

Nature of Geography

The term geography has been coined from two Greek words “**Geo**” meaning the earth and “**Graphe**” meaning to write or describe. Thus geography literally means the description of the earth. The word geographia was first used by a Greek scholar Erastotenes in 3rd century B.C. The literal meaning of the term geography is very general in nature and does not specify what is to be written or described about the earth which is full of innumerable things of the diverse nature.

Geography has a longer genealogy than any science. The earliest records of man's interest in nature of the physical world around him contain observations and speculations of geographical type. In the ancient period geography grew out of explorations, mapping of areas known and the speculation about the material collected. It is difficult to trace the development, diffusion and spread of geographical knowledge during the prehistoric periods. Although geography began as a modern discipline only during the 19th century, there is a consensus that all civilizations contributed to the development of geographical concepts. Greeks and Romans, the pioneers of prehistoric ideas followed two distinct traditions in their geographical work. One was the mathematical tradition and the other was the literary tradition. The fall of the Roman Empire marked the decline of interest in geographical knowledge. No science including geography could flourish during this Dark Age. At this stage geographical knowledge passed on to the Arabs who were then leading trading nations and recorded far and wide. Many of the Greek works were translated into Arabic and thus the Greek tradition was also kept alive.

The Arab scholars and travelers paved the path for future explorations, discoveries and scientific inventions which energized the adventurous people to know more about the world. During the 17th century there arose the need for specialization and division of knowledge into separate fields. Since geography was the integrated study of both man and physical environment, under such a scenario it faced a crisis of identity. The period after the passing away of great modern geographers (**Ritter and Humboldt 1859**) was a period of great disciplinary confusion. Many pleaded that geography should focus on the study of man whereas others maintained that geography should concentrate exclusively on the study of physical earth. It was only in the 1880s by the innovative visions of **Ratzel, Richtofin, and later Blache**. According to them the domain of geography encompasses both natural as well as social phenomena in spatial context. In this process geography had undertaken the task of bridging the gap between the natural and social sciences by studying the man and his environment in totality.

After Second World War geography experienced a number of conceptual changes. In the immediate post war period a major shift occurred in the form of **quantitative revolution**. It focused on mathematical precision in geographical description and analysis. Thus post war

period was in geography was transformed into the science of special analysis of social and economic phenomena, leading to progressive decline in focus on the study of physical environment. By the 2nd half of 1960s, there was general shift from spatial patterns to behavioural processes that had generated these patterns. This new turn into geographical study is called as “**Behavioural revolution**”. It emphasized the role of cognitive (learning though knowing).

This philosophy was soon encountered by lying emphasis on the central and active role played by human agency, human awareness, consciousness and creativity in the process of man –environment interaction. Emphasis was laid on the understanding of meaning, values and human significance of life events. This gave rise to “**Humanistic geography**”. This philosophy emphasized the logical mode of inference rather than statistical one.

In 1970s radical approach developed in geography which was against locational analysis of quantitative revolution. It concentrated on the issues of social of social relevance like inequality, racism, sexism, crime, discrimination against blacks and females, exploitation of environmental resources etc. the social relevance research focused to introduce the concept of social justice and clear political terms in favour of less privileged sections of society, while as the earlier quantitative approach focused on the use of science and technology with a view to increase efficiency in exploitation of resources and there by contributing to economic prosperity of developed nations.

The first modernist geography of 1990s stands out as a unified discipline that combines the best of every tradition- Regional, Systematic, Idiographic, Nomothetic, Marxist, and Humanistic. The current generation of geographers has almost reached the consensus that what where appearing as conflicting perspectives in the past, represent only different ways of looking at the totality life in the world and each perspective has something valuable to contribute towards the better comprehension of the man environment system and thus equip the researcher with better tools of research in the service of society.

With such a broad perspective one cannot confine the subject to the description of the earth only. Geography is the discipline concerned with the systematic description and interpretation of special patterns and regional associations of all those phenomena which influence human life on the earth's surface, it helps us to adapt to the changing circumstances and how to live harmoniously with nature and let others live. In this context it is well said that geography is the base of humanity.

Geography: Objectives and Relevance

Geography is a subject with longer genealogy than any other subject. Geography literally means description of earth's surface, a place where all life forms including human beings live and all human activities take place in combination with physical processes. The surface of the earth is a dynamic entity it changes constantly. Some of these changes are slow and imperceptible while others are rapid and perceptible. The goal of Geography is to study the origin of these phenomena, the processes that change them and have brought them to the present state and arranged them in the space in the way they exist. Besides that it also studies implications of their location and arrangement of these phenomena for human beings. Being spatial science geography studies the surface features of earth and their association with one another and derives meaningful spatial and regional patterns. It is apposite to mention that some of the surface features are not visible like education etc. however geographers have over a period of time devised appropriate method to construct their social topographies. The fundamental objectives of geography are: `

1. What are the natural and cultural features on the surface of the earth? 1
2. How have they come into being?
3. How are they distributed and why?
4. How are they associated with each other?
5. Are the existing patterns of distribution conducive to human welfare?
6. What can be done to modify them?
7. What are the implications of the proposed changes?

Geography as a science that deals with the spatial arrangement of things on the surface of the earth resulting from a dynamic interaction between humans and nature .Geography uses information generated by other subjects to analyze the emerging patterns and structures of the earth's surface and their implications for human beings. The relevance of Geography lies in the fact that with the new emerging trends new problems are surfaced and these challenges are to be answered geographically.

Branches of Human Geography

Traditionally Geography is divided into two main branches: physical and human geography. Physical geography deals with the physical features of the earth while as human geography deals with the human aspect of the earth's surface. Physical Geography provides a stage for human activities these together constitute the whole gamut of geographical studies.

Definition of Human Geography: Finch and Trewartha defined it as follows: *"this human imprint, these features of material culture, associated with agriculture, manufacturing, trade, mining and the other economies-houses, fields, roads, factories domesticated animals etc. become the immediate interest and object of study of human geography."*

Human geography studies human aspects of the earth's surface under number of branches such as:

1. **Economic Geography:** This branch of geography deals with the economic aspect of human societies under following headings or sub-branches:
 - a) **Resource Geography:** That branch of economic geography that focuses on the study of resources their distribution, production, utilisation and conservation.
 - b) **Agricultural Geography:** It studies spatial variations in agricultural activity-the cultivation of soil in order to grow crops and rear livestock.
 - c) **Industrial Geography:** It is the study of spatial variations in industrial activity on the earth's surface.
 - d) **Transport Geography:** It studies the mobility of goods and transport.
2. **Social and cultural Geography:** It studies the social phenomena and occupation of social space, the development of human cultures etc.
3. **Political Geography:** It studies political phenomena in spatial aspect
4. **Population Geography** It is the study population dynamics like Mortality rates, fertility rates, migration etc.
5. **Medial Geography:** It is the study of spatial aspect of disease distribution.
6. **Settlement Geography:** It studies the spatial extent of human settlements their origin and evolution.

7. **Urban Geography:** It studies the spatial extent of urban areas their distribution evolution growth and development etc.

8. **Anthropo-Geography:** It studies the origin and evolution of human species.

Major themes in Geographical thought Formulated by Hagget

(a) The Areal Differentiation Theme:

Hartshorne's researches into the history of geographic thought led him to the conclusion that the fundamental aim of geographic research was the study of areal differentiation of the earth's surface. He also concluded that this study ought to be made by synthesising our systematic understanding within the context of the region. There can be no doubt that this has been and still is one of the major themes of geographic research, although it may be doubted if it is an overriding aim to which all other themes of geography must necessarily remain subservient.

(b) The Landscape Theme:

The concept of 'landscape' as the central focus for geographic research came largely from Germany. Although Hartshorne's review of an admittedly confusing concept led him to conclude that this was not a particularly rewarding focus for geographical research, it has remained of significant importance until the present day.

Ever since Sauer first firmly placed the concept in American Geography in 1925, it has functioned as a major research theme, particularly among the cultural geographers of the Berkeley School. The latter group evolved a distinctive method of investigation which involved distinguishing between the physical and cultural landscapes and examining the interaction between them.

To a certain degree physical geographers also directed their attention to the physical landscape and it is interesting to note that the Davisian method and the method of the Berkeley School are essentially genetic.

(c) The Man-Environment Theme:

A common theme within the context of areal differentiation and landscape geography has been the idea of the man-environment relationship. This theme formed a major focus for research among the Determinists as the moving cause and neglected interaction or feedback effects.

The Possibilists, on the other hand, postulated essentially the same man-environment relationship with man as the moving cause. A more balanced view is now provided by those who regard the essential focus of geography as being the human ecosystem.

(d) The Spatial Distribution Theme:

A view has frequently been put forward that the overriding aim of geography is to describe and explain the distribution of phenomena over the earth's surface. Hartshorne regarded such a study as

being an essential preliminary to the study of areal differentiation, but to others this aim became in itself a sufficient focus for geographic research.

To a degree, opinions on this issue split according to the regional-systematic dichotomy, and we, therefore, find many of the systematic aspects of geographic research (as in climatology and economic geography) developing around this fundamental theme as their focal point of interest. Locational analysis, at present an active area in geographic research, may conveniently be regarded as a manifestation of interest in the theme of spatial distribution.

(e) The Geometric Theme:

The geometric tradition in geography is an extremely old but relatively neglected one. However, since 1950, interest in this tradition has increased markedly.

Spatial Organization as a theme of Geographical Study

Literally, spatial organization refers to the organization of the space by human societies. It is the way a group or phenomenon is arranged on the surface of the Earth. Perhaps people are concentrated into cities or perhaps they're more spread out.

Whatever the spatial organization may be, in geography, we're interested in how things are arranged on the Earth. In particular, geographers like to split things into functional regions, or areas defined by business and economic activities around a focal point or node. A functional region can be thought of as an area where the focal point has influence. The focal point, be that a business or central government, has links to the surrounding area, and these links can be analyzed. This is a really useful way of looking at how the world works and how it is interconnected. If we can see how things are spatially organized, we can next ask the question: 'Why are they organized that way?' And that is what geography is all about.

People & Places

Understanding the distribution of people and places tells you something about how people work. People tend to organize themselves into towns and cities, with far fewer people elsewhere. A population map of the Earth's surface would show certain key hubs with everywhere else being pretty quiet. This tells you something about how humans form communities.

You might also notice that certain parts of the world have more people than others. This might tell you something about the spread of natural resources around the world or perhaps the stability of governments in those areas. But we also know that as countries become more successful, population seems to stabilize and even decrease, as people choose to have less children. And so, perhaps the distribution of people and places can tell you something about a country's worldwide success.

There is a lot you can learn from understanding the distribution of people and places. If you looked at a remote-sensed image, such as an aerial photograph, it can be hard to interpret what you're seeing. Is it a city? Or an area of agriculture? Or a mountainous region? If you understand how people and places (including businesses) are distributed, answering this question becomes easier. If you see a grid of roads, looking like neat boxes, it's probably a city. If you see boxes that are larger and green or yellow in color, you may be looking at farmland. And if you see winding roads that seem to take inefficient routes, you're probably looking at a mountainous area with windy contour-following roads.

You might also see patterns in the locations of cities and towns. Follow a highway and you might notice that there's usually a major town or city every certain number of miles and that number varies by country; different countries have different norms. So, there's a lot you can learn from analyzing the way people and places are distributed.

Environments

Looking at a world map, it's also noticeable that human settlements vary by climate. Temperate climates have a lot of settlements, and warm and wet climates have a fair few settlements as well. But anywhere dryness is a problem because humans need water. And colder places tend not to be very popular either. So that begs the question: 'How are the environments of the Earth distributed?'

