

HUMAN COMMUNITIES AND ENVIRONMENT

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13.1 INTRODUCTION

In the previous unit we have discussed various acts enacted for the protection of environment and we also learnt various conventions and protocols framed for global environmental issues. You would have read as to how human beings have evolved in the natural systems as a result of interactive forces among the pre-existing biological forms. Though late to arrive on the evolutionary scene, human is the only life form to initiate drastic interventions in nature. Man has always been using natural resources around his dwellings to meet his basic, social and cultural needs. The customs, traditions, practices, beliefs, and rules ensured a balance between human needs and environmental conservation in ancient times. However, with passage of time this symbiotic relationship was gradually replaced by destructive dependence. At some point during this phase he apparently forgot that the ecosystem has certain carrying capacity that reflects a limit to its exploitability.

In this Unit you will learn how over exploitation of natural resources has led to environmental degradation and indiscriminate industrialisation has led to deforestation and related problems

of natural calamities, resettlement and rehabilitation. You will also be able to learn the issues related to disaster management.

Expected Learning Outcomes

After studying this unit you should be able to:

- ❖ understand the phenomenon of population growth and the human activities that are responsible for environmental degradation;
- ❖ quantify the extent to which human intervention has brought about environmental degradation;
- ❖ discuss natural calamities and their impact on society;
- ❖ highlight the need for preparedness; and,
- ❖ enumerate the issues related to human health and welfare, resettlement and rehabilitation of affected persons.

13.2 HUMAN POPULATION GROWTH

According to United Nations determinants and consequences of population trends, modern Homo sapiens may have appeared 50,000 B.C. At the dawn of agriculture almost 8,000 B.C. the world population was somewhere around 5 million. Throughout subsequent millennia the human population has been quite small. It has grown relatively slowly and even experienced occasional declines. Figure 13.1 shows the general trend of population growth in the last ten thousand years. As agriculture became more efficient, women began to bear more children and the human population increased. It was possible to grow more food in a given area of land. Hunter-gatherers were mostly nomadic and in their way of life, infants were a liability. In a stationary agricultural society, children are not much trouble and they can help in the farming. Therefore, the population increase between 10,000 BC and about 1800 AD was largely the result of increasing birth rates that coincided with the growth of agriculture.

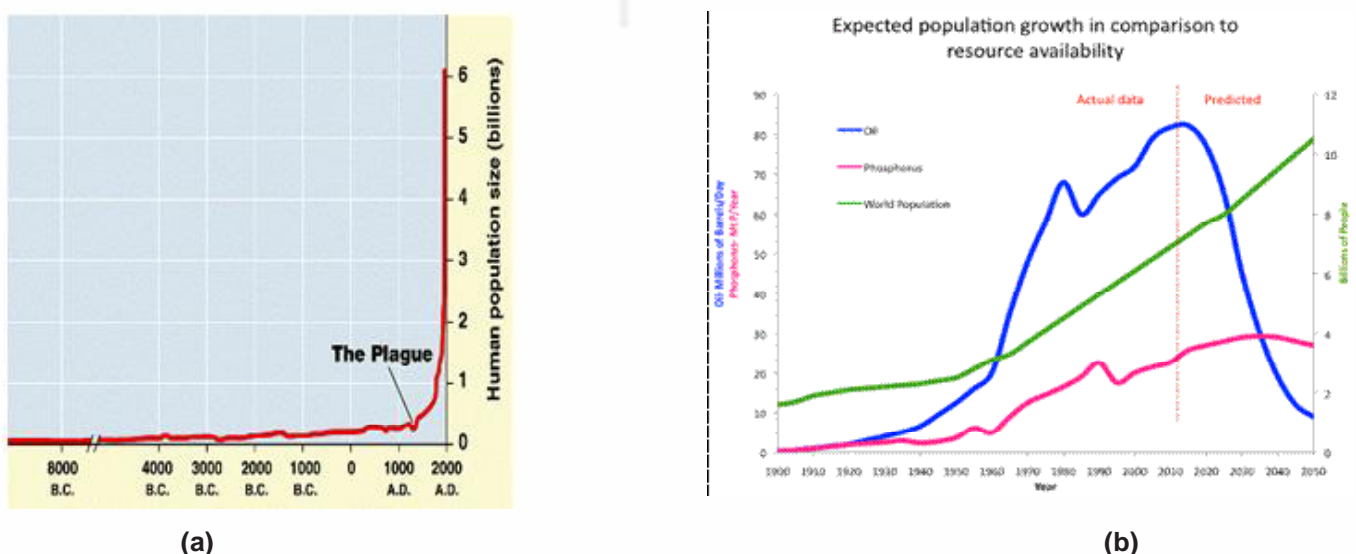


Fig. 13.1: Growth of human population. (a) In the last half million years, note the rapid upturn in the world population in the last 2000 years. (b) During the past 400 years.

But our early ancestor were vulnerable to hostile environments, food was often scarce and famine and outbreak of diseases often took heavy tolls, Thus population growth remained low due to high death rates. For example, it is believed that during the 14th century the bubonic plague killed more than half the population of Europe and Asia. This is shown in Figure 13.1 (a) as a depression.

After 1800, a second and more dramatic increase in the rate of population growth occurred. This coincided with the industrial revolution. Cities grew rapidly, goods and services became more readily available. Progress in medical sciences and improved sanitation brought down the death rates drastically resulting in exponential increase in human population. From Figure 13.1 (b) we can also see that it took several thousand years for the human population to grow to 1 billion which occurred sometimes around 1800. In marked contrast, the population doubled to 2 billion persons in only 80 years and redoubled to 4 billion in hardly 45 years. Human population is expected to be 8.6 billion by mid 2030s, 9.8 billion by mid-2050s and 11.2 billion by 2100. According to one estimate worlds food resources can sustain a maximum of 10 billion people.

13.2.1 Population Growth Trends

In the present day world, there is an improved nutrition and better health care and consequently more newly born babies survive and people live longer. While this is good news, it is major cause in upsurge of population growth. Today total world population (2018) is more than 7.6 billion and it is increasing at the annual rate of 1.18. The total population of India at independence was around 350 million (35 crore). The total size of population increased nearly three fold and reached around 1000 million by the middle of year 2000. The population has increased to 1357 million (17.74% of world population) in 2018.

