

UNIT II Core Component

The syllabus for the core course on environment education for higher secondary stage has been reproduced in Annexure-I. The syllabus perceives environment as an interconnected system of a variety of components namely people, institutions, knowledge, artefacts, geosphere (atmosphere, hydrosphere, lithosphere), biosphere (ecosystems, biological populations), energy, material, and information flows. In order to comprehend the scope and coverage of each of the topics, a brief writeup is presented here.

Chapter 1

PEOPLE AND ENVIRONMENT

1.1 Humans as an Integral Part of the Environment

The introductory section of this Handbook very well brings out how humans mould the environment and are, in turn, moulded by it. They are very much an integral part of the environment. The quality of life of individual human beings hinges on the quality of the environmental matrix in which they are embedded. The institutions they construct, whether it be industries or judiciary determine the quality of this environment. In turn, people construct institutions such as the Pollution Control Boards in response to the quality of their environment. Individual as well as institutionalised knowledge, whether of fishing or of pesticides, often relates to environment and significantly impacts it. Many of their concerns, such as drinking water or traffic congestion relate to environment and prompt activities that impact the environment (see figure 1.1a).

1.2 Growth in Human Numbers over Historical Times

The change in number of individuals per unit area in a given locality is an important variable that has linkages with several other components of an ecosystem. This variable indicates that the population of a particular species varies along two dimensions. For example, human population is dense in the fertile *doab* of Ganga and

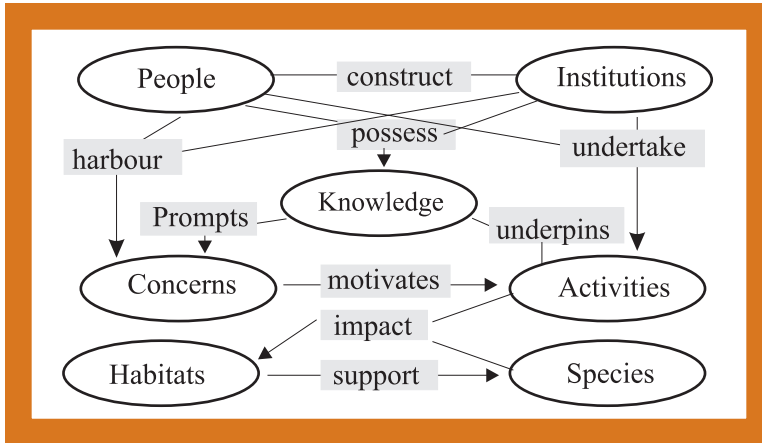


Fig. 1.1a: The Humans as an integral component of the environmental system

Yamuna plains, but it decreases as one moves along the rivers to their origins in the Himalayas. Now imagine the scenario of western Punjab along the Indus river where Harappan population thrived around 2000 BC. During that period the eastern region of Indus around Kalka in the *Shivaliks*, was a barren land. Presently, the latter area is densely populated by human habitation. This second dimension, indicates change over a period, long or short, and is the measure of growth of a population.

The rapid increase in human population for the last one thousand years or so has become a common concern for the world today. This growth in human numbers is now regularly monitored through the census surveys and forms the basic component of the planning process all over the world. Demographers have been speculating about human numbers over its long journey from the dawn of cultural evolution. Their estimates suggest world population between one to five million around 10,000 BC. Though, man was still a hunter-gatherer, cave art had probably begun. However, it is more instructive to visualise the scenario of human numbers from 4000 BC, after a gap of every thousand years, to the beginning of this century. This was the beginning of irrigated ploughing and the use of implements made of metals. The estimates are of about seven million human beings



in various parts of the world, which almost doubled every one thousand years. By 1 AD there were more than 170 million human beings on this earth (Fig. 1.2a).

