuate if asked to do so.
- If you hear an official warning, evacuate at once.

- Return home only after authorities advise it is safe to do so.
- A tsunami is a series of waves. Do not assume that one wave means that the danger is over. Subsequent wave may be larger than the first one. Stay out of the area.



### After a tsunami

- Stay tuned to battery- operated radio for the latest emergency information.
- Help injured and trapped persons.
- Stay away from flooded and damaged areas until officials say it is safe to return.
- Enter your home with caution.
- Use flashlight when entering damaged houses. Check for electrical short circuit and live wires.
- Check food supplies and test drinking water.

## 4. CYCLONE

Cyclone is a violent srorm, often of vast extent, characterized by high winds rotating about a calm center of low atmospheric pressure.This center moves onward, often with a velocity of 50 kilometer or above an hour.

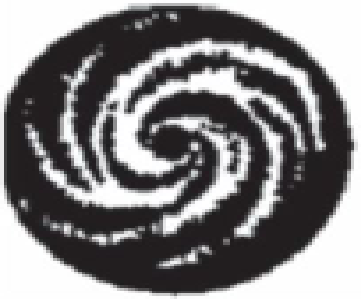
### Before a Cyclone

- Listen to radio or TV weather reports and in case of a cyclone warning ensure that everybody is alerted. This is usually done through a loud speaker or by going home to home
- Identify safe shelters in your area. These should be cyclone resistant pucca houses. Also find the closest route to reach them.
- Keep your emergency kit ready

- Doors, windows, the roof and walls should be strengthened before the cyclone season through retrofitting and repairing.
- Store adequate food grains and water in safe places.
- Conduct Mock Drills for yourself and the community that a warning has been given

### Upon a cyclone Warning

- Listen to your local radio, TV or community warning system for further information
- Close all widows and doors of the home.
- Stay indoors
- Get the emergency kit ready and incase of warning of a severe cyclone, move with your family to a strong pucca house.
- Do not venture into the sea.



### When a Cyclone strikes

- Stay Indoors. Stand below the strongest part of the house if you have not moved to the cyclone shelter
- Protect yourself with blankets, and anchor yourself to a strong fixture or get under a strong table.
- Remain indoors until advised that the cyclone has passed away

### After the Cyclone

- Do not go out till officially advised that it is safe. If evacuated, wait till advised to go back.
- Use the recommended route to return to your home. Do not rush.
- Check for gas leaks before using the stove.
- Dry electrical appliances before use

- Be careful of fallen power lines, damaged roads and houses, fallen trees
- Rescue the victims and help in the relief work.

## 5. FIRE ACCIDENTS

The do's and don'ts that need to be observed for fire breakouts are as follows:

**Do's**

- Incase of Fire, dial 101
- Remain calm, unplug all electrical appliances
- Alert all others around you.
- Learn atleast two escape routes in your office, apartments.
- Buy Fireworks from a licensed shop and keep them in closed box.
- Store crackers away from source of fire or inflammation.
- Light crackers at arms length and stand back while lighting.
- Discard used fireworks in a bucket of water
- Keep buckets of water and blankets ready, incase a firebreaks out.
- Wear thick cotton clothes for maximum safety from fire.
- If clothes catch fire, Stop, Drop and Roll
- Install smoke alarms so as to get warnings.
- Ensure planned escape routes are free from obstructions.
- Try and make way to the window, if the room becomes smoky, crawl along floor.
- Incase of uncontrolled fire, wrap the victim in a blanket, till the fire ceases.
- Incase of burns, splash tap water (not ice water).The process may me repeated till the burning sensation reduces.
- If fingers or toes are burned, separate them with dry, sterile, non-adhesive dressings.
- Make sure the burn victim is breathing, if breathing has stopped or if the victim's airway is blocked then open the airway and if necessary begin rescue breathing.
- Cover the area of the burn with a moist sterile bandage, of clean cloth (do not use blanket or towel for healing burns).

- Consult the local doctor as soon as possible for the proper medication.

**Don'ts**

- Don't burn crackers in crowded, congested places, narrow lanes or inside the house.
- Don't let children burst crackers unaccompanied by an adult.
- Don't put fireworks in your pocket or throw them.
- Don't cover crackers with tin containers or glass bottles for extra sound effect.
- Don't dare to examine unburst crackers...leave them.
- Don't light crackers on own hands.
- Don't use fireworks inside a vehicle
- Avoid long loose clothes, as they are fast in catching fire
- Don't remove burnt clothing (unless it comes off easily), but do ensure that the victim is not still in contact with smoldering materials.
- Don't apply adhesive dressing on the burnt area.
- Don't break the burst blister.
- Don't dispose off lighted cigarette ends carelessly.
- Don't pug too many electrical appliances in one socket.
- Don't store L.P.gas against gas cylinders rules.
- Don't apply any paint on Fire detectors/sprinkler heads.
- Don't engage unqualified contractors for the servicing of fire fighting system.
- Don't relax after hearing fire/emergency call.

# Annexure 2

## Village Disaster Management Plan

(Community Contingency Plan – CCP)


| | Contents | Pages |
|---|---|---|
| 1. | Village Profile | 2-8 |
| 2. | Emergency Response Plan | 9-20 |
| 3. | DRR Plan | 21-26 |



Author:

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**Prepared By: ..... Community**

**Date :**

Passed in PalliSabha on -------

Passed on Gram Sabha on -------

Updated on--------

Passed in PalliSabha on -------

Passed on Gram Sabha on -------

Updated on--------

Passed in PalliSabha on -------

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Updated on--------

Passed in PalliSabha on -------

Passed on Gram Sabha on -------

## PREAMBLE

**Village Disaster Management Plan (VDMP) / Community Contingency Plan (CCP) is a document prepared by the community themselves for their own disaster management based on their own Hazard, Vulnerability, Risk, Resource & Capacity analysis, containing village profile supported by maps, emergency response & disaster risk reduction plans, listing out activities & pin pointing responsibility of the VDMC (Village Disaster Management Committee), SHG (Small Household Group), TF - Task Force Members & the community at normal times, before, during & after a disaster in order to save lives, livelihood & property & integrating it into the long term sustainable village developmental plan. All the activities in the emergency response plan are so well planned, practiced, rehearsed & synchronized that they take place simultaneously in clockwork precision with minimum loss of time & orders.**

1. At all times, to reduce the vulnerability & risk, the VDMC, SHG & TF members along with the community will regularly implement the Disaster Risk Reduction Plan as part of Development Plan_ & constantly train & empower themselves for better preparedness.
2. The VDMC, SHGs & TF members & community will constantly carry out reorientation training, mock drills & updating of the response plan so that they are fully empowered & geared up to meet any emergency situation as per their specified roles & responsibilities spelt out in the emergency response plan (Pre-During-Post stages) to save the lives, lively- hood & property with zero tolerance to loss of lives.

## VILLAGE PROFILE:

**Revenue details:**

- Name of the (Shelter) Village:
- Name of the periphery villages/ Hamlets:
- Name of the Nearest Primary School
- Name Of the Nearest Me School
- Name of the Nearest High School
- Name of the Gram Panchayat:
- Post office:
- R I Circle:
- Name of the Anm Center
- Name of the Asha
- Name of the Anganwadi Center:
- PHC/CHC
- LI Centre
- Fire Station:
- Police Station:
- Electric Sub Station
- Name of the Telephone Exchange
- Name of the Jao

- Name of the VLW/VAW/Executive Officer
- RWSS
- Block:
- Tahasil:
- Sub Division:
- District:
- State:

## Accessibility

Road condition-black top/concrete/graveled/mud hard top (all weather/fare weather & in case of fare weather NOT accessible from which month to which month), trucks & buses can ply from where to where, small four wheeler from where to where & not fit for vehicles from where to where. Each road be described in the above manner with distances & time taken in brackets. The alternate roads in case of the road mentioned is likely to be damaged/submerged may be mentioned under the same heads after describing each road. The aim is how best to reach the village under prevailing conditions in case of a disaster & the ultimate goal is to have all weather roads with heaviest vehicle plying. In the developmental plan (DRR plan) to accord priority for conversion of roads from one state to other as a continuous process depending on the priority of need & availability of funds.Accessibiliy to all the above mentioned places be mentioned.

| Sl No | From | To | Name/ description of road | Condition | Main/ Alternate | All Weather/ Fare Weather (Not accessible From -To-) | Vehicle capacity | Remarks |
|---|---|---|---|---|---|---|---|---|
| | | | | | | | | |

## Disaster History of The Village

A very brief Para mentioning the boundaries of the village/shelter community in the N,S,E &W sides & since when the village/villages is/are in existence if known. Location of the rivers & sea in relation to the village & their distances from the village as crow flies. The disaster history could be tabulated chronologically & disaster wise (Prioritizing based on devastating impact & recurrence) with year of occurrence with max possible information on loss of lives (both men & animals), livelihood & property as under;

| Sl No | Type of Hazard (in order of Priority) | Year of Occu rance | Name of Village | No of Lives Lost & Cause | No of Live tocks Lost & Cause | No of Houses Fully Damaged & Cause | Type of Crop & Approx Acreage Lost | Area Fully Sub Merged With boundary | Area Fully Safe with Boundary | Approx time taken for people to Comeback home | Remarks |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | | | | | |

## Demographic Information

**Household details:**

| Sl No | Name of SHGs | NO. OF H/H | Population Adult/ Children (as per Relief Code age) | | | | | Above 60 yrs. | Leader | Deputy Leader | Task Force Members Name With group |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | ADULT | | CHILDREN | | TOTAL | | | | |
| | | | M | F | M | F | | | | | |
| | | | | | | | | | | | |
| | | | | | | | | | | | |

**Housing pattern:**

| SHG Name | Housing pattern (in bracket safe/ unsafe ) | | | | |
|---|---|---|---|---|---|
| | Thatched | Tile | Asbestos | RCC | Total |
| | | | | | |
| | | | | | |
| Total | | | | | |

**Primary Occupation:**

| SHG Name | Occupation pattern (affected how many HH) | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| | CulTIVATION | Fishing | DAILY LABOUR | R uRAL Artisans | Traditional occpn\ | Petty Business | Service | Any other | Total |
| Sub-Total | | | | | | | | | |

BPL /APL List (Through PRA a SHG wise list of BPL families to be prepared listing the poorest on top & a copy of each to be kept with SHG & VDMC & updated with VDMP / CCP)

| HMG | Economic Status | | |
|---|---|---|---|
| | APL | BPL | Total |
| | | | |
| Total | | | |

**Cultivation profile:** (during flood/cyclone what crop/acreage affected

| Sl. | Season | | | | Area coverage (in Acre) |
|---|---|---|---|---|---|
| | KHARIF | | RABI | | |
| 1 | Type of Cro | Month | Type of Crop | Month | |
| 2 | | | | | |

Migration pattern

| HMG | HH No. | No. of Persons migrating | No of persons being left behind. Name of Head for contact | Where they go (Contact Head& Address& Tel. no) | Purpose | Time Duration |
|---|---|---|---|---|---|---|
| 1 | | | | | | |

Livestock (H/H segregation in annex)

| HMG | Bullocks | Cows | Buffaloes | Sheep | Goat | Poultry |
|---|---|---|---|---|---|---|
| | | | | | | |
| Total | | | | | | |

**Community Resource List:**

| HMG | Resource particulars | Quantity | House No. |
|---|---|---|---|
| | | | |
| | | | |

1. List of Shelter Equipments at Village / shelter:

| Sl | Category | Name of the Item | Quantity |
|---|---|---|---|
| 1 | Search & Rescue | | |
| 2 | First Aid | | |
| 3 | Early Warning | | |
| 4 | General | | |

2. Telephone\ cell phone Number (Govt., PRI & Local in that order)

| Sl | Name of the person/ DESIGNATION | Location (Place or Pada or Sahi) | Phone No. |
|---|---|---|---|
| 1 | COLLECTOR | | |
| 2 | D.E.O | | |
| | | | |

Human Resource

| Sl. | Category | Names | Contact Number | Name of HMGs |
|---|---|---|---|---|
| 1 | Doctor | X | 1 | |
| 2 | PHARMACIST /Nurse/RMP | | | |
| 3 | TBA | | | |
| 4 | ANM | | | |
| | ASHA | | | |
| | AWW | | | |
| | Vetenary surgeon/LI | | | |
| 5 | Carpenter | | | |
| 6 | Mason | | | |
| 7 | Mechanic Telephone/TV/ Radio/electronic/vehicle | | | |
| 8 | Electrician | | | |
| 9 | Boat driver | | | |
| 10 | Swimmer | | | |
| 11 | Retired Army/police/Fire service person | | | |

