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ENVIRONMENT GEOGRAPHY

(1.) Geographers' approach to
environment studies

MAN-ENVIRONMENT RELATIONSHIPS

3.1. APPROACHES TO THE STUDY

The study of relationships between man and environment has always been, in one way or the other, a focal theme in geography but the concept of geography as environmental science and facets of man-environment relationship changed through time with the development of human society and the dimension of environment. In the beginning of the process of evolution of man and his society physical elements of the planet earth e.g. terrain, soil, water, climate, flora and fauna formed man's environment and man was basically a '*physical man*' because of his limited wants, requirements and total dependence on nature. As the man became social, economic and technological man, he broadened his environment by creating his own environment through his design and skill to have provision for better food, shelter, access and comfort. The man-environment relationships, thus, can be perceived and evaluated in a variety of ways and approaches.

1. ENVIRONMENTAL DETERMINISTIC APPROACH

This approach is based on the basic tenet of '*earth made man*' and pays more attention on the complete control of physical environment on man and his activities. In fact, according to deterministic perspectives of man-environment relationships, man is subordinate to natural environment as all aspects of human life viz. physical (health and comfort), social, economic, political, ethical and aesthetic etc. not only depend but are dominantly controlled by physical environment. Though this deterministic or environmentalistic approach blossomed in the writings of E.C. Semple (1910) in the second decade of the present century but its seeds were already sown in the second half of the nineteenth century. In fact, the publication of '*The Origin of Species*' of Charles Darwin in 1859 laid the foundation stone of the concept of environmental influences on man and other organisms.

Fredrich Leplay demonstrated the effects of physical environment on society through his dictum, PLACE (environment) - WORK-FOLK, which shows that environment (PLACE) conditions the type of work, and work shapes, at least in part, the social organisation (Folk) (George Tantham). The concept was further elaborated with the tone of firm determinism by Demolins (1901 and 1903). He postulated that 'society is fashioned by environment'. He attempted to analyse social structure in terms of 'geographical environment'. Three American geographers e.g. W.M. Davis, E.C. Semple and E. Huntington strengthened the concept of environmentalism. W.M. Davis, though more known as a geomorphologist, attempted to link nature with man. His two essays published in 1903 and 1906 clearly demonstrate that human activities, racial characteristics and cultural elements are related to greater extent to the environment. He classified human elements in terms of physical elements and pleaded for the control of physical elements over human elements but later on he modified his earlier concept of man-environment interrelationships as the main subject matter of geography and treated description of regions of the earth as the core of geography. The concept of environmentalism culminated in 1910 when American geographer E.C. Semple published her book 'Influences of Geographic Environment' wherein she opined that 'man is the product of the earth's surface. This means not merely that he is a child of the earth, dust of her dust, but the earth has mothered him, fed him, set him tasks, directed his thoughts, confronted him with difficulties that have strengthened his body and sharpened his wits, given him his problems of irrigation and navigation and the same time whispered hints for their solutions' (E.C. Semple, 1910, pp.1-2). Deterministic/environmentalistic approach was fully organised on scientific plane by E. Huntington. His 'Civilisation and Climate' (1915), 'The Human and Habitat' (1927), 'Season of Birth' (1938) etc. clearly demonstrate the influences of physical environment on man. His postulation that 'climate not only

influences human life but also his birth' proves that he was a strong advocate of environmentalism.

It is apparent that the deterministic/environmentalistic school advocating control of nature on man dominated the geographic thoughts upto 1920. According to Grossman (1977) the first two decades of the twentieth century was influenced by three aspects of contemporary scientific thoughts. (i) Darwinian concepts of natural selection, adaptation and survival of the fittest. Darwin's argument that 'gradual modification and diversification of organisms stems from a process of natural selection and adaptation to environmental factor both being slow but ongoing over long period of time' (C.C. Park, 1980, p.113) is fully reflected in 'Ratzels' social Darwinist concept of geography as the study of man's relationship to his environment' which 'had held sway - whether it was with emphasis on the role of human choice (as in the possibilist tradition of French geography) or on influences and controls exerted by nature on the course of development of human societies (as visible, for example, in the works of Ellen Churchill Semple in U.S.A. and A.J. Herbertson in U.K.)' (R.D. Dikshit, 1985, p.69). (ii) Application of deductive approaches to scientific enquiry and (iii) Acceptance and application of Newtonian concept of cause-effect relationships.

2. TELEOLOGICAL APPROACH

Teleological approach is based on religious faith of man being superior to nature and all other creatures. This school emanated from the teachings of Judeo-Christian religious tradition which preached that 'man is superior to all creatures and every thing is created for his use and enjoyment'. This ideology of man-environment/nature relationship fostered the man to exploit natural resources and to subdue nature without considering the after-effects of reckless and uncontrolled plundering of natural resources. This approach of man-environment relationship led to excessive and rapid rate of exploitation of natural resources in North America and Western Europe as well as in other parts of the world which were their colonies. A host of scien-

tists and environmentalists have held this religious tradition responsible for present-day ecological crises.

3. POSSIBILISTIC APPROACH

Possibilistic approach to the study of man-environment relationships emerged through the criticism of environmental determinism and overtone of teleological approach. Right from the very inception of the school of environmental determinism there was dissenting voice raised by those who believed that 'no doubt physical environment influences man and his activities but there is ample scope for man to change the environment so much so that it becomes suitable for man and his society'. The German philosopher Hegel, fed up with physical determinism remarked, 'Don't talk to me about environmental determinism. Where the Greeks once lived, the Turks live now, that settles the matter'. While reviewing man-environment relationships, Kirchoff concluded that 'man is not an automation without a will of his own. The suggestions thrown out by the nature of his birth place some times find him a docile, some times a different people'. A group of people did not approve the principles of environmental determinism. Though they did not discord the barriers of environment but they gave due weightage to active man. They believed in the capacity of man to modify and mould the nature in their own ways. This concept of possibilism was founded by Febvre who has remarked, 'man is a geographic agent and not the least. He every where contributes his share towards investing the physiognomy of the earth with those 'changing expressions' which are the special charge of geography to study'.

Two French geographers, Vidal de la Blache and Jean Brunhes and American geographers Isaiah Bowman and Carl Sauer founded the school of possibilism which is based on the philosophy of possibilism in nature at every stage in a given space and time as remarked by Febvre, 'There are no necessities, but every where possibilities and man as a master of these possibilities is the judge of their

use'. Possibilists were quite aware of the limitations of freedom of man to dictate terms to 'nature' and thus they did believe that man cannot fully tame the nature and is not always victorious. Febvre, a staunch believer and advocate of possibilism has accepted that 'Man can never entirely rid themselves, whatever they do, of the hold their environment has on them. Taking this into consideration they utilize their geographical circumstances more or less according to what they are and take advantage of their geographical possibilities. But here as elsewhere there is no question of necessity'. Jean Brunhes also accepted the limitations of man's control over nature as is evident from his writings, 'The power and means which man has at his disposal are limited and he meets the nature bounds which he cannot cross. Human activity can within certain limits vary its play and its environment, but it cannot do away with its environment, it can often modify it but it can never suppress it, and will always be conditioned' (Jean Brunhes).

Possibilists replaced more deterministic terms 'Control' by 'influence' and 'influence' by more moderate terms 'response' or 'adjustment'. G. Tantham while bridging the gap between environmental determinism and possibilism maintained that 'the maxim should not be conquest of not submission to, but cooperation with nature'. Harlan Barrows (1923) presented an alternative approach and defined geography as 'human ecology' wherein he pleaded for the study of mutual interaction between man and environment, the study of human societies in relation to their environment and environmental adaptation in place of environmental control.

4. ECONOMIC DETERMINISTIC APPROACH

This approach is based on the basic ideology of Man's mastery over environment and continued economic and industrial expansion through the application of modern technologies. 'The basic thesis of the growth (affluence) school is that because economic growth is required for political, social and economic stability, the 'quality of environment' normally assumes lower priority in formulating

planning proposals and in long-term planning because the deterioration of the environment is generally protracted and socially less oblique than a deterioration in the economy' (C.C. Park, 1980). In fact, 'economic determinism' based on two fallacious assumptions of (i) positive correlation between the population of a given region and the level of economic development and activity in that region and (ii) the interactions of people, resources and society being governed by universal economic principles as observed by W. Zelinsky (1966), believes in man's ability to solve environmental problems arising out of continued economic growth and industrial expansion. It may be pointed out that this extreme concept of economic determinism led to rapacious exploitation of natural resources in the western developed countries and thus created most of the environmental and ecological problems of global dimension.

