



B.A./B.Sc. GE(N)-201

Human Geography and Lab Work Quantitative Technique

B.A./B.Sc. II YEAR



**DEPARTMENT OF GEOGRAPHY AND
NATURAL RESOURCE MANAGEMENT
SCHOOL OF EARTH AND ENVIRONMENT SCIENCE
UTTARAKHAND OPEN UNIVERSITY**

BA/BSc GE(N)-201

**HUMAN GEOGRAPHY AND LAB WORK
QUANTITATIVE TECHNIQUES**



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AND NATURAL RESOURCE MANAGEMENT
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B.A./B.Sc. GE(N)-201**HUMAN GEOGRAPHY**

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BLOCK 1 - CONCEPT AND NATURE

UNIT 1 - NATURE, SCOPE AND ELEMENTS OF HUMAN GEOGRAPHY

1.1 OBJECTIVES

1.2 INTRODUCTION

1.3 MEANING AND DEFINITION OF HUMAN GEOGRAPHY

1.4 NATURE SCOPE AND ELEMENTS OF HUMAN GEOGRAPHY

1.5 CONCLUSION

1.6 SUMMARY

1.7 GLOSSARY

1.8 ANSWER TO CHECK YOUR PROGRESS

1.9 REFERENCES

1.10 SUGGESTED READINGS

1.11 TERMINAL QUESTIONS

1.1 OBJECTIVES

After reading this unit, you will be able to:

- Understand the meaning and definition of Human Geography
 - Learn about the history and nature of Human Geography
 - Gain knowledge about the scope of Human geography
-

1.2 INTRODUCTION

We can say that geography is the oldest discipline of knowledge because the urge to unlock the mysteries of nature has been there since the evolution of man. The instinct of using natural items for their livelihood started in humans. Over the time, the area of information expanded. This information was initially given in textual form. Later on, maps were included in it. This was the earliest form of geography, gradually; social sciences were added to it. This is where human civilization became a part of Geography and it came to be known as human geography. In addition to natural sciences in geography, social sciences were given equal importance.

Human geography is classified as social science. In this science we analyze human relationships and interactions of social facts with physical conditions. Human geography is still in its infancy; its development is progressing slowly. In this unit we will be talking about the meaning, definition, nature and scope of human geography. We would start with the history and basic understanding of the field of human geography including the definitions, nature and scope of the discipline.

1.3 MEANING AND DEFINITION OF HUMAN GEOGRAPHY

Since, the interaction between man and environment begin, human geography originated. In history it has its deep roots. The concerns of human geography have a long temporal continuum though, approaches to articulate them has changed over time. This dynamism and articulation changes are indicating vibrant nature of the discipline.

At starting, the interaction was negligible between various societies and knowledge was also limited about each other. Navigation skills were undeveloped, so before starting off, for a journey, explorers and travelers use to gather information about the path / place where they are moving and travelling. The attempt of explorations & mysteries about people and countries started coming out and Europe witnessed it first in the late 15th century.

Human geography is a science in which spatial distribution of human facts on earth's surface and the study of functional relationships between human groups and their environment are done on a regional basis. The major branch of Geography i.e. Human Geography deals with the study of people, communities, economics, cultures and their interactions with environment by studying their relations. Definitions expressed by some of the Geographers of human geography are given below:

- According to E.C.Semple, “Human Geography is a study of the changing relationships, between the unresting man and the unstable earth”.
- According to French Geographer Vidal de la Blache “Human Geography offers a new conception of the inter-relationship between earth and man..... a more synthetic knowledge of physical laws governing our earth and of the relations between the living beings which inhabit it”.
- According to Brunhes, J, “Human Geography is the ensemble of all these facts in which human activity has a part to play-a complex group of facts in finitely variable and varied, always contained within the limits of physical geography, but having always the easily discernible characteristics of being related more or less directly to man”.
- According to American Geographer E. Huntington “Human Geography may be defined as the study of nature and distribution of the relationships between Geographical environment and human activities and qualities”.
- According to Demangeon, “Human Geography is the study of human groups and societies in their relationships to physical environment”.
- According to Ratzel “Human Geography is the synthetic study of relationship between human societies and earth surface”.
- According to George F. Carter “Human Geography is primarily concerned with the relations between man, ways of life and the places in which they live”.
- According to Dickens, S.N. and Pitts, F.R. Human Geography is looked upon as the study of man and his work.
- According to H. de Blij study of how people make places, how we organize space and society, how we interact with each other in places and across space, and how we can make sense of others and ourselves in our locality, region and world.
- According to Rubenstein, “Human Geography is the study of where and why people and human activities are located”.

In brief, in human geography, we study the influence of physical environment on the economic activity, society, culture and religion of the people of a region.

1.4 NATURE, SCOPE AND ELEMENTS OF HUMAN GEOGRAPHY

Physical environment of the earth is studied under physical geography. The interrelationship between the physical environment and socio-cultural environment created by human beings through mutual interaction with each other is studied under human geography.

Landforms, climate, temperature, soils, rainfall, vegetation, flora & fauna etc, are topics discussed under physical geography. Occupational structure, density of population, road and railway networks, house types, airlines & pipelines network, industries, farms and ports in the earth are discussed under the human geography.

In my own perception, there should be no duality between human & nature. Some experts tried to express in dualism. They must be seen in their own totality. The segregation of nature and human race is not simply possible because their identification is not possible without each other. Especially a human being who is associated with nature in a deep and complex manner, we cannot think of his existence without nature.

With technologies help, man interacts with his environment. In my own perception, single good that is made by man is made without using any natural resource.

Cultural development of a society is indicated by technology. All that we are seeing today has been produced only after understanding natural laws.

Understanding of nature is at most important for developing technologies & as a technology develops, the shackles of natural disasters and problems loosen their grip. Natural resources sustain human beings and human beings are directly dependent on natural resources.

With the passage of time people begin to understand their environment and the forces of nature. With the help of social and cultural development, humans develop more better & efficient technology. With environment they create new possibilities. Humans avail the opportunities provided by nature. Man sustains the opportunity given by nature. Gradually in this way the humanization of nature takes place & imprints of human activities become visible.

Human geography is highly inter-disciplinary in nature. It develops close interference with other sister disciplines in social sciences in order to explain and understand elements of humans on the earth's surface.

In human geography, the major thrust is on the study of human society with relation to the habitat or environment. It embraces the study of human races; the growth, distribution and density of populations of the various parts of the world, their demographic attributes and migration patterns; and physical and cultural differences between human groups and economic activities. It also covers the relationship between man and his natural environment.

Human geography consists of a number of sub-disciplinary fields that focus on different elements of human activity and organization, such as, cultural geography, economic geography, historical geography, political geography, population geography, social geography, transport geography, urban geography etc.

The interrelationship between man and his physical environment was recognized and emphasized in Geography, from the starting by Greek and Romans such as Hecataeus, Herodotus, Aristotle, Eratosthnes and Strabo. The Arab Geographers also established relationships between cultural characteristics and physical environment. In the classical period of modern geography, Humbolt and Ritter, the German Geographer focused on the relationship between social groups and their physical environment. In his work "Erdkunde" Ritter concluded that the earth and its inhabitants stand in the closest reciprocal relation and one cannot be truly presented in all its relationship without the other. Friedrich Ratzel the German Geographer

established human Geography as an independent discipline. His two- volume work “Anthropogeographie” presented for the first time a broad vision of man and his work. Ratzel developed systematic human Geography.

The French Geographer Vidal de la Blache is regarded as one of the founding fathers of modern human Geography and the father of “possibilism”. Jean Brunhes elaborated Blaches ideas on human Geography and possibilism.

Before knowing the subject matter of human geography, it is necessary to know that what kind of study is human geography and why it is studied. Various aspects of the human population are used to study the natural resources, cultural landscape and the functional relationships of all these human progress, so we divide the area of this subject into six parts.

A-Population

B- Natural resources

C- Cultural landscape

D- Human environment adjustment

E- Economic social and cultural relations of different regions

F- Study of the era of development by time

Frinch and Trivarttha considered human geography as the study of usefulness of a given land area. To explore the geographic study of an area, there has to be a closer relation between natural and cultural conditions.

Ellsworth Huntington, an eminent American geographer while determining the area of human geography took a comprehensive view of physical conditions, forms of life and human responses. According to Huntington all elements of bio-physical environment are inter-related and affect each other and their combined affect is reflected in various human responses.

Today, human dominance over the natural conditions has increased and its cultural progress has taken place. As a result of civilization and culture, human desires and actions have been expressed by the effect and response of physical conditions.

Brunhes divided human geography into two bases while explaining the area of human geography.

1- According to the development of civilization

2- Real division on the basis of cultural facts

Based on the development of civilization, the facts of human geography are classified as following sub-divisions.

A- Geography of mandatory requirements

B- Land violation geography

C- Social geography

D- Political and Historical geography

Based on the cultural facts, the facts of human geography are classified under the following headings:

A- Unproductive work of land

a- Home

b- Way

- B- Conquest of plants and animals
 - a- Agriculture
 - b- Animal husbandry
- C- Destructive occupation of soil

Paul Vidal de La Blache has classified the study of human geography into the following chapters:

Population: its distribution, density, major gathering, means of subsistence, relationship in population density, causes of population growth.

Cultural elements: Environment adaptation of environment i.e., plants, animals and humans, tools and raw materials, means of subsistence, house building materials, development of human settlements and civilizations.

Transport and excursion: Human, animal transport and carts, roads, railway and ocean transport. Apart from this, the Blache has also mentioned human races and urban centers.

According to Demeingion, the study areas of human geography are as follows:

- 1- Human life in natural regions
- 2- Industries such as hunting, fisheries farming, animal husbandry, industry and trade.
- 3- Human habitat and migration
- 4- Human settlements

American geographer C.L. White and G.T. Reiner have given great importance to the adjustment in the study of human geography. The main three classification of adjustment are given:

- 1- Economic adjustment: in which industries are studied.
- 2- Social and cultural adjustment: in this, population, land owned social classes, caste classes, human habitation, dresses, home, art and religious beliefs etc.
- 3- Political adjustment: it has local, provincial, national governance and international union etc.

These geographers also assume that geography has the ability to solve many complex problems in the world. Generally following actions are necessary to fulfill this goal:

- 1- Surveying the world's social events.
- 2- Classification of the physical and biological elements of the human environment.
- 3- The mutual impact of these two elements on human events.

With all the facts we get to know about the sequential information about human geography development & to understand, the development of this discipline has been a steady process.

1.5 CONCLUSION

Human geography as second major branch of geography focuses on the study of people and their social groups, cultures, economies, and interactions with the environment by studying their relations in spatio-temporal perspective. Human geography is the study of changing relationship between the active man and dynamic earth surface features. In reality, geography's core concern is to understand the earth as the human home & also to study about all of the elements which

have sustained them. At all, human geography wants to explain the relationship between all the elements of human life and the space in which it all happen. With other sister disciplines in social science in order to understand and explain the human elements on the earth's surface is a close interference developed by human geography. Expansion of knowledge led emerging and submerging of many new fields and it also happened to human geography also. Sociology, Demographic Studies, History, Urban Studies and Planning, Political Science, Demography, Urban or Rural Planning, Agriculture Sciences, Business Studies, Commerce, Tourism & Travel Management and International Trade are the social sciences closely connected with human geography and all these are such disciplines which study about human activities & its behaviors'. This is how realm of human geography is continuously expanding.

1.6 SUMMARY

After thoughts of above Human Geographers, we can say that Human Geography is a study of close relationship between humans and natural environment. The major thrust is on Human Geography is the study of human society with relation to the habitat or environment. Many Geographers gave definitions in this unit; E.C.Semple told that Human Geography is a study of the changing relationships between man and the earth. Vidal de la Blache told that Human Geography offers a new conception of the interrelationship between earth and man. Human Geographers divided human geography in six different ways; population, natural resources, cultural landscape, human environment adjustment, economic social and cultural relations of different regions and study of the era of development by time.

1.7 GLOSSARY

Ecology- Branch of biology dealing with the relations and interactions between organisms and their environment, including other organisms

Cultural landscape- Cultural properties that represent the combined works of nature and man.

Era- Era is long and distinct period of time that passed away.

Environment- The conditions in which a person, animal, or plant lives or works.

Adjustment- The process of adapting or becoming used to a new situation.

Inter-relationship- The way in which each of two or more things are related to the other or others.

Impact- A marked influence.

1.8 ANSWER TO CHECK YOUR PROGRESS

1- "Earth as a home of man" ideology is derived from which of the following sciences?

- A- The Physics
- B- The Sociology
- C- The Ecology
- D- The Philosophy

- 2- What is the basis of the realistic division of Brunhes related facts about in human geography?
 - A- Natural facts
 - B- Social facts
 - C- Economic facts
 - D- Cultural facts
- 3-Which of the following is studied in human geography?
 - A- Primitive
 - B- Animal and birds
 - C- Human community
 - D- Solo human
- 4-Who wrote “Erdkunde”?
- 5-Who wrote “Anthropogeographie”?
- 6-What is the basic purpose of human geography?
- 7-Who was the father of human geography?

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1.11 TERMINAL QUESTIONS

- 1-Explain when and how did human geography begin?
- 2-Define Human Geography and give definitions of Geographers.
- 3-Explain the nature of Human Geography.
- 4-Write a note on the scope of human geography
- 5-Explain the purpose of Human Geography.

Unit 2 - MAN AND ENVIRONMENT

- 2.1 OBJECTIVES**
- 2.2 INTRODUCTION**
- 2.3 DETERMINISM**
- 2.4 POSSIBILISM**
- 2.5 NEO DETERMINISM**
- 2.6 PROBABILISM**
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- 2.11 REFERENCES**
- 2.12 SUGGESTED READINGS**
- 2.13 TERMINAL QUESTIONS**

2.1 OBJECTIVES

After reading this unit you will be able to understand:

- The discipline of geography has two fundamental branches of study- 1) Physical Geography and 2) Human Geography.
- The Physical geography studies physical environment and Human geography studies spatial differentiation and organization of human activities and human use of the physical environment.

2.2 INTRODUCTION

You have already learned that the core concern of geography as a discipline is to understand the earth as home of human beings and to study all those elements which have sustained them. Thus, the main objective here is studying how human beings and natural environment interact. The earth is comprised of two major components: nature (physical environment) and life forms including human beings. Physical geography studies natural environment and human geography studies “the relationship between the physical/natural and the human worlds, the spatial distributions of human phenomena and how they come about, the social and economic differences between different parts of the world” (Livingstone, David and Rogers 1996, p. 1-2).

Geography as a discipline is comprised of multiple dualisms with varying schools of thought. There have been wide-ranging debates about the nature, subject matter, methodology and approaches of study: whether the subject matter should be human or physical; whether geography should be a theorizing/law making (nomothetic) or descriptive (idiographic); whether the approach of the study should be regional or systematic? However, it can be argued that the dichotomy between physical and human is not a valid one as nature and humans are inseparable and interdependent and should be studied holistically. As discussed earlier, the relationship between humans and natural environment is the main focus of human geography. The man-nature relationships have been interpreted in several ways. Since the post-Darwinian era, geographers have differed greatly over the approaches and methodology required for examining and interpreting human-environment relationships. In this unit, we would learn about the various schools of human geography that have attempted to explain the varying forms of human-environment interactions on earth. In the following sections, we would learn about the main schools of human-environment interactions- 1) Determinism, 2) Possibilism, 3) Neo-Determinism and 4) Probabilism.

2.3 DETERMINISM

Broadly speaking, environmental determinism was at the center of one of the longest debates in the history of the social science of geography (Beck, 1985). This idea stirred considerable debate in the emerging field of human geography. The simple definition of environmental determinism is that “the natural environment is responsible for all human actions and the environment controls the course of human action”. In other words, it is the belief that the variations in human

activities can be explained by differences in the natural environment. “The essence of deterministic school of thought is that the history, culture, lifestyle and stage of development of any social group, society or nation are exclusively or largely governed by the physical factors (terrain, climate, drainage, fauna and flora) of the environment” (Husain 2002, p.38). Determinists generally consider man as a passive agent on whom the environmental factors are acting and determining his attitude, decision-making processes and lifestyle.

Scholarly interest in the influence of the environment on people can be traced back to classical antiquity. The first attempt to explain the physical features and character traits of various people and their culture with reference to the influence of natural conditions were made by the Greek and Roman scholars. Greek historian Thucydides pointed out the natural conditions and geographical position as the underlining factors of Athens’ greatness. Aristotle believed that climatic causes result in the differences between northern Europeans and Asians. He argued that the inhabitants of cold countries are courageous, brave but unintelligent, lacking in political organization and capacity to rule their neighbors. Whereas, he thought that the people living in warm climates of Asia were intelligent, but lacking in courage which makes slavery their destiny and natural state. On the other hand, people of Greece occupying the middle positions geographically, he saw them as endowed with the finest qualities and thus destined by nature itself to rule all others. The Greek scholars correlated the easy going ways of life in Asia to the favorable environmental conditions, whereas Europeans had to work hard for living due to poor and/or harsh environment. Greek scholars also tried to correlate varying physical features of people with their location and environment.

Similarly, Strabo (Roman geographer) postulated that the physical conditions such as slope, climate, relief etc. all are works of God and absolutely govern the lifestyles of people. The environmental determinism dominated the writings of Arab geographers as well. They divided the habitable world into seven terrestrial zones and highlighted the physical and cultural characteristics of races and nations living in these zones. Al-Battani, Al-Masudi, Ibn-Hauqal, Al-Idrisi and Ibn-Khaldun attempted to correlate the environment with human activities and their modes of life. Al-Masudi, for example, asserted that lands with abundant water have humorous and gay people; while dry and arid regions have short-tempered people; and the nomads who live in open air are marked by strength, resolution, wisdom and physical fitness.

The German philosopher, Immanuel Kant, also a determinist, strongly argued for a scientific base to the study of geographical or environmental phenomena which he considered to be just as essential as the exact sciences. The environmental causation continued throughout the 19th century when geographers regarded geography as primarily a natural science. Kant’s philosophy about man and environment relationships was adopted by Alexander von Humboldt and Carl Ritter who developed an inductive approach to explain natural phenomena. Ritter attempted to establish the cause variations in the physical constitution of body, physique and health in different environmental conditions. Similarly, Humboldt also asserted that physical environment greatly affects the mode of life of the inhabitants as the mode of life in mountainous areas greatly differs from that of the plain areas.

As a scientific theory, environmental determinism was founded in the latter 19th Century by the German geographer, Friedrich Ratzel. He was in turn greatly influenced by Herbert Spencer's perspective on Darwin's theory of natural selection. Soon, other geographers picked up the idea that seemed to promise a positivistic approach to the study of human geography in relationship to habitable space. Among those who led the American determinist movement were Ellsworth Huntington, William Morris Davis, Griffith Taylor, and most notably, Ellen Churchill Semple. The scientific milieu in the late half of the 19th century and early decades of the 20th century was dominated by Darwin's ideas, deductive approaches and an acceptance of the Newtonian cause and effect relationships. The origin of scientific determinism lie in the work of Charles Darwin whose seminal book *Origin of Species* (1859) influenced many geographers. The founder of the 'new' determinism was Friedrich Ratzel. He supplemented 'classical' geographical determinism with elements of 'social Darwinism' and developed the theory of 'lebensraum' which explains that state as an organism which owed its life to the earth and which was ever striving to seize more and more territory. In Ratzel's opinion, "similar locations lead to similar modes of life". He cited the examples of British Isles and Japan and asserted that both these countries have insular locations, which provide natural defense against the invaders. Consequently, the people of these countries were making rapid progress. Ratzel believe in the survival of the fittest and saw 'man' as the end product of evolution- an evolution in which the mainspring was the natural selection of types according to their capacity to adjust themselves to physical environment. He was convinced that the course of history, the mode of life of people and the stages of its development are closely influenced by the physical features and location of a place. In his deterministic approach, he gave more weight to location in relation to topographic features.

At the beginning of 20th century, 'environmentalism' became particularly widespread in the United States, where leading proponents were W.M. Davis, Ellen Churchill Semple and Ellsworth Huntington. The cycle of erosion model of landform development developed by Davis was based on Darwin's ideas. Semple was a staunch proponent of determinism. Her books *American History and its Geographic Conditions* (1905) and *Influences of Geographic Environment* (1911) established environmentalism in America in the early decades of the 20th century. Semple, in her book, distinguishes the attitudinal characteristics of the people living in different physical settings. She points out that the dwellers of mountains are essentially conservative as there is little in their environment that would stimulate them to change and very little reaches from outside world. According to her, diffusion of new ideas and innovations in the hilly tracts of isolation is relatively slower as compared to the well-connected plain areas of the world. On the other hand, people living in plain areas of Europe are energetic, thoughtful and cautious. Similarly, people of the Mediterranean region, where the climate is temperate and mild, are humorous, sporting and imaginative.

Ellsworth Huntington, an American geographer wrote the monumental book, *The Principles of Human Geography* in 1945, was a proponent of environmental determinism. Huntington's writings on climate and civilization displayed his preference for racial variations

and environmental explanations. 'Civilization', in his view, could thrive only where allowed by climate. The ideal environment was a temperate one: free from extremes of heat or cold, yet blessed with a bracing seasonal contrast between winter and summer. Rainfall should be spread throughout the year, as prolonged dry seasons sapped both human health and mental acuity. Short-term alternations between wet and dry, on the other hand, were regarded as a positive force, refreshing the mind and spirit. Huntington translated these favorable conditions into numbers and then mapped them across the world. He concluded that climatic energy peaked in Western Europe and Northeastern North America. Huntington next compared the map to one showing the 'level of civilization'. In essence, Ellsworth Huntington's took his own favorite climate to be the driving force of human history. But he also accepted that climate did not determine everything. Huntington ultimately sought to harmonize environmental and racial determinism, arguing that racial differences arose through natural selection propelled by climatic disparities and climate change.

Although environmental and racial theories dominated much academic discourse through the 1920s, they were increasingly challenged, denounced as both prejudicial and reductionist. One of the most withering critiques came from Franz Boas, a German-born scholar who had switched from physics to geography after receiving his doctorate. Conducting field research on the environmental determinants of Inuit (Eskimo) culture on Baffin Island, he came to think that culture had to be understood in its own terms rather than in terms of nature, and that tribal people were in no way intellectually inferior to others. Boasian anthropology, based on cultural relativism and particularism, was effectively a direct rebuttal to determinism. Environmental determinism was criticized as being overly simplistic because it neglects the cultural factors that affect human behavior. Societies that inhabit areas with similar climates and landforms may be very dissimilar.

2.4 POSSIBILISM

Possibilism in geography developed as a reaction to extreme generalizations of environmental determinists that led to a counter thesis which presented the man as an active rather than a passive agent. In this view, people can do anything, anywhere they choose. Human beings carry out activities despite the constraints and restraints of the physical environment. People conquer the environment and change wilderness into productive landscape. In this scenario, the level of technology is the main consideration, not the environment itself. The concept of Possibilism is most commonly associated with the work of the French geographer Vidal de la Blache (Johnston, Gregory, Pratt and Watts, 2000). Blache developed this geographical approach as a reaction to the more traditional geographical concept of environmental determinism. Deterministic school of thought "regarded all the facets of human activity (from farming practices to political systems) as ultimately determined in character by the natural-environmental context" (Cloke, Philo and Sadler, 1991, p.64). On the other hand, the possibilist school of thought is shaped by the idea that "the natural environment offers possible avenues for human development, the precise one chosen being very much a human decision"

(Cloke et al., 1991, p.65). This does not mean that people are totally free to choose their own directions, but there is an “ongoing ‘dialogue’ between natural environments and the human communities they support”. This dialogue, as described by Blache, results in a “human world full of different *genres de vie* (lifestyles), distinctive to particular people living in particular places” (Cloke et al., 1991, p.64). Thus, possibilism explains that the environment does not dictate what people would become, but rather offers the opportunities for people what they choose to be. People adapt to the different environmental conditions at different places and which produces different living conditions and habits (Tatham, 1951, p.167).

French historian Lucien Febvre elaborated further on the concept of possibilism and pointed out that, when it comes to human behavior in relation to the environment, “there are no necessities, but everywhere possibilities; and man, as a master of the possibilities, is the judge of their use”. According to Febvre, men have the most influence as a geographical agent on the earth. Thus, “we should put man in the first place, and no longer the earth, nor the influence of climate, nor the determinant conditions of localities” (Febvre, in Johnston et al., 2000). Both Vidal de la Blache and Lucien Febvre believed that nature is not mandatory but permissive. Other authors who contributed in developing possibilism are Isaiah Bowman and Carl Sauer who were both from the United States of America. It has been argued that the ideas of possibilism with the common emphasis on human actions and human ability to choose their destinies laid down the foundations of Humanistic geography.

The philosophy of environmentalism was increasingly attacked after the Second World War. Many geographers started criticizing the one-sided approach adopted by the determinist in interpreting geographical and historical reality, their exaggerated notions of nature’s active role and their view of man as a passive agent with limited ways of adaptation. It became clear that human actions cannot be explained only in terms of environmental factors. Spate criticized the fanatic approach of environmental determinists stating that “environment taken by it is a meaningless phrase; without man environment does not exist”. He also emphasized the need to “consider the psycho-physiological influence of the geographical environment via the social structure”. Spate concluded that geographical environment is only one of the factors of spatial differentiation and “it acts through society; cultural tradition has a certain autonomous influence”. Hartshorne rejected environmentalism on the grounds that it contradicts the concept of geography as an integrated science by separating nature from man and thus is “disruptive of fundamental unity of the field”.

Possibilism attempts to explain man and environment relationship in a different way, taking man as an active agent in environment. Possibilism asserts that natural environment provides options, the number of which increases as the knowledge and technology of a cultural group develops. Possibilists presented a model of people perceiving the range of alternative uses to an environment and selecting the best fitted to their cultural dispositions. This point of view was named ‘possibilism’ by Lucien Febvre, who writes: “The true and only geographical problem is that of utilization of possibilities. There are no necessities, but everywhere possibilities. The natural data (factors) are much more the material than the cause of human

development. The 'essential cause' is less nature, with its resources and its obstacles, than man himself and his own nature." Vidal de la Blache refuted the concept of physical determinism and wrote "nature sets limits and offers possibilities for human settlement, but the way man reacts or adjusts to these conditions depends on his own traditional way of life." In his opinion, lifestyles (*genres de vie*) are the products and reflections of a civilization, representing the integrated result of physical, historical and social influences surrounding man's relation to milieu in a particular place. He believed that whereas society and nature were usually represented as "two adversaries in a duel", the human being was in fact "part of living creation" and "its most active collaborator". He provided examples of different socio-cultural groups in the same or similar environment, and pointed out that these differences are not due to the dictates of physical environment but are the outcome of variations in attitudes, values and habits. It is this concept which became the basic philosophy of the school of possibilism. The possibilists also argued that it is impossible to explain the difference in human society and the history of that society with reference to the influence of physical environment. They hold that human beings bring their influence to that environment and change it. For the possibilists, the works of man, not the earth and its influence, are the starting points, the most important is the freedom of man to choose.

But, the possibilists also recognize the limitations imposed by physical environment. Fabvre holds the same view that "men can never entirely rid themselves whatever they do of the hold their environment has on them." In the similar manner, Brunhes remarks that "the power and means which man has at his disposal are limited and he meets in nature bounds which he cannot cross". Human activities can vary within certain limits of its environment, but it cannot completely overlook the environment. In other words, human beings can only modify the natural environment but it can never surpass it. Similarly, Blache pointed out that "there is no question of geographical determinism; nevertheless, geography is a key that cannot be dispensed with."

Possibilism is intrinsically associated with the French School of Geography founded by Vidal de La Blache. The French geographers saw in the physical environment a series of possibilities for human development and argued that the actual ways in which development took place were related to the culture of the people concerned, except perhaps in regions of extremes like deserts and tundra. The historian Lucien Febvre criticized the environmental determinism by asserting the mobility of man as against the passivity of the environment, and regarded other humans as part of environment, of any group because they contributed to the formation of that group's cultural surroundings or milieu. Influenced by the ideas of Lucien Febvre, H.J. Fleure tried to formulate world regions based on human characteristic rather than the traditional climatic-biotic regions. Possibilism has also been influential in the rise of the school of cultural geography associated with the name of Carl Ortwin Sauer and the University of California at Berkeley, and with the development of the idea of human ecology founded by H.H. Barrows of the University of Chicago. Barrows gave greater importance to humans than to environment. Sauer asserted that geographer's role is to investigate and understand the nature of the transition from the natural to the cultural landscape. Doing so, the geographer would identify the major changes occurring as a result of human occupation of landscapes. According to the possibilists,

nature is never more than an adviser. This involves man in the first place and not the earth, nor the influence of climate or the physical surroundings of locations. The range of possibilities in every region is limited more by human choices and desires than the dictates of the environment. For example, human beings with their technical skills can grow banana, rice and rubber in Antarctica but they have to consider the input cost. Humans can never entirely rid themselves of the hold of the physical environment. Taking this into consideration they utilize their geographical circumstances and take advantage of their natural possibilities.

The possibilistic approach has been criticized by many geographers. Griffith Taylor, while criticizing possibilism, opined that society as a whole should make a choice, and since only an advisory role is assigned to geographer, his function “is not that of interpreting nature’s plan”. Taylor was largely right when he wrote that the task of geography is to study the natural environment and its effect on man, not all problems connected with man or the ‘cultural landscape’. Moreover, possibilism does not encourage study of physical environment and it promotes over anthropocentrism in geography. Geographical determinism at least obliges the geographer to turn his attention to nature. Possibilism tended to exaggerate the role of culture and to neglect the importance of natural environment. The approach of possibilism may be as ludicrous as determinism, but possibilistic generally recognized the limits to action which environment set and avoid the great generalizations made by determinists.

2.5 NEO-DETERMINISM

The concept of ‘neo-determinism’ was put forward by Griffith Taylor- a leading Australian geographer. He argued that possibilists had developed their ideas in temperate environments such as north-western Europe, which offer several viable alternative forms of human occupancy. But such environments are rare: in most of the world as in Australia the environment is much more extreme and its control over human activity is enormous. He coined the term ‘stop- and-go determinism’ to describe his views. In the short term, people might attempt whatever they wished with regard to their environment, but in the long term, nature’s plan would ensure that the environment won the battle and forced a compromise out of its human occupants. He, in the 1920s, argued that the limits of agricultural settlement in Australia had been set by factors in the physical environment such as the distribution of rainfall. Taylor’s view was initially most unpopular in Australia, but it has been generally accepted since then.

In his book on Australia published in 1948, Taylor reaffirmed his basic position that the best economic programme for a country to follow has in large part been determined by nature (environment), and it is the geographer’s duty to interpret this programme. Man is able to accelerate, slow or stop the progress of a country’s (region’s) development. But he should not depart from directions as indicated by the natural environment. Man is like the traffic controller in a large city who alters the rate but not the direction of progress. Neo-determinism is also known as ‘stop-and-go determinism’ and Griffith Taylor’s philosophy can be explained by the role of a traffic controller. Man follows nature’s programme only if he is wise. But he admits the possible contention that within broad limits set by environment man can choose. Taylor concedes

him the choice between what is wise and what is foolish. But wisdom and folly are human concepts. The natural environment knows nothing of them. In nature there is only the 'possible' and 'impossible'. The possibilists admit that the opportunities offered by any environment are not all equal. Some environments demand little adjustments while other environments make humans struggle continuously. The ratio between human effort and return can be taken as the price nature demands from human beings for their particular choices.

In no environment are the possibilities limitless and for every choice price must be paid, proponents of possibilism admit this, but within these limits freedom to choose exists. Man makes his choice, and man himself judges its relative wisdom or folly by reference to goals he himself has established. Limits to man's freedom beyond those generally recognized by possibilists are, according to Taylor's definition, those imposed by man's conception of wisdom. There is nothing indeed that contradicts the assertion of Febvre that there are no necessities but everywhere possibilities and man as a master of these possibilities is the judge of their use. Thus, man chooses, but only from the range which nature presents him. In brief, people might attempt whatever they wished with regard to their environment, but in the long term, nature's plan would ensure that the environment won the battle and forced a compromise out of its human occupants.

2.6 PROBABILISM

The concept of probabilmism was put forward by O.H.K. Spate (1957). Probabilism is the view that although the physical environment does not uniquely determine human actions, it does nevertheless make some response more than others. The term was proposed as a mid-way between a stark environmental determinism of Ratzel and a radical possibilism of Febvre, Blache and Sauer. While the environmental determinists, influenced by the cause and effect relationship of Darwin, asserted that human activities are controlled by the physical environment, the possibilists opined that physical environment provides the opportunity for a range of possible human responses and the people have considerable discretion to choose between them.

According to Spate, "human action was represented as not so much a matter of all-or-nothing choice or compulsion, but a balance of probabilities". For example, there is a probability that the land use intensity in the Sutlej-Ganga plain decreases away from the market centres; the population density decreases away from metropolitan centres in all directions; crop yields diminish beyond a certain walking distance from the village settlement. There may be, however, exceptions to each of these generalizations, and in many cases, there are also limits to the range of territory which they hold true. The exceptions and the limits demand explanation. After this concept, the probability theory came to be regarded as an essential component of geographical analysis since it provided "a common mode of discourse for scientific study of the landscape". This view, in fact, is perfectly compatible with the original Vidalian conception. The geographers started to use the probability theory to determine the man and environment relationship and also to make a scientific study of the landscape.

The probability theory was criticized on several grounds. For example, a complete knowledge about the environment (resources) may not be available; the data available about the

resources and their utilization may not be reliable; the perception about resources (environment) differs from man to man, community to community, region to region and country to country. The application of probability model, owing to these constraints, may be difficult and the results thus obtained may not be authentic, close to the ground reality.

Cultural or Social Determinism

Cultural or social determinism emphasizes the human element: “Our thoughts determine our acts, and our acts determine the previous nature of the world” (James 1932, p. 318). Since human interest, desires, prejudices and group values vary across space; there is a consequent variation in the cultural landscape and levels of socio-economic development. The modification of an environment largely depends on our perceptions, ideas and decision-making processes. This philosophy, advocated by American scholars, can be summed up as the principle according to which the “significance to man of the physical and biotic features of his habitat is a function of the attitudes; objectives and technical skills of man himself”. For example, a country that is richly endowed from the point of view of the hunters might appear poor to an agricultural community; the importance of coal is not evident to those who cannot make use of it. All these truths are self-evident. It is also true is that as technology develops; the importance of the environment does not decrease but changes and becomes more complex.

The philosophy of cultural determinism is fairly widespread among American geographers. Eduard Ullman, for example, wrote that “the environment is essentially neutral, its role being dependent on the stage of technology, type of culture and other characteristics of a changing society”. The assessment of a mountain pass, for example, will differ for those who possess horses, automobiles, aero planes; the assessment of soil fertility will not be identical from the point of view of a Japanese farmer and an Amazonian. Similar natural conditions may call forth different reactions on the part of man, and within similar sets of conditions, different cultures can take place. George Carter singles out three fundamental factors in human geography. He has laid greater stress on cultural forces and writes that “ideas remain as the primary cause of change...., it is these ideas that determine the human use of physical world”. He also emphasized the point that human will is the decisive factor.

After the Second World War, the school of social determinism became quite popular in Austria, Holland and Sweden. It, however, does not enable us to achieve a profound understanding of social relations or landscape. Social groups can be distinguished with reference to ethnic, religious, professional and certain other features, while social changes are only noted but rarely linked with any fundamental economic causes or the class structure of society. The study of the influence exerted by these groups on landscape is reduced to the definition of purely external factors of the cultural landscape (type and deployment of houses, land use, field patterns, etc.) right down to the morphological and functional changes within the confines of a single street. Infinitely painstaking ‘micro-territorial’ research of this type is usually purely empirical in character and cannot provide the basis for scientific conclusions of any real significance. Social or cultural determinism thus does not adequately assess the environmental factors, i.e., the influence of natural environment upon ‘cultural geographical differences’. Social

determinism is thus also rigid like environmental determinism and therefore cannot be accepted in its crude form.

2.7 CONCLUSION

The understanding of human-environment relations has been the core subject matter of geography. Since the post-Darwinian era, geographers have differed greatly over the approaches and methodology required for examining and interpreting human-environment relationships which led to the development of various schools of human-environment interactions such as Determinism, Possibilism, Neo-Determinism and Probabilism. In 1990s, geographical studies started showing a renewed interest in human-environment research when the idea that humans have an influence on recent climate change was accepted. The environmental protection movements appeared in various countries in the 1960s and 1970s which gradually gained political support for increased research activities in these fields. The global climate change discourse received geopolitical importance and turned the attention to the fragile relation of humans and their environment. In the 21st century, investigation of human-environment relationships have become more significant not only in geography but in other social sciences as well. These emerging issues have presented a real challenge for geography. The climate change discourse raises the question again that environmental changes can radically transform the life of societies. Many studies indicated correlation between climate change and cultural disasters. These phenomena emphasize the need for understanding these effects in order to reduce, stop or reverse the undesired results.

2.8 SUMMARY

The core concern of geography as a discipline is to understand the earth as home of human beings and to study all those elements which have sustained them. Geography as a discipline is comprised of multiple dualisms with varying schools of thought. Determinism implies that people do not have freedom of decision making and their actions and decisions are determined by natural environment. While seeking explanations for cultural geographic patterns strictly within the physical world, they attempted to show a direct causal connection between physical environmental factors and human activities. They held the belief that the elements of natural environment exert influence on all living creatures including human beings. In the determinists' view, people respond to the actions of nature. Many environmental determinists identified climate as the most powerful factor of the physical world. At the other extreme end from environmental determinism is cultural determinism or possibilism. In this view, people can do anything, anywhere that they choose. Human activities are not restrained by the environment. The role of people is to conquer the environment and transform wilderness into productive landscape. The technology level is the main consideration, not the environment itself. However, contemporary geographers avoid subscribing to either of these two extreme viewpoints. Physical environment is seen as passive; it does not dictate responses from people. People do indeed

consider physical factors in making their decisions about land use and resource development, but they make these decisions within the framework of a culture.

2.9 GLOSSARY

Culture: The phenomena that binds people together by shared beliefs and values and by a common image of themselves and the world.

Cultural landscape: The features constructed by humans that form part of the visible environment.

Cultural Region: An area that is distinguished from other areas on the basis of ethnicity, beliefs and other aspects of culture (i.e. a type of uniform region).

Diffusion: The spreading of a phenomenon (such as a group of people, tools, a disease, an institution or an idea) over an area.

Ecological perspective: An emphasis on the interrelationships between humans and their environments.

Habitat: The environment of an organism or group of organisms.

Perceived environment: The portion of the total environment that is continuously sensed and which serves as a basis for decision-making.

2.10 ANSWER TO CHECK YOUR PROGRESS

1. What are differences between environmental determinism and possibilism?
2. What do you mean by 'Neo-Determinism'?
3. What is Probabilism?
4. What do you understand by cultural determinism?

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2.13 TERMINAL QUESTIONS

1. What are the major schools of human-environment relations in Geography?
2. What are the underlying ideas behind determinism and possibilism? How these two schools of thought are different from each other?
3. Provide a brief account of the most influential geographers of deterministic and possibilist approaches.
4. Elaborate on the nature and scope of contemporary human-environment studies in Geography.

UNIT 3 - BASIC PRINCIPLES AND APPROACHES IN HUMAN GEOGRAPHY

3.1 OBJECTIVES

3.2 INTRODUCTION

3.3 PRINCIPLES OF HUMAN GEOGRAPHY

3.4 APPROACHES OF HUMAN GEOGRAPHY

3.5 CONCLUSION

3.6 SUMMARY

3.7 GLOSSARY

3.8 ANSWER TO CHECK YOUR PROGRESS

3.9 REFERENCES

3.10 SUGGESTED READINGS

3.11 TERMINAL QUESTIONS

3.1 OBJECTIVES

After reading this unit you will be able to understand:

- The basic principles and approaches of human geography.
- The basic knowledge of the field of human geography including definitions and nature of discipline.
- The historical account of the development of human geography.
- The various schools of thought in human geography, most influential human geographers and various sub-fields developed under discipline.

3.2 INTRODUCTION

There have been numerous conceptualizations and theorizations with regards to the nature, scope and study areas of geography. One of the most significant definitions of the discipline was given by Hartshorne in his monumental work, *Perspective on the Nature of Geography* (1959), in which he stated that “geography is concerned to provide accurate, orderly and rational description and interpretation of the variable character of the earth’s surface”. Geography is the study of the interrelationships between people and environment and how these vary spatially and temporally across places. Geography, though an integrative science, has a dichotomous character and the fundamental dichotomy in geography is physical geography v/s human geography. Physical geography concentrates on spatial and environmental processes that shape the natural world and tends to draw on the natural and physical sciences for its scientific underpinnings and methods of investigation. Human geography concentrates on the spatial organization and processes shaping the lives and activities of people and their interactions with natural environment. Human geography is more allied with the social sciences and humanities, sharing their philosophical approaches and methods.

Main characteristic of human geography that separates it from other related fields (such as economics, sociology, political science) is that it applies a set of core geographical concepts to the any phenomena under study. These concepts include space, place, scale, mobility and nature. These core concepts postulate the idea that human activities do not operate without the influence of space, place and environment, but are thoroughly grounded in and through them. In terms of methodology, human geography employs all available quantitative and qualitative techniques from across the social sciences and humanities. However, it is always kept in mind that any analytical technique used in human geography should provide a thorough geographical analysis.

Human Geography as the study of human-environment interactions

Human geography is the study of humans and their adjustment to the natural environment. There are numerous racial and ethnic groups in the world spread over varying geo-climatic conditions on the earth. Different societies and ethnic groups utilize the natural resources in terms of the level of their cultural and technological development. There are numerous examples of social and ethnic groups that live in close proximity to natural environment and yet are very different in

other aspects. The mode of life of Pygmies of Congo basin differs from that of the Bedouins of Saudi Arabia. The Aborigines of Australian desert and Eskimos of Tundra region practice hunting for their survival. The Nagas have very closed demarcation of their territory and their lifestyle is totally different than the Nepalese and Kukis living in the same environment. The Gujjars and Bakarwals, who migrate to the higher Himalayas and the Sivaliks in the summer and winter seasons, differ from the Kashmiris and Dogras who also live in the same habitat. These variations in the lifestyles are expressions of human adjustment to the natural environment. Apart from sustenance and material gains such as food, clothing, shelter, tools, technology, customs, traditions, socio-economic institutions, higher needs like religion, faith, language, literature, fine-arts and folklore etc. are also directly or indirectly influenced by the physical environment. In other words, humans have molded their habits and lifestyles according to the natural surroundings and endowments.

The indigenous people living in the areas of isolation and relative isolation have been judiciously utilizing their habitat without disturbing the ecological balance. However, their economies are often considered primitive and their technology dismissed as crude. There are numerous such social groups that display the symbiotic relationship between people and their physical surroundings. For instance, year-round hunting and fishing have allowed the Inuit to survive in the inhospitable Arctic temperatures. The protein-rich food obtained from animals and fish, their fur clothes, igloo and sledges show the skills of Inuit and their capacity to adjust to their environment. The nomadic pastoralism in Saudi Arabia and Sahara deserts provides livelihood to the Bedouins and Tuaregs respectively. The Kirghizs and Kazakhs of the Central Asia are able to maintain good standard of food and nutrition in their fragile pastoral ecosystems. Shifting cultivation has sustained thousands of distinct cultures in the highly vulnerable tropical rainforest ecosystems of Amazon, Central and Southern India.

Human beings interact with their physical environment with the help of technology. Better understanding of natural laws allowed humans to achieve great technological advancements. At the same time, these technological advancements equipped us to better control our physical environment. During the early stages of civilization, human beings were completely dependent on their natural environment and lived their lives according to the dictates of nature. The level of technology was low and the stage of human development was primitive. Human beings were directly dependent on natural resources for sustenance. As human beings begin to understand their environment and the forces of nature with the passage of time, they developed better and more efficient technology. This helped humans to achieve freedom from the shackles of natural forces and create new possibilities with the help of natural resources. The imprints of human activities are everywhere; health resorts on highlands, huge urban sprawls, fields, orchards and pastures in plains and rolling hills, ports on the coasts, oceanic routes on the oceanic surface and satellites in the space. Nature provides opportunities and human beings use them and slowly nature starts bearing the imprints of human endeavors. However, we should try to strike a

balance between utilization of nature and total surrender to nature. In other words, human beings can conquer nature by obeying it. They can proceed in their pursuits of development when and where nature allows the modifications. Possibilities can be created within the limits that do not damage the environment. Mindless exploitation of nature practiced by developed economies has already resulted in numerous ecological problems such as green house effect, ozone layer depletion, global warming, receding glaciers and degrading lands.

Human Geography: Historical development

Human interaction with nature has deep roots in history. Human attempts to adapt, adjust and modify the natural environment began very early in human history. Thus, it is safe to say that the beginning of human geography can be traced back to the early stages of human and environment interactions. The discipline of human geography has a long temporal continuum even though that the approaches to articulate them have changed over time. This dynamism in approaches and thrusts shows the vibrant nature of the discipline. The view that there are close relationships between humans and natural environment was emphasized by all the ancient scholars including Greek, Roman, Chinese and Arab scholars. Greek and Roman scholars attempted to explain the impacts of physical environment on cultural development. Similarly, Roman geographers studied the effects of geo-ecological features on level of progress achieved by various societies. Arab geographers tried to find connections between cultural aspects of different races and their physical environment. The idea that environment determines the course of human actions was revived during the renaissance period.

However, human geography got its modern credentials during the later part of 18th century and the beginning of 19th century when Alexander von Humboldt and Carl Ritter focused their work on the relationships between social groups and their natural environment. Human geography achieved unprecedented popularity after the publication of Darwin's *Origin of Species* in 1859. The German geographer Friedrich Ratzel established Human Geography as an independent discipline and is considered the founder of modern human geography. His two-volume work *Anthropogeographie* (1882) is considered a landmark in the history of human geography, in which he defined human geography as the "synthetic study of the relationship between human societies and the earth's surface". His work presented for the first time a broad vision of the human settlements and their economic activities and a deep analysis of their complex relationship with physical environment. In the similar fashion, Ellen Churchill Semple defined human geography as the "study of changing relationship between human societies and the earth's surface". Subsequently, human geography attained great popularity in France. Both, the German and American schools of thought, thriving under Ratzel and Semple respectively, popularized 'environmental determinism' through their works. However, the solid naturalistic formulations of Ratzel that helped conceptualize the determinist school of thought were very strongly criticized by the French school of Geography. The French geographer Vidal de la Blache wrote a classic titled *Principles de Geographie Humane* and stated that "human geography offers a new

conception of the interrelationship between earth and man... a more synthetic knowledge of the physical laws governing our earth and of the relations between the living beings that inhabit it". The more humanistic geographers educated around Paul Vidal de la Blache (1845-1918) put their emphasis on the 'freedom' of the individuals and societies to keep or to fight the natural conditions. In this way the French school developed the possibilistic school of thought. It was also the time when many fascinating natural science theories and laws were formulated such as the genetics of Mendel, the classification of Linné, the evolutionism of Darwin and the Ecology of Haekel, which all influenced the development of human geography. German school of geography was more naturalistic even in the role of laboratory analysis into the geographic research, while the French school of geography was more oriented to the fieldwork and to the application of direct observation techniques. German school had more general and analytical geographers who employed techniques like thematic cartography and aerial photogrammetry whereas, the French school geographers were more descriptive and synthetically developed their Regional approach.

The British school of human geography, created under the leadership of Halford J. Mackinder (1861-1947) and Andrew J. Herbertson (1865-1915), provided an intermediate position between the other two prevailing schools of thought. British Geography was closer to the German school in some methodological aspects, but also integrated aspects of social development as per the conceptualizations of French sociologist Le Play. The British school created a very influential Political and a Historical Geography. Griffith Taylor formulated his 'Stop and Go determinism' stating that human beings are capable of accelerating, slowing or halt the progress made by human societies. However, he emphasizes that human beings should not depart from the direction as indicated by the natural environment. In the 1930's, the discipline of human geography was divided into cultural geography and economic geography and soon into several other branches like political geography, social geography, agricultural geography, transport geography, geography of gender and so on. Since the quantitative revolution in the 1950s and 60s, the philosophy underpinning human geography research has diversified enormously. The 1970s saw the introduction of behavioral geography, radical geography and humanistic geography. These were followed in the 1980s by a turn to political economy, development of feminist geography and the introduction of critical social theory underpinning the cultural turn. Together these approaches formed the basis for the growth of critical geography and the introduction of postmodern and post-structural thinking into the discipline in the 1990s. These various developments did not fully replace the theoretical approaches developed in earlier periods, but rather led to further diversification of geographic thought. For example, quantitative geography continues to be a vibrant area of geographical scholarship, especially through the progress made in the fields of remote sensing and GIS.

3.3 PRINCIPLES OF HUMAN GEOGRAPHY

As already stated so many times, human geography studies the relationships between human beings and the natural environment. The human-environment relationships have been interpreted in several ways. There have been numerous approaches, principles and methodologies developed by geographers to examine and interpret human-nature interactions. Here is a brief description of the major schools of thought developed in human geography.

Environmental Determinism: Determinism is “the point of view that environment controls the course of human action” (Lewthwaite 1966). In other words, it is the belief that variations in human behavior around the world can be explained by differences in the natural environment. The philosophies, approaches and practices that flow from a concern with the environment are known as environmental determinism. The essence of the deterministic school of thought is that the history, culture, lifestyle and stage of development of a social group, society or nation are exclusively or largely governed by the physical factors of the environment such as terrain, climate, drainage, flora and fauna etc. The determinist generally consider humans to be ‘passive’ agents and various environmental factors control human attitudes, decision-making processes and lifestyles. As discussed earlier, the determinist school of thought has roots in the writings and teachings of ancient Greek, Roman, Arab and other scholars who conceptualized that natural conditions of any location greatly influence the course of civilization. Modern deterministic school of human geography got its modern credentials during the later part of 18th century and the beginning of 19th century when Alexander von Humboldt and Carl Ritter focused their work on the relationships between social groups and their natural environment. Environmental determinism was greatly influenced by the publication of Darwin’s *Origin of Species* in 1859. The German geographer Friedrich Ratzel, who is considered the founder of modern human geography, was a strong proponent of determinist school. In the similar fashion, Ellen Churchill Semple defined human geography as the “study of changing relationship between human societies and the earth’s surface”. Subsequently, determinism attained great popularity among American Geographers. Both, the German and American schools of thought, thriving under Ratzel and Semple respectively, popularized ‘environmental determinism’ through their works. However, environmental determinism was criticized by many geographers on account of presenting over-simplified generalizations of social and cultural development of any region. Determinist failed to take into account the cultural factors that affect human behavior which could explain the existence of markedly different cultures in similar geographic regions across the world. Determinism school was criticized as it failed to provide empirical evidence for its generalizations. It was increasingly proven that people make their own culture, history and civilization and the human course of action cannot be described through the simplified explanations of environmental determinism.

Possibilism: Possibilism is the school of thought that has an opposite philosophy than environmental determinism. Possibilism considers human beings to be ‘active’ agents in

environment. This is a belief that natural environment provides opportunities and human beings can utilize them depending on the level of knowledge and technology of a socio-cultural group. The term 'possibilism' was given by Le Febvre, who wrote that "the true and only geographical problem is that of utilization of possibilities. There are no necessities, but everywhere possibilities." Febvre also explained that "the natural data are much more the material than the cause of human development. The essential cause is less nature, with its resources and its obstacles, than man himself and his own nature". The possibilists saw a series of possibilities in natural environment that can be used by human development. They argued that the actual ways in which development takes place were dependent of the culture of the people concerned rather than just the immediate physical surroundings. Only exceptions are the areas of extreme physical conditions such as deserts, tundra, equatorial and high altitudes as they severely limit the possibilities available for human development. Even in such cases, the course of human development cannot be simply explained through physical environment as evidenced by existence of vastly different cultures in similar geographic and ecological regions. The French geographer Vidal de la Blache wrote a classic titled *Principles de Geographie Humane* and stated that "human geography offers a new conception of the interrelationship between earth and man... a more synthetic knowledge of the physical laws governing our earth and of the relations between the living beings that inhabit it". These geographers educated around Paul Vidal de la Blache (1845-1918) put their emphasis on the 'freedom' of the individuals and societies to keep or to fight the natural conditions. In this way the French school developed the possibilistic school of thought. However, even though human beings have numerous possibilities in a given natural setting, they still cannot go against the directions laid by the physical environment. The Possibilist School was criticized for completely ignoring the influence of physical environment.

Neo-Determinism: The concept of neo-determinism was put forward by Griffith Taylor in the 1920s. Studying the agricultural settlement in Australia, he argued that agricultural development was greatly influenced by factors of the physical environment such as distribution of rainfall etc. He postulated the idea that the economic development of a country is largely determined by nature. Human beings are able to accelerate, slow or stop the progress of a country's development. Similar to a traffic controller in a large city, human beings can alter the rate of progress but not the direction of progress of a country's development. His geographical philosophy is thus expressed precisely with the phrase 'Stop and Go Determinism'.

He described that the well-endowed parts of the world offer a number of different possibilities for making a living, but in the other nine-tenths of the Earth's land area, nature clearly has the upper hand. In most parts of the world, the land is either too dry, or too cold, or too wet or too rugged. Any settlers who fail to heed this nature-given limitation must face disaster. Elaborating his philosophy of 'stop-and-go determinism' Taylor observes- "Protagonists of the possibilist theory instance the carrying of fertilizer to the Canadian prairies, or the remarkable development of somewhat sterile northern Denmark as examples of human control which have determined the

utilization of the regions concerned. I do not for a moment deny that man plays a very important part, but he does not take fertilizer to the 'barren grounds'; nor would the Danes have developed their less attractive regions, if they had been free to choose among the good lands of the world". According to Taylor, societies of the above mentioned regions have merely pushed ahead in nature's 'plan' for their terrain. Even if we are able to replicate these advancements in other parts of the world, it would only prove that we have taken one more step towards our adjustment to the limits laid down by nature. Essentially, human beings are not free agents and we should not depart from the directions indicated by our natural environment.

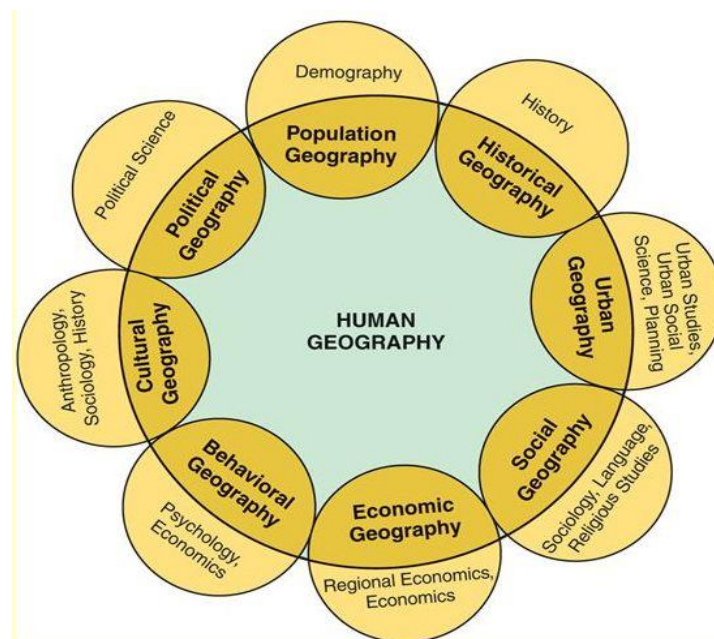
Cultural or Social Determinism: In Ancient Greece, there was a popular perspective that only those who spoke their language could understand their behaviors, values, and social systems. The Greeks felt that their culture was what defined them as a people, and it's something you had to learn by being a part of their society. Cultural determinism supports the idea that our emotional and behavioral patterns are formed and molded by the culture we are raised in. The cultural or social determinism emphasizes the human element: "our thoughts determine our acts and our acts determine the previous nature of the world" (James 1932). It is well established that human interests, desires, prejudices and values vary across space. Similarly, the modification of an environment largely depends on our perceptions, ideas and decision-making processes. This philosophy, as advocated by American scholars, can be summarized as the principle that the "significance to man of the physical and biotic features of his habitat is a function of the attitudes, objectives and technical skills of man himself". For instance, a country is richly endowed from the point of view of the hunters, but may appear poor to an agricultural community. The importance of various natural resources is only evident to people who can utilize them. As technology develops, the environment does not become irrelevant; rather it becomes more complex. The philosophy of cultural determinism was developed by many American geographers. Eduard Ullman wrote that "the environment is essentially neutral, its role being dependent on the stage of technology, type of culture and other characteristics of a changing society. However, social determinism has been criticized as it does not adequately assess the natural environment, i.e. the influence of environmental factors upon 'cultural geographic differences'.

