UNIT 25 COMMONALITIES AND DISSIMILARITIES IN ENVIRONMENTAL MANAGEMENT

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25.1 INTRODUCTION

This is the last unit of the Human Environment Course. Till now you have studied about environment of India. You have studied about the living and non-living components of environment. The social and man-made environment plays an important part in determining the pattern of use of natural resources. Human activities such as deforestation, desertification, urbanisation, over exploitation of resources, wildlife elimination and habitat destruction have great impact on general functioning of environment and the ecological balance. Man, himself, is often victimised for his shortsighted activities. Pollution and radiation hazards are posing threats of multiple diseases to human beings. Therefore it becomes imperative that the management of environment be done with an understanding of the mechanism underlying the proper functioning of ecosystem. Effective management is not possible without proper legislation and social awareness. You have studied in detail about management of the quality of atmosphere, water and land by controlling pollution, the lack of database and the restrictions imposed by the carrying capacity of the ecosystem.

It is important to note that till now you have learnt about the environment with reference to the Indian context. This particular unit will give you an exposure to commonalities and dissimilarities of environmental management in the Indian subcontinent. The integration of the natural systems prevailing in the various countries of the world is so high that ecological, economic and socio-political processes, movement and trends positive as well as negative, of one country affect those in others. Therefore, it becomes imperative that a coordinated approach to environmental protection for the subcontinent as a whole should be developed by the people and governments of these countries.

25.1.1 Objectives

After reading this unit, you will be able to:

- justify the region being designated as the Indian subcontinent,

- define the boundaries of Indian subcontinent,
- name our subcontinental neighbours and bring out the factors underlying our cultural unity,
- understand the integration of the natural systems of the countries of the Indian subcontinent,
- discuss the need for a coordinated approach towards the conservation and protection of the environment in the subcontinental region.

25.2 THE INDIAN SUBCONTINENT

Even a cursory glance on the globe would bring out the significance of the term "subcontinent" in the context of South Asia. The vast and varied land mass sprawling like a giant between the snowy heights of the Himalayas, soaring to the skies streches to the breaking waves of the Indian Ocean, washing its coast for thousands of kilometres. If another peninsula of Eurasia, with approximately the same size and jutting into the Atlantic to the West can be designated as the continent of Europe, there is far greater justification for the peninsula with its roots in the Himalayas and jutting into the Indian ocean to the south, to be designated at least as a subcontinent. The series of sharp arid ridges of the Kirthar-Sulaiman ranges and the associated highland systems in the west and west-north-west, seried ramparts of the snow-clad Himalayan ranges in the north, and the thickly forested rain-swept hills and dales of the north-east almost abutting into the Bay of Bengal—from Makran in Baluchistan to Chittagong in Bangladesh—the mountainous boundary wall has clearly demarcated the South Asian domain as a subcontinental realm with its own distinct geographical personality.

The land gets an abundance of sunshine from the tropical sun and the splashing rains from the monsoons—the two elements together exerting a tremendous impact on the life of its teeming millions. Mother nature and human endeavour have jointly moulded the destiny of the subcontinent, having a remarkable continuity, defying time and still changing like the patterns in a kaleidoscope.

At every stage in the march through the corridors of time, we have leaned heavily on nature. To being with, we were almost its slaves. Slowly but steadily we learnt to probe into the mysteries of nature and to cooperate with it. We are now increasingly interacting with it with the help of science and technology at our command. We can neither defy nor ignore nature, for we are its children—being nurtured in its lap.

The general direction of our development is largely influenced by nature. It provides the broad framework of development. It tells us: if you develop in certain directions you will get the best results. In order to usher in an era of plenty for our people we should carefully listen to this advice.

25.2.1 Its Geographical Location

The globe shows the Indian subcontinent as the southward extension of the great land mass of Asia. The Indian Peninsula tapers towards the Indian Ocean, dividing the oceanic realm into the two flanking expanses of blue waters, known as the Arabian Sea and the Bay of Bengal. They wash the western and the eastern coast of Indian peninsula respectively.

These two seas have played an important role in determining the nature of interaction of the peoples of the subcontinent with those of the surrounding regions in Africa, South-west and South-east Asia. At times they have provided easily negotiable maritime communication links between us, on the one hand, and, on the other, with the people inhabiting the peninsula as well as the archipelagos of South-east Asia and the littoral countries of West Asia as well as East Africa. It is, however, also true that, at some other times and in some important respects, these water bodies have also acted as barriers to human interaction. The link-role of these oceanic realms is reflected in the diffusion of cultural influences of the subcontinent into the distant lands to its west and east. It is also reflected in the assimilation into our society of new cultural elements coming from its maritime neighbours and adding to it a new flavour and richness. These expanses of blue waters have, at the same time, promoted a certain degree of isolation and have fostered a unique cohesiveness in our civilisation along with a high degree of diversity within it.

As we have noted earlier, an unbroken chain of lofty mountains girdles the subcontinent almost uninterruptedly for thousands of kilometres, practically walling it off from the rest of the trans-Himalayan Asia. It is because of the formidable nature of the mountain realm that all approaches to the subcontinent from the north-east and north-west have been beset with great difficulties, allowing inter-communication only through a few passes favoured by the nomads or pilgrims. This partially enclosed character of the subcontinent has played an important unifying role in strengthening the forces of cultural unity in diversity of our peoples.

Surrounded by the major realms of Asia, the subcontinent occupies a fairly large area of the globe. The whole of the subcontinent is situated in the Northern hemisphere. The southern tip of the Peninsula misses the equator by a few degrees. The Tropic of Cancer passes approximately through its middle.

The snowy lands of its northern-most fringes belong to the mountain system which radiates from the roof of the world—the Pamirs, situated in the heart of Asia. The hot and steamy Kanyakumari constitutes the southern most tip where the Indian peninsula, getting narrower and narrower loses itself into the ocean. If one were to travel for the northern-most to the southern-most point in the mainland, one would cover a distance of about 3,200 kilometres. This accounts for about 30^0 of latitudinal extent, which is one third the angular distance between the Equator and the North Pole.

India, east to west, covers almost the same distance as it does north to south—approximately 3,000 kilometres. Its western-most point lies on a creak in the salty marshes of the Rann of Kutch. Where the realms of Burma, China and India meet and where the virgin forests and untrampled hills still slumber in their primeval majesty, there lies the eastern-most point of India. East to west India covers almost 30^0 of longitude—roughly equalling the longitudinal extent of Spain, France, Belgium, Holland, Germany and Poland combined—which is one twelveth of the earth's circumference at the Equator. When the sun has already risen in Arunachal, it is still night in Saurashtra and it will be only after two hours that the sturdy Kathiawar peasant will rub his eyes and greet the earliest rays of the sun.

25.2.2 The Subcontinent and the Oriental World

Let us look at a map of the Orient. Indeed, the Indian Ocean unites the Oriental world consisting of East Africa, West Asia and South and South-east Asia. With the opening of the Suez Canal, the Mediterranean has been linked with the Indian Ocean and Southern Europe and North Africa have been brought within its orbit.

India occupies a pre-eminent position in the Indian Ocean. No other country has such a large coastline on this ocean as ours. The Deccan Peninsula projects itself into the Indian Ocean, thus making it possible for India to look both ways—towards West Asia, Africa and Europe from its western coast and towards South-east Asia and the Far-east from its eastern coast. Other countries except Sri Lanka bound the Indian Ocean. India is in it. The Indian Ocean is truly Indian Ocean.