By 1 AD, human beings had acquired enough skills and tools to manipulate the natural world and to some extent had begun to carve niches, which were entirely man-made. This led to a faster growth of population, which is indicated by an addition of more than one hundred million members to human numbers, by

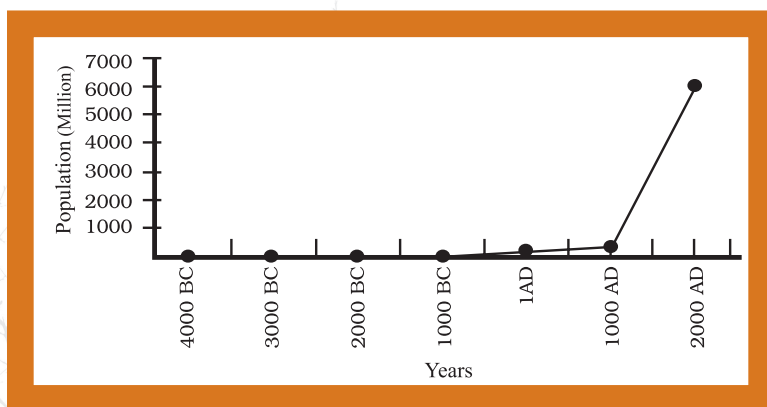


Fig. 1.2a: Growth in human number over historical times

1000 AD. By then various civilisations of human beings were prospering in different parts of the world, and man was ready to take a grand leap. The next one thousand years saw unprecedented growth in human numbers, from around 300 million to 6000 million spread almost in every natural niche and also other erected niches by man himself. It was the dawn of an industrial revolution, which tremendously boosted the growth of human population, a trend, which continues even today. The human population increased by 2000 million in a span of just 25 years between 1975 to 2000.

At this moment, it is important to ponder upon the consequences of this staggering number of human beings on the planet earth, which has a finite space and more or less finite resources. There are different schools of thought, besides the environmental scientists, who are deeply worried about the future of human society. This situation is further compounded in the unprecedented success of human societies in consumption of natural resources, gaining success over its natural enemies, and above all creating an artificial environment for its survival. One school of thought advocates stringent measures to control human numbers as it is a threat to natural

resources on the earth. The other school of thought does not consider growth in numbers as a big threat, but instead it views the culprit as the mechanisms that fail to maintain sustainable use and egalitarian distribution of natural resources.

The science of ecology, however, envisages that it is wiser to keep track of human numbers, and also of inhibitory feedback loops. The latter includes environmental, social and psychological factors, rather than simple physical control mechanisms. Consideration of these factors takes us beyond the Malthusian fallacy. Thomas Malthus, in the eighteenth century thought that the growth in human numbers would outstrip the growth in food supply, but it did not happen. This is not to deny that human numbers have not created problems for the quality of life and welfare of all. This is where the phenomenon of demographic transition has some significance. The demographic transition is the process of stabilisation of population growth in the more highly developed countries. This theory explains the stages of demographic transition in terms of economic development through pre-modern, early industrial, mature industrial and post-industrial stages. The last stage is characterised by a higher, but stable population size. Birth rates and death rates are both low. The standard of living is much higher than during the early periods. Most of the developed countries have undergone a complete demographic transition.

The scenario in large part of the world is worsening as the inequality in the use of resources by various human groups, is on the increase. Thus a large section of this human number is living under the conditions, which may even be worse than the hunter-gatherer stage. It is not only hunger that may be intensified further as human number crosses 9.4 billion mark by 2050, the technological innovations may further destabilise demographic structure of population through gender bias. For example, the thesis that basic education would reduce gender bias has been refuted in two states of India, the coastal Kerala and the mountainous Himachal Pradesh. These finer issues need a closer look.

1.3 Migrations of People

Social animals, including human beings form various levels of aggregations. Each group adapts to the

surrounding area. Over a period of time, population of these groups changes due to birth, death and migration of individuals. In humans the groups of people have various forms due to cultural evolution. These groups identify themselves with a particular village, town, city and country. Furthermore, they identify with social, cultural, religious and technological advancements. This makes the process of migration of human populations more complex than of the other social animals. The dynamics of human population depends upon two processes of migration: emigration, the movement of people out of certain area, immigration, the entry of people in an area.