5. ECOLOGICAL APPROACH

Ecological approach to the study of man-environment relationships is based on the basic principle of ecology which is the study of mutual interactions between organisms and physical environment on the one hand and interactions among the organisms on the other hand in a given ecosystem. Thus, man is considered as an integral part of nature/environment. The relationship of man 'with the natural environment should be symbiotic and not exploitative nor suppressive' (C.C. Park, 1980). This school recognises man, being most skilled and intelligent, as the leader of all biota and steward of the earth. This approach further lays emphasis on wise and restrained use of natural resources, application of appropriate environmental management programmes, policies and strategies keeping in view the ecological principles so that already depleted natural resources are replenished (wherever possible), degraded environment is set right and ecological balance is maintained.

It may be pointed out following C.C. Park (1980) that man-environment relationships and debate should be viewed taking into account the

multi-dimensional aspects of environmental problems which are the result of complex series of several factors viz. physical, economic, social, political ethical etc. but any positive approach adopted for the study of man-environment relationships must take into account the fact that there should be harmony and not hostility between man and environment. It is obvious that the relationship between man and environment is two-directional as the environment affects and influences man and in turn man also influences and modifies the environment. This type of mutual interactions and relationship between man and environment is symbiotic in character.

3.2. ENVIRONMENT AND MAN

The environment affects man through (i) biophysical limitations, (ii) behavioural controls and (iii) resource availability. Weather and climate affect human well-being and health. The study of reactions of human body to changes in the atmospheric environment is known as '*human biometeorology*' which lays emphasis on to 'establish how much of the overall biological variability is the result of changes in weather, climate and season' (J.E. Hobbs, 1980, p.60). According to M. Bates (1966) three levels of climatic environment affect human behaviour viz. (i) '*microclimate*' (which represents weather conditions surrounding an individual organism), (ii) '*ecological climate*' or '*ecolimate*' (represents weather elements of the habitat of the organisms, in the case of man the habitat may be his house and working places like factory, office, mine, agricultural farms, pasture or forest) and (iii) '*geographical climate*' or '*geoclimate*' (weather conditions of larger areal unit and longer temporal span).

Biologically, human body can function properly only in certain suites of environmental conditions in terms of oxygen, heat, light, humidity and precipitation, wind, lightning, fog, clouds, atmospheric electricity and space. Even the survival of human body depends on the above factors. Lack of required amount of oxygen at higher altitudes

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2.) Perception of environment in different stages of civilization

different parts of the earth's surface also influences and conditions the economic and political behaviour of human being. To a certain extent by man's perception of the environment and his responses to these environmental factors like vul-
canic eruptions, floods, droughts, landslides, etc. influence man's perception of the environment and decide his reactions and actions. For example, the inhabitants of the riverine tracts of major alluvial rivers of North India are largely adversely affected by frequent floods and riparian decay. They give that rivers are sources of danger to the inhabitants of equatorial regions. The riverine tracts are seldom free from the disastrous role of rivers. The Chambal valley (India) has witnessed the social behaviour of the local people of the adjoining areas. The network of ravines provides ideal shelter for people after committing crimes. The ravines which extend standards by providing safe shelter to the criminals. Many more examples demonstrate the impact of environ-

3.3 MAN'S INTERACTIONS WITH THE ENVIRONMENT

A HISTORICAL PERSPECTIVE

Man is an important part of the biotic component of the environment and simultaneously he is also an important factor of the environment. Thus man plays important roles in the natural environmental system in different capacities such as 'biological or physical man', 'social man', 'economic man' and 'technological man'. All the natural functions of human beings such as birth, growth, health and deaths are affected and determined by the natural environment in the same manner as the cases of other organisms but man being most developed and advanced animal, both physically and mentally and hence technologically, is capable of making substantial changes in natural environment so as to make it suitable for his own living. The role of most primitive biological or 'physical man' in the functions of natural environmental system was fundamentally that of user of environmental resources and thus he played the role of a factor of the environment but as the skill and technology of man developed with cultural development his roles towards natural environment also changed progressively such as from user

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through modifier and changer to destroyer of the environment.

So, it is the technology of man which has drastically changed the man-environment relationship from prehistoric period to the present most advanced industrial period. In fact, 'the industrial and scientific revolutions have led to rapid changes in our environment, but all technology, from the most primitive to the most advanced, causes some changes in the environment' (D.B. Botkin and E.A. Keller, 1982). It may also be stressed that religious ideas and materialistic outlook of man have also played significant roles in changing man-environment relationships on a large-scale. Modern technological man, intoxicated by highly advanced technology and materialistic viewpoints, has changed and is changing the environment for his vested interests to such an extent that even the very existence of human beings is threatened.

Thus if we look at historical progression of man-environment relationships it becomes clear that purely natural relationship between 'physical primitive man' and natural environment during prehistoric period has changed to hostile relationship between 'technological man' and the environment at present. This substantial change and shift in the nature and magnitude of man's interactions with the natural environment has given birth to numerous environmental problems of serious consequences because the changes effected by man in the environment have become unadjustable by the in-built selfregulatory mechanism of the natural environmental system/ecosystem. The study of changing relationships between man and environment in historical perspective may help in demonstrating the increasing adverse impacts of human activities on the environment. The changing relationships of man with the natural environment from prehistoric to modern periods may be divided into four stages as given below -

1. Period of hunting and food gathering
2. Period of animal domestication and pastoralism

3. Period of plant domestication and agriculture
4. Period of science technology and industrialization

1. PERIOD OF HUNTING AND FOOD GATHERING - This period is related to most primitive man when he was basically a part of natural environment and his function was like other animals. Thus the primitive man was functionally a '*biological man*' or '*physical man*' because his basic requirements were limited to food only which he could collect from his surroundings. Thus the primitive man used to satisfy his hunger by fruits which were easily obtained from plants and trees and he spent his nights in the caves or on the trees. The relationship between man and the environment was very friendly, cordial and sweet. The natural environment provided all requirements of early man (food and shelter) and thus man was totally dependent on his environment. Though even early man used to derive resources from the nature (only food) but this did not make any change in the natural environment because only fruits were used.

With the march of time man learned to hunt animals for his food. This led to first attempted intentional step of man in the exploitation of natural resources. Even the hunting of animals (significant component of biotic components of natural environment) by early man did not make any change in the natural environment system because of his limited requirement and very low population and unorganized society.

The discovery of fire made a significant change in the attitude of man because now he learned to cook animal flesh before eating. This practice required wood which he used to derive easily from the forest. The demand of wood for burning purposes to roast animals made another significant starting point in the technology as the man had to invent some device to cut and chop trees and their branches to get firewood. He also invented some tools to kill animals. Thus the discovery of fire and invention of tools and weapons

made the man capable of exploiting natural resources from the forest through fruit gathering and animal hunting.

The first destruction of environment started with inadvertent burning of forests due to carelessness of man while cooking and roasting the animals with fire. This led to a chain of effects by man on his environment. He might have seen the destruction and clearing of dense forests and running of animals away due to inadvertent man-induced fire. He, thus, might have intentionally used fire to drive away dangerous animals from his surroundings. At a much latter date he also might have used fire to clear the forest for different purposes (such as creation of habitats, farmland etc.). Since the early man depended exclusively on fruit gathering and animal hunting to satisfy his hunger, he was very much mobile because he had always to move in search of food. This mobile tendency of early man was also responsible for least interference with the environment in terms of its destruction.

It may be concluded that "fire was one of the first major ecological tools used by human beings to change the environment for their own benefit. Indeed, fire has been used around the world by early peoples to clear the land for improved travel and hunting or for farming" (D.B. Botkin and E.A. Keller, 1982).

2. PERIOD OF ANIMAL DOMESTICATION AND PASTORALISM - With the march of time early man learned to domesticate animals for his own benefits. He might have domesticated some milch cattle and some animals for meat in the beginning. Slowly and slowly his herd of domesticated animals might have substantially increased. This trend might have necessitated to create habitats (ranches fenced with branches of trees and thorny bushes) though for temporary stay for the domesticated animals. Thus early man used to burn forest to create temporary home for the domesticated animals, to exploit forest resources to gather fodder for his animals and food for himself. Domestication of animals might have also given birth to group

or community life among the early peoples in order to protect their animals and themselves from wild animals.