The ocean became a unifying force quite late in history. But space relations on the land surface have been of significance from the dawn of history. With a view to understand them in their proper context, let us have a careful look at the map of the subcontinent to its north and north-west. Mountains rise in all their majesty—almost like the ramparts of a fort. It appears to have cut us off from the regions lying to the north or the north-west. But this is an illusion. A physical map with its shades of green and brown and dark brown is sometimes quite misleading. Hordes of pastoral nomads entered the fertile valleys of the subcontinent along these lines of access. Buddist Bhikshus crossed into Tibet and went further on to China, Korea and Japan with their message of peace. The Prince of Macedonia brought his armies into the subcontinent. The beauties of Greek sculpture came in its wake. Our merchants, with their long caravans, crossed these barren heights to establish trade links with Central Asia, Afghanistan and Iran; the stories of the Panchtantra went along with them. Mongols, Turks, Arabs and Iranians came as conquerers but settled down in this land bringing with them the simple beauty of the dome and majesty of the minaret; taking back to their original homelands the Indian numerals, the Hindisa, the decimal system and the ideas of the Upanishads. The give-and-take, this exchange of ideas and goods became possible only because our land was situated in close vicinity to the major

highways of the ancient and the medieval world. We have been and continue to be the central link in the chain which binds West Asia, East Asia, Central Asia and South-east Asia.

SAQ 1

State which of the following statements is true by putting 'T' against the correct one in the box provided. Compare your answers with those given at the end of this Unit.

I) The justification for designating Indian peninsula as subcontinent lies in the fact that:
   a) It has a vast geographical area. [ ]
   b) It is a land of valiant soldiers. [ ]
   c) The people of this peninsula are culturally united to each other. [ ]
   d) The distances have become short with the improvement in modes of transport. [ ]

II) The characteristic feature of Indian subcontinent as we march through the corridors of time, has been as follows:
   a) Man has never tried to overcome geographical barriers. [ ]
   b) At every stage we have leaned heavily on nature. [ ]
   c) The geographical barriers have always impeded the mixing of cultures. [ ]
   d) We have never tried to change the course of nature events. [ ]

III) The role played by the vast oceanic water bodies flanking Indian subcontinent in the latter's culture is as follows:
   a) The oceanic waters have impeded the flow of culture from outside. [ ]
   b) The oceanic waters have permitted only one way flow of culture, i.e. towards outside. [ ]
   c) The oceanic water afforded a certain degree of isolation, allowing the development of typical Indian culture, while accepting some changes allowing mixing of cultures. [ ]
   d) The oceanic waters played no role in exchange of cultures either to or from the Indian subcontinent. [ ]

IV) The role played by Himalayan ranges in nurturing Indian culture can be best represented by the following statement:
   a) The Himalayan ranges girdle the subcontinent of India, practically walling it off from the rest of the trans-Himalayan Asia. [ ]
   b) The partially enclosed character of this subcontinent imparted by Himalayas has strengthened the forces of cultural unity in diversity of our peoples. [ ]
   c) Today the modes of transport have improved and Himalayas offer no barrier to mixing of cultures. [ ]
   d) Himalayas have had no role to play in nurturing the Indian Culture. [ ]

25.2.3 Our Subcontinental Neighbours

As in the case of all countries with a hoary civilisation, the boundaries of India are mostly natural and historically determined. The seas of the Indian Ocean provide the boundary in the south, giving India a coast line approximating in length equal to the radius of the Earth. Separated by the sea from the mainland are a number of Indian islands, the Andaman and the Nicobar chain in the Bay of Bengal. To the east lies our subcontinental neighbour Bangladesh and beyond it our South-east Asian neighbours—Burma, Malaysia, Indonesia, Thailand, Combodia, Laos and Vietnam. To the west along our land borders lies Pakistan and beyond the Khyber, Afghanistan. Across our subcontinental neighbour—Pakistan along the coast are our West Asian neighbours—Iran, Iraq and other Arab lands. Further west across the ocean lie our African neighbours—Egypt, Sudan, Ethiopia, Somalia, Kenya and Tanzania. To the south, just across the sea, lies Sri Lanka. The Maldive Islands lie to the south of our Lakshadweep group almost like pearl beads in the same garland.

The Himalayas guard our northern frontiers. Across the mountain wall lies the Sinkiang region of China—the Tarim basin wherein once flourished the ancient civilisation of Kashgar and Khotan. The apex of the North Indian triangle, viewed in this background, assumes great strategic significance. Here meet five countries of Asia—China, the USSR, Afghanistan, Pakistan and India. Himalayas, the crown of our subcontinent lie indeed at the most important node of the Asian polity.

When the northern boundary of India turns south-east and eastwards, the mighty Himalayas are met with a low range of hills: Naga, Mishmi and Patkoi. Stretching approximately from the Indus to the Brahamaputra and covering about 2,400 kilometres in length, these snow-capped ranges stand as sentinels over our destiny.

Superimposed over the lofty ranges lies to our north the independent Himalayan kingdom of Nepal. History and geography have combined to carve out a common destiny for the Indian and the Nepalese people. Bhutan, famed for its scenic beauty, is situated further east along our northern frontiers. To the east of Bhutan, the crest of high Himalayas acts as the dividing line between the Indian and the Chinese realms.

Across this line of demarcation beats the heart of Tibet. Lhasa, its spiritual and political capital, is within 300 kilometres of the Indian border. The Indian boundary stretches eastwards along the region of thick tropical forests and complex mountainous terrain wherein lies the north-eastern tri-junction, where Burma, China and India meet each other.

The eastern boundaries of India are guarded by the offshoots of the Himalayas. The almost continuous chain of hills and ranges—consisting of Mishmi, the Patkoi and the Naga hills, followed by the Barail range, the Lushai hills and, finally, the majestic Arakan Yoma—loses itself in the Bay of Bengal to rise again in the Andaman and Nicobar islands. Across this ridge, covered by lush tropical greenery, Burma and India join their hands of friendship. Mandlay, the focus of interior Burma is within 300 kilometres of our borders.

Our western boundary separates us from our brothers in Pakistan, who share with us a history which goes back to the days of Mohenjodaro and Kalibangan. In its north, adjoining India is the land of the sturdy Pathans, the home of Frontier Gandhi. In the south of this lies the land of five rivers where the golden fields of wheat adjoin the villages of Amritsar and Jallandhar. Further, to its south, adjoining the desert sands of western Rajasthan lies Sind encompassing the Indus delta.

We have traditionally been a peace loving people. Never have 'Indian armies marched in hordes into other peoples' lands. Historians know of Indian temples of Combodia, Buddhist manuscripts in Chinese monasteries and Indian merchandise excavated from long forgotten towns in Central Asia. But nowhere can they come across a monument commemorating Indian conquest. Indian history is the history of a people who have lived in peace with their neighbours. But we love freedom which we have rested from the hands of a mighty colonial power. We guard this freedom zealously.

As we have already noted, the social ethos of the subcontinent reflects a high degree of unity in diversity. The factors that have led to the emergence of this unique feature of the polity are not far to seek. We shall examine the spatial aspects of this ethos, by identifying, on the one hand, the factors leading to regional differentiation and diversities, and the factors which operate as bonds of unity, on the other.

SAQ 2

i) Fill in the blank spaces using appropriate words. Compare your answers with those given at the end of this unit.

   a) The globe shows the Indian subcontinent as the ..... extension of the great land mass of Asia.
   a) The whole of the subcontinent is situated in the ..... hemisphere.
   c) The southern tip of the Indian peninsula misses the equator by a ... degrees.
   d) The tropic of cancer passes approximately through the ..... of the subcontinent.

ii) State whether the following statements are true or false by indicating T or F in the box provided against each. Compare your answers with those given at the end of this unit.

   a) The Arabian sea and the Bay of Bengal wash the western and the eastern coast of Indian subcontinent, respectively. [ ]
   b) Himalayas form an unbroken chain of mountains girdling the subcontinent, almost uninterruptedly. [ ]
   c) Surrounded by the major realms of Asia, the Indian subcontinent occupies as fairly large area of the globe. [ ]
   d) Indian subcontinent is wholly situated in the Northern hemisphere. [ ]

25.3 ACTORS OF DIVERSITY AND UNITY OF CULTURES

25.3.1 Diversity

The large geographical spread of the subcontinent provides fertile ground for the germination and flowering of regional diversities in the social mileau. India, is the seventh largest country in the world—approximating in size with the continent of Europe minus the USSR. It would have been surprising, indeed, if the degree of regional differentiation in a subcontinent of such dimensions would have been less marked than what it is.