Factors of Migrations

The factors contributing to movement of people from the place of their living may be classified in various ways. It includes the factors that are within the individual, for example, the curiosity of a person to search for a new place or country for a job. These factors also lie within the family, the search for better resources due to increase in the number of persons. It is also possible that the people of a village move away due to a disaster. People may also leave their place of stay or country due to ethnic or other conflicts.

The other way of looking at this issue is in terms of push and pull factors. Push factors include — scarcity of jobs, few openings, primitive lifestyle, political turmoil, lack of medical care, religious disputes, loss of property and natural calamities. The pull factors include — job prospects, better lifestyle, choice of religion, political freedom, better education, good health care and secure living.

Migrations of people are also dependent on the resource use. Humans have spent long time in history as hunter-gatherers living in a small area. The second long period of human history is marked by nomadic pastoralism. With the domestication of plants and animals it was possible to enhance resource use and move over a large area. For example, take the movement of Kanaora transhumant across the Himalayas, from the Tibetan plateau to the Ganga-Yamuna *doab*. The third stage of resource use is settled cultivation, where the major emphasis is to intensify the production of plant resources and consequent surplus production and the

remarkable complexity in social organisation. Though people lived in a small area, they moved long distances to sell their surplus produce. The fourth stage in resource use is the industrial mode that has appeared merely 200 years ago. In this short period, characterised by increase in technical skills and knowledge base, the world became a single unit. People now migrate from one corner of the globe to the other, and are even planning to colonise other planets.

Study of Migration

Scientists are studying the migrations of human populations through genetic variations. The purpose is to explore human origins from patterns of genetic diversity among populations all over the world. Two hypotheses have been proposed for testing. The single origin hypothesis states that human beings have their origins in Africa from where they have migrated to other regions of the world. *Homo sapiens* colonised Africa about 100 to 150 thousand years ago, and they moved out of Africa around 60 to 70 thousand years ago. The alternate hypothesis assumes that the human populations originated in each continent and evolved in parallel.

Two important tools of studying human migrations, the genetic and the linguistic, have their basis in biological and cultural evolution. Genetic affinities provide an important tool to study migrations of humans. Language is another tool to study migration of people. These two tools complement each other.

In India, biologists have found that the subcontinent was populated by several waves of people (implying migration during different periods) speaking various languages (Fig. 1.3a). Biologists use genetic markers for tracing the migrations of various communities. For example, a major migration of Dravidian speakers to the Indian subcontinent probably occurred around 4000 BC from the Middle East with knowledge of cultivation of crops and domestication of animals.

Future Scenario of Migration

In U.S. and Europe the stock of migrating people is on the increase. The economic migrations are increasingly replaced by despair migrations. In general, the speed

<i>Austic language speakers</i>	<i>after</i>	<i>63,000 BC</i>
<i>Dravidian speakers</i>	<i>around</i>	<i>4,000 BC</i>
<i>Sino-Tibetan speakers</i>	<i>after</i>	<i>4,000 BC</i>
<i>Indo-European speakers</i>	<i>after</i>	<i>2,000 BC</i>

Fig. 1.3a: Major migrations of people to Indian subcontinent

of human migrations is increasing largely due to social factors such as poverty, wars and persecution. For example, in Europe, presently around 700 million Africans and 500 million people from the Middle East are seeking asylum. By 2030, these numbers will rise to 1,400 and 1,000 millions, respectively.

India in recent times has incensed a few major migrations of human populations. Huge population of people migrated immediately after partition in 1947. Migration of rural population to urban areas especially metropolises has been a continuous process since the last few decades. Millions of Indians have migrated to different parts of the world in search of better job prospects and quality of life.