The Equator of the Earth is an imaginary line moving east to west around the Earth that is halfway between the North Pole and South Pole. Since the Sun is overhead at the Equator more than anywhere else on the Earth, it is the hottest part of the Earth; the Sun's rays are highly concentrated. The North Pole and South Pole on the other hand are the coldest. In between are so-called temperate areas, where there are no extremes of temperature and precipitation.

But precipitation isn't as simple as temperature. There are deserts with hardly any rainfall near the Equator and frozen deserts near the poles. This is all about the way the Earth's weather patterns and air and water currents flow. When water is evaporated from the Earth, it moves in those currents from place to place. When that water is finally released from the clouds in the form of rain, it may have traveled hundreds of miles. The places where this moisture is taken tend to be wet, and places that mostly lose moisture tend to be dry.

Geography as a Science of Relationship between Man and Environment

The concept of geography as the study of man and environment relationship is quite old.

The Greek, Roman, Indian, Chinese and Arab geographers attempted to establish a relationship between man and natural environment. Kant, in the concluding part of the 18th century, advocated the impact of environment on the lifestyle and physical constitution and lifestyle the equatorial, hot deserts, Mediterranean, coastal and mountainous regions. According to Kant, the inhabitants of torrid zone are exceptionally lazy and timid, while the people of the Mediterranean region living in

the mild temperature conditions are industrious, hard working and progressive.

The environmental causation continued throughout the 19th century. Humboldt asserted that the mode of life of the inhabitants of the mountainous countries of the Andes mountains differ from that of the people of Amazon basin, coastal plains and islands like Cuba and West Indies. Ritter attempted to establish the cause variations in the physical constitution of body, physique and health of people living in the different physical environmental conditions.

The idea of defining geography in terms of man and environment relationship developed on scientific lines in the later part of the 19th century after the publication of Origin of Species (1859) by Charles Darwin. This seminal work gave a new direction to the discipline of geography. The theory of evolution held that all living species have evolved from pre-existing forms. His geological observations and theories had one thing in common: the idea that things in nature change with time. He also believed that the face of the earth also changes with the change in environment over the period of time. In this book, Origin of Species, Darwin presented his idea that species evolve from more primitive species through the process of natural selection. In his account of natural selection occurs, known as Darwinism, he pointed out that not all individuals of a species are exactly the same but have variations and some of these variations make their bearers better adapted to particular ecological conditions.

He theorized that well-adapted individuals of a species have more chance of surviving and producing young than do the less adapted, and that over the passage of time the latter are slowly weeded out. Through his theory Darwin showed how the multitude of living things in our world could have come into being without any recourse to a divine master plan, in a plain, causal, naturalistic way. Darwin argued that a struggle for existence must take place; it followed that those who survived were better adapted to their environment than competitors. This means that relatively superior adaptations increase while relatively inferior ones are steadily eliminated.

The Darwin's concept of man and environment relationship may be summarized as under:

1. Organisms vary, and these variations are inherited (at least in part) by their offspring.
2. Organisms produce more offspring than can possibly survive.
3. On an average, offspring that vary most strongly in direction favoured by the environment will survive and propagate.

The Darwin's theory had a far-reaching impact on the growth and development of geography. It assumed that variations in animals were random. In this way, the older teleological conception (the religious belief that God has a plan and every phenomena of the earth have been created to perform certain functions for man) of nature was profoundly challenged.

Darwin's book upset many established patterns of thought, contradicted firmly held religious tenets (teleological concept) and brought in focus the concept that humans are one species among many that

have evolved more primitive one. In his subsequent book, *The Descent of Man and Selection in Relation to Sex* (1871), Darwin provided evidence of human evolution from one primitive species and discussed the role of sexual selection in evolution.

The concept of defining geography in terms of relationship became quite popular in Germany. The work of Darwin influenced Friedrich Ratzel, who published *Anthropogeography* in two volumes in 1882 and 1891 respectively.

In the first volume, he organized the material to show the influence of physical environment on history, culture and the mode of life of the people, while the second volume deals with the geographical distribution of men in the world. It was because of this book in which he discussed the man and environment relationship of the different tribes of the world that he is considered as the 'founder of human geography'.

Ratzel, by applying the organic theory to political geography, developed the concept of *lebensraum* (literally living space or the geographical area within which an organism develops). While developing the man and environment relationship, Ratzel, in his book *Political Geography* (1897), equated a nation with a living organism, and argued that a country's search for territorial expansion was similar to a growing organism's search for space. Conflict between nations was thus seen as a contest for territory within which to expand, with the fittest surviving.

The concept was appropriated by the German School of Geopolitik in the 1920s and 1930s and used to justify the Nazi programme of territorial expansion. In the opinion of Dickinson and Gumplovicz, "Ratzel's work contains more and more important knowledge concerning the state, than the entire theoretical political science literature of the last 100 years".

Ratzel's book *Anthropogeography* had a great influence on the geographic thought of America, France, Britain, Russia and Sweden. Ratzel's most important disciple was Ellen Churchill Semple. Semple, in the introduction of her book, *Influences of Geographic Environment* declared "man as the product of earth's surface". The influence of physical environment on the history of people of the region in any part of the world can be found in her writings. The main cause of variations in the history, culture and lifestyle of the people of plains and mountains can be traced in the physical environment.

Subsequently, the French geographers, especially Vidal de Lablache, Brunhes, Martone, etc. The concept of *pays* (micro-region), developed by Lablache, was also based on the concept of relationship. He also coined the concept of *genres de vie* (lifestyle).

Lablache was convinced that *genres de vie* were themselves reflective of nature (physical environment), even as they transformed it. He always conceived human geography as natural, not a social science.

Ultimately, geography as the science of relationship appeared in the form of environmental

determinism. Environmental determinism is the doctrine according to which the human activities are controlled by the physical environment. The environmentalists considered natural environment as the 'geographic factor' and their geography was known as 'pure geography'. In the opinion of environmental determinists, human geography is the study of influence of physical environment on man.

Barrows, in his presidential address (1922), recommended that relationships in geography should be studied "from man's adjustment to environment, rather than the reverse". Hettner (1907) also supported the concept of geography as the study of relationship. Thus, both the physical factors and the human factors (cultural environment) are to be studied in their relations to each other.

Geography is, therefore, exclusively human geography, or as Barrow stated, geography is 'human ecology'. Geography is a natural science in the same way as plant ecology is a biological science. Sauer, in his book *Agricultural Origins and Dispersals* (1952), focused upon the patterns of human culture in relation to the natural environment. He also tried to explain how human interactions with physical environment have resulted into various cultural patterns in the different parts of the world. While examining the lifestyle and history of the people in the different regions of the world, it may be said that there is a close relationship between the environment and the mode of life of the people. Undoubtedly, terrain, topography, temperature, rainfall, natural vegetation and soils have a direct bearing on the culture, economy and society of the people, yet the role of man as the transforming agent of his physical surroundings cannot be ignored. In fact, works of man reveal many facts for which environmental forces alone can give no satisfactory explanation. For example, similar locations may not lead to similar mode of life.

The Eskimos of Tundra region differ markedly in their economic activities and cultural practices from the Tungus, Yakuts and Yukaghirs, etc. The Khasis and Nepalis, living in Meghalaya (India) in the same physical environmental conditions, have the different cultural ethos. Same is the case with the Gujjars and Bakkarwals of Kashmir Valley and the Kashmiris in the state of Jammu and Kashmir. Likewise, the Hanjis (water dwellers) of Dal Lake and Jhelum river in Srinagar have different attitude and mode of life from the inhabitants of Srinagar city. Geography, as the discipline of relationship, though was quite prominent approach, it lost its position after the Second World War. The advocates of spatial science, locational analysis, behaviouralists, radicalists and humanists criticized this approach and declared it just deterministic and unscientific.

Dualism and Dichotomy in Geography

Dualism may be defined as the ideological drift which changes the basic philosophy as well as methodology of the subject. In simplest of the terms, dualism means division of subject into two branches, whereby the philosophical viewpoints governing the nature of study in such branches are different from each other. However if the philosophy and methodology adopted in the study of

subject in such branches are contradictive of each other, then such dualism attains the status of dichotomy. So dichotomy is said to exist in the subject, if the two branches are mutually contradictive of each other.

Geographers throughout the history of geographical thought have been confronted with the methodological problems of dualism and dichotomy. Dualism existed in geography even in its pre-historical period, although in an obscure and vague manner. For example, Herodotus laid emphasis on the tribes and nations and their physical surroundings, Strabo concentrated on regional description. Al-Masudi, Ibn-Khaldoon, Aristotle, Hippocrates and others tried to interpret the influence of physical environment on the life styles of various people. However, dualistic thinking in geography became more conspicuous during the post-renaissance period in Europe. Since then a number of dichotomies appeared on the scene and with the passage of time, many more are likely to appear. Some of the most prominent among them are;

1. Physical geography versus Human geography

2. General geography versus Regional geography

3. Historical geography versus Contemporary geography

Dichotomy between Physical Geography and Human Geography;

Geography is study of both the physical and social phenomenon. Physical geography is the study of physical or natural environment of earth. Its subject matter and methodology is similar to those of other natural sciences like physics, geology etc. Physical geography indeed is study of unification of a number of earth sciences which gives us a general insight into the nature of man's environment. Human geography on the other hand is concerned with the study of spatial patterns of human occupation of the earth and human activities in various parts of the earth. The interaction between human beings and their physical environment is a very important component of the subject matter of Human geography.

While one section of geographers considers geography as a physical science with no place in it for man, the other section emphasizes that man is an essential and integral part of the subject matter of geography. As regards the dichotomy of Physical geography versus Human geography, the Greeks were probably the first, who started the branching of the discipline. Hecataeus gave more weightage to physical geography while Herodotus and Strabo emphasized the human aspect. In the study of natural phenomenon including climatology, meteorology, oceanography etc. it is possible to use the methods of natural sciences and to draw conclusions with a large measure of scientific precision. The methods of natural sciences however do not lend themselves very well to the study of social and cultural phenomenon.

Varenius was one of the first scholars to suggest these essential differences in the characteristics of physical and human geography. Immanuel Kant delivered lectures on physical geography at the University of Königsberg. Humboldt was primarily interested in physical geography. On the other hand, Ritter was more inclined towards the human aspect. Reclus laid emphasis on systematic physical geography. Darwin gave importance to physical aspect of the discipline while postulating the concepts of Struggle and Survival. In the 2nd half of the 19th century, geographers concerned themselves more and more with physical geography. Geographers like Köppen, Davis, Martonne, Mill, Jefferson, Dokuchaev and Huntington gave greater emphasis on landforms and climate as the major component of study. Ratzel and Semple also gave great importance to physical environment which determines the life styles of people.

On the other hand a large section of geographers gave more emphasis on the human aspect of the phenomenon. Ritter and Ratzel were among the first who considered man as an agent who brings change in the landscape. In geography, according to Febvre, we deal with man's work, man's calculations, man's environment, the perpetual ebb and flow of humanity; man not the soil or the climate- is ever in the forefront." It was Vidal de la Blache who founded the school of Human geography. He gave relatively less importance to the elements of physical environment as the major determinants of cultural landscape of a region. Vidal had a clear insight into the weakness of physical geography and the deterministic argument. According to Vidal, it is unreasonable to draw boundaries between natural and cultural phenomenon; they should be regarded as united and inseparable. Jean Brunhes prepared himself for the conceptual framework of Human geography. In America, Mark Jefferson brought the idea of central places, the primate city and the civilizing rails in the field of human and urban geography.

The basic philosophy of the followers of human geography was to establish a man-nature mutualistic relationship in which each of the two is dependent on the other. All geographical studies are aimed at developing an understanding of the earth surface and its physical and social phenomenon both as spatially varying entities unique in their own way as well as components in a mutually interacting system.