3.4 APPROACHES TO HUMAN GEOGRAPHY

Each of the physical, biological and social sciences has its own philosophy, methodology and subject matter. Economics deals with the production, movement and consumption of goods and services; demography studies the compositions of human population; geology studies the composition and structure of solid earth. Human geography attempts to explain the relationship between elements of human life and the spaces they occupy. Study of all aspects and elements of human life inevitably makes human geography an inter-disciplinary subject. It studies myriad elements of human societies such as the study of human races, the growth, distribution and

density of population of various parts of the world, demographic attributes and migration patterns, socio-cultural differences among various groups, their economic activities and so on. It covers the relationships between man and the natural environment and the spatial distribution of human activities. Human geography also takes into account the mosaic of culture, language, religion, customs and traditions; types and patterns of rural settlements; size, growth and functions of urban centers and the classification of various types of regions. Spatial distribution of livelihood patterns, economic activities, industries, trade, transport and communications which are dependent on physical environment also make up the subject matter of human geography. Human geography develops close inter-connections with other social sciences to develop a better understanding of the human elements on earth. As our knowledge base expanded, more and more sub-fields have emerged in every field of study. Similarly, human geography has developed various sub-fields of study (Figure 3.1). These sub-disciplines reflect the expanding realm of human geography. The boundaries between sub-fields often overlap and intersect. Human geography provides integration for all the social sciences as it provides sciences the necessary spatial, temporal and systems viewpoint that they otherwise lack. At the same time, human geography draws on other social sciences in the analyses identified with its sub-fields, such as behavioral, political, economic or social geography.

Figure 3.1: Sub-divisions of Human Geography related to their Allied disciplines



Source: After Fenman (1919), taken from Husain (2002), p. 35.

Table 3.1: Different approaches of Human Geography

Period	Approaches	Broad Features
Early Colonial period	Exploration and description	Imperial and trade interests prompted the discovery and exploration of new areas. An encyclopaedic description of the area formed an important aspect of the geographer's account.
Early 1900s to 1920s	Regional analysis	Elaborate description of all aspects of a region was undertaken. The idea was that all the regions were part of a whole, i.e. (the earth); so, understanding the parts in totality would lead to an understanding of the whole.
1930s through the inter-War period	Areal differentiation	The focus was on identifying the uniqueness of any region and understanding how and why it was different from others.
Late 1950s to the 1960s	Spatial organization	Marked by the use of computers and sophisticated statistical tools. Laws of physics were often applied to map and analyze human phenomena. This phase was called the quantitative revolution. The main objective was to identify mappable patterns for different human activities
1970s	Emergence of humanistic, radical and behavioral schools	Discontentment with the quantitative revolution and its dehumanized manner of doing geography led to the emergence of three new schools of thought of human geography in the 1970s. Human geography was made more relevant to the socio-political reality by the emergence of these schools of thought.
1990s	Post-modernism in geography	The grand generalizations and the applicability of universal theories to explain the human conditions were questioned. The importance of understanding each local context in its own right was emphasized.

Source: Human Geography: Nature and Scope, NCERT

Regional Approach: Regional approach in geography studies the specific unique characteristics of places in terms of their culture, economy, topography, climate, politics and environmental factors. A region itself is defined as, “a part of the earth's surface with one or many similar characteristics that make it unique from other areas”. Although scholars had been studying specific regions since ancient times, modern regional approach in geography has its roots in the French school of human geography under the leadership of geographer Paul Vidal de la Blache. In the late 19th century, Blache developed his ideas of the *milieu*, *pays*, and *possibilisme* (or

possibilism). The *milieu* was the natural environment and *pays* was the country or local region. In the 1920s and 1930s, geography became a regional science concerned with “why certain places are similar and/or different and what enables people to separate one region from another”. This practice became known as *areal differentiation*. Regional approach in geography can be defined as “*the study of the spatial distribution of physical and human phenomena as they relate to other spatially proximate and causally linked phenomena in regions or other spatial units*”. Regional approach, along with spatial analysis and landscape approaches, is one of the three major approaches in human geography. Its roots can be traced back to Hecateus of Miletus and Strabo. According to Strabo, a geographer is “the person who describes the parts of the earth”. However, this description of the parts of earth includes developing an understanding of various features of the earth. The “classic epoch of regional geography” was in the late 19th and early 20th century when the concept of region was the centre-point of much of the conceptual debate in geography (Claval 1993, p. 15). Geographers like Paul Vidal de la Blache and Alfred Hettner were leading advocates of regional perspectives. Richard Hartshorne, drawing from the ideas of Hettner, advocated for areal differentiation as the core concept of geography. Areal differentiation can be seen as the idea that “geography is about showing how unique regions reveal the co-variation of phenomena that can only be understood through identifying regions”. However, it should be pointed out that recognizing regions requires understanding of similarities as well as differences over space. Therefore, “areal differentiation is about establishing degrees of sameness as well as difference between regions” (Agnew 1989).

Spatial Analysis Approach: Unwin (1981) presents “spatial analysis as the study of the arrangements of points, lines, areas and surfaces on a map”. The advocates of spatial science consider human geography as that “component of social sciences which focuses on the role of spaces as a fundamental variable, influencing both society’s organization and operation and the behavior of its individual members”. Spatial analysis got popularity during the period of quantitative revolution and it is closely associated with the philosophy of positivism. The goal of spatial analysis was “building accurate generalizations with predictive power by precise quantitative description of spatial distribution, spatial structure and organization and spatial relationships”. The generalizations arrived at with the application of spatial analysis could be based on just three fundamental spatial concepts: 1) direction, 2) distance and 3) connection. In the spatial analysis some of the geographers merely apply techniques derived from the general linear model to geographical example, others have argued that spatial data analysis poses particular statistical problems. Spatial analysis for man and environment relationship has been criticized for several counts. One of the main criticisms is that spatial analysis focused on spatial determinism and the logical impossibility of defining spatial variables independent of the context within which they were supposed to operate. The other weakness of spatial analysis is that it does not take into consideration the cultural values and normative questions while attempting to establish the man and environment relationship.

Behavioral Approach: Behavioral approach in human geography arrived due to the dissatisfaction with the models and theories developed by the positivists that were based on the ‘economic rationality’ of man. Geographers increasingly realized that the models based on quantitative techniques provided poor descriptions of geographic reality and were inadequate in explaining man and environment relationships. Theories based on statistical and mathematical techniques, such as central place theory could not adequately explain the spatial organization of society. Similarly, the economic rationality of human decision-making was criticized as it failed to explain human behavior in many instances, for example, people living in floodplains who do not want to leave despite the risk of floods. Behavioral Geography signifies a psychological turn in human geography which emphasized the role of cognitive (subjective) decision-making variables on human spatial behavior. Main objectives of behavioral approach were to develop models which can provide alternative perspectives from spatial location theories developed through positivist approach and to understand the spatial dimension of cognitive or subjective decision-making processes. The behavioral approach in geography was introduced in the 1960s due to the frustration with normative and mechanistic models developed through quantitative techniques. The behavioral postulates such as ‘rational economic man’ and isotropic earth’s surface were the basis of these normative models. However, such behavioral postulates were quite unreal as they assume that human being is an omniscient and fully rational actor who is free to operate in a competitive manner on isotropic (homogenous) space. These normative models ignore the complexities of real world situations and instead concentrate on idealized behavior which makes them grossly unrealistic. Behavioral approach suggests that people act rationally, but within the constraints of their culture and socialization. In other words, “the essence of behavioral approach in geography lies in the fact that people’s behavior is mediated by their understanding of the environment in which they live or by the environment itself with which they are confronted”. Behavioral approach has taken the view that, “a deeper understanding of man-environment interaction can be achieved by looking at the various psychological processes through which man comes to know his environment, and by examining the way in which these processes influence the nature of resultant behavior”.

Welfare Approach: Although human geography has emerged from earth sciences and has continuing links with physical geography, yet the basic objective of this branch of knowledge is to examine the various problems of different social groups in relation to their environment. At present, especially after the 1960s, the geographers have adopted a welfare approach. The welfare approach in fact emerged as the reaction to positivism, quantitative revolution, spatial science, and model building which was thought to be insufficiently concerned with contemporary problems of human societies. The 1970s saw a major redirection of human geography towards ‘welfare’ issues such as poverty, hunger, deprivation, malnutrition, crime, distribution of assets, income and access to social services such as education and health-care. This corresponded to a major shift in social concern, from narrow economic criteria of development or progress to broader aspects of the quality of life.

Humanistic Approach: The main feature of humanistic approach is that it gives central and active role to human awareness and human agency, human consciousness and creativity. It is an expansive view of the human as a person and what he can do. The humanism in geography is usually traced back to the French school of human geography. The supporters of humanistic geography, however, disagree with this genealogy as they argued that Vidal de la Blache's writings bear many of the hallmarks of functionalism. In fact, Blache himself regarded human geography as a natural science. There are undoubtedly affinities between *la géographie humaine* and humanistic geography. The revival of humanism in geography was started in 1970s. Humanism in geography emerged as a reaction to quantitative revolution. It was also a rejection of the geometric determinism. Humanistic geography gave man a central position with the human being at its very centre, "people geography". During the past few decades, humanistic geography has advanced from its early attack on positivism to a criticism of structuralism. It has developed a more precise methodology of empirical investigation.

3.5 CONCLUSION

Human geography is a major sub-discipline within the wider subject field of geography. Geography is considered the study of the Earth's environments and peoples and the interactions between them. The word 'geography' comes from ancient Greek which literally translates as "to write or describe the world". Till the late 19th century, the objective of geography was to describe the natural and human world region by region. However, the understanding of geography has gradually expanded by more sub-disciplinary pursuits. The basic distinction of geographical subject matter consists of two halves: physical and human geography. Physical geography generally means the science of the Earth's surface, while human geography usually refers to the study of its people, and geographical interpretations of economies, cultural identities, political territories and societies. Human geographers analyze population trends, theorize social and cultural change, interpret geopolitical conflict and seek to explain the geography of economic activities around the world. Human geographers study the myriad ways humans inhabited the physical environments, used resources, adapted to different climates and developed distinct regional cultures.

3.6 SUMMARY

The history of geography is basically the history of interactions between nature and society. Human perception of the environment has always played a major part in human history and in the daily struggle between individuals and their environments. Geographers study the total environment, i.e. they seek to understand the processes that form physical and cultural environments and the interplay among these environments. Ancient Greek, Roman, Arab and other scholars attempted to describe the human-environment relationships and the influence of physical environment on human societies and cultures. The German geographer Friedrich Ratzel established modern Human Geography as an independent discipline. His work

Anthropogeographie (1982) presented for the first time a broad vision of the human settlements and their economic activities in terms of the physical environment. After the Second World War, the distinction between physical and human geography was firmly established, especially among the French Regional School. Human geography today has also expanded into many separate branches, focusing on population, economic activities, urban or rural characteristics, and cultural or political organization of a territory. Each one of these branches have employed different approaches- from the neo-positivist, to the Marxist or behavioral. The combination of various branches and points of view together with innumerable methods and techniques of analysis has amplified the study area of human geography. Recent multi-disciplinary approaches to cultural, economic, social and political spheres of the human organization at different scales with new themes such as gender, globalization, environment and multicultural issues have further pushed the limits of human geographical studies.

3.7 GLOSSARY

Culture: The phenomena that binds people together by shared beliefs and values and by a common image of themselves and the world.

Cultural landscape: The features constructed by humans that form part of the visible environment.

Habitat: The environment of an organism or group of organisms.

Perceived environment: The portion of the total environment that is continuously sensed and which serves as a basis for decision-making.

Region: An area that is differentiated from other areas according to specific criteria.

Spatial perspective: An emphasis of the locations, patterns or arrangements of phenomena.

3.8 ANSWER TO CHECK YOUR PROGRESS

1. What are differences between environmental determinism and possibilism?
2. What do you mean by 'Neo-Determinism'?
3. What are the recent approaches to the study of human geography?

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3.11 TERMINAL QUESTIONS

1. Describe approaches of Human Geography.
2. Provide a brief account of different schools of Human Geography.
3. Give a brief account of some sub-fields of Human Geography.
4. How is Human Geography related to other social sciences?
5. Write a note on the contemporary scope of Human Geography.

BLOCK 2 - HUMAN HABITATION

UNIT 4 - POPULATION: GROWTH, DISTRIBUTION AND DENSITY

4.1 OBJECTIVES

4.2 INTRODUCTION

4.3 GROWTH OF POPULATION AND WORLD PATTERN

4.4 DISTRIBUTION OF POPULATION AND WORLD PATTERN

4.5 DENSITY OF POPULATION AND WORLD PATTERN

4.6 CONCLUSION

4.7 SUMMARY

4.8 GLOSSARY

4.9 ANSWER TO CHECK YOUR PROGRESS

4.10 REFERENCES

4.11 SUGGESTED READINGS

4.12 TERMINAL QUESTIONS

4.1 OBJECTIVES

After reading this unit you should be able to:

- Understand the regional differences covering of people in the world.
 - Know increase of population in the world as well as regional difference of increase of population.
 - Understand density of population in different regions of the world.
-

4.2 INTRODUCTION

The population of the world is distributed unevenly within the continents and countries of the world. More than half of the world's population lives in Asia, this accounts for only one-fifth of world's land area, while North, Central and South America together occupy more than a quarter of the land surface, have only one-seventh of the population. The African continent also accounts for a quarter of the land surface but has just over one-tenth of the world population. Europe, whose area is only one twenty-fifth of the total, has about one-ninth of the world's people. In Europe far more people live in northern and western European countries than in southern and Eastern Europe (Leong and Morgan, 1992). The study of population distribution is very vital for population geographers, because its better understanding holds the key to the analysis of entire demographic character of an area. In prehistoric period, the world population was very scanty and uneven. During the Neolithic Age, the world population had been started increased when the man learnt to cultivate and produce crops. The agricultural revolution around 800 B.C. resulted to increase of food supply. The increase in supply of food led to better nutrition and decline of death rate. This started to increase population at faster pace. The rapid growth in population was begun from mid of the eighteenth century. In the beginning of Christian era, the world population was about 300 million of which 20-20 percent was shared by India and China each, 10 per cent by Egypt, 10 per cent by Mediterranean Europe and the remaining 40 per cent population was spread in other parts of the world. During medieval period, agriculture in Europe started taking the shape of business and there was more emphasis on trade and commerce. The main characteristics of population of the world in medieval period, prior to the Industrial Revolution were high death rate, high infant mortality, short life expectancy, periodic famines, vulnerability to epidemics, high birth rate and much fluctuation of death rate and responding birth rate. Fertility and mortality, the two demographic variables are responsible for the growth of global population. The major turning point in the growth of population came with the Industrial Revolution. After 1750, the modern period of rapid growth of population was started. The Industrial Revolution along with the Medical Revolution pushed the world population to one billion by 1850. The distribution of population was largely depended on the quality of the land itself, which is very uneven. Where the land is well suited to agriculture or there are natural resources for industrial development the population will naturally be larger than in areas where climatic conditions are hostile or where resources are few. Since earlier civilization, Valleys have been the major attraction for human settlement but slope and hill top

are avoided. The pattern of population distribution and density in an area is the product of the inter-play between the physical milieu and the society through the matrix of time (Chandna, R.C., 2014). The regional contrasts in the distribution of population and density of population are mainly affected by three major factors- physical, socio-economic and demographic factors.

Currently, the world population reached 7.3 billion as of mid 2015. China (1.4 billion) and India (1.3 billion) remain the two largest countries of the world both with more than 1 billion people representing 19 and 18 per cent of the world's population respectively. In 2015, 50.4 per cent of the world's population is male and 49.6 per cent is female. The median age of the global population, that is, the age at which half the population is older and half is younger, is 29.6 years. About one-quarter (26 per cent) of the world's people is under 15 years of age, 62 per cent are aged 15-59 years and 12 per cent are 60 or over (World Population Prospects, 2015).

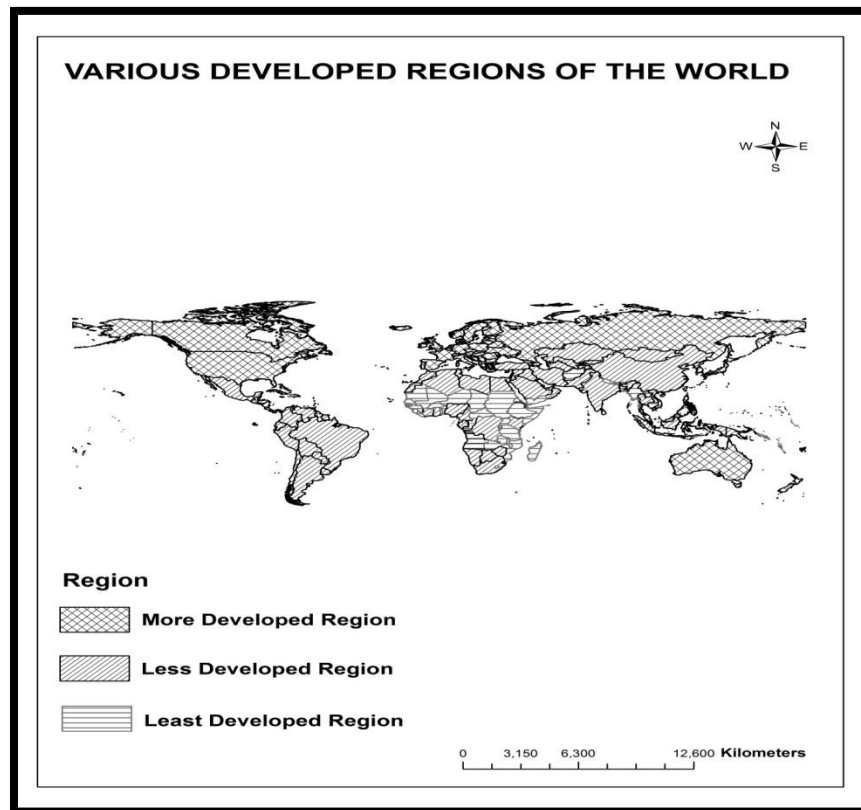
4.3 GROWTH OF POPULATION AND WORLD PATTERN

The history of global population growth from the early beginnings of Homo sapiens up to the recent times can only be based on speculation because evidence in support of it is quite scanty. It may be recalled that census operations first began in a few countries as recently as the beginning of the nineteenth century and that, up to the end of the Second World War. The United Nations, after carefully reviewing all the information available for the period, has prepared estimates for the populations of major regions since 1920. The estimates of Walter F. Wilcox and A.M. Carr-Saunders for the period 1650 to 1900 are even today considered to be the most authoritative estimates of world population, region wise and for different countries (Bhende, A. and A., Kanitkar, T, pp. 67). Over the past two centuries, huge growth in the global population was largely due to the advances in modern medicines and improvements in living standards. This has significantly reduced infant, child and maternal mortality, contributing to an increase in life expectancy (United Nations Population Fund). The world's population growth was accelerated after the start of Industrial Revolution in the 18th century that raised standard of living of mankind and widespread famines and epidemics diminished in some regions. Currently, the world population continues to grow though more slowly than in the recent past. The growth of population remains especially high in the group of 48 countries of least developed countries of which 27 are in Africa. The concentration of population growth in the poorest countries will make it harder for those governments to eradicate poverty and inequality, combat hunger and malnutrition, expand education enrolment and health systems, improve the provision of basic services and implement other elements of a sustainable development agenda to ensure that no-one is left behind.

According to United Nations, the world's countries were divided into three categories according to social and economic advancement such as More Developed Regions, Less Developed Regions and Least Developed Regions. More Developed Regions comprise all of Europe, North America, Japan, Australia and New Zealand. The Less Developed Regions comprise all regions of Africa, Asia (except Japan), Latin America and the Caribbean plus Melanesia, Micronesia and Polynesia. The group of least developed countries consists of 48

countries in 2015 are especially low incomes, high economic vulnerability and poor human development indicators. Out of them, 34 countries are in Sub-Saharan Africa, 9 in Asia, 4 in Oceania and one in the Caribbean. Sub-Saharan Africa includes all countries of Africa except the Northern African countries of Algeria, Egypt, Libya, Morocco, Sudan, Tunisia and Western Sahara.

Map 4.1



Source: United Nations Population Division, World Population Prospects, the 2015 Revision

The Growth of World Population from 1920 to 2015

The population of the world had been increasing from 1920 to 2015 (see in table 4.1). The global population was 1811 million in 1920 and 7336 million in 2015 after 95 years. During the period 1920 to 2015, 5525 million people were increased in the world. The population of the world started increasing rapidly in the twentieth century and the rate of population growth increased from the year 1920 to 1970. The decadal growth rate of world's population during 1920 - 1930 was 11.3 per cent that rose to 22.5 per cent in 1970. After that, the decadal growth rate of world's population was decreasing to 20.6 per cent in 1980, 19.6 per cent in 1990, 15.4 per cent in 2000 and 13.1 per cent in 2010. During the period 2010-2015, the rate of growth of world population was 5.9 per cent. The world population was increased very gradually from 1920 to 1950. During 1950-1960, population was increased fairly rapid, the rate of population growth was 19.5 per cent from 12.3 per cent in 1950.

Table 4.1: Growth of World's Population (1920-2015)

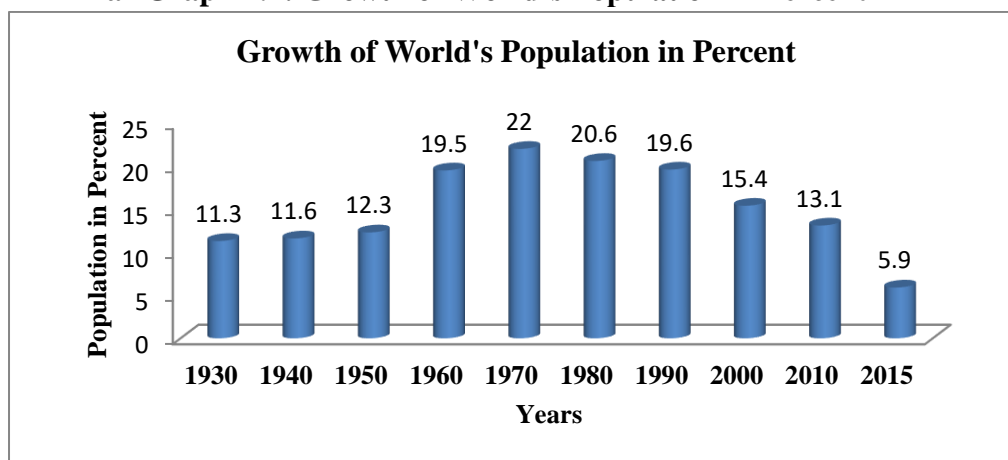
Year	World population in Million	Increase	Increase in per cent
1920	1811		
1930	2015	204	11.3
1940	2249	234	11.6
1950	2525	276	12.3
1960	3018	493	19.5
1970	3682	664	22.0
1980	4440	758	20.6
1990	5310	870	19.6
2000	6127	817	15.4
2010	6930	803	13.1
2015	7336	406	5.9

Source: 1. 1920-1940, United Nations Demographic Year Book, 1962, pp. 124

2. 1950 to 2010, United Nations, World Populations Prospects, the 2015 Revision.

3. World Population Data Sheet 2015, Population Reference Bureau, United Nations, New York.

The highest decadal growth rate of world population was recorded of 22.0 per cent in 1970. The growth of World's population was accelerating after World War II and when the population of less developed countries began to increase dramatically. It is clear that, during the earlier stages of the demographic transition, the growth of population in the world was mainly regulated by the rates of mortality.

Bar Graph 4.1: Growth of World's Population in Percent

Source: 1. 1920-1940, United Nations Demographic Year Book, 1962,

2. 1950 to 2010, United Nations, World Populations Prospects, the 2015 Revision.

3. World Population Data Sheet 2015, Population Reference Bureau, United Nations, New York.

Growth of Population in Developed and Developing Regions 1920-2015

Table 4.2 shows that growth of population in Developed and Developing countries. In developed regions, population was 613 million in 1920 to 1254 million in 2015. In the duration of 95 years, 641 million people were rose in the developed regions. The rate of population growth in the developed regions was decreasing from 10.2 per cent (1970) to 3.7 per cent (2010). During the period 2010- 2015, the rate of growth of population was 1.7 per cent. The highest decadal rate of population growth in the developed regions was recorded 12.5 per cent during the year 1950 – 1960. Developed countries as a whole will experience little or no population growth in 21th century and much of that growth will be from immigration from less developed countries (World Population Data Sheet, 2012). Population in the developing regions also increasing from 1198 million in 1920 to 6082 million in 2015, 4,884 million people increased during the expand of 95 years. The decadal rate of population growth in the developing regions increased from 11.7 per cent (1920-1930) to 27.2 per cent (1960-1970). After that rate of population growth was decreasing to 25.5 per cent in 1980, 24.0 per cent in 1990, 18.6 per cent in 2000 and 15.4 per cent in 2010 while growth of population during 2010- 2015 was 6.8 per cent. In the developing regions, highest decadal rate of population growth was recorded 27.2 per cent in the year 1970. The poorest countries in the world will see the growth of population.

Table 4.2: Growth of Population in Developed and Developing Regions in million (1920-2015)

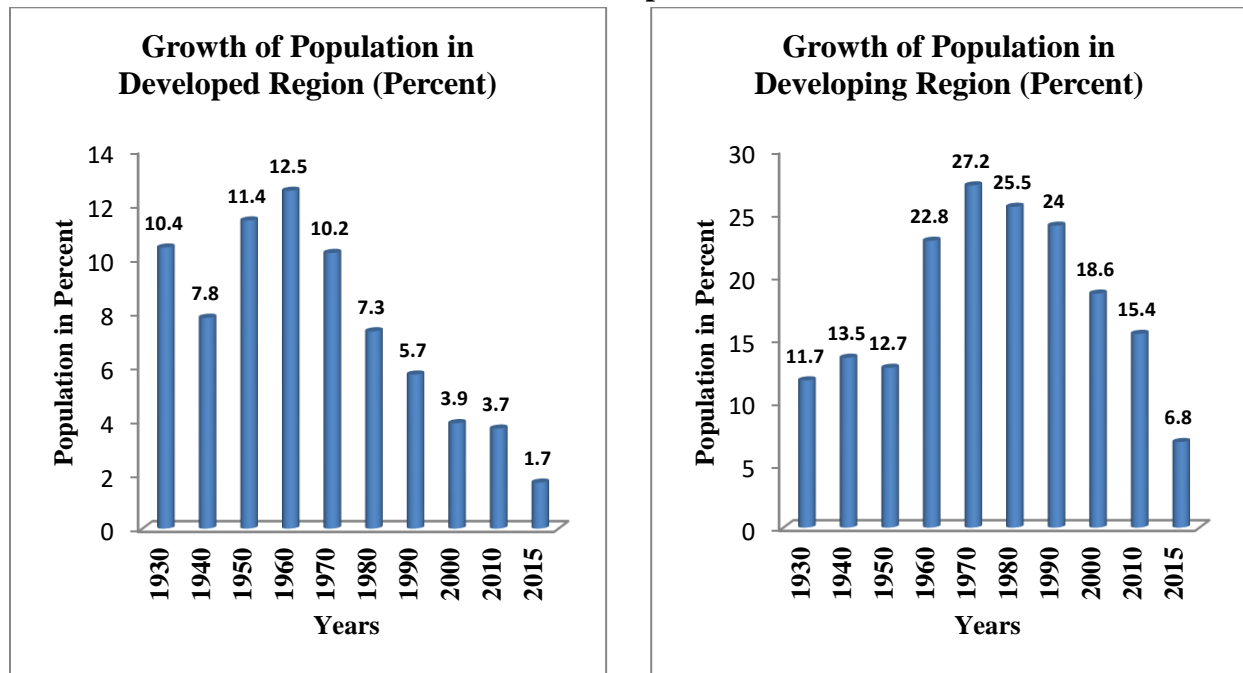
Year	Developed Region	Increase	Increase in per cent	Developing Region	Increase	Increase in per cent
1920	613			1198		
1930	677	64	10.4	1338	140	11.7
1940	730	53	7.8	1519	181	13.5
1950	813	83	11.4	1712	193	12.7
1960	915	102	12.5	2103	391	22.8
1970	1008	93	10.2	2675	572	27.2
1980	1082	74	7.3	3358	683	25.5
1990	1144	62	5.7	4165	807	24.0
2000	1189	45	3.9	4938	773	18.6
2010	1233	44	3.7	5696	758	15.4
2015	1254	21	1.7	6082	386	6.8

Source: 1. 1920-1940, Bhende, A.A., Kanitkar, T, Principles of Population Studies, 2014, pp. 73.

2. 1950 to 2010, United Nations, World Populations Prospects, the 2015 Revision.

3. World Population Data Sheet 2015, Population Reference Bureau, United Nations, New York.

Bar Graph 4.2



Source: 1. 1920-1940, Bhende, A.A., Kanitkar, T, Principles of Population Studies, 2014
 2. 1950 to 2010, United Nations, World Populations Prospects, the 2015 Revision.
 3. World Population Data Sheet 2015, Population Reference Bureau, United Nations, New York.

According to United Nations, the concentration of population growth in the poorest countries will make it harder for those governments to eradicate poverty and inequality, fight of hunger and malnutrition, expand of education enrolment and health systems, improve the provision of basic services and implement other elements of a sustainable development agenda to ensure no-one is left behind.

Growth of World's Population in major regions from 1950-2015

The growth of population in major regions of the world has been presented in table no. 4.3. The continent of Asia was the most populous continent of the world. Its population was increasing from 1394 million in 1950 to 4397 million in 2015. In the duration of 95 years, about 3003 million people rose in the continent. The decadal rate of population growth was rise up to 1970, after that they began to decline. The decadal rate of population growth during 1950- 1960 was 21.0 per cent and 25.7 per cent during 1960- 1970. The decadal rate of population growth was decreasing to 23.9 per cent (1980), 21.9 per cent in 1990, 16 per cent in 2000 and 12.3 per cent in 2010. The maximum decadal growth rate was recorded during the period 1960-1970 (25.7 per cent). The rate of population growth during 2010- 2015 was 5.4 per cent. Over the period 1950-2010, the population of Asia was grown primarily due to the excess of births over deaths.

Africa is the second most populous continent after Asia in the world. The highest growth rate of population in the world during the period 1950 to 2015 was found in the continent of

Africa (32.2 per cent) during 1980-1990. Africa's population was increasing from 229 million in 1950 to 1171 million in 2015; about 942 million people were rose in the duration of 95 years. The decadal rate of population growth in the continent of Africa increased from 24.5 per cent during 1950- 1960 to 32.2 per cent in 1990, after that they began to decline, that is 28.8 per cent in 2000 and 28.3 per cent in 2010. The population growth during 2010- 2015 was 12.2 per cent. Since 1950 to 2010, the population of Africa was generally increased due to natural increase. The population of Western Africa, Eastern Africa and Middle Northern Africa has been growing at a rapid rate since 1950 and the highest birth rates and death rates in the world observed in the African continent (Bhende, A.A., Kanitkar, T, 2014, pp. 76).

Europe is the third most populous continent with 742 million people in 2015. Its population increases from 549 million in 1950 to 742 million in 2015, 193 million people rose in the duration of 95 years in the continent. The decadal rate of growth of population was decreasing from 10.4 per cent in 1960 to 1.2 per cent in 2010. The rate of population growth during 2010- 2015 was 1.0 per cent in the continent. During the second decade of the twentieth century, the growth rate of population had been declined in Europe due to the larger number of deaths during the First World War. After the Second World War and economy recovery there was "baby boom" in Europe, the birth rate and the population once again increasing at high rate of growth. This increase continued up to about 1956, after which a downward trend may be observed. The cycle of rising and falling rates of population increase was because of changing social and economic conditions.

After the end of World War II and economy recovery in North America, the rate of growth of population began to increase and continued up to 1960. The population of North America was increasing from 172 million in 1950 to 357 million in 2015, about 185 million people was increased during the expand of 95 years. The decadal rate of growth of population was decreasing from 18.6 per cent in 1960 to 10.6 per cent in 1990. During 1990- 2000, the rate of growth of population was increased with 11.7 per cent in the continent and once again growth rate was declined. During the period of 2010- 2015, rate of population growth in North America was 3.8 per cent. The generally increasing impact on population growth since 1950 in North America was mainly due to positive net migration for employment and other purposes.

Table4.3: Growth of Population according to Continents (1950 -2015)

Year	Asia	Increase in %	Europe	Increase in %	Africa	Increase in %	North America	Increase in %	Latin America	Increase in %	Oceania	Increase in %
1950	1394		549		229		172		169		13	
1960	1687	21.0	606	10.4	285	24.5	204	18.6	221	30.8	16	23.1
1970	2120	25.7	657	8.4	366	28.4	231	13.2	288	30.3	20	25.0
1980	2626	23.9	694	5.6	478	30.6	254	10.0	365	26.7	23	15.0
1990	3202	21.9	721	3.9	632	32.2	281	10.6	447	22.5	27	17.4
2000	3714	16.0	726	0.7	814	28.8	314	11.7	527	17.9	31	14.8
2010	4170	12.3	735	1.2	1044	28.3	344	9.6	600	13.9	36	16.1
2015	4397	5.4	742	1.0	1171	12.2	357	3.8	630	5.0	40	11.1

Source: 1. 1950 to 2010, United Nations, World Populations Prospects, the 2015 Revision.

2. World Population Data Sheet 2015, Population Reference Bureau, United Nations, New York.

In Latin America and the Caribbean, the population was increasing from 169 million to 630 million in 2015. In the duration of 95 years, about 461 million people were increased in the region. Over the period 1950-2010, the population of Latin America and the Caribbean was grown primarily due to natural increase that is excess of births over deaths. From the latter half of the nineteenth century, rates of population growth started increasing and continued up to 1960, after that they began to decline (Bhende, A.A., Kanitkar, T, 2014, pp. 76). During 1950- 1960, the decadal growth rate of population was 30.8 per cent. After that the growth of population decreasing to 30.3 per cent in 1970, 26.7 per cent in 1980, 22.5 per cent in 1990, 17.9 per cent in 2000 and 13.9 per cent in 2010 whereas growth rate during the period 2010-2015 was 5.0 percent.

In the duration of 95 years, about 27 million people were increased in the countries of Oceania Region. In 1950, the population of Oceania was 13 million and it increased to 40 million in 2015. The decadal rates of population growth were fluctuating in the Oceania. During 1950-1960, the rate of growth of population was 23.1 per cent, 25.0 per cent (1970), 15.0 per cent (1980), 17.4 per cent (1990), 14.8 per cent (2000) and 16.1 per cent in 2010. But the rate of population growth during 2010- 2015 was 11.1 per cent. According to World Population Prospects 2015, the increasing of population growth since 1950 was due to positive net migration. In the second half of the nineteenth century, the rates of total and natural increase were quite high in Australia and New Zealand but started declining towards the beginning of the twentieth century because of declining fertility. After the Second World War, however there was a recovery in the fertility rates resulting in an increased growth rate of the population (Bhende, A.A., Kanitkar, T, 2014, pp. 76).

Growth of population in major countries of the World (2010-2015)

Table 4.4 presents the rate of population growth in selected countries of the world during 2010- 2015. The very high growth of population above 30.0 per cent was found in U.A.E (77.8 per cent) and Angola (31.6 per cent). The high growth of population in U.A.E may be due to start of receiving foreign workers on a large scale in the recent time whereas Angola was due to natural increase. Only the country of Jordan had high rate of population growth that was between 20.1 to 30.0 per cent. The rate of population growth in Jordan was 24.6 per cent during 2010-2015. Eleven countries fall under the medium growth of population ranges between 10.1 to 20.0 per cent. The rate of growth of population in South Africa was 10.2 per cent, 10.5 per cent in India and Israel, 10.7 per cent in Afghanistan, and 10.8 per cent in Kenya and Egypt, 13.1 per cent in Yamen Republic, 14.8 per cent in Mexico and Nigeria, 15.4 per cent in Ethiopia and 20.0 per cent in Surinam. Low growth rate of population (0.0 to 10.0 per cent) were found in Fiji (0.0 per cent), Sri Lanka (1.0 per cent), Russia (1.7 per cent), France (2.1 per cent), China (2.5 per cent), Italy (3.3 per cent), U.S.A (3.7 per cent), Argentina (4.2 per cent), Sweden (4.3 per cent), New Zealand (4.5 per cent), U.K (4.7 per cent), Canada (5.0 per cent), Nicaragua (5.0 per cent), Brazil (5.8 per cent), Colombia (5.9 per cent), Venezuela (6.3 per cent), Australia (6.7 per cent), Paraguay (7.7 per cent), Trinidad and Tobago (7.7 per cent), Pakistan (7.7 per cent),

Indonesia (8.6 per cent). The countries of Ukraine, Spain, Germany and Japan were had very low rate of population growth in the world that is below 0.0 per cent. These countries were having negative growth of population during the period of 2010- 2015. The rate of population growth in Ukraine, was – 6.8 per cent, - 1.5 per cent in Spain, -0.6 per cent in Germany and -0.4 per cent in Japan.

Table4.4: Growth of Population in major Countries of the World (2010- 2015)

Country	Increase in Percent(2010-2015)	Country	Increase in Percent(2010-2015)
Asia		France	2.1
China	2.5	Italy	3.3
India	10.5	Ukraine	-6.8
Indonesia	8.6	Sweden	4.3
Pakistan	7.7	Spain	-1.5
Japan	-0.4	North America	
Afghanistan	10.7	U.S.A	3.7
Yemen Republic	13.1	Canada	5.0
Israel	10.5	Latin America and Caribbean	
Jordan	24.6	Brazil	5.8
Sri Lanka	1.0	Mexico	14.8
U.A.E	77.8	Colombia	5.9
Africa		Argentina	4.2
Nigeria	14.8	Venezuela	6.3
Egypt	10.8	Paraguay	7.7
Ethiopia	15.4	Nicaragua	5.0
South Africa	10.2	Trinidad and Tobago	7.7
Kenya	10.8	Suriname	20.0
Angola	31.6	Oceania	
Europe		Australia	6.7
Russia	1.7	New Zealand	4.5
Germany	-0.6	Fiji	0.0
U.K	4.7		

Source:1. World Population Data Sheet 2010, Population Reference Bureau, United Nations, New York.

2. World Population Data Sheet 2015, Population Reference Bureau, United Nations, New York.

4.4 DISTRIBUTION OF POPULATION AND WORLD PATTERN

The global population is distributed unequally within the continents and countries of the world. Some regions are highly populated and others are less populated. The population of the world had reached 7336 millions in 2015 from 1811 million (1920). The less developed regions confined 82.91 per cent of the world's total population in 2015 whereas only 17.09 per cent was confined to more developed regions (as given in table 4.5). The share of population by less developed regions in the world's total population is increasing due to the population explosion being experienced by the countries of these regions associated with their second stage of demographic transition. In 1920, developing regions shared of 66.15 per cent of the world's total

population; in 1950 the corresponding figure was 67.80 per cent, in 1990 accounted of 78.44 per cent, in 2010 shared of 82.19 per cent. The share of the population by more developed countries has been declining as most of them have reached the final stage of demographic transition and are experiencing either stagnation or slow growth in their population. In 1920, more developed regions shared of 33.85 per cent of the world's population. Their share reduced to 32.20 per cent in 1950 and 21.54 per cent in 1990 and by 2010, it had been further reduced to 17.79 per cent. In 2015, more developed regions have population of 17.09 per cent of the world's population.

Table4.5: World Population Distribution (1920- 2015)

Year	World population	Developed Regions	Share in total world's population	Developing Regions	Share in total world's population
1920	1811	613	33.85	1198	66.15
1930	2015	677	33.60	1338	66.40
1940	2249	730	32.46	1519	67.54
1950	2525	813	32.20	1712	67.80
1960	3018	915	30.32	2103	69.68
1970	3682	1008	27.38	2675	72.65
1980	4440	1082	24.37	3358	75.63
1990	5310	1144	21.54	4165	78.44
2000	6127	1189	19.41	4938	80.59
2010	6930	1233	17.79	5696	82.19
2015	7336	1254	17.09	6082	82.91

Source: 1. 1920-1940, United Nations Demographic Year Book, 1962, pp. 124

2. 1950 to 2010, United Nations, World Populations Prospects, the 2015 Revision.

3. World Population Data Sheet 2015, Population Reference Bureau, United Nations, New York.

World Population Distribution in 2015

The world population reached 7.3 billion in 2015. Eighty-three per cent of the world population lives in Less Developed Regions and Seventeen per cent lives in More Developed Regions. In Least Developed Regions, world population lives thirteen per cent (as given in table 4.6). Asia was recorded the most populated continent in the world. The continent of Asia alone contributed more than half the world's total population (4,397 million) followed by Africa with 1171 million population was the second largest populated continent of the world, Europe with 742 million, Latin America and Caribbean with 630 million, North America with 357 million and Oceania with 40 million. Sixty per cent of the global population lives in Asia, 16 per cent in Africa, 10 per cent in Europe, 9 per cent in Latin America and the Caribbean and 5 per cent in North America and the remaining 1 per cent in Oceania. Within the continent of Asia, the South Asian Region has maximum population (1834 million). The country of China has been recorded of highest population with 1371.9 million in the continent as well as also in the world. In Africa, Eastern Africa had largest population with 388 million in the continent and Nigeria recorded

most populous country in the continent (181.8 million). Eastern Europe had largest population in the continent of Europe with population 292 million. Russia was the most populated country in Europe with population of 144.3 million. The part of South America had largest population in Latin America and Caribbean Region and Brazil recorded highest populated country in the region. U.S.A (321.1 million) recorded most populated country in the North America and Australia (23.9 million) was recorded in the Oceania Region.

Table4.6: World: Population Distribution in 2015

Region	Population in Millions	Region	Population in Millions
World	7336	Africa	1171
More Developed Region	1254	Europe	742
Less Developed Region	6082	Latin America	630
Least Developed Region	938	North America	357
Asia	4397	Oceania	40

Source: World Population Data Sheet 2015, Population Reference Bureau, United Nations, New York.

In 2015, the percentage of young people under the age of 15 accounts for 26 per cent of the world's total population and age of 60 or above comprising of 12 per cent of the world's total population (given in table 4.7). Least Developed Region had highest percentage of young people under the age of 15 whereas More Developed Region consists of greatest percentage of age 60 or above. The continent of Africa recorded highest percentage of young people under the age of 15 that is 41 per cent followed by Latin America and Caribbean (26 per cent), Asia (24 per cent), Oceania (23 per cent), North America (19 per cent) and Europe (16 per cent). The part of Middle Africa with 45 per cent consist of largest percentage of young people under the age of 15 in Africa region , Central America with 29 percent in Latin America and Caribbean region, South-Central Asia and Southern Asia with 30 per cent in the continent of Asia, Solomon Island with 37 in Oceania, Northern Europe with 18 per cent in Europe. In the continent of Northern America, Canada and America have 16 per cent and 19 per cent of young people under the age of 15 respectively. Niger, Uganda, Chad, Angola, Mali, Somalia, Gambia, Zambia, Dem. Republic of the Congo and Burkina Faso were the top ten countries with youngest population in 2015(see in table 4.8). All of these top countries were from the African Continent.

As fertility declines and life expectancy rises, the proportion of the population age 60 or above rises. The continent of Europe had greatest percentage of age 60 or above with 24 per cent in the world in 2015 followed by Northern America (21 per cent), Oceania (16 per cent), Asia (12 per cent), Latin America and the Caribbean (11 per cent) while Africa comprises only 5 per cent of

Table 4.7 Percentage of Population under Age 15 and 60 or over in 2015

Area	Under age 15	60 or above
World	26	12
More Developed Region	16	24
Less Developed Region	28	10
Least Developed Region	40	5
Africa	41	5
Asia	24	12
Europe	16	24
Latin America and the Caribbean	26	11
North America	19	21
Oceania	23	16

Source: United Nations, World Populations Prospects, the 2015 Revision.

Table 4.8: Top Ten Countries with Youngest Population in 2015

Rank	Country	Youngest Population (Median age in years)
1	Niger	14.8
2	Uganda	15.9
3	Chad	16.0
4	Angola	16.1
5	Mali	16.2
6	Somalia	16.5
7	Gambia	16.8
8	Zambia	16.9
9	Dem. Republic of the Congo	16.9
10	Burkina Faso	17.0

Source: United Nations, World Populations Prospects, the 2015 Revision.

Oldest population, In Europe, the Southern and Western part of Europe have the highest percentage of age 60 or above with 26 per cent. In Northern America, Canada and U.S.A had 22 per cent and 21 per cent of age 60 or above respectively. Australia and New Zealand were consist of maximum percentage of age 60 or above (20 per cent) in Oceania region. In Latin America and the Caribbean region, highest percentage of oldest people was found in Caribbean (13 per cent) and the part of Northern Africa in African region. Japan, Germany, Martinique, Italy, Portugal, Greece, Bulgaria, Austria, China, Hong Kong SAR and Spain were the top ten countries with oldest population in 2015 (present in table 4.9). By 2050, all major areas of the world except Africa will have nearly a quarter or more of their populations age 60 or above. The number of older persons in the world is projected to be 1.4 billion by 2030 and 2.1 billion by 2050 and could rise to 3.2 billion in 2100. Population aging is projected to have a profound effect on the number of workers per retiree (World Population Prospects 2015 Revision).

Table 4.9: Top Ten Countries with Oldest Population, 2015

Rank	Country	Oldest Population(Median age in years)
1	Japan	46.5
2	Germany	46.2
3	Martinique	46.1
4	Italy	45.9
5	Portugal	44.0
6	Greece	43.6
7	Bulgaria	43.5
8	Austria	43.2
9	China, Hong Kong SAR	43.2
10	Spain	43.2

Source: United Nations, World Populations Prospects, the 2015 Revision.

Table 4.10 reveals the percentage of population in broad age groups by major areas in 2015. The number of young people under the age of 25 has grown rapidly in the recent years. In 2015, the 3.1 billion people under the age of 25 contributed of 42 per cent of the world's total population. Africa, Asia and Latin America and the Caribbean are home of the world's young people. The continent of Africa comprises the highest percentage of children ages under 15 with 41 per cent in the world followed by 26 per cent in Latin America and the Caribbean, 24 per cent in Asia, 23 per cent in Oceania, 19 per cent in North America and 16 per cent in Europe. Again, Africa recorded the highest number of young population ages 15-24 with 19 per cent. The continent of Africa encompasses largest number of young people in the world. According to United Nations, global fertility levels are projected to continue to decline, the youthful age structure of countries in Africa and Asia ensures that the number of young people will continue to grow and reach 3.4 billion by 2050. Providing young generations with health care, education and employment opportunities, including in the poorest countries and groups is a pivotal focus of the 2030 Sustainable Development Agenda. Latin America and the Caribbean recorded of second highest of young population ages 15-24 with 17 per cent followed by Asia with 16 per cent, Oceania with 15 per cent, North America with 14 per cent and Europe with 11 per cent. Although Europe continent was consist of the small number of young people in the world. The highest percentage of ages 25- 59 found in the continent of Europe with 49 per cent followed by Asia with 48 per cent, North America with 47 per cent, Latin America and the Caribbean with 46 per cent, Oceania with 45 per cent and Africa with 34 per cent. Europe continent had largest number of oldest people above 60 years that is 24 per cent followed by 21 per cent in North America, 16 per cent in Oceania, 12 per cent in Asia, 11 per cent in Latin America and the Caribbean. Africa consists of lowest percentage of oldest people only 5 per cent in the world.

Table 4.10: Percentage of Population in broad age groups by major area, 2015

Area	0-14	15-24	25-59	Above 60
Africa	41	19	34	5
Latin America and the Caribbean	26	17	46	11
Asia	24	16	48	12
Oceania	23	15	45	16
North America	19	14	47	21
Europe	16	11	49	24

Source: United Nations, World Populations Prospects, the 2015 Revision.

Distribution of population in major countries of the world in 2015

Table 4.11 reveals the population distribution in different countries of the world in 2015. China with population of 1371.9 million was the most populous country of the world in the year 2015. The population of the country was more than the total population of all the developed countries put together. India was ranked second populous country in the world with a population of 1314.1 million, followed by 321 million population inhabited in U.S.A, Indonesia with 256 million, Brazil (205 million), Pakistan (199 million), Nigeria (182 million), Bangladesh (160 million), Russia (144 million), and Mexico (127 million). Japan (126.9 million), Ethiopia (98.1 million), Egypt (89.1 million), Germany(81.1 million), U.K (65.1 million), France (64.3 million), Italy (62.5 million), South Korea (50.7 million), Colombia (48.2 million), Spain (46.4 million). China, India, U.S.A, Indonesia, Brazil, Pakistan, Nigeria, Bangladesh, Russia, and Mexico were the top ten most populous countries in the world in 2015 (see in table 4.12). China and India were sharing population 18.70 per cent and 17.91 per cent to the total population of the world respectively., China has almost succeeded in stabilizing its population, Pakistan, Bangladesh, Nigeria, Brazil etc were still held up in the explosive second stage of the demographic transition. India was experiencing the demographic trap. Soon India was expected to acquire the top ranking position in the world in terms of population size (Chandna, R.C.2014). It is estimated that by 2050, India's population would reach 1,660 million while China with a population of 1366 million will be shifted to second rank and will be followed by U.S.A (398 million), Nigeria (397 million), Indonesia (366 million), Pakistan (344 million), Brazil (226 million) Bangladesh (202 million), Congo, Dem, Rep.(194 million) and Ethiopia (165 million). Russia no longer has a place in top ten most populous countries of the world. However, five countries are and will continue to be from the continent of Asia.

Table4.11 World: Country- wise Population Distribution in 2015

Countries	Population in Millions	Countries	Population in Millions
China	1371.9	Germany	81.1
India	1314.1	U.K	65.1
Indonesia	255.7	France	64.3
Pakistan	199.0	Italy	62.5
Bangladesh	160.4	Ukraine	42.8

Japan	126.9	Sweden	9.8
Afghanistan	32.2	Spain	46.4
Saudi Arabia	31.6	Brazil	204.5
South Korea	50.7	Mexico	127.0
Israel	8.4	Colombia	48.2
Iraq	37.1	Argentina	42.4
Sri Lanka	20.9	Venezuela	30.6
U.A.E	9.6	Paraguay	7.0
Nigeria	181.8	Nicaragua	6.3
Egypt	89.1	Trinidad and Tobago	1.4
Ethiopia	98.1	U.S.A	321.2
South Africa	55.0	Canada	35.8
Kenya	44.3	Australia	23.9
Angola	25.0	New Zealand	4.6
Russia	144.3	Fiji	0.9

Source: World Population Data Sheet 2015, Population Reference Bureau, United Nations, New York.

Table 4.12 World: Top Ten Most Populous countries in 2015 and 2050

Country	Percentage in World	Population in Million in 2015	Country	Population in Million in 2050
China	18.70	1,372	India	1,660
India	17.91	1,314	China	1,366
U.S.A	4.38	321	U.S.A	398
Indonesia	3.49	256	Nigeria	397
Brazil	2.79	205	Indonesia	366
Pakistan	2.71	199	Pakistan	344
Nigeria	2.48	182	Brazil	226
Bangladesh	2.18	160	Bangladesh	202
Russia Federation	1.96	144	Congo, Dem. Rep.	194
Japan	1.73	127	Ethiopia	165

Source: World Population Data Sheet 2015, Population Reference Bureau, United Nations, New York.

4.5 DENSITY OF POPULATION AND WORLD PATTERN

Table 4.13 shows that world's population density during the year 1970- 2015. The density of population has been recorded increasing with every increase in population. The density of population in the world was increasing from the year 1970 to 2015.

In 1970, only 27 persons were inhabited of each km² in the world. It was followed by 35 persons per km² in 1984, 49 persons per km² in 2007, 51 persons per km² in 2010, 52 persons per

km² in 2012 and 56 persons per km² in 2015. In 1970, the less developed regions had a density of 34 persons per km² while the corresponding figure for the more developed countries was only 18 persons per km². Europe with a density of 94 persons per km² was the most densely populated continent of the world in 1970. Asia had the second position with a density of 75 persons per km² followed by Latin America (14 persons per km²), Africa (11 persons per km²), North America (11 persons per km²) and Oceania with a density of only 2 persons per km².

In the year 2015, on an average 56 persons per km² were inhabited in the world. The less developed countries were inhabited 75 persons per km² whereas the more developed countries inhabited only 25 persons per km². Asia with a density of 142 persons per km² was the most densely populated continent in the world followed by 40 persons per km² in Africa, 33 persons per km² in Europe, 31 persons per km² in Latin America, 19 persons per km² in North America and 5 persons per km² in Oceania. The continent of Asia had been increasing the density of population from 1970 to 2012 while Europe was decreasing the population of density. Thus, Asia, which had a density of 75 persons per km² in 1970, added 67 more persons to the share of each square km during 1970- 2015. Asia, Africa and Latin America were fast adding to their densities and countries of these continents were associated with their second stage of demographic transition. The demographic factor of natural rate of increase had primarily been responsible for speedy crowding of the continent of Asia. The regional contrast in the density of population was mainly take place by physical, socio-cultural and demographic factors. The population density continues to grow gradually in the world, slowly in the more developed countries and rapidly in the less developed countries.

Table 4.13: World: Density of Population, 1970-2015

Area	Density per km ²					
	1970	1984	2007	2010	2012	2015
World	27	35	49	51	52	56
More Developed Region	18	19	27	23	27	25
Less Developed Region	34	48	65	68	70	75
Asia	75	101	126	130	134	142
Africa	11	18	31	34	35	40
Europe	94*	99*	32	32	32	33
Latin America	14	19	28	28	29	31
North America	11	12	15	16	16	19
Oceania	2	3	4	4	4	5

Source: 1. 1970-2007, Chandna, R.C. Geography of Population, 2014, pp 46

* Excluding Former U.S.S.R

2. 2010-2012, World Population Data Sheet 2010 and 2012, Population Reference Bureau, United Nations, New York.

3. 2015, United Nations Population Division, World Population Prospects, the 2015 Revision.

World Density Pattern in 2015

Table 4.14 and Map 4.2 present the world population density pattern in 2015. There were 56 persons per km² of density in the world in 2015. The less developed countries continue to be the more crowded parts in comparison to the more developed countries. Asia with an average

density of 142 persons per km² was the most crowded part of the world while Monaco, the country of Western Europe was recorded the world's most densely populated country with its density of 25,323 persons per km² in 2015. Within the continent of Asia, the Southern Asia presented higher density of 285 persons per km² while other parts had a density of 146 persons in South East Asia, 139 persons in East Asia, 54 persons in West Asia and only 17 persons in Central Asia. The country of Singapore recorded highest density of population with 8005 persons per km² in Asia. Within Africa, Eastern Africa was most crowded part (59 persons per km²) followed by Western Africa (58 persons per km²), North Africa (29 persons per km²), South Africa (24 persons per km²), Middle Africa (23 persons per km²). Mayotte, the country of Eastern Africa displayed highest density in Africa (640 persons per km²). Within Europe the density varied significantly. The countries of Western Europe consist of a density of 176 persons, 118 persons in Southern Europe, 60 persons in Northern Europe and only 16 persons in Eastern Europe. Eastern Europe was the least crowded part in Europe. The country of Monaco recorded highest density in the continent as well as also in the world. Within Latin America and Caribbean, Caribbean displayed highest density by 191 persons, Central America by 70 persons and South America by 24 persons. Within the countries of North America, U.S.A had a density of 35 persons and Canada consists of density 4 persons only. However, within Oceania density of population varied from 511 persons (Nauru) to 3 persons (Australia). Australia, the largest country in Oceania recorded lowest density of 3 persons per km², New Zealand (17 persons) and Fiji a density of 49 persons per km². The density of population within a continent varies greatly between the countries.

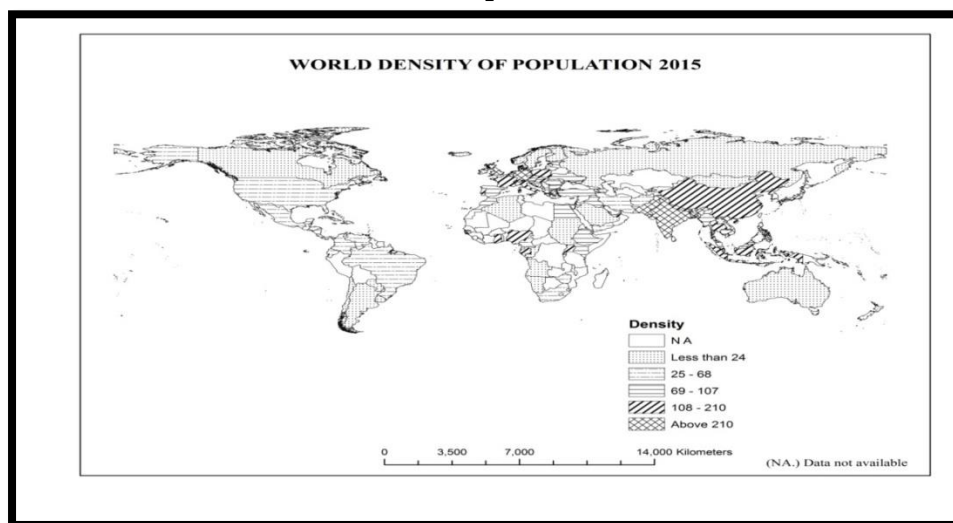
Table4.14: World: Density of Population, 2015

Country	persons per km ²	Country	persons per km ²	Country	persons per km ²
World	56	Venezuela	35	Sri Lanka	330
Less Developed Countries	75	Ecuador	65	Bhutan	26
More Developed Countries	25	Bolivia	10	Pakistan	775
Africa	40	Chile	24	Europe	33
Nigeria	200	Uruguay	20	Denmark	134
Egypt	92	Caribbean	191	Sweden	24
Ethiopia	99	Dominica	97	Portugal	113
Congo	14	Trinidad and Tobago	265	Bulgaria	66
Cameroon	49	Cuba	107	Ireland	68
Kenya	81	Jamaica	258	Finland	18
Guinea	30	Asia	142	Austria	104
Rwanda	471	China	147	Greece	85
Namibia	3	India	441	Iceland	3

Sudan	23	Pakistan	245	Italy	203
Morocco	77	Bangladesh	1237	Spain	92
Zimbabwe	40	Singapore	8005	Monaco	25323
Uganda	195	Japan	347	Norway	14
Angola	20	Israel	373	Luxembourg	219
Algeria	17	Jordan	86	Switzerland	210
Ghana	120	UAE	110	Czech Republic	136
Gambia	197	Yemen	51	Poland	126
South Africa	45	Afghanistan	50	France	118
North America	19	Iran	49	Germany	231
U.S.A	35	Iraq	84	Belgium	373
Canada	4	Turkey	102	Netherlands	502
Central America	70	Kuwait	218	Hungary	109
Mexico	65	Democratic People's Republic of Korea	209	Russia	9
Nicaragua	51	Mongolia	2	Ukraine	77
Cuba	94	Cyprus	126	Oceania	5
South America	24	Georgia	58	Australia	3
Argentina	16	Myanmar	83	New Zealand	17
Brazil	25	Cambodia	88	Fiji	49

Source: United Nations Population Division, World Population Prospects, the 2015 Revision.