1.4 Dispersion of Human Populations

Dispersion refers to the organised and/or unorganised spread and scatter of human habitation (and population) over wider geographical landscapes. Depending on the circumstances, dispersion is effected by gradual and/or rapid migration from one geographical location to another, involving travel by land, water and air. Questions to ask are:

- What factors determine where humans live?
- Why do they settle down at a particular geographical location?
- Why do they continue to live there?
- Why do they move out?

Factors Influencing Dispersion

The dispersion of human populations across various regions of the earth has been the result of many deciding criteria, such as birth place, proximity to water, availability of resources to support lifestyle besides natural calamities

such as earthquakes, famines, droughts, war and other historical reasons.

It is important to note here that as long as there exists a force that draws a community to a particular location, it would continue to remain in that location. If changing circumstances, such as prolonged drought, industrial recession, or desertification, were not conducive to supporting a community, it would tend to migrate or perish. This would mean that sustainability of the community is fundamentally no longer feasible at that location.

Water

Modern human settlements (rural and urban) usually began as small informal clusters at a location conducive to supporting their lifestyle. These locations traditionally were situated close to water sources, such as rivers and lakes, which provided easy access to water, a fundamental resource necessary to support and sustain human activities.

Employment Opportunities

In modern times, economics and employment opportunities have been among the main forces attracting communities to form human settlements. Such settlements formed the business/commercial and/or industrial centres. These centres develop in locations conducive to business and industrial activity, such as sea-coasts (to encourage imports and exports by sea), or mining towns situated in areas rich in minerals and ores. Such centres of commercial and/or industrial activities also provide ample employment opportunities, attracting communities, causing migration from other traditional settlements, and leading to the formation of suburban settlements. Modern cities depend on a strong network of infrastructure to provide basic human needs such as water supply and sanitation.

Migration

People from rural areas migrate to urban areas in search of better opportunities. But cities usually do not provide all of them with adequate food, clothing, housing, water and sanitation facilities. So, these rural immigrants, in order to sustain themselves, often turn to begging, and

sometimes even to illegal activities. These people are often compelled to live in slums within the cities or on the outskirts.

People are also displaced from their original homes due to social or religious conflicts or wars. Due to the ethnic troubles in Sri Lanka in 1983, many Tamil speaking people fled the country, and settled down in India, Australia, and other parts of the world. Some fled from Germany during the late 1930s to different parts of the world. Similar reasons have caused thousands of Burmese, Afghans, Tibetans, etc. to live in India as refugees.

There are very few places which are devoid of permanent human inhabitants. In many regions that are extremely arid or bitterly cold, the population may be spread very thin. The densest settlements are in the temperate and/or subtropical climates, in river valleys, and near sea-coasts.

1.5 Rural and Urban Settlements

Human settlements are geographical places inhabited by people. The 1976 Vancouver Declaration on Human Settlements defined human settlements as follows:

“Human settlements means the totality of the human community – whether city, town or village – with all the social, material, organisational, spiritual and cultural elements that sustain it. The fabric of human settlements consists of physical elements and services to which these elements provide the material support”. The physical components of settlements comprise: Shelter, Infrastructure and Services.

Shelter, i.e., the super structures of different shapes, size, type and materials erected by mankind for security, privacy and protection from the elements and for their singularity within a community.

Infrastructure, i.e., the complex networks designed to deliver to or remove from the sheltered people, goods, energy or information.

Services cover those required by a community for the fulfilment of its functions as a social body, such as education, health, culture, welfare, recreation and nutrition.