With the march of time the early peoples might have gathered larger herds of domesticated animals. They still stuck to nomadic way of life as they had to move from one place to another place in search of water and fodder for their animals and food for themselves. Thus increase in the population of domesticated animals also led to increase in the population of early peoples which ultimately led to meaningful exploitation of environmental resources but this could not change the natural state of the environment because the population of early peoples and their domesticated animals was still under manageable size and the changes brought in by human activities in the environment were well within the limit of self-regulatory mechanism of the natural environmental system/ecosystem.

(D.B. Botkin and E.A. Keller (1982) have maintained that prehistoric people changed the environment (i) by hunting (of animals for his food); (ii) by decreasing the abundance of some animals through hunting; (iii) by increasing the abundance of others when they altered the habitats (of animals) and made them more favourable to those species; (iv) by burning (of the forests for making his and his domesticated animal's movement easy, for creating homes for his animals etc.); (v) by domesticating plants and animals; (vi) by changing erosion rates by agricultural and other land clearing practices and thus altering soils as well as vegetation and (vii) by transporting organisms into new areas from which they had been isolated by geographical boundaries.)

3. PERIOD OF PLANT DOMESTICATION AND AGRICULTURE - Domestication of plants for food was a hallmark in the development of human skill of taming and controlling the biotic component of the natural environmental system or ecosystem. Domestication of plants initiated primitive type of agriculture and sedentary settled life of people who previously were nomads and wanderers. But still

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many of the people used to live nomadic life. It may be pointed out that initiation of cultivation of mainly food crops resulted into the formation of social groups and organizations which gave birth to early human civilization known as '*river valley civilization*' because most of people settled in the river valleys due to availability of water and fertile land for cultivation.

Thus the emergence of socially organized human communities, human civilization and farming practices changed the existing almost friendly and cordial relationships between man and his natural environment. Gradual but continuous improvement in farming practices resulted into gradual increase in human population and in the number of domesticated animals and thus more and more virgin forest lands were cleared through felling of trees with the help of more advanced tools and weapons and through burning of forest in order to increase the agricultural land so that increasing number of human beings could get food. People also moved from the area of greater concentration (of people) to other areas in search of new fertile land. This led to spread of human population and thus destruction of natural ecosystem. Shifting or Jhuming cultivation, which was most prevalent form of primitive cultivation, was responsible for more destruction of natural forest. Such farming practice is still in operation in many of the hilly regions of south and south-east Asia. North-eastern hill states of India are still characterized by Jhuming cultivation.

With the march of time man developed his own environment known as '*the cultural environment*' by building houses and thus creating villages and towns and cities, by developing social institutions like schools and colleges, by building places of worships like temples, churches, mosques etc., by constructing roads, railroads, bridges, canals etc. It may be pointed out that all these and many more elements of '*cultural environment*' were evolved through various stages of agricultural development upto 1860 or say before industrial revolution.

tion. All these could be possible because of development in technologies which changed the physical and social man into 'economic man' but no serious damage was done to the natural environment though significant changes, no doubt, were brought in the environment. Though man became successful in transforming the natural environmental resources in his way but the nature was still supreme and master and man continued to be guided by physical environment.

4. PERIOD OF SCIENCE, TECHNOLOGY AND INDUSTRIALIZATION - The dawn of industrial revolution in late nineteenth century (say precisely since 1860 A.D.) with the emergence of science and development of more efficient and sophisticated technology initiated the hostile relationship between man and his natural environment. Extreme concept of the western world, advanced technologies and scientific techniques of the modern 'technological man' led to reckless and indiscriminate rapacious exploitation of natural resources for industrial expansion and urban growth which have altogether created most of the present day environmental and ecological problems of global dimension.

The impacts of modern technological man on natural environment are varied and highly complex as the transformation or modification of one natural condition and process leads to a series of changes in the biotic and abiotic components of biospheric ecosystems.

The man's impacts on environment fall into two broad categories viz. (i) *Direct or Intentional Impacts* and (ii) *Indirect or Unintentional Impacts*. Direct or intentional impacts are preplanned and premediated because man is aware of the consequences, both positive and negative of any programme which is launched to change or modify the natural environment for economic development of the region concerned. Such changes include land use changes (clearing of forests and burning of grass lands for crop cultivation; felling of trees for commercial purposes; changes in cropping patterns in

relation to new farming techniques, new high yielding seeds, irrigational facilities etc.), constructions and excavations (constructions of dams, reservoirs and canals, diversion and manipulation of river channels, construction of embankments and dykes to protect the area from floods, construction of roads and bridges, increase in urbanisation, mining, drilling of mineral oils, withdrawal of groundwater etc.), agricultural practices (mechanisation of agriculture, use of chemical fertilisers, pesticides and insecticides), weather modification programmes (cloud seeding to induce precipitation, dispersal and clearing of clouds and fogs, checking of hailstorms etc.), nuclear programmes etc. It is significant to point out that the effects of such anthropogenic changes in the natural environment are noticeable within short period and may continue to affect the environment for long time but these effects are reversible because both before and after studies (which are possible) may enable the man to set the adverse effects right to certain extent if so intended by making suitable changes in the initial programmes. For example, deforestation (either for cropland or for commercial purposes) leads to accelerated rate of soil erosion resulting into gully erosion and loss of soil fertility on the one hand and enormous increase in sediment load in the river which causes severe floods on the other hand. These chain effects can be effectively stopped by reforestation of the deforested areas. Similarly, changes in farm practices, which introduce adverse changes in the environment, may be rechanged to suit the environmental and ecological situations.

As regards weather modification and transformation of climate at local and regional levels through purposive human action, the after effects are seldom pre-mediated. It is important to note that it is not possible to master meteorological processes because 'there is no permanent channels of control in the atmosphere as in machines and living organisms' (E.K. Fedorov, 1983, p.93) but man can control or divert undesirable natural atmospheric processes and disturbances as cyclones, hailstorms, precipitation, clouds etc. One of the

intentional or purposive actions of man to modify meteorological phenomena is 'cloud seeding' to stimulate clouds and precipitation through crystallisation of supercooled drops through the application of solid carbon dioxide and certain compounds of iodine. 'A few hundred grams of solid carbon dioxide or a few grams of an iodine compound are enough to crystallise a cubic kilometre of a supercooled cloud of water drops' (E. K. Fedorov, 1983, p.93). The second area of weather modification is prevention of hailstorms. Such practices are being carried in Soviet Union, Bulgaria, Hungary, Yugoslavia, Switzerland etc. The third area is of dispersal of low, supercooled clouds and fogs to clear airports in winter for smooth landing and take off of aircrafts. In all the cases enormous heat energy employed to induce precipitation, to prevent hails and to disperse and clear clouds and fogs is released and it causes additional heating of the lower layer of the atmosphere and thus changes the natural meteorological processes.

Withdrawal of groundwater for drinking water and irrigational purposes is a general practice in almost all the countries but some times the impact is so enormous that it becomes disastrous and pounds back on man and society. The example of Brooklyn (Kings County, New York, U.S.A.) is sufficient to demonstrate environmental impact of groundwater withdrawal. The pumping of water from beneath the ground surface of Brooklyn city for urban dwellers resulted in a cavity of 5-mile diameter reaching to a depth of 35 feet below sea level by 1936 (drilling continued for the first three decades of the present century). The water table dropped considerably due to withdrawal of groundwater at the rate of 75 million gallons per day on the one hand and poor replenishment of groundwater from natural sources (through infiltration of rainfall and snowmelt) because of increasing urbanisation on the other hand. This resulted into the formation of big cavity beneath the city, consequently saline sea water leaked into the cavity and the wells became contaminated due to salty water which forced the city authorities to close down

these contaminated wells. A few recharge wells were constructed and used water was allowed to return to the groundwater through these recharge wells. This resulted into rapid rate of rise of water table by 1965. The trend of rise in water table continued upto 1970's and the water table rose to the foundations of buildings causing great damages to human construction. Excessive withdrawal of groundwater also results in land subsidence (it may be pointed out that there was no land subsidence in the case of Brooklyn as referred to above because of massive and strong rocks). A land subsidence of one metre to 3 metres has been reported in a few localities of San Joaquin valley in California because of drop in water table from 30 m to 150m due to pumping of groundwater from the basins filled with alluvial sediments (A.N. Strahler and A.H. Strahler, 1976, p.127). The cases of landsubsidence due to withdrawal of groundwater have occurred in several localities and cities all over the world e.g. Houston City (Texas, U.S.A., 0.3 to 1.0 m), Mexico city (ground subsidence from 4 to 7m between 1891 and 1959), Venice (Italy) etc. Ground subsidence also occurs due to mining activities.