The differentiation in the natural landscape has contributed to the emergence of different forms and patterns of man-nature interactions in the different regions of the subcontinent.

The differing sources of the waves of immigration into the subcontinent from the surrounding territories in a process spread over millenia, the different routes of dispersal of these into this vast land and the consequent concentration of diverse ethnic elements in different regions has created a social mosaic.

The formation of regional identities of the agricultural communities in different regions at different points of time within a long range of about 3,000 years has contributed to the strengthening of the regional forms in the social sphere. This process of region formation has been further sharpened by the continuity of the historical tradition of an essentialy agricultural society.

25.3.2 Underlying Unity

In the light of the above, the unique feature of the social geography of the subcontinent is not the extent of its plurality but the fact that social diversity has been based on and sustained by an underlying unity which has grown with time. The factors that have led to strengthening of this underlying unity of the social ethos in India may now be examined.

First, inspite of the differences in the environmental factors of the various regions, the Monsoonal rhythm of the seasons provides a strong element of uniformity. The alternation of the dry and the wet seasons and the concentration of the life-giving rains to a few months in the year is, by and large, a subcontinental phenomenon. The rain-fed subsistence agriculture and the village community based on it was, in more senses than one, a gift of the Monsoons. The all-pervasiveness of the Monsoons— inspite of the many regional variations—has provided the natural base for a certain degree of uniformity in man-nature interactions throughout the length and breadth of this vast expanse of land; the unity of the subcontinent is strongly rooted in this commonness.

Second, the horizontal spread of cultural and socio-economic attributes from different parts of the country to each other has generated a process of cultural synthesis which has put its stamp on regional categories and has created strong bonds of integration. The unifying role of this horizontal spread became strong and meaningful to the extent it made use of its capacity to assimilate within itself elements of regional traditions and getting itself enriched and transformed in this process. The cultural ethos of the subcontinent is thus strongly rooted in this composite matrix.

Third, the development of inter-regional economic linkages and the emergence of a natural home market during the last two hundred years or so, though constrained by the negative influences of colonial exploitation, have played an important role in strengthening the centripetal forces in the subcontinent. The British, by striking at the roots of the self-sufficiency of the village community, brought the bulk of rural India into a largely unified subcontinental market. The establishment of networks of railways and other means of communication greatly facilitated this process. The requirements of the economy also generated inter-district and inter-state migrations on a considerable scale, breaking the age-old isolation of regional groups from each other. Of special significance in this connection was the rural-urban migration stream which brought together into urban agglomerations, people who spoke different

languages and/or professed diverse faiths, but were citizens of an emergent subcontinental polity.

25.3.3 The Subcontinent in an Unequal and Fragmented World

The subcontinent of South Asia is the home of a large segment of humanity—accounting for more than 20% of the world's population. Not only is the subcontinent the home of a historical tradition of great chronological depth but it has also been interacting in each phase, from the prehistoric to the contemporary—with the most vital domains on the globe—with the Euphratis—Tigris and the Nile Valleys in the prehistoric times, with Greece and China during the ancient period, with Central and West Asia during the medieval times, and with Western Europe in the modern period. Through the vicissitudes spread over millions of years, there has, however, been a unique continuity of tradition of settled agriculture from the neolithic revolution in about the fifth millennium B.C. to the green revolution of our own times.

The destiny of the subcontinent underwent a catastrophic change in the wake of the industrial revolution and the cleavage in the human condition operationalised by it. Along with the rest of the colonial empires, this populous region was also transformed into the raw material appendage of and market for the goods of the developed world. Its teeming millions eked out a miserable existence in abject poverty for about two centuries of external domination. Inspite of some positive changes that have taken place since Independence, the subcontinent continues to be the home of a large part of the world's poor—the hungry, the illiterate and the diseased. The GNP per capita, for example, in Nepal and Bangladesh ranges around $ 160 as compared to $ 21,000 in Switzerland, $ 18,000 in USA or $ 16,000 in Japan. The daily caloric availability per capita in the case of this region ranges from 1,900 to 2,400 as compared to 3,600 for USA or 3,400 for Canada. While annual per capita energy consumption (in kgs of oil equivalent is as low as 23 in Nepal, it is as high as 9,000 in Canada. Life expectancy in India (58 years) or Pakistan (55 years) compares unfavourably to a high degree with that in Japan (78 years) and Canada (77 years). Infant mortality rate is as high as 138 in Nepal and as low as 6 in Japan. South Asia is the home of the bulk of the illiterates of the world. While illiteracy has been wiped out from the developed countries, the percentage of illiterates is as high as 85 in Bhutan and 74 in Bangladesh as well as in Nepal. Approximately 43 per cent of all the illiterates of the world live in the subcontinent. Since development, like freedom is indivisible, the movement for a better world cannot but be based on a strategy of rapid economic development and equitable distribution of its fruits in the subcontinent as a part of the strategy to build a more just New World Order.

Thus, subcontinent has been and continues to be a erucible in which plural ethnicity and diverse cultures have come to terms with each other in mixes and amalgams along a broad spectrum.

Having thrown off the yoke of colonial rule, each member of this subcontinent, namely the India, Bangladesh, Nepal, Sri Lanka and Pakistan has been organising its social and political life along nationally desired lines. The wide range of experiences—both its successes and failures—is a rich storehouse which has much to teach to the coming generations not only in the subcontinent but to the peoples of the wider world as well.

This is important particularly because the process of building self-reliant and independent polities in the countries of South-Asia, as in the rest of the developing world, has been quite often hindered as a result of the "interest" taken by and intervention of the great powers of the world, particularly the ex-colonial masters of previous years, in the affairs of the region. There are important lessons in this experience for all countries of the subcontinent; and they may become inputs in decision making with a view to avoid pitfalls, to beware of mirages on the horizon and to thus checkmate moves from the powerful to disrupt indigenous processes of self-realisation and self-articulation in the region.

It is of significance to note that the degree of interaction among the countries of the subcontinent is so high that both ecological and socio-political processes, movements and trends—positive as well as negative—of one country affect those in the others. Just as a cyclone does not respect international boundaries and destroys property in

Bangladesh as well as in India in one onslaught; communal riots in either country tend to pollute the political atmosphere in the other. Rain bearing clouds do not need a passport to move from India to Pakistan and high yielding variety of seeds developed in one country provide the basis of higher productivity in the other.

SAQ 3

Match the phrases given in Column A with their counterparts in Column B. Compare your answers with those given at the end of this Unit.

	Column A		Column B
i)	Development of self-reliant polities in the countries of South Asia	a)	has created a social mosaic with distinct regional concentrations in Indian subcontinent
ii)	Immigration of people from neighbouring territories	b)	has become the raw material appendage of the developed world
iii)	Development of inter-continental trade links over the past two hundred years	c)	has been quite often hindered as a result of "intervention" of great powers in the affairs of this region.
iv)	With the industrial revolution, this populous region	d)	has brought the bulk of rural India to a unified subcontinental market

25.4 UNITY OF NATURAL SYSTEMS IN THE SUBCONTINENT

The strong elements of commonality in the subcontinental ethos is, to a large extent, the function of the high degree of integration in the natural systems prevailing therein. This is both a source of strength in building a better life for its teeming millions as well as a cause for great concern. The latter is generated by the rapid degradation of the subcontinental environment and the destruction of its natural resources. The situation calls for united efforts in utilising our limited resources in keeping with the rigorous demands of sustainability in the development process. It may, however, be noted that integrating an environmental emphasis into development policy and planning is a necessary but not a sufficient condition for the attainment of the desired objectives. The building up of an effective institutional framework to support such policies is equally important. As highlighted by the United Nations Conference on Human Environment held in Stockholm (1972) "countries will have to undertake their own respective experimentation and improvisation in devising their institutional arrangements for environmental control in the light of their own specific needs and requirements as they emerge in the course of development". It is being increasingly realised by the people as well as the governments of the region that it is essential to develop a coordinated approach to environmental protection for the subcontinent as whole because the region constitutes a single highly integrated system of interdependent and interrelated natural phenomena. Deforestation in Nepal, for example, leads to flooding in North Bihar. A barrage on the Ganga in India creates misgivings in Bangladesh. Indira canal and the associated green belt in India contributes to desertification control across the international borders in Pakistan.

