Unit 7 Human communities and the Environment

Demography is study of human population in regards to its different parameters like composition, size, distribution. Demographic study provides important data for formulation of future policies in social sector like health, education, employment, housing and environmental conservation.

Human population is total number of human beings inhabiting a given area at a particular time. India is ranked second after China in world population. Sharp increase in human population in last few decades led to population explosion.

Population explosion is causing severe resource depletion and environmental degradation. Resources like land, water, fossil fuels, minerals etc. are limited and due to over exploitation, these resources are getting exhausted. Renewable resources like forests, grasslands etc. are under tremendous pressure. Industrial and economic growth are raising our quality of life but are adding toxic pollutants into the air, water and soil. As a result, the ecological life-support systems are getting jeopardized.

Malthus theory of population growth states that human population would continue growing, if left unrestricted until it would become too large to be supported by the resources available. The increasing population would be then kept under check through natural calamity such as mass famine and starvation. Population should be controlled through moral restraint.

Population explosion and Environmental issues

Population explosion leads to various environmental problems because of overburdening on natural resources:

1. **Global warming**: At global scale, burning of fossil fuels has led to increased carbon dioxide gas emission. Being a GHG (green house gas), increase in its atmospheric levels have contributed to an increase of temperature by trapping heat radiation causing green house effect resulting in global warming and climate change. Global warming causes melting of polar ice caps, raising sea levels, contributing to flood and submerging coastal regions.

2. **Deforestation:** Forests need to be cleared to make more land available for agricultural activities and fulfilling other needs of growing population**.** It gives rise to soil erosion, destruction of ecological balance, has erratic rain and drought like situation.
3. **Biodiversity destruction:** Deforestation leads to destruction of wild life habitat and loss of biodiversity which upsets the ecological balance. It leads to destruction of the food chains and food webs and collapse of ecosystem that can in turn threaten the human's own existence on earth.
4. **Pollution:** Population pressure leads to high level of water, air, soil and noise pollution. It is because of over consumption and non-judicious use of natural resources. Pollution contamination of these natural resources further threaten human lives as various pollution related diseases like lung and skin cancer, respiratory and water borne diseases.
5. **Stress on natural resources:** Increasing population causes over exploitation and non-judicious use of non- renewable natural resources like fossil fuels etc.
6. **Water scarcity:** Population explosion has led to increase in demand of availability of clean potable water. A third world war might be caused due to water scarcity.

Population control/ regulation

Population explosion leads to economic poverty, environmental degradation and over exploitation of natural resources and to overcome the population explosion problem in India, many family welfare programmes have been initiated by the Govt. of India.

Family Welfare Programme: The National Family Welfare Programme **(NFWP)** was started in 1951 to stabilize and reduce the population growth. NFWP committee encouraged marriage at appropriate age, small family size, with healthy motherhood and increased time gap between the child births. Modern science has provided several birth control techniques including mechanical barriers, surgical methods, chemical pills and physical barriers to implantation. Family planning methods are important as they have led to reduced birth rate, infant mortality rate and increased life expectancy rate.

Women and Child Welfare: The government of India has set up **Department of Women and Child Development** in 1985 which plans and makes policies, programs, help in enacting and amending legislation for welfare of women and children. Children and women belong to special risk group and are vulnerable to exploitation. Many governmental and autonomous organizations such as National Commission for Women (NCW), National Commission for Children, National Institute of Public Cooperation and Child Development (NIPCCD), Rashtriya Mahila Kosh (RMK), UNICEF etc. works towards their development, welfare and protection .

Women usually suffer gender discrimination in developing countries. High number of cases of domestic violence, dowry deaths and mental torture to women needs immediate attention. There are many '**Women cells**' that exist almost everywhere and fight for the protection of women rights and dignity. There is a full-fledged **Ministry for Women and Child Development** whose aim is to work for the welfare and upliftment of women encompassing family planning, healthcare, education and awareness. Besides government initiatives there are NGO's, mostly as '**Mahila Mandals**' to create awareness amongst women of remote villages even to empower, train, educate and help them to become economically self-dependent. On an international level, the **United Nations Decade for Women (1975 to 1985)** witnessed inclusion of several women welfare related issues on international agenda.