Constructional activities, like construction of dams and reservoirs, upset the equilibrium of the rocks below and thus is triggered off seismic events because the load of water of lakes and reservoirs constructed behind the dams on major rivers increases hydrostatic pressure which causes disturbances in the underlying rocks. The earthquakes of Denver since 1962 (Denver, Colorado, U.S.A., due to pumping of fluids under pressure into disposal well upto the depth of 3600m and associated release of strains within the already disturbed rocks), Los Angeles earthquake of 1963 (California, U.S.A. caused due to raising of the hydrostatic pressure through pumping of fluids into the oil field so that the production of mineral oil could be increased, This resulted into the movement of pre-existing faults and triggered off tremors which fractured the wall of the Baldwin Hills Reservoir), Lake Mead earthquake (Hoover Dam in Arizona and

Nevada, U.S.A., due to weight of accumulated water in the Mead Lake Reservoir), earthquakes occurring around Lake Kariba (on Zambezi river in Zambia), Koyana earthquake of 11 Dec. 1967 (Satara, Maharashtra, India, due to weight of water in the Koyana Reservoir) etc.

Man changes the river regime and ecology through flood control measures, reservoirs, construction of dykes and flood walls to restrict the water into river valleys, flood diversion systems and stream channelization (strengthening, shortening, widening, deepening of river channels to prevent seasonal overbank flooding).

The Indirect Impacts of man on the environment are not premediated and planned and these arise from those human activities which are directed to accelerate the pace of economic growth, especially industrial development. Though such economic activities may be economically important but the after-effects are certainly socially undesirable. The indirect impacts of human economic activities on the environment are not immediately noticeable because of time-lag because the effects of economic activities bring in slow rate of changes of moderate nature in a few components of the ecosystems and these changes take long time to cross the sensitivity of the system. Moreover, the indirect impacts are experienced after long time when they become cumulative. Sometimes, such effects are not reversible and therefore it becomes very difficult to identify and evaluate them. These effects may change the overall natural system and the chain effects some times become suicidal for human being. Majority of the indirect impacts of human activities on the environment are related to pollution and environmental degradation.

The release of toxic elements into the ecosystem through their uses as insecticides, fertilizers etc. changes the food chains and food webs (e.g. introduction of D.D.T.). Similarly, the release of industrial wastes into stagnant water, rivers and seas contaminates water and causes several diseases and deaths of organisms and thus disturbs ecological

balance (e.g. washing and dumping of tailings or waste sludges from factories, release and concentration of specks of asbestos, release of mercury in its toxic methyl form, leakage of crude oil from oil tankers, release of lead, mixing of different quantities of dissolved inorganic matter etc.).

M.C. Saxena (1989, N.I.P., April 10, p.5) has cautioned the people against the environmental pollution caused due to indiscriminate and excessive use of pesticides, fertilizers and a number of other chemicals (about 2000 chemicals are released to the environment each year). According to him these toxicants are transported across the placenta and reach the developing foetus of woman and cause abortions and premature labour. Increasing urbanisation and industrial expansion are responsible for the release of enormous quantities of pollutants (ions of chlorine, sulphate, bicarbonate, nitrate, sodium, magnesium, phosphate etc.) through sewage effluent into the river and lakes and thus contaminating the water. 'The basins of rivers flowing through thickly populated and industrially developed regions (and there are almost all the rivers of the U.S.A., Japan and European countries, including two thirds of the rivers in the European part of the U.S.S.R.) have long lost their natural state and been converted into transport, power and water - main systems of sorts and at the same time into sewers' (E.K. Fedorov 1983, p.910). The Yamuna river at Delhi has, in fact become a sewage as 323 million gallons of sewage enter the Yamuna per day through 17 open drains, while the capacity of all treatment plants of the Municipal Corporation of Delhi (MCD) is only 184 MGO (million gallons per day). 'Before the Yamuna enters the capital, 100 millilitres of its water contain more than 7500 disease causing bacteria but after receiving Delhi's share of sewage carries 24 million bacteria according to pollution control experts' (N.I.P., Feb., 20, 1989, p.8). The tanneries (151) of Kanpur city are heavily polluting the Ganga by discharging 5.8 MLD (million liters per day) of untreated effluents. The pollution of the Gomti river at Lucknow has resulted into the death of all useful organisms.

Urbanisation, industrial expansion and land use changes very often change weather and climate though in long-term perspective. Economic activities of man are capable of affecting the heat balance of the earth and its atmosphere which in turn transforms weather and climate at regional and global scales. Infact man changes the atmospheric conditions through (i) changes in the natural gaseous composition of the atmosphere mainly in the lower part, (ii) changes in the water vapour content of the troposphere and the stratosphere through direct (cloud seeding) and indirect means (deforestation), (iii) changes and alteration of land surfaces (deforestation, mining, urbanisation etc.), (iv) introduction of aerosol in the lower atmosphere, (v) release of additional heat in the atmosphere (from urban and industrial sources) etc.

The burning of hydrocarbon fuels has increased the concentration of CO_2 in the atmosphere. The natural content of CO_2 in the atmosphere was fixed at 0.029 per cent or 290 ppm (part per million) before industrial revolution (before 1860) but at present the atmospheric level of concentration of CO_2 is estimated to be 0.0319 per cent (319 ppm, an increase of 10 percent) and it is expected that by the turn of the present century it would increase to 0.0370 per cent (370 ppm, an increase of 25 percent over the pre-industrial level). The increase in CO_2 content of the atmosphere may change heat balance by increasing the level of sensible heat in the atmosphere because CO_2 allows more absorption of incoming short wave solar radiation and out going

longwave terrestrial radiation. Release of chlorofluorocarbon in the atmosphere through the propellants used in spray can dispensers and fluids used in refrigerators and air conditioners and of nitrogen oxides emitted from the engines of supersonic jets (flying at the height of about 60,000 feet with a speed of more than twice the speed of sound) is capable of depletion of ozone. It may be pointed out that ozone gas in the atmosphere (ozone layer is concentrated mostly at the height of 15 km -36/55 km) absorbs ultraviolet rays of the sun and thus protects the earth from becoming too hot. Depletion in ozone layer means less absorption of ultraviolet rays and thus increase in the temperature at the earth's surface. Thus increase in air temperature through increased solar ultra-violet radiation due to decrease in the concentration of O_3 (ozone) would cause skin cancer, immuno-suppression in human body, decrease photosynthesis, water use efficiency and crop yield. The marine environment would also suffer drastic damages as the productivity of phytoplankton would be reduced due to decrease in photosynthesis and therefore zooplankton feeding on phytoplankton would starve. This will also affect the mortality of larvae of zooplankton. The species composition of marine ecosystem may change as certain species are more vulnerable to ultraviolet radiation. Ultraviolet radiation also accelerates the photochemical processes that create urban smogs.

This theme (the impacts of human activities on environment) is further elaborated in Chapter 14 of this book (Man and Environmental Processes).

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HUMAN GEOGRAPHY

UNIT-I: NATURE AND PRINCIPLES

1. Nature Scope, Element of Human Geography

HUMAN GEOGRAPHY: NATURE, SCOPE, SCHOOLS AND APPROACHES

It is always a difficult proposition to define a subject. With the passage of time as knowledge grows and culture advances, the definition of the subject also changes. It is because of these reasons that none of the definitions given of human geography is not universally accepted. Human geography is one of the important branches of geography. Though several definitions of geography have been given, the most important in vogue is that given by Hartshorne in his monumental work—*Perspective on Nature of Geography*—in which he stated that “geography is concerned to provide accurate, orderly, and rational description and interpretation of the variable character of the earth’s surface.” Geography, though an integrative science, has a dichotomous character. The internal logic of geographical study has tended to split the subject into two parts: (i) physical geography, and (ii) geography of human creations known as ‘human geography’.