Let us have a closer look at some of the important components of this integrated system of interdependence.

25.4.1 Mountain Ecosystems

The highland complex of North, North-West is the abode of rich vegetative cover as well as the source of glacier-fed perennial rivers of the subcontinent. The Indus-Sutlej and Ganga-Brahamputra systems, having their sources in the close vicnity to each other near the Mansarovar under the shadows of Kailash are like the loving arms of a mother supporting the subcontinental expanse in its lap.

It is being increasingly realised that environmental degradation in the mountainous complex of the North-West, North and the North-East of the subcontinent is already acquiring disastrous proportions. This is particularly true of the Himalayan sector,

which is under relatively greater pressure of population. Deforestation, and the consequent loss of vegetation cover is leading to soil erosion which, in its turn, is the cause of declining productivity of farmland as well as flood damage on a disastrous scale in the five Himalayan countries of Bangladesh, Bhutan, India, Nepal and Pakistan. The deteriorating situation calls for an emphasis on inter-regional co-operation and joint action by the countries concerned with a view to make a scientific assessment of the carrying capacity of the diverse ecosystems in the mountain realm and the sustainability of the natural resources utilisation strategies therein. Lack of co-ordination between sectoral policies, which quite often move in opposite directions, need particular attention. How to work out the trade-offs between resource use in forestry and agriculture, or in forestry and irrigation? How to assess the competing demands of agriculture and industry on energy resources? These and many similar questions are quite complex and tend to exacerbate environmental problems and further wound the fragile eco-systems in the mountain realm of the subcontinent. The restoration of forest cover in the Himalayas and their scientific management calls for monumental efforts by all nations concerned particularly because environmental management policies in this region with a high incidence of poverty cannot be evolved without reference to their likely impact on employments and incomes. In our zeal for environmental protection, let us not forget that problems of hungry children are no less important than those of wilting flowers.

The Indus Water Treaty between India and Pakistan is a good example of how an intricate problem can be satisfactorily managed to the advantage of both the parties concerned. It is hoped that similar arrangements for co-operation between countries located upstream and downstream in the Himalayas in the eastern sector would be worked out among Bhutan, India and Nepal as well as between India and Bangladesh.

25.4.2 Arid Ecosystems

The Great Indian Desert called the Thar—the Marusthali or the land of the Death—straddles the Indo-Pak boundary. Surrounded by the irrigated lands of the Indus in Pakistan, the Sutlej riverian tracts in Indian Punjab and the Aravallis in Rajasthan lies the mighty Thar, covering approximately 1,00,000 square miles. The wandering sand dunes and the hot scorching winds blowing over this vast territory do not require a visa or a passport to move from India to Pakistan or vice versa. The problems of controlling the spread of the desert and of evolving effective methods of utilising the scarce water resources of these arid as well as semi-arid lands optimally are common to India and Pakistan and it is not possible for either country to handle them on its own separately.

Desertification control has shown rather limited success in the adjacent regions of both countries. The main reasons are not far to seek. Environmental and socio-economic factors are not being integrated into the control mechanisms and Indo-Pak joint measures are halting and extremely slow on the up-take.

The following points need to be taken into consideration in the struggle against desertification.

1) Soil classification surveys should be considered as the starting point for the basis of selecting and developing the most suitable intervention strategy.
2) Proper drainage arrangements in irrigated areas must be insisted upon with a view to avoid problems of salinity and waterlogging at a later stage.
3) Special programmes should be launched for a better understanding of the socio-economic and cultural factors contributing to desertification, otherwise the corrective measures would meet people's resistance and would not bear the desired results.
4) Technological intervention should lay particular emphasis on the fact that there is adequate potential of non-conventional sources of energy, i.e. solar or wind, in the region and their optimal utilisation needs to be built into the desertification control strategy.

25.4.3 Coastal Eco-system

The coastal eco-system of the subcontinent is the largest of the tropical coastal stretches on the globe. Its management calls for a common subcontinental approach

for the simple reason that the coast is a continum from Makaran to Chittagong. A plan for its environmental management is required to emphasise, among others, the regulation of the dynamics of coastal processes as well as the associated land use changes in relation to each other, preservation of the rare mangrove ecosystems, acceleration of coastal afforestation, control of the inflow of industrial waste into the sea, rational utilisation of resources in a replenishable cycle and encouragement to environment-friendly tourism. The main sources of sea contamination along the coast in the region are municipal sewage, waste from petroleum-, hydrocarbon-, petrochemical-, food-and beverage-processings, metal and chemical industries, hot effluents from thermal plants and residues from sea-salt extraction, agricultural runoff in the form of residues of pesticides and fertilisers, and increased siltation under the impact of some agricultural practices. Coastal pollution in this region is particularly serious because of the high population density of the coastal plains, deltas and estuaries of the subcontinent.

It is most welcome that the sea programmes of the UNEP (United Nations Environment Programme) treat the subcontinent—Bangladesh, India, Pakistan, Maldives, and Sri Lanka—as a regional entity, calling for joint cooperative action. In the next section we will discuss management of resources in this region. But before that try the following SAQ.

SAQ 4

Tick mark (✓) the correct statements and cross (×) the wrong statements in the space given. Compare your answers with those given at the end of this unit.

i) Himalayan range is not affected by environmental degradation. [ ]

ii) Desertification control has a limited success in the adjacent areas of India and Pakistan. [ ]

iii) Coastal pollution in the subcontinent is serious because of low population density along the coastal plain. [ ]

iv) Governments of the countries of Indian subcontinent need to develop a co-ordinated approach to environmental protection programmes. [ ]

25.5 RESOURCE MANAGEMENT

You have already read how the natural systems of the countries of the subcontinent are integrated. Overexploitation of natural resources and harnessing the forces of nature for the benefit of growing human population of this subcontinent has led to the present state of environment. An integrated approach in management of resources will certainly help these countries to save their environment. Integration in resource management involves judicious use of resources, conservation and recycling. By doing this over a period of time the benefits obtained from a resource or resource complex like a river valley, are maximised and at the same time the impact of human activities on environment are minimised. In this section, we will discuss the management of two types of resources, i.e. water and energy.

25.5.1 Water

In the light of the seasonal concentration of rainfall over the entire subcontinent, water management plays a crucial role in the development process in the region, particularly in the agricultural sector and in rural areas. The integration of environmental and ecological considerations into the planning and management of water resources in the subcontinent is, therefore, not only desirable but a necessary condition for sustainable development. Barring the peninsula, almost all the rivers of the subcontinent belong to two river systems—the Indus and the Ganga with its trans-Himalayan tributary—the Brahamputra. The Indo-Gangetic plains have the character or a continuous stretch of alluvium on the surface of the earth inhabited by a significant proportion of the world population. The most important characteristic of the Himalayan rivers, as sources of irrigation, lies in the fact that they are fed by over 1500 glaciers and have, so to say, a permanent reservoir only partly dependent for its replenishment on the fluctuating Monsoons. The river basins are generally low-lying flood plains and combined with the deltaic and coastal plain they constitute the food

bowl of the subcontinent, with as high a cropping intensity as 250 per cent. A large number of densely populated industrialised urban settlements of the subcontinent are also located in this region. About 64 per cent of the total land area is being put to agricultural use, which has flourished for millions of years; intensive cultivation has been practised for centuries; and the use of agro-chemicals are currently prevalent on a fairly large scale.

A number of problems are cropping up and it is desirable and necessary to give particular attention to their solutions in water resource development planning and management, e.g., water quality in relation to human health, preventive measures against increasing salinity and waterlogging, regulation of floods and minimising their negative effects, sustainable ways of utilising fish and plant wealth in rivers, other inland waterways and surface storage arrangements.