Vulnerability Details

| Sl No | HMG | Name | Type of Disability | House No |
|---|---|---|---|---|
| | | | | |

Institutions inside the SHELTER / Village community

VDMC

| Sl. | Name | Designation | Specialisation if any | Ph. No. | HMG |
|---|---|---|---|---|---|
| 1 | | | | | |
| 2 | | | | | |

SHGs

| Sl. | Name of the Members | Sub-group | Sex | Age | Tele No. | HMG |
|---|---|---|---|---|---|---|
| 1 | | Early warning | | | | |
| 2 | | | | | | |

TASK FORCE

| Sl. | Name of the SHG | Total HHs | House No. | | Leader | Dy. Leader | Sub Group |
|---|---|---|---|---|---|---|---|
| | | | From | To | | | |
| | | | | | | | |

VDMP /C.C.P VOLUNTEERs

| Sl. | Name | Designation | Specialisation if any | Ph. No. | HMG |
|---|---|---|---|---|---|
| 1 | | | | | |
| 2 | | | | | |

Youth Club profile:

| Sl | Name of Youth Club | Total Members | President | Secretary | Treasurer | Activities/ specialisation |
|---|---|---|---|---|---|---|
| 1 | | | | | | |
| 2 | | | | | | |

SHG profile

| Sl | Name of SHG | Total Members | President | Secretary | Treasurer | Activity/ specialisation |
|---|---|---|---|---|---|---|
| 1 | | | | | | |
| 2 | | | | | | |

PRI member's profile

| SHG | Sl. | Designation | Name of the person | Contact Phone |
|---|---|---|---|---|
| | | | | |
| | | | | |
| | | | | |

Infrastructure\ public utilities (For shelter purpose)

| Sl | Name of the Infrastructure | Village | Capacity | Key holder |
|---|---|---|---|---|
| 1 | Cyclone shelter | | | |
| 2 | School | | | |
| 3 | Hospital | | | |
| 4 | RCC Building (Individual with house) numb | | | Head of the house |
| | a. | | | |
| 5 | ANM Center / Anganwadi center. | | | |
| | Others if any | | | |

Drinking Water source and functionality

| SHG | Tube-well no. | Functional (current/ disaster) | Other source of drinking water | location |
|---|---|---|---|---|
| | | | | |
| | | | | |

Market/ shop (grocery/kerosene/medicine/PDS/dry food/rice mill)

| Village | Type of shop | Name of the owner | Location | Contact Phone |
|---|---|---|---|---|
| | | | | |

Burial ground:

- Location of the Burial ground. (High or Low lying location, Direction, Distance from Shelter)
- Animal carcass disposal area

**Annexures:**

- Social Map
- Hazard & Vulnerability Map
- Resource Map
- Seasonality Map
- Networking Map
- List of the households (shelter community)

*Emergency Response Plan (pre, during & after with roles & responsibilities pin pointed for each member)*

1. Communication & Warning Dissemination Plan (inside village (SHGs), out in field, rivers/creeks, Sea, market place etc, mode of communication, responsibility by name & equipment). The early warning team will take all the required initiatives to disseminate the message.

| Period | Activity | Name of Leader & Members | SHG | Equipment & Stores | Remarks |
|---|---|---|---|---|---|
| Before (on receipt of warning) | 1.Confirm warning from district control room/block control room/GP office & inform Secretary, President, Vice President & TF Leaders.VDMC approves & orders for issue of warning<br>2.First Warning for all to return to their homes & individual & house hold preparedness commence<br>HWGs<br>Fields<br>River/Sea<br>Market place<br>Any other place<br>3. Second Warning for VDMC meeting. House hold preparedness to continue<br>4.Third Warning for move to shelter & safe places to commence<br>5.Fourth Warning for all to be indoors except VDMC members. Head count & registration by all SHG leaders supported by TF members & feed back to VDMC.<br>6.Fifth warning for all move to stop & all to be indoors including VDMC members | WDO&EO | | | |
| During | 1.Constant communication through shelter mobile phone with Dist Control Room, IMD, warning dissemination center, Red Cross control Room, Block control Room & GP office & feed back on the state of emergency to EC members of VDMC | | | | |
| After | 1.Confirm de-warning from Dist Control Room/ block control room/GP office & inform Secretary, President, Vice President & TF Leader.<br>2.VDMC members to move out first for a quick assessment of the situation out side & then order for community to return home | | | | |

2. Individual & House Hold Preparedness Plan. (Time plan applicable to all)

| Period | Activity | Supervision/Assistance | Remarks |
|---|---|---|---|
| After First Warning & till Third Warning | 1.Precious house hold documents, valuables, cash in safe container with lock & key<br>2.Food items for all types of people for 03 days<br>3.Drinking water for all for 03 days<br>4.Medicine as required<br>5.Clothing & under garments for three days<br>6.Utencils as required<br>7.Radio, torch, sticks, lantems, match boxes, mosquito nets<br>5.Strengthening the roof & structure of house<br>6.Packing & safe keeping of all house hold goods (in case the house is likely to be submerged packing for moving to safe place) | SHG Leader/Dy. Leader/ TF members | |

3. Co-ordination(role distribution plan at VDMC & TF Meeting).On issue of second warning all SDMC members move to the shelter & carry out role & responsibility co-ordination for all activities.

| Period | Activity | VDMC/TF &Support teams | Responsibility (For all the VDMC & TF members by designation for all activities | Remarks |
|---|---|---|---|---|
| Before | Early Warning | President<br>Vice President<br>Secretary<br>Asst<br>Treasurer<br>WDBEO/<br>Asst<br>TF Leader/Dy Leader<br>SHG Leader/Dy Leader | After discussion with EC members on confirmation of EW (eEarly Warning) from Govt. sources by WD & EO give instructions for issue of First Warning.<br>Give permission for issue of all the warnings on consultation by secy & WD & EO<br>Assist President in all activities & in absence of President take all decisions.<br>Convene the meeting of EC members for confirmation of Early Warning & then on second warning facilitate the coordination meeting.Monitor all the preparedness,evacuation activities & keep EC members informed<br>In consultation with president, vice president & secretary allot fund as per SDMC approval for all emergency purchases & coordinate purchases. | |

| Period | Activity | VDMC/TF &Support teams | Responsibility (For all the VDMC & TF members by designation for all activities | Remarks |
|---|---|---|---|---|
| | | | Keep abreast with al warnings,confirm from Govt source & inform EC members. Cardinate move of al warning teams,issue of all warnings.<br>Check back roles & responsibilities by name,issue equipmetas required,monitor move & activities.<br>Timely issue of all warnings to all SHG members.Monitor & supervise the house hold preparedness.<br>Monitor & execute house hold & individual evacuation plan.Coordinate the activities of the TF members of the SHG | |
| During | | President<br>Vice President<br>Secretary<br>Asst<br>Treasurer<br>WD&EO/<br>Asst<br>TF Leader/<br>Dy Leader<br>SHG Leader/<br>Dy Leader | | |
| After | | President<br>Vice President<br>Secretary<br>Asst<br>Treasurer<br>WD&EO/<br>Asst<br>TF Leader/<br>Dy Leader<br>SHG Leader<br>/Dy Leader | | |

4. Village / Shelter Management Plan (Cleanliness, Food, Water, medicines, lighting, cooking, resting, storing, consoling, FA)

| Period | Leader & Team | Responsibility | Equipment/ Stores | Remarks |
|---|---|---|---|---|
| Before | Warning Dissemination (WD) & Equipment Operator (EO) 02 Members from each SHG by name-Cleaning, water, rations, cooking, purchases. | Clean the roof &entire shelter<br>Clean the over head water tanks<br>Store clean drinking water in all the three water tanks. | Motor,pipe, cleaning material, buckets, updated SHG wise population list, cooking utencils, | |
| | Asst WD&EO, Dy leader TF & 01 member from each SHG by name-Equipment all types-repair,maint,purchases, | Stock all dry food as per the VDMC guide lines<br>Earmark space for SHGs,house hold emergency items,cooking,TF & SDMC members.<br>Clean the area earmarked for animals & post one member per HHG for guidance & help<br><br>Check all the First aid Kits for all the medicines & stores for over due-dates<br>In case of some urgent purchases of medicines take sanction from EC & buy<br>Check all the Equipments for functionality,Carry out minor repairs if required after approval of EC/VDMC<br>Purchase spare battery for all torches & patrol & kerosene oil for generator & candles,match boxes | | |

| Period | Leader & Team | Responsibility | Equipment/ Stores | Remarks |
|---|---|---|---|---|
| During | Warning Dissemination (WD) & Equipment Operator (EO) 02 Members from each SHG by name-Cleaning, water, rations, cooking, purchases.<br><br>Asst WD&EO, Dy leader TF & 01 member from each SHG by name-Equipment all types-repair,maint,purchases | | | |
| After | Warning Dissemination (WD) & Equipment Operator (EO) 02 Members from each SHG by name-Cleaning, water, rations, cooking.<br><br>Asst WD&EO, Dy leader TF & 01 member from each HWG by name-Equipment all types repair,maint,purchases | | | |

5. **Evacuation Plan**

- Vulnerable House Holds-Over all in charge by name

| Period | House No | SHG | Support Vehicle & owner's name | Place to be shifted to | Remarks |
|---|---|---|---|---|---|
| | | | | | |

- Vulnerable People- Over all in charge by name

| Period | House No | SHG | Name | Type of disability | Responsibility for shifting | Remarks |
|---|---|---|---|---|---|---|
| | | | | | | |

6. Animal Evacuation Plan- Over all in charge by name

| Period | Identified location | Capacity | Animals from which SHGs | Support Team | Water & Fodder arrangement | Remarks |
|---|---|---|---|---|---|---|
| | | | | | | |

7. Search & Rescue Plan

| Period | Sub Team No Leader & Members by Name | Task | Equipment | Communication | Remarks |
|---|---|---|---|---|---|
| Before | ONE-Leader, 04 members (01&04) | Evacuation form damaged houses, fallen trees etc | Cutting & Rubble clearance equipment<br>Torch-02<br>Water bottles with water-05 ltr.s<br>First Aid box-01<br>Rain Coat | Mobile Phone set(borrowed/ purchased from Community funds | |
| | TWO-Leader & 06 members (01&04) | Evacuation from water, high rise buildings | Ropes, Rope ladders, Life buoys, Life jackets<br>Water bottle-05 ltrs water<br>First Aid box<br>Torch<br>Rain Coats | Mobile Phone set(borrowed/ purchased from Community funds | |
| During | ONE-Leader, 04 members (01&04) | Evacuation form damaged houses, fallen trees etc | Cutting & Rubble clearance equipment<br>Torch-02<br>Water bottles with water-05 ltr.s<br>First Aid box-01 | Mobile Phone set(borrowed/ purchased from Community funds | |
| | TWO-Leader & 06 members (01&04) | Evacuation from water, high rise buildings | Rain Coat<br>Ropes, Rope ladders, Life buoys, Life jackets<br>Water bottle-05 ltrs water<br>First Aid box<br>Torch<br>Rain Coats | Mobile Phone set(borrowed/ purchased from Community funds | |

| Period | Sub Team No<br>Leader & Members by Name | Task | Equipment | Communication | Remarks |
|---|---|---|---|---|---|
| After | ONE-Leader, 04 members (01&04)<br><br>TWO-Leader & 06 members (01&04) | Evacuation form damaged houses,fallen trees etc<br><br>Evacuation from water, high rise buildings | Cutting & Rubble clearance equipment<br>Torch-02<br>Water bottles with water-05 ltr.s<br>First Aid box-01<br>Rain Coat<br>Ropes, Rope ladders, Life buoys, Life jackets<br>Water bottle-05 ltrs water<br>First Aid box<br>Torch<br>Rain Coats | Mobile Phone set(borrowed/ purchased from Community funds<br><br>Mobile Phone set(borrowed/ purchased from Community funds | |