13.2.2 Human Activities and Environmental Degradation

Much before we faced the effects of globalisation, calamities like floods, earthquakes, eruption of volcanoes, and forest fires were wreaking havoc on human lives. But with rapid industrialisation, exploitation of non-renewable natural resources, construction of huge dams, deforestation, indiscriminate use of chemicals and human greed for quick returns with lower inputs contributed to the escalation of the occurrence of these calamities. This, coupled with human-made disasters like nuclear accidents, industrial accidents, disposal of toxic wastes, accidents in the transportation of hazardous wastes, oil spills and emission of Green House Gases, has created a situation that threatens the existence of humanity. There are sections of scientists and social scientists who argue that all environmental calamities are human-made disasters whereas others argue that development and economic growth cannot be achieved unless we take calculated risks. These issues are debatable but the issue at stake is the survival of humanity. It is to be acknowledged that the margin between natural calamities and human-made disasters is becoming thinner gradually and this is what we are going to discuss in the following sections.

SAQ 1

Fill in the blanks.

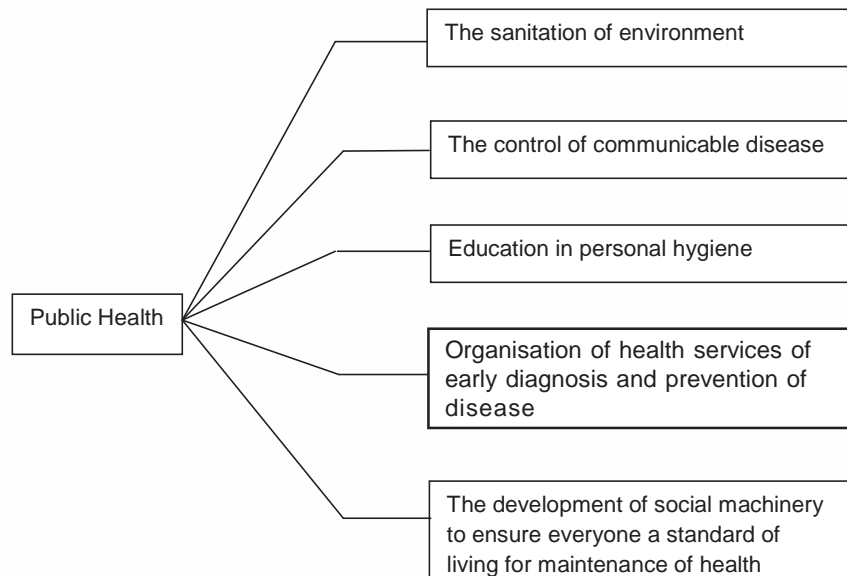
- (i) Hunter-gatherers were mostly
- (ii) After a second and more dramatic increase in the rate population occurred.
- (iii) The population has increased to 1357 million in
- (iv) Human being has to depend on resources.

13.3 HUMAN HEALTH AND WELFARE

A broad and widely used definition of health given by the World Health Organisation (WHO) is that it is “a state of complete physical, mental and social well-being and not merely the absence of disease or infirmity”. One measure of health is the ability to function effectively within a given environment. Since the physical, biological and social environment keeps on changing throughout the life of an individual, good health involves a process of continuous adaptation to such changes.

Environmental health can be defined as “the aspect of public health that is concerned with all external conditions such as all forms of life, substances, forces, problems and challenges and any other condition in the surroundings of human being that may exert an influence on their health and well-being”. Disease, in this sense, represents a maladjustment of the human being to his her environment.

Although ancient civilisations were aware of the effects of environment on health, the importance of clean environment in the modern times was realised in Europe only after the Industrial Revolution in 1842. It was known as “the great sanitary awakening”. As a consequence, the discipline of Public Health was established. It was defined as the science and art of preventing disease, prolonging life and promoting health and efficiency through organised community effort. The objectives of public health are given below.



So far, in the developing countries like ours, significant success has not been achieved for such desirable goals of public health. However, in developed countries, communicable diseases have been almost eradicated by improving sanitary conditions. So the emphasis in public health has moved to the preventive, therapeutic and rehabilitative aspects of chronic diseases and behavioural disorders, like smoking, drug abuse and alcoholism which are prevalent in these countries. Thus, today, public health gives emphasis on planning and evaluation of health activities, programmes and systems. With such challenges, public health is now termed 'Community Health'.

13.3.1 Community Health

Community health is defined more broadly and encompasses the entire gamut of community-organised efforts for maintaining, protecting and improving the health of the people. It involves motivation of the individual and groups to change the pattern of behaviour. In addition, it also seeks to plan medical care to achieve optimal health of the members of community as a whole.

Previously, the subject of community health was covered in Hygiene, Public Health or Preventive and Social Medicine.

In community health, instead of studying individuals as a patient, it is essential to understand that:

- The patient represents the community.
- Diagnosis of disease in the community, (referred to as community diagnosis) is essential.
- Planning treatment for the community is the objective.

For example a single case of a cholera patient detected in a village is a danger signal. It shows that the disease is present in the community, there may be many cases of it and unless checked its spread will grip the whole village. So the appropriate measures for treatment and control of the disease are planned in advance. Since it is a water-borne disease, water sources-river, wells or underground water are examined for infection and accordingly treated. In addition, necessary treatment for the affected people and precautions such as vaccination for vulnerable people is also done.

13.3.2 Environment-Health Relations

We have already told you that an individual's health is the result of interaction of a large number of influences upon him or her. We can divide these influences into the following three groups: i) genetic influences, ii) behavioural influences and iii) environmental influences. We will now briefly describe these influences.

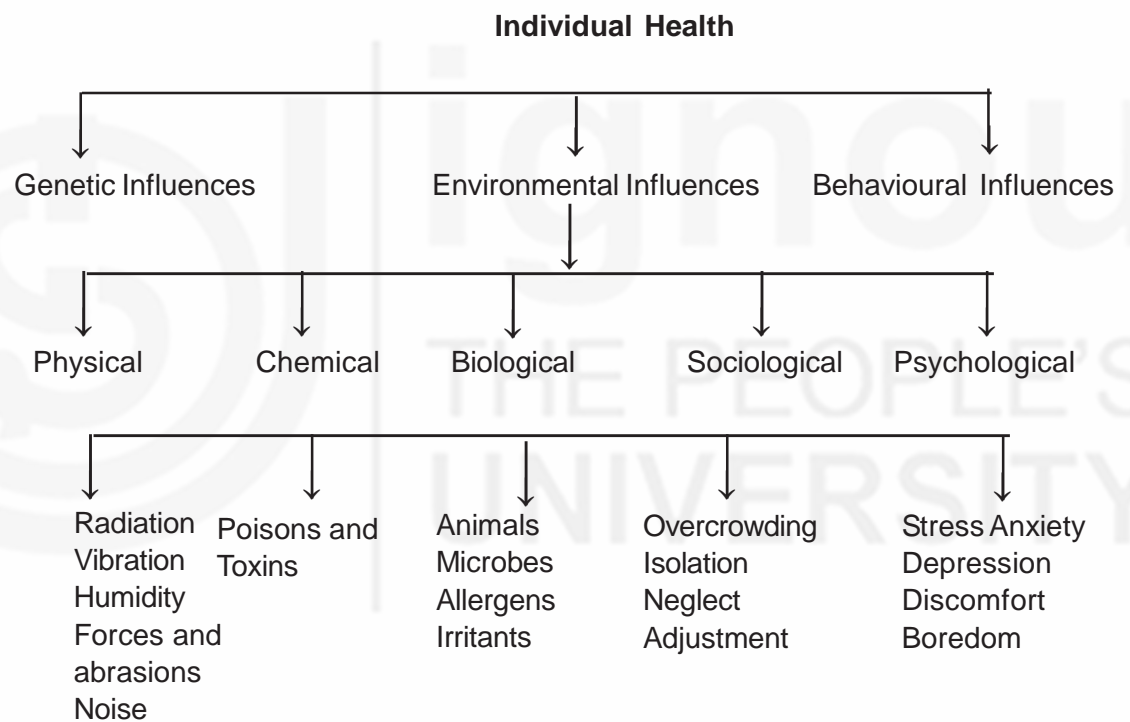
1. **Genetic Influences** : All organisms inherit a set of genes called genome from their parents. Genes determine the physical and physiological characteristics of an organism. That is why a child bears some resemblance to his parents. We also find that some human beings are born with abnormalities. The inherited abnormalities are called hereditary diseases which are passed on from parents to the offspring.