Map 4.2



Source: United Nations Population Division, World Population Prospects, the 2015 Revision.

4.6 CONCLUSION

The global population was increasing from 1920 to 2015. The population of the world has started increasing rapidly in the twentieth century and rate of population growth increased from the year 1920 to 1970. After that, decadal growth rate of world's population was decreasing. The growth of World's population was accelerating after World War II and when the population of less developed countries began to increase dramatically. Developed countries as a whole will experience little or no population growth in 21th century and much of that growth will be from immigration from less developed countries. The poorest countries in the world will see the growth of population. The continent of Asia was the most populous continent of the world. Sixty per cent of the global population lives in Asia, 16 per cent in Africa, 10 per cent in Europe, 9 per cent in Latin America and the Caribbean and 5 per cent in North America and the remaining 1 per cent in Oceania. China has the largest population with 1371.9 million in the world in 2015.

4.7 SUMMARY

The study of population distribution is very vital for human and population geographers, because its better understanding holds the key to the analysis of entire demographic character of an area. The population of the world is distributed unevenly within the continents and countries of the world. More than half of the world's population lives in Asia. In prehistoric period, the world population was very scanty and uneven. During the Neolithic Age, the world population had been started increased when the man learnt to cultivate and produce crops. The agricultural revolution around 800 B.C. resulted to increase in food supply that led to better nutrition and decline of death rate. This started to increase population at faster pace. The rapid growth in population was begun from mid of the eighteenth century. In the beginning of Christian era, the world population was about 300 million. The main characteristics of population of the world in medieval period, prior to the Industrial Revolution were high death rate, high infant mortality, short life expectancy, periodic famines, vulnerability to epidemics, high birth rate and much fluctuation of death rate and responding birth rate. Fertility and mortality, the two demographic variables are responsible for the growth of global population. The major turning point in the growth of population came with the Industrial Revolution. After 1750, the modern period of rapid growth of population was started. The Industrial Revolution along with the Medical Revolution pushed the world population to one billion by 1850. The distribution of population depends to a large extend on the quality of the land itself, which is very uneven. Where the land is well suited to agriculture or there are natural resources for industrial development the population will naturally be larger than in areas where climatic conditions are hostile or where resources are few. The regional contrasts in the distribution of population and density of population are mainly affected by three major factors- physical, socio-economic and demographic factors. The history of global population growth from the early beginnings of Homo Sapiens up to the recent times can only be base on speculation because evidence in

support of it is quite scanty. It may be recalled that census operations first began in a few countries as recently as the beginning of the nineteenth century and that, up to the end of the Second World War. The United Nations, after carefully reviewing all the information available for the period, has prepared estimates for the populations of major regions since 1920.

Currently, the world population reached 7.3 billion as of mid 2015. China (1.4 billion) and India (1.3 billion) remain the two largest countries of the world both with more than 1 billion people representing 19 and 18 per cent of the world's population respectively.

Over the past two centuries, the huge growth in the global population was largely because of advances in modern medicines and improvements in living standards. This has significantly reduced infant, child and maternal mortality, contributing to an increase in life expectancy (United Nations Population Fund). The world's population growth was accelerated after the start of Industrial Revolution in the 18th century that raised standard of living of human beings and widespread famines and epidemics diminished in some regions. Currently, the world population continues to grow though more slowly than in the recent past. The growth of population remains especially high in the group of 48 countries of least developed countries of which 27 are in Africa.

According to United Nations, the world's countries were divided into three categories according to social and economic advancement such as More Developed Regions, Less Developed Regions and Least Developed Regions. The global population was increasing from 1811 million in 1920 to 7336 million after 95 years in 2015. The population of the world started increasing rapidly in the twentieth century and the rate of population growth was increased from 1920 to 1970. The decadal growth rate of world's population during 1920 - 1930 was 11.3 per cent that rose to 22.5 per cent in 1970. After that, decadal growth rate of world's population was decreasing. During the period 2010-2015, rate of growth of world population was 5.9 per cent. The growth of World's population was accelerating after World War II and when the population of less developed countries began to increase dramatically. It is clear that, during the earlier stages of the demographic transition, growth of population in the world was mainly regulated by the rates of mortality. In developed regions, population was increasing from 613 million in 1920 to 1254 million in 2015. The decadal rate of growth of population in the developed regions was increased from 10.4 per cent in 1920 to 12.5 per cent in 1960. After that, rate of population growth in the developed regions was decreasing. During the period 2010-2015, the rate of growth of population was 1.7 per cent. Population in the developing regions was also increasing from 1198 million in 1920 to 6082 million in 2015. The decadal rate of population growth in the developing regions increased from 11.7 per cent (1920-1930) to 27.2 per cent (1960-1970). After that the rate of population growth was decreasing to 25.5 per cent in 1980, 24.0 per cent in 1990, 18.6 per cent in 2000 and 15.4 per cent in 2010 while growth of population during 2010- 2015 was 6.8 per cent. In the developing regions, highest decadal rate of population growth was recorded 27.2 per cent in the year 1970. The poorest countries in the world will see the growth of population. According to United Nations, the concentration of population growth in the poorest countries will make it harder for those governments to eradicate

poverty and inequality, fight of hunger and malnutrition, expand of education enrolment and health systems, improve the provision of basic services and implement other elements of a sustainable development agenda to ensure no-one is left behind.

The continent of Asia was the most populous continent of the world. Its population was increasing from 1394 million in 1950 to 4397 million in 2015. The decadal rate of population growth was rise up to 1970, after that they began to decline. The maximum decadal growth rate in Asia was recorded during the period 1960-1970 (25.7 per cent). Over the period 1950-2010, population of Asia was grown primarily due to the excess of births over deaths.

Africa is the second most populous continent after Asia in the world. Africa's population was increasing from 229 million in 1950 to 1171 million in 2015. The decadal rate of population growth in the continent of Africa increased from 24.5 per cent during 1950- 1960 to 32.2 per cent in 1990, after that they started to decline. Since 1950 to 2010, population of Africa was generally increased due to natural increase.

Europe is the third most populous continent with 742 million populations in 2015. Its population was increasing from 549 million in 1950 to 742 million in 2015. The decadal rate of growth of population was decreasing from 10.4 per cent in 1950-1960 to 1.2 per cent in 2000-2010. The rate of population growth during 2010- 2015 was 1.0 per cent in the continent of Europe. During the second decade of the twentieth century, the growth rate of population had been declined in Europe due to the larger number of deaths during the First World War. After the Second World War and economy recovery there was "baby boom" in Europe, the birth rate and the population once again increasing at high rate of growth. This increase continued up to about 1956, after which a downward trend may be observed. The cycle of rising and falling rates of population increase was because of changing social and economic conditions. The population of North America was increasing from 172 million in 1950 to 357 million in 2015. The decadal rate of growth of population was decreasing from 18.6 per cent in 1960 to 10.6 per cent in 1990. During 1990- 2000, rate of growth of population was slightly increase to 11.7 per cent in the continent and once again the growth rate was declined. During the period of 2010- 2015, rate of population growth in North America was 3.8 per cent. The generally increasing impact on population growth since 1950 in North America was mainly due to positive net migration for employment and other purposes. In Latin America and the Caribbean, population was increasing from 169 million to 630 million in 2015. Over the period 1950-2010, the population of Latin America and the Caribbean was grown primarily due to natural increase that is excess of births over deaths. During 1950- 1960, decadal growth rate of population was 30.8 per cent. After that growth of population was decreasing and growth rate during the period 2010-2015 was 5.0 per cent. In 1950, population of Oceania was 13 million and it increased to 40 million in 2015. The decadal rates of population growth were fluctuating in the Oceania region. The rate of population growth during 2010- 2015 was 11.1 per cent. According to World Population Prospects 2015, the increasing of population growth since 1950 was due to positive net migration.

The very high growth of population above 30.0 per cent was found in U.A.E (77.8 per cent) and Angola (31.6 per cent). The high growth of population in U.A.E may be due to start of

receiving foreign workers on a large scale in the recent time whereas Angola was due to natural increase. Only the country of Jordan had high rate of population growth that is between 20.1 to 30.0 per cent. The rate of population growth in Jordan was 24.6 per cent during 2010- 2015. South Africa, India, Israel, Afghanistan, Kenya, Egypt, Yemen Republic, Mexico, Nigeria, Ethiopia and Surinam were had medium growth of population ranges between 10.1 to 20.0 per cent. Fiji, Sri Lanka , Russia, France, China, Italy, U.S.A, Argentina, Sweden, New Zealand , U.K , Canada, Nicaragua, Brazil, Colombia, Venezuela, Australia , Paraguay, Trinidad, Pakistan, Indonesia consisted of low growth rate of population (0.0 to 10.0 per cent). The countries of Ukraine, Spain, Germany and Japan had very low rate of population growth in the world that is below 0.0 per cent. These countries had negative growth of population during the period of 2010- 2015.

The world population reached 7.3 billion in 2015. Eighty-three per cent of the world population lives in Less Developed Regions and Seventeen per cent lives in More Developed Regions. In Least Developed Regions, world population lives thirteen per cent. Asia was recorded the most populated continent in the world. The continent of Asia alone contributed more than half the world's total population (4,397 million). Sixty per cent of the global population lives in Asia, 16 per cent in Africa, 10 per cent in Europe, 9 per cent in Latin America and the Caribbean and 5 per cent in North America and the remaining 1 per cent in Oceania. In 2015, the percentage of young people under the age of 15 accounts for 26 per cent of the world's total population and the age of 60 or above comprising of 12 per cent of the world's total population. Least Developed Region had the highest percentage of young people under the age of 15 whereas More Developed Region consists of greatest percentage of age 60 or above. The continent of Africa had the highest percentage of young people under the age of 15 that is 41 per cent followed by Latin America and Caribbean (26 per cent), Asia (24 per cent), Oceania (23 per cent), North America (19 per cent) and Europe (16 per cent). Niger, Uganda, Chad, Angola, Mali, Somalia, Gambia, Zambia, Dem. Republic of the Congo and Burkina Faso were the top ten countries with youngest population in 2015. All these top countries were from the African Continent.

As fertility declines and life expectancy rises, the proportion of the population age 60 or above rises. The continent of Europe had the greatest percentage of age 60 or above with 24 per cent in the world in 2015 followed by Northern America (21 per cent), Oceania (16 per cent), Asia (12 per cent), Latin America and the Caribbean (11 per cent) while Africa comprises only 5 per cent of oldest population. Japan, Germany, Martinique, Italy, Portugal, Greece, Bulgaria, Austria, China, Hong Kong SAR and Spain were the top ten countries with oldest population in 2015. By 2050, all major areas of the world except Africa will have nearly a quarter or more of their populations age 60 or above. The number of older persons in the world is projected to be 1.4 billion by 2030 and 2.1 billion by 2050 and could rise to 3.2 billion in 2100. Population aging is projected to have a profound effect on the number of workers per retiree (World Population Prospects 2015 Revision).

The number of young people under the age of 25 has grown rapidly in the recent years. In 2015, 3.1 billion people under the age of 25 contributed of 42 per cent of the world's total population. Africa, Asia and Latin America and the Caribbean are home of the world's young people. The continent of Africa comprises the highest percentage of children ages under 15 with 41 per cent in the world followed by 26 per cent in Latin America and the Caribbean, 24 per cent in Asia, 23 per cent in Oceania, 19 per cent in North America and 16 per cent in Europe. Again, Africa recorded the highest number of young population ages 15-24 with 19 per cent. The continent of Africa encompasses largest number of young people in the world. According to United Nations, global fertility levels are projected to continue to decline, the youthful age structure of countries in Africa and Asia ensures that the number of young people will continue to grow and reach 3.4 billion by 2050. Providing young generations with health care, education and employment opportunities, including in the poorest countries and groups is a pivotal focus of the 2030 Sustainable Development Agenda. Latin America and the Caribbean recorded of second highest of young population ages 15-24 with 17 per cent followed by Asia with 16 per cent, Oceania with 15 per cent, North America with 14 per cent and Europe with 11 per cent. Although Europe continent was consist of the small number of young people in the world. The highest percentage of ages 25- 59 found in the continent of Europe with 49 per cent followed by Asia with 48 per cent, North America with 47 per cent, Latin America and the Caribbean with 46 per cent, Oceania with 45 per cent and Africa with 34 per cent. Europe continent had the largest number of oldest people above 60 years that is 24 per cent followed by 21 per cent in North America, 16 per cent in Oceania, 12 per cent in Asia, 11 per cent in Latin America and the Caribbean. Africa consists of lowest percentage of oldest people only 5 per cent in the world.

China with population of 1371.9 million was the most populous country of the world in the year 2015. The population of the country was more than the total population of all the developed countries put together. India was ranked second populous country in the world with a population of 1314.1 million. China, India, U.S.A, Indonesia, Brazil, Pakistan, Nigeria, Bangladesh, Russia, and Mexico were the top ten most populous countries in the world in 2015. China and India were sharing population 18.70 per cent and 17.91 per cent to the total population of the world respectively., China has almost succeeded in stabilizing its population, Pakistan, Bangladesh, Nigeria, Brazil etc were still held up in the explosive second stage of the demographic transition. India was experiencing the demographic trap. Soon India was expected to acquire the top ranking position in the world in terms of population size (Chandna, R.C.2014). It is estimated that by 2050, India's population would reach 1,660 million while China with a population of 1366 million will be shifted to second rank and will be followed by U.S.A (398 million), Nigeria (397 million), Indonesia (366 million), Pakistan (344 million), Brazil (226 million) Bangladesh (202 million), Congo, Dem, Rep.(194 million) and Ethiopia (165 million). Russia no longer has a place in top ten most populous countries of the world. However, five countries are and will continue to be from the continent of Asia.

The density of population has been recorded increasing with every increase in population. The density of population in the world was increasing from the year 1970 to 2015. In 1970, only

27 persons were inhabited of each km² in the world. It was followed by 35 persons per km² in 1984, 49 persons per km² in 2007, 51 persons per km² in 2010, 52 persons per km² in 2012. In the year 2015, on an average 56 persons per km² were inhabited in the world. The less developed countries were inhabited 75 persons per km² whereas the more developed countries inhabited only 25 persons per km². Asia with a density of 142 persons per km² was the most densely populated continent in the world followed by 40 persons per km² in Africa, 33 persons per km² in Europe, 31 persons per km² in Latin America, 19 persons per km² in North America and 5 persons per km² in Oceania. The continent of Asia had been increasing density of population from 1970 to 2012 while Europe was decreasing the population of density. Thus, Asia, which had a density of 75 persons per km² in 1970, added 67 more persons to the share of each square km during 1970- 2015. Asia, Africa and Latin America were fast adding to their densities and countries of these continents were associated with their second stage of demographic transition. The demographic factor of natural rate of increase had primarily been responsible for speedy crowding of the continent of Asia. The regional contrast in the density of population was mainly take place by physical, socio-cultural and demographic factors. The population density continues to grow gradually in the world, slowly in the more developed countries and rapidly in the less developed countries. The less developed countries continue to be the more crowded parts in comparison to the more developed countries. Monaco, the country of Western Europe was recorded the world's most densely populated country with its density of 25,323 persons per km² in 2015.

4.8 GLOSSARY:

Demography - The composition of a particular human population.

Population - The total number of people in a country or region.

Growth - The process of increasing in size.

Pattern - Give a regular or intelligible form to.

Density - The quantity of people in a given area.

World population - The total number of living humans on Earth.

Old People - People who are elderly (of age of 60 or above).

Death Rate - Number of death every year per 1000 people in a population.

Birth Rate - The number of live births per thousand of population per year

Life Expectancy – The average period that a person may expect to live

4.9 ANSWER TO CHECK YOUR PROGRESS

Question 1. What is Demography?

Question 2. Define Population.

Question 3. Define Density of Population.

4.10 REFERENCE

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4.12 TERMINAL QUESTIONS

- Question 1. Explain the pattern of growth of world population.
- Question 2. Describe the pattern of population distribution in world.
- Question 3. Discuss the pattern of world population density.
- Question 4. Discuss briefly the growth of world population in major regions from 1950- 2015.
- Question 5. Explain the distribution of population in major countries of the world in 2015.
- Question 6. Explain the density of world population in 2015.

UNIT 5 - POPULATION MIGRATION

5.1 OBJECTIVES

5.2 INTRODUCTION

5.3 TYPES OF MIGRATION - CAUSES AND CONSEQUENCES

5.4 CONCLUSION

5.5 SUMMARY

5.6 GLOSSARY

5.7 ANSWER TO CHECK YOUR PROGRESS

5.8 REFERENCES

5.9 SUGGESTED READINGS

5.10 TERMINAL QUESTIONS

5.1 OBJECTIVES

After reading this unit you should be able to:

- Know about population change in any area.
 - Understanding the spatial process and spatial interactions.
 - Know about reasons for movement of people.
 - Understand types of migration.
 - Know about access causes and consequences of migration.
-

5.2 INTRODUCTION

Migration is the movement of people from one place to another place. It is the third component of population change next to fertility and mortality. Population Geographers have devoted much more attention to the study of migration rather than fertility and mortality. The study of migration occupies significant place in Population Geography because in combination with fertility and mortality, it determines the size and the rate of population growth, as well as its structure and characteristics. One of the important aspects to study migration is to find out the reasons for which any person leaves his/her residence and finds a new residence. It is an important factor for contributing to the growth of population particularly in urban areas. According to United Nations Population Fund, in 2015, 244million people (3.3 per cent) of the world's population lived outside their country or region. The majority of migrants were cross borders in search of better economic and social opportunities. Globalization has increased the mobility of labour. Migration is an important force in development and a high priority issue for both developing and developed countries. In addition, almost half of all migrants are women, and most of them are of reproductive age. They have specific needs and human rights concerns.

For Geographers, migration is not merely a reallocation of human resources but is a process, which has a three-fold impact (a) on the area experiencing in- migration (b) on the area experiencing out- migration and (c) on the migrants themselves. Whenever migration takes place, in whatever form, it modifies the area of origin, the area of destination, as well as the way of life of the migrants (Chandna, R.C., 2014). It plays an important role in the distribution of population of any area and determines the growth of the labour force in any area. Industrialization and economic development have been causes of large – scale movements of people from agriculture sector in rural areas to towns; from one town to other town and from one country to another. The movement of migrants from rural to rural, rural to urban, urban to rural and urban to urban areas is generally linked with the degree of economic and social development. Internal and International migration can be positive forces for economic and social development as they offer a mechanism to rebalance labour markets in areas of origin and destination and to accelerate the diffusion of new ideas and technologies. Migration can also result in significant flows of remittances to areas of origin. Overall, international migration is a much smaller component of population change than births or deaths. However, in some countries and areas the impact of migration on population size is significant, including in countries that

send or receive proportionately large numbers of economic migrants or those affected by refugee flows (World Population Prospects, 2015 Revision).

According to the U.N.O, migration is a form of Geographical mobility between one geographical unit and another, generally involving a change of residence. The Census of India determines the migration by birth place and migration by place of last residence. Migration Study by place of birth is like studying onetime event but data on migration by last residence reveals recent migrations over the years and therefore more information on the current status of the population. When a person is enumerated in census at a different place than his/her place of birth, she/ he are considered as migrant on the basis of place of birth. Change of residence from one district to another district within a state, from urban to rural, from rural to urban, from one town to another town, from one state to another and from one country to another is considered to be migratory movements as per Census. In intra-state, migration majority of the migration is from one rural or urban area to another rural or urban area and to other districts of the State however the flow of people in inter-state migrants is mainly towards urban areas. In India, a large number of males migrated from rural to urban areas, due to better employment opportunities in the urban areas. However, they leave their families behind in the native village due to high cost of living in the urban centres. In the West, urban areas offer many opportunities for the girls, so a large number of females move from rural to urban areas due to farming activities in the countryside have become more and more masculine.

Of the three major components of population change, migration is the most difficult to conceptualize and measure. The difficulties arise in conceptualizing and measuring because, unlike fertility and mortality, migration is not just an unequivocal biological event but a physical, social and political transaction. Therefore, movement of people is the product of the social, cultural, economic, political and physical circumstances in which individuals and societies find themselves.

5.3 TYPES OF MIGRATION- CAUSES AND CONSEQUENCES

Types of migration

Migration may be classified into various types on the basis of motivation, distance and time. On the basis of motivation, migration can be classified as Economic migration and Social migration. Economic migration is mainly caused by economic factors including resource base of the area, availability of fertile, arable land and employment opportunities. For instance, depressed economic condition and poor employment opportunity in the rural areas of Bihar and Eastern U.P are causes of out migration to the states of better economic condition like West Bengal, Punjab, Haryana, Delhi, Gujarat, Maharashtra, etc. Social migration is governed by social customs, religion, faith, social- cultural contact, etc. The movement of females from the place of their parental residence to the residence of their spouses at the time of marriage is the social migration. On the basis of distance, migration may be classified as long-distance and short- distance. Type of migration can be classified as permanent, temporary and periodic or seasonal migration based on time, depending upon the period of stay of the migrants. In

permanent migration, the migrants do not return their native place in future. In temporary migration people leave their residences for short time for education, job, etc. and then come back to their original place. In periodic or seasonal migration, people move in a definite time period of the year to other places particularly in agriculture sector. For example, during the summer season, transhumance people take their animals to the higher reaches of the mountains for grazing there, while during the winter, the upland pasture areas become too cold and often get snow covered. Therefore, they bring their animals back to the lower valley areas where they have their permanent residences. Movement of people from one place to another in search of seasonal employment, for instance, migration of labourers from Bihar to Punjab during the rice plantation and harvesting season is also an example of seasonal migration.

Migration can be also classified into two groups on the basis of areal size or scale (a) Internal Migration (b) International Migration.

(a) Internal Migration

Migration of people within an area lying within the territorial jurisdiction of a country is known as Internal Migration. The Internal Migration is divided into four types as given below-

(i) Rural to Urban migration

Rural to Urban migration is caused by both push of the rural areas due to lack of facilities of better employment, education resulting in pull by the urban areas due to better opportunities in these sector. The inflow of migrants also depend on the size of the Urban Agglomeration or city as in large UAs and cities the availability of work and employment is greater. This type of migration carries the people of rural to the growing urban centers. Rural to Urban migration is more prominent in the less developed countries. In rural areas, poverty, unbearable unemployment, low and uncertain wages, uneconomic landholdings and lack of facilities for good education, health, recreation and other services work as the push factors. The pull of the urban areas may include better employment opportunities, regular and higher wages, fixed working hours, better amenities of living, good educational facilities and social- cultural activities. The life in urban areas is more attractive and secure. In India, some movement from rural to urban areas may also take place with a view to moving to a new environment due to the rigid caste system in the countryside. The poor people are migrating to improve of their living condition due to poor economic condition, whereas the rich migrate due to their desire for better and greater comforts of life. A large number of educated rural males also move to the urban areas because they are unable to find a suitable job in and around their rural sector. For instance, the rural people of remote hill areas of Uttarakhand were migrating to the urban areas of the state as well as other urban areas of the neighbouring states or Union Territories or cities like UP, Delhi, Chandigarh, Lucknow etc. due to the shortage of earning sector in the villages of hilly area, poor agricultural activities, unemployment, poor educational system, lack of good medical facilities, poor road network, worst terrain feature etc. In India, large scale unplanned movement of people from rural to urban areas may cause growth and spread of slum areas in the large cities.

Image 5.1:Hilly Area of Uttarakhand



Source: Google



Educational System in Rural Area Educational System in Urban Area

Source: By Author

(ii) Urban to Urban migration

Urban to Urban migration is more common in the highly urbanized countries of the world, though it also takes place in less developed countries in small magnitudes. This type of migration takes place between movements of people from small towns with less facility, to large cities with more facilities. In the developed countries, people migrate from one urban centre to another with a view to improving their employment prospects. Whereas, in the less developed world where the big cities are the chief magnets, these attract such migrants from other urban centres who have acquired sufficient skills for their absorption in big industrial centres. The emptiness caused in the small urban centres is filled by the subsequent in –migration from the surrounding rural areas. Thus, in the developing countries this migration forms a part of what is commonly known as ‘step- migration’. Urban to urban movement, which is caused by economic factors mostly, has neither time nor distance barrier.

(iii) Rural to Rural Migration

This type of migration takes place in the countries where occupation is primarily agrarian. The movement of people takes place from one rural area to another and may take place even for longer distances. Such type of migration is often permanent. Rural to Rural migration originates from crowded areas of low agricultural productivity, towards sparsely populated areas where there are large scale developmental activities and good facilities of education, medical, road connectivity to other urban areas. In our country, an outstanding feature of rural to rural migration is the majority of female migrants for the reason of marriage.

(iv) Urban to Rural Migration

Urban to Rural Migration take place to the city of high degree of urbanization. This type of movement is found more in developed countries and less in developing countries. People in the urban areas are started to move out toward the rural areas due to overcrowding and over congested at the core area of the city as well as polluted of environment. The development of network of efficient transportation system has facilitated such type of movement. This type of residential migration is limited to short distance and accelerates commuting.

The movement of people in different streams (rural to urban, urban to urban, rural to rural and urban to rural) of intrastate, interstate and international migrants in India according to census-2011 with decadal growth 2001- 2011 is presented Table 5.1.

Migration stream	Number of Migrants			Decadal growth 2001-2011		
	Persons	Males	Females	Persons	Males	Females
Total Migrants	141908270	47514362	94393908	44.4	44.4	44.3
Intrastate Migrants	118718531	36535335	82183196	47.1	52.2	44.9
Rural to Rural	59122546	11749617	47372929	21.0	17.7	21.8
Rural to Urban	21846299	9375986	12470313	53.6	44.2	61.6
Urban to Rural	10084012	3974723	6109289	93.4	93.2	93.6
Urban to Urban	22447083	9898650	12548433	126.8	126.1	127.7
Interstate Migrants	21941906	10425348	11516558	30.4	22.5	38.5
Rural to Rural	4489792	1545738	2944054	0.3	-12.2	8.4

Rural to Urban	8077263	4506600	3570663	26.7	18.5	39.0
Urban to Rural	1393144	622493	770651	32.3	19.0	45.3
Urban to Urban	7153671	3366135	3787536	59.3	52.9	65.5
Total Migrants from Outside Country	1112177	493233	618944	50.1	27.6	74.6
Migrants to Rural area of India	505306	180908	324398	28.6	-4.0	58.8
Migrants to Urban areas of India	606871	312325	294546	74.4	57.8	96.2
Source: Table D-2 Census of India 2011 Registrar General of India Compiled by Dr. Ranju Joshi Pandey, Uttarakhand Open University						

The data given in above table reveals that out of total 141.90 migrants 118.71 people migrated from one part of the state to another part of the same state between 2001 and 2011 census were as the number of persons migrated from one state to other states within the country reported 21.94 million during the same period. As per Census 2011 number of migrants from other countries is recorded 1.11 million during last 9 years of commencing of Census 2011. The data reveals that people moving constantly from rural to urban, urban to rural, rural to rural and urban to urban due to different reasons like employment, education, marriage, movement with family etc. The decadal growth of migrants depicts that it is much higher from rural to urban areas and also from one urban area to another urban area definitely for better education, employment and other prospective required to lead a comfortable and better life as per the needs of younger generation. However to analyze and study the same age group wise data will definitely be a better tool. It is very interesting to note that during the decade 2001-2011 the number of migrants recorded a significant growth of 50.1 percent.

(b) International Migration

People move from one country to another across the International borders, the migration is called International migration. The terms emigration and immigration are used to indicate out-migration and in-migration across the international borders, respectively. International migration is as old as human history, whether it is voluntary or forced upon people by famines, conquests, economic factors, over population etc. According to Neo- Marxists, International migration is as coercive labour migration which is a manifestation of dependency that promotes underdevelopment in the periphery and overdevelopment at the core. In the classical world, International migrations were considered as voluntary, rational attempts of the human beings to maximize utility and to attain social uplift. Thus, the migrants enter the new society at the lowest

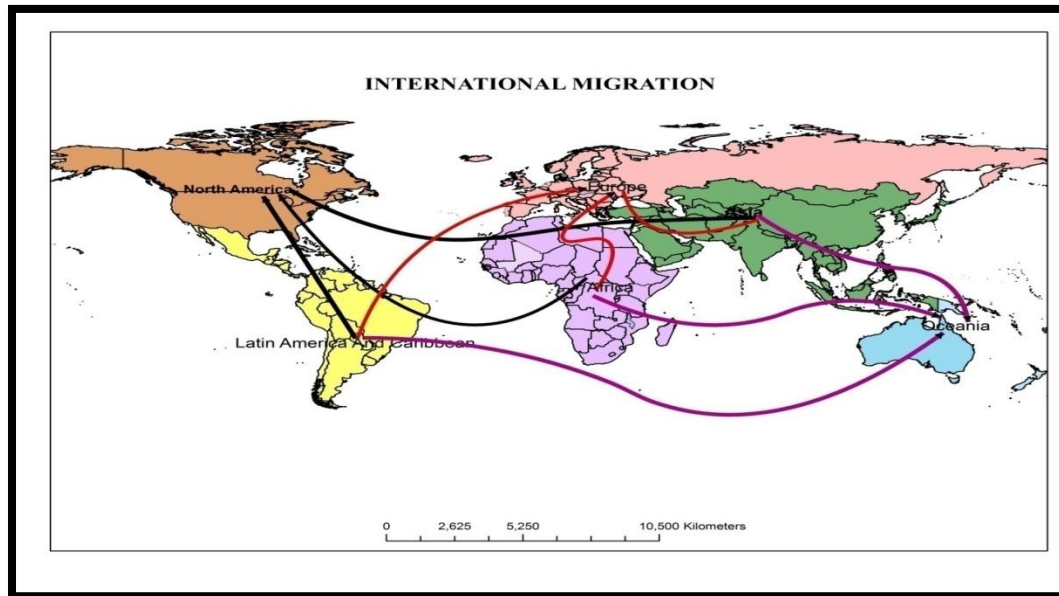
economic and social strata, but have opportunities for improvement, so that there is a progressive convergence of their characteristics with those of the host communities. This is how the functionalists looked at the International migrations. The migrants are moved out by thought that a little higher of their standard of living than that of the people at the place of origin.

Important, large scale International migrations have been made since very early times, until mid- twentieth century from the West European countries to North America, South America, Australia and many countries of Asia and Africa from China and Japan to South- East Asia and from India to South- East Asia, Sri Lanka, Mauritius and South Africa. In late medieval period, the European countries have suffered over population and their resources were insufficient in relation to the number of their population. In some places, the peasants became too numerous and were consequently landless and many of them had often been uprooted because machinery had ruined their home industry. The European emigration began very early in the sixteenth century, with the Spaniards and Portuguese. Up to the early nineteenth century, it consisted mainly of the English, Scots, Irish, French and the Germans. The destinations of the European emigration were mainly to the countries of the New World which were almost uninhabited, but were capable of supporting newcomers. In the nineteenth century, Indian emigration was started by the Britishers to suit their own purposes. The Indians, by nature, are hard working, live on little and are satisfied with low wages. In those days, Britishers were miserably poor in their own country, yet were eager to make money. During the British period, a number of Indian youths were marked out for emigration and various gangs of Indian workers began to be sent to the different Islands and to parts of tropical America and Africa to work in sugar plantations. During 18th and 19th century, Indians were started migrate to different countries of Africa like Kenya, Uganda, Tanganyika, Mozambique, Tanzania, Zimbabwe, Somalia, Ethiopia, Zambia, Natal, South Africa etc. Most of these migrants migrated to African countries were from the states of Punjab, Gujarat, Maharashtra, Tamil Nadu and Kerala. After 1840, people of our country had also started migrate to West Indies and their destinations were mainly in Guinea, Trinidad Jamaica, Martinique and Guadeloupe. Most of the Indians migrated to these islands as labourers to work in the agricultural fields. Such migrants were largely from Eastern Uttar Pradesh and Bihar.

In China, the eastern part was very densely populated and its population was mainly based on agriculture. They had serious problems of unemployment, poverty and overpopulation. The Chinese are less tied to their land than the Indians. The Chinese started migrated and have established colonies in Eastern Siberia, South America, California and throughout South- East Asia. Now, more than 10 million Chinese live out of China. The Japanese Islands have been over populated and Japanese practiced infanticide of baby girls and restriction on their birth, before the fourteen century to control the rapid growth of population. It was help to prepare the Japanese mind for emigration. Between 1950- 2015, the major areas of Europe, Northern America and Oceania have been net receivers of international migrants while Africa, Asia and Latin America and the Caribbean have been net senders, with the volume of net migration generally increasing over time. The movement of people from Africa, Asia and Latin America

and the Caribbean to Europe, Northern America and Oceania has dominated the world migration patterns for almost half a century, but flows among developing countries have also been important. Several high-income and middle-income countries in the “global south” have also been attracting migrants in large numbers for several years (World Population Prospects, 2015 Revision).

Map 5.1



Source: Google

For the past several decades, Europe, Northern America and Oceania have been the main receivers of migrants (see in table 5.2). Net migration to these three major areas generally increased over time. Net migration means the difference between the number of immigrants and the number of emigrants. The average annual net migration per year for the decade 1980- 1990 to these three areas was 1.3 million, during 1990-2000 was 2.5 million and 3.1 million during the decade 2000-2010. From 2010-2015, the average annual net migration was 2.2 million per year (see in fig 5.1). In Oceania, the average annual net migration was increased from 0.1 million per year for the decade 1980- 1990 to 0.2 million for the decade 2000- 2010. In 2010-2015, average annual net migration in Oceania was 0.2 million per year. In Northern America, the average annual net migration was increased from 0.8 million per year during the period 1980- 1990 to 1.5 million per year during the year 1990- 2000 while it decline to 1.2 million per year during the year 2000 – 2010. Average annual net migration in 2010- 2015 was 1.2 million per year. The average annual net migration of Europe also increased from 0.4 million per year for the decade 1980-1990 to 1.7 million per year in 2000-2010 but average annual net migration in 2010-2015 was 0.8 million per year. In contrast to above three areas, Africa, Asia and Latin America and the Caribbean have been net senders of international migrants. In Africa, average annual net migration during 1980- 1990 was -0.4 million per year, -0.2 million during 1990- 2000, -0.3 million during 2000-2010, -0.6 million in the year 2010-2015. In Asia, average annual net

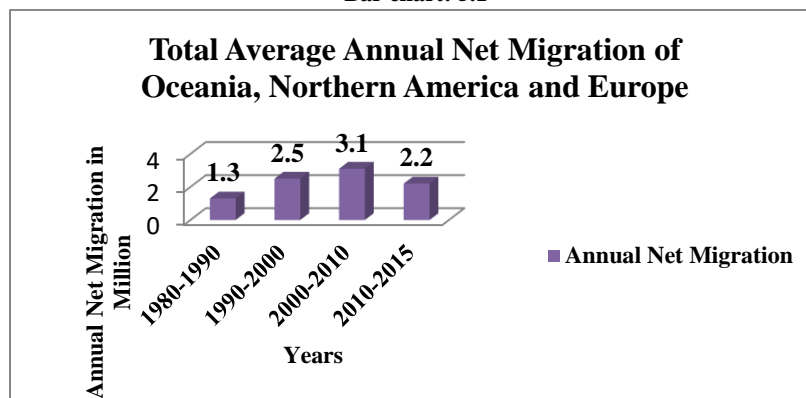
migration was -0.3 million per year during 1980- 1990, -1.5 million during 1990- 2000, -1.9 million during 2000- 2010 and -1.3 million during 2010- 2015. The average annual net migration in Latin America and the Caribbean was -0.7 million per year during 1980-1990, -0.8 million during 1990-2000, -0.8 million during 2000-2010 whereas from 2010-2015 was -0.4 million per year. In Africa, Asia and Latin America and the Caribbean, the number of out - migration is more than from in - migration.

Table 5.2 Average annual net migration by major area 1980- 2015 (in millions)

Area	1980- 1990	1990-2000	2000-2010	2010-2015
Oceania	0.1	0.1	0.2	0.2
Northern America	0.8	1.5	1.2	1.2
Europe	0.4	0.9	1.7	0.8
Africa	-0.4	-0.2	-0.3	-0.6
Asia	-0.3	-1.5	-1.9	-1.3
Latin America and Caribbean	-0.7	-0.8	-0.8	-0.4

Source: World Population Prospects Data Booklet, 2015 Revision

Bar chart: 5.1



Source: World Population Prospects Data Booklet, 2015 Revision

Table 5.3 presents average annual net migration of selected major countries of the world during the period 2005- 2015. The countries where the number of out-migration have been more than the number of in- migration are China, Afghanistan, Bangladesh, India, Pakistan, Sri Lanka, Thailand, Philippines, Nigeria, Egypt, Libya, Ethiopia, Kenya, Zimbabwe, Portugal, Argentina, Colombia, Mexico, Cuba, Fiji while countries where the number of in- migration have been more than the number of out- migration are Japan, Republic of Korea, Bhutan, Singapore, Qatar, Kuwait, Israel, Saudi Arabia, Turkey, U.A.E, Bahrain, Iraq, Jordan, Oman, Ghana, South Africa, Switzerland, Netherland, Germany, France, Belgium, Austria, Spain, Italy, United Kingdom, Sweden, Norway, Finland, Denmark, Russia Federation, Ukraine, Poland, Brazil, Chile, Canada, U.S.A, Australia and New Zealand. Annual Average Net Migration of U.S.A was 1008 thousand person. The country has received largest number of in -migrants among the major countries of the world.

Table 5.3 Annual Average Net Migration of selected countries in 2015

Country	Annual Average Net Migration in Thousands (2005-2015)	Country	Annual Average Net Migration in Thousands (2005-2015)
China	-400	Kenya	-24
Japan	80	Zimbabwe	-53
Republic of Korea	70	Switzerland	73
Afghanistan	-20	Netherlands	17
Bangladesh	-580	Germany	128
India	-543	France	81
Pakistan	-238	Belgium	54
Nepal	-140	Portugal	-1
Bhutan	3	Austria	30
Sri Lanka	-100	Spain	166
Malaysia	110	Italy	153
Thailand	-76	United Kingdom	242
Singapore	85	Sweden	54
Qatar	122	Norway	41
Kuwait	104	Finland	18
Israel	29	Denmark	18
Saudi Arabia	167	Russia Federation	328
Turkey	195	Ukraine	43
U.A.E	390	Poland	7
Philippines	-253	Brazil	2
Bahrain	35	Argentina	-5
Iraq	9	Colombia	-29
Jordan	68	Chile	34
Oman	140	Mexico	-93
Nigeria	-60	Cuba	-27
Ghana	14	Canada	241
South Africa	200	USA	1008
Egypt	-49	Australia	216
Libya	-58	New Zealand	7
Ethiopia	-11	Fiji	-6

Source: World Population Prospects, Data Booklet, 2015 Revision

The main receiving countries Canada, Australia, New Zealand and Israel except the United States has been declining the magnitude of immigration for permanent settlement. The

decline is related with the new immigration policies adopted by these countries during 1971- 80. The immigrants coming to these receiving countries were from developing countries though United Kingdom still constitutes the main source of migrants to them. The United Kingdom supplies the largest number of immigrants to the five receiving countries. The United States, which is the leading country to allow for permanent immigration, also contributes to emigration. The United States ranks seventh and India ranks eight among the supplies of immigrants. In recent times, Western Asia countries Bahrain, Iraq, Jordan, Kuwait, Lebanon, Turkey, Israel, Oman, Qatar, Saudi Arabia, U.A.E and Yemen are started receiving foreign workers on a large scale. Saudi Arabia is the leading receiving country. Recently, not only the number of persons involved in the International migrations has decreased significantly, but also the purpose of migration has undergone a change. It is largely due to this experience that the receiving countries all over the world have, of late, tended to adopt measures for restricting and regulating immigration and labour- recruitment. Although, the number of persons involved in the International migrations may constitute only a small proportion of the world's total migration, yet, it is of great importance for certain countries, as it is the chief source of demographic change for them(Chandna,2014). A distinction can be made between three types of International migrants 1. those who have the legal sanction of the receiving countries, 2. those whose states is considered illegal by the receiving countries and 3. those who have been admitted as refugees. Since 1970s, highly educated and skilled professionals have migrated from India to most advanced countries, such as the U.S.A, U.K, Canada and some countries of the West, leading to a serious problem of brain drain.

Overview of Indian migration according to 2011 census

Migration data were recorded at the time of first Indian census in 1881. In India, there has been a steady increase in the number of migrants. In 1961, there were about 144 million migrants by place of birth. The main reasons for migration in our country are work/employment, business, education and marriage. About 5.4 million persons reported as migrant by last residence from across the International border as per Census- 2011. Out of this 4.50 million migrants are from Asian Countries and 0.40 million migrants are from American Countries 0.38 million people migrated from African Countries whereas from European Countries the number of migrants is 0.11 million. 0.09 Million people migrated from Oceans. The top three countries from where people migrated are Bangladesh (2.3 million), Nepal (0.78 million), Pakistan (0.70 million).

Table 5.4 presents reasons for migration of migrants by last residence during last ten years.

Reason for Migration	Number of Migrants			Percentage of Migrants		
	Persons	Males	Females	Persons	Males	Females
Work/employment	1,79,41,353	1,49,19,568	30,21,785	12.64	31.40	3.20

Business	12,24,423	9,00,336	3,24,087	0.86	1.89	0.34
Education	39,37,006	23,26,443	16,10,563	2.77	4.90	1.71
Marriage	5,82,55,881	14,14,636	5,68,41,245	41.05	2.98	60.22
Moved after birth	1,27,60,972	66,53,405	61,07,567	8.99	14.00	6.47
Moved with household	3,05,57,279	1,27,65,336	1,77,91,943	21.53	26.87	18.85
Others	1,72,31,356	85,34,638	86,96,718	12.14	17.96	9.21
Total	14,19,08,270	4,75,14,362	9,43,93,908	100.00	100.00	100.00
Source Table D-3 Census of India -2011 , Registrar General of India Compiled by Dr. Ranju Joshi Pandey, Uttarakhand Open University						

The data relating to reasons for migration, as depicted in Table 5.4, reveals that amongst male the majority of males (31.40 %) migrated due to work and employment whereas in case of female this proportion is only 3.20 %. In case of females majority of females (60.2%) migrated due to marriage. This is followed by another reason moved with household comprising of 26.87 % & 18.85 % for males and females respectively. This is because when a male of a household being head moved for work and employment with entire household the reasons for other member like student, dependent, household duties etc was recorded as ‘moved with household’ in Census. About 14.0 males & 6.47 % females are recorded as moved after birth as usually mother goes either to her parents or hospital either in other town/ district only for delivery and when such family is enumerated in usual place of residence the reason for such child is recorded as ‘moved after birth’. The education is another reason effecting migration and as per Census - 2001 about 4.90 % percent males and 1.71 females migrated due to education. Though in terms of percentage this figure is not very significant but in absolute terms about 0.23 million males and 0.16 million females left their last residence for the purpose of education. The migration due to business is not very significant in terms of males and as well females. For better understanding it is always good to analyze the data with cross classification with age group wise data.

State /UT	Total Population	Total Migrants	Percentage of migrants to Total Population	Rank of States in terms of proportion of migrant population in the State
INDIA	1,21,08,54,977	45,57,87,621	37.6	
GOA	14,58,545	11,40,690	78.2	1
CHANDIGARH	10,55,450	6,78,188	64.3	2
DAMAN & DIU	2,43,247	1,48,592	61.1	3

PUDUCHERRY	12,47,953	7,12,401	57.1	4
ANDAMAN & NICOBAR ISLANDS	3,80,581	2,16,341	56.8	5
DADRA & NAGAR HAVELI	3,43,709	1,88,057	54.7	6
KERALA	3,34,06,061	1,78,63,419	53.5	7
MAHARASHTRA	11,23,74,333	5,73,76,776	51.1	8
PUNJAB	2,77,43,338	1,37,35,616	49.5	9
ARUNACHAL PRADESH	13,83,727	6,30,831	45.6	10
ANDHRA PRADESH	8,45,80,777	3,83,60,644	45.4	11
GUJARAT	6,04,39,692	2,68,98,286	44.5	12
TAMIL NADU	7,21,47,030	3,12,74,107	43.3	13
KARNATAKA	6,10,95,297	2,64,63,170	43.3	14
NCT OF DELHI	1,67,87,941	72,24,514	43.0	15
UTTARAKHAND	1,00,86,292	43,17,454	42.8	16
HARYANA	2,53,51,462	1,05,85,460	41.8	17
SIKKIM	6,10,577	2,47,049	40.5	18
HIMACHAL PRADESH	68,64,602	26,47,067	38.6	19
ODISHA	4,19,74,218	1,54,21,793	36.7	20
WEST BENGAL	9,12,76,115	3,34,48,472	36.6	21
TRIPURA	36,73,917	12,99,623	35.4	22
MIZORAM	10,97,206	3,87,370	35.3	23
CHHATTISGARH	2,55,45,198	88,88,075	34.8	24
ASSAM	3,12,05,576	1,06,44,234	34.1	25
MADHYA PRADESH	7,26,26,809	2,47,35,119	34.1	26
RAJASTHAN	6,85,48,437	2,20,71,482	32.2	27
LAKSHADWEEP	64,473	20,401	31.6	28
JHARKHAND	3,29,88,134	96,59,702	29.3	29
UTTAR PRADESH	19,98,12,341	5,64,52,083	28.3	30
NAGALAND	19,78,502	5,49,618	27.8	31
BIHAR	10,40,99,452	2,72,44,869	26.2	32
MEGHALAYA	29,66,889	7,59,554	25.6	33
MANIPUR	28,55,794	6,86,935	24.1	34
JAMMU & KASHMIR	1,25,41,302	28,09,629	22.4	35
Notes - Arranged in descending order of percentage of migrants				
Source - Table D-1 and Primary Census Abstracts India -2011 of Registrar General of India Compiled by Dr. Ranju Joshi Pandey, Uttarakhand Open University				

The table 5.5 above depicts the data of number of migrants in States and Union Territories of the Country. The State Union Territories have been arranged in descending order of

migrants population and their ranking in terms of proportion of migrant population with total population of respective State/ UT has also been depicted. Out of total 1210 million populations about 455 million is migrated population which constitutes 37.6 percent of total population. 19 States/UT have recorded proportion of migrant population more than the national proportion of 37.6 whereas the proportion of migrant population in remaining 16 State/UT is recorded less the proportion of the Country. Goa (78.2), Chandigarh (64.3) and Daman & Diu (61.1) are three top most States/UT where proportion of migrant population is recorded more than 60%. The population of 5 States/ UT (Puducherry, Andaman& Nicobar, Dadra & Nagar Haveli, and Kerala& Maharashtra) comprises of more than 50% migrant population. Uttarakhand with rank 16 in terms of proportion of migrant population lies almost in the middle of all 35 States/UT with 42.8 percent of migrant population. In the north eastern states, barring Sikkim, the proportion of migrant population lies between 35.4 (Tripura) to 24.1 (Tripura). The Jammu & Kashmir lies in the last rung of the ladder in terms with proportion of migrant population with 22.4 percent migrant population.

Migration Profile of Uttarakhand

Uttarakhand is a hill state located in the northern India. The remote areas of the state are extremely backward up till now. Therefore, people who are living in remote and interior areas of the state have been moving in other developed places of the state as well as outside the state. In remote areas of the state, there are problem of unemployment, lack of earning sector, poor road condition and connectivity, poor agricultural activities, poor educational system and poor medical facilities. Human beings are required all the basic needs which are necessary to settle permanently in a place. In the present time, migration is the major issue of the state of Uttarakhand.

State/ Union Teriitory	Total migrants	Reason for migration							% of migrants from other States to total migrants of Utrrakhand
		Work/e mployment	Busines s	Educati on	Marriage	Moved after birth	Moved with household	Others	
Total Migrants	4317454	617094	19210	93315	1816110	64636	1090702	616387	
States in India beyond the state of enumeration	1250575	291227	8263	27021	369611	14580	404739	135134	28.97
Uttar Pradesh	890663	203460	5587	13211	295933	9335	280962	82175	20.63
Last residence outside India	82198	26768	431	1823	12822	528	23315	16511	1.90

Bihar	76116	31963	363	1907	9207	763	24022	7891	1.76
NCT of Delhi	52002	7994	507	2121	11430	1276	20568	8106	1.20
Punjab	45667	8038	442	1068	12635	802	15849	6833	1.06
Haryana	33899	5667	397	1105	11327	524	10571	4308	0.79
West Bengal	26298	6803	182	598	6210	193	8658	3654	0.61
Himachal Pradesh	24089	3488	103	680	9328	286	6695	3509	0.56
Rajasthan	18410	3729	255	1223	3262	297	7023	2621	0.43
Madhya Pradesh	13268	2930	69	715	2094	147	5246	2067	0.31
Maharashtra	13114	2287	107	568	1645	223	5809	2475	0.30
Jharkhand	10768	5033	30	387	1449	103	2625	1141	0.25
Jammu & Kashmir	9268	1479	48	686	799	171	2826	3259	0.21
Assam	5731	1325	30	362	679	58	2261	1016	0.13
Gujarat	5344	1078	37	246	564	85	2435	899	0.12
Odisha	4224	1236	15	213	636	39	1312	773	0.10
Andhra Pradesh	3565	751	18	531	259	37	1356	613	0.08
Chhattisgarh	3239	988	9	136	588	23	1018	477	0.08
Chandigarh	2850	431	17	140	585	87	1141	449	0.07
Karnataka	2330	499	18	150	259	32	877	495	0.05
Kerala	1962	662	5	128	146	24	543	454	0.05
Tamil Nadu	1748	502	8	92	123	13	647	363	0.04
Unclassifiable	1566	295	7	63	321	35	462	383	0.04
Arunachal Pradesh	1232	189	2	184	62	8	401	386	0.03
Manipur	926	130	1	176	85	10	371	153	0.02
Meghalaya	880	108	1	68	79	3	414	207	0.02
Nagaland	729	101	3	66	47	8	356	148	0.02
Sikkim	612	109	2	135	57	7	172	130	0.01
Tripura	501	77	3	66	35	3	213	104	0.01
Lakshadweep	328	4	1	0	20	11	26	266	0.01
Mizoram	286	38	1	35	19	5	105	83	0.01
Goa	236	50	1	8	20	2	130	25	0.01
Andaman & Nicobar Islands	110	21	0	7	15	2	39	26	0.00
Puducherry	69	20	1	3	9	1	27	8	0.00
Dadra & Nagar Haveli	66	11	0	5	5	2	29	14	0.00
Daman & Diu	45	26	0	1	0	0	12	6	0.00
Source - Table D3 Uttarakhand Census 2011 - Registrar General of India Compiled by Dr. Ranju Joshi Pandey, Uttarakhand Open University States/UT arranged in descending order of proportion of migrants									

The data given in the table reveals that out of total 43.17 million migrants about 1.20million migrated from outside the State of enumeration which established that rest of persons (41.97

million) migrated from one district to another, from one town/village to another town/village etc within the Uttarakhand. Out of 1.20 million migrated from other States majority 0.89 million migrated from Uttar Pradesh comprising 20.63 percent of total migrants. About 1.90 percent migrated population (0.89 million) consists of those who migrated from other countries outside India. 0.76 million migrated from Bihar followed by Delhi from where 0.52 million migrated to Uttarakhand. A significant number of persons also migrated from Punjab (0.46 million) & Haryana (0.34 million). A very few people migrated from Southern and North East Part of India. These people migrated to Uttarakhand due to various reasons as depicted in above table.

Now in the following tables data has been presented for five top most states from where people migrated to Uttarakhand due to most effective reasons of migration viz, Employment, Education and Marriage.

State/ Union Territory	Total migrants	Number of migrants migrated for Work /Employment	Percentage to Total migrants from State
Jharkhand	10768	5033	46.74
Bihar	76116	31963	41.99
Kerala	1962	662	33.74
Chhattisgarh	3239	988	30.50
Odisha	4224	1236	29.26

Source - Table D-3 Uttarakhand -2011 Registrar General of India
Compiled by Dr. Ranju Joshi Pandey, Uttarakhand Open University

The data reveals that for work and Employment majority of people moved to Uttarakhand from Jharkhand and Bihar basically Jharkhand state has been created by cutting the geographical boundaries of Bihar. Jharkhand is in the top in terms of reason of work and employment from where 46.74 percent migrated for work and employment and from Bihar 41.99 percent people migrated to earn their livelihood as they reported the reason of work and employment for their migration to Uttarakhand. In terms of absolute value of migrant population though is in the top with 76116 migrant populations but in terms of proportion of migrant population it attains the second place as amongst migrant from Bihar many of them reported migrated due to family moves which indicate that Bihari migrants moved to Uttarakhand with their spouse and family. The Kerala occupied third place in terms of proportion of migrated population who migrated for the reason of employment. Fourth and Fifth place is occupied by Chhattisgarh & Odisha with percentage of 30.50 & 29.26 migrants who came to Uttarakhand for work & employment.

State/ Union Territory	Total migrants	Number of migrants migrated for Education	Percentage to Total migrants from State
Sikkim	612	135	22.06
Manipur	926	176	19.01
Arunachal Pradesh	1232	184	14.94
Andhra Pradesh	3565	531	14.89
Tripura	501	66	13.17

The above table depicts the data in terms of percentage of migrants to total migrants of the States/UT for top 5 States/UT from where people migrated to Uttarakhand due to the reason of education. The 5 top most States are Sikkim (22.06 %), Manipur (19.01%), Arunachal Pradesh (14.94%), Andhra Pradesh (14.89 %) & Tripura (13.17%). It is evident from the data that migration for the education taken place mostly from north eastern regions of the India.

State/ Union Territory	Total migrants	Number of migrants migrated due to marriage	Percentage to Total migrants from State
Himachal Pradesh	24089	9328	38.72
Haryana	33899	11327	33.41
Uttar Pradesh	890663	295933	33.23
Punjab	45667	12635	27.67
West Bengal	26298	6210	23.61

Marriage is another reason for which migration takes place. In terms of proportion of migrant population to the total migrants of that state it is evident from above table that 5 top most States from where migration took place on account of marriage are Himachal Pradesh (38.72 %), Haryana (33.14 %), Uttar Pradesh (33.23 %), Punjab (27.67%) and West Bengal (23.61%).The pattern indicates that Uttarakhand is having good social relations with the neighbouring states of northern/western part of India.