8. First Aid Plan:

| Period | Teams | Task | Equipment | Remarks |
|---|---|---|---|---|
| Before | Two TF Members per SHG by name | First Aid cover during preparation & Evacuation | One First Aid Kit each | |
| During | 1.One Team of four members by name<br><br>2.One Team of four members by name<br><br>Icase safe shelters are planned in individual/ public safe buildings then at least one TF (FA) member by name should be at each location. | For First Aid in the shelter<br><br>For emergency First Aid support when required. Otherwise support in the shelter<br>For First Aid support | Four first aid boxes<br><br>Two First aid boxes | |
| After | Two TF Members per SHG by name | First Aid cover during Rehabilitation & cleaning up | One First aid kit each | |

9. Village Patrol/Security Plan:

| Period | Team | Task | Equipment | Remarks |
|---|---|---|---|---|
| Before | A Team of )$ with a leader by name for An average of four HMGs | Go round the SHGs & Inform house holds for proper securing of all doors & widows from inside & lock at the entrance door Check the above & ensure after evacuation | Rain coats/ Umbrellas, Water bottles, Torches, sticks, spare locks& keys& chains | |
| During | Do | When ever possible go around the area of responsibility & check for safety of each HH | Do | |
| | | | | |

10. Head Count & registration Plan

| Period | Team | Task | Stores | Remarks |
|---|---|---|---|---|
| Before | HWG leader/ Dy leader With two members all by name | After FOURTH warning check From each HH leader as per the list all members safely in In case of individual/public safe building occupied check the same | House hold wise detailed list of members Torch Pen/Pencil Stick | |
| During | do | Consolidate head count & report to Executive Committee-VDMC | Do | |
| After | do | Assist in compilation & verification of list of killed /wounded | do | |

11. Situation Assessment Plan:

| Period | Team | Task | Stores | Remarks |
|---|---|---|---|---|
| Before | All EC members of VDMC | 1.Consolidate the H/H head count for all types of shelter & check for all accounted for after fourth warning. 2. Consolidate animal count from animal evacuation leaders 3.Consolidate house safety plan from the patrol teams | | |
| During | Do | Constantly check all the above aspects till de-warning | | |
| After | Do | 1.After de warning move out First & check the entire shelter villages & record damage to lives (both human & animals) houses& crop for corroboration with the detailed report of the damage assessment team | | |

12. Relief Distribution Plan:

| Period | Team | Task | Stores | Remarks |
|---|---|---|---|---|
| Before | One member from each HMG with a nominated leader all by name. | Verify &Update the H/H master list for total number of Adults children. In case possible carry out advance stocking of relief material in accordance with scales & master list. Store dry food in accordance with the VDMC policy (from Govt./Purchase from Community funds) | | |
| During | do | Supervise distribution of clean drinking water & dry food. In case possible organize cooking & distribution of hot food. Establish link by telephone with block officials for earliest provisioning of dry food & relief material as per the relief code scales. | | |
| After | do | Ensure that all the house holds receive dry food/relief material/cattle fodder as per the master house hold lists in presence of the SHG leaders & obtain signature from the house hold heads & SHG leaders. Earliest possible carry out social audit through palli sabha of the distribution of all relief materials & have it documented. | | |

13. Community kitchen Plan

| Period | Team | Task | Stores | Remarks |
|---|---|---|---|---|
| Before | Relief distribution team as above | Organise collection/purchase of rations as per VDMC policy Collect/hire utensils in addition to the shelter equipment if required. Procure stove/gas as per VDMC policy Organise cooking ,distribution & cleaning | | |
| During | Do | Do | | |
| After | Do | Do | | |

14. Damage Assessment Plan

| Period | Team | Task | Stores | Remarks |
|---|---|---|---|---|
| Before | Leader & one member from each SHG all by name | Inspect& assess the existing condition of each house & note<br>Update & authenticate the HH record of adult & children status<br>Update & authenticate the Animal holding status of each HH<br>Update & authenticate the cultivated land acrage of each HH with the crop cultivated | House Profile H/H Population Profile HH Animal profile Cultivated land profile Stationary Camera | |

| Period | Team | Task | Stores | Remarks |
|---|---|---|---|---|
| During | Do | Continue & complete the above data base | Do | |
| After | Do | Carry out physical examination of all the above ,compare them with before status & note exact state of damage<br>Photograph exact state of damage.<br>Apraise the VDMC members at the earliest about the status of each type of damage<br>Earliest possible call for the Palli Sabha,record each & every damage with photograph & have the proceedings passed by Palli Sabha<br>Through VDMC officially hand over the orinal copy of the Palli Sabha with photographs to Panchayat office/Tahsil office/block office as per requirement & obtain receipt. Keep one set of documents with VDMC<br>Follow up till inspection by Govt. & correct amount of compensesation received by all | do | |

15. Water & Sanitation Plan

| Period | Team | Task | Stores | Remarks |
|---|---|---|---|---|
| Before | Leader<br>& one member from Each SHG by name | Ensure all drinking water facilities are functional. Carry out repairs where required. Maintain a status report of all drinking water sources SHG wise College/purchase drinking water purification stores & store them for use. Issue to shelter Management committee for the Over Head water tanks. | | |
| During | Do | Inspect & ensure clean drinking water at the shelters | | |
| After | Do | Disinfects, wells, tube wells & all drinking water sources.<br>Clean up village of all fallen trees/branches/all stagnant water bodies/all debris<br>Organise clean drinking water facility for all<br>In case required organize water takers/bottled water till drinking water supply is restored | | |

16. Carcass Disposal Plan.

| Period | Team | Task | Stores | Remarks |
|---|---|---|---|---|
| Before | One leader & one member from each HMG by name | Inspect the burial ground & animal carcass disposal ground<br>Identify fire wood & store. | Digging tools, cutting tools, gloves, face aprons | |
| During | Do | Collect information on deaths | Do | |
| After | Do. Additional man power if required from SDMC | Ensure that all formalities in accordance with relief code for compensaton are completed before burial/ cremation of body | do | |

17. Documentation (photography & approval of relief distribution & damage assessment resolution by Palli sabha & Gram Sabha)

| Period | Team | Task | Stores | Remarks |
|---|---|---|---|---|
| Before | VDMC with leaders<br>Of relief distribution<br>& damage Assessment groups | Updated & authenticated Data bank of status of Houses<br>House hold population,animal,<br>Crop wise acrage cultivated | | |
| During | Do | Keep a record of all types of damage /death reported<br>Record of all types of relief material received | | |
| After | Do | Inspect & accurately record all types damages/deaths compiled by the teams& check photographs<br>Check & verify all types of relief distributed from the beneficiaries<br>Prepare a resolution on the above aspects with photographs & accurate verified data.<br>Request for earliest Palli Sabha & Gram Sabha & have the resolution passed through social adit | | |

## DRR Plan

### (Disaster Risk Reduction Plan)

1. Communication & Connectivity Plan

| Sl No | Road from-to | Present condition of the road | Proposed status of up gradation/ Fresh construc-tion | Approx cost | Priority | Date passed in Palli Sabha | Date passed in Gram Sabha | Follow up action | Budget allocation with date and amount | Date of comple-tion | Remarks |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | | | | | |

2. Infrastructure, Housing & Planned integrated Village development Plan (Both Public & Private)

| Sl No | HMG | Private | Public | Approx cost | Priority | Date passed in Palli Sabha | Date Passed in Gram Sabha | Budget allocation with date and amount | Date of comple-tion | Remarks |
|---|---|---|---|---|---|---|---|---|---|---|
| | | | School | | | | | | | |
| | | | Anganwadi center | | | | | | | |
| | | | PHC | | | | | | | |
| | | | Embankment | | | | | | | |
| | | | Sluice Gate | | | | | | | |
| | | | | | | | | | | |
| | | | Drainage | | | | | | | |
| | | | Sewerage | | | | | | | |
| | | IAY House | | | | | | | | |
| | | Individual H/H latrine | | | | | | | | |

3. Drinking Water & Sanitation Plan

| Sl No | HMG | Type | Quan-tity | Cost | Priority | Approved in Palli Sabha | Approved in Gram Sabha | Budget alloca-tion with date and amount | Comple-tion | Remarks |
|---|---|---|---|---|---|---|---|---|---|---|
| | | Tube well | | | | | | | | |
| | | Pipe water supply | | | | | | | | |
| | | School Toilets | | | | | | | | |
| | | Anganwadi center toilet | | | | | | | | |
| | | House hold tiolets | | | | | | | | |
| | | | | | | | | | | |

4. Flood Protection/Drainage Plan.

| Sl. No. | Type | Location | Approx Cost | Priority | Passed Palli Sabha | Passed Gram Sabha | Budget allocation with date and amount | Comple-tion | Remarks |
|---|---|---|---|---|---|---|---|---|---|
| | River embankment | | | | | | | | |
| | Embankment strengthening | | | | | | | | |
| | Stone Packing & spurs | | | | | | | | |
| | Sluice gates | | | | | | | | |
| | Canals/drains | | | | | | | | |
| | Saline embankments | | | | | | | | |

5. Cropping Plan.

| Sl No | Season | Current cropping | Current damage pattern | Suggested alternate cropping | Govt. consul-tation | Final approval alterna-tive | Trial Plot Implem entation | Out come | Budget alloca-tion with date and amount | Remarks |
|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | | | | |
| | | | | | | | | | | |
| | | | | | | | | | | |
| | | | | | | | | | | |

6. Irrigation Plan

| Sl No | Type | Location | Approx cost | Priority | Passed Palli sabha | Passed Gram Sabha | Budget allocation with date and amount | completion | Remarks |
|---|---|---|---|---|---|---|---|---|---|
| | Bore Well | | | | | | | | |
| | Canal | | | | | | | | |
| | Aqua Duct/ drain | | | | | | | | |
| | Lift Irrigation | | | | | | | | |

7. Fishery/Poultry/diary/horticulture & additional sustainable income generation plan.

| Sl No | HMG | Type | No of H/H | Under any Govt Scheme | Detail pro posal | Cost | Govt assi stance | Indiv idual Contr ibution | Proce ssing In charge | Budget allocation with date and amount | Implem enta-tion | Remarks |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | Fishery | | | | | | | | | | |
| | | Poultry | | | | | | | | | | |
| | | Diary | | | | | | | | | | |
| | | Duckery | | | | | | | | | | |
| | | Horticulture | | | | | | | | | | |

8. Any Other Livelihood Sustainability Plan

| Sl No | HMG | Proposal | No of HH Covered | Under any Govt Scheme | Detail pro posal | Cost | Govt assi stance | Indiv idual Contr ibution | Proce ssing In charge | Budget allocation with date and amount | Implem entation | Remarks |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | | | | | | |
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| | | | | | | | | | | | | |

9. Anti Migration & NREGS Plan.

| Sl No | SHG | No of HH | No of Individuals | Proposed develop ment Work/ village asset | loca-tion | Priority | Cost | No of man days | Passed Palli Sabha | Passed Gram Sabha | Budget allocation with date and amount | No of days employ-ment received | Asset posse-ssion | remarks |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | | | | | | | | |

10. Energy Resource Use/ Conservation Plan.

| Sl. No | SHGs | Type of energy | Saving/use plan | Passed Palli Sabha | Implemen-tation | No of HH observed | No of HH penalty | Recurring savings | Remarks |
|---|---|---|---|---|---|---|---|---|---|
| | | Electricity | Voluntary Lights out days & timings | | | | | | |
| | | Solar | Use of water Heaters | | | | | | |
| | | | Use of solar cookers | | | | | | |

| Sl. No | SHGs | Type of energy | Saving/use plan | Passed Palli Sabha | Implementation | No of HH observed | No of HH penalty | Recurring savings | Remarks |
|---|---|---|---|---|---|---|---|---|---|
| | | Mechanical | No transport use day/ cycle use day | | | | | | |
| | | | School/ College children cycle use only | | | | | | |

11. Environment & Ecology Plan

| Sl No | Plan Proposal | Location | Annual Targets | Approx cost | Govt. support | Collective support | Budget allocation with date and amount | Annual achievement | Remarks |
|---|---|---|---|---|---|---|---|---|---|
| | H/H Plantation | | | | | | | | |
| | Community Plantation | | | | | | | | |
| | Carbon Trading Plan | | | | | | | | |
| | Individual H/H Water harvesting plan | | | | | | | | |
| | Community water harvesting plan/ structure | | | | | | | | |
| | Shelter belt plantation plan | | | | | | | | |
| | Mangrove regeneration plan | | | | | | | | |

12. Provision under Govt. schemes

| Sl No | SHG | Name of the scheme | No of H/H to be Covered | Name of the Agency submitted | Passed Palli Sabha | Passed Gram Sabha | Assistance received no of persons | Remarks |
|---|---|---|---|---|---|---|---|---|
| | | | | | | | | |
| | | | | | | | | |
| | | | | | | | | |
| | | | | | | | | |
| | | | | | | | | |

## Declration

We, the VDMC, Task Force, Volunteers and villagers of _____ hereby declare that, the Village Disaster Management Plan / Community Contingency Plan is prepared/ updated by us and finally accepted on dated .....for saving of the Lives & Property of the shelter community/communities. We will use the Emergency Response Plan and the DDRR (Development & Disaster Risk Reduction Plan) as per the responsibility assigned to us in this existing Village Disaster Management Plan / CCP. The information provided to this document is true & correct to the best of our knowledge and belief.