Human settlements are classified as village, town and city. India is by far a country of villages with a total number of 368,588 human settlements classified as villages inhabited by 72.2 per cent of its population. In India out of the total population of 1027 million as on 1st March 2001, about 742 million live in rural areas and 285 million in urban areas. Around 5,161 human settlements in the country that are classified as towns and cities are urban settlements. Rural settlements in India can broadly be put into four types –



1. Clustered, agglomerated or nucleated
2. Semi-clustered or fragmented
3. Hamlets
4. Dispersed or isolated.

The above classification is based on size, structure, population, built-up area and inter-settlement distance. Thus, a clustered rural settlement has groups of houses, which are closely packed; whereas a fragmented rural settlement is one in which the houses are widely spread across the boundaries of the village.

The classification of urban settlements in India is shown in fig. 1.5a.

Class	Population Size	No. of UAs (Urban Areas)/Towns	Designation
Class I	1,00,000 and above	423	City
Class II	50,000 - 99,999	498	Town
Class III	20,000 - 49,999	1,386	Town
Class IV	10,000 - 19,999	1,560	Town
Class V	5,000 - 9,999	1,057	Town
Class VI	Less than 5,000	227	Village
Size Unclassified		10 (in Gujarat)	
All classes		5161	

Fig. 1.5a: Classification of urban settlements in India

Cities with a population of 1,000,000 (one million) and more are known as metropolitan cities and those between 100,000 and 1,000,000 are megacities. India is one of the fastest urbanising countries in this part of the world. The number of cities having a population of more than a million have gone up from 24 in 1991 to 35 in 2001 is evidence to this change.

The major differences in rural and urban settlements are represented in terms of land use, population densities, infrastructure, architectural form and lifestyles. The rural settlements have lower population densities and the land use is primarily agrarian. In urban areas land use is classified primarily under industrial, commercial, residential, and public utility. Urban areas have population densities that often reach as high as 10,000 people per square kilometre in some parts of the settlement.

Both types of settlements have their own benefits. Whereas urban settlements provide the goods and services to the population, the rural settlements are the food bowls of our country. Both urban and rural settlements face many environmental problems mainly arising due to pressure on resources, developmental activities, and infrastructure.

1.6 Environment and Health

The environment influences our health variously through exposures to physical, chemical and biological risk factors. It is quite appalling that, nearly more than 60,000 new chemicals are being pumped annually into the environment. Most of these are synthetic organic chemicals, which are neither degradable nor safely disposable. They disturb the balance of nature and cause adverse impact on our health.

Air pollution alone accounts for nearly 3 million deaths a year. Unclean water and poor sanitation kills more than 12 million people annually. Almost 90 to 95 per cent of sewage and 70 per cent of industrial wastes are being dumped untreated into surface waters. It is a hard fact that about 80 per cent of our population do not have means for proper sanitation whereas more than 50 per cent do not have access to potable drinking water.

Particulate matter is known to cause adverse health effects like heart and lung disorder, respiratory illness, mortality and increased risk of cancer. Inhalation of

asbestos fibres can cause asbestosis and lung cancer, including a rare but lethal form called mesothelioma. The State of the World Population 2001 Report says that, "More people are using more resources with more intensity and leaving a bigger 'footprint' on the earth than ever before". Increased carbon monoxide and carbon dioxide emissions are leading to a global warming trend that will have severe environmental impact. The Report calls for widespread action to protect the environment and reduce unsustainable consumption and production. Pollutants from vehicular emission is the main irritant for asthma patients affecting the air passages in the lungs. Nitrogen dioxide enters into the lungs, and results in asthma. Sulphur dioxide and nitrogen oxides result in less visibility.