Some Common Genetic Diseases

Phenylketonuria
Haemophilia
Mongolism
Sickle-cell anaemia
Thalassaemia

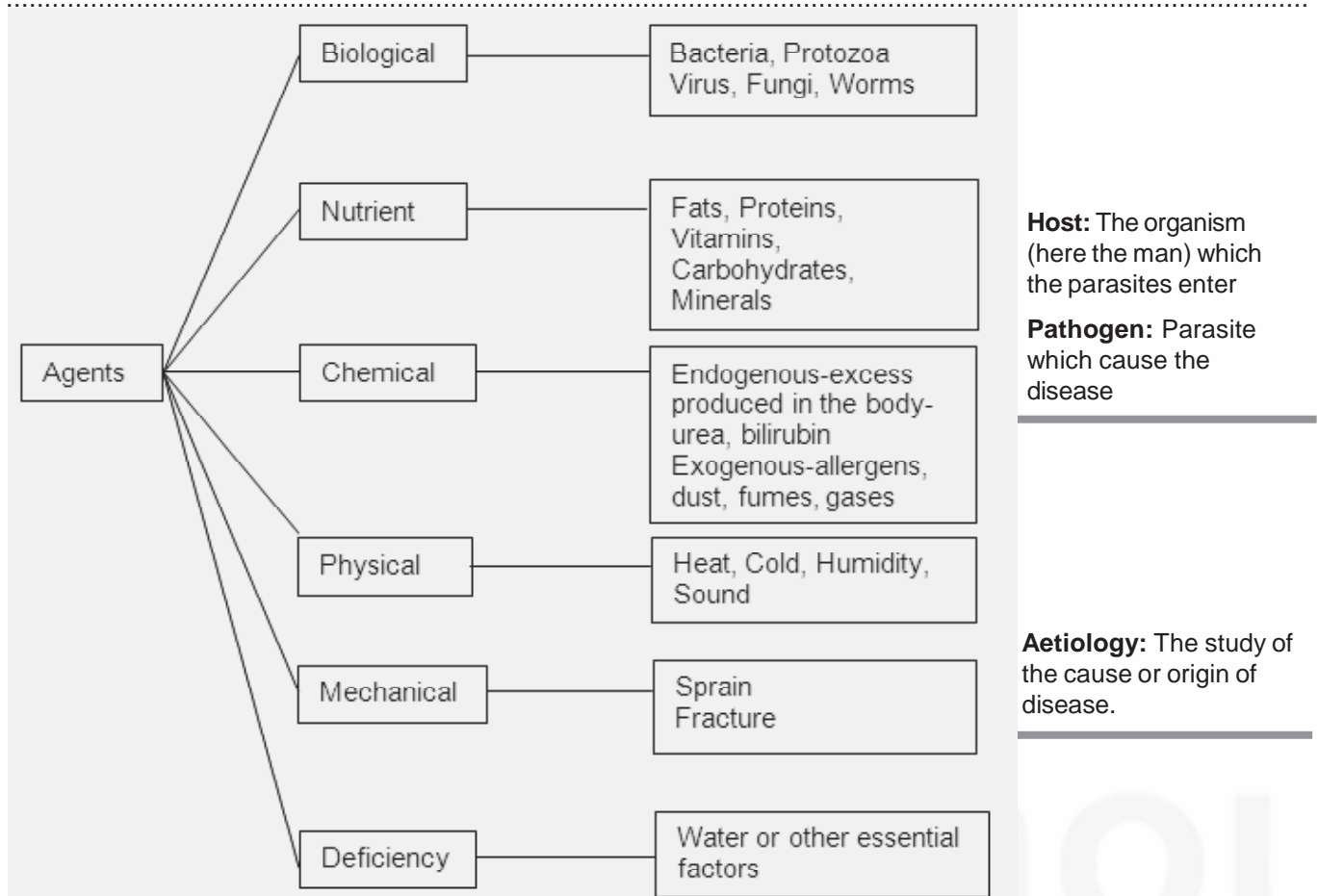
There are other diseases such as allergies, diabetes, hypertension, and schizophrenia which cannot be regarded entirely genetic in the same sense as hereditary diseases. However, they are due to the **interaction of genes with environment**. These diseases are triggered and affected by nutrition, stress, emotion, hormones, drugs and other environmental interactions. In other words, they would not occur if the environment is favourable for the person. Such diseases are referred to as due to genetic influences.

- 2) **Behavioural Influences** : Alcoholism, smoking, drugs, chewing tobacco, or irregular food habits result in various kinds of ill-health. The habits of a person change throughout ones life time. These depend upon self-responsibility, nutritional awareness, stress management, physical fitness and environmental sensitivity of an individual.
- 3) **Environmental Influences**: You know the various components of environment. All of them exert influences on our health. As shown below these are physical, chemical, biological, sociological and psychological.



Agents of Ill-health

The agent of ill health or disease may be living or non-living matter, a tangible or intangible force, an excess or lack of a substance in the body. In some ailments like heart disease and peptic ulcer. the causative agent is not known. By and large, these agents are classified as given below:



13.3.3 Preventive and Mitigatory Welfare Measures

Disease is a complicated interaction between human and environment. Not long ago, human beings were victims of epidemics of plague, smallpox, cholera, influenza, etc. over which they had little control. Advances in science and technology have helped to understand these diseases and find their control. It was found that the spread of these diseases is linked with the environment. The deteriorating environment poses danger to the present and the future generations with new types of health problems. Hence, appropriate measures need to be taken immediately. However, the options we can exercise are rather limited and not clear-cut since they entail both costs and benefits.