State	Number of Out Migrants		
	Persons	Males	Females
UTTAR PRADESH	3,93,540	97,329	2,96,211
NCT OF DELHI	2,94,704	1,54,496	1,40,208

HARYANA	77,179	34,402	42,777
PUNJAB	55,392	27,187	28,205
MAHARASHTRA	42,968	24,560	18,408
CHANDIGARH	31,164	17,198	13,966
RAJASTHAN	23,233	10,771	12,462
HIMACHAL PRADESH	22,740	9,092	13,648
MADHYA PRADESH	12,253	5,773	6,480
GUJARAT	11,938	6,678	5,260
KARNATAKA	5,177	2,959	2,218
WEST BENGAL	3,599	1,690	1,909
JAMMU & KASHMIR	3,180	1,633	1,547
CHHATTISGARH	2,509	1,325	1,184
ANDHRA PRADESH	2,306	1,209	1,097
JHARKHAND	1,396	602	794
ASSAM	1,194	732	462
MEGHALAYA	1,191	528	663
BIHAR	1,144	425	719
TAMIL NADU	1,040	602	438
ODISHA	931	564	367
KERALA	790	403	387
NAGALAND	751	295	456
DADRA & NAGAR HAVELI	707	487	220
GOA	658	382	276
ARUNACHAL PRADESH	450	252	198
DAMAN & DIU	405	291	114
SIKKIM	359	227	132
ANDAMAN & NICOBAR ISLANDS	255	117	138
MIZORAM	142	63	79
TRIPURA	141	69	72
MANIPUR	81	49	32
PUDUCHERRY	51	30	21
LAKSHADWEEP	2	1	1
Source - Table D-2 India 2011 Census, Registrar General of India Compiled by Dr. Ranju Joshi Pandey, Uttarakhand Open University			

The above table presents sex wise figures of persons migrated from Uttarakhand to Other States and States/UTs has been arranged in descending order of out migrant population. The data shows that from Uttarakhand people migrated to all the States/UT, though their number is very small in case of few States particularly in North Eastern States. The top 5 States to which people migrated from Uttarakhand are Uttar Pradesh, NCT of Delhi, Haryana, Punjab and Maharashtra. Looking at sex wise data it may be seen that to UP more female migrated as compared to male perhaps

more female migrated due to marriage. In case of Delhi and Maharashtra the migration of male is higher than that of females and reason can be attributed to the well known facts that male migrated due to work and employment unaccompanied with their spouse. In case of Haryana and Punjab the migration of more female as compared to male marriage may be the most effective reason. However to ascertain these presumptions separate analysis of data for all reasons of migration for all the states will be more appropriate and realistic.

Causes of migration

Present day migrations are the result of the growing process of industrialization, technological advancement and changes in the social and economic areas. The other factors which are responsible for population movements are wars, political events, and regional disparities in natural resources, in employment potentials, in wages and in availability of agricultural land. The factors causing or controlling migration vary considerably from region to region and also from person to person. Migration is a complex phenomenon and to know about the motives behind it is not easy. Various studies, which have been conducted in this field, are mostly of specific nature and it is difficult to generalize their findings so as to make the same applicable in different situations (Chandna, 2014). There are two types of factors responsible for migration they are “push and pull factors”.

Push factors: These factors function as out- migration and compel the people to migrate to other areas. People migrate due to unemployment, hunger and starvation, lack of facilities of basic need for life when they do not find means of livelihood in their home areas. Millions of people are migrate from villages, small town to the big cities because cities offer them a secure and better living conditions.

Pull factor: These factors operate as in- migration and attract the people to these areas. There are many factors in an area that attract more people to it. Urban centers provide a vast scope for employment in industries, transport, trade and other services and also offer modern facilities of life. As a result, cities pull people from other areas.

Sometime, both push and pull factors function simultaneously in the same area because of which it sometimes becomes difficult to differentiate between them. The causes of migration are numerous; they may be classified into four broad categories - natural, social, economic and demographic.

1. Natural causes of migration

Natural hazards such as flood, drought, climate change, volcanic eruption, earthquakes, etc. are responsible for the forced out migration of people. These all are the push forces which compel the people to leave their residential places and to move to other places. These factors are created out migration of the people.

2. Economic causes of migration

Economic intention constitutes the most important factor causing the movement of people from one region to another. The development of industry and technology, employment opportunities,

level of economic development, availability of fertile agricultural land, etc are economic factors that initiate the migration. The area of depressed economic conditions creates of out migration, whereas the area which has economic prosperity offer greater employment potential and attract in-migrants. The industrial pull is more dynamic than the agricultural push. Various economic factors determine the magnitude and direction of migration. The availability of good agricultural land is a most powerful economic factor determining magnitude and direction of population movement. The areas which have acute pressure of population upon their limited agricultural land cause out-migration, whereas those where new agricultural lands are reclaimed receive such migrants. Countries like India, where the process of agricultural development are in progress, have been witnessing such migration in the newly reclaimed areas or to the areas where extension of irrigation has improved the general conditions of agriculture. Terrai region of U.P and Dandakaranya of Madhya Pradesh, Odisha and Andhra Pradesh have been quoted in this regard.

The availability of employment opportunities is the next economic factor leading the magnitude and direction of migration. This is the powerful economic factor for the movement of population. The development of means of transport and communication in recent times also stimulated migratory tendencies. The expansion of transport network has increased the spatial interaction and has accelerated both migration and commuting. The most important for causing of migration was the desire to improve one's economic status.

3. Social causes of migration

Social factor also played important role to migrate people from one place to another. Some social customs that had create specific type of migration. For example, females move from the place of their parent's residence to the residence of their spouses at the time of marriage. 1. Marriage is a very important social factor for migration. 2. Religious freedom has been another social cause of migration. The large- scale sailing of 'Pilgrim Fathers'' across the Atlantic was also the product of the desire to preserve religious faith. The people of lower status were the most mobile. In India, low social-economic status people are more mobile because they have no landed property to tie them in their native places. 3. The availability of information through education, cultural contacts, and spatial interactions also widens the migration tendencies. The information network and cultural contact widens the horizons for job opportunities. 4. Education is another important reason for migration. Rural people migrate to the urban centres for higher education due to lack of educational facilities, especially those of higher education and many of them settle down in the cities for earning a livelihood after completing their education.

4. Political cause of migration

Political disturbances and interethnic conflicts forcedly people away from their homes. For example, a large number of people have migrated out of Jammu and Kashmir due to the disturbing conditions there. The Government policies also contribute to the population movement. For example, in the early years of Communist regime in China, a large number of people moved out from the countryside to the urban areas due to collective farming.

5. Demographic causes of migration

Demographic factors like age, sex, population density, over population, marital status, etc. play an important role in migration. Young adults were more migrating than other groups. The varying degrees of population pressure vis- a- vis resource potential of the area find expression through migration of population. In India, the people on large- scale have been migrating from densely populated parts of U.P, Bihar, West Bengal, largely due to a poor population –resource ratio in these areas. The relationship between human and physical resources forms the basis of all population movements.

Consequences of migration

Migration impacts both the regions of in and out migration to undergo changes in their demographic structures. With the movement of people from one area to another all the demographic attributes like numbers, density, growth, fertility, mortality, age, sex, literacy, etc. occurrence a quantitative change in their numerical expressions. The population decreases at the area of its origin and increases at the area of its destination. Migration is one of the major causes of high sex ratio in source areas and low sex ratio in the receiving areas. This happens because it is mostly the youthful male population which is involved in migration (Khullar, 2016). The youthful population is depleted to the source regions and this result in lowered rates of births and lower rates of growth. However, an inverse impact is observed in the structure of the population in receiving areas. At present, countries in Asia, Africa and Latin America are undergoing technological changes; this causes migration from rural to urban areas. Such migration has given rise to metropolitan cities. In India and in many other developing countries, growth of population, industrialization and economic development experience a rapid increase in internal migratory movements. The movement of people especially from rural – urban migration has attracted the attention of planners and policy –makers to the problems arising out of migration. Large scale rural- urban migration causes overcrowding, unplanned and haphazard growth of cities like slums and shanty colonies as well as putting tremendous pressure on the infrastructure. Cities are facing serious problems like water shortage, air and water pollution, problem of sewage disposal and management of solid wastes.

The effect on the resource- population ratio is one of the major economic consequences of migration. An increase in the density of population, through migration, brings more pressure on its resources and enhances the capacity to exploit its resource potential. The migrant people are facing serious adaption problems for instance, the rural migrants moving to the new industrial towns suffer from lack of pure air, dust, open space, etc. The case of respiratory problem is veryhigh among the people who migrate from rural areas to industrial towns. Migration affects the occupational structure of both the regions of out migration and in migration. In the region of out migration, the proportion of working population is lowered whereas working population in the region of in migration is increased. Thus the population of the receiving areas tends to become more productive. One of the serious consequences of migration is ‘brain drain’. This

refers to the movement of the skilled persons from the poorer countries to the developed countries in search of better economic opportunities for instance, migration of doctors and engineers from India to the U.S.A, U.K and Canada. However, the quality of human resources in the source region suffers a lot. Most people migrate for economic gain. Economic benefit is the most important consequence of migration. Out migrating people send remittance to their families at home and add to economic prosperity. Remittances from the International migrants are one of the major sources of foreign exchange. According to World Banks Migration and Remittances Factbook 2008, India is the top receiving of remittances from abroad. In India, Punjab, Kerala, Tamil Nadu receive very significant amounts from their international migrants. Remittances by internal migrants also play an important role in the economic growth of the source regions.

Migration has impacted deeply the life of women. The male members of the family migrate from rural to urban areas, leaving their wives behind at home puts tremendous physical and mental pressure on the women. Migration take place an intermixing of diverse cultures and leads to the evolution of composite culture. It breaks the narrow thought and widens the mental horizon of the people. But at the same time, migration has serious negative consequences i.e. anonymity, which creates a social vacuum and a sense of dejection among individuals. The immigrants bring with them their language, religion, tradition and other cultural values. Mostly, they not only try to preserve their culture and language but also try to spread. When and where two or more groups of people having different languages and socio- cultural values stay together, many serious problems come in the way of integration and amalgamation of people of different groups. For example the French and English people in Canada, the English and Dutch people in South Africa, Tamils and Sinhalese in Sri Lanka where people are confronted with such type of problems. But the interaction between people of different ethnic and cultural backgrounds in an area proceeds to the enrichment of civilization. It is well recognized that migration is mostly beneficial to human society.

5.4 CONCLUSION

Migration, in combination with fertility and mortality determines population size, growth of population and growth of labour force in an area. Industrialization and economic development causes, large – scale movements of people from farm areas to towns from towns to other towns and from country to another. The other factors such as wars, political events, and regional disparities in natural resources, in employment potentials, in wages and in availability of agricultural land are also responsible for population movements. The most important for causing of migration was the desire to improve one's economic status. Education is also an important reason for migration. Economic benefit is the most important consequence of migration. Therefore, movement of people is the product of the social, cultural, economic, political and physical circumstances in which individuals and societies find themselves. Rural to Urban migration is more prominent in the less developed countries. In India, a large number of males migrate from rural to urban areas, due to more employment opportunities in the urban areas.

5.5 SUMMARY

Migration is the movement of people from one place to another place. It is the third component of population change next to fertility and mortality. Migration, in combination with fertility and mortality determines population size, growth of population and growth of labour force in an area. A residential change from one tehsil to another within the district cannot be considered as a migratory movement. Change of residence from one district to another within the country, from one state to another and from one country to another may be considered to be migratory movements. Industrialization and economic development causes, large – scale movements of people from farm areas to towns from towns to other towns and from country to another. Wars, political events, and regional disparities in natural resources, in employment potentials, in wages and in availability of agricultural land are also responsible for population movements. The most important for causing of migration was the desire to improve one's economic status.

Migration may be classified into various types on the basis of motivation, distance and time. On the basis of motivation, migration can be classified as Economic migration and Social migration. On the basis of distance, migration may be classified as long-distance and short-distance. Migration may classify as permanent, temporary and periodic or seasonal migration based on time i.e. period of stay of the migrants. Migration can be also classified into two groups on the basis of areal size or scale (a) Internal Migration (b) International Migration. Migration of people within an area lying within the territorial jurisdiction of a country is known as Internal Migration. The Internal Migration is divided into four types –(a) Rural to Urban Migration (b) Urban to Urban Migration (c) Rural to Rural Migration (d) Urban to Rural Migration. People move from one country to another across the International borders, the migration is called International migration. The terms emigration and immigration are used to indicate out-migration and in-migration across the international borders, respectively.

International migration is as coercive labour migration which is a manifestation of dependency that promotes underdevelopment in the periphery and overdevelopment at the core. In the classical world, International migrations were considered as voluntary, rational attempts of the human beings to maximize utility and to attain social uplift. For the past several decades, Europe, Northern America and Oceania have been the main receivers of migrants. Net migration to these three major areas generally increased over time. The average annual net migration per year for the decade 1980- 1990 to these three areas was 1.3 million, during 1990-2000 was 2.5 million and 3.1 million during the decade 2000-2010. From 2010-2015, the average annual net migration was 2.2 million per year. But Africa, Asia and Latin America and the Caribbean have been net senders of international migrants. The countries where the number of out-migration have been more than the number of in- migration are China, Afghanistan, Bangladesh, India, Pakistan, Sri Lanka, Thailand, Philippines, Nigeria, Egypt, Libya, Ethiopia, Kenya, Zimbabwe, Portugal, Argentina, Colombia, Mexico, Cuba, Fiji while countries where the number of in-migration have been more than the number of out- migration are Japan, Republic of Korea, Bhutan, Singapore, Qatar, Kuwait, Israel, Saudi Arabia, Turkey, U.A.E, Bahrain, Iraq, Jordan,

Oman, Ghana, South Africa, Switzerland, Netherland, Germany, France, Belgium, Austria, Spain, Italy, United Kingdom, Sweden, Norway, Finland, Denmark, Russia Federation, Ukraine, Poland, Brazil, Chile, Canada, U.S.A, Australia and New Zealand. Annual Average Net Migration of U.S.A was 1008 thousand person. The country has received largest number of in - migrants among the major countries of the world.

The remote areas of the state of Uttarakhand are extremely backward. People who are living in remote and interior areas of the state have been moving in other developed places of the state as well as outside the state due to unemployment, lack of earning sector, poor road condition and connectivity, poor agricultural activities, poor educational system and poor medical facilities. The largest number of migrants migrated from Uttarakhand to Delhi was people moved with households and second largest moved was due to work or employment. Marriage is the main reason for migration of Uttarakhand's people in Uttar Pradesh however more females were migrated than males due to marriage. Among males, work or employment was the main reason for migration in Uttar Pradesh.

There are two types of factors responsible for the process of migration called push and pull factors. Push factor function as out- migration and compel the people to migrate to other areas. Pull factor operate as in- migration and attract the people to these areas.

The causes of migration are numerous; they may be classified into four broad categories - natural, social, economic and demographic. Economic intention constitutes the most important factor causing the movement of people from one region to another. With the movement of people from one area to another all the demographic attributes like numbers, density, growth, fertility, mortality, age, sex, literacy, etc. occurrence a quantitative change in their numerical expressions. The population decreases at the area of its origin and increases at the area of its destination. In India and in many other developing countries, growth of population, industrialization and economic development experience a rapid increase in internal migratory movements. Large scale rural- urban migration causes overcrowding in the cities and also causes unplanned and haphazard growth of cities like slums and shanty colonies as well as putting tremendous pressure on the infrastructure. Cities are faced serious problems like water shortage, air and water pollution, problem of sewage disposal and management of solid wastes. The effect on the resource- population ratio is one of the major economic consequences of migration. An increase in the density of population, through migration, brings more pressure on its resources and enhances the capacity to exploit its resource potential.

Out migrating people send remittance to their families at home and add to economic prosperity. Remittances from the International migrants are one of the major sources of foreign exchange. According to World Banks Migration and Remittances Fact book 2008, India is the top receiving of remittances from abroad. In India, Punjab, Kerala, Tamil Nadu receive very significant amounts from their international migrants. Remittances by internal migrants also play an important role in the economic growth of the source regions. The interaction between people of different ethnic and cultural backgrounds in an area proceeds to the enrichment of civilization. It is well recognized that migration is mostly beneficial to human society. Therefore, movement

of people is the product of the social, cultural, economic, political and physical circumstances in which individuals and societies find themselves.

5.6 GLOSSARY

Migration- The process of people travelling to a new place to live, usually in large numbers.

Mortality- The number of deaths within a particular society and within a particular period of time.

Push Pull factor-The push pull factors are those that drive people away from a place and draw people to a new location.

Rural - In relating to, the countryside rather than the town.

Urban - In relating to a town or city.

Deforestation- The action of clearing a wide area of trees.

Industrialization- The development of industries in a region on a wide scale.

5.7 ANSWER TO CHECK YOUR PROGRESS

Question 1: What is migration?

Question 2: Define all types of migration.

Question 3: Identify the causes of rural to urban migration.

Question 4: Explain the Consequences of Migration.

Question 5: Find out the reasons of out migrants of Uttarakhand to Other States.

Question 6: Find out population of net migrants in Uttarakhand.

Question 5: Write the notes on following topics:-

- a. Rural to Rural Migration.
- b. Rural to Urban Migration.
- c. Urban to Urban Migration.
- d. Urban to Rural Migration.
- e. International Migration.

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5.10 TERMINAL QUESTIONS

- Question 1. What is migration? Discuss the pattern of International Migration.
- Question 2. Explain the Consequences of Migration.
- Question 3. Describe the causes of migration.
- Question 4. Define all types of migration.
- Question 5. Discuss the pattern of Migration in India as per 2001 census.

UNIT 6 - SETTLEMENTS

6.1 OBJECTIVES

6.2 INTRODUCTION

6.3 TYPES OF HUMAN SETTLEMENTS

6.4 PATTERN OF HUMAN SETTLEMENTS

6.5 CONCLUSION

6.6 SUMMARY

6.7 GLOSSARY

6.8 ANSWER TO CHECK YOUR PROGRESS

6.9 REFERENCES

6.10 SUGGESTED READINGS

6.11 TERMINAL QUESTIONS

6.1 OBJECTIVES

After reading this unit you should be able to:

- Understand man's relationship with the environment.
- Better understand the origin of human settlement.
- Recognize the relationship between settlement and nature.
- Know the location and the size of human settlement.
- Better understand the different types of human settlement.
- Understand the interrelation between internal structure and outer shape or form of settlement.
- Know the various pattern of settlement.

6.2 INTRODUCTION

In human geography, the study of settlement is very important because the form of settlement in any particular region shows man's relation with the environment. The origin and development of human settlements depend mostly on the nature and availability of facilities for human habitation of the place. The formation of human settlements occurred before recorded history, so the actual reasons behind its formation are not clear. Shelter is one of the most important basic needs of human being next to food. Human being need sound sleep and rest safely at some place. They have selected caves, rock-cut hiding places, tree branches for construction of houses for their shelter. These places of shelter were becoming actual expression of human cultural activities and assume various forms as well as names. Men started building houses that result in a group of dwelling later further becomes "Settlement". Therefore, human habitation was established and laid foundation for civilization on the surface of the earth. Settlements have grown up gradually and evolved over a long period of time. Men construct houses and developed settlement to protect them from weather and to enjoy social life. Before the domestication of animals and plants and the establishment of permanent settlements, human beings were nomads and wandered across all over the places in search of food and water. The main reasons for the establishments of settlement have religious, cultural, military, political and economic influences.

From the study of site, pattern and arrangement of settlements, we can see something of the history of man's exploitation of the surrounding land. Thus, settlement is man's important step towards adapting himself to his physical environment. Soil, water, forest, availability of building materials, defensive locations, dry points free from floods and mineral resources are important factors, which affect the growth and development of human settlement. Settlements not only reflect man's relationship to his natural environment but also the religious and social customs of his society. In a town or village, some buildings are always reserved for public use such as a town or village hall, a church, mosque or temple, administrative buildings or palace of the local ruler. Such type of buildings helps to give settlements their uniqueness. From the very beginning settlements usually developed near rivers, lakes and springs where water could be

easily obtained because water is the one of the most crucial basic needs of human beings. These water bodies provide water for cooking, drinking, washing, irrigation, navigation facilities and defense. The ultimate goal of human activity is his own welfare while settling somewhere on the earth. In fact size, shape, form, layout, types and patterns are the elements of a settlement.

6.3 TYPES OF HUMAN SETTLEMENT

In simple language, type of settlement means the degree of dispersion or nucleation of the dwellings. Settlement type is determined by the extent of the built-up area and the distance between the houses. The term “settlement” refers to a group of houses or huts with a certain planned layout. It includes the buildings meant for residential or other purposes as well as the streets or the roads which connect them together. According to Richthofen, settlement is the natural manner in which man established himself on the earth’s surface.

Many Geographers have suggested various schemes for the classification of settlements. According to Leong and Morgan, settlement can be classified in several different ways but the most obvious classification is into towns and villages. They have also suggested that settlement can be classified by their pattern or shape such as dispersed settlement and compact or nucleated settlement. Einch and Trewartha et al. refer to two main types of settlement such as the isolated or dispersed and the nucleated. On the basis of their sites and position, settlement can also be classified into dry point settlement, wet point settlement and fortified settlement. Some Geographers also tried to produce regional classifications on the basis of size, degree of compactness, shape and regularity of settlements. With the development of ‘Settlement Geography’, Geographers also developed the classification using both the morphological and functional characteristics of the settlements.

In general, settlement can be broadly divided into two types; rural settlement and urban settlement. The rural and urban are relative terms with having varied meanings in relation to the type of population and the mode of life of people in the settlement. The main differences between rural and urban settlements are the size, economic activities, density of houses, density of population, type of houses, land use and land cover, cultural development, administration, standard of living etc.

Rural Settlement

In rural settlement most of the people are engaged in primary activities such as agriculture, fishing, forestry etc and density of population is relatively low. According to D.R. Khullar, rural settlement refers to cluster of dwellings called ‘Villages’ together with the surrounding land from which the inhabitants derive their sustenance. Bruhnes has termed village as the collection of houses and residents of the most numerous aggregations. Richthofen describe villages are the groups of families united by common descent or at least having rites in common who cleave to one another because of the necessity for cooperating in the cultivation of the same crops. In

India, rural landscape is mainly dominated by the villages and the primary activities are carried out by the residents of those villages.

Different types of rural settlements are responsible by various factors and conditions. These major factors are

(i) Physical features such as natures of terrain, altitude, climate, availability of water .Soil also played a vital role in determining spacing of settlement.

(ii) Cultural and ethnic factors such as social structure, caste, religion are important factors to determine the type of a settlement. For example, lower caste people generally live on the periphery away from upper caste settlement which shows social segregation that further leads to fragmentation of a compact settlement into several units.

(iii) Security factors – region which were exposed to frequent invasions from outside villagers preferred to live in compact settlements which help them a lot in defending against their enemies. Some village people are also preferred to built houses closely to each other and live together to protect themselves from theft, burglaries and robberies.

There are four main types of rural settlement. They are:

(i) Dispersed Settlements

When all the dwellings in a settlement are not close to each other, and are separated from one another by large upon spaces, the settlement is called dispersed settlement. The inhabitants of this settlement live in isolated dwellings spread in the cultivated fields. Although such type of dwelling is lack of neighborhoods, communal interdependence and social interactions. Dispersed settlements are mainly found in the areas of extreme climates, mountainous and hilly tracts, thick forests, grasslands, poor agricultural lands, areas of extensive cultivation as well as the areas where it is essential that the farmer should live on his agricultural land rather than in a distant village.

Fig.6.1. Dispersed Settlement



Source: Google

The Prairies grassland of U.S.A and Canada, Pampas of Argentina, Velds of South Africa, Downs of Australia, Steppee grassland of Kazakistan, Uzbekistan, Turkmenistan, Kirgistan, east

of Ural and in our country, desert and semi desert regions of Rajasthan, forest land of North East States, Siwaliks, side valley of Jammu and Kashmir, higher altitude of Himalayas, parts of peninsular are the regions of dispersed settlement. .

(ii) Hamleted settlements

Sometimes a settlement is divided into a number of clusters all located in a little distance from the main settlement. This type of settlements is called Hamleted settlement. This settlement is a consequence of over population in the main village and sometimes it occurs due to social customs. In some cases, the Hamleted settlement develops around a village because the lower caste people serving the village community are not allowed to settle in the village itself. Hamleted settlements are found in the eastern parts of Uttar Pradesh, Bihar, West Bengal, Madhya Pradesh and Coastal plain.

Fig. 6.2. Hamleted Settlement



Source: Google

(iii) Semi-compact settlement.

The settlement which is marked by one main village with two to five or more hamlets have populations of 100 to 200, it referred to as semi- compact settlement. These hamlets would be connected with main village by the foot path or bullock cart tracks. This is also a transitional phase in the growth of compact settlement. Such type of settlement may result from the tendency of clustering in a restricted area of dispersed settlement or the scattered settlements start taking the shape of semi- compact settlements as the new technology is adopted and the increase of population. Increase of population can cause village growth and increases the number of houses in the village. These houses started occupying the open spaces and lead to semi- compact settlement which ultimately acquires the shape of a nucleated or compact settlement. This settlement also may result from segregation or fragmentation of a large compact village. In such cases, the central part of the main village is occupied by the land-owning and dominant community but lower strata people of the society and workers are settled on the outer area of the village. Semi-compact settlements are found in the east of Aravallis, state of Rajasthan, hilly tracts of Madhya Pradesh, Arunachal Pradesh, Meghalaya, Manipur, Mizoram, Tripura, Sikkim, Siwaliks, Brahmaputra valley and Gujarat plain.

Fig.6.3. Semi-compact Settlement



Source: Google

(iv) Compact or Nucleated settlement

The settlement in which all the dwelling are built in close proximity to each other without much of intervening space are called Compact or Nucleated settlement. Such type of settlement is based on farming, comprises houses, farm structures and other buildings such as religious centers, with fields for grazing animals and growing crops surrounding the village buildings. The field must be accessible to the farmers and are located within a radius of two or three kilometers from the village and houses. This settlement is generally found in the highly productive alluvial plains. In this type of settlement, the general living area is distinct and separated from the surrounding farms, barns and pastures. Flat plains with soils, sufficient rainfall, and agglomeration of water point, a high water table, perennial river, and need of cooperation, social, economic and religious thoughts, crop pattern, rich forest and insecurity in the past are the main forces which have led to the origin of the compact settlement. Compact settlement are found in the intensively cultivated plains and valleys of countries such as Northern India, Eastern China, Egypt, Syria, Bangladesh, Pakistan, Myanmar, Java, Thailand, Sri Lanka, Nepal, Pakistan, Mexico, Brazil, Kenya and North-Western European plains.

Fig.6.4. Compact Settlement



Source: Google

Compact settlements are also found in many of the hunting and fishing communities. For instance, the American Red Indians hunting and fishing tribes are living in big villages, because compactness is needed for making, maintaining and handling fishing boats. Compact settlements at the tops of hills and ridges of Nagaland are the results of the practice of head-hunting in the past, where people of each settlement have to depute volunteers from each family to work as the watchmen in nights against the invading head-hunting. In the productive alluvial regions like Indo-Gangetic Plains, Hawang Ho valley, the valley of Nile etc., compact settlements got established during the pre-historic period.

Urban Settlement

Urban settlements are those settlements where people are mostly employed in secondary, tertiary and quaternary activities. The major activities of people are trade and commerce, services, manufacturing, construction etc. Town and cities are the forms of urban settlement. Towns are of many different sizes, there is no particular size in order to become town ranging from small country towns, to enormous sprawling cities with several million inhabitants. In fact site, situation and function are inseparably related in town development. And inertia is an important factor in this development. The first towns grew up as trading centers at advantageous locations along ancient route ways and they were established not only by the traveling traders but also by the local inhabitants. The Jews played a major role for the development of medieval towns in Europe. In other areas start of town growth were helped by the traders of India, China and Arab. The development of a town is based on its relationship with the surrounding region. The growth and development of many river valley civilizations in the world led to the origin of towns at favorable locations as permanent human settlements. The origin of urban centers has been traced to about 5000 B.C. The development of cities in the Greek-Roman world started in 600 B.C. to 400 A.D. In India, the development of urban area was associated with the development of Indus Valley civilization dating back to 2350 B.C. lead

According to Jean Brunches, a town can be said to exist if the majority of population spend the greater part of its time within the bounds of the agglomeration. F.Ratzel define a city is a contiguous and dense agglomeration of people and dwellings occupying a large area of ground and lying at the focus of great trade routes. According to Census of India the minimum population for a town is 5000 whereas towns with population of 1, 00,000 and above are called cities.

Classification of Town

Various Geographers have attempted to classify towns in many ways. However, the most important and meaningful classification is based on population size, function and the age.

Town classification based on age

J.M. Houston recognized three stages of city growth base on age. They are:

1. The Nuclear Stage

This city is in the early stage of development and presented by central area of a large town confined by walls on the outer fringe.

2. The Formative Stage

Formative stage cities are developed following the Industrial Revolution. The extension of industrial revolution has changed the transport and trade. Outside the central area many houses were built and factories lay along the lines of transport and communication.

3. The Modern Stage

Cities are in rapid growth in this stage. Effective efficiency of transport has favored a link between the centre and the suburbs.

Griffith Taylor also recognized four stages of cities growth base on the age. They are

1. The Infantile Stage

Infantile stage cities are at an initial stage of development where no separation between domestic and commercial areas or rich and poor residential areas and buildings and lawns are haphazardly distributed. For example Teghra in Begusarai district.

2. The Juvenile Stage

In this stage, concentration of commercial activity starts at the centre. The residential houses are established in the fringe areas and factories come up in between. Toronto is an example of this stage.

3. The Maturity Stage

In this stage, residential areas of poor are closer to the centre and the richer at the outer fringe, well separating between the two classes. Commercial and industrial areas are well established particularly along the railway lines and on the sides of the lake. Delhi, London, Ontario are some of the examples of Maturity stage.

4. The Senility Stage

After attaining the maturity stage, the senility stage takes place when the growth of the cities stops. Decays of some districts and decline in economic development occurred in this stage. Industrial towns of Lancashire, Yorkshire and Durham in Britain and Agra, Fatepur Sikri, Mathura and Muzzaffarnagar in U. P are some of the example of senility stage.

Mumford's classification of Town

Mumford in his classification compares a town as a living organism and demonstrates how a single town resembles a whole civilization. According to him, a town rises through three stages and then sinks through another three. They are

1. Eopolis

Eopolis is the earliest stage of a city evolution. It is a small town originated from village which is dominated by agriculture, mining and fishing.

2. Polis

This stage is marked by a small market town with some manufactures, dependent upon the region. Small markets are developed to serve the newly developed town.

3. Metropolis

It is a very large city with at least ten lakhs of population that develops under favorable circumstances. Metropolis city dominates its surrounding cities, towns and villages along with a number of industries and outgrowth of residential colonies in its suburb. Struggle of class, integration of culture, retail business and bankers and university level of education could be found in this stage.

4. Megalopolis

Megalopolis is a highly bloated and urbanized city. It is formed when several cities and metropolises merged together. Megalopolis is an urban area where material wealth dominates life, original art, varieties of business, development of industry, size dominates form and the evils of bureaucracy intensify. For instance, early 20th century New York, 18th century Paris, 22th century Rome.

5. Tyrannopolis

City of Tyrannopolis, predominates countrywide urbanization. In this stage, wealth demonstration and extravagance become the yardsticks culture, good living and the expansion of trades and commerce of both national and international levels.

6. Necropolis

This is the last stage of the decline of urbanization and it is also known as city of the dead. This stage may attained due to war, famine or disease, deterioration of living conditions, decline of municipal services, decay of cultural institutions and the city begins to resemble a shell-like ancient Babylon and Nineveh, Vaishali, Mohanjodaro and Harappa.

Classification of Town base on population

On the basis of number of inhabitants in an urban centre, town can be classified as follows,

Towns having a population below 50,000 are called small town. For instance, Mussoorie, Nainital in Uttarakhand, Rajouri in Jammu and Kashmir, Sohna in Haryana. Major Towns having population ranges between 50,000 to 99,999. Rudrapur in Uttarakhand, Tezpur in Assam, Port Blair in Andaman and Nicobar Island etc, are some example of major town. A town which has above 1, 00000 populations is called a city. For example, Haldwani, Dehradun in Uttarakhand, Aligarh in Uttar Pradesh, Alwar in Rajasthan, Puri in Orrisa etc. City which has a

population of 10,00,000 is called metropolis. Delhi, Mumbai, Kolkata, Hyderabad, Chennai etc are the example of metropolis.

The towns have been classified on the basis of many factors such as age, population, geographical location etc. but the most important classification is based on the functions performed by a city. Most of the town performed multifunctional role. However, small towns are dominated by a single function. Thus, on the basis of dominant function performed by the town/city, it can be classified into the following types of towns.

1. Administrative Town

Towns which perform important administrative functions are known as administrative town. They are mainly the capital city of country, states, and district headquarters. Examples of Administrative Towns are New Delhi, London, Chandigarh, Dehradun etc.

2. Commercial Towns

Commercial towns are those where their dominant function is trade and commerce. These towns have houses of business, insurance company, banks and financial organization and offer commercial services. New York, London, Amsterdam, Kolkata, Kanpur, Bhopal etc are the example of commercial towns.

3. Industrial Towns

These are towns whose main function is transforming raw materials into manufactured goods. These towns have an efficient network of transport and communication with those towns which supply raw materials. Glasgow in England, Nagasaki in Japan, Chicago in the U.S.A, Kanpur, Mumbai, Modinagar, Jamshedpur, Hugli etc are some examples.

4. Mining Town

A town, whose main function is mining of minerals like coal, limestone, goal, silver, mica, iron etc is known as mining town. These towns comprise large industries related to mineral mines and these locations are largely governed by the availability of mineral resources. For instance, Raniganj, Jharia, Bokaro, Kiruma in Sweden, Pennsylvania in the U.S.A etc.

5. Transport Town

Transport towns mainly engaged in export and import activities and produce transport equipments. These towns also serve as a main transport junction. Such transport towns are Kandla, Vishakhapatnam, Chennai, Mumbai, Kathgodam etc.

6. Defence Town

These towns have defensive functions. They have barracks, training facilities, cantonments, special air fields, docks and harbors for naval vessels etc. Such towns are also called garrison towns. For example, Nova Scotia in Canada, Plymouth in England, Cochi, Chennai, Ambala etc.

7. Cultural Town

Towns which have cultural functions like provision of education, art, religion etc are known as cultural towns. For example, Cambridge, Oxford, Harvard, Aligarh, Roorki etc are educational town, Mathura, Haridwar, Ujjain, Madurai, Kurukshetra, Amritsar, Mecca etc are religious town, Mumbai, Hollywood etc are entertainment town.

8. Tourist Town

A town which functioned as a recreation centre is called tourist town. Such types of towns are located in favorable geographical area and salubrious climatic conditions. These towns may be coastal, hill and health resorts and also have a very clean environment than other towns. Some tourist towns are Mussoorie, Nainital, Chennai, Kerala, Drjeeling, Shimla etc.

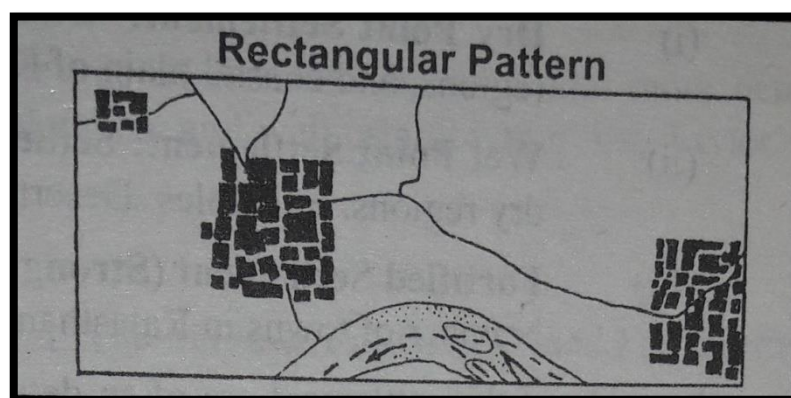
6.4 PATTERN OF HUMAN SETTLEMENTS

The patterns of settlement refer to geometrical shapes formed by the arrangement of dwellings. Physical and cultural factors are responsible for various types of agglomerations and dispersions. The site of the village and the surrounding topography and terrain influence the shape and size of a village. The external shape of the morphological structure of settlements reveal some geometrical form as a result of definite layout of houses, streets, open spaces etc. in relation to the field. In fact, the pattern of settlement is the outcome of a series of adjustments to the environment which have been going on for centuries. Moreover, socio- cultural factors like caste structure of the people living in a village and the functional needs of the people also have a close bearing on its shape and size. In the valleys of mountainous areas, the pattern of settlement is generally linear, while in the fertile plains their shapes may be rectangular, near the lakes and ponds the settlements are of circular or semi-circular type while at the cross roads, the shape may be rectangular, circular or triangular. The settlement pattern may be broadly classified under the following:

Rectangular Pattern

Rectangular settlements mainly develop at the crossing of two arteries of transport. This type of settlements pattern is develop in productive alluvial plains and wide intermontane valleys. The lanes in the rectangular settlements are almost straight, meeting each other at right angles. The rural settlements of the Sutlei- Ganga plains especially those which developed on the cross-roads, fall in this category. The well- planned settlements of Germany, Russia, Central Asian Republics, China, and North and South Korean, Vietnam, Malaysia, Israel and France are some example of rectangular pattern.

Fig 6.5 Rectangular Pattern

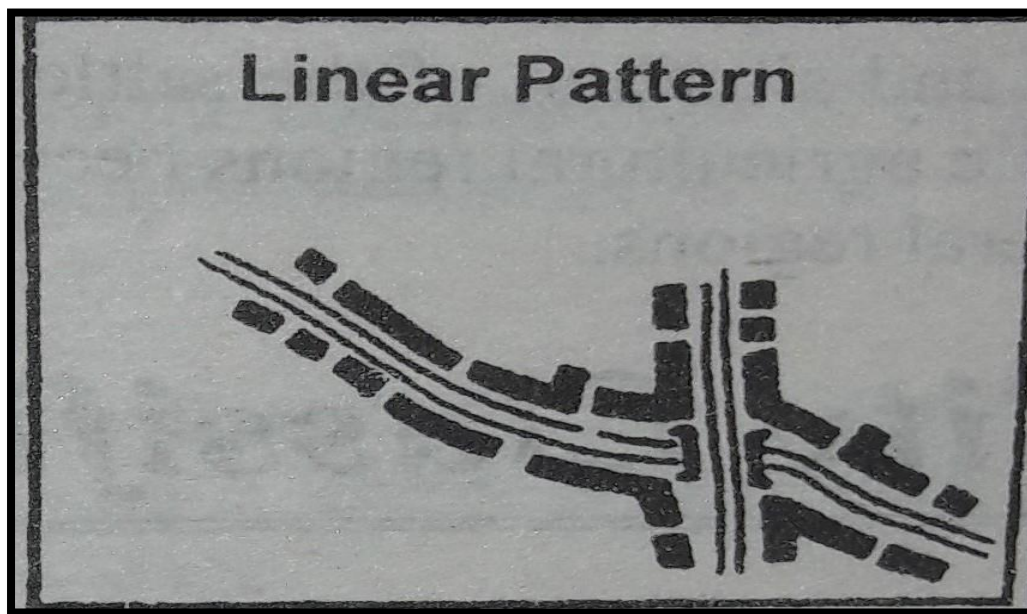


Source: Book of Human Geography

Linear Pattern

When the houses in a settlement are arranged in a straight line on two sides of a road or canal or railway line or along some geomorphological features like a riverbank or levee or a coastline the resultant pattern of settlement is called linear pattern. This type of pattern is one of the most important designs of settlements. Terrain and topography features are responsible for the development of linear settlement in the hilly areas. Along the river banks and the sea shores, the flood and water level influence linear settlements. Such type of settlements are found in the Middle Himalayas, Alps, Rockies, Andese, Pyrenes, Pamir, Hidukush, Zagros, Elbuz, Siwaliks and along the roads in the plains of Ganga- Yamuna Doab and villages in the canal irrigated parts of North India.

Fig 6.6 Linear Pattern



Source: Book of Human Geography

Triangular Pattern

When the shape of the settlement resembles a triangle, it is known as triangular pattern. This type of pattern is generally developed at the confluence of rivers. The lateral expansion of houses at the confluence is constrained by the rivers. Consequently, the settlement acquires a triangular shape.

Star- Like Pattern

When the dwelling in settlements are aligned along a number of roads, all radiating outwards from the centre, the shape of the settlement is star-like. Star- like pattern of settlement is found both in villages as well as in towns. This is caused mostly by new development, spreading out along the major roads and is developing on the sites and places where several metalled roads converge. This pattern of settlement is found in the countryside of North-West Europe, plains of Yangtze-kiang, Punjab province of Pakistan and the Sutlej- Yamuna plains.

Circular Pattern

When the settlement develops in such a manner that at the centre of it lies a water body like a pond or a lake, the resultant pattern is called circular pattern. Since the people prefer to stay near the water bodies, they construct their houses along the banks. Such settlements acquire the circular or semi-circular shapes. This settlement is found in the vicinity of crater lakes and on the levees of Ox-bow lakes, hill top villages of Italy and also found in desert regions around Oasis. The main occupation of the people of circular settlements is to earn their livelihood is either by catching fish or by providing services to the tourists.

Nebular Pattern

When the shape of a settlement looks like a 'nebula', the resultant pattern is called nebular pattern. The arrangement of roads is almost circular which ends at the central location or the nucleus of the settlement. The size of this settlement is usually small and mainly develops around the house of the main village landlord or around the mosque, temple or church. Such type of pattern is found in several villages of the Ganga-Yamuna Doab.

Elongated Pattern

When the houses are simple arranging along a line or a series of lines, the resulted pattern is called an elongated pattern. The settlement is extended in one direction and restricted in another due to certain physical features. This pattern is found along the higher ground level in inundated areas, dissected topography from two sides, narrow strip between two streams and at the edge of an alluvial terrace.

T shape Pattern

When a limb develops from a main rectangular or elongated form of village into T shape, the resultant pattern is called T shape pattern. This type of pattern develops at tri-junction of the roads and houses are built along the roads forming T-shaped settlement.

Radial Pattern

Radial pattern of settlement is developed when various roads and streets coming from different directions converge at a site and the point of convergence of roads forms the core of the settlement. People build their houses along the streets or roads which radiate outward from the central portion of the settlement. The central part is occupied by important structures such as landlord's house, temple, mosques or by socio-cultural buildings. This pattern of settlement is found mostly on those villages which are planned.

6.5 CONCLUSION

Settlement and its surrounding environment are mutually interdependent. Men constructed houses and developed settlement to protect themselves from weather and to enjoy social life. They started building houses which result in a group of dwelling later further becomes "Settlement". Settlement can be broadly divided into two types; rural settlement and urban settlement. Physical, Cultural and ethnic and security factors are responsible for occurring different type of rural settlement. There are four main types of rural settlement such as dispersed,

hamleted, semi-compact and compact settlements. Towns are classified based on population size, function and the age. According to J.M. Houston, city was classified into three stages based on age that is Nuclear Stage, Formative Stage and Modern Stage whereas Small Town, Major Town, City and Metropolis are classified base on population size. But the most important classification is based on the functions performed by a city. They are Administrative Town, Commercial Town, Industrial Town, Mining Town, Transport Town, Defense Town, Cultural Town and Tourist Town. Rectangular Pattern, Linear Pattern, Triangular Pattern, Star- like Pattern, Circular Pattern, Nebular Pattern, Elongated Pattern, T shape Pattern, Radial Pattern are the major settlement pattern.

6.6 Summary

The study of human settlement is to understand man's relationship with the environment, to know its origin, location and size. This study also tried to identify the different types of human settlement as well as various pattern of settlement. The origin and development of human settlements depend mostly on the nature and availability of facilities for human habitation of the place. Shelter is one of the most important basic needs of human being next to food. Human being need sound sleep and rest safely at some place. Men started building houses that result in a group of dwelling later further becomes "Settlement". Men construct houses and developed settlement to protect themselves from weather and to enjoy social life. Therefore, human habitation was established and laid foundation for civilization on the surface of the earth. Settlements have grown up gradually and evolved over a long period of time.

6.7 GLOSSARY

Established – Set up on a permanent.

Settlement- Settlement is any form of human dwelling, from the smallest house to the largest city.

Civilization- The stage of human social development which is considered most advanced.

Tourist- A person who is travelling a place for pleasure.

Cultural- Relating to the ideas, customs and social behavior of a society.

6.8 ANSWER TO CHECK YOUR PROGRESS

1. Describe briefly the origin of human settlement.
2. Define settlement.
3. What are the two types of human settlements classified on the basis of function?
4. Explain type of rural settlement.
5. State the factors and the conditions which are responsible for the different types of rural settlement.
6. What is mean by dispersed settlement?
7. Define compact settlement.

8. What is a town?
9. Explain the classification of town base on age?
8. Write short note on:
 - (i) Linear Pattern
 - (ii) Rectangular Pattern
 - (iii) Circular and semi –circular Pattern
 - (iv) Triangular Pattern

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6.10 SUGGESTED READING

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6.11 TERMINAL QUESTIONS

1. What is a settlement? Describe the various types of human settlements.
2. What are the different types of settlement patterns? Explain them.
3. Explain the various classification of town.
4. Describe the functional classification of urban settlement.

BLOCK 3 - ECONOMY

UNIT 7 - EVOLUTION OF HUMAN ECONOMY

7.1 OBJECTIVES

7.2 INTRODUCTION

7.3 EVOLUTION OF HUMAN ECONOMY

7.4 SEQUENCE OF HUMAN OCCUPANCE

7.5 CONCLUSION

7.6 SUMMARY

7.7 GLOSSARY

7.8 ANSWER TO CHECK YOUR PROGRESS

7.9 REFERENCE

7.10 SUGGESTED READINGS

7.11 TERMINAL QUESTIONS

7.1 OBJECTIVES

The purpose of this unit is to provide you with an understanding about the gradual development of human economy and also discuss the sequence of human occupancy.

After reading this unit you should be able to:

- Describe the concept of human economy
- Trace the development of human economic activities
- Classify various human economic activities
- Sequence of human occupancy

7.2 INTRODUCTION

You have learnt about the human habitation in the previous block which explains that human habitation has been affected by various natural and human factors. Similarly, human economy has also been affected by the same elements. The choice of economic activity human pursued for their livelihood depends upon relief, climate, soil, vegetation, water resources, mineral resources, technology etc. For example, the kind of knowledge, skills and technology used in a cold region to attain livelihood may not be applicable in desert regions. It is the complex action and influence of environmental and human elements decide the economic activities of the people in a particular area.

Keith defined “human economy is the result of set of process that involves its culture, values, education, technological evolution, history, social organization, political structure and legal system as well as its geographical, natural resource endowment and ecology as main factors”. The objective of human economy is to sustain life and serves the need of the whole humanity and not just a narrow individual. In other words, human economy is based on the economic activities performed by the people. Therefore, all the occupations come under human economic activities. It is important to understand the evolution of human economy because it affects the social and economic well-being and opportunities of people living in different areas. It also influences the distribution of environmental impacts.

Human Economy: Types and Elements

Human economy changes over the period of time due to changes in the technology and innovation. On the basis of organization of economies, there are three major types of economic systems: subsistence economy, commercial economy and planned economy. Major Characteristics of Economic Organization are discussed in figure 7.1.

Figure 7.1: Characteristics of Economic Organization

<i>Subsistence</i>	<i>Reciprocal</i>	<i>Peasant</i>	<i>Redistributive</i>	<i>Market commercial</i>
Absence of machine technology			Complex Technology	
Limited exchange	Reciprocal exchange	Peripheral market	'State' market	Market
Market less				
	Value of 'gifts'	Money variable	All-purpose money	
Production unit: family, kinship			Production state-managed	Production by institutional units
Distribution relatively complex			Distribution state organised	Distribution by market
Production and distribution units: multipurpose social units			Production and distribution units economically oriented	
Primary activities dominant			Secondary and tertiary activities dominant	
Craft specialised		Cottage industries	Large industrial units	

Source: Saxena, 2013

- a) Subsistence economy is a non-monetary economy in which goods and services are created for the use of the producers and their kinship groups. Therefore, economic surplus is minimal resulting in little exchange of goods and only limited need for markets.
- b) Commercial economy is a self-managed economy in which economic decisions are made by individuals and are based on market determined demand and supply. Market competition is very important in shaping the production decisions and distribution patterns. The laws of supply and demand determine their price and quantity of a commodity. Producers freely market their goods and services and their prices are determined in a free price system.
- c) Planned economy is also known as command economy. In this economy, government controls the economic decisions. Through a government agency both supply and price are regulated. The production of a commodity and its locational patterns are carefully programmed by central planning departments.

Elements of Human Economy

An economic system has five economic elements or sectors. On the basis of physical, regional and cultural variation, human activities which generate income are known as economic activities

and have been divided into five categories: Primary, Secondary, Tertiary, Quaternary and Quinary (Fig 7.2). Map 7.3 provides the distribution of major human economic activities.

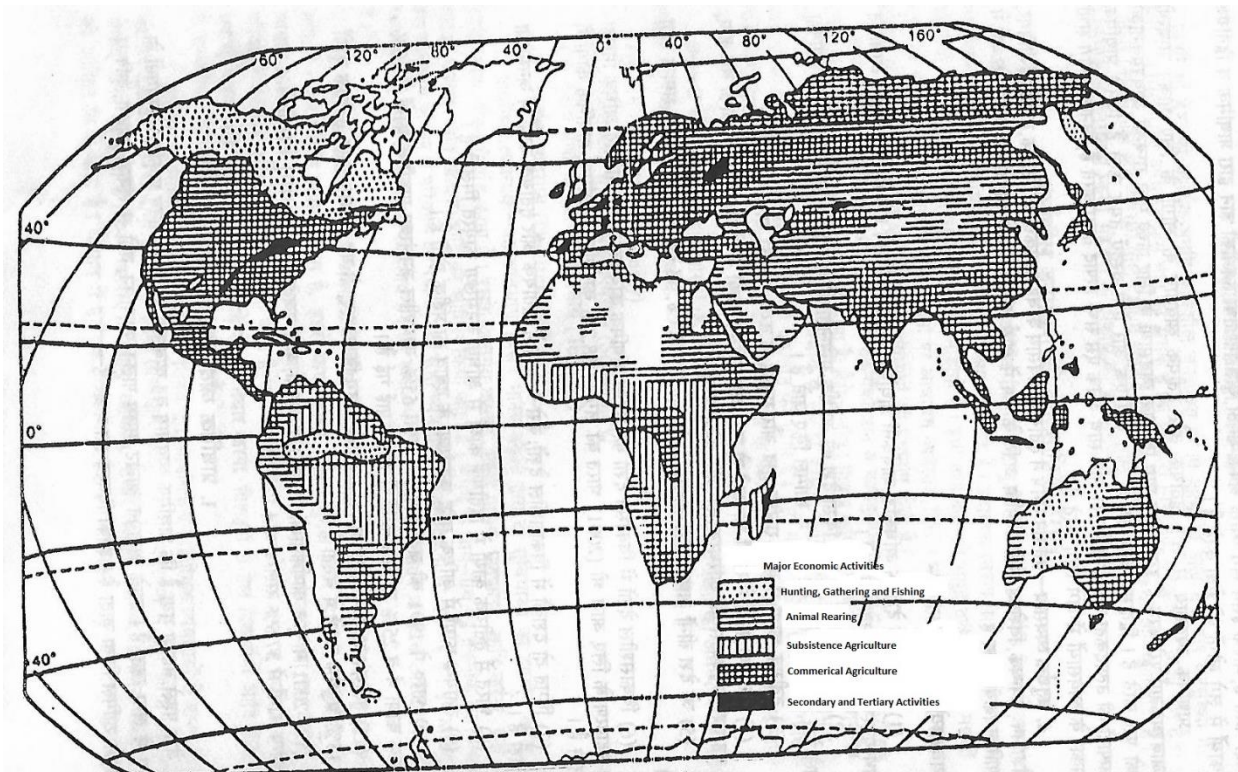
Figure 7.2: Types of Human Economic Activities



Source: Prepared by Author

All activities are linked with Transportation and Communication

Map 7.3: Distribution of Major Human Economic Activities



Source: Alka Gautam (2010)

The five main sectors of the economy do not stand alone. They are connected and integrated with transportation and communication services and facilities not assigned to any sector but common to all (Figure 7.2).

Primary sector of the economy is directly dependent on nature as it extracts raw materials directly from the earth. It includes agriculture, forestry, fishing and mining. For example, minerals and ores are natural products and obtained by the mining and quarrying. These activities are called 'Primary' as they provided the foundation or products for all the other sectors on economy. People engage in primary activity are called red-collar workers due to outdoor nature of their work.

Secondary sector transform the natural products obtained from primary sector are then process them and changed into more usable forms or goods. For example, they add value by making copper into wire, and wheat into flour, bread, biscuit etc. Since these activities are associated with manufacturing of finished goods, they are known as industrial/ manufacturing activities. People involved in this sector are called blue collar workers.

Tertiary sector supplies services to consumers as they do not produce goods. On the other hand, they depend on the goods that are produced and manufactured by the primary and secondary sectors. The goods produced in the other two sectors needs to be transported or stored in a storeroom. Therefore this sector either sells or provides service to consumers. People participate in tertiary activity are called pink collar workers.

Quaternary sector are specialized tertiary activities in the 'Knowledge Sector'. It involves the knowledge and skill based part of the economy. Activities associated with this sector include information technology; media, research and development, education, financial planning etc. People participates in tertiary activity are called white collar workers.

Quinary sector of the economy provides services that focus on the creation, re-arrangement and interpretation of new and existing idea or technology. This sector includes the highest levels of decision making in economy. People participate in this sector are called gold collar professions.

7.3 EVOLUTION OF HUMAN ECONOMY

Evolutionary changes in human civilization changed the economic activities and economic systems. Human economy has evolved in the different period of human civilization. It can be divided into prehistoric period, ancient period, medieval period and modern period.

Prehistoric period:

The prehistoric period dated back to two million years ago. Based on the technology of stone tools the different stages have been identified in this period: Palaeolithic age (Old Stone Age) and Neolithic (New Stone Age) age.

In Palaeolithic age, human started making tools using stone, bones and woods and adopted hunting and gathering as the main economic activity. The earliest criteria for livelihood of an area were access to source of water, least effort and continuous food supply and security. The two major feature of this age was discovery and control of fire and gender based division of

labour and sharing of food which has shaped the economy of that time. Thus, during this period humans evolved from an unspecialized food gather to a specialized hunter-gather.

Neolithic age is characterized by grinding and polishing of stone and advent of agriculture, settled lifestyle, pottery, domestication of animals. Middle East, Meso and Andean America and South East Asia were the main site of agriculture. This age was marked by the invention of wheel which has provided the base for the development of small scale secondary and tertiary activities. Main sites of Neolithic age were in West Asia (Mesopotamia), Egypt, India and China.

In the prehistoric period, human learnt the art of cultivation of plants and domestication of animals. Initially they domesticated goats, sheep, pigs, and later horses and donkey. With this humans developed the barter economic system.

Ancient period

Copper and Bronze Age: Around 4000 B.C., metallurgy came into existence and also urban centers flourished during this era. People started mining and using different metals such as copper, silver, gold and later bronze and iron. Around 3000 BC the use of wheel for vehicles and sail for ships made easier the transportation of greater loads. During the second millennium, domestication of horse started in grassland of the Central Asia steppes. In the meantime, agricultural surplus gave rise to urban centers. Further intellectual progress was reflected in writing, mathematics, astronomy and development of calendar. The economic scientific and technological advancement led to further social, political and intellectual progress.

Iron Age: It was around 1500 BC, iron is begun to be used. This was a landmark as it increased agricultural productivity and made possible the clearing of forests for the purpose of settlement and agriculture. Also more sophisticated weapons were made.

In Ancient period, goods were exchanged and economy run under barter system of those commodities that were transportable, divisible, had high intrusive value such as cowrie, animals, metals ingots, giant stones, beads, feathers, salt etc. These primitive monies were difficult to counterfeit and acted as a store of value.

Medieval Period (600 – 1500 BC)

Middle ages experienced major transformation in the human economy across the globe but no international space economy existed during medieval times. In Europe precolonialfeudal economy flourished in which The Church formed the apex of socio-economic structure and economic life was primary rural. Space economy was essentially domestic, local and regional. Production structure of most societies was subsistence. Farmers work in the field and feuds takes a proportion of their production so they were exploited socio-economically. Urban areas as well as trade and commerce sector was undeveloped.

After around 1000 BC, change had been experienced in which trade and commerce activities were flourishing resulting in urbanization. Agriculture was expanding due to

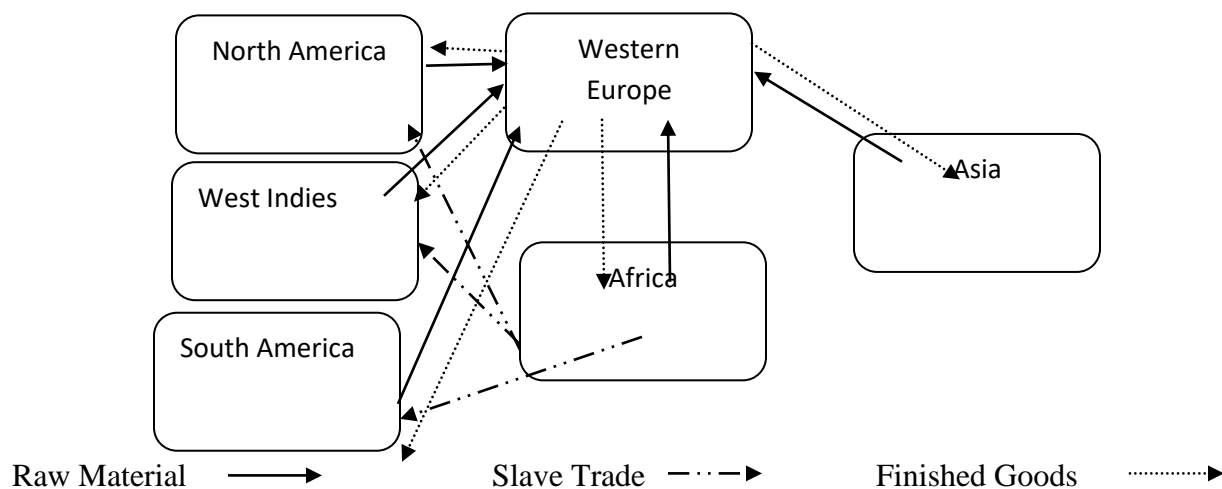
improvement in production techniques and technology resulting better income of the farmers which provided them purchasing power to buy non-agricultural produce. Consequently, further provided boost to trade and commerce. New craft and business centers started emerging. Demand in this sector inspired farmers to opt new occupation of craftsmen.