Lead is a hazardous chemical used in preparation of paint. Children are more vulnerable when they are exposed to it through direct contact. Highest incidence of arsenic from ground water in West Bengal exceeds the World Health Organisation's (WHO) maximum permissible level of 50 micrograms per litre. Food cooked with such arsenic contaminated water causes health problems. Industrial waste including electronic waste from discarded computers and mobile phones and overwhelming use of plastics result in surface pollution causing adverse health effects. Today, there is evidence that pollutants, including pesticides, endocrine disruptors, dioxin, in the environment, accumulate in the environment over time. Polychlorinated Biphenyls (PCBs) are endocrine disrupters that can cause cancer and infertility. Studies on the impact of Bhopal Gas tragedy reveal that highly toxic chemicals like lead, chromium, mercury, chlorobenzene have spread into the soil, water and vegetable crop plants. These deadly toxins passed on from mothers to their babies when breast-fed, are carcinogenic in nature, and depress the immune and endocrine system. High concentrations of DDT are recorded in mother's milk. Most of these toxins comprise the components of pesticides, herbicides, dyes, paints, cosmetics, drugs and perfumes. Ground water is getting contaminated due to the disposal of the waste and polluted water by manufacturing units of steel, aluminium, bricks, coal, fertilizers and pesticides.

Climate Change and New Diseases: Scientific and technological intervention should be oriented towards formation of a spectrum of eco-products in lieu of existing

non-degradable toxins. Environment-friendly transport systems utilising non-fossil fuel energy should replace the present trend. The government must devise scientifically sound strategies and policies for environmental protection and sustainable development, henceforth relying on the recycling of materials, conserving our environmental resources and preventing the adverse impact on our health.

1.7 Gender and Environment

Is there really a link between gender and environment? The most spontaneous answer is 'yes'. It has become very important to understand the link between gender and environment. Gender issues have come to the forefront in many development sectors including agriculture, forestry, water, energy etc.

It has been observed for many years that women are in closer contact with nature and their surrounding environment as compared to men. Women are often most sensitive to changes in the environment because they are in closest contact with the home and the land. The most obvious impact of various activities performed by women on a daily basis is on their health. Women spend more time than men on basic subsistence activities, such as gathering fuel-wood, carrying water, grazing cattle, collecting non-timber forest products and cooking. According to the World Bank (2001) women of all developing countries spend between 2 to 9 hours a day



collecting fuel and fodder, and performing cooking chores. More than half of the world's households cook with wood, animal waste, crop residues and untreated coal, exposing primarily women and children to indoor air pollution, which according to the World Health Organisation, is responsible for the premature death of over 2 million women and children a year worldwide from respiratory infections. It has been proved that

the amount of total suspended particles present inside a kitchen has 1,000 times greater chance to penetrate deep into our lungs than the suspended particles outside. Women are constantly exposed to *chulha* smoke in India due to several cultural mindsets.

Men are more linked with the environment when it comes to agriculture. They spend most of their day in the agricultural field. Thus they show symptoms of the adverse impacts of excessive use of pesticides during agricultural practices in order to get greater yields. Women have more traditional knowledge about the medicinal plants in the area and their use.

Furthermore, as women rarely own land they cultivate, there is little incentive for them to make environmentally sound decisions, while their lack of access to credit hampers them from buying technologies and inputs that would be less damaging to natural resources. These negative factors set up a cycle of declining productivity, increasing environmental degradation and food insecurity for the future.

Women farmers tend to use and perfect traditional cropping methods developed over time to protect precious natural resources. This makes them key players in the conservation of soil fertility. Women employ methods such as fallowing (leaving fields uncultivated for at least a season), crop rotation (planting a field with different successive crops), intercropping (planting several different crops in a field at one time), mulching (spreading organic material on the soil around plants to avoid water evaporation) and a variety of techniques that promote soil conservation, fertility and enrichment. Planners are now recognising the value of learning from women's local knowledge to protect and sustain the environment.

In rural India, shifting from fuel wood to cleaner sources of energy, like kerosene or Liquefied Petroleum Gas (LPG), halves the mortality rate of children under five. Home lighting, agro-processing, drinking water pumping and more efficient stoves can reduce women's workloads, provide income earnings and improve women's health. Women in particular, need to be informed about alternative methods of cooking, farming, heating and waste disposal. Gender-sensitive planning in training and technology development would not only improve production today, but it would also ensure the protection of the environment for tomorrow.