**SDMC Members Signature:**

| Sl. | Name of the Members | Designation | Signature/ LTI / RTI |
|---|---|---|---|
| 1. | | | |
| 2. | | | |
| 3. | | | |
| 4. | | | |
| 5. | | | |
| 6. | | | |
| 7. | | | |
| | | | |
| | | | |

**Task Force Membres Signature :**

| Sl. | Name of the Members | Designation | Signature/ LTI/ RTI |
|---|---|---|---|
| 1. | | | |
| 2. | | | |
| 3. | | | |
| 4. | | | |
| 5. | | | |
| 6. | | | |
| 7. | | | |

**Volunteers Signature :**

| Sl. | Name of the Volunteer | Name of the HMGs | Signature/ LTI/ RTI |
|---|---|---|---|
| 1. | | | |
| 2. | | | |
| 3. | | | |

HMG Members/ Community Members Signature :

| Sl. | Head of the Family | Name of the HMGs | Signature/ LTI / RTI |
|---|---|---|---|
| 1. | | | |
| 2. | | | |
| 3. | | | |
| 4. | | | |
| 5. | | | |
| 6. | | | |

Approval by Palli Sabha on

Signature of all Present

Approved by Gram Sabha on

Signature of all Present


**NATIONAL INSTITUTE OF DISASTER MANAGEMENT**
IIPA Campus, I.P. Estate, Mahatma Gandhi Road, New Delhi - 110002
Tel: 23702445, 23702432, 23705583; Fax: 23702446
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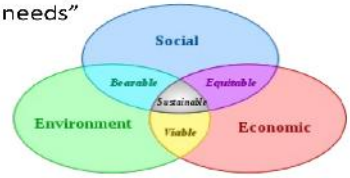
# Social issues and the environment

## Introduction

- We live in a Natural as well as social world
- Development cannot be of only the rich nor it means only high living standards.
- Also not just ECONOMIC development
- It has to be a holistic approach.
- Social aspects, development and environment have a strong relation.

## From Unsustainable to Sustainable

- G.H Bruntland, Director of World Health Organisation : "Meeting the needs of present without compromising the ability of future generations to meet their own needs"




## Key aspects of Sustainable development

- Inter- generational equity
  - Stop overuse
  - Reduce Impacts
  - Maintain ecological balance
  - Hand over a safe, healthy and resourceful environment to our future generations
- Intra-generational equity
  - Minimize gap between and within nations
  - Support economic growth of poorer countries
  - Provide technological help

## Measures for Sustainable development

- Using appropriate technology: concept of "Design with nature"
- 3-R approach: Minimization of resource use, use again and process to get new product from same material.
- Promoting environmental awareness and education
- Carrying capacity: Supporting and Assimilative

## Indian Scenario

- Tremendous Population
- Tremendous natural diversity
- Hence makes planning sustainably all the more important but complex.
- National Council of Environmental Planning and Coordination set up in 1972.
- Ministry of Environment and Forests set up in 1985.

## Social Issues

- Urban problems related to ENERGY
- WATER CONSERVATION
- Resettlement and Rehabilitation issues
- Environmental ethics
- Climate Change
- Global Warming
- Acid Rain and Ozone layer Depletion
- Nuclear Accidents and Holocaust
- Wasteland Reclamation
- Consumerism and waste products

## 1. Urban problems related to energy

- Cities are the main centers of Economic growth, trade, education, employment
- Now 50% population lives in Urban areas
- Urban sprawl
- Difficult to accommodate
- Uncontrollable and unplanned growth
- Densely populated, consume more resources, NEED MORE ENERGY

## Energy demanding activities

- Residential and Commercial lighting
- Private and Public transport
- Modern life style: electronic gadgets
- Industries
- Waste disposal
- Prevention and Control of pollution

## Effects

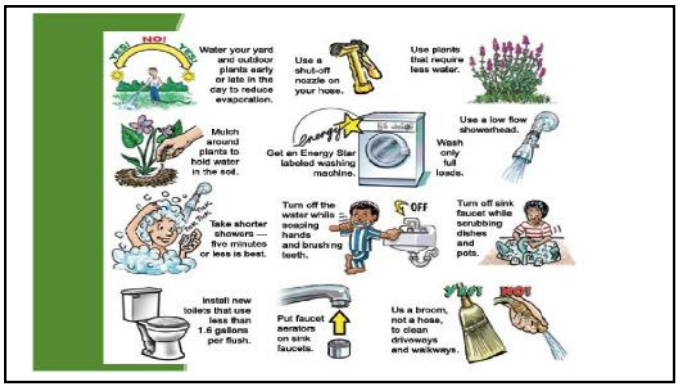
- Unequal distribution of energy
- Power cuts and load – shedding
- Demand energy from other states
- Overall society suffers
- Economic development hampered.

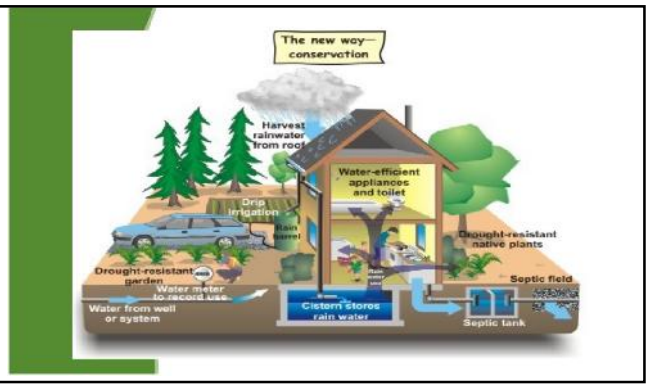

## Water Conservation

- Water is a vital resource.
- Majority of water resources are polluted heavily
- Its amount is limited for use
- So conservation is Extremely important
- **Water conservation** refers to reducing the usage of water and recycling of waste water for different purposes such as cleaning, manufacturing, and agricultural irrigation.

## Actions…

- Some researchers have suggested that water conservation efforts should be primarily directed at farmers, in light of the fact that crop irrigation accounts for 70% of the world's fresh water use.
- Drip irrigation instead of sprinkle irrigation.
- Common strategies include: public outreach campaigns, tiered water rates (charging progressively higher prices as water use increases), or restrictions on outdoor water use such as lawn watering and car washing.
- 100's of ways to conserve water



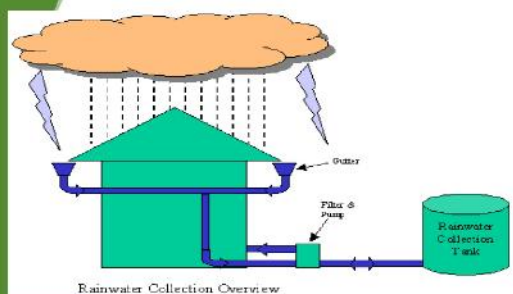

## Introduction

- In urban areas, the construction of houses, footpaths and roads has left little exposed earth for water to soak in.
- In parts of the rural areas of India, floodwater quickly flows to the rivers, which then dry up soon after the rains stop. If this water can be held back, it can seep into the ground and recharge the groundwater supply.
- This has become a very popular method of conserving water especially in the urban areas.
- Rainwater harvesting essentially means collecting rainwater on the roofs of building and storing it underground for later use. Not only does this recharging arrest groundwater depletion, it also raises the declining water table and can help augment water supply.

## Status

- Town planners and civic authority in many cities in India are making rainwater harvesting compulsory in all new structures.
- No water or sewage connection would be given if a new building did not have provisions for rainwater harvesting
- A number of government buildings have been asked to go in for water harvesting in Delhi and other cities of India.

## Process



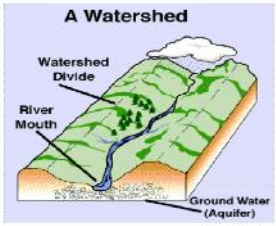

Rainwater Collection Overview

## Case study

- The area surrounding the River Ruparel in Rajasthan, is an example of proper water conservation. The site does not receive even half the rainfall received by Cherrapunji, but proper management and conservation have meant that more water is available than in Cherrapunji.
- The water level in the river began declining due to extensive deforestation and agricultural activities along the banks and, by the 1980s, a drought-like situation began to spread.
- Under the guidance of some NGOs (non-government organizations), the women living in the area were encouraged to take the initiative in building johads (round ponds) and dams to hold back rainwater.

- Gradually, water began coming back as proper methods of conserving and harvesting rainwater were followed.
- The revival of the river has transformed the ecology of the place and the lives of the people living along its banks. Their relationship with their natural environment has been strengthened.

## WATER SHED MANAGEMENT




## Concept of Watershed

- Watershed is a geo hydrological unit or piece of land that drain at a common point.
- A watershed is defined as any spatial area from which rain or irrigation water is collected and drained through a common point.
- The watershed and drainage basin are synonymous term indicating an area surrounded by a ridge line that is drained through a single outlet.

- A watershed is simply the land that water flows across or through on its way to a common stream, river, or lake.
- A watershed can be very large (e.g. draining thousands of square miles to a major river or lake or the ocean), or very small, such as a 20-acre watershed that drains to a pond.


## Objectives of watershed management

1. To control damaging runoff and degradation and thereby conservation of soil and water.
2. To manage and utilize the runoff water for useful purpose.
3. To protect, conserve and improve the land of watershed for more efficient and sustained production.
4. To protect and enhance the water resource originating in the watershed.
5. To check soil erosion and to reduce the effect of sediment yield on the watershed.
6. To rehabilitate the deteriorating lands.
7. To moderate the floods peaks at down stream areas.
8. To increase infiltration of rainwater.
9. To improve and increase the production of timbers, fodder and wild life resource.
10. To enhance the ground water recharge, wherever applicable.

## Watershed management practices

- Watershed management involves many techniques
- The techniques can be summarized as : Grassland development, Gully Plugs, Tree plantation and contour trenching on hill tops and slopes, Contour bunding, Water conservation structures, Lift irrigation schemes, Land leveling etc.
- Public participation and awareness

## The Sukhomajri - Water Shed Management Project : A Success Story of Participatory Approach

- Sukhomajri, a small hamlet of about one hundred families with average land holding of 0.57 ha, is located in the foothills of Shivaliks in Panchkula district of Haryana.
- It is at a distance of about thirty kilometers by road to the north-east of Chandigarh.
- Central Soil & Water Conservation Research and Training Institute, Chandigarh.

- Until 1975, Sukhomajra had no source of regular irrigation. The entire agricultural land (52 hectares) was under rain-fed single cropping.
- Small land holdings (less than one hectare per family) coupled with frequent crop failures due to erratic distribution of rainfall, made agriculture least dependable as a means of adequate livelihood.
- Consequently, the people of Sukhomajri were forced to keep a large number of sheep, goats and cows to eke out a living.
- But, once the domestic animals, especially the goats and cows, were allowed to graze freely in the nearby hills, followed by indiscriminate felling of trees for fuel and other domestic consumption, **the hill slopes, once covered with lush green vegetation, soon became bare and not even a blade of grass was to be seen.**

- In the year 1975, the continuing problem of silting of the prestigious man-made Sukhna Lake in Chandigarh drew the attention of the Central Soil and Water Conservation Research and Training Center, Chandigarh.
- A reconnaissance survey conducted by the Centre under the leadership of Shri P.R. Mishra, the then Officer-in-Charge, revealed that the major source of sediment was about twenty-six per cent of the catchment area located in the close proximity of Sukhomajri and a few nearby villages.
- Sedimentation was caused by the erosion of the bare hill slopes caused by over-grazing particularly by goats whose rearing had been the traditional occupation of the Gujjars inhabiting the village.