The demands of modern life, it appears, cannot be met without compromising the quality of 'internal' environment. Let us take an example. Many of the serious ailments are due to the life style people have. One kind of situation arises from highly competitive culture, the so called rat race that brings physical comfort, but also tension, worries about work, career, economic status, etc. Tensions, worries and frustration can also predispose people for stress-related illnesses. In the other group are people who lack proper nutrition, poverty and ignorance suffer from various types of physical as well as psychological illnesses.

SAQ 2

- a) Which among the following diseases are due to genetic influences?
- i) Schizophrenia
 - ii) Hypertension
 - iii) Hemophilia
 - iv) Diabetes
 - v) Allergies
 - vi) Sickle cell anaemia
 - vii) Mongolism (Down's syndrome)
 - viii) Alcoholism
- b) Match the following types of environmental influences with their respective category

Environmental Influences	Category
a) Toxin	i) Psychological
b) Radiation	ii) Biological
c) Stress	iii) Physical
d) Microorganism	iv) Sociological
e) Neglect	v) Chemical

13.4 NATURAL DISASTER

According to the World Health Organisation, an environment disaster or calamity is an event that causes damage, economic disruption, loss of human life and deterioration in the health and health services on a scale sufficient to warrant an extraordinary response from outside the affected community or area.

Natural calamities adversely affect the lives of a large number of people, causing considerable damage to infrastructure and property. The ill effects are more pronounced in developing countries due to the lack of preparedness, lack of systems for sufficient warning, and lack of facilities for quick access to the site of calamity.

At the global level, Asia is more prone to natural calamities. It is reported that for each major natural calamity in Europe and Australia, there are ten in Latin America and Africa and fifteen in Asia. According to CRED World Disaster Report (1998), the ratio of those killed to those affected depends on the type of calamity, degree of preparedness and the density of population. Table 13.2 gives the annual average number of people killed or affected over a period of ten years (2005-2014).

Table 13.2: Annual average number of people killed or affected over a period of ten years (2005-2014).

Country	People Killed (approximate)	People Affected (approximate)
Bangladesh	10433	42307931
India	28777	144142963

Nepal	2683	2197638
Pakistan	82802	49784339
Sri Lanka	832	9842558
Bhutan	24	20028
Maldives	Data not available	204649

Source: CRED World Disaster Report (2015)

Natural calamities could be broadly classified under the following headings:

- i. **Atmospheric** – Rains, Hail storms, winds, lightning, fog, heat/cold waves, etc.
- ii. **Hydrological** – Floods, sea-shore waves, glacier advances, water logging, etc.
- iii. **Geological** – Land slides, avalanches, earthquakes, volcanic eruptions, shifting sands etc.
- iv. **Biological** – severe epidemics (in humans, plants, animals), forest fires, pest invasions (locusts) etc.

Under certain circumstances development can increase disaster proneness. The location of a dam in an area of high seismic activity, the construction of roads in difficult terrains or unstable geomorphologic conditions and promotion of water intensity crops in areas off unpredictable rainfall are examples of development measures dictated by policies of globalisation leading to or aggravating the phenomena of natural disaster. In spite of the absence of prediction mechanisms to pinpoint the location, the timing and intensity of natural disasters, the preparedness, appropriate management, the pre and post operative mechanisms would go a long way in mitigating people's suffering.

Let us now discuss briefly various kinds of natural disasters.

13.4.1 Earthquakes

It is now generally accepted that an earthquake occurs due to vibrations(s) of the Earth produced by the release of energy. This energy radiates in all directions from its source (epicentre). Earthquakes can also occur because of atomic (nuclear) explosions or by volcanic eruptions. Large reservoirs with their hydro-static pressure of water may also induce earthquake.

In Fig. 13.3 you can see the various seismic zones of India. These are explained below:

- **Zone V:** This is the most severe seismic zone and is referred to as Very High Damage Risk Zone.
- **Zone IV:** This is referred to as High Damage Risk Zone.
- **Zone III:** This is termed to as Moderate Damage Risk Zone.

- **Zone II:** This zone is referred to as Low Damage Risk Zone.
- **Zone I:** This zone is termed as Very Low Damage Risk Zone.

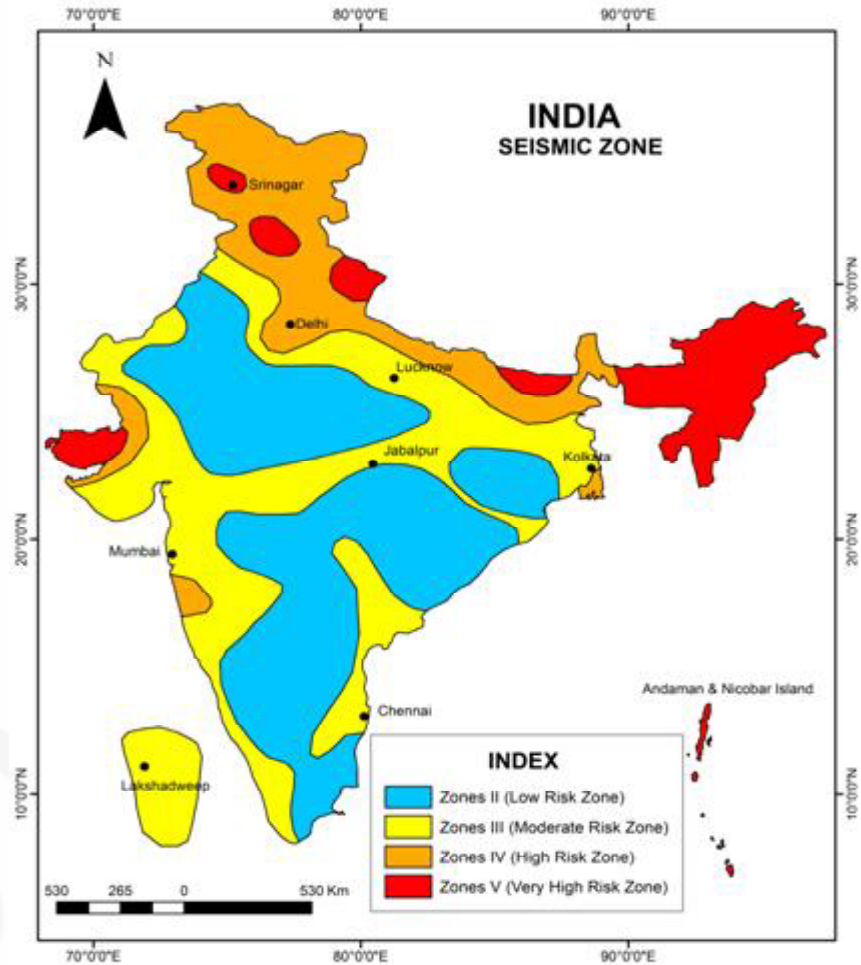


Fig. 13.2: Seismic zones in India.