It is evident from above discussion that the dichotomy of physical geography versus human geography is artificial. The dualism is the result of historical development of the discipline. In brief geography does not fall into two groups i.e. physical and human; these two are just the two extremes of a continuum.

Dichotomy Between General Geography and Regional Geography

This dichotomy between 'general' and 'regional' was first raised by Bernhard Varen (also known as Varenius) in the 17th century.

Varenius, who published *Geographia Generalis* in 1650, recognised general geography as a sub-discipline which formulates general laws, generic laws and principles. In later periods, general geography came to be known as systematic geography as it derived knowledge from other systematic disciplines for formulating universal and generic ideas. General geography considers the whole world as a unit whereas regional geography deals with the description of particular regions or countries.

Alexander von Humboldt, the father of modern geography, categorised the discipline into geography and uranography. He described uranography as 'descriptive astronomy' while geography, according to him, was concerned with the interrelationship of phenomena found together in an area.

Richtofen considered regional geography to be descriptive, where it would depict the salient features of a region. Thus a homogenous pattern would evolve in a region. According to him, general geography studies the spatial distribution of geographical features.

Before the advent of Ratzel, systematic geography was founded by Humboldt, while Ritter founded regional geography. After Ratzel, Hettner viewed geography as an idiographic (regional) rather than nomothetic (general) discipline.

Ratzel's approach was deductive. He was concerned with the genesis of things, not their relationship and interdependence. Ratzel applied the Darwinian concept of survival of the fittest to human societies.

Vidal de Lablache rejected Ratzel and argued in favour of specific studies (*pays*). Thus Vidal was in favour of regional geography. Vidal propounded the principle of 'terrestrial whole'.

After the loss of popularity of regional geography, three separate branches—'general geography, compage regional geography and descriptive geography—have emerged. Berry does not consider any conflict exists between regional and general geography because they lie at the two extremes of a continuum rather than being different approaches. They are just the two ways of looking at the reality. They support each other. Thus the two concepts are interpenetrative in nature.

During the 1980s and the 1990s, the major concerns were as follows:

- i. A little attempt to emphasise on the epistemology of observation.
- ii. A new trend in regional geography dealing more with social structure, customs etc., making regional geography rather abstract.
- iii. An argument by some regional geographers that modern traditions eliminate spatial differences, encouraging other modes of explanation such as 'cognitive mapping', to map hyperspace and the culture of postmodernism in the western world, for example.

Dichotomy between Historical Geography and Contemporary Geography

Historical geography studies the geography of a region as it was in the past decades. The basic premises of historical geography do not exactly coincide with the framework of geography; rather, it

exists side by side with the geography of modern times.

Historical geography encompasses both regional and general geography apart from all other branches.

So, social geography in reality has become a part of historical geography. Historical geography can, therefore, be considered as a separate branch of study complete in itself. Contemporary geography revolves around the existing areal differentiation of phenomena which will ultimately pass into the realm of historical geography in the near future.

C.T. Smith (1967) has mentioned the following concerns as those of historical geography:

- (a) The role of geographical factor in history
- (b) The evolution of cultural aspect of societies
- (c) The reconstructed study of past geographies
- (d) The study of changes in geographical features through chronological periods.

The modern trend of the study of historical geography dates back to the 1920s and 1930s when, after Darby, historical geography was established as a 'self-conscious discipline'. Several geographers like East have studied the human geography of Europe in several historical periods. Ralph Brown analysed the geography of the USA at the time when it was settled by the Europeans. S.M. Ali in his *The Geography of Puranas* has endeavoured to construct the geography of ancient India.

Whittlesey and East were convinced that the flow of historical events is better understood if we study the historical reconstruction of geography; others, however, view the domain of historical geography to be in the symbiotic man-environment relationship during the past ages.

This leads to the study of determinism and possibilism since each social group produces a particular trend of determinism; social, economic and technological determinisms occur simultaneously with geographical determinism.

The geographers belonging to the Berkeley school argue in favour of the reconstruction of changing cultural landscapes over the past ages. The study of cultural landscape has a striking similarity with genetic morphology because both are concerned with landscape evolution. For an effective reconstruction of the past, landscape features such as settlement distribution, habitation types and field patterns are considered to be the most valuable sources.

Historical geography can be divided into several sub-types, viz., agricultural geography, regional geography, industrial geography, urban geography and so on. Past reconstruction of geography is of paramount importance for establishing a bridge between the geographical studies of the past and the present.

Some geographers, Mackinder, for instance, consider the distinction between historical and contemporary geography as baseless, because, according to Mackinder, historical geography has been considered with the historical present. So, historical and contemporary geography are one and the

same because whatever we study in geography at present will be a part of historical geography in due course of time.

The real challenge to historical geography came during the 1960s and early 1970s with the initiation of quantitative revolution. The descriptive empiricism of historical geography was discarded by the new perspectives, such as functionalism.

The historical geographers challenge the notion of quantification by invoking historical materialism and by throwing light on the humanistic aspect of idealism, which again confers on man the central role in geography. Meinig (1989) has expressed his concern that historical geography has become a 'dangerously weak field' of study due to a minuscule number of followers.

During recent decades, a close relationship has been established between historical and cultural geography in North America and Europe. In recent years, the most significant contribution of historical geography lies in the construction of a viable social theory within the discipline. The studies of academicians like Langton (1984) and Gregory (1988) suggest that geography and history are on a converging trend in the approach to regional geography.``

Dichotomy Between Functional and Formal Geography

The dichotomy between functional and formal geography suggests the division of geography into the geography of real places and geography of geometric places in black and white.

The dichotomy came into being in order to avoid the division between regional/systematic and physical/ human geography.

The believers of functional regions argue in favour of a causal relationship between the complex and heterogenous features of a place as well as the causal relationships among phenomena at different places on the earth. So, the basic spatial idea suggests that phenomena such as relief, soil, land use, transport links and industrial clusters are arranged not by chance but according to a rational idea of using space in the best possible manner.

The homogenous regions formed by social groups and societies are called formal regions. These communities are organised into microsystems or part systems. A formal or uniform region represents a "discrete distribution" defined on the basis of certain specified criteria and has a homogenous character in terms of those criteria. Formal regions are defined on the basis of a single feature or a "well-defined association of several selected features".

The functional or nodal region is defined on the basis of its area of influence around a nodal centre, that is, a city or a town or several nodal centres related to each other. The most important factor for delimiting the functional region involves the spatial interaction of a node with its hinterland.

In the study of functional regions, the issues related to absolute distances and space have little relevance. This approach considers the measurement of accessibility and isolations in terms of cost

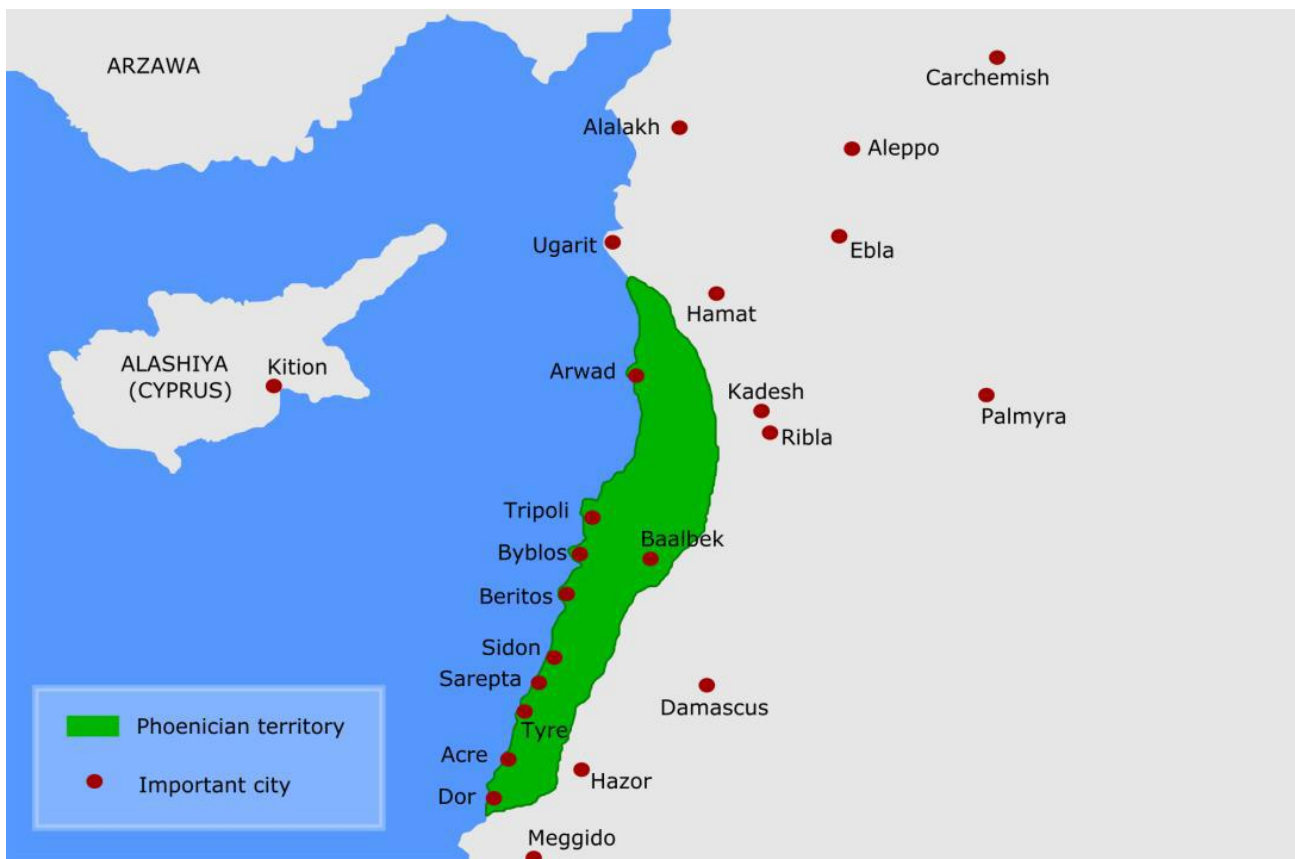
distance, mileage etc.

According to Pip Feror, since factors such as socio-economic demands and technological advancement affect distances in terms of cost or time, the space is truly dynamic in nature. Such space has been defined by Pip Feror as plastic space, i.e., a space that changes continuously in size and form. P.E. James has viewed such dichomies— including deductive versus inductive, topical versus regional, idiographic versus nomothetic—as mutually exclusive rather than contradictory in nature.

Contribution of Phoenicians

More than 2,500 years ago Phoenician mariners sailed to Mediterranean and southwestern European ports. The Phoenicians were the great merchants of ancient times. They sold rich treasures from many lands.

These Phoenicians (the Canaanites, or Sidonians, of the Bible) were Semitic people. Their country was a narrow strip of the Syrian coast, about 160 miles (260 kilometers) long and 20 miles (32 kilometers) wide. The area now comprises Lebanon and parts of Syria and Israel. Their territory was so small that the Phoenicians were forced to turn to the sea for a living. They became the most skillful shipbuilders and navigators of their time. They worked the silver mines of Spain, passed through the Strait of Gibraltar, and founded the city of Cadiz on the southern coast of Spain. They sailed to the British Isles for tin and may have ventured around southern Africa. They founded many colonies, the greatest being Carthage.



The Phoenicians began to develop as a seafaring, manufacturing, and trading nation when the Cretans—the first masters of the Mediterranean—were overthrown by the Greeks (see Aegean Civilization). Not only did they take the fine wares of the Eastern nations to the Western barbarians, but they also became skilled in making such wares themselves—especially metalwork, glass, and

cloth. From a snail, the murex, they obtained a crimson dye called Tyrian purple. This was so costly that only kings and wealthy nobles could afford garments dyed with it.