During medieval period, gold and silver bullion were the standard currency for the exchange of goods.

Modern Period (14 century - till date)

After the end of feudal system in Europe, Renaissance period emerged known as Age of Discovery and Exploration resulting in the rise of Mercantilism. Europeans started long-distance economic interaction between various nations and eventually dominated the worldwide import-export trade in Africa, Asia, and the new world of North and South America and given birth to international trade. European trade network tied all major continents together into one world system with complex trading ties (Fig 7.4). Mercantilism increased the commercial production of goods raised as an important economic activity which occurred in prevailing towns and small cities and began to produce surplus resulting in the sell and purchase of land, labour and capital as a commodity. With this economic activities expanded rapidly in the cities. Cities became centers of production and trade and rapidly expanding in area and population. Another important feature of mercantilism era was slave trade which benefitted the industrial revolution that begun in England in the late 18th century. The economic impact of the slave trade on the European economy was extremely positive.

Figure 7.4: Merchandised Trade Relationship



Source: Hussain Mazid, 1993

The industrial revolution increased the productivity in Europe and compels the industrialized nation to find new markets which resulted in the emergence of Colonialism.

Largely, goods were exchanged in the gold standard was not universal before World War I. Many countries of Latin America or the Far East were stick to more inflationary silver standard rather than the gold standard. Because of the lack of political unity in Europe instead of gold and silver bullion, paper currency and became the standard currency. The gold standard worked smoothly until August 1914 when World War I. The period after World War I had seen horrible inflations. To overcome the economic problems arise after WWI Bretton Woods conference established a dollar standard to replace the gold standard.

Another watershed in the history of human economy can be traced after WWII especially after 1960s and after globalization of economy started. One of the main features of this global economy is the increasing interdependency between places which includes international trade, Multinational Corporation, international labor migration, foreign aid (both economic and military) and technology transfer.

The most recent advancement in recent decades has been in the field of transportation and communication. After the end of cold war i.e. 1990, globalization of economy predominates. The major features of the evolution of human economy have been summarized in Table 7.1.

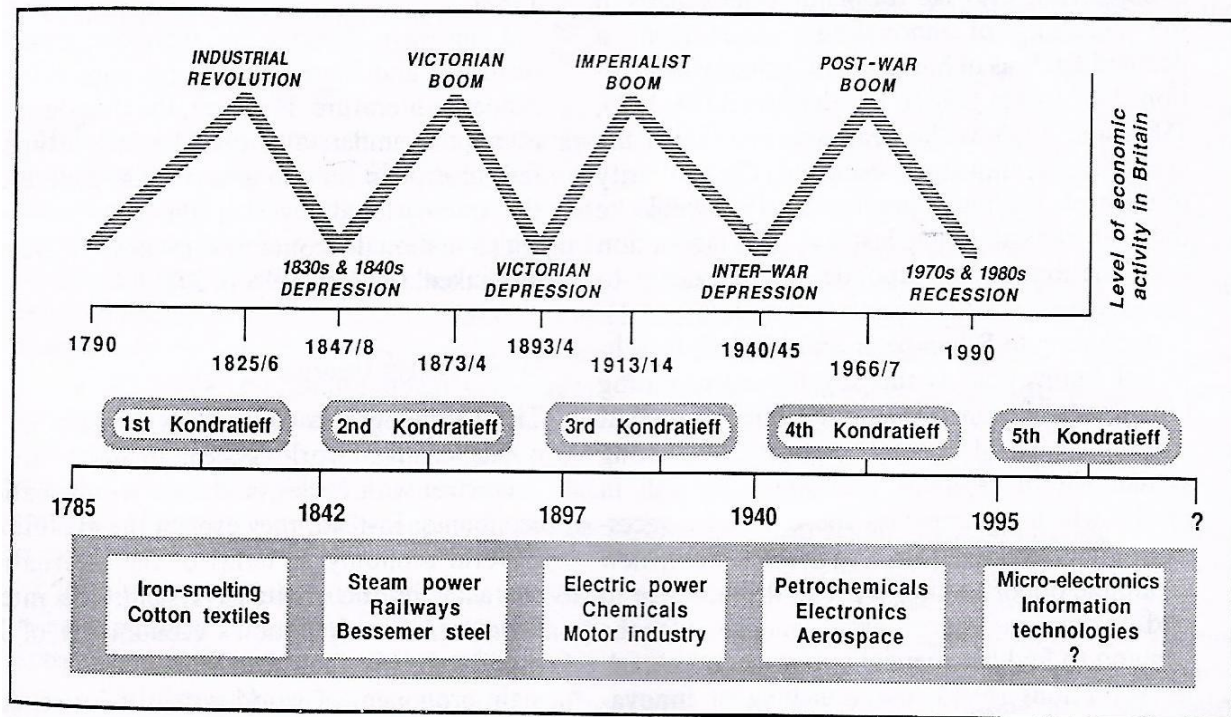
Table 7.1: Evolution of Human Economic Organization

Traditional ←-----→ Modern				
Feature	Subsistence	Reciprocal	Peasant	Exchange
	<ul style="list-style-type: none"> ➤ Commodity sharing ➤ No urban foci ➤ Simple technology ➤ Animate power (muscle) ➤ Localized economy 	<ul style="list-style-type: none"> ➤ Barter 	<ul style="list-style-type: none"> ➤ Minor exchange for capital ➤ Village settlement pattern ➤ Mixed traditional and modern technologies ➤ Limited regional specialization 	<ul style="list-style-type: none"> ➤ Commercial activity ➤ Major urban development ➤ Complex technology ➤ Inanimate power ➤ Regional specialization ➤ Regional trade
Production Systems	Gathering Nomadic herding Shifting agriculture Labour-intensive subsistence agriculture			Commercial agriculture Commercial fishing Commercial gazing Commercial forestry Manufacturing and commerce

Source: Fellmann, 1992

The modern period experienced various ups and downs in the human economy. Kondratieff (1935) provided the long wave of economic activity and identified phases of the cycle in economic development associated with the application of technological innovations or revolutions. Kondratieff first wave coincides with the industrial revolution in Britain followed by industrial expansion in Europe and the Victorian depression of the 1880s. Next change observed with the Imperialist expansion of Britain, Germany and the US reaching its peak in World Wars (1914) and ended with inter war depression of World War II (1940-45). The fourth cycle began with the post-World War boom and followed by descent into international recession in the late 1970s and 80s. The fifth cycle beginning in mid-1990s and faced depression in 2008. The model states that the period of a wave ranges from forty to sixty years and the cycles consist of alternating intervals between high sectoral growth and intervals of relatively slow growth i.e. expansion, stagnation, and recession. Schumpeter related these cycle with innovation cycle (Fig 7.5).

Figure 7.5: Innovation cycles and economic activity



Source: Healey and Ilbery, 1990, pg. 15

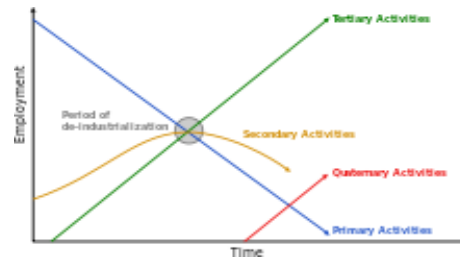
THREE SECTOR MODEL

When you go out from your house to buy some goods (primary or secondary goods) for your family then you use some services (transport or communications). They are part of our sectoral economy. Based on human activities, economic sectors were evolved.

The evolution of sectorial economy was conceptualized by the economist Fisher (1935), Colin Clark and (1940) and Jean Fourastié (1949) in the Fisher-Clark model by developing three-sector theory which divides economies into three sectors of activity i.e.

primary, secondary, and tertiary. According to Fourastie, the main focus of an economy's activity shifts from the extraction of raw materials, through manufacturing and finally to the services sector. Fourastié saw the process as essentially positive, emphasized that with the shift in the economic activities will result in the increase in quality of life, social security, blossoming of education and culture, higher level of qualifications, humanization of work, and avoidance of unemployment (Fig 7.6)

Fig 7.6: Three Sector Theory



Source: Clark(1940)

The distribution of the workforce among the three sectors progresses through different stages as follows, according to Fourastié:

First phase: Traditional civilizations

In this phase, highest percentage of the people involved in primary sector i.e. 65% followed by secondary sector (20%) and tertiary sector (15%) respectively. This phase characterized by underdeveloped society with negligible use of science, technology and machinery. The state of development corresponds to that of European countries in the early Middle Ages, or that of a modern-day developing country

Second phase: Transitional period

Transitional period witness declining workforce in the primary sector and increasing workforce in the other two sectors as compared to the first phase. Equal share of workforce percentage involve in primary (40%) and secondary (40%) sector followed by tertiary sector (20%). This phase symbolizes more use of machines in the primary sector, which has reduced the number of workers needed. As a result, the demand for machinery production in the secondary sector increases. The transitional phase begins with industrialization which helped in the development of the tertiary sector so as the financial sector and the power of the state.

Third phase: Tertiary civilization

In the third phase, highest workforce is engage in tertiary sector (70%) followed by secondary (20%) and primary sector (10%) respectively. As the primary and secondary sectors are increasingly dominated by automation so the demand for workforce falls in these sectors and replaced by the growing demands of the tertiary sector. The situation now corresponds to modern-day industrial societies or the service or post-industrial society. In 21st century, the

tertiary sector has grown to such an enormous size that it is further divided into an information-based quaternary sector, and human services - based quinary sector.

With this model, it can be concluded that developed countries such as USA, Britain, Japan represent the highest or third stage of economic development whereas people living in underdeveloped countries of Africa have still not come out from their primitive economic mode surviving on the free gifts of nature with no surplus sell to others.

Check Your Progress

- Note:** a) Write your/the answer in the provided space.
 b) Refer Answers to check your progress provided at the end of this unit.
- 1) Briefly explain the evolution of human economy.

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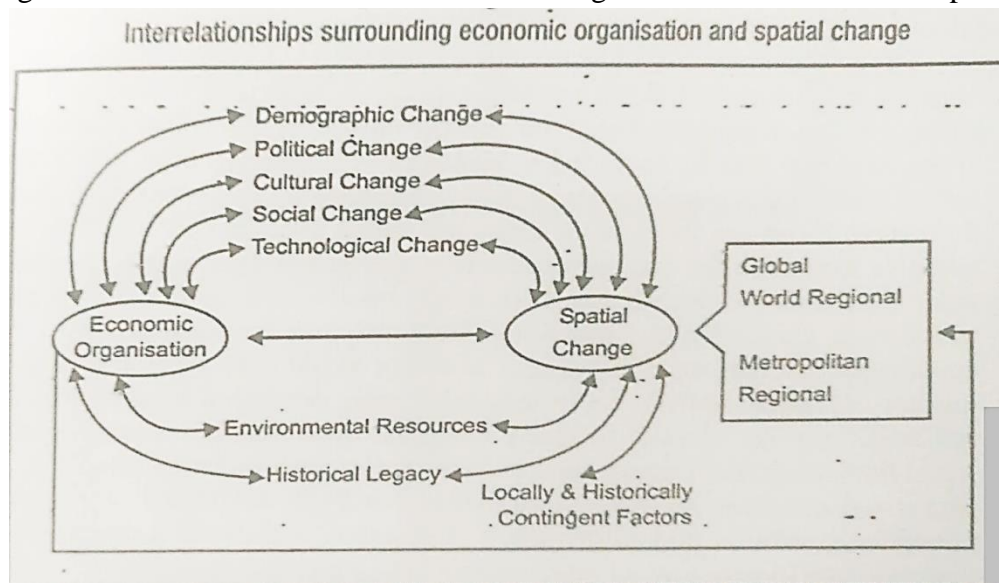
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7.4 SEQUENCE OF HUMAN OCCUPANCE

Change is the law of nature and in human economy is an important feature of modern world economy. Economic changes are abrupt and distressing (rise of oil prices in 1973-74); gradual and progressive or can be fluctuating. These different types of economic changes with different frequencies and severities at different locations means the way national and local economy evolve varies over time and from place to place consequently affects the human occupancy (Fig 7.7).

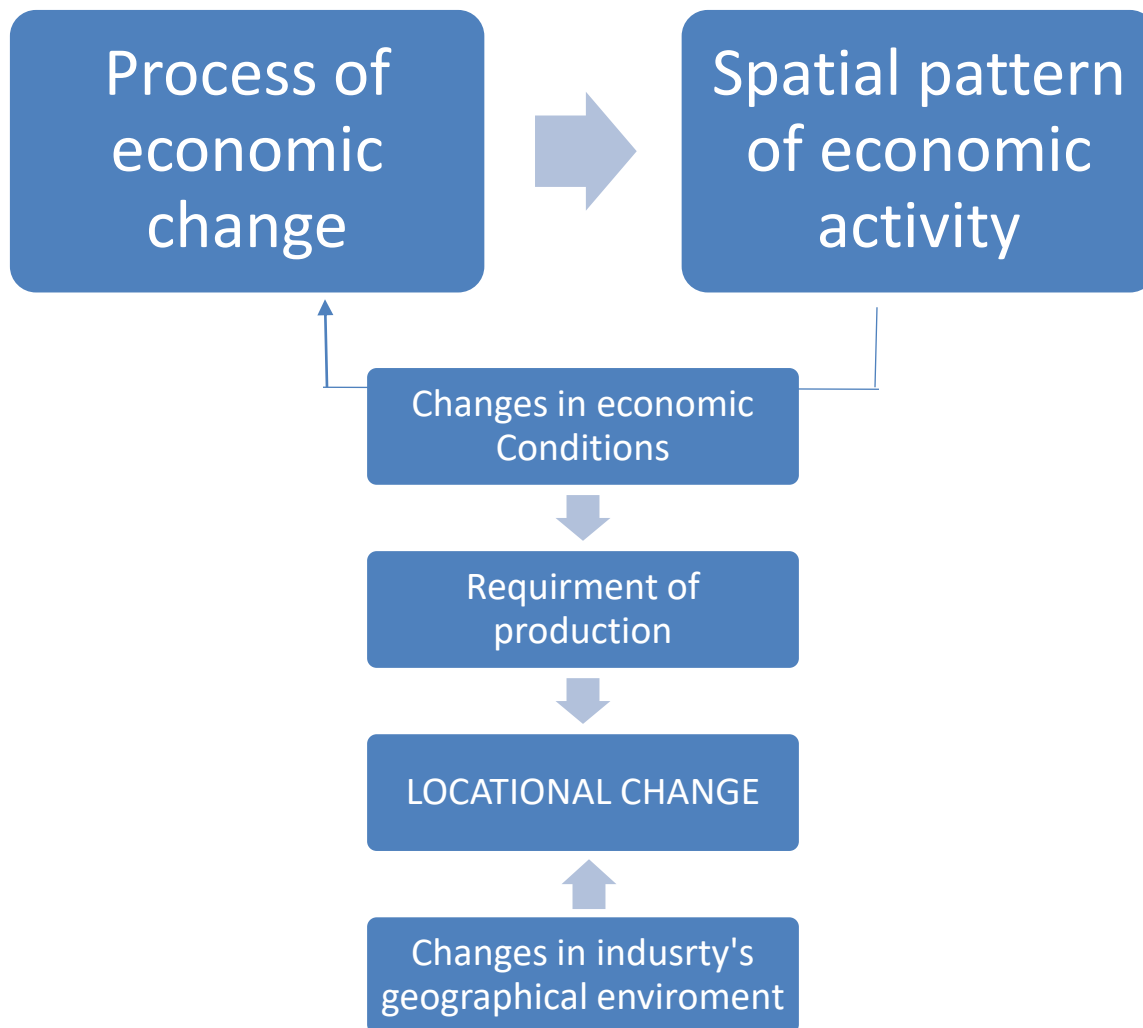
Figure 7.7: Interrelation between Economic Organization and Human occupancy



Source: Saxena, 2013

The sequence of human occupation implies that changes in the economic conditions will change the locational pattern of man (Fig.7.8) basically; Human beings have advanced from primary economic stage based on village level subsistence and barter economy to the modern globalized economic activities based on services and information technology that are available in urban and metropolitan areas.

Figure 7.8: Changes in economic conditions brings locational change



Source: Prepared by Author

Since prehistoric time, man fulfills all his needs from wild vegetation, animals or fishing. During this time, people prefer to live in homestead. With the expansion of human knowledge, it was realized that instead of hunting animals, it is better to tame them or domesticate them for milk, meat or their other products. The art of domestication of animal's started pastoralism activity and some societies accepted nomadic life and other adopted tribal cultural. Gradually, man learnt the art of cultivation and started producing food from agriculture. Then agriculture

became the prime occupation and man started constructing permanent houses and settled in sedentary village life. After having surplus in agriculture sector, industrial sector started developed. Man mastered the art of extracting raw material from primary sector and converting into more useful form which boosted the cottage industries. Further improvement in the knowledge and technology, man explored and mined minerals from the earth and using them in industrial sector. Mining and industries were complementing each other and those are growing in size and given birth to industrial towns or urban centers. Industrialization faced two problems a) division of labor, b) marketing the surplus goods. To overcome these problems tertiary sector was boosted and developed trade, transportation and communication facilities to reach new markets. Now, quaternary and quinary sectors are gaining strength and making metropolitan cities as cosmopolitan city (Fig 7.9).

Figure 7.9: Sequence of Human Occupance



Source: Prepared by Author

Derwent Whittlesey introduced the concept of “sequent occupance” in 1929 to describe a chronological series of cross-section of the geography of an area. Geographically, human’s economic activities differ from one region to another. For example, people living plain areas prefer carry out agricultural activities due to availability of water, rich soil, and leveled or flat land. On the other hand, coastal region have rich marine resources, so they exploit and develop them for their sustenance. Similarly, Human occupancy differ in time and space across the globe. Human occupance means cultural landscape changes with effect of economic landscape. As the economic activities changes, human occupance also changes.

The sequence of human occupance is not the same for all the regions. Human occupance of an area Whittleys wrote is ‘like other biotic phenomena carry within itself the seed of its own transformation, carries and he drew an ‘analog between sequent occupance in chorology and plant succession in botany’. Furtherance to that he also spoke of a ‘genetic treatment’ and stated that ‘the view of geography as a succession of stages of human occupance establishes the genetics of each stage in terms of its predecessor’. He explained the sequent occupance of a small district in northern New England recognized three stages of human occupance:

1. The Indian stage of hunting and collection in the “virgin mixed forest’.
2. The period of a “thorough-going subjection of the land to farming.
3. The period of the decline of farming and the re-growth of forest, with ‘vestiges of the farming epoch’ lingering on.

According to him, 'normal sequence are rare, perhaps only ideal', because of interruption, usually from within. E. Acherman's also studied the sequent occupance of the town of Concord to the west of Boston recognizes five period of occupance:

1. Aboriginal Indian (Before about 1635)
2. Subsistence farming (1635-1775)
3. Dairying and manufacturing (1775-1830)
4. Rural depopulation (1830- 1880)
5. Truck gardening and residential (Since 1880)

Alfred Meyer's studied the Kankakee Marsh in northern Indiana and Illinois and recognizes four stages in the transformation of a 'haven of wild life' not 'a modern home of man':

1. The period of the Indiana hunters and French traders (before 1840)
2. The period of the pioneer trappers and frontier farmers (1840- 80)
3. The period of the stock farmers and sportsmen fowler (1880- 1910)
4. The period of the corn but farmers and river resorted (since 1910)

All these studies describe the current human landscape of a region, as a combination of all the cultures which have sequentially occupied the region from the past to the present. This economic phenomenon occurs in the same region, but at different times.

Sequence of Human Occupance: A Case Study of New Zealand

Sequence of Human Occupance can be best described in Robonocruizo novel in which a man ship get wrecked and landed in an island and from hunter and gather to competition and finally a developed person. But in real world New Zealand is the best example.

New Zealand is an island country located in the East of Australian continent discovered in 700 A.D. Before its discovery, it was a forested land but three cultural groups shaped the occupancy pattern and changed the natural forested landscape to agricultural land and at present metropolitan culture pre dominates.

Moa (name of a bird) hunters (A.D. 700 through the 14th century) were the indigenous people of New Zealand form the first cultural group. Their main economic activity was hunting and gathering. After the discovery of fire, Moa hunters began to use fire to clear trees in order to have land for agriculture and eventually, destroyed many forested areas, and disrupted ecosystems. Earlier forested areas converted into grasslands and soil erosion became a problem. They dwell in crude villages with tribal culture.

Maori, next occupants of New Zealand arrived between A.D. 1200 and 1400. They practice agriculture without disturbing the natural environment. They cultivate sweet potato, taro, yam, and gourd. They reside in villages which were more elaborate and had permanent settlements as compared to moa hunters. Although no longer dominant but their presence is still visible in parts of New Zealand.

Europeans, are the most recent occupants and have made the most significant changes to the natural landscape and occupancy. They introduced commercial activities such as extensive sheep grazing, gold rushes, timber exploitation, crop farming, dairy farming, and urbanization eventually have changed New Zealand's landscape dramatically. European's occupancy ranging from farming communities to large metropolitan cities. Most New Zealanders are now city dwellers. Urbanization, and all its associated effects on the landscape, arrived with the Europeans.

Check Your Progress II

- 1) Discuss the sequence of human occupancy in New Zealand.

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7.5 CONCLUSION

The economy of a nation has evolved in successive phases over the period of time giving rise to classification of various sectors of economic activity besides dividing the population on the basis of economic activity. It points towards gradual development of primitive form to developed form. A subsistence based economy changes its features after introduction of Industrial Revolution. The gradual development of primitive economy led by Primary sector, Secondary sector & Tertiary sector to amalgamation of new sector namely Quaternary sector and Quinary sector with itself to complete the evolution of a primitive economy to a developed economy.

With the progress in economy systems, exchange of goods and currencies were also progressing. The primitive monies were eventually replaced metal coins then paper currency and today electronic blips. The progress of economy impacts human habitation as well. Progress leads to demand for more labor causing migration from one place to another resulting in development of new township at areas which were not accessible earlier, thus new habitations come up. The state of an economy can also be identified by the occupation of its population viz. in a primitive or developing economy, majority of population is dependent on agriculture and allied activities i.e. mining, construction and manufacturing industries while in developed economy, a majority of population will be involved in service sector. In other words, the development of an economy is predominantly depends on changes in economic activities which in turn leads to changes in human occupancy.

7.6 SUMMARY

Human economy evolved some 5 lakhs years ago, economy activities such as hunting, fishing and food gathering were largely subsistence. Till Paleolithic era or up to 8000 B.C. people live in nomadic life. In Neolithic era (8000 - 4000 BC), Humans learnt the art of domestication of plants and animals and started living sedentary life resulting in extra production of plants and animals produce which could be exchanged involving barter system. The Stone Age was characterized by the discovery of wheel, fire, pottery and weaving that aided the economic progress. Areas of Asia and Europe showed some economic progress by producing cotton, wool, meat and sharp implements for agriculture purposes.

Copper and Bronze era (4000 BC- 2000 BC) marked the evolution of city life. Great civilization emerged along the river valley such as Indus valley (Harrapa and Mohanjodaro urban centers), Sumerian, Nile river valley (Egyptian) and Hwang – Ho river valley (Chinese). Urban centers gained advancement in science, technology and arts resulting in increased agricultural production and improved irrigation systems. Improvement in agriculture sector resulting in division of labor and surplus food production. The whole population was not required to engage in agriculture sector. Consequently, people engage in secondary and tertiary activities which triggered the growth of cities and urbanization process resulting in rural-urban linked economy. People engaged in secondary activities started producing agricultural implements and inputs such as hoe etc. which could be exchanged for food products.

During Iron Age (1200 BC – 600 BC) rural-urban linked economy was further strengthened by the production of iron farm implements led to increase agricultural efficiency and productivity. In other sectors of economy such as weaving, transportation and sophisticated armaments were developed. Moreover, this era led the foundation for industrial revolution. Till 1750, economic activities were refining at a slow pace.

Major watershed had been observed after 1750 in the history of human economy as Industrial revolution triggered the economic progress in all the sectors of economy resulting in growth of transportation system around 1800 led colonial and capitalist economy with exchange of goods in gold standard. But after World War II, goods are exchanged in Dollar and human economy is progressing towards globalized economy/globalization with advanced with Multinational Companies (MNCs).

Undoubtedly, Human beings have advanced from primary economic stage based on subsistence and barter economy i.e. food gathering, hunting, fishing and agriculture to the modern globalized economic activities based on services and information technology. The sequence of human occupancy is not the same for all the regions. People started living in homestead and gradually developed tribal cultural then moved to villages and now residing in more developed urban areas. Developed countries such as USA, Britain, and Japan represent the highest stage of economic development whereas people living in underdeveloped countries of Africa have still not come out from their primitive economic mode.

7.7 GLOSSARY

- Economy** : The production, distribution, trade and consumption of goods and services by different agents in an area or kind of work predominantly people do.
- Human Economy** : The economic domain of human practices and transaction.
- Economic Activity:** The production of goods and services which uses natural resources, labor and capital (Which produce consumer goods or provides services).
- Barter System** : A system of exchange where goods are directly exchanged with goods, not with money.
- Sequent Occupance:** The notion that successive societies leave their cultural imprints on a place.

7.8 ANSWER TO CHECK YOUR PROGRESS

Check Your Progress I

1) Human economy has evolved from primary activities then gradually moved to secondary and tertiary and now to quaternary and quinary activities with barter system to gold standard and Dollar as universal currency for exchange of goods.

Check Your Progress II

- 1) New Zealand indigenous people practice hunting and gathering and reside in the forest. They have advanced from village level agricultural activities to industrialization that arrived with Europeans and now the modern globalized economic activities that are available in urban and metropolitan areas.

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7.11 TERMINAL QUESTIONS

- 1) Mention the elements which create variation in human economies.
- 2) Explain the significance of human economic activities.
- 3) Classify human economy and also mention their important regions.
- 4) What are the major characteristics of economic sectors?
- 5) Discuss the sequence of human occupation.

UNIT 8 - PRIMARY HUMAN ACTIVITIES

8.1 OBJECTIVES

8.2 INTRODUCTION

8.3 TYPES OF PRIMARY ACTIVITIES

8.4 CONCLUSION

8.5 SUMMARY

8.6 GLOSSARY

8.7 ANSWER TO CHECK YOUR PROGRESS

8.8 REFERENCE

8.9 SUGGESTED READINGS

8.10 TERMINAL QUESTIONS

8.1 OBJECTIVES

The unit aimed at enabling you to understand the different types of primary human activities which are very important for the development of any country's economy. At the end of this unit, you should be able to:

- Describe the various types of primary activities.
- Indicate the factors affecting different primary activities.
- Explain the characteristics of primary activities.

8.2 INTRODUCTION

In the previous unit, you have learnt about the meaning and evolution of various human economies. As you know, human activities which generate income for their sustenance are known as *economic activities*. Economic activities are broadly classified into primary, secondary, tertiary, quaternary and quinary activities. A detailed discussion on the types of primary activities will be done in this unit.

Primary activities are directly dependent on natural environment or natural resources. In other words, it is characterized by the utilization of earth's resources such as land, water, vegetation, building materials and minerals and refers to as "building block" or 'principal activity' of an economy. Thus, it includes hunting and gathering, pastoral activities, fishing, forestry, agriculture, mining and quarrying.

8.3 TYPES OF PRIMARY ACTIVITIES

On the basis of the use of natural resources, primary activities are classified into two broad categories:

The major types of primary activities are Hunting, Grazing/Pastoral, Forestry, Livestock raising, Fishing, Agriculture, Quarrying and mining.

HUNTING AND GATHERING

The oldest human activity known to mankind is hunting and gathering that started around 1.8 million years ago. The early man depended on their immediate environment for their sustenance. They obtained food through foraging that includes hunting for animals and gathering the edible plants (berries, nuts, fruits and roots) from the nearby forests.

Characteristic of Hunters and Gathers

- 1) They lived in a small group, with usually less than 50 persons, because it is believed a large number would quickly exhaust their resources within walking distance.
- 2) People living in very cold and extremely hot climates or harsh climatic conditions survived on hunting and gathering

- 3) Hunting and gathering requires a small amount of capital investment and operates at very low level of technology. They used primitive tools made of stones, twigs or arrows so the number of animals killed was limited just to fulfil their needs.
- 4) The yield per person is very low and little or no surplus is produced so just to satisfy all their basic needs such as food, shelter and clothing they were involve in this activity.
- 5) Archaeological evidence proves that division of labour was stereotype. Men were involved in hunted game or catching fish whereas the women collected berries, nuts and roots.
- 6) The group travelled frequently in search of animals or food but its direction and frequency of travel was determined by the movement of game and the seasonal growth of plants at different location.

Contemporary Hunting and gathering

Today perhaps a quarter-million or less than 0.005 percent of the world population still depends on this activity. Hunters and gathers well in isolated locations of the world such as high latitude zones which include northern Canada, northern Eurasia and southern Chile; and Low latitude zones such as the Amazon Basin, Tropical Africa, Northern fringe of Australia and the interior parts of Southeast Asia. Prominent hunting and gathering societies are African Bushmen of Namibia and Bostawana and Aboriginals in Australia.

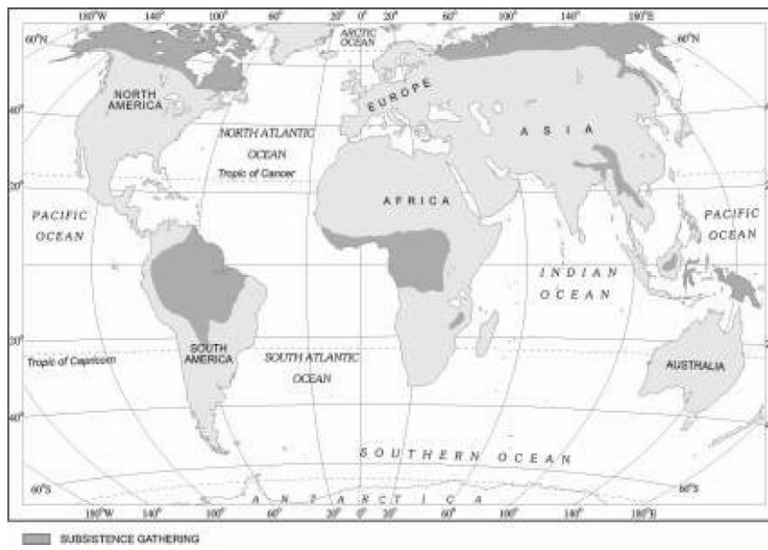
In modern times some gathering is practiced at commercial level and is market oriented as well. People involve in gathering activity collect leaves, barks of trees and medicinal plants of valuable plants and after simple processing sell the products in the market.

The use of various parts of the plants: The bark is used for quinine, tannin extract and cork. Leaves supply materials for beverages, drugs, cosmetics, fibers, thatch and fabrics, Nuts for food and oils and tree trunk yield rubber, balata, gums and resins.

Under present circumstances, hunting and gathering has very less chance of becoming important at the global level. The products obtained from gathering activity cannot compete in the world market. Many items supplied by the gatherers in tropical forests have been replaced due to change in technology and synthetic products often are of better quality and available at lower prices. Similarly, the people living near the coastal areas still involve fishing as a primary activity but are facing stiff competition due to modernized fishing activity. In some case, many species now have become extinct or endangered due to illegal hunting (poaching).

Hunting and gathering were carried out at different levels with different orientations but it provides insight into human customs that prevailed in prehistoric times.

Map: 8.1: Hunting and Gathering



Source: Stoddard, 1986

PASTORALISM

At some stage in history, it has been realized that due to overuse of local resources or conflict with the other tribes made hunting/foraging an unsustainable activity then human beings might have thought of domestication of animals. Grazing as an economic activity found in areas: a) which are too hot or too cold, b) where rainfall is too low. In other words, either in grassland or hot or cold deserts regions of the world where farming is impossible. Depending upon the different climatic conditions people of that area domesticated animals found in those regions.

Major Characteristic of Pastoralism

- 1) It has practiced in the region of spare population or low density.
- 2) It requires extensive use of land.
- 3) Livestock graze on natural vegetation.

The level of animal rearing (subsistence or commercial level) depends upon the geographical factors and technological development of that area. It also has been carried out at different levels with different orientations. There are two types of pastoralism: a) nomadic herding (subsistence level) and b) commercial grazing (commercial level).

Nomadic Herding

Nomadic herding also known as pastoral nomadism is a primitive subsistence activity, in which the herders reared animals to fulfill their needs such as food, clothing, shelter, recreation, tools and transport. Nomadism is a scientific and technological adaptation to scarce and ephemeral pasturage.

Typical herding societies are called nomadic. People live in temporary structures and move with their livestock over a considerable distances from one pasture to another pasture according to the

commands of ecological conditions, the needs of the animals, amount and quality of pastures and water. Only about 15 million people are engaged in this activity but they sparsely/hardly occupy about 20 percent of the world land area.

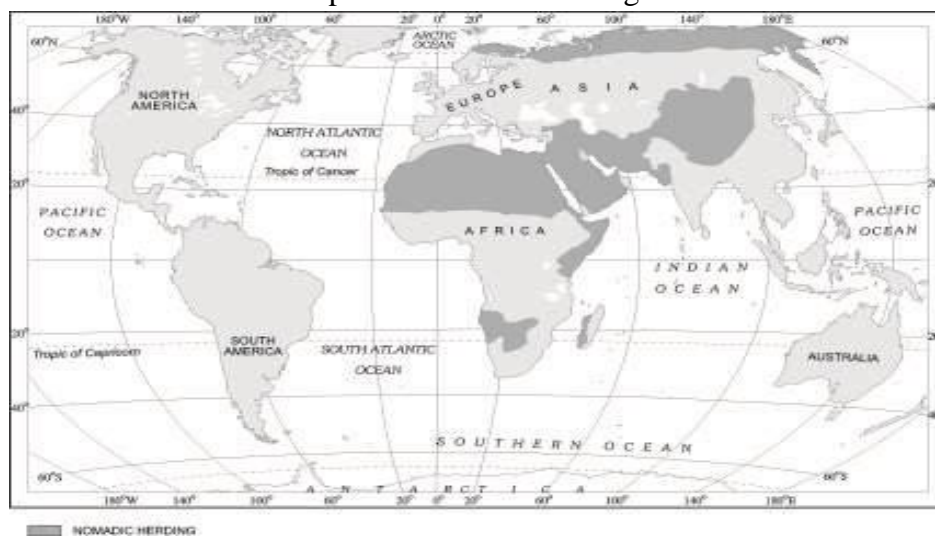
Important Features of Pastoral Nomadism

- 1) Their survival depends mainly on animals rather than crops. The animals provide milk, cheese and meat for food and their skin, wool and hair are used for clothing and tents or shelter.
- 2) As a matter of tradition, each nomadic community inhabits a well-identified territory.
- 3) The size of their herd is an important measure of power and prestige and their main security during adverse environmental conditions.
- 4) Some pastoral nomads obtain grain from sedentary farmers in exchange for animal products. Nomads consume more grains rather than meat. Animals are not slaughtered although only the dead animals are consumed.

A wide variety of animals is kept in different regions depending upon relative prestige of animals and the ability of species to adapt to a particular climate and vegetation. In tropical Africa, cattle are the most important livestock, while in North Africa and Middle East, camel is the most preferred livestock followed by sheep and goats. In Sahara and Asiatic deserts, sheep, goats and camels are reared, whereas in the Central Asia, horses are an important animal. In the mountainous areas of Tibet and Andes, yak and llamas are very important animals, whereas in the Arctic and sub-Arctic areas, reindeer are the most significant animals.

Pastoral nomadism is associated with three important regions of arid and semi-arid areas of the world. The core region extends from the Atlantic in North Africa to eastwards across the Arabian Peninsula into the steppe of Mongolia and Central China. The second region extends over the Tundra region of Eurasia while in the Southern hemisphere; there are only small areas in South-West Africa and on the island of Madagascar (Map. 8.2). All these regions are sparsely populated.

Map 8.2: Nomadic Herding



Source: Stoddard, 1986

Movement of pastoral nomads in search of one pasture to another is undertaken either over vast horizontal distances in the flat regions or vertically from one elevation to another in the mountainous regions. Some nomads practice transhumance such as in Himalayan regions, Gujjars, Bakarwals, Gaddis and Bhotiyas migrate from plains to the mountains in summers and to the plains from the high altitude pastures in winters. Similarly, animals pasture in the Alpine meadows or Tundra regions in the summer and be herded back down into the valley for winters.

The number of pastoral nomads and areas under their control has been decreasing primarily due to imposition of political boundaries and new settlement plans by different countries.

Commercial Livestock Rearing

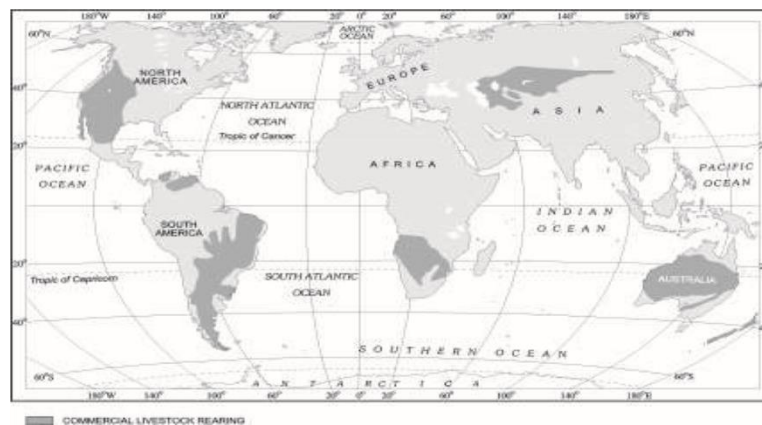
Commercial livestock rearing or ranching is more organized, specialized and capital intensive activity as compared to nomadic herding. It is essentially associated with western cultures and is practiced on permanent ranches. Ranches are divided into a number of parcels to regulate the grazing and sometimes fenced to limit the number of animals in a pasture according to its carrying capacity. When the grass of one parcel is grazed, animals are moved to another parcel. Important animals that are reared include sheep, cattle, goats and horses.

Characteristic of Commercial Livestock Rearing

- 1) It is a specialized activity as in this activity only one type of animal is reared.
- 2) Rearing of animals in ranching is organized on a scientific basis. All the products are scientifically processed and packed.
- 3) The main emphasis of Commercial Livestock Rearing is on breeding, genetic improvement, disease control and health care of the animals.

This form of agriculture is adapted to semi-arid or arid grassland land of tropical and temperature regions. It is practiced more in developed countries, such as in New Zealand, Australia, Argentina, South Africa, Uruguay and United States of America, where the vegetation is too sparse and the soil too poor to support crop farming (Map 8.3).

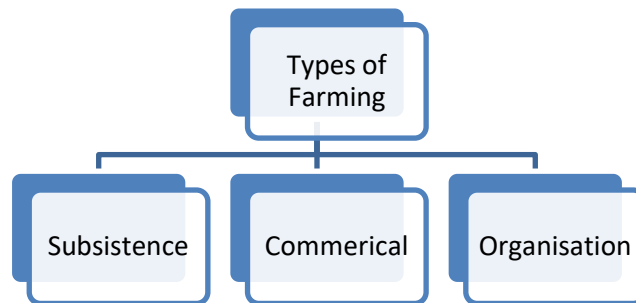
Map: 8.3: Commercial Livestock Farming



Source : Google

AGRICULTURE

Agriculture of any region is affected by the physical, techno-economic and socio-institutional factors which give rise to diversified agriculture system. The main agricultural systems of the world are as follow:



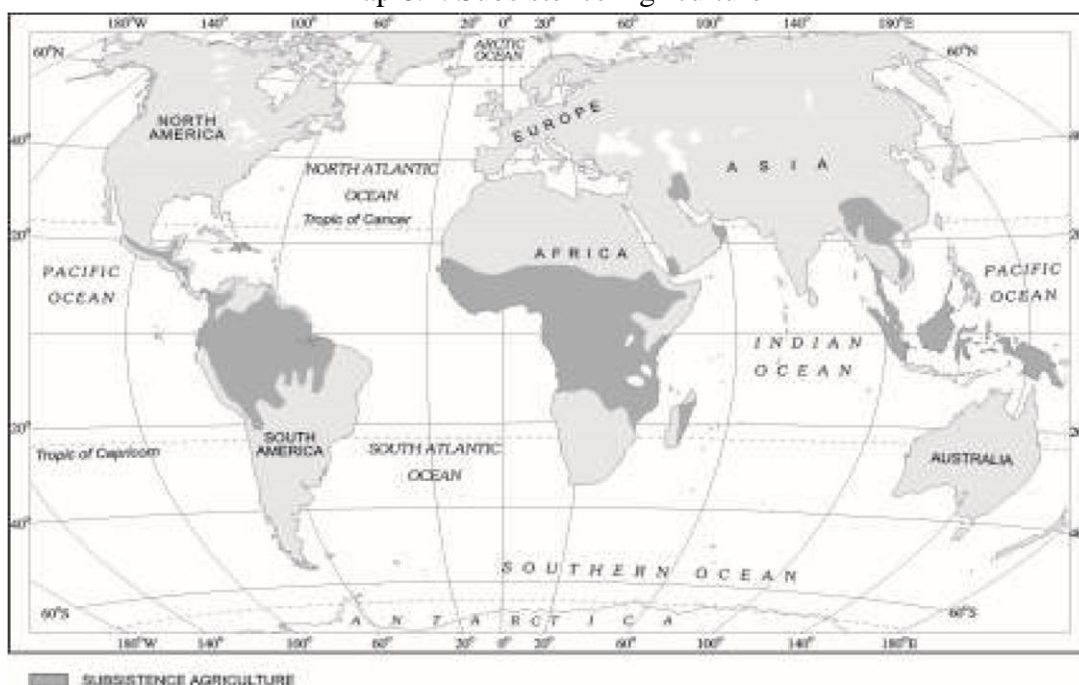
Source: Prepared by Author

Subsistence Agriculture Subsistence Agriculture is self-sufficiency farming in which the crops grown are largely consumed by the farmers and their family. It can be classified - Primitive Subsistence Agriculture and Intensive Subsistence Agriculture.

Primitive Subsistence Agriculture

Primitive subsistence agriculture also known as shifting cultivation or slash and burn agriculture is the oldest and environmentally sound form of agriculture which originated about 7000 – 8000 BC. It is extensively practiced by the tribes of tropical region, especially inhabited in Africa, south and Central America and South East Asia (Map 8.4).

Map 8.4: Subsistence Agriculture



Source: Stoddard, 1986

In this type of agriculture, a small forest land (about 0.5 -1.0 hectare) is usually cleared by felling and burning, and the ashes add to the fertility of the soil. After 3 to 5 years, the fertility of soil declines and the farmer shifts to another parts and clears other piece of the land in the forest for cultivation. The farmer may return to the earlier patch after sometime when the soil fertility and biomass is restored. This is called field rotation. The farmers use primitive tools to till their soil such as sticks, hoes or crude wooden plough.

One of the major problems of shifting cultivation is that it destroys natural resources and genetic wealth. The *jhum* cycle has reduced due to loss of fertility in different parcels. In the tropical region of the world it is known by different names, e.g. Jhuming in North Eastern states of India, Milpa in Central America and Mexico and Ladang in Indonesia and Malaysia.

Intensive Subsistence Agriculture

Intensive Subsistence Agriculture is largely confined to the densely populated regions of Monsoon Asia in which farmer cultivates a small parcel of land using simple tools and more labor. In this region agricultural density is so high that farmers can produce enough food for their survival. It is prevalent in South, South-West and East Asia such as China, Japan, India, Bangladesh, Myanmar, Thailand, Sri Lanka, Malaysia, Cambodia, Islands of Pacific, Indian Ocean and South-East Asia. The intensive subsistence agriculture region of Asia can be divided into two: one where the rice dominates and other areas are dominated by crops other than paddy such as wheat, pulses etc.

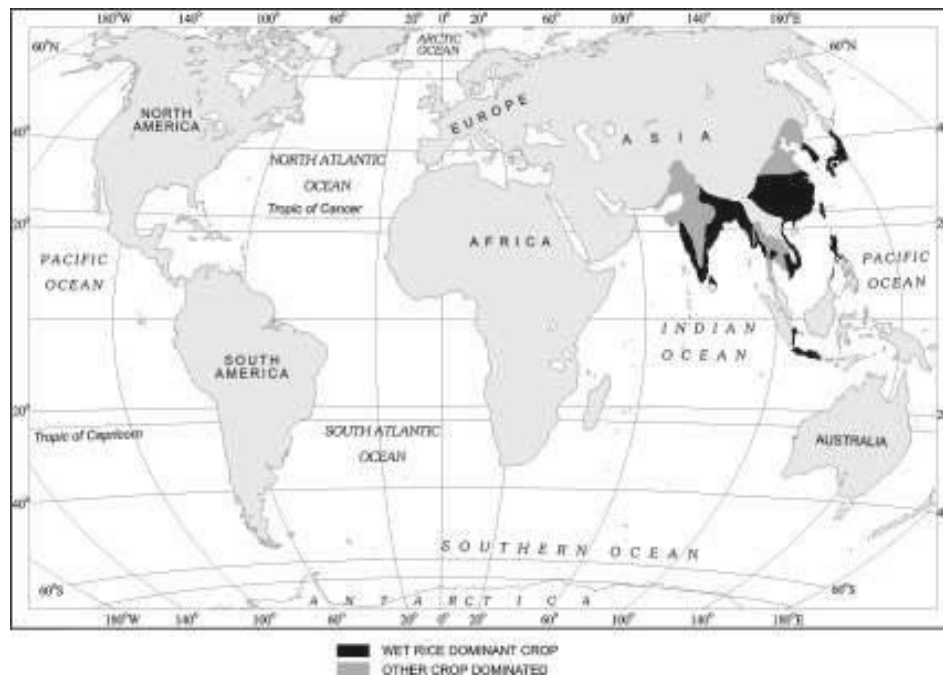
- i) *Intensive subsistence agriculture dominated by wet paddy cultivation*: It is characterised by dominance of the paddy or wet rice crop mainly practiced in the Monsoon land.

Characteristic:

- 1) Density of population is very high resulting into land fragmentation and small land holdings. Moreover, the yield per unit area is high but per labour productivity is low.
- 2) Use of machinery is limited as most of the work are done by manual and hand labour or with the help of family members leading to intensive use of land.
- 3) Every type of farm manure is used to maintain the high fertility of the soil.
- 4) Some farmers practice fish culture in paddy field.

(ii) *Intensive subsistence agriculture dominated by crops other than paddy*: Many parts of monsoon Asia, which borders the paddy growing region are characterized by lack of moisture or have a short growing season, unable to cultivate paddy. Therefore, Wheat, soya bean, barley, millets and sorghum are grown in the regions of northern China, Manchuria, North Korea, North Japan and South Asia. Farming in this region has similar characteristics to those dominated by wet paddy except that crops are cultivated with irrigation.

Map 8.5: Intensive Subsistence Agriculture



Source: Stoddard, 1986

Plantation Agriculture

Plantation agriculture is the oldest of the modern types of large scale specialized agriculture. The Europeans introduced it in their colonies which were situated in the tropics mainly for profit-oriented large scale production of crops such as tea, coffee, cocoa, rubber, cotton, oil palm, sugarcane, bananas and pineapples (Table 8.1). It is found in the tropics and subtropics of Latin America, Africa and Asia.

Table 8.1: Plantation crops introduced by the European in the Tropics

Colonial Power	Crops	Regions
French	Cocoa and Coffee	West Indies
British	Tea	India and Sri Lanka
British	Rubber	Malaysia
British	Sugarcane and Banana	West Indies
Spanish	Coconut and Sugarcane	Philippines
Dutch	Sugarcane	Indonesia
Portuguese	Coffee	Brazil
Portuguese	Sugarcane	Australia

Source: Prepared by Author

The characteristic features of Plantation farming are

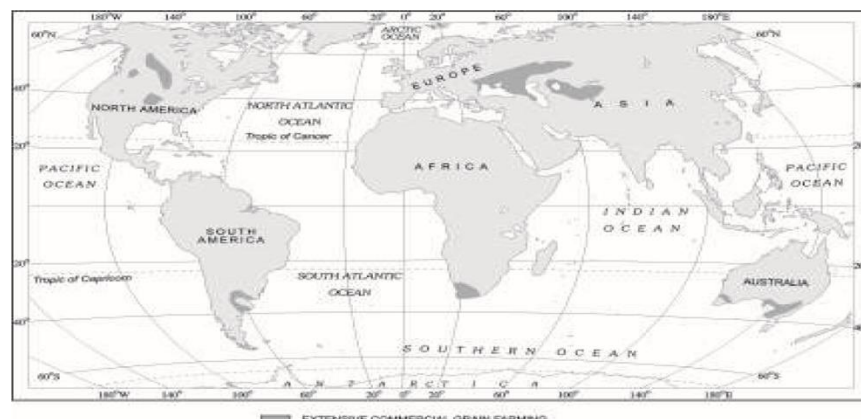
- 1) Large estates or plantations: They are raised on large land holdings usually of more than 40 hectares.
- 2) Capital intensive: To maintain, a large estate large capital investment is required. Capital is needed in creating facilities for comfortable living of the managerial and technical staff.
- 3) Scientific methods of cultivation: Farms are scientifically managed as all the work executed with specialized skill.
- 4) Single crop specialization: it is highly specialized and one single crop is grown in the estates.
- 5) Good Transport system: A good system of transportation is necessary which links the estates to the factories and markets for the exports of the products to the different parts of the world.

Presently, ownership of most of the plantations has been in the control of the Government or the nationals of the countries concerned.

Commercial Grain cultivation

Commercial Grain cultivation is an extensive and mechanized form of agriculture practiced in the semi-arid lands of the mid-latitudes. These areas were earlier utilized by nomadic herders. It is best developed in Eurasian steppes, the Canadian and American Prairies, the Pampas of Argentina, the Velds of South Africa, the Australian Downs and the Canterbury Plains of New Zealand (Map 8.6). Wheat is the main crop of the region, other crops grown are corn, barley, oats and rye. The size of the farm is very large ranging from 240 to 16000 hectares; therefore entire farm operations are highly mechanized. These areas have low yield per acre but high yield per person as compared to intensive agriculture. Average yield of wheat is 1700 per hectare but due to mechanizing of farm operations less labor is required so per person yield is high.

Map 8.6: Commercial Grain farming



Source: Stoddard, 1986

Mixed Farming

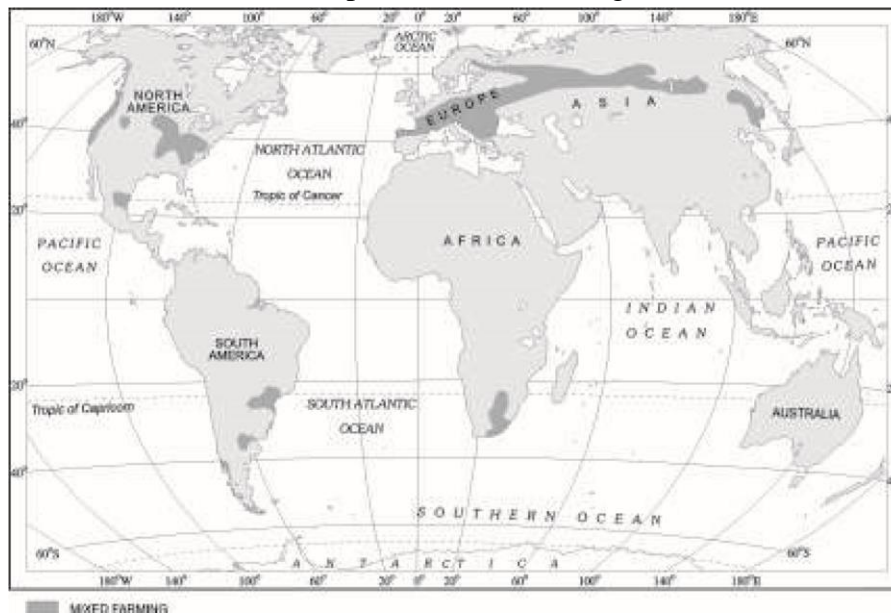
Mixed farming is a type of commercial agriculture in which crops are cultivated and livestock are reared simultaneously in a same farm. It is also known as commercial livestock and crop farming.

Highly developed regions of the world, e.g. North-western Europe, Eastern North America, parts of Eurasia and the temperate latitudes of Southern continents practice mixed farming (Map. 8.7).

Characteristic of Mixed farming

- 1) Mixed farms are moderate in size ranging from 10 -15 hectares in North America and usually cultivate wheat, barley, oats, rye, maize, fodder and root crops.
- 2) Integration of crop-livestock is the prime characteristic so equal emphasis is laid on crop cultivation and animal husbandry.
- 3) Animals like cattle, sheep, pigs and poultry are reared and provide the main income along with crops. Therefore, fodder crops are an essential element of mixed farming.
- 4) Soil fertility is maintained by adopting Crop rotation and intercropping methods.
- 5) Mixed farming required high capital expenditure on farm machinery and farm building, moreover, extensive use of chemical fertilizers and green manures are also important component to increase the productivity along with farmer's skill and expertise.

Map 8.7: Mixed Farming



Source: Stoddard, 1986

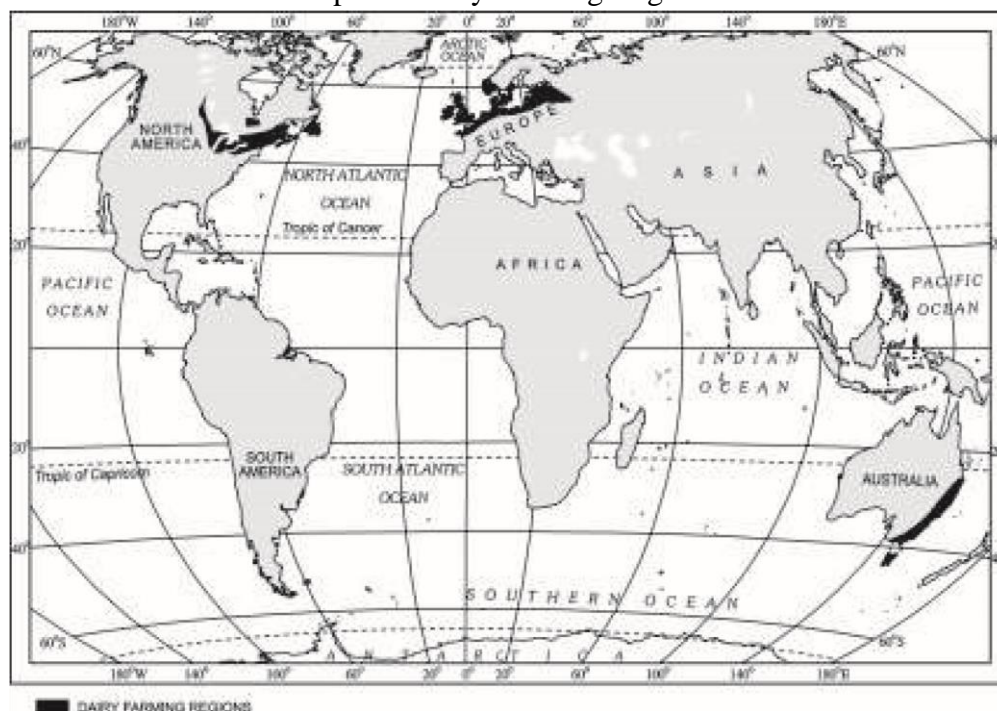
Dairy Farming

Dairying is highly specialized commercial farming in which milch animals are reared for their milk and other products. The main regions of commercial dairy farming are located in temperate latitude of the world. The major dairying region is North Western Europe, followed by Canada and last belt is located in southern hemisphere that includes South Eastern Australia, New Zealand and Tasmania (Map 8.8).

Characteristics of Dairy Farming:

- 1) Capital Intensive: High capital is required to build animal sheds, storage facilities for fodder, feeding and milching machines.
- 2) Scientific methods: Scientific methods are used in cattle breeding, health care and veterinary services.
- 3) Labour intensive: It involves rigorous care in feeding and milching the cattles. Unlike raising crops, there is no off season during the year in dairying.
- 4) Market: Milk is supplied from the milk shed to the market i.e. large urban and industrial areas as it's a highly perishable product. That is why; dairy farm must be closer to the market.
- 5) Infrastructure: With improved infrastructure such as the development of transportation, refrigeration, pasteurization and other preservation processes have increased the duration of storage of various dairy products and can reach any area of the world with spoilage.

Map 8.8: Dairy Farming Regions



Source: Stoddard, 1986

Mediterranean Agriculture

Mediterranean agriculture is a form of commercial agriculture that mainly exists the land bordering the Mediterranean Sea. The countries on either side of the Mediterranean Sea in Europe and in North Africa from Tunisia to Atlantic coast, southern California, central Chile, south western parts of South Africa and south and south western parts of Australia practice this form of agriculture.