Human Geography is Human Ecology

The concept of human ecology was put forward by the American geographers who were the believers of Social Darwinism. It was H.H. Barrows who in his presidential address to the Association of American Geographers in 1923 declared that “human geography is human ecology.” The followers of this school tried to establish an interactive relationship between man and his biotic and abiotic elements of environment. They opined that a struggle for existence must take place; it followed that those who survived were better fitted to the environment than their competitors. Relatively superior adaptations increase; relatively inferior ones are eliminated. The central idea of human ecology is that man, like plants and animals, has to struggle in his physical environment and in the process of struggle weakers get eliminated.

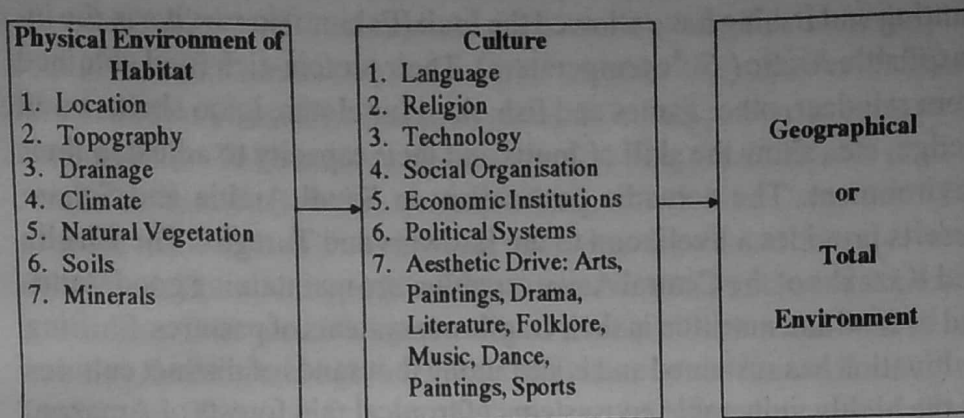
The advocates of human ecology also believed that the ecological

principles, e.g., 'the food-chain' 'the Web-model' etc., are applicable to all aspects of biology, from plants to animals to people. The discipline of human geography as human ecology was further strengthened by the works of Lamarckian who emphasized that organism could *consciously adapt* themselves to their surroundings and pass on acquired characteristics to offsprings. The Ratzel's organismic conception of state, the Davisian geomorphology, the environmental determinism of Miss Semple, Huntington and Taylor, the regional geography of Herbertson, and the anthropological human geography of Fleure—all prove to some or greater extent that human geography is human ecology.

The approach of taking human geography as human ecology has, however, been criticized on several counts. This definition puts man at par to plants and animals, who is also supposed to struggle in his environment for survival. But man is a tool making, tool using and culture making animal. Man, through his knowledge, scientific advancement and innovations, transforms the habitats and ecosystems drastically to fulfil his material needs. For his food, he is not dependent on his environment, at the time of droughts and inadequacies of foods, he may import cereals and other commodities from the distant regions which may save his species. Moreover, he possesses the power, skill and technology to grow tropical crops (rice, sugarcane, rubber, spices) in the temperate and frigid regions under artificial conditions and vice-versa. Thus, the human life is not exclusively controlled by his habitat and natural environment. Contrary to this, he himself is a great agent of transformation in his physical surroundings. The principles of ecology do not apply on human societies with the same magnitude as they apply on plants and animals. Human geography, therefore, cannot and should not be taken as human ecology.

Human Geography is the Study of Man and His Adjustment to Natural Environment

One of the popular and widely accepted definitions of human geography is the "man and his adjustment to his natural environment" (Fig. 1.1). There are numerous racial and ethnic groups in the world, and the geo-climatic conditions of the various parts of the earth also differ from each other substantially. Each society or ethnic group uses, misuses and underuses its natural resource base according to its cultural stage and technological advancement. For example, the mode of life of Pygmies of

BASIS OF GEOGRAPHICAL ENVIRONMENT**Figure 1.1**

Congo Basin differs from that of the Badawins of Saudi Arabia, the Aborigines of Australian desert and Eskimos of Tundra have been compelled by their environments to practice hunting for their survival. The Nagas, who used to practise head-hunting till recent past, have a very closed territorial demarcation and their life style is altogether different from the Nepalese and Kukis living in the same environment. The Gujjar and Bakarwals who oscillate in the higher Himalayan and the Siwaliks in the summer and winter season differ from the Kashmiris and Dogras who also live in the same habitat. These variations in the life style in fact are expressions of man's adjustment to his natural environment. The impact of environment on man and his adaptation to physical environment have been emphasized by the Greek, Roman and Arab scholars. Aristotle and Darwin were also of the same view that man struggles for his survival.

Apart from material gains and cultural achievements, the food, clothing, shelter, tools, technology, customs, traditions, socio-economic institutions, higher needs like religion, faith, language, literature, fine arts and folklore, etc., are directly or indirectly influenced by physical environment. In other words, man has moulded his habits and life style according to his physical surroundings and natural endowments.

The indigenous peoples living in the areas of isolation and relative isolation are judiciously utilizing their habitat without disturbing much the ecological balance, though their economies are often called primitive and their technology dismissed as 'Stone Age'. A number of examples may be cited to show the symbiotic relationship of the primitive

social groups and their physical surroundings. For example, the mobile hunting and fishing have allowed the Inuit (Eskimo) to survive in the inhospitable Arctic (-50°C temperature). Their protein-rich food obtained from reindeer, other games and fish, their fur cloths, igloo shelters and sledge, etc., show the skill of Inuits and their capacity to adjust in their environment. The nomadic pastoralism in Saudi Arabia and Sahara and Kazakhs of the Central Asian republics are maintaining good standard of food and nutrition in their fragile ecosystems of pastures. Shifting cultivation has sustained and is sustaining thousands of distinct cultures in the highly vulnerable ecosystems of tropical rain forests of Amazon, Congo Basins, the islands of South-East Asia and the hilly regions of North-East, Central and Southern India. Non-indigenous peoples would not have been able to survive in these extreme condition without destroying the balance of ecosystem.

The various ethnic groups and indigenous peoples have developed certain norms, traditions and values to protect their environment while obtaining their food, fuel and other basic needs. For example, the Pygmies of Congo Basin construct their houses at the tree; the Mesais of the eastern plateau of Africa live in circular enclosures in order to protect their cattle against the wild beasts; the nomads of West Asia deserts instal *khaimas* (tents) and dismantle them when they move from one pasture to another. The Gujjars and Bakarwals of Jammu & Kashmir, the Tharus of the Terai region of Uttar Pradesh, the Bhutias and Lapchas of Sikkim and Bhutan oscillate in the valleys and alpine pastures with their cattle to utilize the available green grasses in the different seasons of the year. The terraced farming of Angani Nagas (tribe living around Kolima), the *jhuming* of Lothas, Aos, Semas, Konyaks, Kukis, Garos, Khehis and Mizos of the North-East India, and the rice-fish culture in the paddy fields by the Apatanis (Arunachal Pradesh) are the results of their physical environment. These peoples have been compelled by their environment to adopt a particular mode of life and they have developed appropriate technologies for the utilization of their resources and maintain their ecosystems, resilient and sustainable. The key to the success is sustainability. These tribals and ethnic groups utilize the available resources rationally without depleting them. For this purpose they use their intimate knowledge of plants, animals, soils, climate, seasons and terrain, not to exploit nature but to co-exist with it. This involves careful

management of resources, control of population.

The Eskimos of the American Arctic and Asiatic Tundra are representatives of hundreds of tribal peoples who have adjusted in the harsh Arctic environment. The Eskimos exemplified adaptation to extremely cold climates. Their main sustenance is still being obtained from marine Arctic mammals (whales, seals, walrus), which they hunt with the greatest skill and with ingenious weapons fabricated largely from driftwood. They could paddle across open water in skin covered small boats. They habituated themselves to a meat diet. They use animal oil for cooking, heating and lighting. They built their *igloos* (winter homes) of ice-blocks. They use furs for clothing and bedding. In summer, they move away from the coast to hunt caribou and reindeer and to gather wild fruits, sheltering themselves in skin-covered tents. They live and migrate in small groups or single families.