Perhaps the most significant contribution of the Phoenicians was a syllabic writing, developed in about 1000 BC at Byblos. From this city's name come the Greek word *biblia* (books) and the English word Bible. This form of writing was spread by the Phoenicians in their travels and influenced the Aramaic and Greek alphabets. After the Jews and Egyptians, it was the Phoenicians who contributed to the advancement of geographical knowledge. Phoenicians occupied Asia Minor (coastal Turkey, Lebanon, Syria, Israel) while Tyre (Tyr) and Sidon (Saida) were their major ports and towns. Gadeira (Gadis) was established by the Phoenicians as early as 1100 B.C., while Carthage (near the present Tunis) and Utica cities were established in about 813 B.C. along the northern coast of Libya (Africa) as the colonies of Phoenicians.

Thus, Phoenicians were the first repositories of geographical knowledge. But their narrow, selfish and secretive policies prevented them from communicating to others the information they had obtained about the distant nations and trading centres.

The Phoenicians were expert sailors who are credited with discovering how to use the North Star to gauge direction. As a result of this discovery, the Phoenicians could sail on the open seas and in the ocean; they no longer had to use the coastline as a navigational aid. Phoenician sailors passed this important information on to the Greeks and other Mediterranean cultures.

CONTRIBUTION OF GREEKS

Greek civilization was one of the well flourished civilizations dating back to 500Bc – 200Bc established in Greece and its surrounding areas. There is no doubt that the roots of modern geography are to be traced back to the thoughts of ancient Greek, because Greeks were pioneers in many branches of knowledge. Not only geography has its origin during Greek period but other subjects also. Greek period is rightly called as the “**Golden period**” because all Greeks provided a framework of concept that guided the western thinking for many centuries. It was the most advanced economy of the world. The labour pays of the Greeks were 12kg of wheat which was three times higher than that of Egyptians which is only 4kgs per person. They give their children religious knowledge. First established schools were peripathic school and plantonic academy. The private education was given upto the age of 18years. Followed by this they were given military training for two years. The fertile soil of greece has given birth to large number of scholars like Homer, Thomal, Anaximander, Hecataeus, Herodotus, Erastoshenes, Aristotle, Plato, Hipparchus etc.

Factors responsible for the contribution of Greeks:

- a) Greeks possessed philosophical and scientific aptitude. They focused on the role of reason and enquiry and were having the quest for knowledge. They used to make considerable emphasis on literature.
- b) They were not secretive, they were very open minded and cooperative.
- c) Location of Greece: It was a coastal area and was an earthquake zone, there were hot springs and volcanoes which were considered by some of them as supernatural things while others tried to explain them with scientific reasoning.
- d) The establishment of the famous Museum and library at Alexandria provided impetus to Greek scholars to know more about the phenomena of nature, places and people.
- c) The millet centre of learning also contributed to their geographical knowledge.

Hecateus was a Greek scholar of 6th century Bc from Millets (the centre of learning in those days). He was a pioneer Greek scholar and one of the earliest writer of Greek prose. He was the first Greek scholar to classify the information about then known world brought to the millets and named it as "Ges-periodos", it was the first systematic description of the then known world, that was published by the end of 6th century BC. Ges-periodos describes the places in the vicinity of Mediterranean Sea which was called as perplus means coastal area. Hecateus divided his book "Ges-periodos" into two parts, part 'A' dealing with geographical information about Europe' and part B dealing with Libya. Libya in those days consists of Asia and Africa. Hecateus described earth as a spherical body surrounded by water called as Oceanus'. Hecateus was a great traveler and has travelled extensively which is clear from his "periplus" meaning coastal survey in which he described all the places around mediterranean sea. He had also visited Egypt. He also navigated river Nile and had described its sources as the Southern Ocean. Hecateus for the first time gave two approaches for the study of geography

- a) Normathetic or law seeking approach.
- b) Ideagraphic approach (descriptive)

Hecateus prepared the world map but it was based on the map of Anaximander and did some modification in it. He divided it into two parts by drawing a line passing through Halaspond, Caspian Sea and Cacasious mountains. The northern part he named as Eurapa and southern part as Libya that

includes Africa and Asia. The literature reveals that most of the work of Hecateus is not intact but was unfortunately lost.

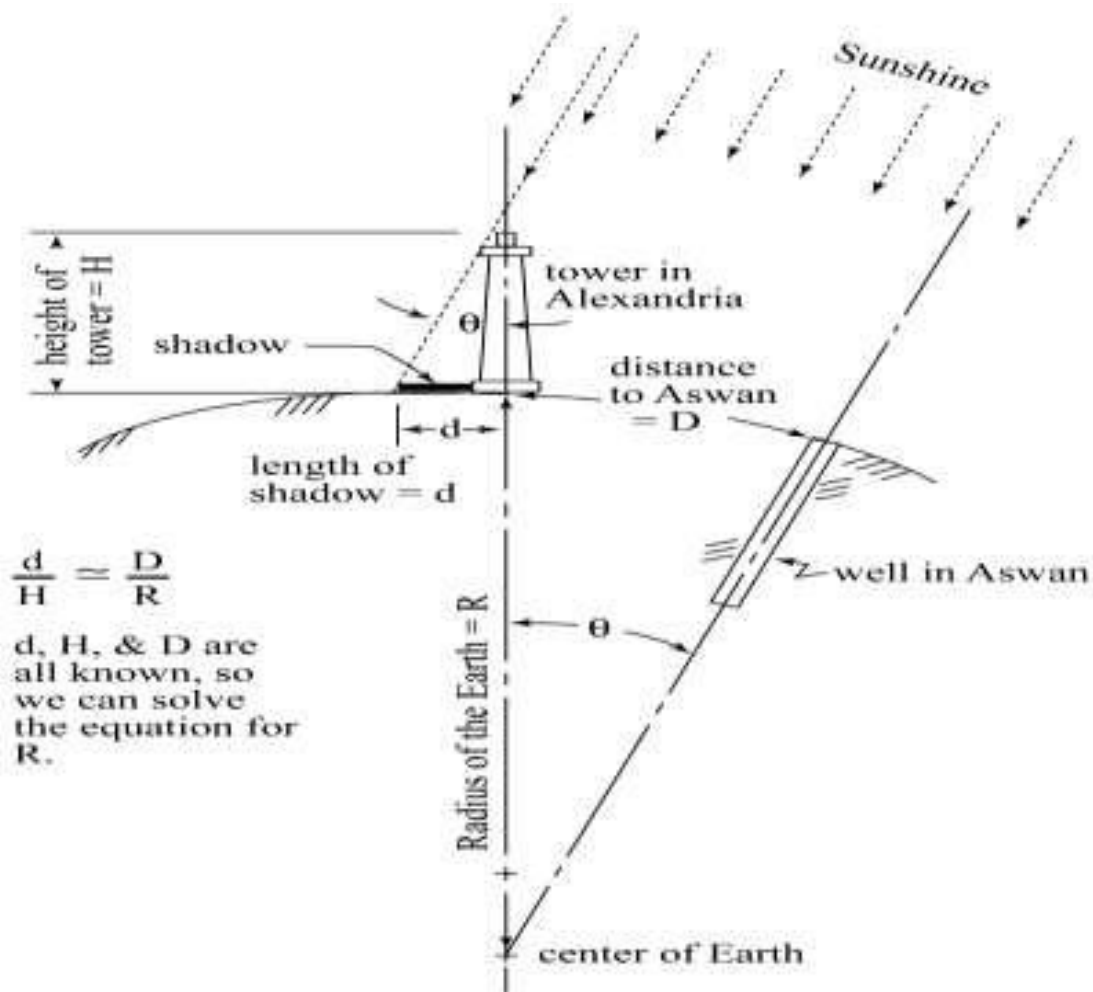
Herodotus was an outstanding Greek scholar of 5th century BC. There is no exaggeration in the statement to say that Herodotus was the **father of history**-- first and foremost historian but there are very good reasons for calling him as a great contributor in 'ancient geography'. Firstly it was Herodotus who placed historical events in a geographical setting and most of his historical accounts are truly geographical in nature. Secondly it was Herodotus who believed history must be treated geographically and all geography must be treated historically.

He contributed both in physical and human geography. Herodotus came up with the concept that Egypt is the gift of river where he emphasized that silt and mud of river leads to development of delta. It was he who for the first time gave concept that winds move from cold to hot places. He attempted to measure the age of earth on the basis of rate of sedimentation and estimated that one foot of sediment is formed in 880 years. Taking the total sediment strata 158 kms thick, Herodotus calculated the age of the earth as 440 million years when the exact age of earth is 4.6 billion years. In human geography it was Herodotus who for the first time gave an interesting detail of then existing tribes and their lifestyle, on the basis of this, anthropologists consider him as the first ethnographer.

Eratosthenes an eminent Greek scholar has been rightly regarded as " **Father of Geography**" He put a stamp on the subject of geography as the "study of earth as the home of man". His outstanding contribution for which he is renowned throughout the world is his measurement of the circumference of world. Eratosthenes was not only an ancient scientific scholar but also a mathematical geographer and was well versed in mathematical geography.

He has also prepared a world map with respect to correct distance. His remarkable contribution was his text "Geographica". He also described the five climatic zones: one Torrid Zone, two temperate zones and two frigid zones. He also measured different latitudes and longitudes. It is this reason that Eratosthenes was also considered the father of "Geodesy".

He has used Thales theorem – When two parallel lines are crossed diagonally by a straight line, the opposite angles are equal – while measuring the earth's circumference as given below:



Homer was the well known Greek and probably the first poet whose work was published in the form of Illiad and Odyssey. He described the four winds coming from different directions.

Thales was the first Greek genius, philosopher and traveller who originated several basic theorems of geometry. He was also the first who started the measurement of the earth and location of things on the face of the earth.

Anaximander is credited with the introduction into the Greek world of a Babylonian instrument known as Gnomon. Gnomon is a pole set vertically above a flat surface on which the varying position of the sun could be measured by the length and direction of the shadow cast by the vertical pole.

Hippocrates in his book *On Airs, Waters, Places* explained the man-nature relationship in the context of climatic conditions.

Hipparchus established the concept of locating the exact position of each place o the surface of the earth. On the basis of an Assyrian arithmetic, he divided the circle into 360 degrees. He made an

attempt of showing the three-dimensional earth on a flat surface. He is credited with devising two projections to do so; these are the stereographic and the orthographic projections. He even pointed out that these projections have their limitations as they can only represent a hemisphere and not the entire world. Thus supported and flourished the mathematical tradition of geography. Another important contribution of Hipparchus is the invention of

Astrolabe – an instrument similar to Anaximander's Gnomon but easier to handle.

The purpose was to provide accurate measurement of latitude at sea by observing the polestar's angle.

Another important Greek scholar who deserves mentioning is **Posidonius**. He recalculated the earth's circumference and came to a figure much smaller than that of Eratosthenes (approximately 18000 miles).

Strabo, a Greek scholar, and traveller was highly influenced by the historical topographical tradition of former Greek scholars especially Homer, Hecataeus and Aristotle (Adhikari, 2010). He was in acceptance of Aristotle's zones of habitable world – the *Ekumene* (as defined by Eratosthenes). His biggest contribution is his monumental work '**Geographia**' in 17 volumes; a compilation of writings of his predecessors. Out of these 17 books, eight are in Europe, six on Asia and one of Africa (Egypt and Ethiopia). The first two books were devoted to the historical review of the development of geography from the times of Homer.