Around 20 million children in our country are working as child labourer and in various hazardous industries like firework, match industries etc. Poverty is the main reason to drive these children into long hours of work in miserable, unhealthy conditions. In 1959, UN General Assembly adopted the **Declaration of Rights of a Child.** It became an international law in 1990. The law defines the right of a child to:

a) **survival** (good standards of living, good nutrition and health),
b) **protection** (freedom from exploitation, abuse, neglect and inhuman treatment),
c) **development** (access to education, early childhood care and support, social security and right to recreation) and
d) **participation** (freedom of thought, conscience and appropriate information to the child).

India is signatory to **World Declaration on Survival, Protection and Development of Children**.

A national of action for children has been formed by the Ministry of Human Resource Development (MHRD), Government of India, in which a plan has been formulated for children's welfare in areas of health , education , nutrition ,clean and safe drinking water , sanitation and environment. Some of the important actions are; at least primary level schooling, mid-day meals scheme, special emphasis on girl child education including health and nutrition etc.

Many women and child welfare programs have been initiated for example Integrate Child Development Service (ICDS) 1975, Balika Samridhi Yojana 1997, Support to Training and Employment Program (STEP) for women, Swadhar etc. Ban on child labour, dowry prohibition, better healthcare and education system has shown far reaching effects on child and women empowerment.

Rehabilitation and resettlement of people due to development projects

Various development projects often lead to displacement of native or tribal people who are poor and often not educated. Their rehabilitation is a major socio-economic issue. Developmental projects are planned to bring benefits to the society. However, in the process of development, very often there is over-exploitation of natural resources and degradation of the environment. Native people of the project site are directly affected. They are generally the poorest of the poor, underprivileged tribal people. Various types of projects result in the displacement of the native people who undergo tremendous economic and psychological distress, as the socio-economic and ecological base of the local community is disturbed.

1. **Displacement problems due to dams**: The big river valley projects have one of the most serious socio-economic impacts due to large scale displacement of local people from their ancestral home and loss of their traditional profession or occupation. India is one of countries in the world leading in big dam construction and in the last 50 years more than 20 million people are estimated to have been directly or indirectly affected by these dams.

   The **Hirakund Dam** has displaced more than 20,000 people residing in about 250 villages. The **Bhakra Nangal Dam** was constructed during 1950's and till now it has not been

possible to rehabilitate even half of the displaced persons. Same is the case with **Tehri Dam** on the river Bhagirathi, construction of which was green signaled after three decades of long campaign against the project by the noted activist Sunderlal Bahuguna the propagator of Chipko Movement . The immediate impact of the Tehri Dam would be on the 10,000 residents of the Tehri town.

CASE STUDY

The **Sardar Sarovar Project** which plans to build 30 big, 135 medium and 3000 minor dams on the Narmada river and its tributaries is estimated to submerge almost as much area as it is meant to irrigate. A total of 573 villages, consisting of about three lakh people are going to be affected due to submergence under water. As a result of the big dams the community rights of the tribals is breached. It is a traumatic experience to get uprooted from ones native place where its generations have lived and move to a new place as a total stranger. Very often the family breaks up. It is a big price that the tribals have to pay for a big dam project which is supposed to bring happiness and prosperity to the country. In return of this big sacrifice, the tribals must be given adequate compensation in the form of land, jobs, cash compensation etc and care should be taken to improve their quality of life.

2. **Displacement due to Mining**: Mining is another developmental activity, which causes displacement of the native people. Several thousands of hectares of land area is covered in mining operation and the native people are displaced. Sometimes displacement of local people is due to accidents occurring in mined areas like subsidence of land that often leads to shifting of people.