- To address the problem the Research Center applied soil conservation techniques developed by comprising of mechanical and vegetative measures.
- This reduced the runoff sediment from the highly eroded Shivaliks at a spectacular rate from eighty tonnes to less than one tonne per hectare, within a short span of a decade.
- The vegetative measures consisted of planting of tree species like khair *(Acacia catechu)* and shisham *(Dalbergia sissoo)*, in pits and bhabbar grass *(Eulaliopsis binata)* at mounds of trenches, and also Agave americana and Ipomea cornea, in critical areas to protect the soil against erosion.
- However, all these measures for containing the sediment in situ did not succeed in the absence of the willing cooperation from the people of Sukhomajri, who depended for their sustenance on the resources available in the catchment area.

- Hence, to promote agriculture and water availability in the area earthern dams were constructed. This resulted in rain water harvesting & storage which could be used by the villages for agriculture through out the year.
- Villagers agreed to protect the hilly watersheds from grazing and illicit cutting of vegetation and in turn, were allowed to cut grass to stall feed their cattle and collect dry and dead wood or pruned branches for their domestic fuel consumption.
- As a result, the forest areas which had a desolate look in the beginning of the project were covered with grass and trees within a period of 10 to 15 years. Grass production increased more than double in the same period (from 3.82 t/ha to 7.72 t/ha).

- At Sukhomajri, four earthen dams have been built between 1976 and 1985. These serve three main purposes;
- to check instantly the gully formation in agricultural fields and, thereby, effectively prevent silting through the erosion of soil;
- to store surplus rainwater from the catchment area to be used later for irrigation after the withdrawal of monsoon and
- rehabilitation of the catchment.

## LESSONS FROM SUKHOMAJRI

- Peoples' participation must be ensured right from the beginning.
- The needs and the problems of the people must be identified at the outset.
- Unless a project is aimed at meeting their needs, solving their problems and mitigating their hardship, it may not succeed.
- Watershed Management Projects should have short gestation period. The benefits should be available in shortest possible period.
- Constitution of a village society (HRMS) must be a pre-requisite before taking up such projects.
- The emphasis should be on sustainability and equity, i.e., all the common property resources must be available to all sections of the society.

## WATER CONSERVATION

**Definition**

Process of Saving Water for Future Utilization

**Need for Water Conservation**

- To meet the increasing demands of water.
- To recharge the underground water.
- To reduce the ground water contamination from the intrusion of saline water.
- To reduce the surface runoff loss.
- To increase hydrostatic pressure to stop land subsidence.

**Methods of Water Conservation**

- Rain Water Harvesting
- Watershed Management

## RAIN WATER HARVESTING

- Ground water plays a critical role in the urban environment.
- Urbanization strongly affects ground water recharge flow and quality thereby creating serious impact on urban infrastructure
- As urban dwellings go on increasing shrinkage of open land leads to continuous decline in ground water levels in many areas.

## Rain water harvesting is essential

- Due to rapid urbanization infiltration of rain water into the soil has decreased drastically and recharging of ground water has diminished.
- Over exploitation of ground water resources has resulted in declined in water levels in most part of the country.
- To enhance availability of ground water at specific place and time.
- To improve the water quality in aquifers.
- To improve the vegetation cover.

## BENEFITS OF RAIN WATER HARVESTING

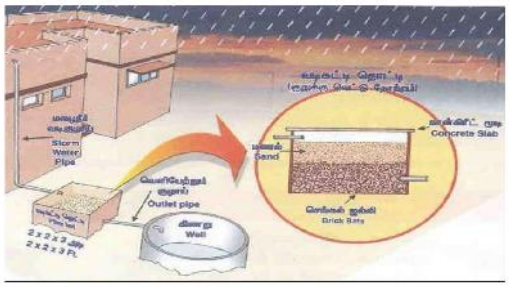
- The ground water level will rise.
- Quality of water improves.
- Soil erosion will be reduced.
- Saving ground water .

## RAIN WATER HARVESTING TECHNIQUES:

There are two main techniques of rain water harvestings.

- Storage of rainwater on surface for future use.
- Recharge of ground water.

## RAIN WATER HARVESTING



## Water shed management

- watershed is a basin like landform defined by peaks which are connected by ridges that descend into lower elevations and small valleys.
- It carries rainwater falling on it drop by drop and channels it into soil and streams flowing into large rivers.
- It involves management of land, water, energy and greenery integrating all the relevant approaches appropriate to socioeconomic background for a pragmatic development of a watershed.

Greening of the watershed through proper management of land, water and energy resource.

The objectives of watershed management

- Conserving soil and water
- Improving the ability of land to hold water
- Rainwater harvesting and recharging
- Growing greenery trees, crops and grasses

## RESETTLEMENT AND REHABILITATION

**Resettlement**

Relocation or displacement of human population

**Rehabilitation**

**TREATMENT – MAKING THE SYSTEM TO WORK AGAIN**

- Repairing Damaged Infra Structures
- Providing Safe Land for Building
- Restore Social Services

## ENVIRONMENTAL ETHICS

**Definition:**

Environmental ethics refers to the

**Issues.**
**Principles.**
**Guidelines.**

relating to human interactions with their Environment.

**Environmental Problems**

a. Acid Rain,
b. Air Pollution,
c. Global Warming,
d. Hazardous Waste

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d. Hazardous Waste

## CLIMATE CHANGE

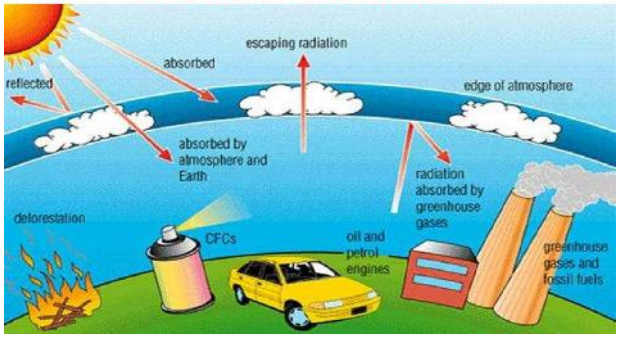
**Causes**

- Uneven Heating – Earth's Surface.
- Properties – Air, Land and Water.
- Fossil Fuels – Combustion.
- Green House Gases.

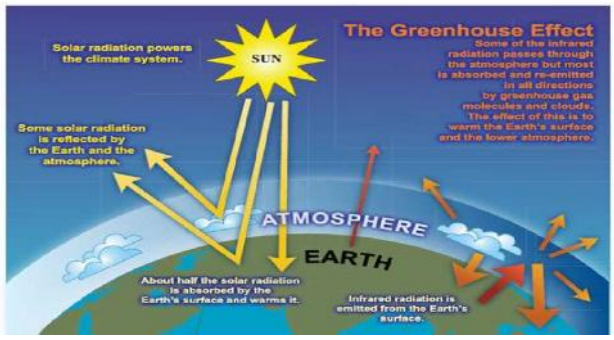
**Effects**

- Affect Agriculture, Wind and Ocean Current.
- Relocation of Birds, Animals and Humans.
- Acid Rain.

## GREEN HOUSE EFFECT




## GREEN HOUSE EFFECT




The **greenhouse effect** is a process by which radiant energy leaving a planetary surface is absorbed by some atmospheric gases, called greenhouse gases.

They transfer this energy to other components of the atmosphere, and it is re-radiated in all directions, including back down towards the surface.

This transfers energy to the surface and lower atmosphere, so the temperature there is higher than it would be if direct heating by solar radiation were the only warming mechanism.

**Greenhouse gases**

By their percentage contribution to the greenhouse effect on Earth the four major gases are:

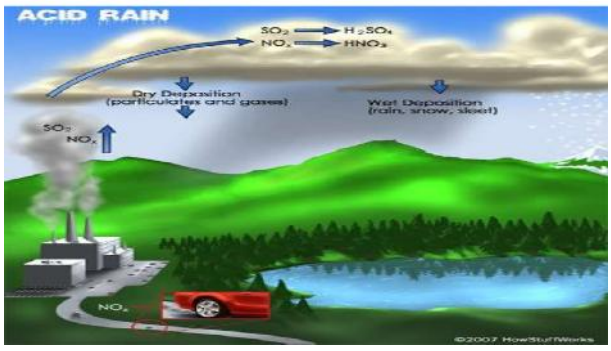
- water vapor, 36–70%
- carbon dioxide, 9–26%
- methane, 4– 9%
- ozone, 3– 7%

**Global warming** is the increase in the average temperature of Earth's near-surface air and oceans since the mid-20th century.

Global surface temperature increased $0.74 \pm 0.18$ °C ($1.33 \pm 0.32$ °F) during the 20th century.

Most of the observed temperature increase since the middle of the 20th century has been caused by increasing concentrations of greenhouse gases, which result from human activity such as the burning of fossil fuel and deforestation. Global dimming, a result of increasing concentrations of atmospheric aerosols that block sunlight from reaching the

## ACID RAIN OR ACID PRECIPITATION



## ACID RAIN

As the name suggests, acid rain is just rain which is acidic. The rain becomes acidic because of gases which dissolve in the rain water to form various acids.

In general about 70 percent of acid rain comes from sulphur dioxide ($SO_2$), which dissolves into the water to form sulphuric acid.

The rest comes from various oxides of nitrogen mainly $NO_2$ and $NO_3$, collectively called $No_x$. Oxides of carbon

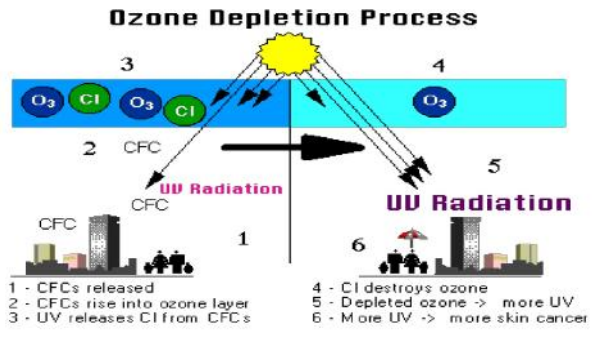
## CONTROL METHODS

The best approach to reduce acid rain is to reduce the amount of $NO_x$ ,$SO_2$ and $CO_2$ being released into the atmosphere.

Fitting a catalytic converter to a car can reduce the emissions of $NO_x$ by up to 90 percent, but they are very expensive, and cause more carbon dioxide to bea released, which contributes to the greenhouse effect.

Best option is not to burn fossil fuels, but to use alternative energy sources which are less polluting.

## OZONE LAYER DEPLETION




## Formation of ozone in the atmosphere:

Ozone absorbs uv radiations and is broken into atomic and molecular oxygen.

$$O_2 \rightarrow 2O$$

$$O_3 \rightarrow O + O_2$$

The products formed combine again to form ozone

$$O + O_2 \rightarrow O_3$$

and hence a dynamic equilibrium is set up due to which the concentration of ozone in the atmosphere remains constant.

The ozone layer protects the earth from the harmful uv radiations.

If the concentration of ozone is reduced (ozone depletion), the concentration of uv radiations reaching the earth increases.

This leads to irritation of the eyes, skin cancer and damage to immune system in human beings.

In agriculture it causes decrease in productivity.

**Causes of ozone depletion**

Chlorofluorocarbons (CFCs) are used as refrigerants, aerosols and as industrial solvents.

CFCs are noncombustible and volatile. They reach the atmosphere and are broken down into chlorine free radicals by uv radiations.

**ill effects**

Due to ozone hole, the uv radiation increases causing eye infections, skin cancer in human beings and decrease in photosynthesis in plants.

**Control of ozone depletion:**

Ozone depletion can be controlled by using hydrochlorofluorocarbons and hydrofluoroalkanes in place of CFCs. These contain more hydrogen in their molecule and undergo oxidation readily.