In order to understand the strength and severity of an earthquake, it is necessary to measure its intensity. There are several methods to measure the intensity of the effect an earthquake produces on life and property. The Richter scale describes the amplitude of the earthquake wave radiating out in all directions from the focus (epicentre) which is closely related to the amount of energy released. This is also a measure of ground motion as recorded on a seismograph.

It is now accepted that people must be made aware of the methods of minimising the risks. Training the public in Earthquake Resistance Construction in the earthquake prone areas may yield some results.

13.4.2 Floods, Cyclones and Tsunamis

Water is essential for life. Water cycle ensures that the water that drains into the sea, evaporates and comes back as clouds to rain and snow over the earth, bringing fresh water. However, there are certain phenomena associated with the flow of water in nature that can cause untold misery to human beings. Principal among these are: floods, cyclones, hurricanes, and landslides. Tsunami caused a great deal of damage in South Asian countries and,

therefore, we have included it in our discussion. We discuss some of these calamities briefly.

Floods

Floods are the most common of all natural calamities (Fig. 13.3). Floods regularly claim thousands of lives and adversely affect millions of human beings annually worldwide. Bangladesh and India together account for over two-third of global death count each year. More than the loss of life and damage to property, millions of people are displaced every year due to floods in the South Asian countries.

A flood is the discharge of water that exceeds the canal capacity of the river. Floods are caused by different factors that include:

- climate extremes – heavy and prolonged rainfall
- melting of snow and ice
- collapse of dams
- deforestation and land slides
- silting of river beds reducing the carrying capacity of rivers
- lack of coordination between officials of adjoining countries or states facing similar problems.



Fig. 13.3: Village is over flooded with water.

It is possible to reduce the adverse effects of floods by construction of dams and reservoirs at appropriate places, strengthening the embankments on rivers and canals, improving the carrying capacities of rivers, canals and reservoirs by periodical deepening and deepening operations.

Weather forecasting and flood plain management techniques can help in minimising casualties and damage.

Cyclones

One of the most common coastal calamities is the cyclone. Cyclones claim many lives and cause immense damage to property every year.

Cyclones are caused in the tropical belt when sea water gets heated up to 27°C and more, so that low pressure areas develop above the water levels. The low pressure areas remain stationary for three to four days and draw energy from the sea surface. As the pressure in the centre falls, the wind speed increases and cloud burst starts spiralling around the centre causing squalls. As the pressure falls in the centre, the winds in the surrounding areas rush inwards creating spirally moving storms. The cyclone then moves landward towards areas of lowest pressure. Strong winds and heavy rain destroy and annihilate weather comes in their way.

A tropical cyclone that struck northern Bay of Bengal in 1970 caused tidal waves of 6 meters height killing three hundred thousand people and destroying 65% of the total fishing capacity of the coastal region.

Today, with the advancement in weather prediction techniques, remote sensing satellites and cooperation between countries in sharing information on weather conditions, it is possible to predict the birth of a cyclone and monitor its movements to pinpoint the area where it is likely to hit the coast. In spite of this, the damage caused is very severe, the well planned relief operations going haywire in the last minute.

Tsunamis

A tsunami is a wave in the ocean or in a lake that is created by a geological event. They are also known as tidal waves or seismic sea waves (Fig. 13.4). Most tsunamis are very weak and have heights of only a few centimetres. But the intensity varies from time to time. Near the place of origin tsunamis may have height of many meters. As they spread out or move into the deep ocean, their heights decrease. However, their heights increase again as the tsunami waves reach shallow water near impact areas. The expected heights for the larger tsunamis are around 9 – 20 meters. Tsunamis are most often caused by earthquakes and landslides. Volcanic eruptions can also cause tsunamis.



Fig. 13.4: A sight of Tsunamis.

On 26th December 2004 the Indian coastline experienced the most devastating tsunami in the recorded history. The tsunami was triggered by an earthquake of magnitude 9.0 on the Richter scale at 3.4° N, 95.7° E off the coast of Sumatra in the Indonesian Archipelago at 06:29 hrs IST (00:59 hrs GMT). It devastated the shores of **Indonesia, Sri Lanka, India, Thailand**, and other countries with waves of up to **15 m** high, even reaching the east coast of **Africa, 4500 km** west of the **epicentre**. Almost 79,900 people were killed by the earthquake and tsunami in Indonesia. Tsunami killed at least 41,000 people in Sri Lanka, 10,000 in India, and 4,000 in Thailand.

The mangrove forests and coral reefs are natural defences against tsunamis.

Box 13.1 : Mangroves as a Shield

“Though we cannot prevent the occurrence of such natural calamities, we should certainly prepare ourselves to mitigate the impact of the natural fury on the population inhabiting the coastal ecosystems. Our anticipatory research work to preserve mangrove ecosystems as the first line of defence against devastating tidal waves on the eastern coastline has proved very relevant today. The dense mangrove forests stood like a wall to save coastal communities living behind them,” said M.S. Swaminathan, Chairman, M.S. Swaminathan Research Foundation (MSSRF), Chennai. The mangroves in Pitchavaram and Muthupet region acted like a shield and bore the brunt of the tsunami. (The Hindu, 28 December, 2004).

The massive loss of life and property caused by Tsunami of 2004 could have been avoided if only we had an advance warning system. It was therefore decided to install the equipment required for predicting tsunamis. The indigenous warning system includes putting in place a Deep Ocean Assessment and Reporting System, around 20 data buoys and a software programme that would help predict the location, time and height of any tidal formations like tsunamis based on the changes and disturbances detected underwater following seismic changes. India has tied up with the Pacific Tsunami Warning Centre and countries such as Indonesia, Thailand and Myanmar for the required international co-operation in its proposed software programme for the networking of the available data on tsunami and deep water oceanic changes.

13.4.3 Droughts

A ‘drought’ can be defined as a prolonged period of unusually dry weather, with little rainfall, in a region where rains are normally expected (Fig. 13.5). As such a drought differs from a dry climate which is usually associated with a region that is normally or seasonally dry. Droughts often last for years. Drought is a creeping calamity because it develops slowly and has a prolonged existence.



Fig. 13.5: A scene of drought hit region.