CASE STUDY

Jharia coal fields, Jharkhand have been posing a big problem to the local residents due to underground fires and they are asked to vacate the area. The proposal of large scale evacuation of about 0.3 million population of Jharia raises question of their relocation and rehabilitation for which proper planning is required. Some 115 crores of rupees have been spent to put out the fires since 1976, still the problem persists. The people of Jharia are being asked to evacuate the area, but till now there is no alternative land and rehabilitation package prepared. As a result of

it, the local people have formed a “Jharia coalfield Bachao Samiti”. The latest estimates show that about Rs. 18,000 crores will be spent for shifting the Jharia population while the cost for extinguishing the fire would be around 8,000 crore.

3. **Displacement due to Creation of National Parks**: When some forest area is covered under a National Park, it is a welcome step for conservation of the natural resources. However, it also has a social aspect associated with it which is often neglected. A major portion of the forest is declared as core-area, where the entry of local dwellers or tribals is prohibited. When these villagers are deprived of their ancestral right or access to the forests, they usually retaliate by starting destructive activities. There is a need to look into their problems and provide them some employment.

CASE STUDY

The tribals belonging to Tharu Community in 142 villages in Bihar in the **Valmiki Tiger Reserve** area in the district of West Champaran feel that they have been deprived of their legitimate ancestral rights to collect firewood and fodder from the forest. Their employment is also lost due to the “Project Tiger” initiative. The jobless villagers feel cheated and are found to indulge in destruction of forest and forest wealth in connivance with foreign agents who supply them arms and ammunition for illegal logging and poaching. In order to stop the local tribals from becoming criminals, the foremost effort of the planners should be to compensate for the loss to the locals by providing them job opportunities.

The **Wayanad Wildlife Sanctuary in Kerala** has caused displacement of 53,472 tribal families. At the time of its initiation it was decided to transfer land to these tribal families in order to settle them. However, till 2003 only 843 families could get the land. As a result of this the tribals felt cheated and in January, 2003 they encroached into the forest in large numbers, cut down the trees, started constructing huts and digging wells causing a violent encounter with the forest officials, ultimately causing injuries and deaths to the people.

REHABILITATION ISSUES

The United Nations Universal Declaration on Human Rights [Article 25(1)] has declared that **right to housing is a basic human right**. In India, most of the displacements have resulted due to land acquisition by the government for various reasons. For this purpose, the government has the Land Acquisition Act, 1894 which empowers it to serve notice to the people to vacate their lands if there is a need as per government planning. The major issues related to displacement and rehabilitation are as follows:

1. Tribals are usually the most affected amongst the displaced who are already poor. Displacement further increases their poverty due to loss of land, home, jobs, food insecurity, loss of access to common property assets, increased morbidity and mortality and social isolation.
2. The tribals are not familiar with the market policies and trends. Even if they get cash compensation, they get alienated in the modern economic set-up.
3. The land acquisition laws ignore the communal ownership of property, which is an inbuilt system amongst the tribals. Thus the tribals lose their communitarian basis of economic and cultural existence.
4. Kinship systems, marriages, social and cultural functions, their folk-songs, dances and activities vanish with their displacement.
5. Loss of identity and loss of the intimate link between the people and the environment is one of the biggest loss. The age-long indigenous traditional knowledge, which has been inherited and experienced by them about the flora, fauna, their uses etc. gets lost.

REHABILITATION POLICY

There is a need for a comprehensive National Rehabilitation Policy. Different states are following different practices in this regard.

CASE STUDIES

In case of **Sardar Sarovar Project**, Gujarat Government is formulating its policy. It has decided that :

- each landed oustee shall be entitled to allotment of irrigable land in the state which he chooses for his resettlement.
- The area of the land would be equal to that owned by him earlier and the minimum land given to an oustee would be 2 hectares.

However, there are problems of landless oustees and those natives who were cultivating forest land. The people of 20 submerged villages in Gujarat have been resettled at different locations leading to disintegration of joint families.