The need for data collection on a long-term basis through a programme of environmental monitoring and assessment is necessary for formulating long-term policies relating to changing water demands and utilisation patterns in the region.

25.5.2 Energy

The share of various sources in the total energy consumed in the subcontinent is reflective of the diversity of resource bases of the different countries of the region. Coal has the largest share of commercial energy utilised in India. It is followed by oil and natural gas. Natural gas, followed by oil, is the main source of commercial energy in Bangladesh and Pakistan. Hydropower supplies a substantial portion of power in Nepal, Pakistan and Sir Lanka and also constitutes a major source of power generation in India.

There is a great need to develop regional co-operation among countries of this region in the crucial sphere of power generation and utilisation. An agreement by the South Asian Countries to co-operate in the field of energy would, for example, make it possible to construct a pipeline for bringing natural gas from Iran across Pakistan to India and Bangladesh. It would also become possible that some of the surplus natural gas is transported from Bangladesh for use in Eastern India. Both Pakistan and Bangladesh are poor in coal, with which India is well endowed. The complimentarity of power resource availability in the countries of the subcontinent calls for co-operation for mutual advantage and development of the region as a whole.

Nuclear power plants have been in operation in India for two decades, but the capacity is still rather small—less than 3000 MW out of a total installed capacity of 55,000 MW. The environmental problems—being fallouts of the use of nuclear power such as the long-term storage of nuclear wastes, reactor accidents and proliferation of nuclear weapons—are well known.

The most important area in the management of energy resources, which is being greatly neglected in all the countries pertains to the utilisation of non-conventional sources of energy like solar, wind, tidal or geo-thermal. The region is rich in such resources; most of these are involved in natural cycles and are inexhaustible. It is, therefore, particularly unfortunate that their utilisation is being grossly neglected.

The role of energy in sustainable development in South-Asia is paramount and requires efforts at multi-levels and within a multi-sectoral perspective. The vulnerability of the biotic component of environment is related to the widespread misuse of related energy. As is well known, South Asian communities are largely dependent on fuelwood for cooking purposes. The demand for fuelwood is, therefore, increasing at an alarming rate with the rapid growth of population. As a consequence, deforestation is acquiring alarming proportions; and the ecosystem as a whole is being progressively affected adversely. The subcontinental upland slopes are being subjected to destructive erosion and removal of soil cover in the upper reaches, on the one hand, and sedimentation in reservoirs as well as flooding downstream, on the other. Environmental degradation accompanied by increasing scarcity of fuelwood, is fast reaching the catastrophic level. The search for alternative sources of renewable energy is, therefore, acquiring high priority in the agenda of development planning in the subcontinent. It is fortunate in this context that the region has enough potential in the sphere of non-conventional sources of energy—solar, tidal, wind and geo-thermal.

SAQ 5

Fill in the blanks with appropriate words from the text :

i) All the rivers of Indian subcontinent belong to ..... and ..... river systems.

ii) The river basins combined with deltaic and coastal plains form the ..... of the subcontinent.

iii) Coal has the ..... share of commercial energy utilisation in India.

iv) Geo-thermal energy is ..... source of energy.

25.6 STRATEGY FOR ENVIRONMENTAL MANAGEMENT

The development processes in the subcontinent are caught in a vicious triangle—the three apices of which are high rate of population growth, back-breaking malnutrition and galloping ecological degradation. While it is no doubt true that economic development at a rapid rate is a necessity in this region to satisfy the basic human needs of its teeming millions, it should not be at the same time forgotten that development has to be intertwined with protection of the environment, on which the survival of the human species depends.

If follows, therefore, that development needs to be necessarily and on principle imbued with environmental considerations. Such a policy leads to sustainable development. Some of the important measures ensuring sustainability in development and providing a basis for the proper management of indigenous natural systems of our environment are as follows :

i) to develop and strictly adhere to a national conservation strategy;

ii) to nurture capabilities for comprehensive data collection and analysis;

iii) to make scientific assessment of their environmental impact before embarking upon developmental projects;

iv) to enact suitable legislation for enforcing appropriate standards relating to emissions into the atmosphere as well as discharges into water bodies or into the bowels of the earth;

v) to enact legislation which ensures safe collection, transportation. storage and disposal of toxic and hazardous waste;

vi) to promote strict adherance to laws establishing basic environmental norms for proposed settlements and for upgrading environment—friendly amenities in existing settlements;

vii) to provide safe methods of long-term storage of nuclear waste before taking up construction of nuclear power plants.

viii) to minimise, restrict and strictly control the use of chemical pesticides in agricultural practices;

ix) to insist upon land use planning and watershed management in particular, with a view to minimise and ultimately eliminate environmental degradation;

x) to carefully operationalise the sustainable development of coastal zones; and

xi) to promote environmental awareness and adherance to environmental-friendly values among the people.

25.6.1 Institutional and Legislative Framework

It is an unfortunate fact that the practice of integrating environmental concerns in development policies has not been given the attention in the subcontinent that it deserves. This is mainly due to the incidence of poverty and the low level of economic development. In the earlier years after the dawn of Independence a high rate of economic growth was considered to be the central goal and environmental concerns were greatly neglected and quite often sacrificed at the altar of high rate of growth. It is only during the late seventies that environmental protection began to be recognised as an important aspect of project planning. Let us take a cursory look at some of the important steps taken in the three countries of the subcontinent on their own and some aspects of their collective endeavours in this regard.

India

The Indian concern for comprehensive environmental protection became quite strong in the wake of the UN Stockholm Conference. The National Committee on Environmental Planning and Co-ordination (NCEPC) was set up as an apex body in 1972. The Wildlife (Protection) Act was enacted in the same year. Moreover, the 42nd Amendment to the Indian Constitution provided a provision obligating the government to protect the environment—forests and wildlife in particular. The Forest (Conservation) Act was passed in 1980 to regulate the use of forest lands for non-forestry operations. The Department of Environment was established in the same year. It has a wide range of functions: planning, regulation, conservation, promotion and co-ordination. The Ministry of Environment is generally headed by a Cabinet Minister. The Indian Parliament passed a comprehensive Environmental Protection Act in 1986. It bestowed adequate powers to central and state governments to take action with a view to integrate environmental goals into development programmes. The link among the concerned government agencies is established through ad hoc committees dealing with different environmental issues. Side by side with officials, a large number of social scientists and technical experts are also associated with the work of these committees.

Pakistan

The achievement of a high rate of economic growth was emphasised as the central objective in Pakistan before the Sixth Five Year Plan (1983-88), which focussed attention on the need to improve the quality of life and to integrate environmental considerations into the development trajectory.

The Government of Pakistan established the Environment and Urban Affairs Division under the Ministry of Housing and Works. It was made responsible for controlling environmental pollution and promoting environment-friendly policies. The Pakistan Environmental Protection Ordinance was subsequently promulgated. The principal feature of the Ordinance with respect to institutional arrangements was, setting up of a Pakistan Environmental Protection Council (EPC) and a Pakistan Environmental Protection Agency (EPA). The importance attached to the EPC may be guaged from the fact that it was chaired by the President himself.

Nepal

Environmental protection is not the responsibility of a single ministry in Nepal but is taken care of by the co-ordinated efforts of a number of relevant departments and ministries. The National Commission for Conservation and Natural Resources (NCCNR), composed of representatives of relevant ministries, was set-up to implement a national resource conservation strategy. The work of the NCCNR is operationalised by the Ministry of Forests and Soil Conservation and by the Department of Soil Conservation and Watershed Management.