Box 13.2 : Drought in Rajasthan – 2000

Rajasthan, the largest State in India with an estimated population of about 54 **million** was in the grip of a **severe drought in the year 2000**. Out of the 32 total district in the State drought was prevalent in 31 districts and among these 25 districts were affected severely. Around 73.64% villages were under the clutches of drought; affecting nearly 33.04 million people and 39.97 million cattle. The severity of the drought could be judged from the fact that **out of a total of 2647 major water reservoirs only 300 were filled in that year. Also, nearly 75 to 100% crop had been destroyed due water scarcity**. All this caused loss of livelihood leading to mass migration in search of employment.

Source: <http://www.un.or.in/UNDMT/states/rajas/dstatus.html>

Though climate is usually the prime reason for the triggering of drought, the situation is often made worse by the way people use the water resources. Felling trees for firewood, denuding the forest for agricultural or housing purposes, mining, unscientific farming method, indiscriminate drawing of ground water are identified as causes of droughts. It is argued that serious droughts in developing countries are more a function of global development policies than climatic conditions.

Droughts produce a series of direct and indirect impacts that usually extend far beyond the area experiencing the actual water shortage. These may be classified as

Economic – loss of crop, dairy, livestock, fishery produce;

Environmental – Damage to plant and animal species, erosion of soils; and

Social – Food shortage, damage to health, conflicts between water users.

It is possible to take precautions in drought prone areas by constructing reservoirs, educating people in water conservation, scientific farming and optimal use of ground water resources.

Ground water, which is found in aquifers below the surface of the Earth, is one of the most important natural resources. Ground water accounts for about 38 percent of the water in India and the city water departments supply this to

households and businesses (public supply). It caters to the need of drinking water for more than 97 percent of the rural population.

We now recount an illustrative example of proactive water harvesting in India.

Water Harvesting Measures

One of the effective measures to combat drought and the resulting water shortage is to adopt water harvesting measures. It means capturing rain where it falls or capturing the run off in your own village or town and taking measures to keep that water clean by not allowing polluting activities to take place in the catchment area. The water harvesting can be undertaken through a variety of ways. Some of these are:

- Capturing runoff from rooftops,
- Capturing runoff from local catchments,
- Capturing seasonal floodwaters from local streams, and
- Conserving water through watershed management.

These techniques can serve the following purposes:

- Provide drinking water,
- Provide irrigation water,
- Increasing groundwater recharge,
- Reduce storm water discharges, urban floods and overloading of sewage treatment plants.
- Reduce seawater ingress in coastal areas.

Box 13.3 : A Case Study of Hyderabad Metropolitan Water Supply and Sewerage Board

The Hyderabad Metropolitan Water Supply and Sewerage Board (HMWSSB) has set up an ambitious plan of taking up several water harvesting measures in the twin cities of Hyderabad and Secundrabad and its vicinity through active involvement of people to improve the ground water level. The water harvesting measures, under the Neeru-Meeru (Water and You) Programme, include construction of recharge pits or a mini-treatment units, planting saplings or any other action that would improve water recharge, and green cover which ultimately increase the ground water levels. They have plans to sensitise different opinion makers like ex-servicemen, retired officials, women's groups and NGOs.

The groups would be sensitised on motivational aspects and techniques of various water harvesting structures. The trained groups would in turn reach out to communities to explain its benefits. As part of the strategy, the Board has recently created water soldiers, by sensitising ex-servicemen. It has also proposed to involve the student community in a big way so that the schools, colleges and other institutions would contribute to the cause of improving ground water table, thus enabling it to cover 25% of the 7 lakh houses with some type of water harvesting method. You can find out more about this effort at the website:

Source : http://www.hyderabadwater.gov.in/RWH_Note.html

You may like to reflect on the issues discussed so far. Try the following SAQ.

SAQ 3

Match calamities given in **Column A** with the statements of **Column B**:

Column A

- i) Earthquakes
- ii) Flood
- iii) Cyclone
- iv) Tsunami
- v) Drought

Column B

- a) Discharge of water exceeding the canal capacity of the river.
- b) Caused in the tropical belt when sea water get heated up.
- c) A wave in the ocean created by geological events.
- d) A prolonged period of unusually dry weather with little rain falls.
- e) Energy radiates in all direction from its epicentre.

13.5 PREPAREDNESS FOR DISASTER MANAGEMENT

There have been specific ways of countering and minimising natural disasters or calamities in general but some important strategies can be adopted.

Emergency preparedness is viewed as a programme of long term development activity whose goal is to strengthen the overall capacity and capability of a country to manage efficiently all types of emergencies and bring about an orderly transition from relief through recovery and back to sustainable development.

Emergency preparedness is an on-going multi-sectoral activity. It forms an integral part of the national system responsible for developing plans and programmes for emergency management, prevention, mitigation, preparedness, response, rehabilitation and reconstruction.

We now briefly describe the United Nations Environmental programme (UNEP) for disaster management.

Box 13.4 : Prevention and preparedness to reduce the costs of disasters

The fundamental goal of the United Nations Environment Programme (UNEP) disaster management programme is to reinforce the centrality of environmental concerns in disaster management. The other cornerstone is the adoption of preventive strategies and practical measures to reduce the potential loss of human lives and property, as well as destruction of the environment.

The success of this approach depends on increasing public awareness of the risks that natural, technological and environmental hazards pose to societies, and on educating people about the value of existing approaches for prevention and preparedness. UNEP contributes on this process through its programmes on environmental law, early warning and assessment, and Awareness and Preparedness for Emergencies at Local Level (APELL).

APELL programme, developed in conjunction with governments and industry, recognises that the incidence and effects of environmental disasters can be reduced by prevention and preparedness initiatives at the local level. The APELL concept has been successfully introduced to more than 30 countries and in more than 80 industrial communities worldwide.

The figure below presents the framework for disaster management. You may like to examine its applications in your specific context and modify it.