The case of **Pong Dam** is different. The dam was constructed on Beas River in Himachal Pradesh in 1960, while it was a part of Panjab. The water is harnessed to irrigate Rajasthan. Rajasthan, therefore, agreed to provide land to the oustees in the command area of Indira Gandhi Canal. However, to carry Beas Water to Rajasthan, another dam had to be built adding 20,722 more families that were displaced and had to be resettled by Rajasthan. Out of 30,000 families uprooted due to Pong dam, only 16,000 were considered eligible for allotment, as only they were bonafide cultivators for whom 2.25 lakh acre land was earmarked. What happened to the rest of the 14,000 families is not answered. Panjab, which is one of the beneficiaries of the dam is totally out of the rehabilitation issue. Only Rajasthan and Himachal Pradesh are trying to settle the matter.

Development projects and their Consequences

For better quality of human life, developmental projects are essential. To satisfy the ever increasing demands of growing human population, over exploitation of natural resources has taken place. Developmental activity has direct or indirect impact on its environment.

Developmental projects are being undertaken at the cost of environment and negatively impacting biodiversity leading to loss of flora and fauna and in worst case causing their extinction. The projects like construction of dams, their water catchment areas, mining, creation of parks,

construction of highways and railway tracks requires resettlement and rehabilitation of the affected population to new areas. Environmental accidents like nuclear radiation exposure (Chernobyl accident in former USSR), pollution and toxic contamination of water, air, soil, oil spills also forces people to resettle and rehabilitate.

Uprooting of native people causes many environmental and socio-economic problem. The tribal people who live in close association with their natural resources loses their identity which creates psychological pressure on them. The heritage and traditional knowledge about the nature and its resources and sustainable use are lost in this case.

Economically poor tribal people are worst affected as their homeland assets and jobs are lost. Being uneducated they get alienated in modern economic setup. Cash and land compensation given to such people is often delayed, not paid. The land compensation provided by the government agencies is usually less fertile and unfit for agriculture. The refugee camps of the migrants become their permanent settlement leading to its overcrowding and over exploitation of natural resources.

Carbon footprint

1. The total amount of greenhouse gases produced to directly and indirectly support human activities, usually expressed in equivalent tons of carbon dioxide (CO_2).
2. It relates to the amount of greenhouse gases produced in our day-to-day lives through burning fossil fuels for electricity, heating and transportation etc.
3. It is directly related to the amount of natural resources consumed and increasingly used or referred to as a measure of environmental impact. For example: When you drive a car, the engine burns fuel which creates a certain amount of CO_2, depending on its fuel consumption and the driving distance. When you heat your house with oil, gas or coal, then you also generate CO_2. Even if you heat your house with electricity, the generation of the electrical power may also have emitted a certain amount of CO_2. When you buy

food and goods, the production of the food and goods also emitted some quantities of CO_2.

4. It is calculated by multiplying the emissions of each of greenhouse gases by its 100 year global warming potential (GWP: is a measure of how much heat a greenhouse gas traps in the atmosphere up to a specific time horizon, relative to carbon dioxide.) GWP of CO_2 =1. GWP of CH_4 =21, this means GWP of CH_4 is 21 times that of CO_2 .
5. The carbon footprint is a very powerful tool to understand the impact of personal behavior on global warming. Carbon emissions can be Direct (include the emissions in making of product) or Indirect (include the emissions in transport and procurement of product).

6. <u>Activities that affect the carbon footprint of individuals</u>:
    a. Car travel depends on distance driven, fuel efficiency, and number of passengers per vehicle.
    b. Air travel depends on distance and number of flights. Take-off and landing use large amounts of fuel, so two short flights produce more carbon than one long flight of comparative distance.
    c. Boat travel depends on distance travelled, fuel efficiency, and size of the boat. Can produce up to 8 times more carbon dioxide than an airplane traveling the same distance citation needed.
    d. Other motorized transport such as bus or train.
    e. Electricity use, if provided by non-renewable resources.
    f. Home heating depends on fuel source and amount used.
    g. Food miles how much food you buy from non-local sources.
    h. Diet - meat-eater, vegetarian or vegan, conventionally farmed foods or organic produce. Production of food includes fuel use for cultivation and processing and packaging.

7. **Ecological footprint** is amount of land and water area a human population would need to provide resources required to support itself and to absorb its wastes, given prevailing technology.