## NUCLEAR ACCIDENTS AND NUCLEAR HOLOCAUST

**Causes**

- Trucks carrying radioactive waste
- Leakage in reactor vessel
- Explosion test – underground
- Improper disposal

**Effects**

Nuclear radiation of

- Low Dose(100 – 250 rads) – Fatigue, Vomiting and Loss of Hair
- Higher Dose(400-500 rads) – Bone Marrow, Blood Cells, Cancer
- Very Higher Dose(10,000 rads) Heart, Brain and Cancer

## WASTE LAND RECLAMATION( or RECOVERY)

**Types of Waste Lands**

- Uncultivable Waste Lands
- Cultivable Waste Lands

**Causes of Waste Land Formation**

- Over-exploitation of natural resources.
- Overgrazing, deforestation, soil erosion, water logging.
- Mining activities, growing demand for fuel, fodder, wood & food.
- Developmental activities – dams, power projects.

**Objective (or) Need of Waste Land Reclamation**

- Increasing population – need Food, Land and Shelter
- Prevent – Soil Erosion, Landslides and Drought
- Conserve – Biological Resources and Natural Ecosystems
- Avoiding – Over exploitation of natural resources

## AIR (PREVENTION AND CONTROL OF POLLUTION) ACT, 1981

The objective of the Act is to provide for the prevention, control and abatement of air pollution

**Functions of Central Board**

- Advice to central government on any matter related to air quality
- To execute nation wide awareness programme
- To provide technical assistance and guidance to state boards
- Collect technical and statistical data to prepare manuals, code, and guide related to air.
- To lay down standards for the quality of air.

## ENVIRONMENTAL PROTECTION ACT, 1986 (EPA)

Environment. includes water, air and land and the interrelationship which exists among and between them and human beings, other living creature, plants, micro-organisms and property.

Environmental Pollutant. means any solid, liquid or gaseous substances present in such concentration as may be or tend to be injurious to environment.

Hazardous Substance. means any substance or preparation which by reason of its chemical or physico-chemical properties or handling is liable to cause harm to human beings, other living creatures, plants, micro-organisms, property of the environment.

## Resettlement and Rehabilitation

## Intro

- Development projects essential
- To have development natural resources are utilized.
- Most affected are locals or native people
- Poorest of poor and underprivileged people
- Various types of project lead to displacement of locals

## Displacement due to dams

- Need space for such huge project.
- Locals, tribals and natives are affected.
- Families have to leave the ancestral place and need to settle elsewhere.
- Hirakund dam: 20000 people in 250 villages
- Bhakra Nangal : not even half of displaced resettled.
- Sardar Sarovar: 41,000 families will get displaced due to reservoir.
- Tehri dam: 10000 people of Tehri town

- A review by the World Bank posits that an average of 13,000 people are displaced by each new large dam constructed currently (Cernea 1996b).
- By this estimate, Indians displaced by the country's 3000+ large dams would number over 39 million.

## Displacement due to mining

- Several thousand hectares of land are covered in Mining operations
- Mining accidents also cause displacement.
- Jharia Coal Mines, Jharkhand: 0.3 million people asked to leave the place
- Reason: Underground fires
- No alternative provided yet.
- Cost of R& R: 18000 crores

## Displacement due to creation of Protected area

- Displacement also takes place where protected areas are established as compensatory measures for the forest lands and natural habitats that are lost.
- A welcome step for natural resource conservation
- But tribals loose the right to their natural homes
- Entry is prohibited in core areas.
- Valmiki Tiger reserve: 142 villages in Bihar of Tharu Community
- Wayanad Wildlife Sanctuary: 53,472 tribal families in Kerala.

## Rehabilitation- issues and policies

- Right to housing a basic human right
- Government acquires land for various reasons
- Already poor tribals most affected.
- Loss of land, food, home, jobs, property assets, social isolation
- Cash compensation not enough, Tribals are unaware so might be a case of cheating.
- Communal settlement does not happen.

## Policy

- Department of Land Resources, Ministry of Rural Development has formulated a National Policy on Resettlement and Rehabilitation for Project Affected Families, 2003 with the objectives to:
- Minimize displacement and to identify non-displacing or least-displacing alternatives;
- Plan the resettlement and rehabilitation of Project Affected Families, (PAFs) including special needs of tribals and vulnerable sections;
- Provide better standard of living to PAFs; and
- Facilitate harmonious relationship between the Requiring Body and PAFs through mutual cooperation.
- National Policy on Rehabilitation and Resettlement 2007

## Climate change

- Climate is average weather of an area
- Control temperature, evaporation rate, seasons, moisture content.
- Conditions if prevail for 30 years...its said to be the climate of an area
- Currently Climate is Changing

## GLOBAL WARMING

- Overall increase in temperature few degrees.
- It happens when greenhouse gases (carbon dioxide, water vapor, nitrous oxide, and methane) trap heat and light from the sun in the earth's atmosphere, which increases the temperature.
- This hurts many people, animals, and plants.
- Many cannot take the change, so they die.

## Facts

- Unsustainable consumption patterns of the rich industrialized nations are responsible for the threat of climate change.
- Only 25% of the global population lives in these countries, but they emit more than 70% of the total global $CO_2$ emissions and consume 75 to 80% of many of the other resources of the world.
- Impacts are already being seen in unprecedented heat waves, cyclones, floods, salinisation of the coastline and effects on agriculture, fisheries and health.

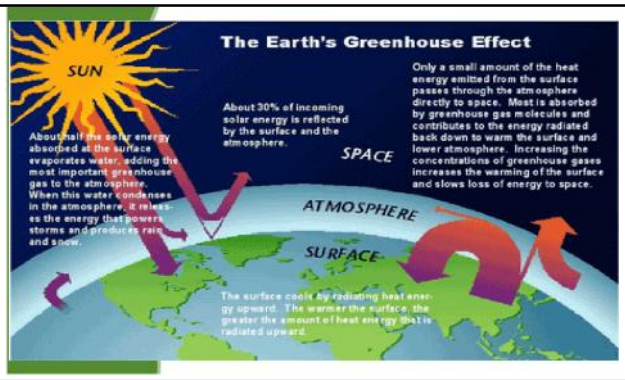
## Why should India be Concerned about Climate Change?

- India is home to a third of the world's poor, and climate change will hit this section of society the hardest.
- Set to be the most populous nation in the world by 2045, the economic, social and ecological price of climate change will be massive.
- The three main 'categories' of impacts are those on agriculture, sea level rise leading to submergence of coastal areas, as well as increased frequency of extreme events. Each of these pose serious threats to India.
- India's main energy resource is coal. With the threat of climate change, India is called upon to change its energy strategy based on coal, its most abundant resource, and to use other energy sources (e.g. oil, gas, renewable and nuclear energy) which may turn out to be expensive.

## Green House Effect

- The **greenhouse effect** is a naturally occurring process that aids in heating the Earth's surface and atmosphere.
- It results from the fact that certain atmospheric gases, such as **carbon dioxide**, ***water vapor***, and **methane**, are able to change the energy balance of the planet by absorbing **longwave radiation** emitted from the Earth's surface.
- Without the greenhouse effect life on this planet would probably not exist as the average temperature of the Earth would be a chilly -18° Celsius, rather than the present 15° Celsius.

- Anthropogenic activities increase the concentration of green house gases.
- Enhanced green house effect
- Carbon dioxide from emissions
- Chloroflurocarbons
- Methane
- Nitrogen oxides

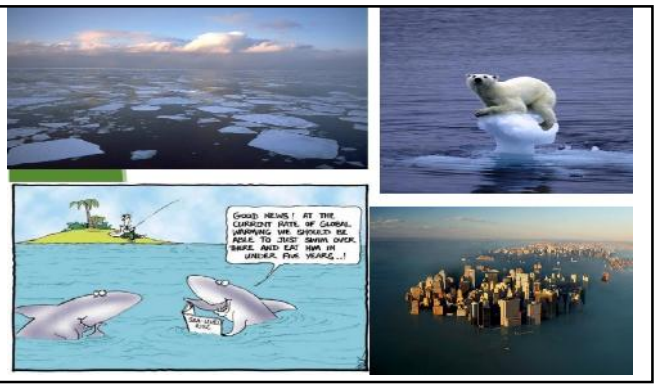



## Effects

- Change in Wind current patterns
- Ocean currents will change
- Hydrological cycle will intensify
- Sea level rise: submergence of areas.
- Changed agricultural production
- Cases of flood, droughts, cyclones on a rise.

- Global warming is affecting many parts of the world. Global warming makes the sea rise, and when the sea rises, the water covers many low land islands. This is a big problem for many of the plants, animals, and people on islands.
- The water covers the plants and causes some of them to die. When they die, the animals lose a source of food, along with their habitat. .
- When the plants and animals die, people lose two sources of food, plant food and animal food. They may also lose their homes. As a result, they would also have to leave the area or die. This would be called a break in the food chain, or a chain reaction, one thing happening that leads to another and so on.

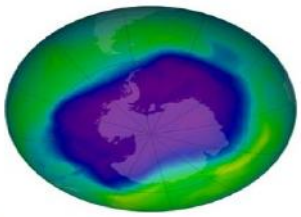
- The oceans are affected by global warming in other ways, as well. Many things that are happening to the ocean are linked to global warming. One thing that is happening is warm water, caused from global warming, is harming and killing algae in the ocean.
- It is killing algae, but it is also destroying many huge forests.
- Global warming is also causing many more fires that wipe out whole forests. This happens because global warming can make the earth very hot. In forests, some plants and trees leaves can be so dry that they catch on fire.



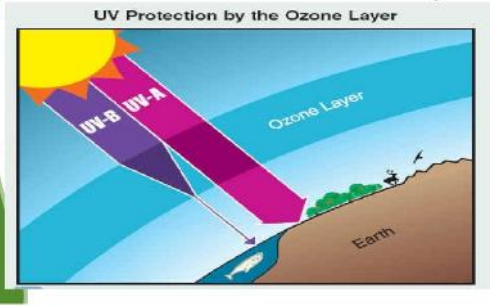
## Solution

- Renewable energy
- Biofuels
- Afforestation
- Reduce the current rate of CFCs use
- Trap methane for fuel
- Potential of algae in Carbon dioxide utilization
- Sustainable agriculture

## Ozone layer depletion



## Natural sunscreen: Ozone layer




- The production and emission of CFCs, chlorofluorocarbons, is by far the leading cause.
- CFCs in the stratosphere. There, the chlorine atom is removed from the CFC and attracts one of the three oxygen atoms in the ozone molecule. The process continues, and a single chlorine atom can destroy over 100,000 molecules of ozone.
- In 1984, ozone layer hole was discovered over Antarctica

## ENVIRONMENTAL LEGISLATION

- India first country to have made provisions for environment protection in its constitution
- After Stockholm Conference , 1972
- Many laws and rules have been made
- **Article 48- A** : *The state shall endeavour to protect and improve the environment and to safeguard forests and wildlife of the country.*
- **Article 51 A (g):** - *It shall be the duty of every citizen of India to protect and improve the natural environment including forests, lakes, rivers and wildlife and to have compasion for living creatures*

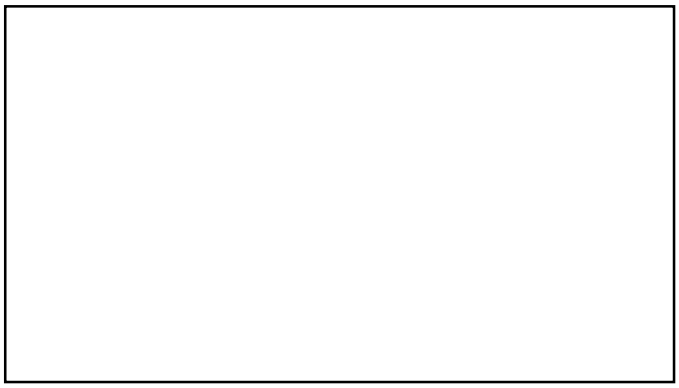
## ACTS

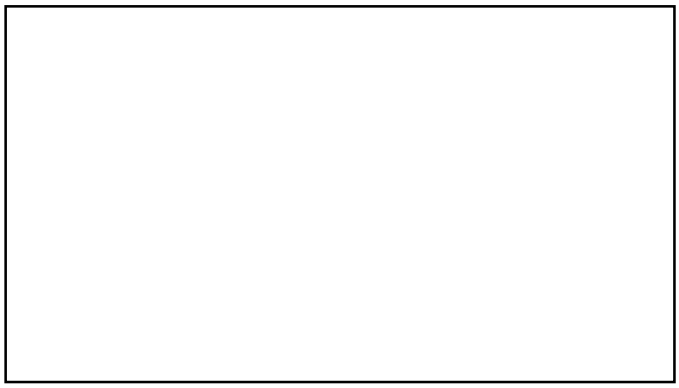
- Wildlife (Protection ) Act, 1972
- Water (Prevention and Control of Pollution) Act, 1974
- Forest (Conservation )Act, 1980
- Air (Prevention and Control of Pollution) Act, 1981
- The Environment (Protection) Act, 1986
- The Biomedical waste (Management and Handling) Rules , 1998
- The Municipal Solid Waste (Management and Handling) Rules, 2000
- The Noise Pollution (Regulation and Control) (Amendment) Rules,2002
- The Biological Diversity Act,2002

## Environmental Ethics

- Ethical behaviour is of utmost importance
- We believe and think: Man is all powerful and supreme creature of the earth.
- Nature has provided us with resources and she nourishes us like our mother, so we should respect and nurture her
- Live sustainably.