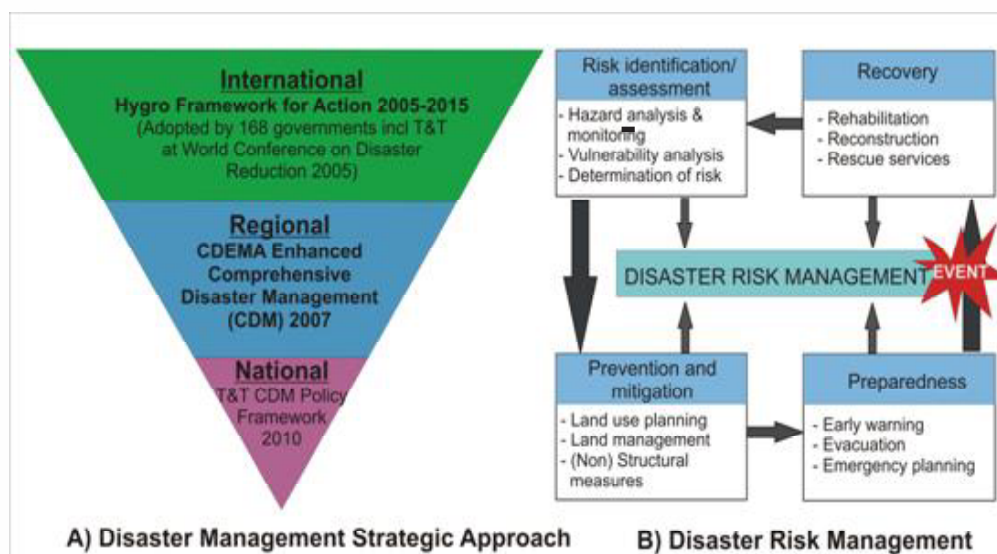


Fig. 13.6: A framework for disaster management.

Effective risk management of any calamity depends on the implementation of a sequential series of actions. The individual stages often overlap but it is crucial that they operate as closed loop because the major objective is to learn from the past experiences and prepare an action plan based on the feedback.

- Pre-planning covers a wide range of activities like construction of defensive engineering works, land use planning, formulation, dissemination and maintenance of evacuation plans;
- Preparedness for disaster management reflects the degree of alertness, immediately before and after the occurrence of calamity, arrangement for emergency warnings and preparedness based on earlier experiences;
- Response deals with events immediately before and after occurrence of the calamity and pressing into service relief activities;

- Recovery and reconstruction are long term activities that attempt to return to normalcy after the occurrence of the calamity.

It is unfortunate but true that environment is clearly not something which humans value. It is usually low on the priorities of people except when they are faced with threats to their own lives or immediate possessions.

We end this section with an exercise for you.

SAQ 4

- a) What steps can be taken to prevent and mitigate human suffering due to droughts?
-

13.6 RESETTLEMENT AND REHABILITATION OF PEOPLE: PROBLEMS AND CONCERNS

It is a well-known fact that both natural and human made disasters force people to move out of their land. For example, Tsunami in South Asia in December 2004, Latur and Gujarat earthquakes, the Orissa super-cyclone and scores of floods and droughts in other parts of our country have rendered thousands of people homeless and jobless. Disasters, like the Bhopal gas tragedy in Union Carbide factory, derailment of trains, are examples of human made disaster. Landslides, common in the Himalayas, are example of nature's fury rendered damaging manifold due to faulty planning.

Strategies for rehabilitation of such displaced people are in the first place by way of preventive action. For instance, care is taken to build earthquake proof houses, gather advance information about cyclones and arrange for timely evacuation, build appropriate bunds in flood prone areas, maintain bridges that take regular up and down passing of trains/ road transport vehicles on them in order to avert likely disasters.

Secondly, advance preparation on the part of administration and local communities are made to face the consequences of sudden calamities. For both these, the primary necessity is that of creating awareness among the people in general and among administrative personnel in particular.

Development projects such as roads, dams and mining come into existence after a fairly long period of planning and awareness of displacement caused by such projects already exists among those who initiate the projects. Despite this, the project authorities pay little attention to the processes of resettlement and rehabilitation of displaced people. Those who give up substantial portions of their assets for the sake of development projects need to be recognized as stakeholders in development projects. They too should benefit from the development.

This section provides guidance for all stakeholders in collaborating to achieve equitable and appropriate support for all of the affected population, depending on their needs.

Shelter, Settlement, and Reconstruction

1. Shelter is critical to survival. From the emergency phase until durable solutions, it is necessary to provide security and personal safety. Shelter and settlement support human dignity and family and community life.
2. More secure shelter in a safer settlement constitutes the immediate and sustainable physical foundation to livelihoods development.
3. Transitional reconstruction begins immediately after a disaster, as people recover what they can, however, for those affected badly it can often occur over a number of years. During transitional reconstruction, some people move, for example from owning an apartment to renting a house. For others, such as those squatting in informal settlements, a disaster may offer an opportunity for a sustainable and legal solution to their housing needs.

13.7 CASE STUDIES AND PEOPLE'S MOVEMENT

Though legislations and regulations are the foundations of most environmental protection policies, the global nature of resources and pollution make international legislations and conventions essential. Public interest Litigations and People's Movement have also played very important role in environmental protection. In this section we will take up a few cases of PIL and people's movement in India against environmental degradation.

Taj Trapezium Zone

Problem of pollution has now become so severe that it is not only affecting human health and livestock but it is also damaging buildings and monuments. Over the past four decades, the fate of the India's most emblematic monument, the Taj Mahal, has repeatedly come into the spotlight because of the ill effect of the pollution caused by the iron foundries, Mathura refinery, glass factories of Firozabad and brick kiln in the Taj Trapezium Zone (TTZ). This is the area around Taj spreading over 10,400 sq.km. On repeated occasions, sulphur dioxide emissions from industries in this area reached levels ten times above the prescribed standard level. Combined with oxygen and moisture, sulphur dioxide converts to highly corrosive acid, sulphuric acid.

Blaming pollution and regulatory negligence of Taj's decay, Mahesh Chandra Mehta, a prominent environmental lawyer, filed a case before the Supreme Court of India in 1984. Mehta pleaded with the court to order the various industries to take anti-pollution measures or to close. He also stressed that pollution was affecting the health of the workers and people living in Agra. Because of Mehta's efforts, in 1996, the Supreme Court finally ruled that the industries in the area were actively contributing to air pollution and ordered major industries units to install pollution control devices. "Not even one per cent chance can be taken when human life apart- the preservation of a prestigious monument like the Taj is involved," stated the court order. The court ordered 292 coal-based industries to switch to natural gas or else to relocate outside the protected zone by April 30, 1997. Because of the

opposition from industries and workers court order was not enforced completely. The Supreme Court struck again in 1997 ordering the closure of 53 iron foundries and 107 other factories in Agra that had not cleaned up their act. The Supreme Court later also banned cars and parking within 500 meters of the Taj's boundary walls. Experts agree that some of these measures have helped to improve air around the Taj.

Chipko Movement

From the last 19th century the Himalayan forests, have been subject to rapid exploitation (Fig. 13.7). This large-scale destruction has led to severe ecological problems. Rapid soil erosion, growing frequency of floods, reduction in the availability of firewood and fodder, landslides and disappearance of water table, caused concern among people. In upper Alkananda Valley. People also resented the conversion of natural forests into monoculture plantations.



Fig. 13.7: Chipko Movement.