8. <u>Ways to reduce carbon footprint:</u>
    a. train should be used instead of car, coach or plane
    b. travel by foot, bicycle or public transportation as much as possible
    c. Use vegetable-based and biodegradable products of all kinds like jutebags, paperbags, bio-diesel
    d. No plastic or paper disposable cups. Bring in a mug or a glass from their home, and wash it regularly.
    e. Power down when you leave, from lights to computers, everything should be off when you leave the office.
    f. Use LEDs in place of fluorescent tubes.
    g. Use natural air ventilation and natural sun light as maximum as possible.
    h. Eat local and organic produce
    i. Avoid meat products as it produces more GHG (methane), consumes more water, fodder
    j. Recycle
    k. Buy recycled products
    l. Rainforest preservation project
    m. Renewable resources: solar panel, wind farms

9. Forest fire, deforestation, frequent use of electrical devices increases carbon foot print.

National Green Tribunal (NGT)

1. The National Green Tribunal is a statutory body, has been established on 18.10.2010 under the National Green Tribunal Act 2010.
2. It is a specialized body equipped with the necessary expertise to handle environmental disputes involving multi-disciplinary issues.
3. The Tribunal's dedicated jurisdiction in environmental matters shall provide speedy environmental justice.
4. The objective of establishing a National Green Tribunal was as follows:
    a. To provide effective and expeditious disposal of cases relating to environmental protection and conservation of forests and other natural resources including enforcement of any legal right relating to environment.
    b. Giving relief and compensation for damages to persons and property
    c. Other Related Matters.

5. New Delhi is the Principal Place of Sitting of the Tribunal and Bhopal, Pune, Kolkata and Chennai shall be the other four place of sitting of the Tribunal.
6. The NGT has the power to hear all civil cases relating to environmental issues and questions that are linked to the implementation of laws listed in Schedule I of the NGT Act. These include the following:
    a. The Water (Prevention and Control of Pollution) Act, 1974;
    b. The Forest (Conservation) Act, 1980;
    c. The Air (Prevention and Control of Pollution) Act, 1981;
    d. The Environment (Protection) Act, 1986;
    e. The Public Liability Insurance Act, 1991;
    f. The Biological Diversity Act, 2002
    g. This means that any violations pertaining only to these laws, or any order / decision taken by the Government under these laws can be challenged before the NGT.

Disasters and their Effects

Disaster is an event affecting a community with little or no warning and cause huge destruction of peoples' life and economy in that region. The disasters have been divided in 2 categories:

1. Natural Disasters- earthquakes, landslides, volcanic eruption , tsunami and cyclone;
2. Man-made Disasters- Bhopal gas tragedy, Chernobyl disaster, dam leakage or collapse etc.

India is prone to many natural disasters like flood , earthquake, cyclone and landslide.

Disaster Management – Post -Disaster management was the focus till now which involved taking care of the situation after its occurrence. Post- Disaster management involves:

a. evacuation ,
b. communication ,
c. search,
d. rescue,
e. fire fighting,
f. medical,
g. food ,
h. shelter assistance etc.

The need of the hour is to emphasize on Pre-disaster management measures to minimize or prevent the loss. Pre-disaster management strategies involve:

i. identification of disaster prone areas,
j. collection of information regarding its past hazards , population , infrastructure present and
k. data regarding its local ecosystem
l. risk assessment to determine the frequency of disaster and time involved in post disaster rescue operations and its return to normalcy.

Mitigation involves forecasting, warning and spread of information quickly by advanced and upgraded technology. Computer and space technology like GIS (Geographical Information System), GPS (Global Positioning System) and satellite communication plays important role in management.

National Disaster Management Authority (NDMA)

Established by Government of India in recognition of the importance of disaster management as national priority. NDMA is an agency of Ministry of Home Affairs and is headed by Prime Minister. Its head office is situated at NDMA Bhawan, Safdarjung Enclave, New Delhi.

Public awareness and training form a critical part of mitigation. In case of emergency situation, the training given can help people to save their own loves and lives of others. Appropriate building technologies and disaster resistant construction should be done. Development and formation of mitigation and rescue strategies should be done at state and district level.