Reasons for the decline of Greeks:

1. Greek faced some epidemics which lead to a lot of disturbance among Greeks.
2. There were some drought conditions in Greece which affected the Greeks badly and led them towards declination.
3. Romans fought a war with Greek in which they won and flourished all over.
4. It was this period when Roman Empire was in its zenith and was largest centralized empire in the world.
5. There was fire in the library of Alexandria in which some 4 lakh books were destroyed. This also led them towards declination as they had now hardly any literature available.

Roman geographers

The geographical scholarship in the ancient period is incomplete without the advancements made in the Roman Empire. Although Romans did not contribute at such a large scale that it can be compared to the contributions of the Greeks, the writings and the contribution of **Ptolemy** cannot be overlooked. He revived the mathematical tradition of Thales which was long forgotten. For him, geography was *a science of the art of map-making*. This concept was borrowed from the works of earlier Greeks especially Aristotle, Hipparchus, Posidonius and Marinus the Tyre (his teacher). He came up with a monumental work known as “*The Almagest*” – the standard reference for the study of the movement of celestial bodies for a long time.

He even accepted Aristotle’s view that the earth was spherical in shape, centered in the universe and remained stationary; the celestial bodies revolving around it in a circular motion. Another significant contribution of Ptolemy was in the field of map making. He improved and modified previous maps by adopting a projection for the world map which had a graticule of meridians of longitude and parallels of latitudes

After the completion of the *Almagest*, he started writing *Guide to Geography*, which consisted of eight volumes. In the first volume, he discusses the map projections. In volumes two to seven, he provides a table of latitudes and longitudes so that every place can be given a precise location in mathematical terms. He accepted the idea that the regions near the Equator were uninhabitable because of higher temperatures.

It would be correctly said that the Greek and Roman scholarship laid the base of scientific geography which left its imprints for centuries to come. The impact is so huge that after the death of Ptolemy it left a vacuum in the history of geographical thinking. As James and Martin (1981) have rightly remarked that after the death of Ptolemy, the geographic horizons that had been widened both physically and intellectually by the Greeks closed in again. It took many centuries before the effort of describing and explaining earth as the home of man got the attention of geographers.

Contributions of Arab Geographers

Arabs were the first to show their interest in geography because of their special surroundings. They gave pictorial form to their conception of the universe on the basis of faith. Their outlook was purely theological. They made outstanding contributions in the fields of mathematical, physical, and regional geography. Their achievements in climatology, oceanography, geo- morphology, linear measurement, determination of cardinal points, limits of habitable world, sprawl of continents and oceans are highly appreciable.

Historical Background:

Most of the Muslim geographers like Al- Maqadisi (945-1000 AD) followed the scientific method while compiling their works. There were three main sources of information, namely, the relevant available literature, personal observations made during their own travel and the information gathered from reliable persons about the lands for which the other two methods were not enough. They were passionate for travelling which is evident from the fact that they believed in collecting information themselves. Examples may be cited of Al-Idrisi's (1100-1166 AD) travels in south, north and west Europe, Ibn Hauqal's (943-969 AD) journeys to eastern part of Europe, Al-Biruni's (973-1050 AD) travels in India, and finally Ibn Battuta's (1304- 1368 AD) travels which covered faraway places like India and China along with the entire Muslim World. Ibn Battuta's travels in Africa took him as far south as Timbuktu on the river Niger.

One of the most important characteristic of Muslim scholars was that they brought comprehensiveness within the geographical thinking. The idea of specialization was not there as most of the writings are related to both physical and human geography; they also include facts on history, religion, philosophy, customs, dress and diets. The works of only two Arab geographers can be described as being highly specialized, namely, Al-Dinawari's (d. 805 AD) work on climatology, and Al- Asma'ai's book on plant geography. The Muslim geographic thought that evolved during the Middle Ages can be viewed from two perspectives. In the first case the contributions in geography were highly influenced by the works and writings of oriental civilizations namely Persians, Indians and Greeks. The second perspective holds more importance as here the purpose was not only to correct the wrong concepts passed down from previous civilizations but also make their own innovative contributions. Apart from making wonderful advancements in the field of astronomy and mathematical geography, Muslim geographers even investigated new branches of geography like urban, religious and linguistic geography.

Prominent Arab Scholars

The Muslim scholars in the middle ages made remarkable contribution to the geographical scholarship. Their contribution is of such an importance that some of the theories and concepts given by them still hold an important place in the philosophy of geography. As already stated that the scholars of the Muslim world had more wider and enriched horizons the information thus provided was more realistic in nature; this becomes more important as during middle ages the Christian world was undergoing one of its darkest period and where no new substantial advancement was made. Some of the major contributions of the Muslim scholars have been discussed here.

These scholars have made remarkable observations in the field of physical geography especially climatology. To start with, reference can be made of **Al-Balkhi** who collected climatic data from the accounts of various Arab travelers and prepared the world's first climatic atlas based on that data entitled *Kitab-Al Ashkal* in 921.

Al-Masudi was another important scholar who hailed from Bagdad. He was a geographer, a historian a world traveler and a prolific writer .He wrote on diverse themes and his important works include *Mehraj-al-Duhab, Kitabul Aswat, Kitab-Akhbar-Zaman*. Al-Masudi described the weather conditions of the places he visited or sailed through and also pointed out that the salt in the seas comes from the land. In the field of study of landforms he appreciated the role of process of erosion and adjustment of streams to structure in the evolution of landforms. He had a clear idea of the spherical shape of the earth. In the field of human geography he tried to study the relationship between human beings and the environment and explained the impact of environment on the mode life and attitude of people (environmental determinism). He even divided the world into seven regions on the basis of language.

Al-Biruni was a Tajik by race and a Persian by culture; his main interests include astronomy, mathematics, chronology, physics, medicine and history. He was a prolific writer; books include *Kitab-al-Hind, Al-Qanuan-Almasudi and Tarikul Hind*. *Kitab-al-Hind* (1030) is regarded as his monumental work which deals with the geography of India. He describes the processes shaping the landforms under normal conditions and even identifies the significance of rounded stones in the alluvial deposits in the southern part of the Himalayas. He mentioned that the distribution of rainfall in the peninsular region is controlled by the eastern and western Ghats. He provided detailed information about the source of Indus and explained the phenomena of floods in its basin. He gave the description of the city of Qannauj. He has provided an accurate account of the seasons of India describing the nature of monsoons. He had also studied Indian culture and Hindu beliefs.

In his astronomical writings he discussed and approved the earth's theory of rotation on its axis and correctly calculated the latitudes and longitudes of many places. He provided his views on the origin of universe in his book *Al-Tahidi*. He explained the phenomena of solar and lunar eclipses .He also attempt to measure the longest and the shortest distance of the moon and the sun from the earth. He studied the relationship of tides with the phases of moon. In geomorphology he compared the fossils discovered in the plains of Arabia, Jurjan and Khwarizmi along the Caspian Sea and suggested the occurrence of sea at these places in the earlier times. One of the most interesting observations made by him is that "*at the south pole the night ceases to exist*" (Adhikari, 2010).

Another scholar who is credited to have made significant contribution to geomorphology is **Ibn-Sina**. He gave the idea of landscape erosion when he observed that the streams cut down their valleys when flowing down the mountains.

He further states that these streams worn down the mountains in a slow but steady process. He even examined the presence of fossils in the rocks in higher mountains.

Al idrisi was a leading scholar of the 12th century. His most important and famous book was *Amusements for Him Who Desire to Travel Around the World (1154)*. His world map is considered as his most important contribution to geography. His map was based on a rough rectangular projection. He had studied Ptolemy's work. His description of Sicily is perhaps the most detailed one and it is of great historical importance. Al Idrisi travelled over a great part of world including Spain, France, England, Sicily, Morocco, Asia Minor and interior parts of Africa. He described the course of many rivers including the Danube and Niger with precision. He did not agree with the Greek's classification of the world into five climatic divisions and provided a more sophisticated classification based on climate.

Ibn Batuta was the greatest Muslim traveler of his time. He spent 28 years in travel and crossed a distance of more than 75000 miles. His primary interest was in people though he has described the physical conditions of various regions that he visited. His description of house types and building materials in deserts is very interesting and informative. Through his experience he labels Morocco as the best of the countries. His book *Rihlah* provides an insight into the soils, agriculture, economy and political history of the then Muslim world. He came to Delhi on an invitation of Mohd. Tughlak and served as a Qazi of Delhi.

Ibn Khaldun was basically a historian but his writings also have been important as they were based on travel. His most important work is known as *Muqaddimah*. In his writings, Ibn Khaldun has maintained that the northern hemisphere is more densely populated than the southern. He stated that the population along the equator is sparse, but there is an increasing concentration away from it up to 60 degrees. Further away there is little or no population. He emphasized the role of fertile land in the origin of settlements. He has argued that the origin of the large cities have always been in the form of small settlements. Ibn Khaldun is considered as one of the early environmental determinists as he tried to correlate man and his environment in a scientific way. He is also credited of establishing political geography in the middle period where he discusses the rise and fall of dynasties and empires. He formulated the first concept of life-cycle of the state. In the words of Kimble (1938) "*Khaldun may be considered to have discovered the true scope and nature of geographical enquiry but the fact remains that his*

knowledge of the physical earth is based largely on Greek theory; and his ideas about environment influence are not highly sophisticated.”

The period from the fifth and fifteenth centuries was remarkable as several concepts and theories were firmly established. There were improvements in the art of navigation which set the next step for the discovery of the world.

Contribution to Mathematical Geography:

1. Arabs were highly influenced by the Greek ideas about the shape and size of the earth. Earth was considered as the centre of the universe, around which revolved the seven planets.
2. The prime meridian plotted by Ptolemy was used by the Arabs for the calculation of time and longitudes. This meridian used to pass through Fortunate Islands, Abu Mashar.
3. For determination of latitudes, the Arabs made use of the sun's shadow where it happened to be on the meridian.
4. Al Battam measured the circumference of the earth as 27,000 miles.

Contribution to Climatology:

1. In AD 1921, Al-Balakhi gathered climatic data and information from Arab travellers and prepared the first climatic atlas of the world— Kitab-ul-Ashkal.
2. Al-Masudi described Indian monsoons.
3. Al-Maqdisi divided the world into 14 climatic regions. He presented the idea that the southern hemisphere was the most open ocean and most of the world's land area was in the northern hemisphere.
4. Ibn-Khaldun, Al-Beruni, Al-Masudi described the influence of climate on vegetation and lifestyle of the people. According to Ibn-Khaldun, people of the warm climate are passionate. He also said that Negros are black because they live in warm climate. People try to build their houses and settlements on the southern slopes near water sources and springs.

Contribution to Geomorphology:

1. Al-Beruni in his Kitab-ul-Hind opined that the stones became round because they had fallen along torrential mountain streams. He also discovered that alluvial soils became finer in texture farther away from mountains.

2. Avicenna keenly observed the works of agents of denudation and ascertained that

(i) Mountain streams erode the slope;

(ii) The highest peaks occur when the rocks are especially resistant to erosion;

(iii) The mountains are immediately exposed to the process of wearing down as soon as they rise up.

Contribution to Oceanography:

1. The Arabs proved that the tides are caused due to the gravitational pull of the sun and the moon,

2. Al-Masudi observed variation in the colour of the ocean water and attributed it to the variation in the salinity of water and presence of vegetation.

Impact of Dark-ages on Geography

The **Dark Ages** is a term often used synonymously with the Middle Ages. It refers to the period of time between the fall of the Roman Empire and the beginning of the Italian Renaissance and the Age of Discovery. Many textbooks list the Dark Ages as extending from 500-1500, although it should be noted these are approximations.

The term Dark Ages was coined by an Italian scholar named Francesco Petrarch. Petrarch, who lived from 1304 to 1374, used this label to describe what he perceived as a lack of quality in the Latin literature of his day.