To check environmental degradation in this region, voluntary organizations like the Gangotri Gram Swarajaya Sangh (GGSS) in Uttarakashi and Dasholi Gram Swarajaya Mandal (DGSM) in Gopeshwar started Chipko Movement in the 1970s. Environmentalists like Chandi Prasad Bhatt and Sunderlal Bhauguna led the Chipko Movement in Garhwal Himalayas.

Chipko means to hug the tree. Volunteers in their attempt to stop commercial felling threatened to hug the trees if the saws came near them. Their activities popularised the movement through folk songs, street plays and widespread campaign. Its slogan was "What do the forest bear? Soil, water and pure air, Soil, water and pure air are the basis of life".

As a result of this struggle, the Government replaced the contractor system and formed Uttar Pradesh Forest Department Corporation (UDFDC) and the forest related activities were encouraged through local cooperatives. In 1981, as a response to Sunderlal Bahuguna's indefinite fast, the Government constituted an eight member expert committee to prepare a comprehensive report on the Himalayan forest policy. The government later put a fifteen-year moratorium on commercial tree fellings in the Uttarakhand Himalayas.

Silent Valley Movement

This movement is regarded as one of the most important ecological movements in India. Silent valley is the narrow valley of the Kunthi River in the state of Kerala in the south west of India at high elevation (Fig. 13.8). Its 8950 hectares of rain forest is rich with valuable plants and animals. In 1973, the state government of Kerala decided to build a dam across the gorge in order to generate hydro electricity. It would have drowned valuable forest and threatened the loss of wild life. Even the government's ecological task force expressed its dissatisfaction over the loss of forest and wild life.



Fig. 13.8: Silent Valley

By 1979, students, voluntary organization like Kerala Sastra Sahitya Parishad (KSSP), science forums, teachers, progressive citizens and journalists began to work against the project. In 1979, Save Silent Valley Committee emerged. This hue and cry among all circles led the government headed by the then Prime Minister Mrs. Indira Gandhi, to set up a high-level technical committee chaired by Prof. M.G.K. Menon and accepted its recommendation that the project should not be proceeded with and that the Valley should be preserved as a precious biosphere reserve.

SAQ 5

Fill in the blanks, with appropriate words.

- i) Both natural and human made force people to move out of their land.
- ii) is crucial to survival.
- iii) has banned cars and parking within 500 meters of the Taj boundary.
- iv) like Chandi Prasad Bhatt and Sunder Lal Bahuguna led chipko movement in Garhwal Himalayas.
- v) is the narrow valley of the Kunthi river in the state of Kerala.

13.8 SUMMARY

Let us summarise what we have learnt so far:

- The primitive hunter-gatherers skilfully manipulated their environment in a way that it would not deplete future supplies. In contrast, agriculture has had a conspicuous impact on the environment. Industrial societies intensively utilized the environment.
- Industrialization surpasses the environmental impacts of permanent agriculture. For most of human history, people lived in small groups and population grew at a slow average rate. As a result of industrialization and medical development, average growth rate increased rapidly. The rapid increase in population size had severe effects on the other species, and, on the air, water and soil upon which we and other forms of life depend.
- The health of an individual is affected by genetic, behavioural and environmental influences. Disease represents a maladjustment of human beings to their environment.
- Since the individual of a community share a common environment, their health problems are generally common. Therefore, these are investigated and healthcare is planned at the community level.
- Most natural calamities like earthquakes, floods, droughts, and cyclones cannot be predicated in advance and when they occur they cause great loss of life and extensive damage to property and infrastructure. Natural calamities have been occurring from times immemorial but of late the damage caused has become qualitatively and quantitatively more.
- Under certain circumstances development can increase disaster proneness. The location of a dam in an area of high seismic activity, the construction of roads in difficult terrains or unstable geomorphologic conditions and promotion of water intensity crops in areas of unpredictable rainfall are examples of development measures dictated by policies of globalisation leading to or aggravating the phenomena of natural calamities.
- In spite of the absence of predication mechanisms to pinpoint the location, the timing and intensity of natural disasters, the preparedness, management, the pre and post operative mechanisms help in the mitigation of people's suffering and in reconstruction mechanisms.
- It is well known that both natural and human made disasters force people to move out of their lands.
- Strategies for rehabilitation and resettlement for displaced people are in the first place by way of preventive action. Provision of shelter is top priority.
- Taj Trapezium zone, Chipko movement, and Silent Valley movement Narmada Bachao Andolan are a few cases of PIL and people's movements in India against environmental degradation.

13.9 TERMINAL QUESTIONS

1. What factors have led to the rapid growth of population in the world? Why is it important to contain our population growth?
2. Discuss the causes of flood in your region? What steps can be taken to prevent and mitigate human sufferings due to floods, cyclone and tsunami?
3. Analyse the various dimensions of natural disaster management.
4. Describe the need for resettlement and rehabilitation of people following a natural disaster.
5. Discuss the following
 - a) Taj Trapezium zone
 - b) Silent Valley Movement
 - c) Chipko Movement.

13.10 ANSWERS

Self-Assessment Questions

1. (i) nomadic ii) 1800, growth iii) 2018 iv) natural
2. A. iii), vi), vii)
B a) v b) iii c) i d) ii e) iv
3. i) e ii) a iii) b iv) c v) d
4. The question is based on section – 13.4 but while answering this question you refer to subsection 13.3.3 with regard to drought.
5. (i) disasters (ii) shelter (iii) Supreme court (iv) Environmentalists
(v) Silent Valley

Terminal Questions

1. Refer to section 13.2
2. Refer to sub-section 13.4.2
3. Refer to section 13.5
4. Refer to section 13.6
5. Refer to section 13.7

13.11 FURTHER READING

1. Botkin, D. B. & Keler, E. A. 8th Ed, (2011) *Environmental Science, Earth as a Living Planet*, New Delhi: Wiley India Pvt. Ltd.
2. Kapur, A. (2010) *Vulnerable India*, New Delhi: Sage India Publication Pvt. Ltd.

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Acknowledgement

1. Fig. 13.4: A sight of Tsunamis.
Source: <https://www.sutori.com/item/untitled-264a-d50b>
2. Fig. 13.5: A scene of drought hit region.
Source: <https://www.thehindu.com/sci-tech/A-video-on-groundwater-depletion-in-India/article16876049.ece>
3. Fig. 13.7: Chipko Movement.
Source: <https://www.indiatimes.com/news/india/chipko-andolan-was-the-strongest-movement-to- conserve-forests-india-needs-it-again-342183.html>
4. Fig. 13.8: Silent Valley
[https://commons.wikimedia.org/wiki/](https://commons.wikimedia.org/wiki/File:Kuntipuzha_River_in_Silent_Valley_National_Park.jpg)
File:Kuntipuzha_River_in_Silent_Valley_National_Park.jpg