National Disaster Management Centre (NDMC) has formulated a National Disaster Management Act, 2015. The central and state government contribute to Calamity Relief Fund (CRF) to provide ready funds for rescue operation.

Disasters like flood, earthquake, cyclone , landslide will be studied in detail.

Flood

Overflow of water due to heavy rains or sudden snow melt the quantity of water in streams exceeds their capacity and water overflows the banks and causes submergence of the surrounding land. This situation is called flood. It is a common phenomenon in Bihar, West Bengal, Uttar Pradesh, Assam, Orissa. In India, Uttar Pradesh is considered to be amongst the worst flood hit states of the country. It has nearly 20% of the total 40 million hectares of flood prone zone of the country. Rivers like Ganga , Yamuna , Brahmaputra , Mahanadi , Godavari are

prone to floods. Flood causes huge loss to human life, life stock , building , electric supply , crops, road and water supply. Outbreak of water borne epidemic disease occurs in such conditions.

Factors contributing to floods are:

a. natural (heavy and prolonged rainfall, river passage blockage, high tides, tsunami, landslide and volcanic eruption under the sea bed) and
b. man-made (sudden water release from dam, breakdown of dam or reservoir).

Frequency of occurrence of floods are increased due to deforestation which results in soil erosion, change in river passage, farming, construction of dams, destruction of wetlands and natural vegetation on coast lines. Construction of roads, parking space and buildings that cover the earth's surface hardly allows infiltration of water into the soil and speeds up the runoff. Clearing of forests for agriculture has also increased the severity of floods.

Mitigation steps for flood control – Maintaining wetlands, afforestation, flood forecasting and flood plan management. Structural steps include construction of reservoirs for regulating monsoon flow and its controlled release after peak flow. Construction of embankments and flood walls, anti-erosion measures and improved drainage are also done to control flood. Flood plains, the low lying areas which get inundated during floods help to reduce floods. Building up of flood control structures like flood walls or deepening of river channels have only transferred the problems downstream. Building walls prevents spilling out the flood water over flood plains, but it increases the velocity of water to affect the areas downstream with greater force. Instead of raising buildings on flood plains, it is suggested that floodplains should be used for wildlife habitat, parks, recreational areas and other uses, which are not susceptible to flood damage. River-networking in the country is also being proposed to deal with the flood problem.

Case studies:

a. Kedarnath Disaster in 2013,
b. Jammu floods in 2014,
c. Chennai floods in 2015.

Earthquake

Earthquake is a sudden movement of ground due to displacement of tectonic plates present in earth's crust. The earth's crust has several tectonic plates of solid rock which slowly move along their boundaries. When friction prevents these plates from slipping, stress builds up and results in sudden fractures which can occur along the boundaries of the plates or fault lines (planes of weakness) within the plates. This causes earthquakes, the violent, short-term vibrations in the earth. The point on a fault at which the first movement occurs during an earthquake is called the **epicenter**. The severity of an earthquake is generally measured by its magnitude on Richter Scale, as shown below:

Richter Scale :Severity of earthquake

Less than 4 :Insignificant

4 - 4.9 :Minor

5 - 5.9 :Damaging

6 - 6.9 :Destructive

7 - 7.9 :Major

More than 8 : Great

Earthquake causes worst effects in densely populated urban regions due to collapse of high rise buildings , dams ,bridges , roads. Earthquake in hilly regions causes landslides and under the sea earthquake causes tsunami like the great tsunami in 2004.

The devastating earthquake which hit Bhuj Town in Gujarat had caused massive damage, killing 20,000-30,000 people and leaving many injured.

Earthquake-generated water waves called tsunamis can severely affect coastal areas. These giant sea swells can move at a speed upto 1000 Km/hr or even faster. While approaching the sea shore they may often reach 15 m or sometimes upto 65 m in height and cause massive devastation in coastal areas. In China such waves killed 8,30,000 people in 1556 and 50,000 in 1976. Tsunami which occurred on 11th March, 2011 in Japan resulted in 15 m high wave which lead to **Fukushima nuclear disaster (Case study).** Anthropogenic activities can also cause or enhance the frequency of earthquakes. Three such activities identified are:

- Impoundment of huge quantities of water in the lake behind a big dam.
- Under ground nuclear testing.
- Deep well disposal of liquid waste.