Characteristic of Mediterranean Agriculture

- 1) Mediterranean region is an important supplier of citrus fruits such as grapes, oranges, olives and figs in which Viticulture or grape cultivation is a specialty. Best quality wines in the world are produced from high quality grapes of this region. Raisins and currants are the products of dried and inferior grapes.
- 2) Crops are cultivated with Dry farming techniques.
- 3) In this region, fortunately, most of the valuable crops such as fruits and vegetables are grown in winters (as summers are dry) when there is great demand in European and North American markets.

Market gardening and Horticulture

Market gardening and horticulture are also known as truck farming and specialty farming. In this, emphasis has been given to the cultivation of high value crops such as vegetables, fruits and flowers, exclusively for the big city markets. It is well developed in densely populated industrial regions of north-west Europe, north eastern United States of America and the Mediterranean regions. For example, Netherlands specializes in horticultural and floricultural crops especially Tulips, which are exported to all major cities of Europe.

- 1) Farms are small in size and are located where there are good transportation links with the urban centre or market.
- 2) It is labour and capital intensive activity.
- 3) To get good production, it lays emphasis on the use of irrigation, HYV seeds, fertilisers, insecticides, greenhouses and artificial heating esp. in colder regions.

Factory Farming

A modern development in the industrial regions of Western Europe and North America is factory farming. A significant feature of poultry farming and cattle rearing is breed selection and scientific breeding. It is, basically, done in stalls and pens, fed on factory-made feedstuff and carefully supervised against diseases. This requires heavy capital investment for building shed, machinery for various operations, heating and lighting.

Farming Organization

Farming organization is affected by the ownership of farmers and government policies which help to run these farms.

Co-operative Farming

Co-operative Farming refers to pooling of land and resources voluntarily for more profitable and efficient system of farming. In this, each farmer remains the owner of his land but they practice joint farming by developing a cooperative society.

Co-operative societies guide farmers with the new information and innovations in the field of agriculture. Moreover, providing all important inputs of farming, processing the products at cheaper rates, exporting of the product to other countries.

Co-operative Farming is not a new concept. Cooperative movement originated in Europe in over a century ago esp. in Britain and France. It has been successful in many western European countries like Denmark, Netherlands, Belgium, Sweden, Italy etc as well. In Denmark, every farmer is a member of a co-operative as the size of the farm increase, per hectare cost of agriculture decreases and profit increases.

Collective Farming

Collective Farming or communal farming is a holding which is jointly owned and operated by the farmers. It based on social ownership of the means of production and collective labour.

Collective farming also known as Kolkhoz was introduced in erstwhile Soviet Union aimed to improve the inefficiency of agriculture and, moreover, to boost agricultural production for self-sufficiency. After its collapse, these have already been modified.

Characteristic

- 1) Size of the farms is large extending over 3400 hectares and farming operations are highly mechanized in Russia.
- 2) Government set the yearly targets and policies and the produce was also sold to the state at fixed prices.
- 3) The farmers had to pay taxes.
- 4) Members were paid according to the nature of the work allotted to them.

MINING

After agriculture, mining may have been considered as the second of mankind's earliest important activities as it continue to supply all the basic resources used by modern civilization. From prehistoric times to the present, mining has played an important role in economic development.

Man has been involved in the extracting minerals from the earth surface throughout human history. Interestingly, history of human civilization is associated with the discovery of minerals in terms of Copper age, Bronze Age and Iron Age. Table 8.2 explains the use of minerals. In ancient times, it was largely confined to the making of tools, utensils and weapons. The actual development of mining began with the industrial revolution and its importance in modern times is continuously increasing in developing machinery, electronics and warfare.

Table 8.2: Humans' Uses of Minerals

Need or Use	Purpose	Age
Tools and utensils	Food, shelter	Prehistoric
Weapons	Hunting, defense, warfare	Prehistoric
Ornaments and decoration	Jewelry, cosmetics, dye	Ancient
Currency	Monetary exchange	Early
Structures and devices	Shelter, transport	Early
Energy	Heat, power	Medieval
Machinery	Industry	Modern
Electronics	Computers, communications	Modern
Nuclear fission	Power, warfare	Modern

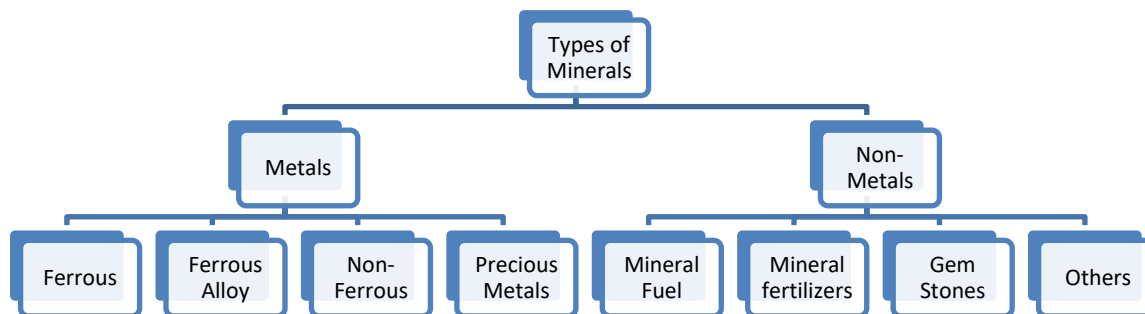
Source: Madigan,1981<http://www.cienciaviva.pt/img/upload/Introduction%20to%20mining.pdf>

Quarrying is the cutting or digging of stone and related materials, from an excavation site or pit and it usually leaves behind a large hole in the ground.

Types of Minerals

There are 1600 minerals available in the world but only 200 are extracted by humans for commercial and industrial purposes. These minerals can be categorized into two groups: metals and non-metals (Chart 8.1).

Chart 8.1: Types of Minerals

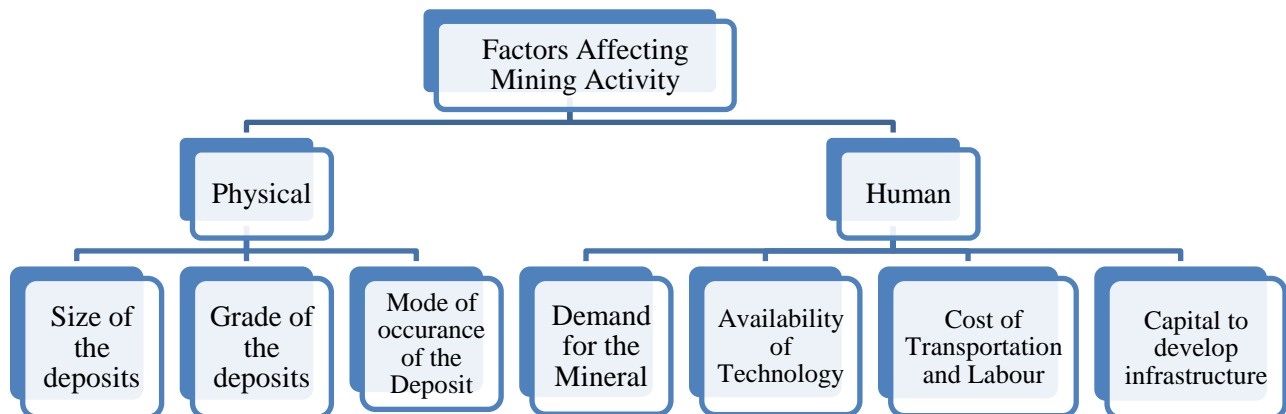


Source: Prepared by Author

Distribution of Minerals Deposits and Mining Regions

Mineral resources are unevenly distributed. Not even a single region in the world possesses all the minerals, even in small quantity. There are various factors that affect the profitability of mining operations. It has been broadly classified into physical and human or economic factors which have been mentioned in Chart 8.2.

Chart 8.2: Factors Affecting Mining Activity



Source: Prepared by Author

Major mining areas of the world are northern North America, northern Eurasia, plateaus of central Asia, the part of the Australian Desert, the Sahara, the Congo Basin and the central part of South America south of the Guiana Highlands to Patagonia.

Methods of Mining

Most of the minerals are obtained either by Surface mining or underground mining methods. The method is to be used to extract the mineral depend on the mode of occurrence and the nature of the ore.

The surface mining or *open-cast* mining is the cheapest and easiest way of extracting minerals from the earth that found close to the surface. Overhead expenses are relatively low whereas the output is huge and rapid in this method.

When the mineral or ore lies deep underneath the surface, underground mining method or shaft method has to be used. In order to extract ore, vertical shafts have to be sunk, from where underground passages radiate to reach the minerals and transport to the surface. Overhead expenses is very high as this method requires specially designed lifts, drills, haulage vehicles, ventilation system for safety and efficient movement of people and material. This method of mining is risky due to occurrence of disastrous accidents caused by poisonous gases, fires, floods etc.

The developed countries are receding from mining activity due to high labor costs. On the contrary, in developing economies with large labor force and to achieve higher standard of living; mining and quarrying are becoming more important activity esp. in Africa and to some extent of South America and Asia. In these areas, more than fifty per cent of the income has been generated from minerals alone.

FISHING

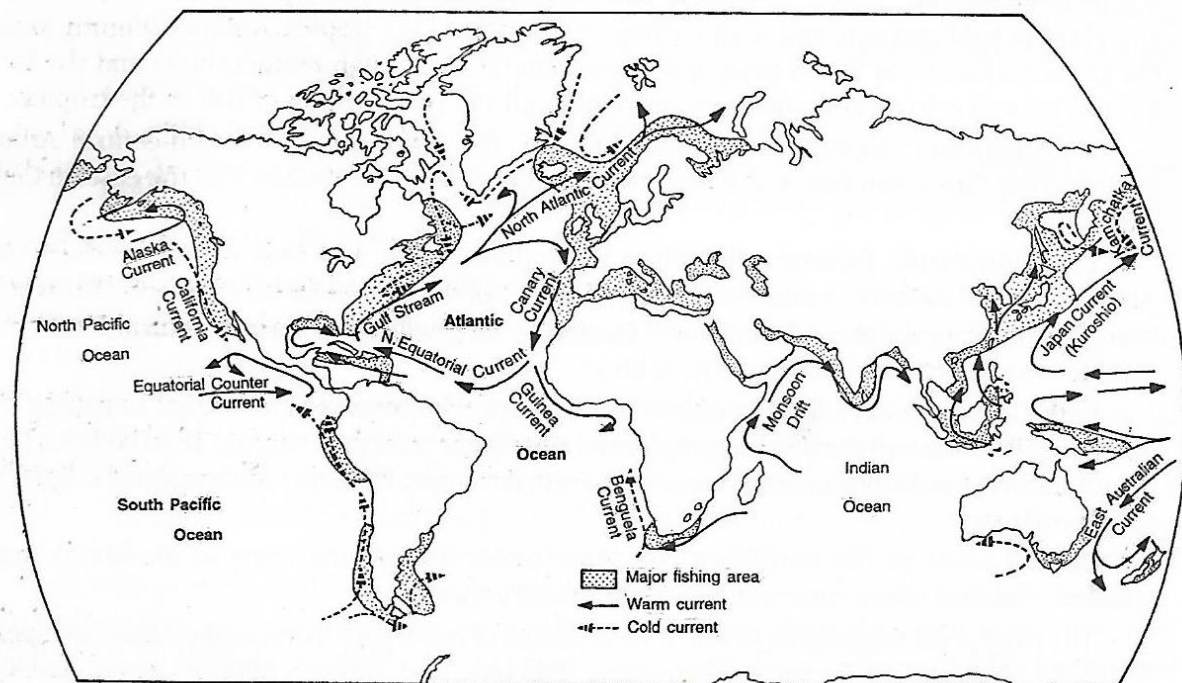
Fishing is among the oldest economic activity of man. People live near the sea, lakes and rivers caught fish or other seafood for food and other uses. Fish is an important food item providing 10% of the food protein to the world's population.

Types of Fisheries

On the basis of production and consumption, it can be divided into subsistence and commercial. On the basis of location of fishing, it is commonly divided into a) Inland (fresh water) b) Coastal c) open-sea.

Major Fishing Grounds: The world most productive fishing grounds are found on the cold and shallow water above the continental shelves of Northern hemisphere. The major fishing grounds are found in the temperate ocean of Atlantic and Pacific in their North-western and North-eastern parts (Map 8.9). There are four major fishing grounds namely the North-west Atlantic, the North-east Atlantic, the North-west Pacific and the North-east Pacific.

Map 8.9: Major Fishing Grounds of the World



Source: Gautam, 2010

Favorable Conditions for Fishing

- 1) **Plankton:** Plankton is a basic food for fish; relation between them is directly proportion. Its occurrence depends upon and upwelling of water.
- 2) **Climate:** Temperate climate is more suitable for fishing as convergence of warm and cold current makes the region rich in plankton.

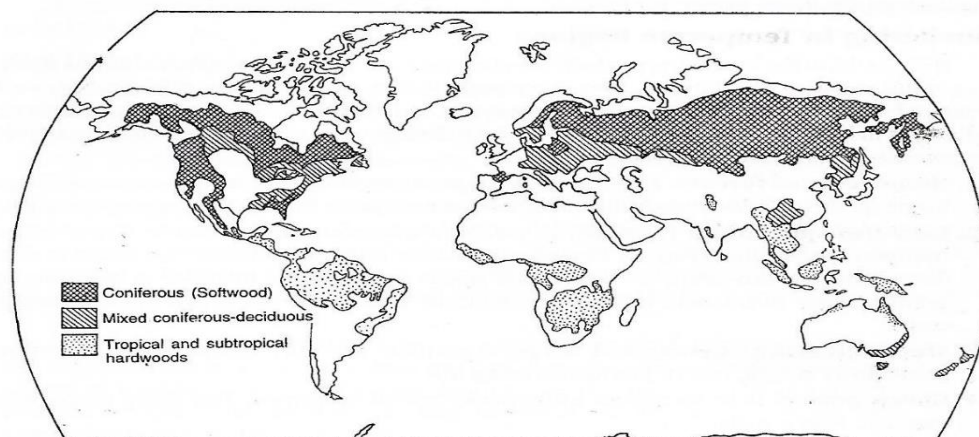
- 3) Market: Fish is a perishable commodity therefore transporting them before it spoils to the market is very essential. To avoid spoilage, fishing vessels must have installed freezing plants facilities.
- 4) Fishing Ports: The type of coastline and nature of the land behind the coast is very essential for ports. Fishing ports must have good transportation facilities, plants for freezing, filleting, curing and processing fish.

Minor fishing grounds: Low plankton content and immense variety of species are the disadvantages in the development of commercial fishing in the Tropical seas. African and South Asian countries like India, Pakistan, Indonesia and Pacific islands, lack preservation techniques and moreover, due to high density of population they consume locally. On the contrary, in Southern hemisphere, improvement in preservation methods and transportation can help Peru, Chile and Argentina as to emerge as important fishing grounds.

FORESTRY

Forest is associations of plants esp. trees. Man has exploited forest to fulfill his demands for fruits, roots, nuts, bark, medicinal herbs, wood, fuel and charcoal. The most important product of forest is timber and lumbering is an important economic activity. Forest of tropical and temperate regions rich in various products that are used for subsistence and commercial purposes (Map 8.10). Commercial gathering and extraction are practiced for industrial and commercial demands.

Map 8.10: Forest Regions of the World



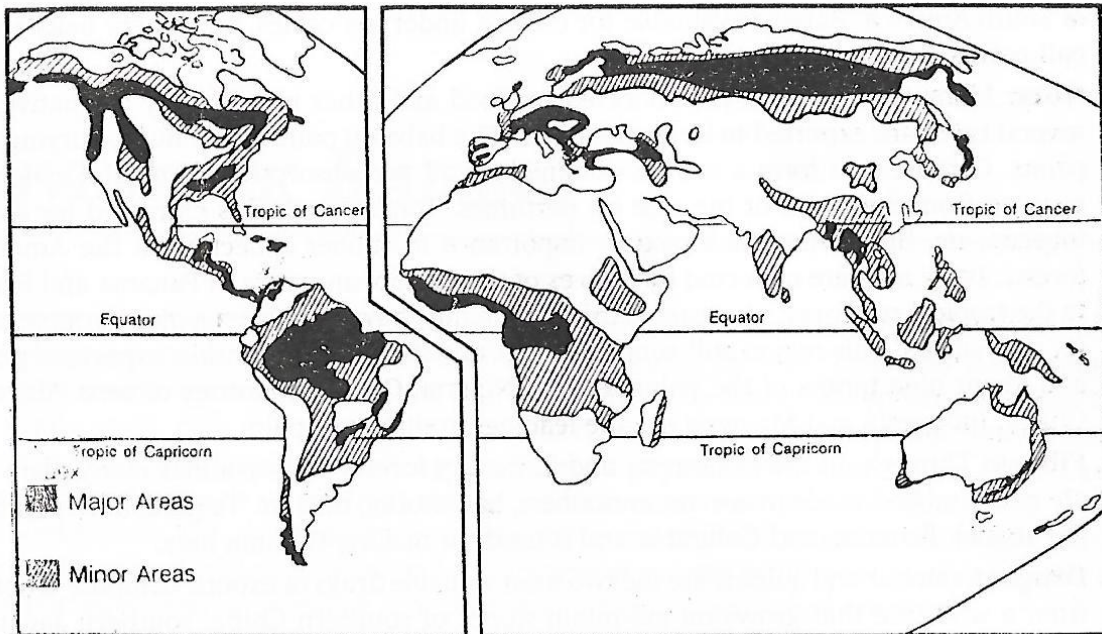
Source: Gautam, 2010

Lumbering in the Tropical Region

Lumbering industry has not yet been properly developed in this region primarily due to dense forest with moist, swampy and unhygienic conditions which created variety of species the same region. They require much longer period for regeneration around 30-35 years. This region is technologically backward with lack of transport facilities. People still use traditional methods of

extraction and shifting cultivation. This region is rich in Mahogany, Cedar and Teak that has high commercial value (Map 8.11).

Map 8.11: Commercial Forestry in the World

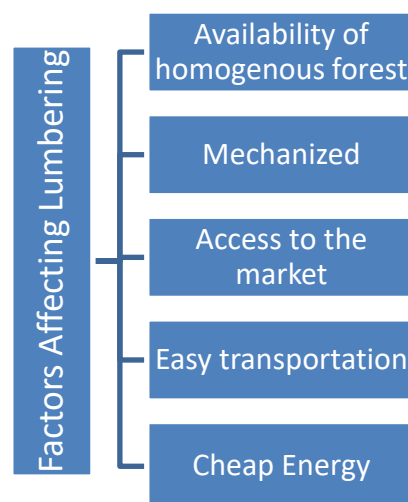


Source: Gautam, 2010

Lumbering in the Temperate Region

Around 80% of the round wood products are obtained from this region. Lumbering industry is well developed, organized and managed. The favorable conditions for the development of lumbering industry are given in Figure 8.3.

Figure 8.3: Factors Affecting Lumbering in the temperate region



Source: Prepared by Author

Check Your Progress I

Note: a) Write the answer in the provided space.

b) Refer Answers to check your progress.

1) What are the Major types of primary activities?

.....

.....

.....

.....

8.4 CONCLUSION

All the human activities revolve around the nature. Ever since existence of human on this earth, discoveries have guided the economic activities of mankind which are known as primary activities. Most common and early activity being hunting and gathering which comes naturally and does not require any specialized skill or knowledge. As progress is made, hunting of animals got supplemented by domestication of animals for milk, meat and other benefits. This led natural extension of activity relating to animal rearing that is grazing. Commercial animal rearing went on to become cash cow for man.

With domestication of animals, next came the identification of Agriculture. Agriculture had various branches viz. subsistence, commercial and organization. Lack of knowledge caused man to resort to subsistence farming but it were colonial powers viz. British, French etc, which introduced cash crops in their respective colonies. Now, profit became aim of farming, thus rapid commercialization started. This was followed by joint/collective/cooperative farming, market gardening, horticulture, factory farming etc. all were highly mechanized and had usage of innovative techniques.

Mining, Fishing and Forestry are other forms of primary economic activities which are also largely dependent on the environment. Undoubtedly, primary economic activities play a very vital role in the development of a country as they provide base to the secondary and tertiary activities.

8.5 SUMMARY

Since the time immemorial, human started their economic activities that were nature driven called primary activities. All the primary activities were carried out at different levels with different orientations. Agriculture is the main primary activity but the oldest known activity was hunting, gathering wild vegetation or fishing. Undoubtedly, hunters and gathers are isolated group but they provide vision into human customs and culture that prevailed in prehistoric times.

After the advent of agriculture, several agricultural regions can be identified on the basis of specific farming practices. Farming can be broadly classified into subsistence and commercial. Subsistence and commercial farming can be further sub divide into Intensive farming, extensive farming, plantation, mixed farming, etc.

Fishing, forestry and mining are other significant primary activities found in abundance in different parts of the world. Interesting, they are unevenly distributed across the globe.

8.6 GLOSSARY

Agriculture	:	An art of cultivation of plants and rearing of animals.
Agricultural Density:		The ratio of farmers to arable land
Dry Farming	:	Farming on non-irrigated land with little rainfall that relies on moisture conserving tillage and drought resistant crops.
Forage	:	Food for animal's esp. when taken by browsing or grazing
Forestry	:	The practice of planting, managing, using, conserving and caring forest.
Lumbering	:	Commercial extraction of timber
Milk shed	:	The first ring surrounding a city from which milk can be supplied without spoiling.
Mining	:	The extraction of any naturally occurring mineral substances—solid, liquid, and gas—from the earth for utilitarian purposes.
Pastoralism	:	The organization of community life around the needs of the herds or livestock.
Plantation	:	A large farm specialized in one or two crops.
Ranching	:	The commercial grazing of livestock over an extensive or a large area that are divided into a number of parcels, which are fenced to regulate the grazing?
Transhumance	:	The process of seasonal migration from plain areas to pastures on mountains.
Truck Farming	:	The distance of truck farms from the market is governed by the distance that a truck can cover overnight to deliver vegetables.
Wet Rice	:	The practice of planting rice on dry land in a nursery and then moving the seedling to a flooded field to promote growth

8.7 ANSWER TO CHECK YOUR PROGRESS

Check Your Progress

- 1) The major types of primary activities are hunting, grazing, forestry, livestock rising, fishing, agriculture, quarrying and mining.

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8.10 TERMINAL QUESTIONS

- 1) Mention the factors of the development of primary activities.
- 2) Describe the significance of primary activities.
- 3) On what basis primary activities are classified? Explain them.
- 4) Differentiate between Mining and Farming.
- 5) Explain the significance of Agriculture as primary activity.
- 6) What are the different types of agriculture? Discuss their characteristics.
- 7) Differentiate between subsistence and Commercial agriculture.

UNIT 9 - OTHER HUMAN ACTIVITIES

9.1 OBJECTIVES

9.2 INTRODUCTION

9.3 SECONDARY ACTIVITIES

9.4 TERTIARY ACTIVITIES

9.5 QURTNERY ACTIVITIES

9.6 CONCLUSION

9.7 SUMMARY

9.8 GLOSSARY

9.9 ANSWER TO CHECK YOUR PROGRESS

9.10 REFERENCES

9.11 SUGGESTED READINGS

9.12 TERMINAL QUESTIONS

9.1 OBJECTIVES

After reading this unit, you will be able to:

- Know about other human economic activities than the primary ones.
- Learn about the role of each sector in the economy.
- Study the link between all the sectors.

9.2 INTRODUCTION

Human beings perform various economic and non-economic activities. The economic activities are generally taken up by people to earn a good living. Non-economic activities are performed mainly for personal, social, religious and emotional motivations. For growth and development of a nation and its people both economic and non-economic activities are required. The economy of a country is steered by different economic activities of its people including manufacturing goods and providing services. People engage in different economic activities to earn their living; the more the number of economic activities, better the scope of higher income for people leading to better living standard and economic growth of the country. Activities of human beings can be broadly classified into primary, secondary, tertiary and quaternary sectors. Primary sector generally involves work in agricultural field, forestry, mining, hunting, fishing, gathering etc., where raw material from the earth is utilized for production of goods and services. In the previous module, you have learnt about the primary activities of human beings. In this module, you will learn about other human activities including secondary sector activities involving manufacturing work, tertiary sector activities including services and knowledge based services of quaternary sector.

9.3 SECONDARY ACTIVITIES

Secondary activities are so called because they developed second after the primary activities. The activities involve transforming the raw material into usable products. During the early civilization period people were mainly involved in primary activities such as fishing, forestry, farming etc. It was only when the production of agricultural products was in surplus that they looked for different activities and started with manufacturing products. Post industrial revolution the growth in manufacturing industries started around the world. However, in India and in many Asian countries, during the colonial rule the economy was under British control, hence growth of manufacturing units was not fully established. British preferred to export raw materials from us and import manufactured products from their country and it was only after the First World War that the manufacturing units developed in this country. Post-independence the growth in industrialization was made part of our national plan and along both government, private companies and individual entrepreneurs came on board to promote manufacturing and industrial growth in our country. These secondary activities require maximum energy than other sector activities; for instance manufacturing goods from raw material, construction works etc.

requires usage of electricity/ energy. Manufacturing activities also creates lots of waste products and uses higher quantity of fuel. The economy of a nation is based on the goods and services it produces and the revenue earned. The country with higher percentage of people engaged in tertiary and secondary activities are more developed than countries with higher percentage of people engaged in primary activities.

Types and role of Secondary Activities

Manufacturing Activities

Manufacturing activities involves making finished products from raw primary products in manufacturing units like industries and factories. Such as for manufacturing furniture's wood is required. Manufacturing units varies in size and capacity and accordingly called small scale, medium scale and large scale industries or factories.

In **small scale** industries in India, the limit of investment in machinery and plant is from twenty five lakhs to five crore rupees. Small scale industries or factories generally cater to local or regional demand. These industries or factories are generally labor intensive and are flexible in nature as changes can happen in these industries depending on the local or regional socio economic conditions. The small scale factories generally have single owner. These industries use locally available resources for production such as cottage industries. The gestation period in these industries is short; hence production of finished goods is faster along with the return on investment. Small scale industries promote innovations, many entrepreneurs of small scale business brings in new ideas and technologies to start up their business. Experimenting with new ideas and innovation in small scale industries is feasible as the risk of both the investment and the return is low. As this small scale industries are labor intensive many people get employment opportunities. 35% of the total export from our country of manufactured products comes from small scale industries.

In India, the investment amount of **medium scale industries** ranges between 5 crores to 10 crores. The medium and small scale industries are the backbone of economic development in a country. Like the small industries the medium scale industries are open to innovation and experimentations and are highly flexible. These industries are also labor intensive, hence job opportunities increases.

Many Asian countries economy such as Hong Kong and Taiwan are based on small and medium based on industries. In Hong Kong in 2005 about 50% of employment was accounted by small and medium scale industries. Wholesale, retail trade and service sector accounts majority of the SMEs. Many countries like Korea to support the medium and small scale industries reduced loan interest and given some tax concessions mainly for those starting SME in rural areas.

The **large scale** industries require huge capital investment, infrastructure and human power to start the business. Generally the heavy industries like iron and steel, automobile, textile industries, IT industries etc. falls under this category. The investment and revenue of these industries are both high. India's economy and economy of many Asian countries is dependent on

these industries. The large scale industries provide job opportunities to many. Here the division of labor is done on the basis of their skills; hence productivity of the employees is also high. Many of these industries have global reach and cater to needs of both national and international customers. Earlier India's export was mainly restricted to tea, coffee etc. however with the growth of large scale industries export of engineering products have increased. Moreover, the rise in India's large scale industries is in sync with five year plans.

Construction Activities

Construction is another prominent secondary activity. Construction of buildings, houses, infrastructures such as roads, bust stops, dams, bridges, offices, schools, colleges etc. are secondary sector activities. These activities are taken up by both governmental and private organization. Construction industry is one of the biggest industries in India. Construction industries can be set up only with due permission from different sectors of government such as central government and state governments. In India, about 50% of construction activity is associated with infrastructural development. Construction industry is a large scale industry; in fact in India after agriculture, construction industries dominate and hence contribute majorly to national economic growth.

Gas, Electricity and Water Supply

Besides the manufacturing and construction activities, electricity, water and gas supply service sector are also secondary activities, which create job opportunities for people.

ROLE OF SECONDARY ACTIVITIES

To achieve the second objective, the role and contribution of the secondary sector is discussed in the following points.

- The contribution of the secondary sector on Indian economy is higher than the primary activities. As per CIA world fact book data of 2014, the industrial sector's contribution was about 24.2% of the total GDP. The growth in manufacturing units and production has led to the rise in the contribution of the secondary sector. The growth of this sector however has not been very smooth; there have been fluctuation in the expansion of this sector in different phases since independence. However, this fluctuation has made this sector dynamic.
- The secondary sector's contribution is not only restricted to GDP but also in generating higher growth of employment. Even during the time of recession in 2009 – 2010, the secondary sector showed a rise of 3.5% in employment mainly in the construction industries.
- In the present time, if you have to travel from one city to other or within your city or town, you take a private or public transport. But have you ever thought how this travel has become easy; this is mainly due to the construction of metalled roads, bridges, railway tracts, airports etc. This construction of infrastructures, supply of electricity, water, gas etc. is the role of the secondary sector. Besides, the house you stay in, your educational institutes, offices etc. all are built by construction industries.

- All the consumable goods that you use or people use including your books and note books are production of the manufacturing unit. Thus the contribution of secondary activities in our daily lives is immense.

Table 1: Distribution of working Population in different sectors in India (percentage) in 2009-10

Primary Activities	
Agriculture	50.19
Mining and Quarrying	0.61
Secondary Activities	
Manufacturing	13.33
Construction Activities	6.10
Electricity, water supply etc.	0.33
Tertiary (Quaternary) Activities	
Trade, Hotels etc.	13.18
Transport, storage etc.	5.06
Financial, business services etc.	2.22
Other Services etc.	8.97

Source: Economic Survey

9.4 TERTIARY ACTIVITIES

Tertiary sector is associated with service industries. These industries provide services such as financial, transport, hotel, educational, communication etc. Today, just at the click of your TV remote button, you get information from all around the world. You can connect and chat with your family and friends whenever you want through your mobile's chat applications. However, this was not the case in the earlier times when people had to travel a longer distance to pass messages or to meet their family and friends. All these facilities of faster communication, transport etc. are part of the tertiary sector. The developed the country the better the communication, transport, educational services. Such as in countries like Canada the total length of the long roads extend beyond 10 lakh km. In India, the total length of the roads is about 33 lakh km. Not only road transportation, rail, air as well as water transport are part of tertiary services.

Unlike the secondary sector, where physical tangible products are manufactured, in the tertiary sector people's knowledge is used to improve productivity. Tertiary sector is the softer part of the economy. The production of services is the main role of this sector. In the tertiary sector the relation with the customer is more direct, thus customer satisfaction is of prime importance. In the last few decades, the developed countries is showing substantial shift towards

the tertiary sector of economy from primary and secondary sectors. India's tertiary sector is also fast growing. As per CIA world fact book and IMF data of 2015, India is the ninth largest country with tertiary output. Hospitality, trade, telecommunication, information technology, healthcare, entertainment, financial services, education, real estate as well as FMCG's contribute majorly in India's tertiary sector output. The tertiary sector is also leading in providing employment opportunities in India today. The economy survey report of 2015-2016 showed that about 66% of the country's GDP has contribution from tertiary activities. Not only in India, in many Asian countries like Indonesia, Taiwan, Malaysia etc. the employment generation by the tertiary sector has outgrown the primary and secondary sectors in the last decades.

The jobs in the tertiary sector are of two types informal and formal. The informal sector jobs are low paying and people with only metric level education or lesser than that are generally employed in such jobs. In the formal sector people with better education and work experiences are employed.

The informal sector jobs include production of services by individuals or households with less than ten workers. In the informal sector also known as unorganized sector people are often engaged in more than one job, hence capturing data about time and intensity of all the services a person is involved often becomes difficult. Hence actual data of this sector is often missing. There is no proper mechanism to capture the data on annual basis about the employment or contribution of this sector. The formal sector jobs include the so called white collar, blue collar jobs. To get employed in such services basic level of education is required.

9.5 QUATERNARY ACTIVITIES

In today's time apart from the secondary and tertiary sector another sector known as quaternary sector is also growing fast. This sector is the knowledge based sector. Intellectuals demanded that quaternary service sector be referred as a value-added form of tertiary sector. In this sector the knowledge based services includes teaching, consultancy, research and development (R&D) etc. The labor force involved in these activities is highly educated and well paid. In fact, 'gold collar' professionals are part of this sector such as scientists, senior doctors, top officials of government services etc. The professionals in these jobs have high positions, power, leadership qualities and designations. The decisions taken by the people in these top positions often have national and at times global reach. The 'gold collar' services are also called as Quinary (tertiary) activities.

This sector comprises people with expertise in their respective fields to take proactive decisions and provide operational solutions as and when required. This workforce has acquired knowledge and required technical skills through education and past experiences in similar fields. The decision making process is so specialized in many activities in this sector special consultancy teams are created to handle the task. For instance, in many private as well as public schools in cities like Delhi, consultants are hired to improve the quality of teachers and their teachings and learning's in the school. Quaternary service sector is widespread (footloose) and with development of transport, communication and energy, quaternary services reaches to every

corner of the society. For instance, if BPO's deals with tertiary services than specialized KPO's with quaternary activities.

ROLE OF TERTIARY SECTOR (INCLUDING QUATERNARY SERVICES)

In the following points the contribution of the tertiary sector to our lives and economy has been discussed to achieve the second objective.

- The contribution of the service sector in the national economy of our country is very vital. In terms of contribution, the service sector contributes maximum to the national economy (as per Economic Survey 2009-2010) in comparison to agricultural and manufacturing activities. Finance, real estate and business followed by trades, hotels etc. contribute maximum to the service sector.
- The employment opportunities in this sector are also increasing. The more people get educated, they move towards service sector jobs then agricultural works. Moreover, with different level of education the job opportunities varies as well as pay check also differs. The agricultural sector is often seasonal hence educated people prefer to opt for jobs, which pay them throughout the year.
- The other benefit of service sector is that it invites maximum FDI (Foreign Direct Investment) in India. In 2014-15, the FDI in service sector was about \$16.4 billion. The reason behind this rise in FDI is mainly liberalization in service sector for FDI. This has resulted in increase in direct investment in our country. Indian government even has taken policy initiatives, such as Global Exhibition on Services and Service Export from India Scheme (SEIS). Other industries like tourism, real estate, IT, Media and entertainment, postal services, shipping and port services, consultancy firms, research and development industries have made considerably grown in the last few decades in India. More the investment betters the job opportunities, which is beneficial for our nation.
- Another positive about the service sector is increase in export of goods and services to foreign nations and in turn earning of foreign exchanges. Our service industry mainly includes IT services, legal, educational, consultancy services etc. As per economic survey of India 2009-10, India earned about Rs. 4.35 lakh crores in service export.

INTERRELATION BETWEEN DIFFERENT HUMAN ACTIVITIES

All the human activities primary, secondary, tertiary even quaternary is interconnected. Each activity complements and supplements each other. Without primary activities you will not be able to get your basic food items, similarly without secondary and tertiary services yours other daily needs will not be fulfilled. In other words, if you are dependent on a farmer for your food supply than he is also dependent on you as a customer, who will buy his produces and pay him for the same.

Following points further elaborate the relations:

1. Farmer's produces wheat, rice, vegetable, fruits, through cultivation but for their production they need support of manufacturing units in the form of tractors, water pumps etc. hence are depended on secondary service.
2. Farmers not only produces for their own consumptions, but also to sell to earn their livings and for that they need help of tertiary services such as transport services to ferry their products to cities and other towns, banking services for loan to buy good quality seeds, fertilizers etc.
3. Similarly, the people in manufacturing unit depend on primary sector for food and supply of raw materials. Such as sugar mills requires sugarcanes from primary producers for sugar production. For survival people in all sector needs food that comes from primary producers.
4. Tertiary sector services like medical services, education, banking etc. are depended on secondary services for construction of infrastructures such as hospitals, schools, colleges, offices, banks etc.
5. Even people in quaternary services like research and development, gold color jobs etc. requires primary (for food), secondary (infrastructure etc.) and other tertiary services for daily survival.

The above points shows that all the economic activities are interdependent even though grouped in different category.

9.6 CONCLUSION

To conclude it can be said, that we humans perform different activities some for our social, personal needs and some for economic needs. The difference between economic and non-economic activities is mainly the objective. For instance a same activity can be economic and non-economic like a father taking his kid to school is a non-economic activity, but if he drops few more children in the school and charges for the same it's an economic activity as money is involved. The economic activities are categorized in different sectors such as primary, secondary, tertiary and quaternary. Unlike the primary activities which largely depend on geographical locations for productivity, the manufacturing units or secondary sectors are not confined to specific geographic locations rather with better infrastructure, roads and transport, the location preference for both secondary and tertiary activities is hardly considered.

In the earlier times the primary activities were more dominant but with changing time and technology the secondary, tertiary and quaternary activities have outgrown primary activities and its contribution to national economy, which shows the sign of development of a nation. However, though categorized in varied sectors, all human activities are dependent on each other. Each sector support the other sector, even in non-economic activities the role of different sectors is prevalent. Due to these different types of economic activities our different needs and demands are met and our society is able to function properly.

9.7 SUMMARY

In this unit on 'other human activities' as heading suggests, other than the primary activities, the secondary, tertiary and quaternary activities have been explained. The role of each sector in our daily lives and nations economy has been thoroughly discussed. The small scale, medium scale and large scale industries have been defined here with emphasis on their contribution in employment generation in our country. All the other economic activities namely secondary, tertiary and quaternary services have largely contributed to our national economy. In fact now the contribution of each of these sectors in our national economy is more than primary sector activities. The percentage of export of goods and services has increased in the secondary, tertiary and quaternary sectors, along with direct investment in our country by foreign nations. In this module, the formal and informal activities in tertiary sector have also been explained along with the role of each sector and interrelation between them. The fact that all the economic activities though categorized in different sectors but are interrelated and interdependent, is very precisely explained in this module. Even the specialized sector known as quinary sector, which is part of quaternary sector have been defined.

9.8 GLOSSARY

BPO (Business Process Outsourcing): This involves outsourcing the operational responsibilities of a specific process of business to a third-party service provider organization.

Economic Activities: The activities associated with earning money.

Footloose Industries: Footloose means not restricted to particular location rather free to relocate anywhere within the country's boundary.

Foreign Direct Investment: When one country invests for production other country for production it's known as FDI.

KPO (Knowledge Process Outsourcing): This involves outsourcing the important knowledge based process to a third party service provider, which specializes in such technical and analytical skills and services.

Primary Activities: This activities involves obtaining goods directly from the soil or the earth such as farming, mining, fishing, forestry etc. are primary activities.

Quaternary Activities: These are specialized and intellectual service oriented activities.

Quinary (Gold collar) activities: The activities of top executives or officials, highest level decision making and leadership roles are Quinary or gold collar activities

Secondary Activities: Manufacturing units of all sizes small, medium and large as well as construction industries are part of secondary activities.

Tertiary Activities: These activities are associated with providing services to general public.

9.9 ANSWER TO CHECK YOUR PROGRESS

Exercise: A

1. Visit any neighbourhood locality and note down at least five primary and secondary sector products.
2. Make a list of 5 items each from manufacturing units and construction units, which you come across in your daily life.

Practice Questions:

- Q1. Name the types of secondary sector activities?
- Q2. How much rise did secondary sector showed in employment generation mainly in the construction sector in the period 2009- 2010?
- Q3. What was industrial sector's contribution in India's total GDP in 2014?

Exercise: B

1. Make a list of five people each engaged in tertiary and quaternary activities in your neighbourhood or locality.
2. Is anyone in your family in Quinary service (gold collar job), if yes, make a note of the job profile?

Practice Questions:

- Q4. What is India's ranking in the world in tertiary sector output in 2015 as per CIA world fact book and IMF?
- Q5. What does FDI stands for?
- Q6. What was the total amount of FDI in service sector in 2014-15?

Exercise C:

1. In your newspaper look for the job opening section and group the different vacancies advertised in different sector of economy.

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9.12 TERMINAL QUESTIONS

- Q1. Define small scale and large scale industries.
- Q2. What type of industry is part of tertiary sector?
- Q3. Give at least two examples of 'gold collar' professions.
- Q4. Name two policy initiatives of Indian Government to increase FDI's.
- Q5. Explain the role of tertiary sector in simple points.

BLOCK 4 - SOCIETY AND CULTURE

UNIT 10 - EVOLUTION OF MAN

10.1 OBJECTIVES

10.2 INTRODUCTION

10.3 EVOLUTION OF MAN (AUSTRALOPITHECUS, HOMO ERECTUS, HOMOSAPIENS)

10.4 CONCLUSION

10.5 SUMMARY

10.6 GLOSSARY

10.7 ANSWER TO CHECK YOUR PROGRESS

10.8 REFERENCES

10.9 SUGGESTED READINGS

10.10 TERMINAL QUESTIONS

10.1 OBJECTIVES

In this unit, you will get to learn about how life first originated on earth and how such a vast variety of organisms, popularly known as biodiversity, evolved through variation and natural selection. Apart from this, you will learn about the evolution of human on the earth through some of the known evidence. We will start with a discussion of Darwin and the theory of natural selection; move on to talk about primates, their social lives, before turning to the conclusion of what we know about the evolution of man. We will also discuss the ways in which remain are found and then survey the major fossil, including the australopithecines, *Homo habilis*, *Homo erectus*, and *Homo sapiens*. In this unit, the process of evolution of human and diffusion at the various places of the world has been provided. While doing so, you will also learn about the evidence, places, evolutionary time period, characteristics etc. of human evolution.

10.2 INTRODUCTION

When the brain capable of abstract thought was acquired by man, one of his first questions must have been, where did we come from? His answer pointed out to give himself a glorious origin - of gods, from the earth itself, from monsters or giant animals. But the present day science offers a more mundane origin that man has evolved from an ape; a member of the same family as today's chimpanzees, gorillas, and orangutans. One Million of years later, a descendant of that ape had evolved far enough away from his simian ancestors to be given his own genus, *Homo*, man. After many years and many species of *Homo*, later the first wise human, a somewhat primitive-looking *Homo sapiens*, arrived then, still later, the first wise men, *Homo sapiens*, present day man, appeared.

The earth came into existence or formed between four to five billion years ago. Life is evolved on the planet earth about 3.5 billion years ago. Approximately fifteen million different species of organisms have evolved since that period. But only about two million have been identified till now. At that time the planet earth was extremely hot. The evolution of life in any form was impossible at the extremely high degree of temperature. So, this becomes important for us to know that how did life originate on the earth. Similarly, the Evolution of new forms of the primitive organisms has led to the evolution of a variety of organisms on the earth surface.

While studying the evolution of man, this becomes important to have a clear understanding regarding the concept of evolution and origin. Origin is generally related to life. Origin of life means the appearance of the simpler primordial life from non-living matter. Evolution of life means the gradual formation of complex organisms from simpler ones. The genesis of complex organisms through the process of 'gradual change' from simple ancestral types over the course of geological time is termed as Evolution or Organic Evolution.

In the broader sense, the term evolution refers to directional change. Biological evolution, however, is something more specific in this regard. For biologists, the concept of evolution is descent with modification from a single common ancestor or ancestral population. While,

evolution is a characteristic of populations, not the individual organisms. As individuals, we grow and learn and we may create inventions or make changes in our lifestyles. But, for a change to be called evolutionary in a biological meaning, it must affect the genes we pass along to the next generation. The primary way we understand the biological history of humanity and, indeed, of all life, evolution is the most important phenomenon.

The primates called *Dryopithecus* and *Ramapithecus* existed, around fifteen Mya. They walked like chimpanzees and gorillas and were hairy. *Ramapithecus* was more man-like while *Dryopithecus* was almost ape-like. Few fossils similar to man-like bones have been discovered in Ethiopia and Tanzania. This showed hominid features leading to the belief that about three to four mya, man-like primates walked in eastern Africa. They walked upright but they probably were not taller than four feet in height. Two Mya, *Australopithecines* lived in East African grasslands. Evidence, prove that they essentially ate fruit but also shows they hunted with stone weapons. Some of the bones among the bones discovered were different. This creature was called *Homo habilis* which was the first human-like being. The brain capacities were 650 to 800 cc. Fossils found in Java in 1891 unearthed the next stage, i.e., *Homo erectus* about 1.5 Mya. *Homo erectus* had a large brain capacity around 900cc. *Homo erectus* possibly ate meat. The Neanderthal man with a brain size capacity of 1400cc lived in the near east and central Asia between 1, 00,000- 40,000 years back. They used the hides to protect their body and buried their dead. *Homo sapiens* arose in Africa and moved across continents and developed into well-defined races. During the ice age between 75,000-10,000 years ago, present day *Homo sapiens* arose. The cave art developed about 18,000 years ago. Agriculture came around ten thousand years back and human settlements started to be developed. The rest is the part of the human history, the growth and decline of civilizations.

10.3 EVOLUTION OF MAN

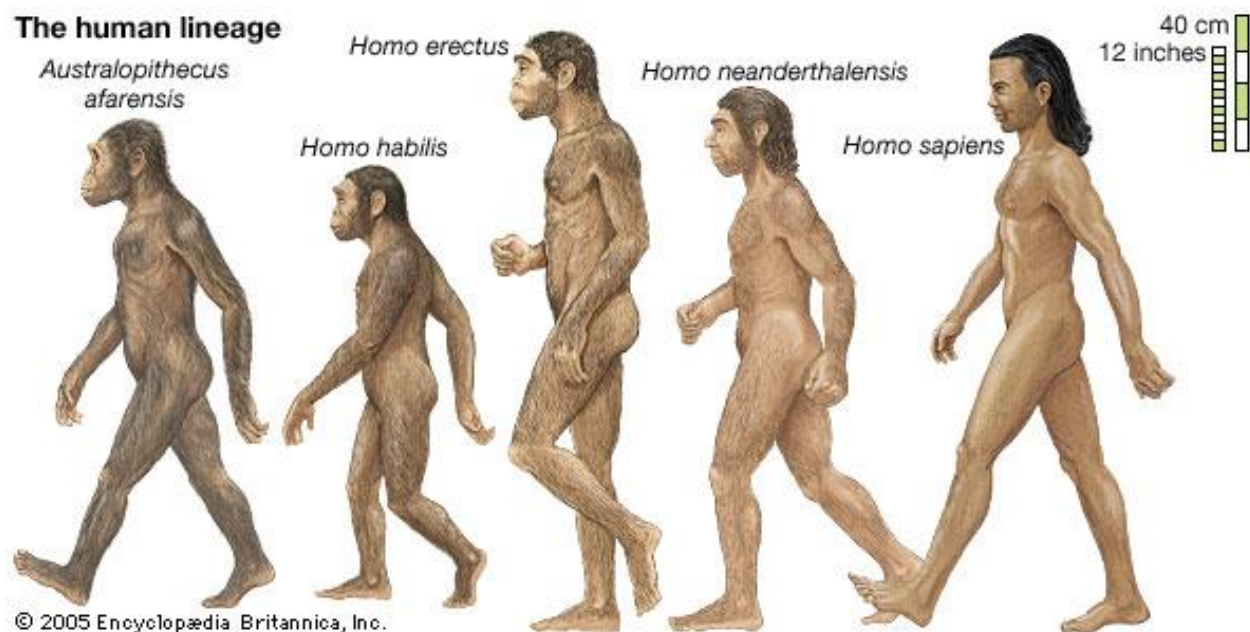
The supposition about the natural world and human history plays an important role in most societies. For example, the belief that man came from earlier life forms was well evolved among ancient European philosophers. In the sixth century BCE, the Greek thinker Anaximander of Miletus postulated that humans arose from fish. A century later, his disciple, Xenophanes of Colophon, by using the evidence of fossil fish from many places around the Mediterranean supported the theory of Anaximander.

Evolution of human or the process by which human beings evolved on the planet earth is from now-extinct primates. If seen zoologically, we the human beings are *Homo sapiens*, a culture-bearing, upright-walking species that live on the ground and very likely first evolved about 315,000 years ago in Africa. Many zoologists refer that we are now the only living members of human tribe, Hominins, but there is plentiful fossil evidence to stipulate that we were preceded for millions of years by other hominins, such as *Australopithecus*, and that our species also lived for a time simultaneous with at least one other member of our genus, *Homo neanderthalensis* (the Neanderthals). In addition to this, we and our forerunners have always

shared the Earth with other apelike primates, from the modern-day gorilla *Dryopithecus* which is long-extinct.

The extinct hominins are in some way related to the apes. Since the great British naturalist *Charls Darwin* published his monumental books *on The Origin of Species* (1859) and *The Decent of Man* (1871) the specific nature of our evolutionary relationships has been the subject of debate and investigation. There is, however, a common view of an ancestor, which existed millions of years ago. This ancestral species does not make a ‘missing link’ along with a lineage but rather a node for divergence into separate lineages. The primates of ancient time have not been identified and may never be known with certainty because fossil relationships are unclear even within the human lineage, which is more recent. In fact, the human “family tree” can be better described as a “family bush,” within which it is not possible to connect a full chronological series of species, leading to *Homo sapiens* on which experts can agree. Fig 10.1 shows the artistic description of five species of the human lineage for the better understanding of the process of human evolution.

Fig. 10.1 An artistic description of five species of the human lineage



Source: Encyclopaedia Britannica, 2005

Fossil specimens are the primary resource for detailing the path of human evolution. For the most of human history certainly, the trove of fossils from Africa and Eurasia indicates that, unlike today, more than one species of our family has lived at the same time. The nature of particular fossil samples and species can be precisely described, the period of time when they lived, the location where they were found. The species lived and might have either died out or

evolved into other species can only be addressed by formulating scenarios, albeit scientifically informed ones.

Fossil evidence are important and need to be studied for the evolution study of the prehistoric life of all forms, typically using fossils is important which is called as Paleontology. Similarly, Paleoanthropology is the study of prehistoric human life or human ancestry, typically using fossils.

DARWIN AND NATURAL SELECTION

In eighteenth and nineteenth centuries, scientists in European and North American proposed many different theories of human evolution. The theory of evolution given by Charles Darwin emphasises on natural selection, however, that proved the most satisfactory scientific explanation of the variety and history of life on earth.

On the primate family tree, humans are just one ape. We split off from chimps around six or seven million years ago along with the other apes. After that, from several genera, various upright walking apes evolved. All of the upright-walking species are called hominids, including us from family Hominidae.

We belong to *Homo sapiens*, from the genus *Homo*. There are at least several members which are extinct from the genus *Homo*. One is *Homo neanderthalensis*, with whom we have blended, while another is *Homo habilis*, which is known for being the early stone tool users.

10.3.1 AUSTRALOPITHECUS

Our recent ancestry is consisting of a variety of upright-walking apes that have mastered tools, fire and the starting of language. The literal meaning of *Australopithecus* is 'southern ape'. It is also an extinct genus of members of the human family tree. Scientists, in general, accept five species: *A. Afarensis*, *A. africanus*, *A. anamensis*, *A. garhi*, and *A. sediba*, as belonging to the genus.

The study about Australopithecus, covering their time of emergence in the fossil record, probable place in our family tree, and overall traits is very important. Map 10.1 shows the fossil sites of the early australopithecines in Africa

Australopithecine Characteristics

The major characteristics of *Australopithecus* species, referred to as Australopithecines, had features that were both human-like and ape-like. Their brains were smaller and more in the range of the brains of the present day apes. They had longer arms that seemed well suited for climbing. In general, they had sloping faces and jutting jaws and features looked like more ape-like than human. However, their skeletons showed the evidence that they walked upright. Furthermore, the teeth's of some species were like human teeth. Most importantly, they showed that our ancestors started walking upright before the evolution of larger brains.

The Genus *Australopithecus*

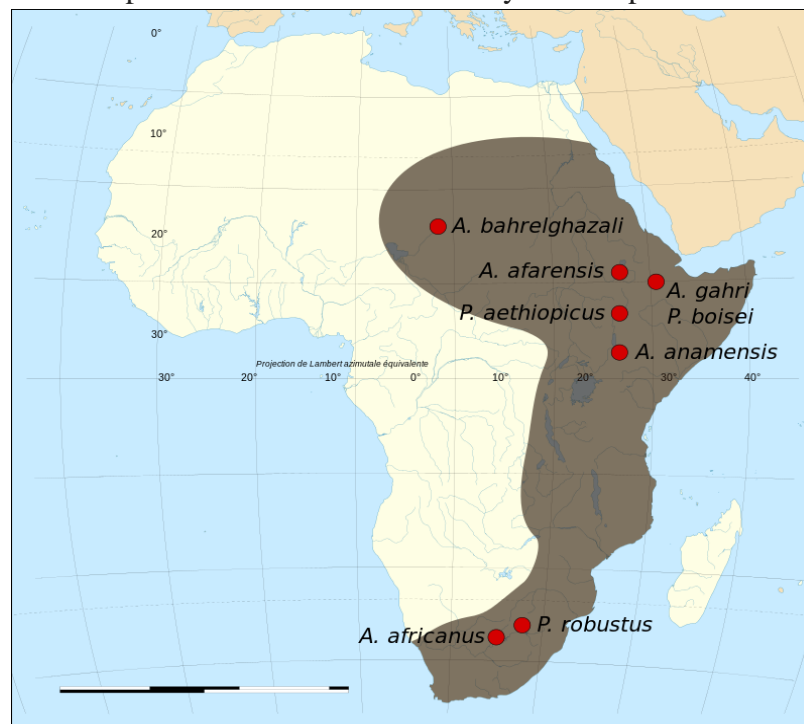
Living some 4.2 to 3.9 million years ago, *A. anamensis* is possibly the oldest known Australopithecine. *A. anamensis* had a jaw like a chimp, but teeth that were clearly hominid. While little of its skeleton has been found, it is thought to have climbed trees like other Australopithecines, as well as walked upright.

The fossil evidence range from Lake Turkana in Kenya to Northeast Ethiopia. Anthropologist Meave named the species officially in 1995.

A. afarensis ranged through Kenya, Ethiopia and Tanzania from 3.85 to 2.95 million years ago. The species is supposed to be either a direct ancestor of genus *Homo* or in a close relation with such an ancestor. It was the first species that made scientists believe that upright walking evolved before the large brains.

Discovered in 1924, the Taung Child was the first proof of early human species in Africa. The name *Australopithecus africanus* literally means 'southern ape of Africa.' It was named for the fact that it lived in present-day South Africa. It was the first of many hominid species to be discovered on the African continent. While not immediately accepted as part of the human family tree, *A. africanus* is one of the most talked-about species, particularly because of the way that the Taung Child is thought to have died. The Taung Child is thought to have been killed by an eagle. The holes in its skull seem to match those that would be made by eagle talons, although some believe it was leopard teeth. A variety of small animal bones and fossil eggshells seem to support the eagle hypothesis. Regardless of how he died, the Taung Child shows that our ancestors were still prey at this time and probably had to work together for protection.

Map. 10.1 Map of the fossil sites of the early australopithecines in Africa

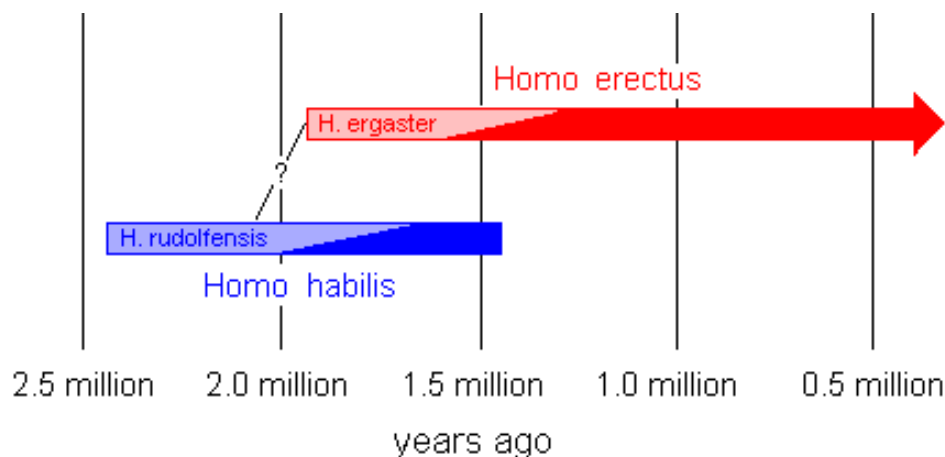


Source: <http://www.archaeologyinfo.com/species.htm>

10.3.2 HOME ERECTUS

Homo erectus is commonly known as ‘upright man’, and an extinct species of man that has an interesting spot within the human evolutionary pedigree. These prehistoric hunter and gatherers were greatly successful in changing vastly different habitats throughout the Old World. The fossil evidence which is related with these species has been found from Africa all the way to Southeast Asia. With the first remains appearing around 1,9 million years ago, and the latest ones surviving into the Middle Pleistocene, *Homo erectus* spanned remarkably large time frame. However, the amount of variation between different fossils from different times and places has raised many unanswered questions regarding the authentic classification of the species, and its specific role in the evolutionary history. Fig. 10.2 shows the time period of evolution of *Homo erectus*.