- Two views:
- Anthropogenic and Eco centric.
- Earth ethics or environmental guidelines help us to protect our mother earth.
- DO NOT's and DO's
- Having fewer wants = limits to growth = good environment





# Human population and the environment

# INTRODUCTION

- **Population :** The word population has been derived from the Latin word "populatio" which means people.
- The group of individual species which occupy a definite geographic area is defined as ***population.***
- **Population Growth :** The change in population per unit area at particular time is called ***population Growth.***

**Population density** :Population density is defined as the number of individual or people per unit area in per unit volume of Environment.

**Carrying Capacity** : Maximum population size indefinitely supported by available resources .

# Human Settlement

- The human settlement can be defined as communities who live in city, village or town with all social, material ,organizational, spiritual and cultural elements which exist and sustain for long time.
- The human settlement needs natural resources, physical elements as well as services to sustain.
- These components comprises of fresh clean air, water , food, shelter and services include like education, medical facilities.

# Environmental factors governing human settlement

- **LAND :** As population increased , people started taking over more and more land for human settlements. Land was used to develop infrastructures like roadways , public complexes and industries.

- **FOOD :** With the increase in population , there was a demand for more and more food and so more land was started to be used for agricultural activities.

Development of advanced technologies in the field Of agriculture caused use of fertilizers and pesticides for increasing productivity which deteriorated the quality of environment and health of human beings.

- **Water Resources:** High population and settlement of human beings in different places caused the problem of water scarcity due to unequal distribution of water resources and unplanned use of these resources for industrialization and urbanization.

- **ENERGY RESOURCES :** Conventional energy resources started depleting due to high demand of increased population for energy.

- **FOREST RESOURCES :** Due to increased population , use of more land area for human settlement and industrialization also increased.

# Population Pollution

- Population pollution is the pollution caused due to ***overpopulation.***

- Overpopulation is the condition when the population (number of organism) exceeds the maximum ***carrying capacity*** of the environment.

# Population Pollution

- The maximum carrying capacity of environment is the capacity to support human beings with the availability of food , water , shelter, as well as protecting human beings against the extremities in environment.
- Over population is not a function of size or density of the population.
- Determined by calculating ratio of population to available sustainable resources.

# Reasons for Overpopulation

***High Birth Rate :***

- The crude birth rate is the number of child's birth per 1000 people per year.
- If the birth rate is high , it implies more number of people will be for human settlement and will therefore cause overpopulation.
- Birth rates are affected by a number of factors :
  - Social beliefs
  - Religious beliefs
  - Mortality rate
  - Literacy
  - Economic prosperity
  - Abortion rate

## ***Low Death Rate:***

- Decline in mortality rate
- The crude death rate is the number of deaths per 1000 people per year.
- Low death rate is basically due to technological advancement in the field of medical science which reduced the mortality rate.
- Other reason for this may be: Average age , Nutritional levels, Standard of diet and housing, Access to clean water, Hygiene level.

***Migration :***

- People from towns and villages generally migrate to cities in search of jobs and better living standards which overpopulates the cities.

- Similarly, people from developing countries try to migrate to developed countries making them overpopulated.

## ***ILLITERACY :***

- People of lower and poor classes generally have larger families due to poor education facilities.

- In India, particularly in villages , due to religious beliefs or due to eagerness to have a male child people tend to have big families.

# Effects of Population Explosion

- ***Population Explosion:*** When the population increases suddenly, it is termed as population explosion.
- ***Population Crash :*** When the population of human beings decreases , it is called population crash.
- It is different from Overpopulation, since this condition arises when economic development fails to maintain pace with the population growth.

# Effects of Population Explosion

1. ***High Demand Of Basic Needs :*** Population explosion causes scarcity of food and increase in the prices of food items.

- It also leads to the formation of slums in big cities.
- Shortage in agricultural land and water may also cause starvation in some parts.
- It creates problems like rush in transportation, education and medical Facilities.

2. ***Reduction In Natural Resources :*** Population Explosion causes depletion in natural resources due to more consumption of these resources by the people.

It leads to high consumption of fossil fuels , minerals and forest resources.

More forest will be cut down to provide wood for housing and fuel.

More water is required for drinking, irrigation and industrial purpose.

## 3. ***Generation Of Huge Quantity Of Waste:***

- Population explosion results in generation of wastewater , industrial effluents and solid waste which poses the stresses over the facilities for disposal of wastewater.
- Causes ecological imbalance

## 4. ***OTHER EFFECTS :***

(a) Increase in migration rate and reduction in living standard of people.

(b) Reduction in agriculture land.

(c) Increase in unemployment

(d) Deterioration in the quality of environment due to pollution in soil , air , water and air.

(e) High crime rate

(f) Energy crisis

(g) Increases number of slums

# Population Growth Rate

- The population growth can be expressed by Population Growth Rate.
- *Population Growth Rate* is the fractional rate at which the number of individuals in a population increases.

$$\text{Growth rate} = \frac{(\text{population at end of period} - \text{population at beginning of period})}{\text{population at beginning of period}}$$

# Control of population growth

1. Education
2. Living standard and employment
3. Government benefits and incentives
4. Publicity

# Control of population growth

- **1.Education**
- Improvement of literacy rate in villages and lower and middle class of people, particularly in women can control the population growth.
- **2.Living standard and employment**

  Employment will improve the living standard of people so there will be improvement in education and awareness of family planning which could control the population growth.

## 3.Government benefits and incentives

- Implementation of government policies to give special incentives to people having only two children and benefits to such children in education later on ,may play an important role in control of population growth.

## 4.Publicity

- Publicity by giving advertisements and incentives, stating importance ,need and significance of birth control and family planning may also control growth.

$$P_n = P + n\,I$$

$P_n$=population forecasted

N=Decades

P=Present population

I=Average Increment of a decade

# Geometrical increase methods

- Principle of this method is that the percentage growth rate of population with time is constant.
- For the past three or four decades , data for future population is calculated by the formula given below.

$$P_n = P_o\{ 1+r/100\}^n$$

- $P_o$= Initial population
- Pn= Population forecasted for n decades.
- r= % growth rate of population

NOTE= This method is used only for those cities having high population growth.

# WOMEN AND CHILD WELFARE

- IN THE COUNTRY LIKE INDIA, WOMEN ARE ALWAYS HAVING A PLACE IN THE HOLY SERMON, EVEN PEOPLE FEEL THAT THE WOMEN ARE BEING A CONSTANT SUPPORTER TO HIS FAMILY MEMBERS AND ESPECIALLY HER HUSBAND.
- BUT ON THE OTHER HAND, THE EVILS LIKE DOWRY AND FEMALE FETICIDE ARE BEING THE OBSTACLES TO THE GROWTH AND DEVELOPMENT OF THE WOMEN.
- IT HAS BEEN SEEN THAT MOST OF THE WOMEN ARE LIVING IN THEIR DEPRESSED, CRUSHED AND EXPLOITED PERSONALITIES.
- THOUGH SOME WOMEN ARE FOUND DOMINATING IN EXPOSING THEIR STRENGTHS AND TALENTS. NOW A DAYS ARE LEADING IN ALMOST ALL FIELDS.
- IN THE ELECTION ALSO 33% SEATS ATE KEPT RESERVED FOR WOMEN, SO THAT THEY CAN EXPLORE THEIR LIMITS AND CAN BE A PART IN ECONOMIC AND SOCIAL ADVANCEMENT.

- THE REASON WHY WE NEED TO PROVIDE SOME STATUTORY PROTECTIONS TO THE RIGHTS OF THE WOMEN IS, THEY ARE BEING FORCED BY THE FAMILY MEMBERS AND SOCIETIES NOT TO THINK OUT OF THE BOX .
- AFTER MARRIAGE WOMEN ARE NOT ENCOURAGED TO TAKE PART IN ANY PRODUCTIVE ACTIVITIES AND ARE ONLY ALLOWED TO TAKE CARE OF THEIR FAMILY AND ADJUST WITH THE NEW ENVIRONMENT.
- THE TRADITIONS LIKE DOWRY, SATI PRATHA, AND ENCOURAGING ONLY MALE BIRTH NECESSITATES THE NEEDS TO PROVIDE SOME STATUTORY PROTECTIONS TO THE RIGHTS OF WOMEN.
- FOLLOWING ARE SOME OF THE ACTS WHICH HELPS THE WOMEN TO STAND ON THEIR FEET AND ENABLES THEM TO FIGHT AGAINST INJUSTICE.

1. DOWRY PROHIBITION ACT, 1961: TO PAY OR DEMAND FOR DOWRY IS A NON COGNIZABLE OFFENCE. (IT IS COGNIZABLE AS PER THE AMENDMENT MADE IN THE ACT AFTERWARDS)
2. HINDU WIDOW REMARRIAGE BILL
3. THE HINDU WOMEN'S RIGHTS TO PROPERTY
4. THE HINDU SUCCESSION ACT
5. THE EQUAL REMUNERATION ACT: TO EQUALIZE THE WAGE TARES FOR MEN AND WOMEN EMPLOYEES WORKING AT THE SAME POSTS.
6. WOMEN AND GIRL ACT 1956- TO PROTECT OR TO UPLIFT FROM ENTRAPPING WOMEN TO NON-ETHICAL ACT.

- **CHILD WELFARE:** FOLLOWING ARE SOME OF THE PROGRAMMES UNDERTAKEN FOR CHILD WELFARE UNDER THE "NATIONAL CHILDREN BOARD".

1. **INTEGRATED CHILD DEVELOPMENT SERVICE:**
   - IMPROVING NUTRITIONAL AND HEALTH STATUS OF CHILDREN.
   - PROPER PSYCHOLOGICAL AND SOCIAL DEVELOPMENT OF CHILDREN.
   - REDUCING INCIDENCE OF THEIR MALNUTRITION, MORTALITY, MORBIDITY AND SCHOOL DROPOUT.
   - ENHANCING CAPACITY OF MOTHER TO LOOK AFTER NORMAL HEALTH AND NUTRITIONAL NEEDS OF CHILD THROUGH PROPER HEALTH, NUTRITION AND EDUCATION.
2. **BALWADI NUTRITION PROGRAMME: (1970-71)**
   - TO PROVIDE FULL NUTRITION.
   - PROVIDE FACILITIES AND INFORMAL PRE-SCHOOL EDUCATION TO CHILDREN 3-5 YEARS OF AGE.
3. **TOY BANK SCHEME: (1986)**
   - TOY ARE COLLECTED IN SCHOOLS FROM CHILDREN AND ARE SENT TO ANGANWADI, BALWADI AND NURSERIES FOR DISTRIBUTING TO CHILDREN WHO CANNOT AFFORD TO BUY SUCH TOYS.