Mitigation steps before earthquake involves detailed information about epicenters and tectonic maps, seismic risks installation of use of earthquake sensors to keep track of seismic activities which can help in avoiding loss of life and property. Construction of earthquake resistant buildings and structures.

Post -earthquake management involves prompt evacuation of people to safe places, medical care of injured, maintenance of law and order , restoration of communication , transport system, water and food supply lines. Reconstructive phase after the disaster involves survey of the damage done, resettlement and rehabilitation of affected people, reconstruction of building and structures. Wooden houses are preferred in earthquake prone areas as in Japan.

Case studies:

- Bhuj earthquake 2001
- Indian Ocean tsunami 2004.

Cyclone

A large revolving vortices of wind, which move like spinning tops formed over sea extending horizontally up to 1000 km and vertically up to 12 to 14 km from surface. They occur in tropical coastal regions. Cyclone are also known as hurricanes , typhoons and willy-willy in the other parts of the world. Cyclones can be normal, severe or very severe depending upon the speed. Cyclone are very powerful winds causing devastation in large areas as they bring heavy rainfall and storms which floods the coastal areas. **The most devastating cyclone in Indian sub continent was recorded in Orissa 1999 ,** with wind speed of 200 to 300 km/hr **(Case study).**

Cyclone leads to death of people and animals , destroy crops , homes, buildings and cause huge loss to properties leading to great economic and financial losses.

Mitigation strategies:

- Cyclone monitoring and early warning systems help in evacuation of people in vulnerable areas. Indian Meteorological Department (IMD) forecasts location, timing, expected wind speed and magnitude of wind tides.
- The Indian coastal belt is declared as cyclone hazard zone because of which no major residential and industrial units are constructed. It stretches from Tamil Nadu to Orissa to West Bengal.
- Maintenance of communication lines important for rescue operations. Devices such as pocket radio, satellite links and Morse Code are helpful.
- Planting of mangrove trees in coastal belts act as wind and tide breakers.
- Increasing public awareness, training , preparedness towards cyclone warning can reduce casualties.

Case study:

- Hurricane Katrina 2005.

Landslides

Landslide is downward slipping of soil or rock under gravity through a sloping region. Landslides occur frequently in mountain regions. In India, the Himalayan regions and Western Ghats are prone to landslides. Landslides causes economic loss by blocking roads affecting trade and movement of people and loss of biodiversity.

Landslide can occur due to characteristics of a particular area, climate rock weathering and natural earthquakes. Man-made activities such as deforestation, change in land use and construction of roads leads to landslide in hilly regions.

Disaster mitigation involves :

- forecasting of landslides based on soil characteristics, rainfall, seismic activities and man-made construction,
- its important to have efficient warning system.
- Developmental projects should avoid overuse of natural resources and change in balance load on the mountains should be prohibited.
- Rehabilitation of people to safer areas should be done.
- Proper drainage during rains and implementation of soil erosion control steps by grass plantation, masonry wall construction and afforestation can prevent landslides.

Environmental Communication and Public Awareness

1. Public awareness can be spread through mass media like radio, TV, newspaper and magazines.
2. People can be made more aware if environmental education is being taught as a subject at school and college levels.
3. Dedicated rallies with posters, awareness and training programmes, workshops, seminars etc. related to environment concerns can be scheduled on special days designated for environment conservation such as 5th June; World Environment Day etc.