The prevailing environmental conditions of Tundra region impose special conditions on the life of man, plants and animals. In the winter season, the sun does not appear above the horizon. Continuous night reigns for several months lead to depressing influence, which gradually affects the temperament and moral of even those most adapted to these cold conditions. The darkness and close confinement which it entails frequently bring on mental disorder, fits of madness, or suicide due to neurasthenia. To reduce the pressure of population on the limited resources during inclement weather, they have developed a unique tradition. At the time of scarcity of food in long, dark dreaded winters of stormy nights, the senior most member walks out of the *igloo* (when other members of the family are sleeping) and tracks down on ice bare-footed, till he gets exhausted. After reaching at unknown destination, he exposes his fur clothes and dies instantaneously of exposure, under the freezing temperature which may be as low as -50°C . This unique way of committing suicide by elderly Eskimos justified by them as it saves the limited food supplies for their children and other family members. In the hot and humid climates of equatorial region (Amazon, Congo Basins and islands of South-East Asia) the life style of peoples is largely controlled by physical environment. The Semang and Sakai of Malaysia, the Pygmies of Congo Basin, the Aeta people of Philippines, the Kubu of Sumatra, the Toalas of Celebes, and the Andamanese Negrito people are still in the hunting and food gathering stage because of their harsh climatic conditions.

Semang, the hill dwellers of Malaysian peninsula resemble in stature and colour to Pygmies of the Congo Basin. Owing to their resemblance with Nagros, they are often referred as Negritos. The Semangs do not practise agriculture, have no domestic animals, and are almost exclusively depended on products of forests. They migrate continuously, save for short natural harvests, and rarely stay more than three or four days at one place. The resources of any one locality are limited and will not support a dense population. Consequently, the individual groups of Semang are small. A band of twenty or thirty persons including children is considered as a large one. Throughout his life, a man will remain with a handful of his kin. The knowledge and opinion of his elders are the only views he hears. His life has been made almost stagnant and stable and there is hardly any change in his life style.

The over-dependence of Semang on vegetable food, hunting and fishing are owing to the environmental compulsions. He has to gather wide varieties of berries, nuts, pith, leaves, shoots and especially roots, tubers and wild yams. In the hot and humid equatorial climate little may be stored or preserved. His hunting is sporadic and confined to little games like rats, birds, squirrels, lizards, monkeys and wildpigs. Wooden bow and arrows are his only weapon. He has no dog and often catches birds in simple noose and spring traps. Like their food supply the clothing of the Semang is supplied mainly from vegetation of the surrounding forests. They make their clothes from the leaves and barks of trees. Thus, the Semangs are in the hunting stage and have a symbiotic relationship with their physical environment.

The Sakais, living in the lower altitudes and valleys in Malaya, build rectangular huts at tree stems and branches, which are walled with bark strips or plaited palm and roofed with palm leaves. Thus, the entire house construction materials are obtained from within their surroundings. Are these not the typical examples of man's adjustment to his environment?

The life in the arid and semi-arid areas is difficult because of the scarcity of water for drinking and irrigation. The inadequacy of rainfall and scarcity of water in the arid areas have resulted into most complex mode of life in dry regions. All development of life in dry regions is subject to water supply. Even when the temperature might ensure for plants (crops) a sufficiently long period in which growth might take place, the lack of moisture imposes strict limitations. Owing to uncertain and

precarious supply of water that all human life is of an unstable character. The yield from crops is irregular and poor, and the whole crop is at the mercy of an erratic rainfall. Agriculture in such areas is not a reliable economic activity and cattle keeping is the dominant activity of work-force. In order to feed their cattle, goats and sheep, the shepherds have to move them about from pasture to pasture. Pastoralism in such areas assumes nomadism, and its pastures are often at the mercy of drought.

Another example of man's adjustment to his environment may be cited from the mountainous areas of the world. In the hilly and mountainous areas, the life of peoples is closely being controlled by terrain and geo-climatic conditions. Mountains have cradled states and kept them independent. The mountains have, however, always given rise to closed societies, self-centred, orthodox and preserving old customs. They have often served as a refuge for people driven back from the lowlands (plains) by conquerors who have better development techniques.

Sowing of crops on the steep slopes, covered with thin soils, of high altitudes is not a rewarding economic activity in mountainous tracts. Under the low temperature conditions of high altitudes, the cereal crops like maize take very long period to harvest. In the French Alps, for example, there are numerous tracts in which corn (maize) takes thirteen months to mature. Seed is sown in July or August, and the harvest is reaped in September of the following year. The cultivable soil is poor, for it is constantly being eroded owing to the steepness of the slopes.

In the young folded mountains like Himalayas, Alps, Caucasus, Tien-Shan and Hindukush, transhumance is practised to utilize the winter and summer pastures. In the summers when snow melting results into green pastures the transhumants ascend in the alpine pastures, while in the winter season when temperature goes below freezing point, they descend to the winter pastures situated at low altitudes. Thus, the life of these people is a kind of periodical shifting. This oscillation movement assumes that they must have two separate dwellings—a permanent one in the village at low altitudes and another in the form of hut in alpine pastures.

The life of the people living in mountains is also restricted by the inversion of temperature—causing hard frost and the stagnation of layers of frozen fog. Moreover, they have to avoid the path of avalanches (e.g., Nashri near Batot and Ramban on the Jammu & Srinagar National High-

way). The movement of mass of snow and rocks may be hazardous for human establishments. In the mountains people generally settled on alluvial fans (Dachigam-Telbal alluvial fan in Kashmir near Srinagar). These alluvial fans deposited by fluvial action are highly productive and provide good sustenance to their populations. Within the mountains, there are numerous lakes and points of aesthetic beauty. At such places, tourist spots and hill resorts have been developed which are the centres of attraction for the local, regional, national and international tourists. The people of the mountains, where terrain and climatic conditions are not very conducive, have also adjusted well in their physical environment.

Mountains influence the life of their inhabitants and social groups and their neighbours fundamentally and variously, but always reveal their barrier nature. For example, the Himalayas, for the occupants of its southern slope, provide an abundant rainfall; while to the leeward side they admit dry winds, and only from the melting snow or the precipitation on their summit do they yield a scanty supply of water. The Himalayas are flanked by the teeming million population of India and the scattered nomadic tribes of Tibet. Mountains are always a challenge to the energies of man. Their beauty, the charm of the unknown beyond tempts the enterprising spirit; the hardships and dangers of their roads daunt or baffle the weak people, but by the powerful ones whose strength is able to dwarf the obstacles is found beyond a prize of victory. Such were Alexander the Great, Genghiz Khan, Napoleon, Hannibal, Babar and those heroes who toiled across the Himalayas, Alps, Rockies and Andese.

Old worn-down mountains, like the Appalachians, the Urals, the Aravallis, broad as they are, have been less effective obstacles than the towering crests of Alps, Himalayas and Caucasus. The Pamir, high but accessible, was a passway in the tenth century A.D. for Chinese caravans bound for the 'Silk Land' to the Oxus river and the Caspian Sea town of Baku. Here, Marco Polo and many other travellers after him found fodder for their pack animals and food for themselves, because they could always purchase meat from the visiting shepherds. Thus, mountains of different elevations situated in different climatic zones have varying influence on the society and inhabitants living in and around them.

In many areas, it is not the productive land, rich mines or forests which provide sustenance and shelter, but man is born and brought up

into water. For example, the Hanjis of Dal, Wular, Anchar lakes of Kashmir have a water-oriented life style. The Moro Bajan of Southern Philippines and sulu Archipelago are sea gypsies (nomads). About the Moro Bajan, it is said that their home is in their boats from the cradle to the grave, and they know no art but of fishing. Subsisting almost exclusively on sea food, they wander about from shore to shore, one family to a boat, in little fleets of half a dozen sail: every floating community has its own headman called the Captain Bajan, who embodies all their slender political organization. When occasionally they abandon their rude boats for a time, they do not abandon the sea, but raise their huts on piles above the water on some shelving beach. Like the ancient lake-dwellers of Kashmir and Switzerland, only in death do they acknowledge their ultimate connection with the solid land. They never bury their dead at sea, but always on a particular island, which the funeral cortege of rude outriggered boats moves to the music of the paddle's dip.