Other thinkers came along and expanded this designation to include not only literature, but also culture in general. The term thus evolved as a designation for the supposed lack of culture and advancement in Europe during the medieval period. The term generally has a negative connotation. Debate continues to rage among historians over whether the Middle Ages were, indeed, dark or not. Increasingly, many scholars are questioning whether the term Dark Ages is an accurate description or not.

The ancient Greek and Roman civilizations were remarkably advanced for their time. Both civilizations made a number of contributions to human progress, notably in the areas of science,

government, philosophy, and architecture. Some scholars perceive Europe as having been plunged into darkness when the Roman Empire fell in around 500 CE. The Middle Ages are often said to be "dark" because of a supposed lack of scientific and cultural advancement.

The decay and disintegration of the Roman Empire led to the decline in literature, science, and explorations in the European and South-West Asian parts of the world. This, however, does not mean that geographical knowledge at that time did not flourish in China, India and South-East Asia.

The period of about five hundred years, i.e., 200 A.D. to 700 A.D., which followed the publication of Ptolemy's *The Guide to Geography* was an age of

complication, turmoil and abridgement. During this period, not a single work of originality in any field of the sciences and humanities was written. There was continuous deterioration, both in the theory of geography and the practice of exploration from the glories of the Greek and Roman periods.

Most of the correct classical concepts were forgotten and old errors reappeared about the map of the world and the habitable parts of the globe. Firmianus (260-340 A.D.), one of the leading protagonists of Christianity, denied the concept of a spherical earth. The interpretation of the nature of the universe reached its fullest expression in the work of Cosmas of Alexandria (600 A.D.). His book *Christian Topography* written about A.D. 550, refuted all the pre-Christianity views on geography. He worked out on earth modelled in all respects upon „Moses Tabernacle“. Cosmas, who was a merchant in early life, travelled fairly widely.

During the period of Christian Europe, there was a deterioration in the art of map-making. The fairly accurate delineations of the better-known coastlines of the Greeco-Roman period were lost, and instead maps became purely fancy. This was the period of the so-called TO maps.

Completely dominated by Christian supernaturalism, the map-makers of Dark Age made no serious attempt to show the world as it actually is. Instead, Firmianus followed an ideal pattern in his own mind, concentrating on artistic and symbolic expression.

About the Dark Age, the German scholar Schmid summarizes: "New countries were not discovered; the empire became smaller not greater; trade relations, thanks to the war in the east, the south and the north, became more and more restricted; besides, there was no longer any question of research in industry and of the spirit of discovery. Thus, the only books that were put together were compilations from older works

Geography as the Study of Environment

Study of the environment occupies a very important place in the subject of geography. The concept of geography as the study of man and environment relationship is quite old. The Greek, Roman, Indian, Chinese and Arab geographers attempted to establish a relationship between man and natural environment. Kant, in the concluding part of the 18th century, advocated the impact of environment on the lifestyle and physical constitution and lifestyle of the equatorial, hot deserts, Mediterranean, coastal and mountainous regions.

Humboldt asserted that the mode of life of the inhabitants of the mountainous countries of the Andes mountains differ from that of the people of Amazon basin, coastal plains and islands like Cuba and West Indies. Ritter attempted to establish the cause variations in the physical constitution of body, physique and health of people living in the different physical environmental conditions. The idea of defining geography in terms of man and environment relationship developed on scientific lines in the later part of the 19th century after the publication of *Origin of Species* (1859) by Charles Darwin.

The main theme of geographical study one way or the other is environmental study. No other discipline can boast of a richer heritage of the study of environment than geography. The close association of environment with geography since the hey-day of determinism, geographers were always concerned with environment and it remained a basic element in most of the approaches. Geography as the study of environment may be defined as inter-relationship between living organisms and natural environment in general and between technologically advanced man and his natural environment, which is operated in temporal and spatial framework. So environmental geography studies the characteristics, composition and functions of different components of natural environmental systems and mutual dependence including man and other biological organisms.

Geography studies the spatial attributes of all the phenomena including man in a given space and highlights complex man-environment relationships at different stages and phases in a time-space continuum while other sciences study individual phenomenon and do not bother for spatial organization. Being an integrating science geography synthesizes all the

elements and components of planet earth into one body and links the social sciences with the natural sciences. Geographers besides identifying complex relationships between man and physical environment have the capability of locating the distribution of such relationships in space, mapping them and exploring the causes of variations in distribution. They recognize and identify the environmental regions, locate them in space and present them on maps.

Ecology- Scope and Significance

Ecology is the study of the relationships among organisms and with their surroundings. These surroundings are called the environment of the organism.

The term ecology was first coined and used by German biologist Earnest Haeckel in 1869. The term oekologie has been derived from two Greek words oikos meaning house/dwelling or habitat and logos meaning study of. Thus according to Haeckel ecology means the science of laws and rules of the management of the organic world.

Haeckel also defined the subject of ecology as the science which studies relationships of organisms with their exterior world.

E.P Odum pleaded that biotic and abiotic components of environment are not only related in a reciprocal manner but also function in an orderly manner as a definite system. Therefore he defined ecology as a study of structure and functions of ecosystem or the study of the functions of nature.

In a simple term ecology may be defined as that science which studies, interrelationships between abiotic and biotic components of the biosphere ecosystem on one hand, and among biotic components on the other hand. Generally ecology is divided into autecology and synecology wherein autecology is concerned with the study of ecological relations of

individual species in a given ecosystem whereas synecology is the study of plant communities in relation to their habitats of the given ecosystem.

Scope of Ecology:-

Earlier ecology was considered to be a branch of biology that deals with the relation of organisms or group of organisms to their environment. Later on, it was realised that ecology is not only concerned with the organisms, plants and animals but also with the energy flows and material cycles on the lands, in the oceans, in the air and in fresh waters. So keeping with modern emphasis, ecology is defined as the study of structural unite and function of nature.

The study of ecology starts with the understanding of the interaction of various biological units with their environment for the production of a series of living systems, i.e. Ecosystems. Ecosystems are classified on the basis of type and level of gross energy flow. Now comes the understanding of the flows of energy and exchange of materials between ecosystems. Then movement of materials back

and forth between organisms and environment is taken up. This movement of materials is known as Bio-geochemical cycles.

The population ecology studies the interaction of organisms with organisms in the maintenance of community structure and function. Here focus is on the role of great physical and chemical forces in the nature.

The most important object of ecology is the study and maintenance of ecological balance and role of man in the degradation of the environment and to suggest remedies for minimising the effects of population explosion, killing of animals and many other problems.

Significance:-

The study of ecology is of paramount importance because:

Environmental Conservation: By studying ecology, emphasis is put on how each species needs the other for peaceful coexistence. Lack of understanding ecology has led to degradation of land and environment which is home to other species thus leading to because extinction and endangerment of species of lack of knowledge e.g. dinosaurs, mammoth, white shark, black rhinos, sperm whales etc.

Resource Allocation: All the plants and animals need to share limited natural resources such as air, minerals, space and environment. Lack of ecological know-how has led to deprivation and looting of these natural resources leading to scarcity as well as exploitation and competition.

Energy Conservation: All species require energy whether light, radiation, nutrition etc. Poor understanding of ecology is seeing the destruction of the energy resources e.g. non-renewable sources like oil, coal, natural gas and also pollution and destruction of the ozone layer.

Eco Friendliness: Ecology helps to appreciate harmonious living among the species; this will ensure natural order of things is followed.

Concept and Broad Types of Ecosystem

Ecosystem is a structural and functional unit of biosphere consisting of community of living beings and the physical environment, both interacting and exchanging materials between them. The term 'ecosystem' was introduced by Tansley in 1935. An ecosystem can be temporary or permanent, natural or man-made, small or large. Ecosystems are so varied in form and stature that whatever has a distinct community of its own, would be an ecosystem, e.g. pond, lake, river, village garden, park, a forest, a grassland, etc.

The two major components of ecosystem are:-

- The biotic components comprising all living organisms, and
- The abiotic components including the physical (non-living) environment.

Broad types of ecosystem

The biosphere is the biggest ecosystem which combines all the ecosystems of the world. But with the difference in physiography, climate, natural vegetation, soil and water bodies, separate ecosystems have been developed. There are essentially two kinds of ecosystems; Aquatic and Terrestrial. Any other sub-ecosystem falls under one of these two headings.

Terrestrial Ecosystems Terrestrial ecosystems can be found anywhere apart from heavily saturated places. They are broadly classed into: **The Forest Ecosystems** They are the ecosystems in which an abundance of flora, or plants, is seen so they have a big number of organisms which live in relatively small space. Therefore, in forest ecosystems the density of living organisms is quite high. A small change in this ecosystem could affect the whole balance, effectively bringing down the whole ecosystem. A fantastic diversity is found in the fauna of this ecosystem. About 30 percent of the land area of the earth is under forest cover, but due to man's intervention this area is gradually becoming smaller. They are further divided into; Tropical evergreen forest, Tropical deciduous forest, Temperate evergreen forest, Temperate deciduous forest and Taiga.

The Desert Ecosystem Desert ecosystems are located in regions that receive an annual rainfall less than 25. They occupy about 17 percent of all the land on our planet. Due to the extremely high temperature, low water availability and intense sunlight, fauna and flora are scarce and poorly developed. The vegetation is mainly shrubs, bushes, few grasses and rare trees. The stems and leaves of the plants are modified in order to conserve water as much as possible. The best known desert ones are the succulents such as the spiny leaved cacti. The animal organisms include insects, birds, camels, reptiles all of which are adapted to the desert conditions.

The Grassland Ecosystem Grasslands occupy about 19 percent of the earth's area. Grasslands are located in both the tropical and temperate regions of the world though the ecosystems vary slightly. The area mainly comprises grasses with a little number of trees and shrubs. The main vegetation includes grasses, plants and legumes that belong to the composite family. A lot of grazing animals, insectivores and herbivores inhabit the grasslands.

The Mountain Ecosystem Mountain land provides a scattered and diverse array of habitats where a large number of animals and plants can be found. At the higher altitudes, the harsh environmental conditions normally prevail and only the treeless alpine vegetation can survive. The animals that live there have thick fur coats for prevention from cold and hibernation in the winter months. Lower slopes are commonly covered with coniferous forests.

Aquatic Ecosystems The aquatic ecosystem is the ecosystem found in a body of water. It encompasses aquatic flora, fauna and water properties as well. There are two main types of aquatic ecosystem - Marine and Freshwater.

The Marine Ecosystem Marine ecosystems are the biggest ecosystems, which cover around 71 percent of earth's surface and contain 97 percent of our planet's water. Water in marine ecosystems features in high amounts minerals and salts dissolved in them. In a marine ecosystem, the ecology of shallow and deep waters as well as estuarine part are different from each other. Each ocean also represents a very large and stable ecosystem.

The Freshwater Ecosystem Contrary to the Marine ecosystems, the freshwater ecosystem covers only 0.8 percent of earth's surface and contains 0.009 percent of the total water. Although freshwater habitats occupy a small portion of the earth's surface, they are of great importance to man because they provide drinking water as well as water for domestic and industrial needs. The ecosystems are habitats to reptiles, amphibians and around 41 percent of the world's fish species.

Biodiversity

Biodiversity or biological diversity is a term that describes the variety of living beings on earth. In short it is described as degree of variation of life. Biological diversity encompasses microorganism, plants, animals and ecosystems such as coral reefs, forests, rainforests, deserts etc.

Biodiversity also refers to the number or abundance of different species living within a particular region. It represents the wealth of biological resources available to us. It's all about the sustaining the natural area made up of community of plants, animals and other living things that is being reduced at a steady rate as we plan human activities that is being reduced by habitat destruction.