25.6.2 The South-Asia Co-operative Environment Programme

While national programmes are quite important, it is regional co-operation among countries of South-Asia in the sphere of environmental management which is of crucial significance. The South-Asia Co-operative Envirnomental Programme (SACEP) is an important step in this direction. It is a joint undertaking of all the countries of South-Asia—Afghanistan, Bangladesh, India, Iran, Maldives, Nepal, Pakistan and Sri Lanka. A ministerial meeting held in 1981 adopted a 6 point Colombo Declaration on the environment of the region as a whole. It is concentrating attention on a concerted programme of activities in the following areas :

i) analysing environmental impact and cost-benefit ratios;

ii) setting up of environmental quality standards;

iii) developing technologies for the development of renewable resources and scientific utilisation of non-renewable resources;

iv) enacting suitable environmental legislation;

v) taking steps to conserve mountain ecosystems and watersheds;

vi) promoting social forestry;

vii) encouraging the conservation of wildlife and genetic resources with particular reference to coral formations, mangrove concentration, deltas and fragile coastal areas;

viii) maintaining and safeguarding the character of island ecosystems;

ix) regulating tourism along environment-friendly lines;

x) evolving suitable policies relating to energy and the environment;

xi) promoting programmes of environmental education and training with particular reference to wildlife management.

With some of the initiatives exemplified by legislative steps taken and institutional framework developed in the region as described above, the possibilities of ecologically sound development processes leading to a better quality of environment in the region appear to be quite bright.

South-Asia is a region of pronounced heterogeneity with respect to anthropological-environmental interactions. Population density is high but so is the fertility of the soil. The three major geo-systems, i.e. mountain, plain and plateau—possess typical characteristics of highland-lowland interactions through different types of interdependencies. The sustainability of development process in the subcontinent essentially depends upon a co-ordinated utilisation of the Himalayan, Indo-Gangetic-Brahmaputra plains and the plateau formations. The Monsoons provide a high degree of climatic interdependence in the region. The common functional elements of the environment, transcending state boundaries, need to be emphasised at the regional, national and subcontinental levels. There is a need to focus attention on regionally agreed measures and programmes through intensive and effective bilateral and multilateral joint policies and actions.

SAQ 6

Match the items given in Column I with those given in Column II. Write your answers in the box provided and compare with those given at the end of this unit.

Column I		Column II
i) National Committee on Environmental Planning and co-ordination	[ ]	a) planning, regulation, conservation promotion and co-ordination.
ii) Department of environment has varied functions such as	[ ]	b) was set up as an apex body in 1972.
iii) Environment and Urban Affairs Division	[ ]	c) co-ordinated effort of various departments and ministries to implement a national resource conservation strategy.
iv) National Commission for Conservation and Natural Resource	[ ]	d) was set up by the Government of Pakistan:
v) The South-Asia Co-operative Environment Programme	[ ]	e) adopted a 6 point Colombo Declaration on the environmentof South Asian region.
vi) Ministerial meeting of South Asian countries held in 1981	[ ]	f) promotes tourism along environment friendly line.

25.7 SUMMARY

In this unit you have studied that :

- on the basis of its geographic vastness, Indian peninsula has been justily called a subcontinent,
- Indian subcontinent has remained and continues to be the cradle of cultural exchange between East, West, Central and South-East Asia,
- today the geographical barriers pose no impedence to will of the artists handicraftsmen, reformers, soldiers and messengers to develop cultural ties with India. However, even in past India has exchanged cultural gifts with the rest of the world albeit at a lower pace,
- the integration in the natural systems of the countries in the Indian subcontinent calls for united efforts in utilising our limited resources in keeping with the rigorous demands of sustainability in the development process,
- co-ordinated approach in environmental management is required to obtain the benefits on a sustainable basis from a resource or resource complex,
- collective endeavours in the formulation of development policies will enchance the sustainable economic growth in the subcontinent.

25.8 TERMINAL QUESTIONS

1) What is the importance of natural barriers such as Himalayan ranges and the oceanic water bodies flanking Indian subcontinent in the building of its culture? Limit your answer to about 75 words.

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2) What were the gifts of other cultures to Indian culture and what did Indian culture give to the rest of the world? Limit your answer to 75 words.

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3) Explain why India became the cradle of cultural exchange between East, West, Central and South-East Asia?

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4) Who are subcontinental neighbours? Locate the situation of neighbouring countries on a map of Asia and mark their position.
(**Hint** : We advise you to buy a blank map of Asia from the market to carry out this exercise.)

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5) United efforts are required by the countries of subcontinent in utilising the limited resources of the region. Explain briefly why it is so?

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6) Enlist any four objectives of the South-Asia Co-operative Environment Programme.

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25.9 ANSWERS

Self Assessment Questions

1) I) a), II) b), III) c), IV) b)

2) I) a) southward b) northern c) few d) middle
II) a) T, b) T, c) T, d) T

3) i) c), ii) a, iii) d, iv) b

4) i) ×, ii) ✓ , iii) ×, iv) ✓

5) i) Indus, Ganga
ii) food bowl
iii) largest
iv) non-conventional

6) i) b), ii) a), iii) d), iv) c), v) f), vi) e).

Terminal Questions

1) The oceanic waters flanking the Indian subcontinent and the Himalayan ranges have acted as formidable barriers to mixing of Indian culture with its neighbours. This has strengthened the forces of cultural unity of our peoples. However, these barriers have also allowed certain degree of mixing of Indian culture with that of West Asia, East Africa and ancient and the medieval world.

2) The Prince of Macedonia brought the beauties of Greek sculpture. The Mangols, Turks and Arabs brought with them the art of making the dome and majestic minarets. India carried Buddism of Sri Lanka, Tibet, China, Korea and Japan. India also gave the world the concept of numerals, the decimal system and the ideas of Upanishads.

3) India became the centre of cultural exchange because the formidable geographical barriers isolating the Indian subcontinent were situated in close vicinity to the major highways of the ancient and the medieval world. In the past, whoever mustered enough courage to cross these barriers, found himself in an altogether different world. Such valient artists, soldiers, merchants or messengers found that they had enough to exchange in terms of culture.

4) To the east lies our subcontinental neighbour Bangladesh. To the west along our border lies Pakistan and beyond the Khyber, Afghanistan. Sri Lanka and the Maldive Islands lie to the south of our Lakshadweep group almost like pearl beads in the same garland. The Himalayas guard our northern frontiers. Across the mountain wall lies—China. Superimposed over the lofty ranges lies to our north the independent Himalayan Kingdom of Nepal. Across the Himalayas lies Tibet. The Indian boundary stretches eastward along a chain of hill-ranges—Mishmi, Patkoi and the Naga hills.
(We advise you to buy a map of Asia from the market and show their position on the map as an exercise.)

5) There is a need to develop a co-ordinated approach to resource utilisation and environmental protection for the subcontinent as a whole because this region has an integrated system of interdependent and interrelated natural phenomena. For example, deforestation in Nepal leads to flooding in North Bihar.
(Students can give other examples also.)

6) The four objectives of SACEP are :
i) Setting up of environmental quality tests.
ii) Regulating tourism along environment friendly lines.
iii) Promoting programmes of environmental education.
iv) Encouraging the conservation of wildlife and genetic resources.
(Students can give any four objectives given in the text.)

EPILOGUE

We have come to the end of this course on Human Environment. It is now time to reflect on what we have learnt in this course. Human Envirnoment implies the ways in which we, the human beings, interact with other living and non-living components of the environment. Human activities during the course of interactions have direct and indirect impact on the environment leading to the disruption in natural balance of physical and biological processes. This disruption has resulted in a number of environmental problems—pollution, over-population, resource depletion, wildlife extinction, etc. In this course, we have discussed broadly the natural, man-made and social environment and environmental hazards caused by human activities. We have also dealt with social, economic and health problems human beings are facing today as a result of fast changing environment.

Human beings, alone among all elements of nature have been able to develop the unique capability to intervene in the natural processes and to change the environment. This unique human capability is the outcome of their ability to use technology and has been increasing exponentially stage by stage; from hand axe to the laser beam or from the abacus to the computer. Technological developments have necessitated and have been accompanied by basic social transformations. When a social institution becomes an impediment in the path of technological change, it is replaced by a new set-up which is conducive to it.