4. **CHILD LABOUR ERADICATION SCHEME: (1994)**
   - TO SHIFT THE CHILD LABOUR FROM HAZARDOUS INDUSTRIES TO SCHOOL.
5. **MID-DAY MEAL SCHEME: (1995)**
   - PRIMARY SCHOOLS ARE PROVIDED FREE MID-DAY MEAL. (AKSHAYPATRA)
6. **THE CHILD LABOUR (PROHIBITION AND REGULATION) ACT, 1986:**
   - PROHIBITS THE EMPLOYMENT OF THE CHILDREN UNDER THE AGE OF 14 YEARS.
7. **INTEGRATED CHILD DEVELOPMENT PROGRAMME: (1975-76)**
   - SUPPLEMENTARY NUTRITION
   - IMMUNIZATION
   - HEALTH CHECKING SERVICES
   - HEALTH EDUCATION
   - NON-FORMAL EDUCATION
   - OTHER RELATED SERVICES

# ENVIRONMENT AND HUMAN HEALTH

- HUMAN POPULATION AND ENVIRONMENT:
  - DUE TO INCREASE IN POPULATION, WE STARTED DESTROYING NATURAL RESOURCES TO OBTAIN SOME OF THE SERVICES LIKE:
  - DESTRUCTION OF FORESTS FOR FIRE WOOD, CONSTRUCTION AND FURNITURE.
  - DRILLING THE BOTTOM OF THE SEA FOR OBTAINING OIL FOR TRANSPORTATION.
  - CONVERTING FORESTS INTO AGRICULTURAL LAND FOR GROWING AND INCREASING FOOD PRODUCTION.
  - USE OF WATER AT RESIDENTS AND INDUSTRIES, CONSTRUCTION OF DAMS FOR WATER STORAGE.
  - LAND POLLUTION DUE TO THE ESTABLISHMENTS OF TEXTILE AND DYING-BLEACHING INDUSTRIES.
  - IN THE PROCESS OF MAKING LIFE MORE COMFORTABLE, WE DEGRADED THE ENVIRONMENT.
  - THE ENVIRONMENTAL POLLUTION IS THE EFFECT OF ALL HUMAN ACTIVITIES LIKE, URBANIZATION, INDUSTRIALIZATION AND POPULATION DENSITY.
  - THE GREATEST POLLUTION IS THE POPULATION GROWTH.

- THE FOLLOWING ARE THE REASONS WHY THE POPULATION GROWTH IS THE GREATEST POLLUTION:

1. AREAS WHERE THE DIGGING PROCESS IS UNDERTAKEN FOR EXTRACTING MINERALS, BECOMES USELESS FOR AGRICULTURAL AND VEGETATION PROCESS. THE PROCESS MAY EXCLUDE SOME USEFUL MINERALS AND MAKE LAND INFERTILE.
2. USE OF WOOD FOR COUNTLESS ACTIVITIES DESTROYS THE FORESTS. DEFORESTATION INCREASES THE LEVEL OF CO2. THIS CAN INCREASE THE CHANCES OF GREEN HOUSE EFFECT.
3. DUE TO ESTABLISHMENT OF DIFFERENT INDUSTRIES, SMOKE, DUST PARTICLES AND POISONOUS GASES ARE EMITTED FROM THE CHIMNEYS OF THE FACTORIES. THESE INCREASES AIR AND WATER POLLUTION AND ALSO INCREASES THE CHANCES OF WATER AND AIR BORNE DISEASES.
4. INCREASED TEMPERATURE WILL ALTER THE SEASON CYCLE AND ADVERSELY AFFECTS THE PRODUCTIVITY OF THE CROPS. EVEN SOME SENSITIVE LIVING SPECIES MAY FACE SURVIVAL PROBLEM.
5. TONS OF GARBAGE AND RUBBISH THROWN EVERYDAY, REDUCES THE SINKING CAPACITY OR GARBAGE STORAGE CAPACITY OF THE EARTH AND WE MAY FACE THE PROBLEM OF GARBAGE DISPOSAL IN NEAR FUTURE.

# Arithmetic Increase Method

- This method is based on the assumption that population increase at a constant rate.
- Thus future population is given as
- $P_n = P + n I$
- Where,
- $P_n$ – Future population
- P = Population at present
- n – No of decades between now and future
- I = average increment for a decade

This method of population forecasting is used for large cities which have reached their saturation population.

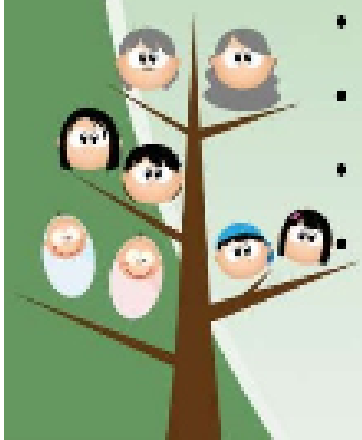
# Geometric Increase Method

In this method per decade percentage increase or growth rate is assumed to be constant and the increase is compounded over the existing population every decade.

$$Pn = Po\left(1 + \frac{r}{100}\right)^n$$

Where,

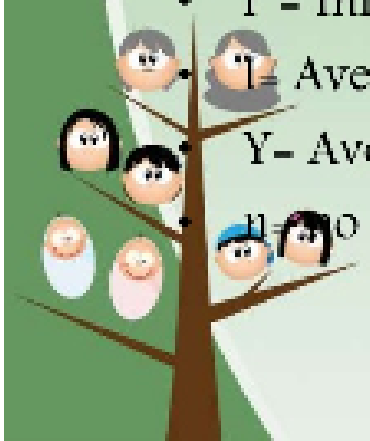
- $P_n$ – Future Population
- $P_o$ = Initial Population
- **r** – rate of growth
- **N** = no of decades



# Incremental Increase Method

- In this method per decade growth rate is not assumed to be constant as in the arithmetic or geometric increase method but it is progressively increased or decreased depending on past data
- $P_u = P + n I + \frac{n(n+1)}{2} Y$

- $P_u$ = Future Population
- P = Initial Population
- I = Average increase in population
- Y = Average of Incremental Increase
- n = no of decades



# ❖ HUMAN RIGHTS

- EQUITY
- NUTRITION,HEALTH & HUMAN RIGHTS

# EQUITY

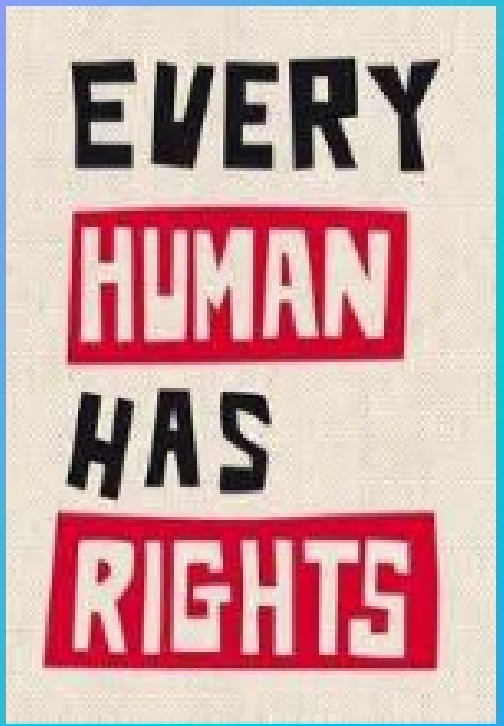
Have equality among people.

Have equal rights on use of natural resources.

# NUTRITION,HEALTH & HUMAN RIGHTS

Proper health & nutrition among people.

Every human has right to life.



# VALUE EDUCATION

- ENVIRONMENTAL VALUES
- VALUING NATURE
- VALUING CULTURES
- SOCIAL JUSTICE
- HUMAN HERITAGE
- EQUITABLE USE OF RESOURCES
- COMMON PROPERTY RESOURCES
- ECOLOGICAL DEGRADATION

# ENVIRONMENTAL VALUES

We should have understanding between nature.

Protect the forest & wildlife.

Protect & improve environment.

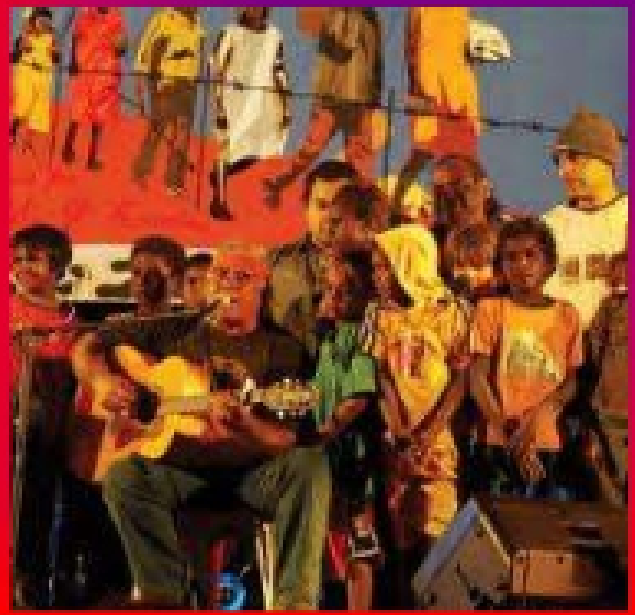
# VALUING NATURE

Protect natural ecosystem.

Protect the rights of local people.

# VALUING CULTURES

We must value the cultures of tribal people.
We must respect their way of life.



# SOCIAL JUSTICE

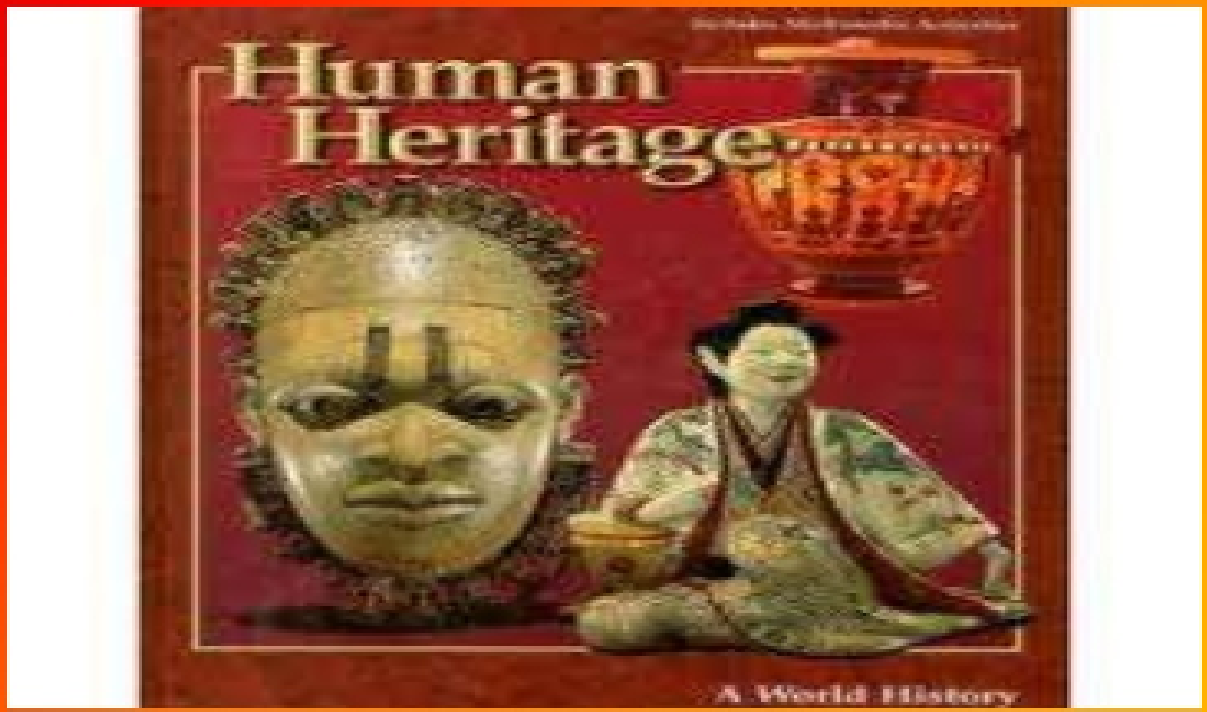
**Safeguard the rights of poor people.**

**Respect & protect their tradition.**

# HUMAN HERITAGE

Heritage preservation is a growing environmental concern,because:

- we have undervalued this heritage.
- it is vanishing at an astonishing pace.



# EQUITABLE USE OF RESOURCES

Less people use more resources & energy.
This leads to great pressure on the environment.
We must use the resources equally & sustainably.

# COMMONLY OWNED RESOURCES

Common resources that we use:

Water that nature recycles,forests and

Grasslands which maintain our climate.


Thank you