There are at present 1.8 million species known and documented by scientists in the world. However scientists have estimated that the number of species of plants and animals on earth could vary from 1.5 to 20 billion. This means that the majority of species are yet to be discovered. Most of the world's bio rich nations are in South; in other words they are the developing nations. In contrast, the majority of the countries capable of exploiting biodiversity are northern nations, in the economically

developed world. These nations however have lower levels of biodiversity of global plant life, probably occur in only 18 hotspots in the world. Countries which have a relatively large proportion of these biodiversity hotspots are referred to as 'mega-diversity nations'.

Some of the countries with higher biodiversities are India, South America, such as Brazil and South-east Asian countries, such as Malaysia and Indonesia. India's globally accepted national hotspots are in the forests of the North-east and the Western Ghats, which are included in the world's most bio-rich areas. The Andaman and Nicobar islands are extremely rich in species and many subspecies of different animals and birds have evolved. Among the endemic species, i.e., those species found only in India, a large proportion are concentrated in these three areas.

Importance:

Biodiversity has a number of functions on the earth. These are as follows:

- **Maintaining balance of the ecosystem:** Recycling and storage of nutrients, combating pollution and stabilizing climate, protecting water resources, forming and protecting soil and maintaining eco balance.
- **Provision of biological resources:** Provision of medicines and pharmaceuticals, food for the human population and animals, ornamental plants, wood products, breeding stock and diversity of species, ecosystems and genes.
- **Social benefits:** Recreation and tourism, cultural value and education and research.

Conservation:

Biological diversity needs to be preserved; it is vital for the survival of human beings. Loss of biodiversity poses a great threat to the food security of human civilisation. Many wild varieties of plants constitute important supplies of valuable nutrients to humans. These plants are also a rich source of genetic material which can be used for the further development of domestic crops. According to the renowned tropical ecologist Norman Meyers, about 80,000 wild plant species could be useful to humans. Unfortunately, factors like overgrazing, forest clearing, conversion of natural lands to agricultural fields and expansion of human settlement in forest areas are gradually destroying our potential food resources.

In biodiversity conservation we study how human activities effected diversity of plants and animals and develop ways of protecting that diversity. Conservation ranges from protecting the population of specific species to preserving the entire ecosystem.

There are two main types of conservation:

1. **In situ or onsite conservation:** In this type of conservation we try to protect species in their natural habitat. It requires identification and protection of natural areas having high biodiversity. This includes the establishment of national parks, natural reserves, sanctuaries etc.

2. **Ex-situ conservation:** In this approach we conserve biodiversity in an artificial setting. This includes storage of seeds in banks, breeding of captive animal species in zoos and setting up of biological gardens, aquariums and research institutes. We also try to reduce the biotic stress and lastly rehabilitation of endangered species.

Ecological Imbalances – Causes and Consequences

Introduction

Ecological Imbalance is the natural or human-caused disruption in the natural balance of an ecosystem. *Ecosystem* is the environment where biotic (living) things interact with abiotic (non-living) factors such as forest, grassland, coral reef, etc. The term 'ecosystem' was coined by a British ecologist, Sir Arthur George Tansley. He depicted natural system in "constant interchange" among their biotic and abiotic parts.

Important causes and consequences of ecological imbalance

In general, there are two factors which contribute to ecological imbalance:

- The Physical or Natural Factor
- The Human Factor

The important causes and effects of ecological imbalance are discussed below:

Soil Erosion

Soil erosion exposes bare rock surfaces to various physical and chemical weathering and biological processes which lead to physical and chemical disruption. The disintegrated soil is the basic material which in interplay with endogenic and exogenic forces cause soil erosion.

The direct consequences of different types of soil erosion are many. These are:

- I. Formation of gullies and ravines which form an undulating topography rendering the affected area unsuitable for habitation.
- II. Deforestation caused by uprooting of plants due to soil cutting.
- III. Washout of upper layer of the soil and loss of soil fertility.
- IV. Loss of pastures and desertification
- V. Increase in frequency of droughts and floods.
- VI. Landslides

Deforestation

Deforestation is a havoc wreaked by thoughtless destructive activities of development. Forest clearings have been made not only for village settlements but for cultivation, especially shifting cultivation and jhumming, and pastures as well. With increase in human population more forests get cleared. Commercial exploitation of forests is the main cause of deforestation. The total forest cover has shrunk to 16% only compared to a time when it was 70% of the land area.

The adverse effects of Tropical Deforestation (Brazil, Indonesia, India, and Thailand) are not restricted to the region itself but it has global adverse effects.

Consequences:

- a. Micro-climatic change, increase in temperature and decrease in humidity/ rainfall.
- b. Soil erosion, loss of soil fertility, increase in sediment load of rivers and siltation of their beds.
- c. Increase in frequency of floods and landslides, loss of habitat to wild species, extinction of different species of plants and animals.
- d. Change in bio-oxygen demand (BOD) values and increase in Carbon dioxide levels on earth and its atmosphere and the resultant greenhouse effect.
- e. Ground water depletion.
- f. Recurring droughts

Volcanoes and Earthquakes

In a volcanic explosion an average 150 cubic km are ejected out of the earth's interior. This material is of three types – solid material, liquid material (*magma*) which comes out of a volcano, known as *lava* and gaseous material. Earthquakes are tremors caused by the passage of seismic / vibratory waves through the rocks.

Both volcanoes and earthquakes cause ecological imbalances due to sudden changes in the environment. During a volcanic eruption gases like chlorine, fluorine, etc are added in the surrounding environment.

Addition of volcanic steam, carbon dioxide, vapour sulphur and poisonous gases takes a heavy toll of life forms. The devastation caused by earthquakes to life and property and to the ecosystem is very high.

Consequences of volcanic eruptions

- I. Threat to animal and plant life. For example, the sweeping clouds of incandescent gases and suspended matter left only 2 people alive out of a population of 30,000 in St Pierre city (West Indies) when Mount Pele burst in 1902.
- II. Destruction of cities and built-ups, e.g., volcanic explosions of Etna & Vesuvius in Italy.
- III. Environment degradation, e.g., volcanic activity in the Andaman & Nicobar Islands.

Earthquakes:

- I. Loss of life and property
- II. Change in river course
- III. Loss of vegetation and animal life
- IV. Development of faults and fractures in earth's surface
- V. Destruction of dams
- VI. Biodiversity losses and environmental degradation

Mining

In mining operations, drilling and deep digging for extraction of minerals causes serious threats to the ecology and environment.

With growing knowledge of mineral resources, due to technological and scientific developments and the economic value of minerals, mining is carried out on large scale. This causes depletion of mineral resources. Mineral resources are the product of geological structure and their replenishment takes thousands of years.

Consequences

- I. Loss of original relief and *increase of wasteland area*. e.g, in U.S.A about 150,000 acres of land has changed into **wasteland**. In mining areas of Bihar, Orissa, Madhya Pradesh, Rajasthan there is **total destruction of land**.
- II. *More mining waste heaps* that cause ecological imbalances.
- III. Pollution due to *dust spreading and spread of diseases* among workers as well as locals.
- IV. Large scale destruction of natural vegetation and wildlife and the resultant ecological challenges.
- V. Creation of '*Ghost towns*'.

There are many more causes and consequences of ecological imbalance like Pollution, over-population, increasing industrialization, unjust utilization of natural resources, etc. A discussion of these needs a detailed explanation of the problem.

Quantitative Techniques and their Relevance in Geography.

Quantitative techniques are the techniques that are concerned with collection, organization, presentation, analysis and interpretation of data. The quantitative techniques in geography are a recent development. To understand and interpret the complex phenomena properly, the statistical methods have been introduced in the field of geography.

Geographical analysis of some phenomenon begins with the identification of its salient feature which are thereafter compared and contrasted in different situations. The quantitative techniques are firmly based on empirical observations and are readily verifiable. The statistical techniques help in reducing a multitude observations, data and facts to a manageable number of facts. These techniques help in the estimation, interpolation and simulation of data which are necessary for forecasting.

As mentioned earlier, quantitative techniques are the techniques that are concerned with collection, organization, presentation, analysis and interpretation of data.

These five stages are summed up as follows:-

1. Collection of data
2. Organization
3. Presentation
4. Analysis
5. Interpretation

Collection of data:-

This is the first stage and involves the collection of data. In collection of data one has to be very careful because they form the foundation of statistical analysis. Geographers use both primary as well secondary data. For collections of primary data, field surveys are conducted. Secondary data is obtained from different offices, libraries offices etc.

Organization :-

A large mass of figure collected from survey often needs organization. This is the second stage and involves arrangements of raw data in a well organized manner i.e. editing of the data through which

the omission, irrelevant answers and wrong computations in the survey may be corrected or adjusted. The edited data then are arranged according to some common characteristics of the items of data. Then after the arrangement of the data the final step is tabulation of the data. In this, final step data is arranged in columns and rows.

Presentation :-

The organized data is presented in an orderly manner to facilitate statistical analysis. In this stage data is represented in the form of maps, graphs and diagrams.

Analysis :-

The purpose of analyzing of data is only to get some information for making decision. In this stage the various characteristics of data are carried out by using different statistical methods like

(a) Measures of central tendency (mean, mode, median, quartiles, percentiles etc).

(b) Measures of dispersion (mean deviation, standard deviation etc).

(c) Correlation

(d) Regression

(e) Relationship measures and

(f) Measure of spatial pattern etc.

Interpretation :-

This is the last stage of statistical investigation. It is difficult task and requires a high degree of skill and experience. This stage involves drawing conclusions from the analyzed data.

Relevance Quantitative Techniques in Geography.

So far as the relevance of quantitative techniques are concerned in geography. There is no exaggeration to say that quantitative techniques play an important role in the discipline of geography that highlighted as follows:-

1. Quantitative techniques are essential tools for analysis and synthesis of data.

2. Geographers have used the quantitative techniques for identification, explanation and decision making.
3. Quantitative techniques are used to measure phenomenon with highest degree of accuracy.
4. It is with the help of quantitative techniques geographers had been in a position to collect a data over a large area by the method of sampling in such a manner that the analysis with the sample become unit of universe.
5. It is with the help of quantitative techniques that geographers started concentrating more on field studies, collecting primary data and utilizing secondary data.
6. It was after the quantitative revolution, there was a turning point in the discipline of geography. Because geographers started making models, theories and laws.
7. It is with the help of quantitative techniques that the validity of geographical data is assessed for theory building and model making.

Quantitative Revolution in geography

Introduction :

After the second world war, the empirical & descriptive approaches in geography were discarded and greater emphasis was laid on the formulation of abstract models and use of statistical techniques to make past geography and its theories more precise in order to have better knowledge of geographical systems and that is process is known to be “ QUANTATIVE REVOLUTION” IN GEOGRAPHY. It was I. Burton who published a research paper, 'The Quantitative Revolution and Theoretical Geography' in 1963.

In other words the application of statistical techniques and mathematical techniques theorems and proofs in understanding geographical systems is known as quantitative revolution in geography.

- The statistical methods were first introduced in geography in the early 1950. The methods were employed in geography for generating and testing hypothesis using empirical data.
- The mathematical techniques and theorems were used for deriving models.

Main features of Quantitative Revolution:

The main features of quantitative revolution are:

1. Widespread adoption of both statistical techniques and abstract models and theories
2. Displacement of the old Idiographic geography (which emphasis on areal differentiation and regional geography) by a new Nomothetic geography (Spatial Science) seeking to establish laws, models and theories of spatial structure.

Quantitative revolution thus involved a paradigm shift (a super model about the growth and development of science) given by S.T. Kuhn which provides deductive and inductive rules about the kind of phenomena in geography which focus on application of scientific laws in geography problem and theory building.