The population size of all other species are rigorously determined by the predator-prey ratio. Suppose there are 100 lions living on 1000 deer. If the number of lions increases, there would not be enough food for all of them; some would die of starvation or be killed in intraspecies struggle for food and the sustainable balance would be restored. Human beings, however, have overcome the rigidity of this controlling mechanism to some extent. On the demand side, by controlling disease they can increase longivity and reduce the death rate. On the supply side, they have already increased food availability at a phenomenal rate. The differential consequences of these phenomena in countries at disparate levels of development pose demographic problems of different kinds and impinge upon the global ecosystem in diverse ways. The population crisis of South-Asia may be understood within the framework of the phenomenon called the demographic transition, through which this region is currently passing, whereby the mortality rate is falling at a higher rate than the fertility rate. The resultant growth rate is consequently of a high order. It is hoped on the basis of historical experience that we are entering the next phase of the transition wherein birth rates would also begin to fall down and the resultant growth rate would tend to even out.

The interactive system constituting human beings and other living and non-living components of nature may be viewed as a triangle of forces. Non-human elements of the nature provide an apex of crucial significance. They lay down the limits of freedom and indicate the direction along which optimum utilisation is possible in the long run. Human beings can ignore the advice of non-human nature only at great cost to themselves and to the earth as their home. The other two apices of the triangle : technology and institutions are provided by human beings. Since anthropoligists define man as a tool using animal, **homo faber,** technology enters, so to say to some extent definitionally in the human destiny. Also, the use of the tools has made the species what it has become. Technology plays a crucial role in the triangle of forces. Firstly, it aids in the developmental processes and within limits accelerates natural processes. Ploughing, for example, accelerates the aeration of the soil. Secondly, technology removes specific deficiencies of the natural processes. Irrigation, for example, provides additional water that is required for adequate plant growth. Thirdly, technology teaches human beings to adjust to the rigours of non-human elements of the nature and to overcome them by understanding them better. For example, a drought resistant variety of oilseeds overcomes water deficiency. It is, however, being increasingly realised that there are limits to technological interventions which human beings can cross only at great danger to the natural systems and to themselves. These limits are not rigidly fixed but continue to expand with better understanding of laws of nature.

The third apex of the triangle of forces is provided by social institutions. Social institutions play a major role in determining the ways in which people interact among

themselves and with their environment. These are either conducive to human interactions with non-human elements of nature or inhibit the proper and healthy interactions. Chipco movement is a good example of the former—it is enabling human beings and trees to live in harmony providing sustenance and health to both. However, some institutions like industrial organisations which may not provide healthy interactions with the environment are the examples of the latter. Human history teaches us that when social institutions become bonds enchaining the proper unfolding of human interaction with non-human nature, these bonds are broken and the dysfunctional institution is replaced by another which aids and supports it. That is how the Zamindari system, imposed on Indian agriculture by colonialism, which was sapping its vitality, was replaced in independent India by land reforms giving propriety rights on land to a large number of tillers of the soil. Land and labour productivity, freed from the chains, went up. Human beings, right from hunting and gathering societies to industrial societies, have interfered in natural systems during the course of development. This has resulted in the modern society, wherein people think in terms of maximum material output and maximum consumption. This mentality has led to near-crisis situation of environment, forcing the modern man to do some rethinking about the developmental strategies.

The laws of nature, therefore, not only impose constraints on development but also point to the direction of optimal as well as sustainable development, a concept enunciated by Burtland Commission on Environment and Development. With such an understanding it has now become possible to steer clear of two equally erroneons strategies—first, the strategy of development at all costs leading to eco-destruction; and second, the strategy of rejecting development in the name of ecology. Ecology has to be saved from misdirected development, no doubt, but development has also to be saved from misdirected ecology.

This is particularly important from the point of view of vast multitudes who inhabit the third world, living a life of hunger and misery. The availability of natural resources and their level of utilisation is highly unequal in developing and developed worlds. To cite a few examples, the per capita closed forest area is 3 hectares in the USSR, 2 hectares in North America, while it is 0.2 hectares in Asia and 0.4 hectares in Africa. The utilisation of natural resources is even more uneven. For instance, the cumulative production of crude oil (1976) was 112 million barrels in North America as against 9 in Asia and Pacific and 6 in Latin America. Similarly for natural gas in trillions of cubic feet, the figures range from 500 in North America to 46 in Asia and Pacific and to 21 in Latin America. What is particularly disturbing is the fact that even in such cases wherein the quantum of natural resources available in less developed countries is higher than in more developed ones, the levels of their actual production and utilisation is considerably low in the former. Water resource availability, for example, in millian gallons per day on an average ranges from 9,540 in Asia to 4,310 in North America and 2,290 in Europe. But water used for energy production is as high as 232 billion cubic metres in North America, 176 in Europe and as low as 68 in Asia. The situation in terms of final consumption is still more alarming. There are many cases wherein the less developed countries are endowed with more resources, their level of production is also higher, but their final consumption is much less than in more developed countries. In case of marine fisheries, for example, Asia catch was as high as 30.7 mmt (million metric tonnes) as compared to 4.8 mmt for North America and 12.6 mmt for the USSR. But the total consumption for all less developed countries taken together does not reach even 1/10th of the consumption in the industrialised countries. The consumption per capita in the industrialised countries is more than 20 times higher than that in the less developed countries.

Under such compelling circumstances, the global village that the world has become and the developing countries, in particular, are not in **Either-Or** situation and cannot afford to opt for **Either** ecology **Or** development. Neither can there be an international division of labour, whereby poor countries save ecology and rich countries enjoy the fruits of development. That would not only be unfair but impractical and counter-productive, for development like freedom is indivisible. A world wherein a few islands of vulgar affluence float in an ocean of misery would collapse under the heavy weight of oppression—of humans against humans, of nations against nations, and, most importantly, of humans against non-human elements of nature. Seen in this context, the all-embracing anti-developmental

injunctions, being issued for the benefit of the innocents of the third world are really intended to widen the North-South gap and treat the misery of the bulk of humanity as a natural calamity. Our ecological concerns are directed to optimise development so as to extricate our people from the vicious stranglehold of hunger and poverty. Let us not forget that hunger continues to be the most potent pollutant in the third world—an eco-destructive force of tremendous magnitude for it destroys the homo sapien, a crucial component of the contemporary eco-system. Those who rightly lose their night's sleep over the fate of a blighted tree or a faded flower should also sometime condescend to look at the bloated bellies, sunken eyes and the skinny arms of hungry children!

A proper strategy for eco-development should simultaneously strengthen the integrity of the ecosystem and ensure an accelerated rate of socio-economic development. The essential characteristic feature of eco-development, defined in this manner is its sustainability.

Sustainable eco-development, in essence, is a process of change, in which the exploitation of resources, the direction of investments, the orientation of technological development and the institutional changes are all in harmony and enhance both current and future potentials to meet human needs and aspirations. Since sustainability is such a crucially important concept in the context of both ecology and development, let us examine its implications in some depth.

First, sustainable eco-development calls for a sane strategy of conservation of natural resources. It was Thoreau who proclaimed "in wilderness is the preservation of the world" and that man should consider himself to be "an inhabitant or a part and parcel of Nature". Conservation does not mean only the preservation of the wilderness but also, and more importanly, the rational management of natural resources so that they may yield the greatest sustainable benefit to the present generation while enriching or at least maintaining their potential to meet the needs of the future generations. Conservation and development may appear to be incompatible, but they are not so. While development aims at achieving human goals largely through the current utilisation of natural resources, conservation aims at ensuring the endless continuance of such utilisation. The conservation strategy is particularly important for living resources. It has two main objectives :

- Essential ecological processes and life support systems should be maintained. The most threatened of these are agricultural, forests, coastal and fresh water systems.
- Genetic diversity should be preserved. The genetic material—contained in the domesticated varieties of crops, plants, trees, livestock, aquatic animals and micro-organisms as well as in their wild relatives—is essential for the breeding programmes in which continued improvements are achieved in yields, nutritional quality, flavour, durability, pest and disease resistance, responsiveness to different soils and climates and some other important qualities.