In the densely populated valley of Kashmir, especially in and around the city of Srinagar, a substantial proportion of the population lives in *dongas* (boats). In the Dal lake and Jhalum river, the water-dwellers (*Hanjis*) present the phenomenon of human life overflowing from the land to the lakes and streams of the country; because these water bodies afford a means of livelihood. Apart from the food supplies, they offer an unclaimed bit of the earth's surface for a floating home. Some of the *donga* boats of *Hanjis* accommodate large families, together with modest poultry, others are handsome house boats (five star hotels) ornamented with flower plans. The *Hanji* population of Kashmir is exempted from taxation and even their floating gardens (vegetable gardens) are exempted from land and water revenues. For their sustenance and to add to their income, they develop floating gardens on rafts and grasses covered with mud and earth, on which they plant tomatoes, cucumber, gourds, onions, garlies, and pumpkins. They also keep ducks which are trained to go into the water to feed and return at a signal. There are small boat-shops, selling grocery, general provisions, fruits, flowers, mutton, clothes and medicines. These small boat-shops move from one *donga* (house boat) to another in the Dal lake. The Hanjis of Kashmir provide an interesting example of man's adjustment to the waterbodies and lakes ecosystems and environment.

The life style, economy, society, religion, beliefs and the cultural ethos of food gathering and pastoral communities of Amazon Basin and

other Latin American regions are also largely controlled by the climate and natural vegetation. The Boro is a sub-group of Red Indians of the Western Amazon forests. Their habitat receive high temperature and moisture throughout the year. It is covered with vast equatorial forests. The damp heat and the rich alluvial soil, fertilized by the decay of the vegetation itself, promote the luxuriant growth of vegetation. Creepers of many kinds and of every size, loop from tree to tree, pushing up the sunlight and knotting the undergrowth into impenetrable thickets. Lichens and mosses cover the tree trunks. The spines of the palms which grow in the shade of the loftier trees, the thorns of climbing plants and the attacks of ants, mosquitoes and flies add to the difficulties of travel in the forest. Communication over any considerable distance is forced on to the waterways.

In this harsh environment of the equatorial region of Amazon Basin, the Boro occupy small clearings in forests which are made by laboriously burning down the trees in some relatively open tract. The group does not live in scattered huts but occupies a single large house, twenty to twenty-five metres on each side and ten to twelve metres high. They have no domestic animals and do not even keep dogs. They hunt the wild game of the forest but this is relatively meagre, but their main dependence is on agriculture (root crops, tubers, cassava, coca, tobacco). These people acquire a remarkable tolerance for the drug, which enables them, when taken in large quantities, to go for several days without sleep, food or drink. Since mineral salt is not obtainable, the Boro eat certain earths (scraped from the hearth) to make the deficiency. Their clothes are made of bark and paint their bodies and wear wood ear lobes and the lips. Boro are not organized and their unity of speech and custom results from their communal houses. These people have many widespread customs to utilize the forests and to conserve them. Among the Boro, prisoners are taken and are carried off by the victors; the adults are *killed and eaten* at the dance feast which celebrates the event. Captured children too young to escape and so betray the settlement to the enemy are, however, handed over to the chief, who brings them up as members of his household in which they serve. There captives, in whom the captives take great pride as evidence of successful fighting, are in some sense the slaves of the chief. The ceremonial cannibalism practised at the feast which follows a successful fight must undoubtedly keep alive the spirit of revenge and the tradition of hostility. Only small portions of the limbs

of victims are eaten, and the rest is discarded as unclean. The skulls are often suspended as trophies in the house (the Headhunters in Nagaland also follow the same tradition). The environmental conditions of Amazon forest are thus adverse to cultural development. The small communities living in dense forests in isolation are not exposed to the outside world. Their social life deeply tinged with fear of the evil magical power of all other men is also a barrier in their advancement. In this society the process of development is highly constrained by the harsh environment. It is the region where nature has the upper hand and determines the destiny of man.

Environmental constraints are quite serious in the hot deserts and drylands. The rainfall in such areas is meager and highly erratic. An entire year's rainfall may occur in just one or two storms of great intensity that produce rapid runoff, flash flooding, severe gullying and erosion. The annual grasses complete their growth cycle and set seed quickly, the seed itself possessing the ability to resist long periods of desiccation until the next burst of moisture. Rodents, camels and gazelles—all possess a degree of drought hardiness and water use efficiency unknown in other environments. The inhabitants of such areas exhibit similar adaptive ability. They have marked spatial mobility, flexibility in diet, and maintenance of low population densities which enhance the resilience character of the fragile ecosystem. Nomadic pastoralism is the classic example of a livelihood adaptation to widely dispersed fodder and water resources. The size of the herds also decreased or increased as per the availability of fodder and water in the region. The social institutions, the mutual co-operation, the sharing of pastures and water resources, the social customs, traditions and economic decision making process of the people of drylands and their overall cultural ethos are such that they are adapting themselves in a highly vulnerable ecosystem and maintaining the environment at a reasonably healthy condition. Their every action is directed to make the environment sustainable not only for the present but also for the generations to come.

The indigenous peoples have adjusted well in their natural environment without disturbing the ecological balance, though their economies are often called primitive, their technology dismissed as 'Stone Age.' Hunting and fishing have allowed the Inuits of Canada and Nootka of Columbia to survive in harsh environments. The Tuareg of Sahara practising nomadic pastoralism efficiently and successfully in the extensive

arid and water deficient areas. The Palus food gatherers and hunters of the Pacific islands travel up to 500 kms (300 miles) in canoes at a speed of 40 kms per hour to catch fish and to maintain their social contacts. The shifting cultivators are sustaining themselves in the highly fragile ecosystems of hills and forests all over the tropical world. Non-indigenous peoples would not have been able to survive in these extreme conditions without destroying the balance of the ecosystem.

The Pygmies of Congo Basin, the Masai of the Eastern Highlands of Africa, the Badwins of Arabia, the Kirghiz and Kazak transhumants of Central Asia republics, the Gujjars and Bakarwals of Jammu & Kashmir, the Ladakhis, the Tharus of the *Tarai* and mountains of U.P. Himalayas, the Lapchas and Bhutias of Sikkim and Bhutan, the Apatanis of Arunachal Pradesh and numerous tribes of the North-East Indian states and that of Chotanagpur Plateau are utilizing their resources in a way so that they may keep their habitats in healthy condition and sustain themselves at a reasonable standard of nutrition. The key to the success is sustainability. These people use the resources available without depleting them. They use their intimate knowledge of plants, animals, soils, climate, and seasons, not to exploit nature but to co-exist alongside it. This involves careful management, control of population, the use of small quantities but a wide diversity of plants and animals, small surpluses, and minimum wastage. Plants provide food, medicines, pesticides, poisons, and building materials, whereas animals provide meat, clothes, strings, implements, and oil.

The economic life of indigenous peoples and the tribals living in the areas of isolation and relative isolation is based not on competition but on co-operation. The survival is only possible when the community works together. Most small-scale indigenous societies have elaborate systems for sharing food, possessions, and ritualizing conflict. And, although largely self-sufficient, many groups have developed mutually beneficial trading relationships. For example, shifting cultivators in the forests of North-East India have traded with their settled neighbours for centuries. Their means of production (land and forests) belong to the community and not to the individuals. Their basic philosophy is "from each according to his capacity and to each according to his needs." In fact, they live with and not against the nature.