4. Ministry of Human Resources Development (MHRD) has launched the Environment Orientation to School Education scheme where special cells have been created in the State Departments of Education for environmental education.
5. Some initiatives of the MoEF are National Environment Awareness Campaign (NEAC), Mational Green Corps Programme (NGC) etc.
6. NGOs also play an important role in bringing environmental awareness.
7. Bombay Natural History Society (**BNHS**), Mumbai established in 1883 influences the conservation policies, undertakes research, publishes nationally and internationally acclaimed magazines and books.
8. The National Museum of Natural History (**NMNH**), New Delhi was opened to public in 1978 which undertakes environmental education through the means of exhibition programmes and educational activities, a large number of Nature Camps.
9. **National Green Corps** (Eco-clubs): is a programme of MoEF covering around 120,000 schools in India with NGC Eco-clubs with objective to educate children about their environment and imparting knowledge about ecosystems and the need for conservation through visits and demonstrations and involving them in conservation efforts.
10. Contributions of eminent scientist and environmentalist like Salim Ali, Indira Gandhi, MS Swaminathan, M.C. Mehta, Medha Patkar, Sunderlal Bahuguna SP Godrej, Madhav Gadgil, Charles Darwin, Rachel Carson etc
11. **Environmental Information System (ENVIS):** The Ministry of Environment and Forests, Government of India has created an Information System called Environmental Information System (ENVIS). With its headquarters in Delhi, it functions in 25 different centers all over the country.
    a. The ENVIS centers work for generating a network of database in areas like pollution control, clean technologies, remote sensing, coastal ecology, biodiversity, western ghats and eastern ghats, environmental management, media related to environment, renewable energy, desertification, mangroves, wildlife, Himalayan ecology, mining, etc.

b. The National Institute of Occupational Health provides computerized information on occupational health i.e. the health aspects of people working in various hazardous and nonhazardous industries, safety measures etc.

12. **Remote Sensing and Geographical Information System (GIS)**: Satellite imageries provide us actual information about various physical and biological resources and also to some extent about their state of degradation in a digital form through remote sensing. We are able to gather digital information on environmental aspects like water logging, desertification, deforestation, urban sprawl, river and canal network, mineral and energy reserves and so on. Geographical Information System (GIS) has proved to be a very effective tool in environmental management. Different thematic maps containing digital information on a number of aspects like water resources, industrial growth, human settlements, road network, soil type, forest land, crop land or grassland etc. are superimposed in a layered form in computer using softwares.

Applications of GIS

a. GIS is very useful for future land-use planning.
b. Interpretations of polluted zones, degraded lands or diseased cropland etc. can be made based on GIS.
c. Planning for locating suitable areas for industrial growth is now being done using GIS by preparing Zoning Atlas.
d. GIS serves to check unplanned growth and related environmental problems.
e. Our satellite data also helps in providing correct, reliable and verifiable information about forest cover, success of conservation efforts etc.
f. GIS also provide information of atmospheric phenomena like approach of monsoon, ozone layer depletion, inversion phenomena, smog etc.
g. We are able to discover many new reserves of oil, minerals etc. with the help of information generated by remote sensing satellites.
h. It also helps in identifying several disease infested areas which are prone to some vector-borne diseases like malaria, etc. based upon mapping of such areas.

Thus, remote sensing and GIS play a key role in resource mapping, environmental conservation, management, planning and environmental impact assessment.

Environmental Ethics, Role of Indian Culture and Religions in Environmental Conservation

Ethics is a branch of philosophy defining a set of cultural values which motivate and guides peoples' behavior at individual, social, regional and global levels. Environmental ethics are firmly rooted in various religions and societies. There are many religions followed in India and in one way or other they connect us to nature.

1. **Hinduism**: The ancient religious scriptures – the Vedas, the Puranas, the Upanishads, the Bhagwat Gita, the Mahabharat, the Ramayana teach environmental ethics and interdependence of human and nature.
2. **Islam**: The central Islamic religious concepts of unity, trusteeship and accountability form the basis of environmental ethics.
3. **Buddhism**: It teaches that all living beings, human and their environment are interconnected and interdependent.
4. **Jainism**: It supports non-violence to all living beings forming basis of environmental ethics. It also teaches sustenance of human life on minimum resource utilization, thereby preventing over exploitation and wastage of natural resources.

The need of the hour is to remind and integrate these religious and cultural ethics into human lives for a safe and secure maintenance of life on earth's face. We are morally responsible towards our future generation to provide them with clean and safe planet to live on.