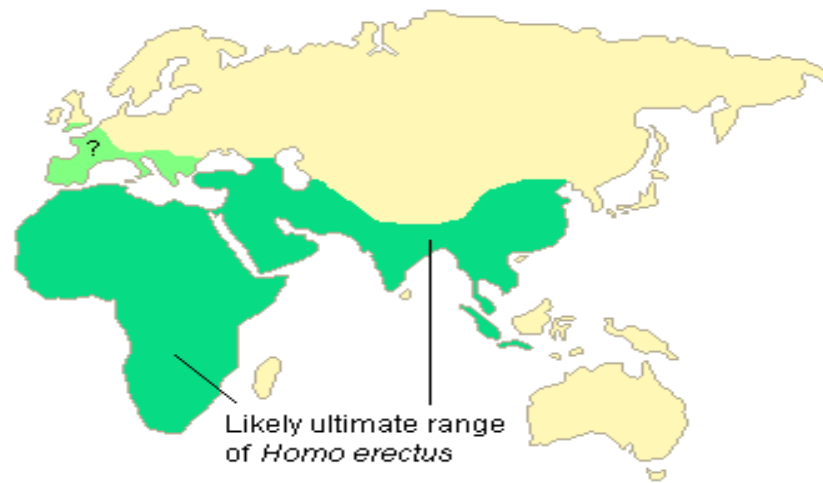
Fig. 10.2 Time period of *Homo erectus*



Source: <http://pratlif.com/origins-life/early-homo.htm>

Geographical Spread

Fossils assigned to the broad definition of *Homo erectus* are found all the way from Southeast Asia to Africa. Areas and sites include Trinil on Java, Indonesia; China (‘Peking Man’); Eurasia including Georgia, where finds at Dmanisi are so puzzling they seem to blur the lines between *Homo habilis*, *Homo rudolfensis*, and *Homo erectus*, and might even end up qualifying as a distinct species (*Homo georgicus*); East Africa (sites at for instance Olduvai Gorge and in the Turkana Basin in Kenya); as well as North- and South Africa. Some finds in Western Europe have also at some point in time been lumped into the *Homo erectus* party, but there is now fairly broad agreement that most of these forms are better matches with *Homo heidelbergensis*.

Map 10.2 Showing the site and spread of *Homo erectus*

Source: <http://pratclif.com/origins-life/early-homo.htm>

This early species of adventurers is generally thought to have started their marathon out of Africa, through the Middle East, the Caucasus and eventually East Asia around 1.9-1.8 million years ago, reaching Indonesia and China by ca. 1.7-ca. 1, 6 million years ago. But what spurred them on? A 2016 CE study developed a model that suggests that *Homo erectus* followed the large herbivores during their dispersal, while also keeping an eye on flint deposits, and actively avoiding areas densely populated by carnivores, at least early on in their migration. However, since *Homo erectus* pops up more or less around the same time in East Africa and Eurasia, there is a chance that their origins lay in Eurasia instead - this could help explain the presence of *Homo floresiensis* in Indonesia, which has *erectus*-like traits. Either way, they spread very rapidly across the globe.

Key physical features

This species had a robust skeleton that was generally similar to those of present day man. However, the skulls of *Homo erectus* were quite different to those of present day humans. The body tended to be shorter and stockier than those of modern humans. The Brain showed an increase in the size over earlier species and averaged about 1050 cubic centimetres and the structure of the brain was much similar to that of present day humans. If we talk about the skull, the face was large with a low, sloping forehead, flat nose and a massive brow ridge. The skull was broad and long with sharp angles at the rear, unlike the curve found in modern humans. The bones of the skull were very thick and formed a small central ridge, known as a midline keel, along with the top of the skull. The jaw was large and thick without a pointed chin. Molar teeth had large roots but were decreasing toward a more modern size. The limbs were like those of modern humans although the bones were thicker, suggesting a physically demanding lifestyle.

Lifestyle and Culture

The stone tools used by *Homo erectus* were made in China about one million years ago are the oldest known. These tools were simple flakes and choppers. (Mode 1 technology). These tools gradually became smaller in size over time and came to include variety in the designs. More complex bifacial tools (Mode 2 technology) like those made by *Homo heidelbergensis* people from Eurasia made a finite appearance in parts of northern China. This indicates a brief period of contact between these different peoples. Comparatively few stone tools have been found in East Asia compared with western Asia, Africa and Europe but tools made from non-durable materials such as bamboo may have been manufactured instead. Animal bones, burnt stones, charcoal and ash deposits indicate that these people may have used fire about five lakh years ago but it is difficult to prove whether this use was controlled.

Environment and Diet

China has undergone notable climatic change during the period that Zhoukoudian was occupied. These changes comprise of three cold glacial periods with harsh winter temperatures. The cooling and drying that took place in these glacial periods have brought an expansion of open habitats, with grasslands and mixed steppes. These environmental conditions favored large grazing animals, which would have been hunted by then *Homo erectus*.

Java had a warmer climate. Low sea levels about 1.6 million years may have seen Indonesia joined to mainland Southeast Asia. The fossil remains of meals have been discovered at some *Homo erectus* sites in China. This evidence shows that they ate large amounts of meat supplemented with plant foods and, in general, had a diet similar to that of early present day man.

10.3.3 HOME SAPIENS

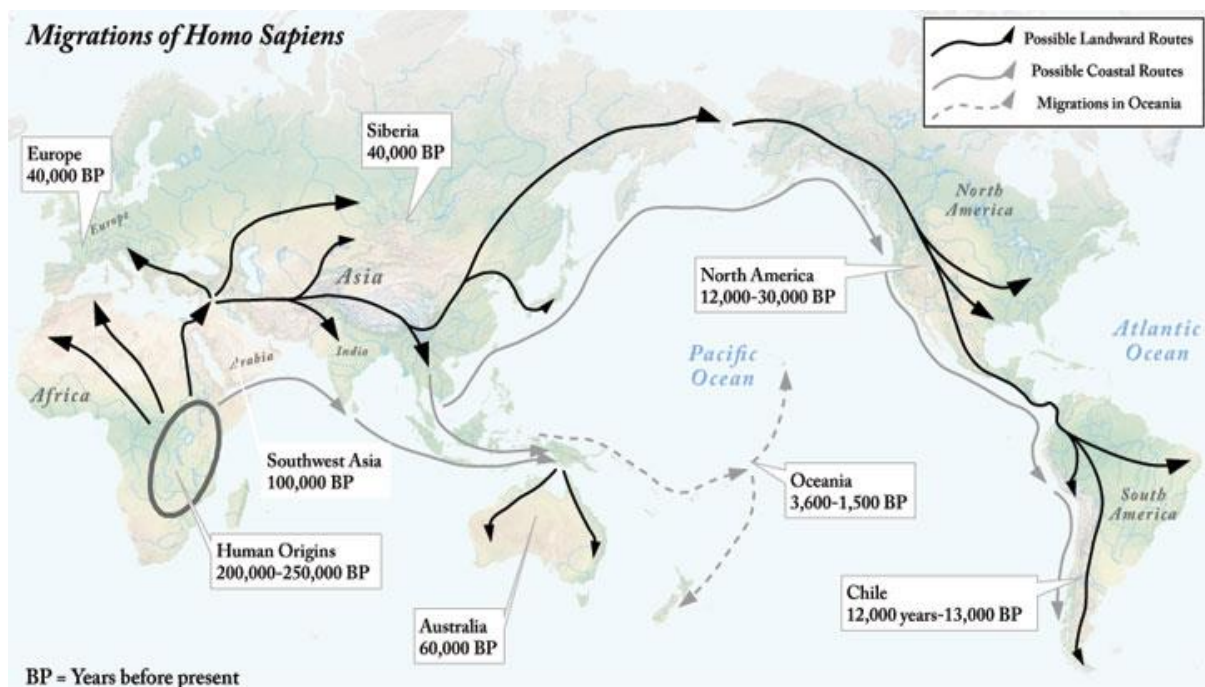
Homo sapiens are the species to which all present day human beings belong. *Homo sapiens* are one of the various species which are grouped into the genus *Homo*, but it is the only species that is not extinct. Presently, all people are classified as *Homo sapiens*. Our species of man first started to evolve approximately two lakh years ago in association with technologies not unlike those of the early Neanderthals. It is now evident that early *Homo sapiens*, or present day man, did not come after the Neanderthals but were their contemporaries. However, it is likely that both present day man and Neanderthals descended from *Homo heidelbergensis*.

Present day man generally has more delicate skeletons compared to the Neanderthals and other late archaic humans. Their brow ridges generally protrude much less and their skulls are more rounded. They seldom have the occipital buns found on the back of Neanderthal skulls. They also have comparatively high foreheads, pointed chins and smaller faces. The name *Homo sapiens* was used by the father of modern biological classification, Carolus Linnaeus in 1758. A man physically resembles the primates more closely than any other known living

species, but at the time it was a bold act to classify human beings within the same framework used for the rest of nature.

Since Linnaeus's time, a large fossil record has been found. This record contains a lot of extinct species that are more closely related to man than to today's apes and that was probably much similar to *Homo sapiens* behaviorally as well. Following the ancestors of the present day, man into the distant past raises the question about the meaning of the word human. *Homo sapiens* are human by the definition, whereas apes are not. But what of the extinct members of the human tribe (Hominini), who were certainly not *Homo sapiens* but were however very much like them? There is no conclusive answer to this question. Although the evolution of man can be said to involve all those species much closely associated to *Homo sapiens* than to the apes, the adjective *human* is usually applied only to *Homo sapiens* and other members of the genus *Homo* (e.g., *H. erectus*, *H. habilis*). Even the definition of *Homo sapiens* is a matter of active debate but, behaviorally, only *Homo sapiens* can be said to be fully human. Some paleoanthropologists suggest the span of this species far back into the time which includes many fossils that are anatomically distinctive, while others prefer to suggest many different extinct species. The majority of paleoanthropologists, want to bring the study of hominins into the line with other mammals. They tend to assign to *Homo sapiens* only those fossil forms that fall within the anatomic spectrum of the species as it is found today. In this sense, *Homo sapiens* is very recent, which have originated in Africa more than 315,000 years ago.

Map.10.3 Migration of *Homo sapiens*



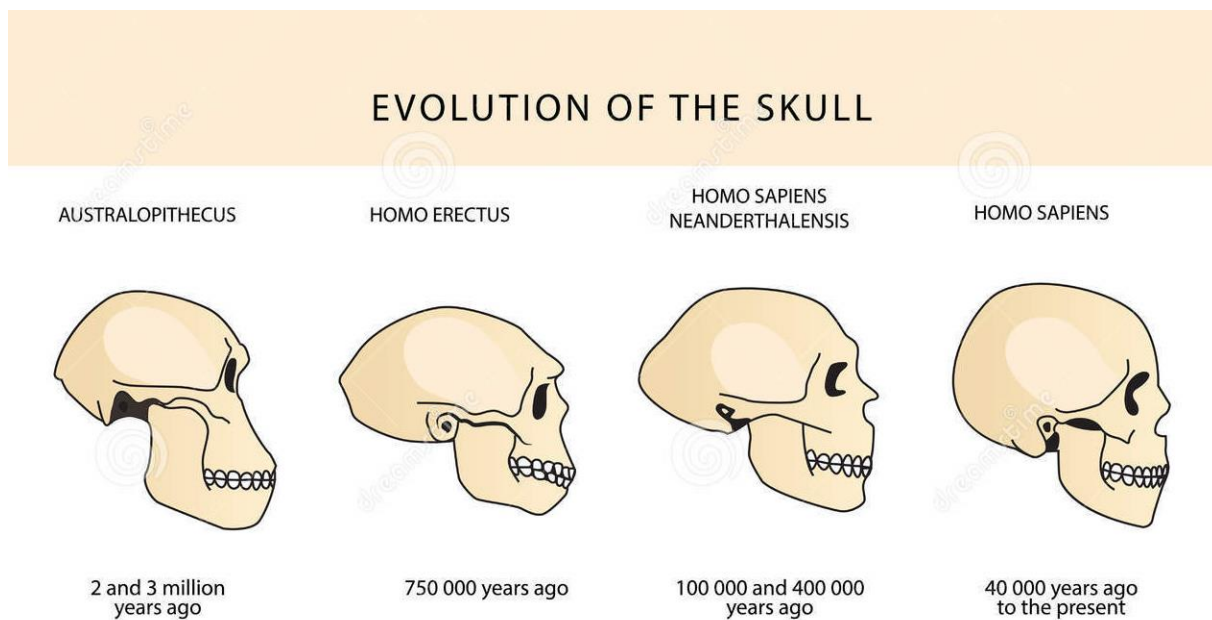
Source: NSW migration heritage centre

Evolution

By the new archaeological discoveries over the last few decades, better dating, and genetic evidence, it has become clear that Africa is actually the place that houses our common origin. The dominant view today is that archaic human – usually thought to be *Homo heidelbergensis*, who in itself developed from *Homo erectus* - gradually evolved into *Homo sapiens* by approximately 200,000 years ago, in either Eastern- or Southern Africa. The first signs of the modern human benchmark of a high, round skull appear at Omo Kibish (Omo 1) in Ethiopia around 195,000 years ago. Within Africa itself, we were not an isolated species; some degree of mixture with archaic species took place, but the details of this are not yet clear.

The first known brave *Homo sapiens* souls who ventured out beyond Africa are found at the sites of Skhul and Qafzeh in Israel, where burials have been dated to be older than 100,000 years ago – and perhaps even up to a staggering 130,000 years ago. However, the main wave(s) of modern humans who left Africa decided they needed a bit more preparation time for the wide world beyond, and waited until around 55,000 years ago. This time, larger numbers spread to way further reach than ever before. Eastern Eurasia was reached by at least 40,000 years ago; Australia between 53,000-41,000 years ago (although it now looks like another, possibly earlier group of humans from an earlier migration already reached the north of Australia by 65,000 years ago); Europe – the last stronghold of the Neanderthals - was not braved until around 45,000 years ago; and the Americas took longer still, until around 15,000-14,000 years ago.

Fig. 10.3 Evolution of Human Skull

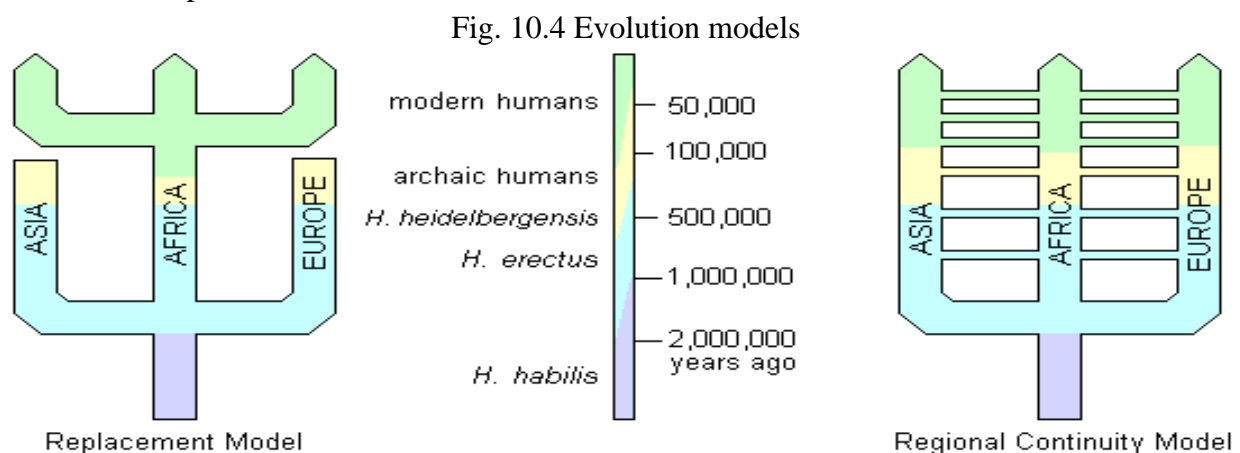


Source: <https://biologywise.com>

It would seem from these dates that the location of initial modern *Homo sapiens* evolution and the direction of their dispersion from that area is obvious. That is not the case. Since the early 1980's, there have been two leading contradictory models that attempt to explain modern human evolution--the replacement model and the regional continuity model.

The **replacement model** of Christopher Stringer and Peter Andrews suggests that present day humans evolved from archaic humans 200,000-150,000 years ago only in Africa and then some of them moved into the rest of the Old World replacing all of the Neanderthals and other late archaic humans starting around sixty to forty thousand years ago or earlier. If this description and evaluation of the fossil records are correct, all people today share a comparatively modern African ancestry. All other lines of man that had descended from *Homo erectus* probably became extinct. From this view, the regional anatomical differences that we now see among humans are recent developments, evolving mainly in the last forty thousand years. This speculation is also referred to as the "out of Africa", "Noah's ark", and "African replacement" model.

The **regional continuity model** supported by Milford Wolpoff suggested that present day humans evolved more or less at the same time in all major parts of the old world from local archaic humans. For example, present day Chinese are seen as having evolved from Chinese archaic humans and eventually from Chinese *Homo erectus*. This would mean that the Chinese and some other people in the Old World have great antiquity in place. Crusaders of this model believe that the last common ancestor of all present day people was an early *Homo erectus* in Africa who lived there at least 1.8 million years ago. It is further advocated that since then there was sufficient gene flow between Europe, Africa, and Asia to prevent long-term reproductive isolation and the subsequent evolution of definite regional species. The evidence has been cited that intermittent contact between people of these remote areas would have kept the human line a single species at any one time. However, subspecies and regional varieties, of humans are expected to have existed.



Source: Dennis O'Neil: https://www2.palomar.edu/anthro/homo2/mod_homo_4.htm

10.4 CONCLUSION

To conclude the entire description regarding the evolution of human that human as in the present form is the result of long evolutionary history. It is very likely that the evolution rate for our species has remained growing since the end of the last ice age, roughly ten thousand years ago. This is predominantly due to the fact that population of human has exponentially grown and moved into new kinds of environments, including urban areas, where we have been subject to new natural selection pressures. This has exerted strong selection for individuals who were fortunate to have strong immune systems that enabled them to survive. Significant changes in diet for most people since the end of the last ice age has been observed. The diet is predominantly vegetarian around the globe and less varied with a heavy dependence on foods made from cereal grains. Probably human species has been able to adapt to these changes and other new environmental stress because it has gained a steadily greater genetic diversity. The consequences of the environmental and behavioural changes for humans are not clear. However, it looks like the average body size of the human body has become somewhat shorter over the last ten thousand years, and we have acquired extensive immunity to the more acute effects of some diseases such as influenza and measles. Lastly, can we say what direction evolution of human will take in the future? This is an extremely interesting question to consider but not possible to answer because of countless unknown factors. Though, it is definite that we will continue to evolve until we reach to the point of extinction.

10.5 SUMMARY

To summaries the unit it can be said that the origin of life on the planet earth can be understood only against the background of origin of universe especially earth. The speculated story of the upcoming events as to what happened to the first form of life is based on Darwinian ideas of organic evolution by natural selection. The life form diversity on earth has been continuously changing over millions of years. The phenomena's like genetic drift and habitat fragmentation may underline the variations leading to the advent of new species and hence evolution with the time. The scientific studies regarding fossils and comparative biochemistry and comparative anatomy provide evidence for evolution. Among the stories of the evolution of individual species, the story of the evolution of present day man is the most fascinating and appears to parallel evolution of human brain and language.

10.6 GLOSSARY

Origin: The Origin is defined as the appearance of the simplest primordial life from non-living matter.

Evolution: Evolution of life refers to the process of gradual formation of complex organisms from simpler ones.

Hominini: Any of a taxonomic tribe of the hominids that includes present day humans together with extinct ancestral and related forms.

Palaeoanthropology: The scientific study of extinct members of the genus *Homo sapiens* by evidence of their fossil remains.

Hominid: A primate of a family which includes humans and their fossil ancestors and also at least some of the great apes.

Neanderthal: The widely distributed as an extinct species of human that was in ice-age Europe between 120,000 and 35,000 years ago, with a retreating forehead and evident brow ridges.

10.7 ANSWER TO CHECK YOUR PROGRESS

1. Approximately how many years ago was the earth formed?
2. Where did life originate in water or on land?
3. Define organic evolution.
4. What is the meaning of *Homo sapiens*?
5. What do you mean by *Homo erectus*?

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10.10 TERMINAL QUESTIONS

1. What were some general and some physical changes were seen in hominid evolution?
2. Discuss in detail about Homo erectus.
3. How are modern humans and Neanderthals related?
4. Discuss the evidence of the evolutionary history of human.
5. What do you understand by Neanderthal?

UNIT 11 - CULTURAL DIFFUSION AND CULTURAL REALMS

11.1 OBJECTIVES

11.2 INTRODUCTION

11.3 CULTURAL DIFFUSION

11.4 CULTURAL REALMS

11.5 CONCLUSION

11.6 SUMMARY

11.7 GLOSSARY

11.8 ANSWER TO CHECK YOUR PROGRESS

11.9 REFERENCES

11.10 SUGGESTED READINGS

11.11 TERMINAL QUESTIONS

11.1 OBJECTIVES

The objective of this unit is to learn about cultural diffusion and cultural realms. While learning about cultural diffusion we will first learn about the concept of culture. After that, we will learn about the 'cultural diffusion' as a term. Similarly, we will talk about the concept of cultural realms. For the better understanding, we will study about the differences between cultural diffusion and cultural realms. This unit also focuses on various types and processes of cultural diffusion and discusses the formation of a cultural realm. This unit attempts to enable you to have a broad understanding regarding various forms of cultural diffusion with a series of examples. Further, you will learn about the concept of the cultural realm and various cultural realms of the world. Each cultural realm of the world has been discussed separately to have a better understanding. After reading this unit you will also be able to establish the relationship between culture and civilization and establish the link between culture and heritage.

11.2 INTRODUCTION

The word 'Culture' is taken from the Latin word 'cult or cults' which means tilling, or cultivating or refining and worship. In sum, it means refining and cultivating something to such a level that its end product induces our respect and admiration. This is the same like 'Sanskriti' of the Sanskrit language. The word 'Sanskriti' has been taken from the root 'Kri (to do) of Sanskrit. Three words came from this root 'Kri; prakriti' (which is the basic matter or condition); 'Sanskriti' which refers to the refined matter or condition and 'vikriti' which refers to modified or decayed matter or condition. When a raw material (prakriti) is refined it becomes 'Sanskriti' and when broken or damaged it becomes 'vikriti'.

You must have seen people speaking different languages, religion, and wearing different clothes at different places. Culture is generally referred to as a certain group's particular way of life. This includes the social meanings of various aspects of life such as race, ethnicity, values, languages, religions, and clothing styles. Culture is the specialized behavioral social patterns, understandings, adaptations, and social systems that summarize a group of people's learned way of life. The structure of culture is consists of Culture Traits, Culture Complex, Culture Region, Culture Realm and Globalization. The concept of culture lies at the heart of human geography, for culture mediates all human decisions and actions. Cultural geography focuses on where cultural ideas and practices developed, how and where they diffused, and how they affect the landscape, human perception, and human–environment relations. Though many different cultures are practiced around the world today, those that are the most dominant, have origins in one of a few areas called "culture hearths." Historically these places of origin of the cultures are the heartlands of various cultures. The most dominant cultural ideas have spread around the world from seven main locations. In diffusion of culture, it spreads cultural ideas from the place of their origin to other regions, groups or countries.

People are not isolated from their regions. Movement of culture takes place by the process of migration. People migrate or travel, trade products and spread the information around the world. In an exceedingly globalized world community, culture has become fluid and may adapt and change because of new influences. Some might argue that cultures are becoming more similar. The development and advancement in the field of technology have certainly changed or modified the culture. The Internet is the biggest medium of cultural diffusion from one place to another at the present time. Technology has also made it possible and convenient for people to travel across the world which lead to cultural diffusion.

The seven major original culture hearths are given below:

- 1) The Nile River Valley
- 2) The Indus River Valley
- 3) The Wei-Huang Valley
- 4) The Ganges River Valley
- 5) Mesopotamia
- 6) Mesoamerica and
- 7) West Africa

These regions are considered as culture hearths because of the origin of religion, highly organized social structures, the use of iron tools and weapons and the development agriculture practices started and spread throughout the world from these areas. Cultural hearths are known as the sources of civilizations, innovations, ideas, and various ideologies spread outward from them. If we take an example of the religious cultural hearth, the areas around Mecca is considered as the culture hearth for the Islamic religion and the area from which Muslims initially traveled to spread their religion and convert people to Islam. The development and spread of tools, social structures, and agricultural practices spread in the same manner from the culture hearths. Perceptual regions depend on an individual's belief cultural context and the mental maps she or he uses to make sense of the world.

CULTURE AND CIVILIZATION

The word 'culture' and 'civilization' are most commonly used synonymously. However, these two words have well defined meanings differentiating them. The term 'Civilization' means having better ways of living and sometimes making nature incline to fulfill their needs. Civilization includes organizing the societies into well-defined political groups working altogether for better conditions of life in terms of food, dress, communication, etc. Thus some groups consider themselves a more civilized and look down upon other groups. This nature of many groups has even led to holocausts and war, resulting in mass destruction of human beings and societies across the world.

On the other hand the word 'culture' refers to the inner being, an elegance and refinement of heart and head. This includes science and art, dance and music, various higher pursuits of human life which are termed as cultural activities. One person who may be poor and wearing

cheap clothes may be considered as ‘uncivilized’, but still he or she may be the most cultured person and have cultural values. One wealthy person may be considered as ‘civilized’ but he may not be cultured’.

Therefore, when we talk about of culture, we must understand that it is different from the civilization. We have seen, culture as the ‘higher levels of inner refinement’ of a person. Human beings are not merely physical beings. They act and live at three levels: physical, mental and spiritual. While better ways of living politically and socially is the better utilization of nature around us may be termed as civilization. This is not sufficient to be cultured. Only when the deepest level of a person’s intellect and consciousness are brought into expression then only we call him/her ‘cultured’.

11.3 CULTURAL DIFFUSION

Cultural diffusion is the spread of cultural trends across locations. Beliefs, practices, and ideas get shared from person to person, and sometimes even around the world through this diffusion, as happens with viral videos. Cultural diffusion may take the form of expansion diffusion or relocation diffusion. Many cultural practices are spread by a type of cultural diffusion called expansion diffusion. This is when a trend is spread from its originating place, outward. There are several forms of this type of diffusion: contagious, hierarchical, and stimulus diffusion. Throughout history, numerous factors have contributed to cultural diffusion. Technology is one such factor. People with TV and the Internet can now see and read about other people and easily borrow culture traits. By the process of assimilation in which the culture traits of newcomers to a country become similar to those people in the new country. Migration is another factor of cultural diffusion. When a person from one society moves to a new society they may give up their traditional ways and assimilate to the new country. The process of cultural diffusion refers to how quickly do others in a culture acquire, learn about, and/or come to use or consume a new idea, behavior, or invention?

11.3.1 FORMS OF CULTURAL DIFFUSION

There are three different forms of cultural diffusion.

Direct diffusion

Direct diffusion occurs when two different cultures are very close to each other and results into intermarriage, trade, and even warfare. An example of direct diffusion of culture is between the United States and Canada, where the people living on the border areas of these two nations engage in hockey, which was started in Canada, and baseball, which is big in American culture. Direct diffusion was very common during ancient times, when small groups, or bands, of humans, lived in adjoining settlements.

Forced diffusion

It occurs when one culture subjugates (conquers or enslaves) another culture and forces its own customs on the conquered people. An example would be the conquistadors that took over the indigenous population and made them practice Christianity.

Indirect diffusion

It happens when traits are passed from one culture through a middleman to another culture, without the first and final cultures ever being in direct contact. An example could be the presence of Mexican food in Canada since they have a huge country in between them. Indirect diffusion is very common in today's world, because of the mass media and the invention of the Internet.

Contagious Diffusion

The videos of Harlem Shake are a good example of contagious diffusion, or when a cultural trend is transmitted through person to person from the source of origin to numerous others, similar to a virus. Even the name 'viral videos' reveals the idea of a contagion, spreading and diffusing an idea is most similar to an illness which would spread through interaction and contact. As cultural trends draw our attention, and gain in popularity, profit may become a motive in perpetuating the trend.

Hierarchical Diffusion

Hierarchical diffusion is another form of expansion diffusion, or when a cultural trend is spread from one section of the society to another, in a definite pattern. Imagine how hip hop culture emerged from within urban places but is now known and spread in all regions of society including suburban and rural areas, as well. When information is known by the government officials before the public, the news is spread in hierarchical diffusion method. Take an example of how the information about a major event, Osama bin Laden's death, spread from the highest levels of government to eventually get shared with the public.

Stimulus Diffusion

Lastly, stimulus diffusion is when a cultural trend spreads but is changed by those adopting the idea. For example, many in the United States practice yoga, but make use of it in a different way than the regions where this activity originated. In fact, most of us associate yoga with a particular form of exercise involving poses, but these movements are only one dimension of the practice of ancient forms of yoga.

To help you remember the name of this type, think of stimulus as a stimulating new idea that sparks another culture to use it and also motivates them to adapt it for their own purpose.

Relocation Diffusion

Expansion diffusion and its various forms are not the only way that ideas and practices are passed along to others. Another way that culture spreads is by relocation diffusion when a person migrates from their home and shares their culture with a new location.

Relocation diffusion accounts for much of the folk culture that can be seen in different regions based on migration patterns. If a person grows up in a large city, for instance, they may have lived near a neighborhood such as Little Italy or Chinatown. The community surrounding these cultural enclaves then has the opportunity to learn about and even participate in the cultural traditions of these groups. Traditions may also be passed on to family members, neighbors, and friends.

11.3.2 EXAMPLES OF CULTURAL DIFFUSION

Religious Cultural Diffusion

- Christianity started in Israel and has spread all over the world.
- An example of forced diffusion is the Afghans forcing the Nuristanis to convert to Islam.
- India is home to many religions: Buddhists, Christians, Muslims and Hindi.
- An example of forced diffusion is the Spanish, French, English and Portuguese forcing the native population of the Americas to become Christian.
- Islam has spread recently to the whole world.
- In China, during the Han Dynasty, Buddhism spread from India to China.

Cultural Diffusion in Technology

- Paper was first made in China and soon spread to the Middle East and Europe.
- Kyrgyz herders in Afghanistan are isolated from the rest of the world and they have cell phones for playing music and taking pictures, even though there is no cellular service there.
- The fax machine was developed in Germany and was then made into a worldwide product by the Japanese.
- China invented the first mechanical clock and soon that technology spread throughout other cultures.
- The anti-lock brake system was developed in the United States and became known due to German automotive suppliers.

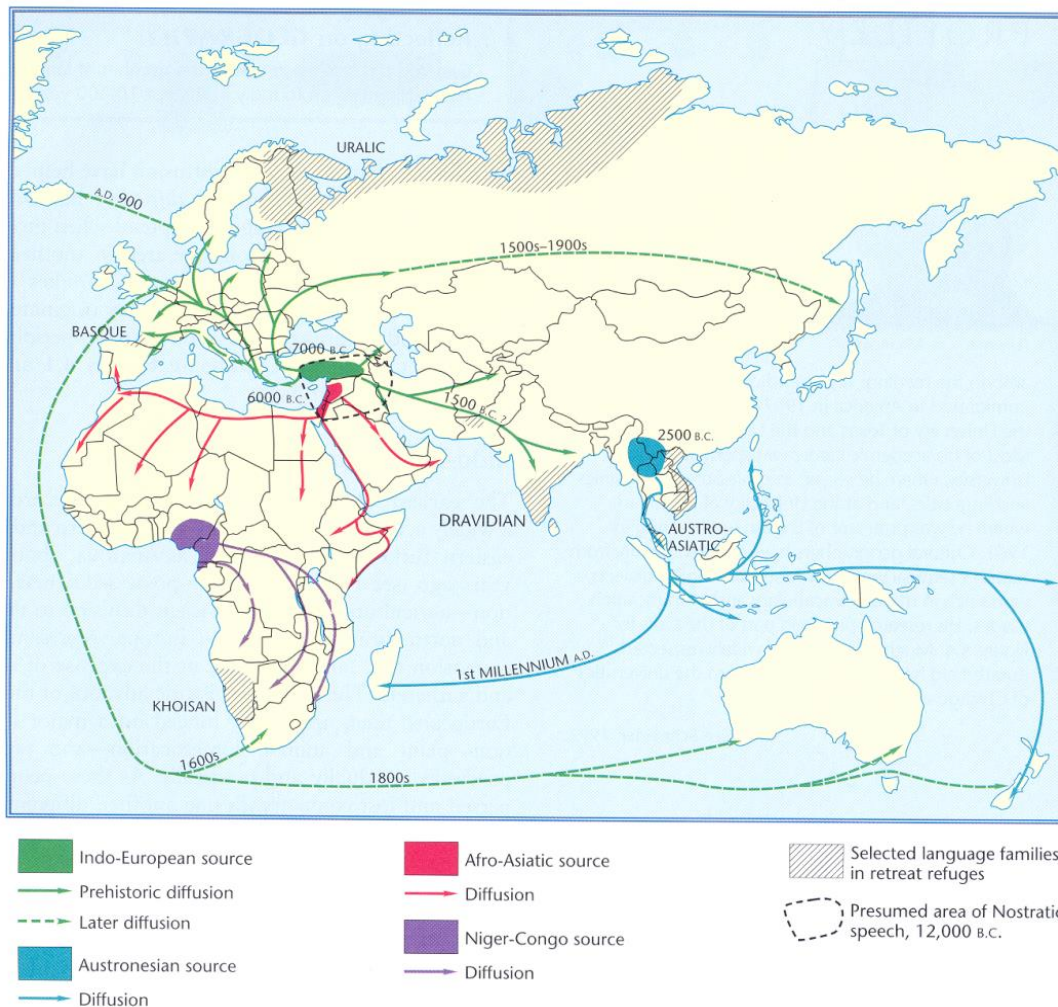
Economic Cultural Diffusion

Trade has been a means of cultural diffusion over the centuries.

- One example is the Silk Road, over which caravans would travel and exchange goods between Europe and Asia.
- An article of clothing can be made from cotton grown in one country and then assembled in another.
- Coca-Cola products are found all over the world.
- In Himalayan villages, you can find people wearing blue jeans.
- McDonald's restaurants have sprung up virtually everywhere.

By reviewing many different examples of cultural diffusion in different contexts you can see that there are many aspects and sources of cultural diffusion. Map 11.1 given below provides information about cultural diffusion in the world.

Map 11.1 Cultural diffusion of the world in different time period.



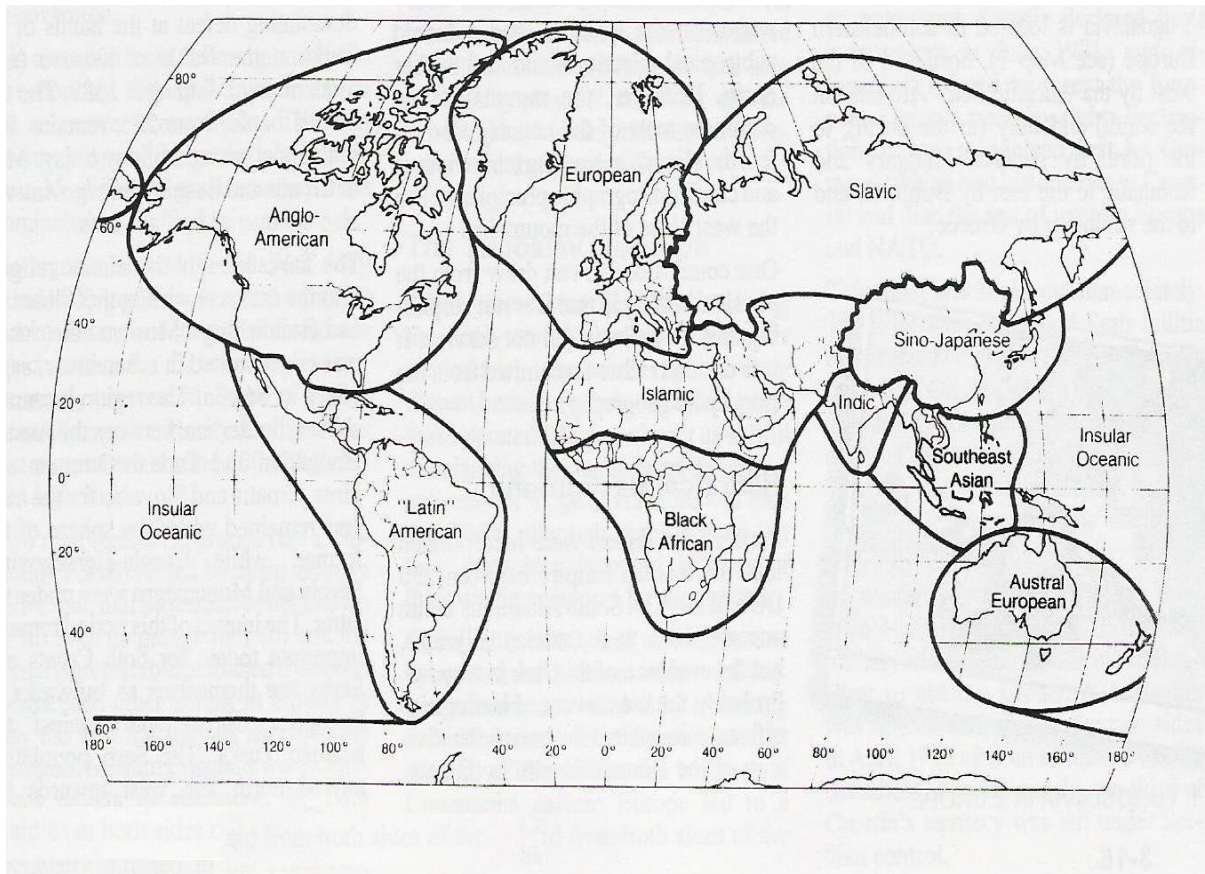
Source: <http://koriley.weebly.com/intro-a.html>.

11.4 CULTURAL REALMS

Cultural realms are defined as cultural regions showing the similar complexes and landscapes grouped to form a larger area. The map given below provides the major cultural realms of the world. A cultural realm is a distinct geographical region where cultural traits maintain a homogeneous pattern. The cultural traits are the product of regional geographical circumstances. Therefore, regional geography which has become the basis of the cultural delineation of realms in the world. The concept of Ratzel's cultural landscape provided encouragement to geographers

for culture regionalization. Map 11.2 provides information regarding various cultural realms of the world.

Fig. 11.2 Cultural realms of the world



Source: <http://www2.johnabbott.qc.ca/~geoscience/intro/WorldCultureRealms.htm>

Other geographers like Blache and Spencer considered the study of cultural realms as an important part of human geography. Apart from the geographers, anthropologists, historians and sociologists have also tried to regionalize the world into distinct cultural realms. The variables of culture include the economic organization, social customs, traditional values, dietary habits, dress patterns, language and uniformity in physical characteristics. On the basis of these variables, various cultural realms can be identified.

Brock Webb tried to establish the dominance of a particular phenomenon over the evolution of the cultural landscape. He found the tremendous impact of religious values over the entire cultural system. All around the world, day-to-day activities, human beliefs and even dress patterns, social values and food habits are influenced by religious messages. According to many geographers, religious messages are also influenced by regional geography. A cultural religious investigation show that the culture of a particular region becomes less effective once the

religious impact is withdrawn. Considering certain phenomena, Brock Webb divided the world into the four major and two minor cultural realms. The major classified cultural realms are Islamic Realm, Occidental Realm, Indian Realm, East Indian Realm and the major cultural realms are South-East Asian Realm, Meso-African or Negro African Realm.

The Characteristics of Cultural Realms are broad of two categories

1. A unique integration of cultural features should generally pervade the area to be organized as a cultural entity.
2. The cultural features must be strongly different from the neighboring area for recognition and demarcation of the boundary.

The major cultural realms of the world are discussed below:

Occidental Realm

The Occidental culture is basically the culture of European society. It is influenced by Christianity to a great extent. It has some regional modifications on the basis of various levels of industrialization, colonization, commercialization, urbanization political and economic thought, and development of transport system, development of social, political and economic institutions etc. In many regions of the occidental cultural realm, the impact of non-religious factors, particularly the effect of modernization is so effective that the religious values are side-lined. Post-industrial Europe is, in fact, merging as a society where traditional values are nearly abandoned. The occidental culture covers a vast area. It is further divided into six sub-regions considering the impact of the regional environment. West European is the most industrialized and urbanized culture. Continental European culture is influence by different political and economic thoughts, while Christianity remains an important influence. Mediterranean Europe includes countries lying to the south of the Alps. It is the region of the dominance of Christianity. To many geographers, the deep-rooted traditional social system is the principal cause of limited economic development in countries like Spain, Portugal and southern Italy, compared to adopted necessary changes in their social systems.

Anglo-American and Australian cultural realms are inherited and are mainly the off springs of west European culture. Both are inhabited by migrants from western part of Europe. There are only few regional differences. Latin American culture is very similar to the Mediterranean culture. It is the only region of occidental culture which lies in the tropics and is underdeveloped. It became a part of the occidental culture as a result of the conversion of tribes into Christianity. The colonial languages, Spanish and Portuguese, have become the state languages. Regional architecture has been influenced by the Spanish and Portuguese styles. Practically all countries maintain economic, cultural and social ties with the Mediterranean countries.

Islamic Cultural Realm

The Islamic cultural realm is greatly influenced by the Islamic values. It covers a large geographical area from Pakistan in the east to Morocco in the west. The population of the region is sparsely distributed due to an inhospitable environment. The river basins, coasts, and oases have been the cradles of Arabian culture in this realm. The Britishers call it the Middle-East while the Germans call it a region of oriental culture dominance. This cultural realm falls between the traditional Indian culture in the eastern part and the modernized European culture in the west. Islamic cultural realm is highly orthodox and based on traditional folk beliefs, the effects of which can be seen in high female illiteracy rates. These nations have very high per capita incomes, but modernization level is very low.

Indic Cultural Realm

The Indic cultural is the culture of the Indian sub-continent regions. Baker called it as sub-feudal land relations, paddy farming, subsistence agriculture, seasonal changes in climate and the agricultural season coming almost at the same time all over the region. The culture of this particular region is mostly influenced by Vedic values. Though the region is populated by various communities, the social system has the hidden the impact of Vedic cultural values.

East Asian Culture

The East Asian culture is mainly a Buddhist culture with some extent of regional modifications. Real Buddhist culture is evident in South Korea and Japan. Even these two nations have experienced the effects of industrialization, urbanization and modernization. The culture of mainland region of China has modified and changed by the Buddhist system. This culture was basically adopted after Second World War.

South-east Asian Culture

It is a transitional culture which is lying at a place from where different cultures have intermingled. The dominance of Buddhism can be seen in Myanmar, Vietnam and Thailand. The Influence of Christianity can be seen in Philippines. Indic culture can be seen over islands of Indonesia, and the Islamic influence is clearly evident in Malaysia and the Indonesian island regions.

Meso-African Culture

Meso-African culture is also known as the Negro culture. It basically includes tropical regions of Africa. Similar and homogeneous cultural systems can also be seen among the American Red Indians, Latin American tribes of Asia-Pacific region. The term 'marginalized culture' is used by Historian Toynbee for these traditional culture units. Some geographers also attempted to include Eskimos under this cultural realm. This cultural realm is widely scattered and characterized by marginalized and relatively isolated communities.

11.5 CONCLUSION

It may be concluded that culture basically is a way of living life. The food which we you eat, the clothes we wear, the language we speak in and the God we worship all are aspects of culture. In simple words, we can state that culture is the personification of the way in which we think and do various things. It also includes the things that we have inherited and learned as the members of a society and community. All the modification and achievements of human beings as members of social group may be called culture. Art, music, literature, architecture, sculpture, philosophy, religion and science are seen as aspects of culture. However, culture also includes various customs, traditions, festivals practiced in different communities, the ways of living and one's outlook on various issues of life

From place to place and country to country culture varies. Its development is largely based on the historical process operating in a local, regional or national context. For example, we differ in our ways of greeting others, food habits, our clothing, social and religious customs and practices from the Western countries. In simple words, the people of any nation are characterised by their distinctive cultural tradition and identity. From the above analysis, it may be concluded that cultural diffusion leads to the formation of cultural realms. Many cultures jointly and due to cultural diffusion form the cultural realms of the world.

11.6 SUMMARY

From the above description it may be summarized that culture is a man-made environment which includes all the material and nonmaterial products of group life that are transferred from one generation to the next. There is a common agreement among social scientists that culture consists of explicit and implicit patterns of behavior learned by human beings. These behaviors may be transmitted through symbols, constituting the distinctive achievements of human groups, including their manifestations as artifacts. The necessary core of culture thus lies in those finer ideas which are channelized within a group-both historically derived as well as selected with their attached value. More recently, culture denotes historically transmitted patterns of meanings embodied in symbols, by means of which people communicate, perpetuate and develop their knowledge about and express their attitudes toward life.

Culture is the diction or expression of our nature in our way of living and thinking. It may be seen in our literature, in religious practices, in recreation and enjoyment. Culture has two definite components, namely, material and non-material. Material culture is related to the material aspect of our life such as our dress, food, and household goods. On the other hand, non-material culture refers to ideas, ideals, beliefs and thoughts. Through the various mediums culture has transmitted from one place of the world to another. In modern time due to technological advancement, various cultures have spread all around the world easily. The process by which a culture is transmitted from one place to another place is called cultural diffusion. This process is very similar to trickledown effect of the development process. The cultural diffusion is very similar to innovation diffusion.

11.7 GLOSSARY

Culture: The term culture is defined as the way in which an individual and especially a social group live think, feel and organize themselves, celebrate and share life. Culture has numerous characteristics. It can be acquired, learned and lost or shared. It is cumulative in nature. It is diverse, dynamic, and gives us a range of permissible behavior-pattern.

Civilization: A civilization is any complex society characterized by urban development, social stratification, symbolic communication form (typically, writing systems) and a perceived separation from and domination over the natural environment, and social domination by the cultural elite.

Cultural diffusion: Spread of cultural ideas from their place of origin to other regions, groups or nations.

Globalization: The exchange of cultures, ideas, goods, and services around the world

Religion: There are mainly five religions in the world: Islam, Buddhism, Christianity, Hinduism, Taoism and Judaism. Out of these major religions only Islam and Christianity can be regarded truly as global religion. These both originated in the Middle East. At the present time, each group has over a billion followers globally. As people get to learn about other religions, they may convert or simply learn and understand other religions as well.

Cultural Realm: A cultural realm is a geographical region where cultural traits maintain homogeneity.

11.8 ANSWER TO CHECK YOUR PROGRESS

1. What are all the achievements of human beings and groups can be called?
 2. What is the difference between culture and civilization?
 3. Give two similarities of culture and civilization.
 4. Give two examples of cultural diffusion.
 5. Give two examples of cultural realms.
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11.10 TERMINAL QUESTIONS

1. What is the difference between the cultural region and cultural realm?
2. What do you understand by the term diffusion?
3. What are the major cultural realms of the world?
4. How is cultural diffusion related to human civilization?
5. What are the characteristics of the cultural realms?

UNIT 12 - WORLD HUMAN RACES-CLASSIFICATIONS

12.1 OBJECTIVES

12.2 INTRODUCTION

12.3 HUMAN RACES-CLASSIFICATION (CHARACTERISTICS, DISTRIBUTION OF WORLD HUMAN RACES)

12.4 CONCLUSION

12.5 SUMMARY

12.6 GLOSSARY

12.7 ANSWER TO CHECK YOUR PROGRESS

12.8 REFERENCES

12.9 SUGGESTED READINGS

12.10 TERMINAL QUESTIONS

12.1 OBJECTIVES

The objective of this unit is to learn about the Human Races of the world. After reading this unit you will be able to understand about the term ‘race’ and various meanings associated with it. This chapter covers broadly about the concept of Human Race. There are huge differences in the opinion regarding the concept and description of race. After that, this unit attempts to make to enable to understand various concepts related to the classification and distribution of human race. Classification of the human race has been a debatable issue since longer times between social scientists and anthropologist. You will learn about the major races of the world and their global distribution with suitable examples and maps. Further in this chapter while talking about various races you will get to know about the places of origin of a particular race, their migration from one place to another and at the same time you will learn about various morphological characteristics of various races.

12.2 INTRODUCTION

The entire topic of human races is a contentious issue, beset by ideological passions. Indeed, so intense are these passions that some people speak as if the race is nothing but skin colour, others assert that the notion of race is just a “social construct,” and others claim that there is no such thing as race or races.

The word “race,” denoting lineage, comes from a French translation of *haras* (silent “h”) into the Italian *razza* — which in Italian of that time applied to animals, not people. These points to current English and Italian usage being derived and adapted, respectively, from the French. A human race is defined as a group of people with certain common inherited features that distinguish them from other groups of people. All men of whatever race are currently classified by the anthropologist or biologist as belonging to the one species, *Homo sapiens*. This is another way of saying that the differences between human races are not great, even though they may appear so, i.e. black vs. white skin. All races of mankind in the world can interbreed because they have so much in common. All races share 99.99+% of the same genetic materials which means that division of race is largely subjective and that the original 3-5 races were also probably just subjective descriptions as well.

When some people use the “race” they attach a biological meaning, still, others use “race” as a socially constructed concept. It is clear that even though race does not have a biological meaning, it does have a social meaning which has been legally constructed. Anthropologists consider the meaning of the word “race” in two different ways. First, physical anthropologists look at the biological characteristics of human populations in different areas of the world. They compare these populations to one another, with the goal of understanding the patterning of human biological variation. In the - nineteenth century, anthropologists studied the external features of people: their skin colour, the colour and configuration of their hair, the proportions of their limbs, the features of their faces and bodies. In the twentieth century, studies of more subtle variation—of blood groups and antibody types, and most recently and more

fundamentally, of genetic material—has added new levels of detail and complexity to that research. Physical anthropologists talk about the scales at which this human physical variation exists, from tiny, local communities to groups found across whole continents. The race for these anthropologists implies the existence of a number of fundamental biological populations into which all humans can be sorted. This concept was a central part of studies of humanity from their beginning almost two centuries ago. The question before anthropologists, in this case, is: do human races exist as biological groupings, and if so what are their characteristics?

Other anthropologists, in their study of human cultures and behavior, look at the race from an entirely different perspective. In this case, the emphasis is not on the biological characteristics of human populations, but rather on the ways in which people divide their social worlds into various groups of humans. In Europe and North America, these divisions have often used language that focused on physical and geographical differences: “Black,” “White,” “Nordic,” “African,” and so on. Anthropologists have established that ingrained prejudices have often had far more to do with these racial definitions than having the real physical characteristics of people. “Race” in these investigations by cultural anthropologists is conceived of as a cultural construction, not a biological fact. It is, in reality, a kind of ideology, a way of thinking about, speaking about, and organizing relationships among human groups: Who is your friend, or enemy? Who is a neighbor, or a foreigner? This ideological understanding of race may use the language of physical features when talking about group differences, but biology is not fundamentally important to the ways that these groups are defined. The question before anthropologists, in this case, is: how and why do people use cultural criteria to define human races, and how have these definitions changed through time?

12.3 HUMAN RACES CLASSIFICATION

Anthropologists distinguish groups of people on the basis of common origin, living, or having lived, in certain defined regions and possessing differing characteristic features in their appearance. But one should remember that there are no strict lines of demarcation between races. All these groups blend imperceptibly into one another with intermediate types possessing various combinations of physical characteristics. Modern man is biologically uniform in basic features (for example upright posture, well-developed hand and feet, prominent chin, absence of bony eye brow, an intricately structured brain encased in a big skull with a straight high forehead and 46 number of chromosomes) and polymorphous as regards many secondary features. Scientists consider all human beings as belonging to a single species, *Homo sapiens*. The variations found in groups living in different geographical areas reflect only a differentiation within the single species due to host of biological, social and other factors. In anthropology there are two schools of thought on the origins of man and the major races—the polycentric and the monocentric schools. The polycentric theory (Franz Weidenreich, U.S.A.) claims that modern man evolved in several regions relatively independent of one another and that peoples developed at different rates. This theory claims that modern man evolved from the “oldest” and “old” people in each region and that this gave rise to the formation of the major races.

Scientists are generally agreed that all men living today belong to a single species, *Homo sapiens*, and are derived from a common stock, even though there is some dispute as to when and how different human groups diverged from this common stock. The concept of race is unanimously regarded by anthropologists as a classificatory device providing a zoological frame within which the various groups of mankind may be arranged and by means of which studies of evolutionary processes can be facilitated. In its anthropological sense, the word “race” should be reserved for groups of mankind possessing well-developed and primarily heritable physical differences from other groups. Many populations can be so classified but, because of the complexity of human history, there are also many populations which cannot easily be fitted into a racial classification.

In most cases, it is a geographic separation that has caused the group to be an isolated breeding population; however, there can be other causes. For example, social taboos against marrying someone of a different religion, social class, or ethnic group can be the cause; and the mating choices of domesticated animals are often restricted by their human owners, sometimes for the explicit purpose of creating a new breed.

All contemporary humans are members of the same polytypic species, *Homo sapiens*. A polytypic species is composed of local populations that differ in the expression of one or more traits. Even within local populations, there’s a great deal of genotypic and phenotypic variation among individuals.

In discussions of human variation, people have traditionally classified populations according to how various traits such as skin color, hair color, hair form (curly or straight), eye color, and shape of the face and nose are combined. People with particular combinations of these and other traits have been placed together in categories associated with specific geographical localities. Such categories are called races.

We all think we know what we mean by the word race, but in reality, the term has had various meanings since the 1500s, when it first appeared in the English language. Race has been used synonymously with species, as in “the human race.” Since the 1600s, race has also referred to various culturally defined groups, and this usage is still common. For example, you’ll hear people say, “the English race” or “the Japanese race,” when they actually mean nationality. Another phrase you’ve probably heard is “the Jewish race,” when the speaker is really talking about an ethnic and religious identity.

So even though race is usually a term with biological connotations, it also has enormous social significance. And there’s still a widespread perception that certain physical traits (skin color, in particular) are associated with numerous cultural attributes, such as language, occupational preferences, or even morality (however it’s defined). As a result, in many cultural contexts, a person’s social identity is strongly influenced by the way he or she expresses those physical traits traditionally used to define “racial groups.” Characteristics such as skin color are highly visible, and they make it easy to superficially place people into socially defined categories. However, so-called racial traits aren’t the only phenotypic expressions that contribute to social identity. Sex and age are also critically important. But aside from these two variables,

an individual's biological and/ or ethnic background is still inevitably a factor that influences how he or she is initially perceived and judged by others.

References to national origin (for example, African or Asian) as substitutes for racial labels have become more common in recent years, both within and outside anthropology. Within anthropology, the term ethnicity was proposed in the early 1950s to avoid the more emotionally charged term race. Strictly speaking, ethnicity refers to cultural factors, but the fact that the words ethnicity and race are used interchangeably reflects the social importance of phenotypic expression and demonstrates once again how phenotype is mistakenly associated with culturally defined variables.

In its most common biological usage, the term race refers to geographically patterned phenotypic variation within a species. By the seventeenth century, naturalists were beginning to describe races in plants and nonhuman animals. They had recognized that when populations of a species occupied different regions, they sometimes differed from one another in the expression of one or more traits. But even today, there are no established criteria for assessing races of plants and animals, including humans.

Before World War II, most studies of human variation focused on visible phenotypic variation between large, geographically defined populations, and these studies were largely descriptive. Since World War II, the emphasis has shifted to examining differences in allele frequencies within and between populations, as well as considering the adaptive significance of phenotypic and genotypic variation. This shift in focus occurred partly because of the Modern Synthesis in biology and partly because of further advances in genetics.

In the second half of the twentieth century, the application of evolutionary principles to the study of modern human variation replaced the superficial nineteenth-century view of race based solely on observed phenotype. Additionally, the genetic emphasis dispelled previously held misconceptions that races are fixed biological entities that don't change over time and that are composed of individuals who all conform to a particular type. Clearly, there are phenotypic differences between humans, and some of these differences roughly correspond to particular geographical locations. But certain questions must be asked. Do readily observable phenotypic variations, like skin color, have adaptive significance? Is genetic drift a factor? What is the degree of underlying genetic variation that influences phenotypic variation? These questions are founded in a completely different perspective from that of 50 years ago and they place considerations of human variation within a contemporary evolutionary framework

It was Thomas de Gobineau who attempted the first classification of human beings on the basis of physical characteristics. Fig 12.1 given below shows the morphology of the face of the people with different races and origin.

Fig 12.1 Major races of the world



Source: Google

A 20th-century classification given by American anthropologist Carleton S. Coon has divided the humans into five races as follows:

- Caucasoid (White) race
- Negroid (Black) race
- Capoid (Bushmen/Hottentots) race
- Mongoloid (Oriental/ Amerindian) race
- Australoid (Australian Aborigine and Papuan) race

We note here that technically, there are only three races viz. Caucasoid, mongoloid and negroid. Australoids, as well as the Capoids (Hottentots and Bushmen), are considered to be sub-groups of Negroid people. In terms of population, table 12.1 provides information about various races.