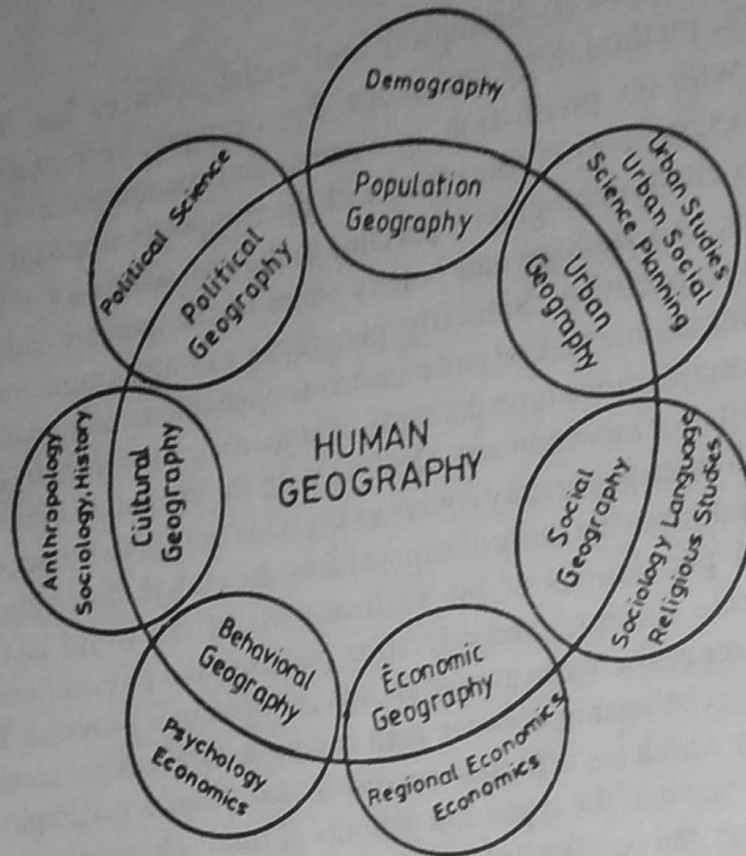
Scope

Each of the physical, biological and social sciences has its own philosophy, methodology and scope. For example, economics deals primarily with the production, movement and consumption of goods and services; geology is concerned with the composition and interior of the earth's crust; demography pertains to the characteristics of human population; and zoology and botany examine the animals and plants kingdoms respectively. Similarly, geography examines numerous tangible and intangible natural and man-made phenomena. In human geography, the major thrust is on the study of human societies in their relation to the habitat or environment. Dealing with the spatial distribution of societies, human geography covers a very wide field or its scope is enormous. It embraces the study of human races; the growth, distribution and density of populations of the various parts of the world and their demographic attributes and migration patterns; and physical and cultural differences between human groups and economic activities. It also covers the relationship between man and his natural environment, and the way in which his activities are distributed. Human geography also takes into account the types and patterns of rural settlements, the site, size, growth and functions of urban settlements, and the functional classification of towns. The study of spatial distribution of economic activities, industries, trade, and modes of transportations and communications.

Human geography deals with the world as it is and with the world as it might be made to be. Its emphasis is on people: where they are, what they are like, how they interact over space, and what kinds of landscapes of human use they erect upon the natural landscapes they occupy. It encompasses all those interests and topics of geography that are not directly concerned with the physical environment like cartography. Human geography's content provides integration for all the social sciences, for it gives to those sciences the necessary spatial and systems viewpoint that they otherwise lack. At the same time, human geography draws on other social sciences in the analyses identified with its sub-fields, such as behavioural, political, economic, or social geography (Fig. 1.2).

Human geography admirably serves the objectives of a liberal education. It helps us to understand the world we occupy and to appreciate the circumstances affecting peoples and nations other than our own. It clarifies the contrasts in societies and cultures and in the human landscapes they have created in different regions of the earth. Its models

FIGURE 1.2



Subdivisions of Human Geography and the Allied Disciplines to Which They are Related.

and explanations of spatial interaction allow us to better comprehend the economic, social, and political systems within which we all, singly and collectively, live and operate. Its analyses of spatial systems make us more aware of the realities and the prospects of our own society in an increasingly troubled and competitive world. Our study of human geography, therefore, can help make us better informed citizens, more able to understand the important issues facing our communities and our countries and better prepared to contribute to their solution.

Human Geography: A Historical Perspective

Human geography, though has a very long history, got increasing importance in the eighteenth and nineteenth centuries. The view that there is close relationship between man and his physical environment was

emphasized by the Greek and Roman scholars. Herodotus, Aristotle and Eratosthenese attributed the progress of certain nations to their favourable environmental conditions. Strabo and his contemporary Roman geographers attempted to explain the effect of geo-ecological features on the life and levels of progress of peoples. The Arabs, like Al-Masudi, Al-Baruni, Ibn-a-Khaldun also attempted to illustrate the relationship between physical environment and cultural characteristics of races. The idea that environment controls the course of human action was revived in the countries of Western Europe during the Renaissance. It received its modern credentials during the later part of the eighteenth century and the beginning of nineteenth century when Alexander von Humboldt and Carl Ritter stressed on the relationship between social groups and their natural environment. The monumental work of Humboldt in the form of *Kosmos* and the *Erd Kunde* of Ritter testify the interrelationship between man and his environment. Human geography became more popular after the publication of *Origin of Species* by Darwin in 1859. Ratzel is, however, known as the founder of modern human geography. His pioneer work *Anthropogeography* is considered as a landmark in the history of human geography. In his book, Ratzel defined human geography as the "synthetic study of the relationship between human societies and the earth's surface." Miss Semple defined human geography as the "study of changing relationship between the unresting man and the unstable earth." Subsequently, human geography attained great popularity in France. The French geographer Vidal de la Blache wrote a classic entitled *Principles de geographie humaine* (published in Paris after his death in 1922 and translated into English in 1926). Vidal stated that "human geography offers a new conception of the inter-relationship between earth and man... a more synthetic knowledge of the physical laws governing our earth and of the relations between the living beings which inhabit it." He, however, recognized, that the human's role was both 'active' and 'passive'. Miss Semple, while declaring "man to be a product of the earth's surface, a child of the earth, dust of her dust which has entered into his bone and tissue, into his mind and soul" gave enough weightage to *environmentalism* which enhanced the credibility of human geography. Huntington defined human geography as the "study of the nature and distribution of the relationships between geographical environment and human activities and qualities." G. Taylor formulated his 'stop-and-go' determinism stating that man is

able to accelerate, slow or stop the progress of a country/community's development. But he should not, if he is wise, depart from the direction as indicated by the natural environment. In 1930s, the discipline of human geography was divided into 'cultural geography' and 'economic geography' and subsequently several new branches like 'political geography,' 'social geography,' 'statistical geography' and 'medical geography' emerged out of human geography.

By the 1980s, human geography has widened to become an omnibus term, describing all those parts of geography which are not solely concerned either with the physical environment or with the technical issues dealt with under such geographical sub-fields as *cartography*. The broad sub-fields of human geography are cultural geography, economic geography, historical geography, political geography, regional geography, social geography, urban geography, medical geography, geography of administration and geography of gender. In parallel with geography as a whole, human geography is made up of three closely linked components: (i) the spatial analysis of the human population, i.e., its numbers, its demographic characteristics, as spread over the earth's surface; (ii) the ecological analysis of the relations between the human population so defined and its environment, i.e., the human biosphere system; and, (iii) the regional synthesis which combines the first two themes in *areal differentiation* of the earth's surface. All these three themes are pursued at various spatial scales leading down from the macro-level (that of the globe itself and major world regions) to the micro-level (that of individuals and groups and their immediate local environment).

Human geography has its origin in some countries from the earth sciences and in others from the social sciences. Human Geography, however, has continuing links with physical geography. It has created acute problems of philosophical orientation of human geographers. Some would argue that we need a much more fully specified model of human beings and their societies before the question of their geography can be understood; such an approach would point towards a more separate type of human geography, linked to social sciences. In this view, human geography can be consistently defined as that part of the social sciences which studies people solely in relation to space and place. It is currently dominated by several philosophical approaches, such as humanism, positivism, realism, structuralism and functionalism,

each of which leads to separate geographical research and writing.

Others would argue that it is precisely the link with the physical environment and with the analytical methods shared with other geographers that gives special character to the field, and allows it to contribute to problems which are, in the final analysis, multi-disciplinary or extra-disciplinary in character. The debate is continuing one with the bulk of opinion swinging strongly from the latter view in the 1960s in the 1980s.

Swings are partly associated with changes in scale of analysis. In both physical geography and human geography, the last four decades have seen a shift towards a concern with *processes*, and with this the intensive study of small geographical areas at a high level of resolution. Such studies are typified in human geography by research on the perception of environmental hazard, on voting behaviour, and on migration patterns. They demand a style of analysis different from the wider view of behaviour observed at the macro-scale. There are some contemporary parallels between human geography and economics. It is encouraging to note that in some parts of physical geography (notably climatology) suits of models have been developed which can take the analysis through from macrostructure at the world level, through mesostructures, to microstructures. Human geography still lacks the conceptual or technical basis for achieving this cross-scale linkage. It is likely that it will continue to be structured as a cluster of loosely related fields, i.e., economic geography, political geography, etc., until such suitable bases have been established.

This evolution in thought about human geography can be summarized in a simple table as under:

Table 1.1
Evolution of Human Geography

Early Writers		The influence of lands upon history.
Classical, e.g.,	Thueydides, Aristotle,	
Modern, e.g.,		
Montesquieu,		
Buckle, Ritter		
Later Writers	Ratzel, Semple	Physical environment influences man.
	Vidal de Lablache	Society viewed ecologically and terrestrial unity as the twin principles of human geography.
	Huntington	Climate influences society, culture and history.