Second, sustainable eco-development calls for optimal utilisation of resources freely available in nature and augmenting them, if and only to the extent necessary, by natural resources which have been transformed to become utilisable by technological intervention. Let us take the example of water use in agriculture. Rainfall is a resource which is freely available in nature. Irrigation water is the end product of technological intervention. The strategy of sustainable development covers the entire spectrum of productive activities of the human beings. Let us illustrate its characteristics from the sphere of primary production, wherein it needs to be operationalised essentially in four ways :

i) The differentiation between animal breeding and plant breeding took place in response to the particular kind of resources available freely in nature in a particular region being more suited either to animal or plant breeding. The semi-arid grass lands were more suited for the former and the humid areas for the latter. The tussle—conflicts as well as adjustments between the settled agriculturists and the nomadic herdsmen—has put its stamp on proto and early history of mankind. This is particularly true to India. Agricultural communities, with their worship of the mother goddess and fertility cults, settled down more than six thousand years ago in the lands fertilised by the waters of the Indus and its tributaries. In contrast, the Aryans, immigrating in hordes from the semi-arid grass lands of central Asia were essentially nomadic herdsmen, who brought their

own spiritual ideas, their male gods and their patriarchal organisation into this land. The interaction between these immigrant herdsmen and the native agriculturists of the Indus Valley produced a cultural synthesis of great elegance and beauty in the subcontinental polity.

ii) There is a regional specificity of agricultural production. The peasant has come to terms with the soil and the climate of his region. Regional specialisation of agriculture is essentially based on the principle of the optimal utilisation of resources freely available in nature. Wheat in the north-west and rice in eastern delta has been a traditional response to differentials in rainfall and temperature.

iii) There is a seasonal sepcificity in production. The differentiation between the Rabi and the Kharif crops in Northern India, for example, is a response to seasonal changes in the availability of water as well as heat in diverse ways in different regions of India. Even in the case of the same crop, varieties differ in different seasons—the **Aman,** and **Aus** and the **Boro** rice of Bengal provide a good example of such a seasonal variation in the case of the same cereal. The crop-rotation system that has been evolved over millenia is the product of social experience in interacting with non-human nature with a view to optimise the use of diverse resources available in nature freely. The seasonal diversity of cropping is also intended to reduce the rate of depletion of soil fertility and in some cases, for example, in the case of leguminous crops like **Arhar** actually to enrich the soil.

iv) There is a way of life wherein seasonal variations are combined with inter-regional movements with a view to optimise the utilisation of resources available freely in nature. It is called **transhumance.** In the case of Rabi and Kharif, the human beings stay at the same place and vary the crop according to seasons. It is the other way round in the case of transhumance. The crop—in this case the herd of goats or sheep—remains the same but the herdsmen move from one place to another with seasonal change.

Third, in the perspective of eco-development, it is imperative to develop a scheme of prioritisation in resource use, flowing from the **degree of expendability** of the resource. It may be better that the two way classification of natural resources into the replenishable and the non-replenishable is expanded into a four-way classification which would be more appropriate from the point of view of eco-development. These four classes of natural resources may be arranged vertically from higher to lower in terms of their degree of expendability as follows :

i) inexhaustible like solar energy ;
ii) cyclic like water in the hydrological cycle;
iii) renewable like natural vegetation; and
iv) non-renewable like fossil fuels.

A sound resource use policy should be based on the principle that moves on to a lower order in the scale only after the possibility of utilising the higher resource has been carefully examined and found to be impossible. Taking the case of energy use, for example, attempts should be made to use solar energy as far as is possible; failing which, one should move down one step to hydro-electric power. If that is also not found to be feasible one may move down a step further to bio-mass energy. Only in case, all these have been ruled out, coal may be used as a last resort.

It is a known fact that Pandit Jawaharlal Nehru was keen on science, technology and industrial development. He also showed his concern for environment as early as in 1957, when he wrote, "We have many large scale river valley projects which are carefully worked out by engineers. I wonder, however, how much thought is given before the project is launched, to having an ecological survey of the area and to find out what the effect would be to the drainage system or the flora and fauna of that area. It would be desirable to have such an ecological survey of these areas before the project is launched and thus avoid an imbalance of nature."

It is heartening to note that in the case of India, as early as in Fourth Five Year Plan, a fairly clear understanding about the relationship between ecology and development was discernible. It was stated therein : "The physical environment as early as in complex and interconnected system in which any action in one part affects others. There is also the interdependence of living things and their relationships with land, air and water. Planning for harmonious development recognises this unity of nature and man. Such planning is possible only on the basis of comprehensive appraisal of

issues—particularly economic and ecological. It is necessary, therefore, to introduce the enviromental aspects into our planning and development. Alongwith effective conservation and rational use of natural resources, protection and improvement of human environment is vital for national well-being. It is particularly important that long-term basic considerations, the social costs and benefits be used as the yardstick rather than private gains and losses."

The above statement of the Planning Commission underlines the crucial significance of judiciously combining ecological concerns with developmental needs in our march towards the future. It is most welcome that the Commission has now, in the fifth decade of independent India, emphasised the need for relating agricultural development to the agro-climatic characteristics of the different regions of India. It has suggested that while formulating the Eighth Five Year Plan, special attention may be paid to the following aspects :

1) Need for sustained increase in productivity without damaging the quality of land;
2) Need for maintaining ecological balance;
3) Meeting increased demand for food, fodder, fibre, fuel-wood and the raw materials for agro-industries;
4) Need for co-ordinating land use policy with policy for optimum utilisation of water resources;
5) Problem of diversion of good agricultural land for non-agricultural purposes;
6) Regional problems such as shifting cultivation, tribal areas, desert areas, alkaline, saline and water-logged areas, wastelands, etc;
7) Optimum cropping pattern, especially in drought prone/desert areas, so that maximum advantage is taken of soil and moisture;
8) Linking of the land use plan with rural employment programmes; and
9) Steps required to improve the database for effective land use planning, including soil surveys and preparation of an inventroy of land resources.

We have in this course disucssed conservation and management of physical and biological resources, various laws to protect environment and various measures to create social awareness which guide us towards the development of a sustainable society. In a sustainable mode of development we do not go on taking from the nature, rather, we enter into a cyclic relationship that removes from and returns to nature, permitting the continued socio-economic development in the long run. Sustainable development, therefore, requires :

i) a political system that secures effective citizen participation in decision making;
ii) an economic system that is able to generate surpluses and technical knowledge on a self-reliant and sustained basis;
iii) a social system that provides for solutions for the tensions arising from disharmonious development;
iv) a production system that respects the obligation to preserve the ecological base for development; and
v) a technological system that searches continuosly for new solutions to the problems.

GLOSSARY

Act : Act is a law passed by Parliament. Where as laws are made by Parliament and also by other bodies including the judiciary (courts).

carburettor : an apparatus for mixing oil-vapour and air in an engine

centripetal forces : forces uniting the cultures

cropping intensity : intensity of cropping a land

disseminate : spread (information)

electrical conductivity : the conductance of a solution enclosed between electrodes of 1 square cm area and 1 cm apart

functionaries : officers or subordinate workers who work for a given programme

halophytes : plants which can tolerate relatively high concentration of salts in the soil

intervention : remedial measures to correct the situation or meet the problem

kilolitres : one thousand litres

locus standi or **Standing** : The right to stand before the court of law or the right to file a suit in the court of law

malnutrition : unbalanced or inadequate intake of food and such condition for a prolonged period leading to adverse results

media : means of communication such as newspapers, radio, TV, etc. An individual spreading knowledge is also a medium

misconceptions : wrong ideas about anything.

opinion leaders : politicians, social workers and others who shape the opinion of people

regeneration : creating again or improving the damaged condition

tertiary level : beyond high school education, that is college or university level education

tort law : law dealing with compensation for civil injuries resulted by individuals

tuning : adjustment of petrol/air ratio to serve as feed for engine

FURTHER READING

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2) Saxena, A.B. *Environmental Education,* Agra : National Psychological Corporation, 1986.

3) Khoshoo, T.N. *Environmental Priorities in India and Sustainable Development : Presidential Address.* New Delhi, Indian Science Congress Association, 1986 (Pages 189-206).