Objectives of Quantitative Revolution:

The main objectives of Quantitative techniques are as:

- To change a descriptive character of geography and make it a scientific discipline.
- To explain and interpret the spatial patterns of geographical phenomena in a rational, objective & cogent manner.
- To use mathematical language instead of the language of literature like 'Af' in the koeppen's classification of climate this stands for 'tropical rainforest climate'.
- To make precise statements about locational order.
- To test hypothesis and formulate models, theories and laws.
- To identify the ideal locations for the various economic activities so that profit may be maximized.
- To provide geography a sound philosophical theoretical base.

Development of Quantitative Revolution:

Quantitative revolution began in USA in mid-1950 in a few selected centers and was led by geographers who had studied natural sciences such as physics and statistics.

- Major theoretical and methodological development in geography

Quantitative revolution led to the development of locational theory, focus of which was on location of economic activities.

Central place theory focus of which on size and distribution of settlements within urban systems.

Locational analysis it focus the study of spatial arrangement of phenomena of spatial science.

Relevance of Quantitative Techniques in Geography:

Geography is one of the oldest earth sciences and its roots date back in the works of early Greek scholars like Thales and Anaximander during sixth and seventh century B.C. There is consensus that all civilizations contributed to the development of geographical concepts. In fact geographical knowledge had been a concomitant of civilization.

Geography for more than two hundred years was confronted with the problems of generalization and theory building. Traditionally, geography was considered to be a description of the earth surface, but in due course of time its definition and nature changed.

Now, it is concerned with providing accurate, orderly and rational descriptions and interpretations variable character of the earth surface.

In the words of Yeates, "Geography can be regarded as a science concerned with rational development and testing of theories that explain and predict the spatial distribution and location of various characteristics on the surface of the earth.

To achieve the above objective and to obtain the real picture of a region, geographers began to use and apply quantitative tools and techniques to which qualitative geography was opposed, especially till the 1960.

After the second war, geographers especially those of the developed countries, realized the significance of using mathematical language rather than the language of literature in the study of geography.

The relevance of quantitative techniques in the field of geography can be drawn from the fact that empirical descriptive geography was discarded and greater stress was laid on the formulation of abstract models. Mathematical and abstract models need rigorous thinking and use of statistical techniques.

- The diffusion of quantitative techniques in geography to make the subject and its theories more precise.
- The most obvious change brought about by the quantitative revolution is the change of methods and techniques.
- With the introduction of quantitative revolution in the field of geography led the major theoretical and methodological development in the subject geography and make the subject more accurate, orderly and rational description in the interpretation of variable characters of earth's surface.
- Quantitative techniques provide a geography a sound philosophical and theoretical base, and to make its methodology objective and scientific.

Advantage of quantitative techniques in geographical studies :

- a) The quantitative techniques are firmly based on empirical observations and readily verifiable.
- b) The quantitative techniques help in reducing a multitude of observations, data and facts to manageable number of factors.
- c) The quantitative techniques help in the estimation, interpolation and simulation of data which are necessary for forecasting.
- d) They also help in describing analyzing and simplifying a geographical system.
- e) Locational theories of industries, agriculture land use intensity and stages of development of landforms can be easily understood and predicted with the help of quantitative techniques.
- f) Finally, quantitative revolution based on positivism distinguishes science from metaphysics and religion thus provides the subject of geography a sound philosophical, scientific and methodological base.

Disadvantages of Quantitative techniques in Geographical studies:

The applications of quantitative techniques in geographical studies have been criticized on several counts such as:

- a) The advocates of quantitative revolution pleaded for the language of geometry. Geometry is not an acceptable language to explain the man environment relationship- the main theme of geography.

- b) The advocates of quantitative techniques in geography focused on “Locational Analysis”. The main weakness of locational is that promotes capitalism and in capitalistic society there is the exploitation of human and environmental resources which makes the rich richer and the poor poorer.
- c) Application of quantitative techniques demands not only considerable mathematical power, they also demand reliable data which is rarely available in developing countries like ours.
- d) Making reliable models and universal laws in human geography like other social sciences with the help of quantitative techniques is however not possible.

Geomorphic field Survey: Meaning, Significance and Procedure

Man and nature is the basic theme of geography. Man’s existence on the earth’s crust is depends upon the terrain it provides and boundaries it offers. According to Vidal de La Blache a famous geographer, “Nature provides the stage and it is for man to act on it”.

Geography is often considered as the study of the feature of earth’s surface including their spatial distribution and interrelation and the interaction of man with them. The natural or physical geographic elements consist of physical feature like landforms, climate, water bodies’ flora and fauna.

Geography is considered to be a scientific discipline. But it is different from Zoology or Botany. In these science subjects practical’s are mostly conducted and performed in an indoor lab. Geographers are also engaged in the practical but the real lab of a geographer is the world outside.

The geomorphic field studies have obtained vital importance in geography. Such field studies are not important only to get the first hand information and the data about socio – economic aspects of human life, but these are of even greater importance to develop full understanding about physical features like V-shaped valley, Delta formation by river, U – shaped valley by glacier, Sand dunes by the action of wind etc. existing in the natural field.

Significance of Geomorphic field Survey

These field surveys are concerned with the study of location, altitude and space relations of various places. Besides it also studies rock types, their litho – logical and mineral characteristics, various structural features like folds, faults, dips, strikes, thrust etc., various landforms such as mountains, plateaus, plains, valleys, gorges, block mountains etc., various geomorphic processes which are constantly engaged in changing the morphological characteristics of the earth’s surface the area under investigation.

There are of course, various techniques of field work and surveying which help in collection of data regarding the geomorphology of the area under study. The information obtained thus is presented in the form of maps – topographical maps, geological maps and many other types of maps. All these maps produce detailed information of the area concerned. Number of instruments is used during the field surveys.

Information about altitude of various places can be obtained with the help of a variety of instruments like Clinometers, Dumpy level, Theodolite. These instruments are called leveling instruments.

Procedure: Before going in the field for any Geomorphic field Survey following criteria should be taken into the consideration:

- a) Plan for visiting area to survey
- b) Purpose for surveying
- c) Acquainted knowledge
- d) Well trained / equipments
- e) Execution of plan & skills
- f) Proper observation
- g) Politeness
- h) Compilation and presentation.

Socio-economic Field Survey:

Field survey refers to collection of information by an individual or group of individuals through direct observation in the field. Through a field survey, information about the physical and socio-economic survey such as relief features, drainage patterns, types of soil and natural vegetation etc (physical features), as well as population structure, sex ratio, literacy, means of transport and communication, urban and rural settlements, etc (socio-economic)is collected which gives a clear view of the pertaining information. The distribution and growth of any phenomena can be best understood by collecting data from the concerned field mainly by field survey.

Field survey constitutes an extremely important aspect of geographical studies. From the very beginning, the geographers have studied the natural and cultural environment of different parts of

the earth through field work only. The study of geography can be done only by personally visiting the concerned area because that gives first-hand information. An area can be remembered better by visiting it rather than by reading about it in the books.

According to a popular saying, "I read, I forget; I see, I remember; I do, I understand." While emphasizing the importance of field work James Fairgrieve says, "Geography comes through the soles of one's shoes." This means that true knowledge of geography lies in the field rather than in the library. Another importance of field survey can be best seen from the remarks of Ratzel (German geographer), I travelled, I sketched, I described.

The importance of field survey in the field of socio-economic aspects of human population is huge and irreplaceable. As we are aware that there are vast differences in social, cultural and economic characteristics between different regions of a country as well different strata of society within a region in other words regional disparities everywhere which directly influenced by the productivity of land , occupation of people , services and facilities available to them as well as the capacity of the people to utilize the resources all these facts need to be gauged out in order to have coherent knowledge of prevailing heterogenetic nature of socio-economic conditions of the concerned area. All these aspects can best gauged through filed observation rather through learning from any secondary sources in order to collect information of all the facts which might not be available or its authenticity might be in doubt borrowed from any secondary sources. As the published data are often not adequate so it is better to collect information through direct observation in the field and validate its authenticity as much as possible. By examining socio-economic conditions of any area it is important to visit the particular area to gauge out the selective indicators by various means such as through personal investigation, questionnaire/ schedule and other primary ways to have a better knowledge of the concerned phenomena and helped to draw rationalized results.

Procedure: Before going in the field for any socio-economic survey following criteria should be taken into the consideration:

- i) Plan for visiting area to survey
- j) Purpose for surveying
- k) Acquainted knowledge
- l) Well trained / equipments
- m) Execution of plan & skills

n) Proper observation

o) Politeness

p) Compilation and presentation.

Application of Remote Sensing

Remote sensing is the science (and to some extent, art) of acquiring information about earth's surface without actually being in contact with it. This is done by sensing and recording reflected or emitted energy and processing, analyzing and applying that information. The process involves an interaction between incident radiation and targets of interest.

Applications:

Each application itself has specific demands for spectral resolution, spatial resolution and temporal resolution. Application of remote sensing plays a much greater role in present form of life. With the help of remote sensing we can get the information of an area which can't be imagined from naked eye (Spectral range of human eye 0.4 to 0.7 microns) or to visit that placed by foot or with any other means having inaccessibility. As we are aware and fully satisfied of the fact that earth is not a homogenous in nature.

Application of the remote sensing in land use and land cover: although the terms land cover and land use is often used interchangeably, their actual meaning is quite distinct. Land cover refers to the surface cover on the ground, whether vegetation, urban infrastructure, water, bare soil or other.

Identifying, delineating and mapping land cover is important for global monitoring studies, resource management and planning activities.

Land use refers to the purpose the land serves, for example, recreation, wildlife habitat or agriculture.

Land use applications involve both baseline mapping and subsequent monitoring, since timely information is required to know what current quantity of land is in what type of use and to identify the land use changes from year to year.

The knowledge will help to develop strategies to balance conservation, conflicting uses and development pressures, issues driving land use studies include the removal or disturbance of productive land, urban encroachment and depletion of forests.

Applications of remote sensing in land use / Natural hazard include the following:

- a) Natural resource management
- b) Wildlife habitat protection
- c) Baseline mapping for GIS input
- d) Urban expansion/encroachment
- e) Routing and logistics planning for seismic/exploration/resource extraction activities
- f) Damage delineation (tornadoes, flooding, volcanic, seismic, fire)
- g) Legal boundaries for tax and property evaluation
- h) Target detection-identification of land strips, roads, clearings, bridges, land/water interface.

Application of remote sensing in agriculture includes the following:

- a) Crop type classification
- b) Crop condition assessment
- c) Crop yield estimation
- d) Mapping of soil characteristics
- e) Mapping of soil management practices
- f) Compliance monitoring(farming practices)

Forestry another product of land use is a valuable resource providing food, shelter, wildlife habitat, fuel and daily supplies such as medicinal ingredients and paper etc. international & domestic forestry applications where remote sensing can be utilized include sustainable development, biodiversity, land title & tenure, monitoring deforestation, commercial logging operations, shoreline and watershed protection, biophysical monitoring (wildlife habitat assessment) and other environment concerns. Remote sensing can be used to detect & monitor forest fire.

Application of remote sensing in structural mapping & terrain analysis, a synoptic view of regional scale is a much different perspective than point ground observations when trying to map structural elements. Remote sensing offers this perspective and allows geologist to examine other reference

ancillary data simultaneously and synergistically, such as geo magnetic information. Certain remote sensing devices offer unique information regarding structures, such as in the relief expression offered by radar sensors.

Remote sensing also gives the overview required to construct regional unit maps, useful for small scale analyses and planning field traverses.

Application of remote sensing in hydrology include

a) Wetlands mapping & monitoring

b) Soil moisture estimation

c) Snow pack monitoring/delineation of extent

d) Measuring snow thickness

e) River & lake ice monitoring

f) Flood mapping & monitoring

g) River /delta change detection

h) Irrigation canal leakage detection

i) Irrigation scheduling.