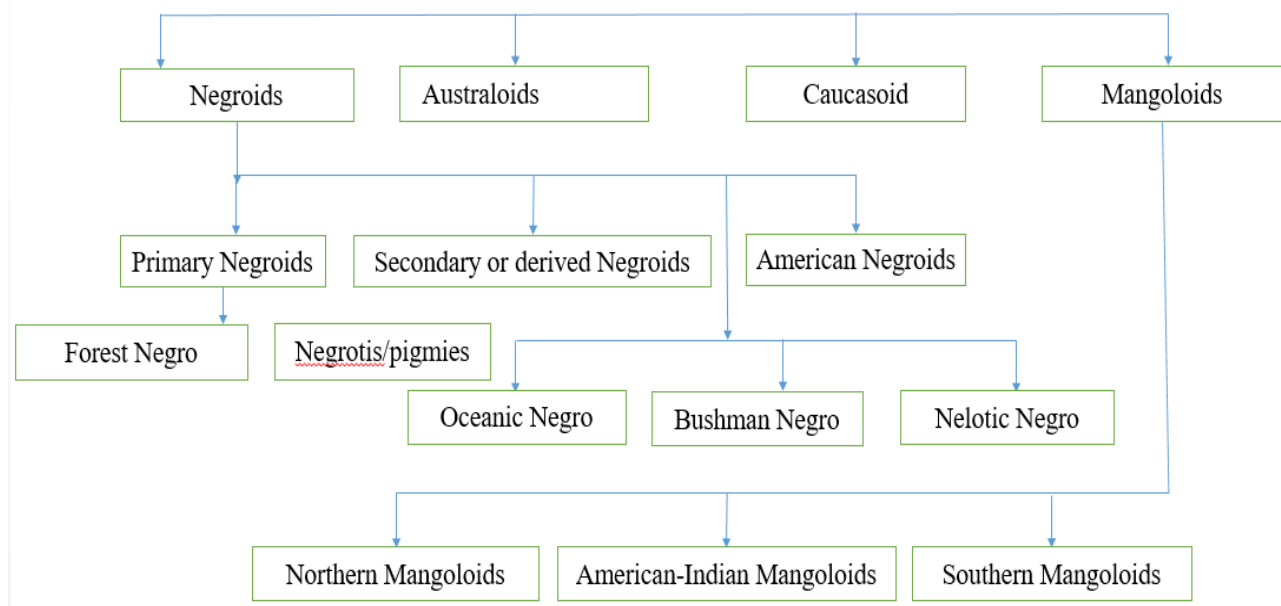
Table: 12.1 Percentage shares of various races of the world

Races	Percentage
Caucasoid	55%
Mongoloid	33%
Negroid	8%
Australoid	4%

Source: Compiled by author

CHARACTERISTICS, DISTRIBUTION OF WORLD HUMAN RACES

Human Races of the world may be classified under various categories according to the places and some external features of human. The major classification of the human races is given in the

Fig. 12.2. Classification of Human Races

Source: Compiled by author

12.3.1 CAUCASOID

Caucasoid includes people from Europe, North Africa, the Horn of Africa, Western Asia (the Middle East), parts of Central Asia and South Asia. The term Caucasian was initially a geographical term denoting the Caucasus region (Caucasia) of central Eurasia. However, later the word got many meanings including one of the races of humans.

The Caucasoids are further classified into various sub-races such as Aryans (including some Indo-Europeans), Semitic (Arabs and Israelis) Hamitic (Berber-Cushitic-Egyptian races), Nordic, Mediterranean, Dinaric, Alpine, Arabid, East Baltic, Turanid, Iranid, Armenoid and so on. Each of these sub-races is based on some geographic location.

Key Features Caucasian people

- The people of Caucasian and its sub-races have white skin colour ranging from white to dark whitish.
- They possess all kinds of hair including straight, blonde, wavy etc.
- They have prominent eyes, pronounced and well-shaped nose and sharp features, medium built and average to stocky musculature.

The Caucasian people have sparse skin pigmentation and due to this reason, they are not suited to live in hot equatorial climates.

12.3.2 NEGROID

Origin of Negroids - The word 'Negro' is derived from a latin word known as 'Nigor' which means 'Black'. The main habitat of Negroids is Africa continent and their main habitat is South Africa that is why this place is also known as Black Africa. Majority of negroids is found in middle and southern Africa which is also termed as black Africa

The Negroid are represented by the African people. They are also called woollen haired people. There are several sub-races of Negroids also including Aborigines, Melanesians, Negritos, Papuans, and Dravidians etc. They also include a number of tribes such as Nilotic, Bantu, Sudanic, Pygmy, Khosian etc.

Salient Features

- Most striking feature of Negroids dark skin due to dense pigmentation, coarse black and wavy hair.
- They have wide noses and foreheads, broad, often thick lips, large built and broad skeletal structure.
- These people have the stamina and ability to survive in very adverse environmental conditions including sever heat. The dense pigmentation adapts them to strong heat and sun of equatorial regions in which this race originated.

Hottentots and Bushmen of the Kalahari. Hottentots and Bushmen are two major groups of Negroid people.

Forest Negroes

They are mainly found in southern region of Africa.

They are also known as sodani Negroes.

They are also found in sahara desert which lies in N & S where there is dense equatorial forest. The maximum clear indication of the negroid race is found in the forest negroes & therefore they are termed as true Negroes.

Features of forest Negroes

Long, Wooly and wavy hairs and are black in colour. Their lips are thick. Skin colour varies from chocolaty to dark Brown. Their average height is 162-172 cms. Fewer hairs are found on skin & face.

Negrotic or pigmies

They are mainly found in Congo Basin in Africa. Are also found in various scattered islands in east such as and man & Nicobar islands in Asia, Malaysian peninsula, Philippians and New Guinea Island.

Features of Negrotic

They live in dense areas. Their Average height is 150 cms. Their skin colour varies from brown to black

Features of pigmies

They are very short in height (142-162 cms.), normally thick lips. Their face is projected out ward. Their eyes are dark brown in colour. Their skin colour varies from black to chocolaty brown.

Secondary or Derived Negroids: Nelotic Negro: - They are found in N.E. Africa- E.Sudan, Ethiopia and Somali land. They are mixture of Negroids and Mediterranean Races.

Features of Nelotic Negroids: Their skin is black in colour. Their average height is more than 175 cms. Eyes are dark brown in colour. Their forehead is long & high. Face is long. Their jaws are comparatively less protected.

Oceanic Negro: They are mainly found in Malaysian peninsula and New Guinea. They are mixture of Mongolian and Asian races.

Features of oceanic Negroes: Nose is slim. Their complexion is generally fair. Their average height varies between 165-170 cms.

Bushmen Negroes: They live in Kalahari Desert or nearby areas.

Features of Bushmen Negroes: Their Average height is 152 to 155 cms. Skin colour varies between dark brown to brown.

American Negroids:- The negroids of USA developed due to the mixture Negroes, Red Indians and European races.

After the discovery of America, Europeans migrated to north and South America force fully. Those people took Negroes forcefully from Africa and kept them as slaves. They were used in plantation, agricultural activities in regions like, porabic, maxico, western islands groups & southern parts.

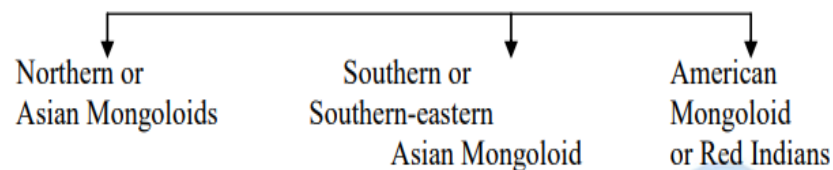
Skin - Brown to Black, Height - 122-130 cms (short) Forehead - long, high Lips - Their protected Jaws - Protruded Hair - wooly & curly.

12.3.3 MONGOLOID

Chinese and Japanese are key representatives of the Mongoloid people. They are also called straight haired people. The Amerinds (Native American Indians) are supposed to be an early offshoot while the Polynesians are a sub-group of the Mongoloids with a great deal of racial intermixture.

Thus Mongoloid group has vast and diverse geographical distribution and so “Asian” seems to be a more suitable term for them. The sub-races of Mongoloids include East Asian, North Asian and Native American.

Classification of Mongoloid



Salient Features

- The striking feature of Mongoloids is yellowish or light whitish skin, extremely straight and black hair, very less hair growth upon their bodies, small, almond-shaped eyes, slight built, very lean musculature and small but clear facial features.

Mongoloids can also be divided into **Neo-Mongoloids** and **Paleo-Mongoloids** also. Neo-Mongoloids include ethnic groups such as Eskimos, Buryats, Chinese, Chukchis etc. They have extremely mongoloid features. The Paleo-Mongoloids include ethnic groups such as Polynesians, Filipinos, Burmese, some Native American people etc.

Northern or Asian Mongoloids:- They are found in yakult, chunchi, kalmud, Tungur, Mongolia, Russia, Siberia, Ural, Caspian, Iran, Afghanistan & India's Southern parts.

Features of Northern Mongoloids: - Their face is protruded outward. Their Nose is broad. Their eyes and skin are brown in colour and lips are thin. Hairs are black in colour. They have less hair on hair skin. They are comparatively taller.

American-Indian Mongoloids: They are also K/a Red Indians They are mainly found in N. Americas

Features of American-Indian Mongolids: Their skin colour varies from yellow to brown. They have black silky & straight hair Eyes are redish brown in colour

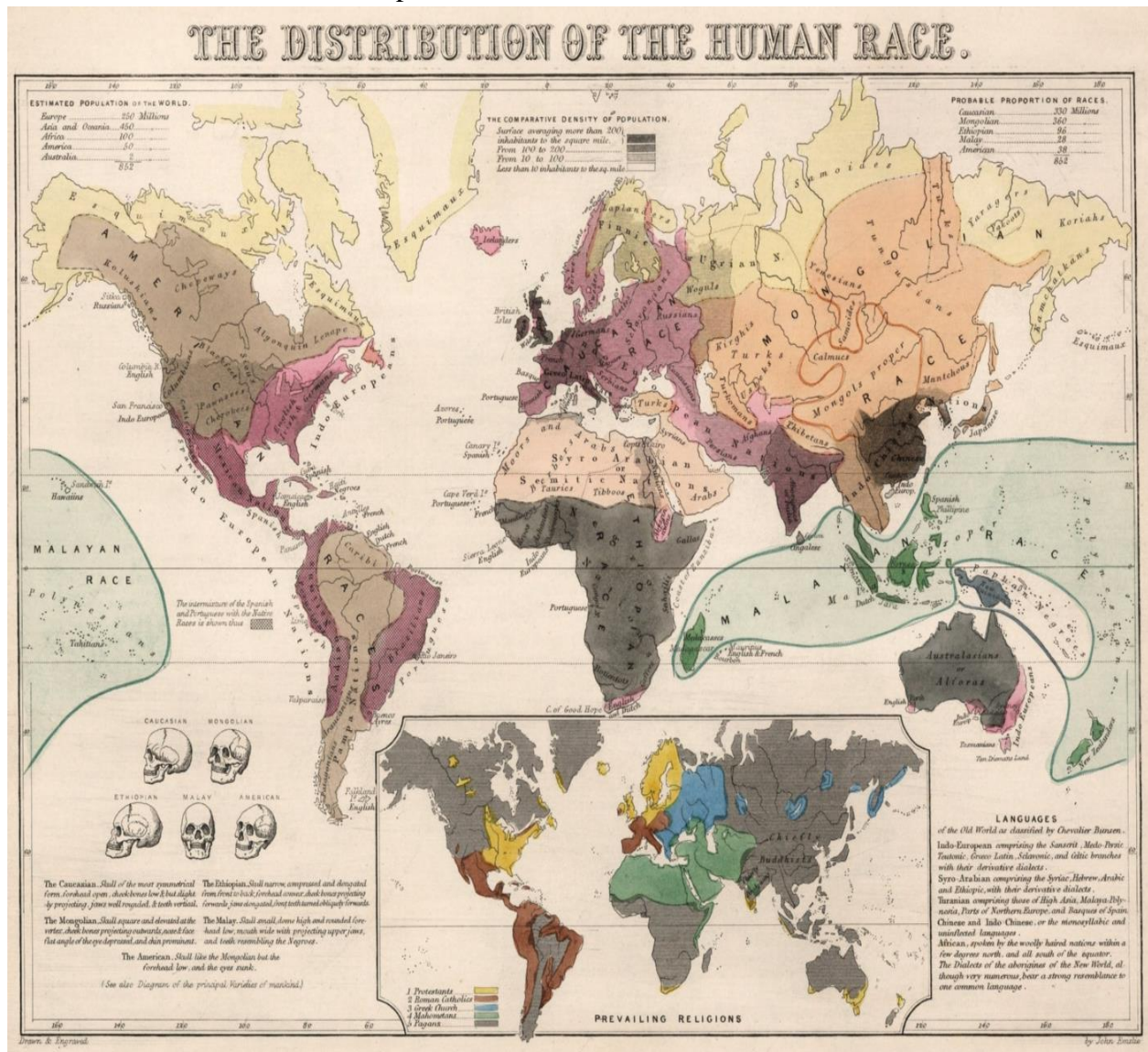
12.3.4 AUSTRALOID

The Aborigines, Melanesians, Papuans, and Negritos i.e. original natives of the Australia sub-continent come under the Australoid race. Australian aborigines resemble Negroes in having brown skins and broad noses, but in many other respects, they differ greatly from Negroes. For example:

- Their lips, although thick, are not averted.
- A significant number of them have blond hair.
- Their hair is typically wavy, unlike the very curly hair of Negroes.
- They have a substantial amount of body hair.
- Compared to most humans, they are prognathous (i.e., their jaws protrude forward).
- They have prominent brow ridges above their eyes (somewhat like the now extinct Neanderthals), which is very rare among Negroes.

It is therefore generally agreed that they should not be classified as Negroes, and DNA tests confirm that the two groups are not closely related. Since they are so different from the other groups, they are usually considered to belong to, the Australoids.

Map:12.1 Human Races of the world



Source: Google maps

12.4 CONCLUSION

On the basis of the above discussion in the chapter this may be concluded that there is large debate on the concept of the race. Both biological and social constructs are widely accepted between social scientists and anthropologists. Human races are grouped under certain groups according to some special characteristics. The spatial distribution of human races have been also studied which shows that various races are found in different parts of the world according to the variation in climatic phenomena and migration of people from one place to another.

Perhaps the first categorization of the population of the world was based on the skin colour. They were referred as White race, Black race and Yellow race. The White race was that particular group of individuals whose skin colour was light or close to white. The black race was

the people whose skin colour were either black, dark brown or any other variant of dark brown. The Yellow race was the one which did not fit in the first or the second category of the white and the black races and who were referred to slightly pale or off white skin colour. Perhaps this was the first criteria being taken to discriminate the people based on their skin colour and they were termed as The Three Great Races of the World.

12.5 SUMMARY

Race is generally used as a synonym for subspecies, which traditionally is a geographically circumscribed, genetically differentiated population. Sometimes traits show independent patterns of geographical variation such that some combination will distinguish most populations from all others. Many human societies classify people into racial categories. These categories often have very real effects politically, socially, and economically. Even if race is culturally real, that does not mean that these societal racial categories are biologically meaningful. The idea that all humans naturally belong to one of a few biological types or races that evolved in isolation were unchallenged for centuries, but large-scale modern studies failed to associate racial labels with recognizable genetic clusters. Recently, the conclusions of those studies have been questioned by authors who argue that racial classification has objective scientific bases and is indispensable in epidemiology and genetics. However, no classification is useful if the classification units are vague or controversial, and no consensus was ever reached on the number and definition of the human races.

The initial discrimination was done on the basis of the skin colour, Negros was considered as the black people or the black race. The Caucasoid were considered as the white people or the white race. The Mongoloids were considered as the yellow people or the yellow race. So this was the initial concept on which the racial discrimination was being done for the population of the world. Other features were also taken into consideration like the stature, the hair colour, the hair form, the eye colour, the eye shape, the fold of the eye, the nasal form, nasal profile and the facial outline and so on. These features strengthen the classification of races but it is not proper to compartmentalize people of the world into small watertight compartment like the races of the world because you cannot technically divide the total population of the world into three categories, Caucasoid, Mongoloid and Negroid. There are many varieties, which do not fall directly under any one of these categories. So therefore, the boundaries need to be broadened. The concept of race was discarded in 1962 as per the UNESCO statement on race and the term race was replaced by “ethnic group”. The compartmentalization into great three races has its historical importance but at present, it is only a fundamental or the foundation of the study of people of the world. The term race is now outdated, it is to be studied only for historical importance.

12.6 GLOSSARY

Anthropology: Anthropology is the study of various aspects of humans within past and present societies. Social anthropology and cultural anthropology study the norms and values of societies

Homo sapiens: The primate species to which modern humans belong; humans regarded as a species.

Phenotypic: Relating to the observable characteristics of an individual resulting from the interaction of its genotype with the environment

Race: A race of humans is a grouping based on shared physical traits, ancestry, or genetics. Although such groupings lack a firm basis in modern biology, they continue to have a strong influence over contemporary social relations.

12.7 ANSWER TO CHECK YOUR PROGRESS

1. What is a Human race?
2. Give four examples of race.
3. What are the two major constructs regarding Races?
4. Which race is dominating in the world?
5. Which race is found in Central Africa?

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12.10 TERMINAL QUESTIONS

- 1) Where and when were the various races formed?
- 2) Do the races differ in other ways, besides the physical traits mentioned?
- 3) What do you mean by racial discrimination?
- 4) What are the major criteria's to classify race?
- 5) Give a detailed account of major races of the world.

BLOCK 5 - HUMAN TRIBES

UNIT 13 - HABITATS, ECONOMY AND SOCIETY OF WORLD TRIBES

- 13.1 OBJECTIVES**
- 13.2 INTRODUCTION**
- 13.3 HABITAT, ECONOMY AND SOCIETY OF KHIRGEES, ESKIMOS, BUSHES, PIGMYS**
- 13.4 CONCLUSION**
- 13.5 SUMMARY**
- 13.6 GLOSSARY**
- 13.7 ANSWER TO CHECK YOUR PROGRESS**
- 13.8 REFERENCES**
- 13.9 SUGGESTED READINGS**
- 13.10 TERMINAL QUESTIONS**

13.1 OBJECTIVES

After reading this unit, you will be able to:

- Know about the habitat of world tribes
 - Know about the economy of world tribes
 - Know about the society of world tribes
-

13.2 INTRODUCTION

This unit is to focus and give brief details about some selected world tribes. So, here in this unit, one is going to study the habitat, economy, and society of Khirgees, Eskimos, and Bush's, Pigmys. These tribes are opposite to each other in all aspects such as clothing, food, shelter, language, habits, etc. So, the main objective of this unit is to give all the information about these tribes and so the comparison between them how they are different to each other and how they play a very important role in the world, by preserving their culture in so-called fast urbanising and modern world. So, this study also shows you how this tribe is adjusting with fast life of the modern world and what the impact on this tribe of modern society is.

13.3 HABITAT, ECONOMY AND SOCIETY OF WORLD TRIBES

13.3.1: KHIRGEES

13.2.1.1: Habitats

Central Asia, the Homeland of khirgees and other nomadic tribes, is cut off by the great mountain ranges from the monsoon rains of the Indian Ocean and China Sea, while the mountains and plateaux of Europe deplete the moisture of westerly winds from the Atlantic Ocean and the Mediterranean Sea. The khirgees are the dwellers of southern tienshan and the pamiirs. They are very closely related to the Kazaks in race, colour, language speech, custom and the way of life. The Russians often call the Kazaks also as Khirgees also as Kirghiz as they resemble too much in their lifestyle with each other. The traditional home of Kirghiz is the higher plateaux of Tien Shan and Pamirs to the east of kazak's territory.

The tents of Khirghees locally known as "*Yurt*". They are circular with vertical walls and dome-shaped roof. The wall frames consist of a collapsible trellis set upright in a circle and standing about four feet high. These yurts constructed of willow rods held together with leather thongs, passing through holes drilled where the rods cross. In a small narrow gap left in the circle, a door frame of stouter poles is fitted. The floor of a yurt is covered with felting, and the inner face of the trellis is often lined with red matting decorated with wool, while woollen rugs are laid face down over the dome before the felt covers are put on so that their pattern may be seen from within. Married sons and children, who share their parent's tent, sleep on the left, while the poor

relatives, dogs, and lambs lie near the door. When honoured guests come, well-furnished couches are prepared for them at the rear part of the tents.

In cold and more exposed places many groups replace their felt tents by more solid huts (kstaw) in winter. The materials may vary from stone to the mountain foothills country. These winter huts usually have rectangular shape. The erection and dismantling of the yurt are the work of women and poor dependents. Animals like camels are needed to carry a large tent when packed for migration.

13.3.1.2: Economy

The Kirghiz barter horses and sleep for cereals, clothes, and utensils. They also purchase flour, barley, sugar, coffee, and tea. In central Asia where the khirgees live, the traditional mode of life has proved to be highly sustainable. The Kirghiz use their limited resources very carefully and judiciously. They use their indigenous knowledge of climate, seasons, plants and animals not to exploit nature but to co-exist with it. Their life is adversely affected by environment, but they have developed social and economic institution to live peaceful in their harsh climatic environment.

13.3.1.3: Society

There are about one million (10 lakh) Khirgees people who live mainly in the republic of Kirghizia. They are similar to Mongoloid in appearance. Physically they are short in stature, strongly built, with yellow skin and coarse black hair. They are the mixture of Mongols and Turkish tribes.

khirgees family consists of father and sons and their wives and servants. The father owns the greater part of livestock and decides the movement of the family. But a number of these families, many of them actually related in the male line, form a clan which recognizes the head of the dominant family as its leader and negotiator with other clans. For the maintenance and defence of its members, a clan is an effective unit. Its poor's are fed when destitute by the richer members. But, within the clan, the leading family of the chief has considerable power and often controls the greater part of the wealth.

The khirgees tribes known for courage, hardihood, the stiff-necked pride of the freeman, vigilance, wariness, sense of locality, keen power of observation, and the conquest capacity to grasp every detail. They also maintain a high standard of honesty. Tribal chieftainship is hereditary among the kirghiz which is a very powerful institution. In winter times this tribe transhumance to lower valley and they all concentrated on one spot. Near these camping sites is their agricultural field which is cultivated by the people who stay back in the summer season. In these agricultural fields, they grow millet, barley, and wheat both for food and horse fodder.

Hunting is also a significant activity for this tribe, but they usually do hunting in spring seasons when great expeditions for hunting are made into the forest areas. Maral deer is a

precious hunt, whose new grown horns are made as velvets. They use yak as the beast of burden which is protected by a thick winter coat and found on the extremely poor scrubby pastures of high mountain areas. Yaks move smoothly and speedily on rocky slopes and narrow paths. On many of the high passes of central Asia, the Kirghizes supply yaks train for the transport of caravan good.

Khirghees practices Muslim religion which is evident by the fact that the food, clothing, and lifestyles of Muslims are very similar to Muslim culture. Fast is observed in the month of Ramzan, and the Mullahs or Tataris wander from aul to aul to lead the payers and recite the Holy Quran. They wear a kaftan (coat) which is a long, padded coat with wide sleeves and a narrow upright collar, reaching to the ankles. The poor Khirgees weave their own cloth from camel hair. They wear tall boots of heavy leather with pointed toes and sharp iron heels which is suitable for ridding but very difficult to walk in.

During the long distance travel, they depend on the hospitality of other groups he encounters. At such occasions, he can usually rely on the hospitality ensures a welcome for the traveller. On the long journeys in an empty country, food in the form of hard cheese and dried flour or baked cakes can be packed away in large

13.3.2: ESKIMOS

The Eskimos is also called "*Inuits*". The word 'Eskimo' means "eaters of raw meat." Their own term for themselves is 'Inuit' which means the "real people". The Eskimos are mostly confined in the Arctic Tundra. In the Northern Hemisphere, the Tundra region, excluding the Arctic Ocean, covers about 5 million sq. km. The dominant ethnic groups who oscillate in the tundra region are Inuits (Eskimos) in Alaska, Canada, Greenland, Eastern Russia; Aleuts n Aleutian Island and Alaska; and Yuits and Chukchis in Siberia.

Map 13.1:- Distribution of Eskimo on world Map



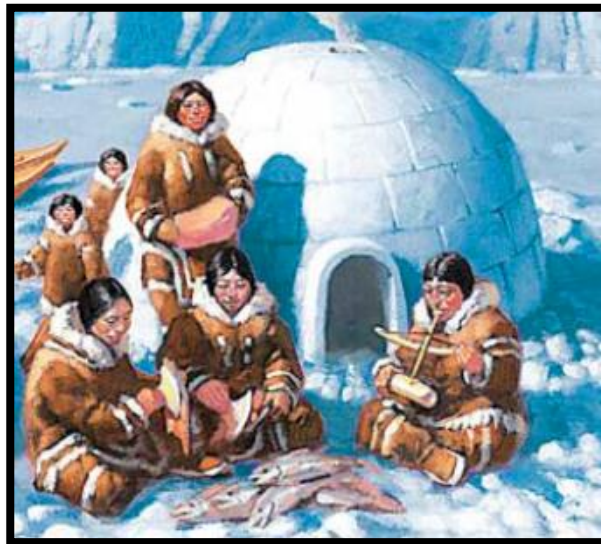
Source: - Masjid Hussian, 2011.

The Eskimos are Mongoloid by race. They are a short-statured people with flat and narrow faces, small snub noses, coarse straight black hair and yellow-brown skin colour. Their clothes are made up of with the furs of reindeer and other animals. A sack-like coat of reindeer hide reaching to the knees, with long sleeves and tail, is the main garment, and during the colder spells, they wore more than two hide fur coats to save themselves from the severe cold. Their main dialects are "*Inupik*" (Greenland and western Alaska) and the "*Yupik*" (south-west Alaska and Siberia).

13.3.2.1: Habitats

The most amazing fact of the Eskimo culture is the peculiar nature of their habitations, implements, and weapons. Eskimos, generally, who live along the shores construct permanent stone house. The stone houses are rectangular in shape, three or four yards across, with a long, narrow entrance passage. The passage and a central aisle in the chamber are excavated in the ground, but the floor of the aisle stands about a foot higher than the passage to exclude cold draught.

Image 13.1:- Eskimos tribes women collecting and cooking food

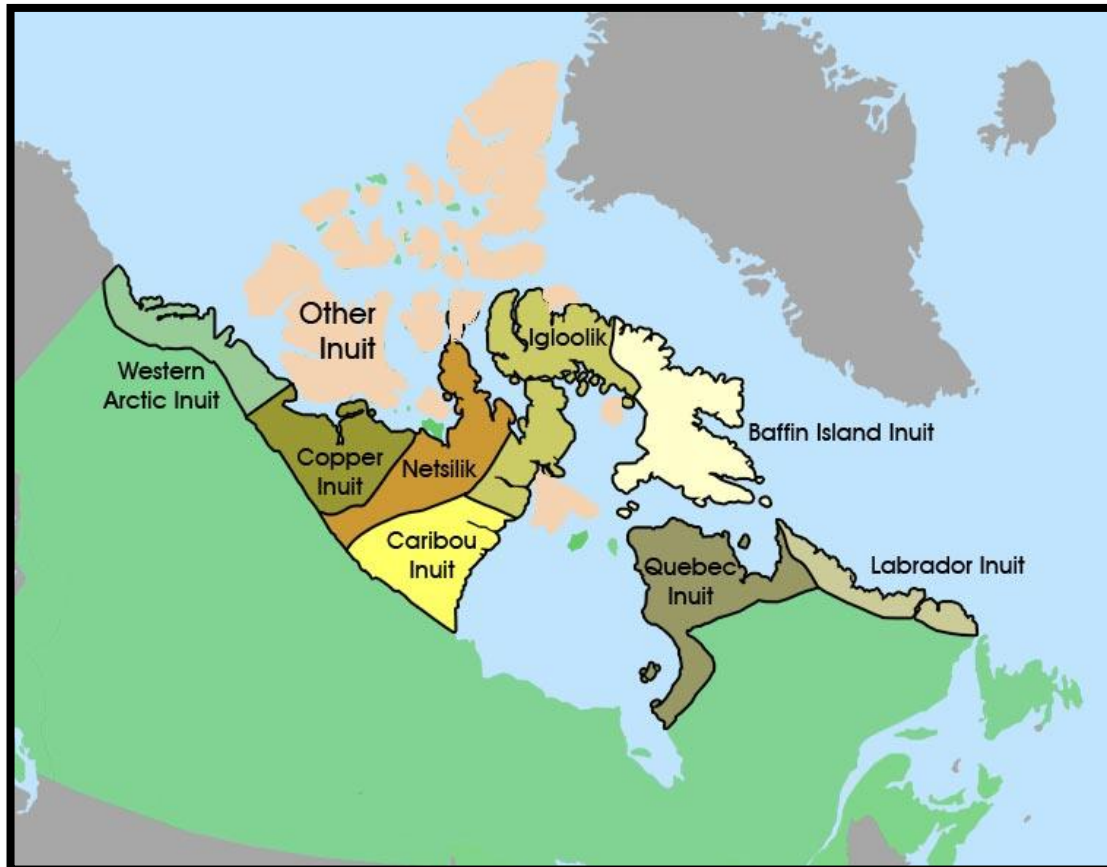


Source: - Google Image

The habitation area of Eskimos extends over four countries: Canada, Russia Greenland and the United States. Some of the major locations and islands are the Aleutian Islands, Alaska, Northern Canada, Victoria, Melcille, Baffin Islands, Greenland, Russian Arctic Islands (Novaya-Zemlya, Severnya-Zemlya, etc.) and northern and north-eastern parts of Siberia up to the Bering-Strait. Despite daylight, there is a sizeable population of hunters, and food gatherers in the Tundra region at present and their ancestors had been living there for the over more than ten thousand years before present. The migratory Eskimos construct "igloos" (snow houses). The igloo closely

follows the layout of the stone house. The large blocks of snow, cut from the compacted snow with an ivory knife, are laid spirally and sloping inwards to build up a dome without any scaffolding?

Map 13.2:- Distribution of different types of Inuits tribes in North America.



Source: - Google Images

The non-availability of wood is met by using the animal fat so abundantly provided by the blubber of seals. Food, when not eaten raw, is boiled in a deep rectangular kettle. Reindeer and caribou hides provide the clothing of Eskimos. The hide of these animals is warmer, lighter, and suppler than the seal skin. In high latitudes, polar bear fur affords to clothe for severe conditions. The Eskimo garments are made up of "gut" which is waterproof in nature to avoid dampness and cold weather. The gut suite is carefully cut out and tailored to established patterns both for men and women. Clothing is made by women. It is finally stitched with sinew thread and often beautifully finished with border strips of contrasting colours. To protect themselves from snow-blindness, they wear slit goggles of ivory.

13.3.2.2: Economy

The Eskimos people are still in the primitive stage of development, having a semi-nomadic life and depending for their sustenance on hunting, fishing and gathering in the harsh environment. During the summer, a number of edible berries, roots, and vegetable are also carefully collected by women. But these are obtained only in relatively small quantities, are luxuries, and do not add very substantially to the diet.

In the winter season, the Eskimo families gather in early winter in settlements along the shore, or on the floe ice; here they stay until March or April. At the advent of spring, they begin to scatter in different direction in search of food. Hunting of seal is the dominant economic activity during the winter season. Death by starvation is a constant danger in the winter season for Eskimos due to non-availability of food. Owing to the extremely cold conditions and non-availability of cereals, the Eskimos eat the flesh of whale, seal and bear to survive. They can digest quantities of fat that would be impossible to digest for other races. They consume precisely foods capable of producing the greatest amount of energy. The seal provides not only food but fuel. Wood is not available and seal blubber (fat) is far superior as fuel to the fat of reindeer which is hunted in summer. It burns more readily and clearly and gives out greater heat.

For travelling, the Eskimos use sledge which are drawn by dogs. The strongest and most spirited dog has the longest trace is allowed to run a few feet in advance of the rest as a leader, while the weaker and more unruly dogs are kept nearer to the sledge.

The dogs are well trained, and a good leader and can find his way on dark nights and in snowstorms to a food depot or camping site. A pair of reindeer will draw a sledge laden with up to 40 kgs at a rate of 4 kms per hour. The reindeer is suitable for long journeys and slow migration, while the dog is suitable for the hunting trip and fast migration.

13.3.2.3: Society

Most Eskimos traditionally have lived primarily as hunters of maritime mammals (seals, walrus, whales), and the structure and ethos of their culture have been fundamentally oriented to the sea. This is a patrilineal society in which the oldest man commands the highest respect. The 'old man'- the ablest of the elders in every group and who presides at ceremonials and festivals- has considerable authority over its members. The produce of hunting and fishing are not kept by individuals but are handed over to the "old man", whose wife distributes it.

The young man is rigorously trained for the difficult and exhausting task of reindeer and caribou hunting. The leading hunter of the group, like the 'strong man' who organises the defence of the group or its territory, attains and keeps his position only by the display of great bravery, strength, and resourcefulness. Cultural rituals and worship to the deity are performed before the big hunts in spring (May-June), long rituals, so that the hunting missions can be successful.

During the summer (July-September) several bands of Eskimos join to gather for cultural festivals and ceremonies. At such occasions, they have games competitions and trials of strength between the young men and of magical power between the magicians.

The common traits of the Eskimos culture are the bow and arrow, salmon spear, large open boat, snow-shoes, tailored clothing, the blubber heating lamp, ridge pole tent and the caribou hunting methods, the harpoons. In the Arctic region, the cultural elements are the dog sledge, the snow house and ice hunting methods. They practice animism and shamanism, in which spiritual healers mediate with spirits. It imputed spirits, or souls, to animals.

War is almost unknown among the Eskimos. The struggle for life is greater among the Eskimos than among any other people; it explains why success in obtaining food is a source of prestige, and failure is considered a disgrace. The old and disabled person commits suicide when the winters are harsh as there is a shortage of food.

Eskimo is ready to forgive and forget looking upon the perpetrators with pity rather than with indignation. Theft and robbery are unknown among Eskimos. The most common offenses being witchcraft, mixing with women, and murder. They practice monogamous, and the marriages are pre-arranged. Marriage without love is the rule in the Eskimo society. They practice monogamous.

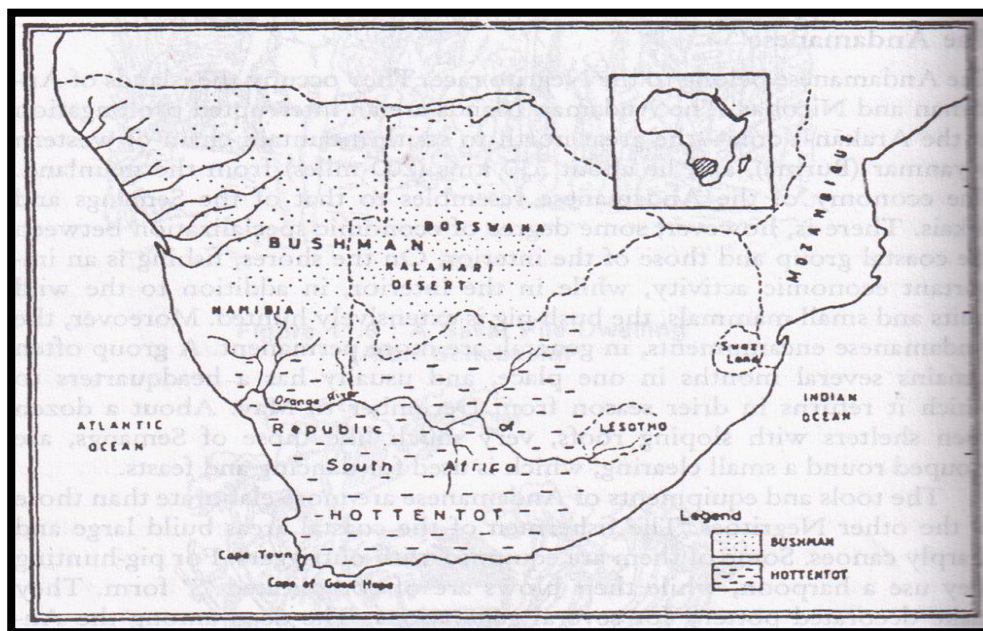
The society of the Eskimos and of those who are living in the Arctic region is a typical example which explains how man has made the best use of the available limited resources in the harsh environment. The main sustenance of Eskimos is still being obtained from marine Arctic mammals, which they hunt with the greatest skill and with indigenous weapons fabricated largely from driftwood. They could paddle across open water in skin covered small boats. They habituated themselves to meat diet and use animal oil for cooking, lighting, and heating. Their winter homes are made up of ice-blocks where they use furs for clothing and bedding. In summer, they move away from the coast to hunt caribou and to gather wild fruits, sheltering themselves in skin-covered tents. They live and migrate in small groups or single families.

The Eskimos has established a fishing industry in Greenland, Alaskan and Canadian. Besides, hunting and trapping are still carried on in some isolated areas of Alaska and Canada, in search of wage labour as well as to take advantage of modern social amenities.

13.3.3: BUSHMEN

The term "Bushmen" (Boschimanner) was given the 17th century by the Dutch settlers to the diminutive hunting peoples of South Africa. Sans are the people of Southern Africa who traditionally have lived as hunter-gatherer, grouped into small bands of 30 to 100. In appearance, the Bushmen show many points of resemblance to the Negritoes. They are short statured (5 feet 4 inches), but they do not have the projecting mouth, thick averted lips, and wide open eyes, characteristics of both Negroes and Negritoes.

Map 13.3:- Bushman Territories in Kalahari Desert



Source: - Masjid Hussain, 2011

The region in which the Bushmen live is a great plateau, about 2,000 metres above the sea level, with massive ranges in the east. Its climate is sub-tropical, and except in the extreme south-west, it is a land of summer rains. The rainfall is abundant in the eastern half of the great plateau. The abundance of rainfall has resulted into dense forests on the eastern mountains and coastlands, fading westward into expanses of tall grass, thorny scrub and ultimately bare sandy and stony deserts. The desert of Kalahari is characterized by ephemeral streams. Permanent water is found only in depressions of the stream-beds and on low mud flats or pans cutting the water table.

Image 13.2:- A men from bush tribes with his traditional crown



Source: - Google images

13.3.3.1: Habitats

Today, the Bushmen are mainly confined in the barren inhospitable environment of the desert of Kalahari (Namibia, Botswana, and Angola) and adjacent sub-tropical grasslands of Southwest Africa. The Namibia desert has virtually no rainfall. The habitat of Bushmen, containing forests, grasslands and thorny bushes, is unique and renowned for their wealth of large game. There are numerous herbivores and carnivores developed and spread over wide areas. Many species of antelope, both large like the great kudu, and small like the duiken and steenbok, are found in great number. The Bushmen eat small animals like ants, lizards, frogs, bees and locusts. The edible fruits are less abundant, but the animal food supply is far richer.

13.3.3.2: Economy

Traditionally, the Bushmen have had a hunter and gatherer culture, living in temporary wooden and rock shelter and caves of the Kalahari in southwest Africa. Hunting is exiting and dangerous and Bushmen hunt enthusiastically in their ancient fashion. They are good mark men and small bows and tiny, unflighted arrows whose bards are smeared with poison from the larvae of cahrysomelidae beetles. The women are usually gathering, often while the men are out hunting and traditional gathering gear is simple and effective. Traditionally Bushmen practice shamanism, conjuring animals with sacred songs and performing almost magical healing. The Bushmen are well known for their rock art painting of stickmen figure hunting and gathering. These Bushmen paintings have become important historical finds as they have given historical finds as they have given historians key data in the lives and times that Bushmen have been around. As well as the movement of African people. The busmen are not notorious for their craft but are more known for their painting and rock art. They do however make traditional arts and craft today such as eggshell jewellery, bows and arrows, dancing and fire sticks and dancing skirts. They are making exquisite textiles and ceramics that have been hand painted with traditional images.

13.3.3.3: Society

The Bushmen are basically hunters. Hunting plays a greater part than the gathering of plants, but it involves close conformity to this seasonal alternation of widespread abundance, followed by seasonal migration to some favourite spots which have permanent water sources on which both beast and man depend. The Bushmen band and its territory is a miniature realm; it consists of a number of families, each with its own huts, and only at the dry seasons these families likely to be united in the vicinity of a source of water.

Each family produces its own food. The women collect the roots, berries, grubs, insects, tortoises, frogs and lizards as well as fire-wood and water. The men go out almost daily to hunt and return for the evening meal. The hunting methods vary with the season and the prey. Usually, a man goes out alone with his son or other relative whom he is training, and a dog. Some of the Bushmen, especially which of the Kalahari, are very skilled in the use of disguises, and imitate th e cries of the young animals. Arrow poisons are variously collected from plant

juices, snake sacs and the dried bodies of spiders. Occasionally when more food is required, the whole of a Bushmen group will combine in a drive which is carefully prepared beforehand.

Every man hunts or gathers for his own immediate family, and he can and does establish private property not only in what is brought in, but also in resources found and left for gathering at a later date. This is usually done by sticking an arrow in the ground close to the "bees hive" nest of ostrich eggs, or patch of roots which the discoverer wishes to preserve.

The abundance of wild beasts and game in the Bushmen territory ensures a fairly abundant supply of hides, bone and sinew. The leg bone of an ostrich or giraffe, split, scaped and ground down to a point provides the best arrow tip. The hides, especially buckskin, are used for clothing and bags. The clothing of a Bushmen is scanty. A man wears a triangular loin-cloth whose point is drawn backwards between the legs. A woman wears a squarish front apron hanging from a waist belt. The most important item of a female dress is the cloak, locally known as kross. It is both a garment and a holdall. When it is tied at the right shoulder and at the waist, the baby, the food and the firewood are all held in its folds on the daily journey back to the camp. Men also often wear a light cloak over the right shoulder and covering the back; among some groups skin caps and tough hide sandals are worn. The large eggs of ostrich not only provide water containers, which are carried in netting bags, but also the material for the Bushmen beads. The ostrich eggs are bartered for iron knives, spearheads, millet, tobacco, honey, wax, feathers, ivory, skins and beads.

The Bushmen way of life is integrated with their environment. Their knowledge of the animals and plants, and their cooperation with neighbouring Bushmen enable them to procure a sufficient food supply. By owning few possessions, less babies and children, and sharing their belongings they enjoy an unrestricted freedom of movement. Although polygamy is permitted, most marriages are monogamous. Magical and medical practices are closely integrated with dancing and trance states, constituting a system of both psychological and physical healing. The San are known for the fine paintings that they and their ancestors have executed on the walls of caves and rock shelters.

Image 13.3:- Bush tribe women in their traditional dress



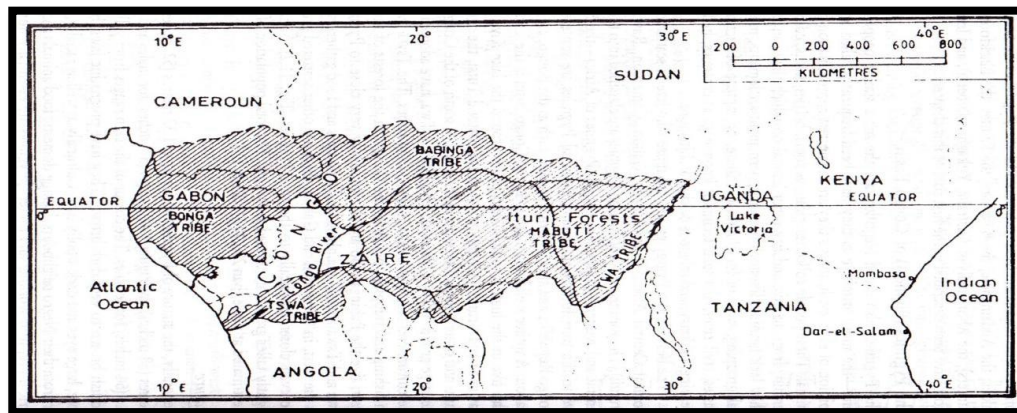
Source: - Google image

The Bushmen, being accustomed to desert life, have a strong sense of survival in harsh climatic conditions. During drought, when hunting, they take care not to hurt females and young of the prey species. They make fires with the minimum amount of wood. They store water in ostrich shells, and they use almost every part of the animals they hunt. Since water supply is scarce, its supply determines the animal population and, in turn, the size of a Bushmen community. In brief, the Bushmen of Kalahari have wonderfully adjusted to their natural environment.

The mode of life and fulfilment of basic and higher needs of Bushmen of Kalahari desert reveals a good example of coping the people of simple technology of coping with a difficult environment (habitat). A Bushmen, with his small bow and arrows in hand, conceals himself by placing over his crouched body the skin of an ostrich, mounted on a frame. Moving cautiously towards the herd, he imitates the movements of these great birds so cleverly that these do not suspect his presence until one of the falls under his arrow. The need of these people for water is paramount, since the Kalahari Desert they inhabit is one of the most inhospitable desert habitats in the world. They fill ostrich egg shells during the short season when the water holes are not dry, or use their intimate knowledge of the country to find the roots, bulbs, and melon like fruits that contain moisture or store up liquids. Not even the most stagnant pool (pond) daunts them, for in such cases they place grass filters at the bottom of the hollow reeds they use in sucking up water. The lifestyle of Bushmen is a typical example of man's symbiotic relationship with his physical environment.

13.3.4: PYGMYS

The Pygmies, also called Negrillos, are the member of an ethnic group which represents the simplest people of mankind. The best known Pygmy groups are those who live in scattered parts of tropical Central Africa (Zaire, Congo, Gabon, Cameroon, Rwanda and Burundi). The eastern Pygmies of Africa the Mbuti live in the Ituri forests of Zaire, the central Pygmies are scattered in the Congo Republic, and the western Pygmies, such as the Bongo, are found in Gabon. Another well-known group in the Congo basin is the Twa (Batwa) who live in the high mountains and plains around the Lake Kivu in Zaire, Rwanda and Brundi in symbiosis with the pastoral Tutsi the agricultural Hutu and other tribes. The Twa and Tswa are still mainly nomadic hunters and food gatherers. Some of the slightly taller groups are termed as Pymoid. The total population of Pygmies is estimated at more than 200,000.

Map 13.4:- Distribution of Pygmies in Congo Basin

Source: - Masjid Hussain, 2011

Generally, the stature of Pygmies varies from 1.33 metres (52 inches) to 1.49 metres (58 inches), averaging 1.46 metres (57 inches) for males and 1.38 metres (54 inches) for females. The colour of the skin ranges from yellowish or reddish brown to very dark brown. They have prognathic jaws, broad flat nose, large eyes and dark woolly hair. Culturally as well as racially, they differ from their Negro neighbours, lacking domestic food animals and skills in agriculture, iron working and pottery. Pygmies are essentially hunters and food gatherers who live in symbiotic relationship with neighbouring sedentary farmers. They live in small communities in the forest in simple huts which are about 1.3 metres (4 feet) high, 3 metres (10 feet) long and about 3 metres (6 feet) wide.

13.3.4.1: Habitats

Pygmies are mainly found in the Congo basin which has hot and humid climate throughout the year due to its nearness to the equator. The average monthly temperature reads around 27 degree C across the year except the areas of high altitudes where the average temperature decreases steadily. Rainfall which is convectional in character also occurs throughout the year, the maximum being recorded in the months of March and September along the equator. The average annual rainfall over the greater parts of the Congo basin is well above 250 cms (100 inches). The hot and humid climate of the Congo basin is ideally suited to the luxurious growth of vegetation. These forests consist of many kinds of broad-leaved evergreen trees. The trees are covered with numerous epiphytic florals on their trunks and branches. Trees of the upper two stories are generally free from climbers. The number of tree species is great, sometimes as many as 100 in one acre, but the proportion of species of economic importance is small. The Pygmies obtain firewood, dyes, tannin extracts, rubber, bamboo, gutta-par-cha, rattan, kapok, (cotton) wood oils, resins, rubber, timber, and various medicines, like quinine, camphor, cocaine, etc., from the forest. These products have great value in the international market.

13.3.4.2: Economy

The Pygmies of Congo basin practice 'silent trade. The Pygmy hunters go by night to groves of their neighbours, who are agriculturists and place there a quantity of meat wrapped in leaves which next day they find changed into grain or any other kind of agricultural or other products. The Pygmies are in the primitive stage of civilization.

Image 13.4:- Men from Pygmies tribe going for Hunting



Source: - Google image

Though the birth rate is high but the ravages of epidemics do not permit a high growth rate of population. In fact, the Pygmies are the slaves of nature and their women are tied down to hard work, suffer great exposure and so become quickly run down physically into a state of low vitality.

In brief, the Pygmies live in close symbioses with nature. Their neighbours are cultivators. Several of the Pygmy groups live in much closer relation with the settled cultivators and this area is famous for batter of forest produce. Many of them practice "silent trading" with the Negroes. Many standing for the barter of game for agricultural crops. The Pygmies are thus free people who are utilizing the environment without much damaging it. Their lifestyle and cultural ethos have been controlled significantly by the forces of physical environment.

13.3.4.3: Society

The food gatherer and hunter Pygmies live in small groups in the forests of Congo basin. They hunt with bows and poisoned arrows and some groups have dogs, but their main food supply is often derived mainly from trees, plants, nuts, birds, insects and small games.

Image 13.5:- Pygmies children in their traditional Dress



Source: - Google Image

The Pygmies depend mainly on vegetable food, hunting and occasional fishing. The main meal of the day is usually made towards sundown, but they eat also in the early morning, and have frequent snacks. The warm humid and damp climate of the lower altitudes of Congo basin allows Pygmies to live without clothes. Many of the Pygmies live in a state of complete nakedness. All the clothes they wear are a covering of bark strip of vegetable fibers which is more or less wide and run more or less around the hips. The tools of Pygmies are few and simple. A fire hardened blade of bamboo will cut ordinary bamboo itself and keep its edge for a considerable time. Rattan canes and woods for digging sticks, bows and spears almost complete their tool materials. Animal bones are scraped down to make tools, but stone tools, although used, are much undeveloped.

13.4 CONCLUSION

The social, economic condition of above mentioned tribes is very different from each other but when one see the historical information for the above-mentioned tribes then their economy is based on the primary activities such as hunting, gathering and rearing animal to sustained their livelihoods. Polygamy is existed in their cultures for above mentioned tribes. But due to globalization, urbanization their life is also changing and there are also influenced by the modern culture of western world. These tribes live in different habitats with different climatic zone which is absolutely main region for their different social and economic condition.

13.5 SUMMARY

The term of Khirgees locally known as "Yurt". Khirgees generally circular in shape with vertical walls and dome shaped roof. The Homeland of khirgees and other nomadic tribes is cut off by the great mountain ranges from the monsoonic rains of the Indian Ocean and China Sea. In central Asia where the khirgees live, the traditional mode of life has proved to be highly sustainable. The Kirghizs use their limited resources very carefully and judiciously. They are strongly Mongoloid in appearance. They are rather short in stature, heavily built, with yellow skin and coarse Black hair. They are the mixture of Mongols and Turkish tribes. The khirgees tribes known for courage, hardihood, the stiff necked pride of the freeman, vigilance, wariness, sense of locality, keen power of observation, and the conquest capacity to grasp every detail. The migratory Eskimos construct igloos (snow houses). The igloo closely follows the plan of the stone house, but the large blocks of snow, cut from a drift of fine grained compacted snow. They can digest quantities of fat that would be impossible to other races. They consume precisely those foods capable of producing the greatest amount of energy. The seal provides not only food but fuel. The Eskimos in Greenland have established a fishing industry. Education, medical services, and local self-governments are the modes of governance. Same is the case with the Alaskan and Canadian Eskimos. The Bushmen are mainly confined in the barren inhospitable environment of the desert of Kalahari (Namibia, Botswana, and Angola) and adjacent subtropical grasslands of Southwest Africa. The Namibia desert has virtually no rainfall. Each family produces its own food. The women collect the roots, berries, grubs, insects and small game like tortoises, frogs and lizards as well as fire-wood and water. The men go out almost daily to hunt, and unless they are following wounded game return for the main evening meal. The Bushmen, being attune to desert life, have a strong sense of survival. In times of drought, the women cease to conceive; when hunting they take care not to hurt females and young of the prey species; they make fires with the minimum amount of wood; they store water in ostrich shells; and they use almost every part of the animals they hunt. The Pygmies obtain firewood, tannin extracts, dyes, rubber, Gutta-par-cha, rattan, bamboo, kapok, (cotton) wood oils, resins, timber, rubber, and various medicines, like quinine, cocaine, camphor, etc., from the forest. These products have great value in the international market. Many of the Pygmies live in a state of complete nakedness. All the clothes they wear is a covering of bark strip of vegetable fibers which is more or less wide and run more or less around the hips. The Pygmies of Congo basin practice 'silent trade'. The tools of Pygmies are few and simple. A fire hardened blade of bamboo will cut ordinary bamboo itself and keep its edge for a considerable time. Rattan canes and woods for digging sticks, bows and spears almost complete their tool materials.

13.6 GLOSSARY

Habitats: - A habitat is an ecological or environment area that is inhabited by a particular species of animal, plant, human being. The word habitat has been in use since about 1755 and derives from Latin word “habere” means to have or to hold.

Economy: - An economy is a system of organization and institute that either facilitate or play a role in the production and distribution of good and service in society.

Society: - A large group of people who live together in an organized way, making decision about how to do things and sharing the work that needs to be done. All the people in a country, or in several similar countries, can be referred to as a society.

Barter System:-A barter system is an old method of exchange. This system has been used for centuries and still used some area of world. Some tribe also follows this system also. People exchanged services and goods for other services and goods for other services and good in return.

Tribal Chieftainship: - This means “the head or leader of a tribe or clan”.

Transhumance: - Transhumance is an action or practice of moving livestock from one grazing ground to another in a seasonal cycle, typically to lowlands in winter and highlands in summer.

Polygamy: - Polygamy defines the practice or condition of having more than one spouse especially wife, at one time.

Silent trade: - Silent trade, also called silent barter, dumb barter (“dumb” here used in its old meaning of “mute”) or depot trade, is a method by which traders who cannot speak each other’s language can trade without talking.

13.7 ANSWER TO CHECK YOUR PROGRESS

1. How social norms are difference for marriage in four above mentioned tribes?
2. How habitat is important for Kirghiz and Pygmies tribe?

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13.8 TERMINAL QUESTIONS

1. What are the differences between economies of Kirghiz, Bushman, Eskimos tribes of world?
2. How habitat conditions are different for Eskimos and Bushman tribe?

UNIT 14 - HABITAT, ECONOMY AND SOCIETY OF INDIAN TRIBES

14.1 OBJECTIVES

14.2 INTRODUCTION

**14.3 HABITAT, ECONOMY AND SOCIETY OF BHEELS,
SANTHALS, TODAS, GADDIS**

14.4 CONCLUSION

14.5 SUMMARY

14.6 GLOSSARY

14.7 ANSWER TO CHECK YOUR PROGRESS

14.8 REFERENCES

14.9 SUGGESTED READINGS

14.10 TERMINAL QUESTIONS

14.1 OBJECTIVES

After reading this unit, you will be able to:

- Know about the habitat of Indian tribes.
- Know about the economy of Indian tribes.
- Know about the society of Indian tribes.

14.2 INTRODUCTION

The unit is too focused and gives brief details about the some selected Indian tribes. So, here in this unit one is going to study the habitat, economy and society of Bheels, Santhals, Todas, and Gaddis. These tribes are totally opposite to each other in all aspects such as clothing, food, shelter, language, habits etc. So, main objective of this unit is to give all the information about these tribes and so comparison between them how they are different to each other and how they play a very important role in the world, by preserving their culture in so called fast urbanising and modern world. So, this study also show you how these tribe adjusting with fast life of modern world and what are the impact on these tribe of modern society.

4.3 HABITAT, ECONOMY AND SOCIETY OF BHILS, SANTHALS, TODAS, GADDIS

4.3.1 BHILS

The Bhils constitute the third largest group of India, the other two being Santhals and Gonds. The concentration of Bhils in the country is found in four states, namely, Gujarat, Maharashtra, Madhya Pradesh and Rajasthan. Their major concentration being in the districts of Panchmahal and Vadodara in Gujarat; Ahmadnagar, Aurangabad, Dhule, Jalgaon and Nasik in Maharashtra; Dhar, Jabua, Khargaon and Ratlam in Madhya Pradesh; and Banswara, Bhilwara, Chittorgarh, Dungarpur, Kota and Udaipur in Rajasthan. The Bhils constitute the third largest group of India. The concentration of Bhils in the country is found in four states, namely, Maharashtra, Gujarat, Madhya Pradesh and Rajasthan. In the state of Rajasthan, the total Bhil population comes to 2,805,948 persons according to the 2011 census. Though they are spread broadly all over the states, their major concentration is in the district of Udaipur, Banswara and Dungarpur where about 60 percent of their population resides. In Gujarat population of Bhils is 3,441,945, Madhya Pradesh is 4,619,068 and Maharashtra is 1,818,792.

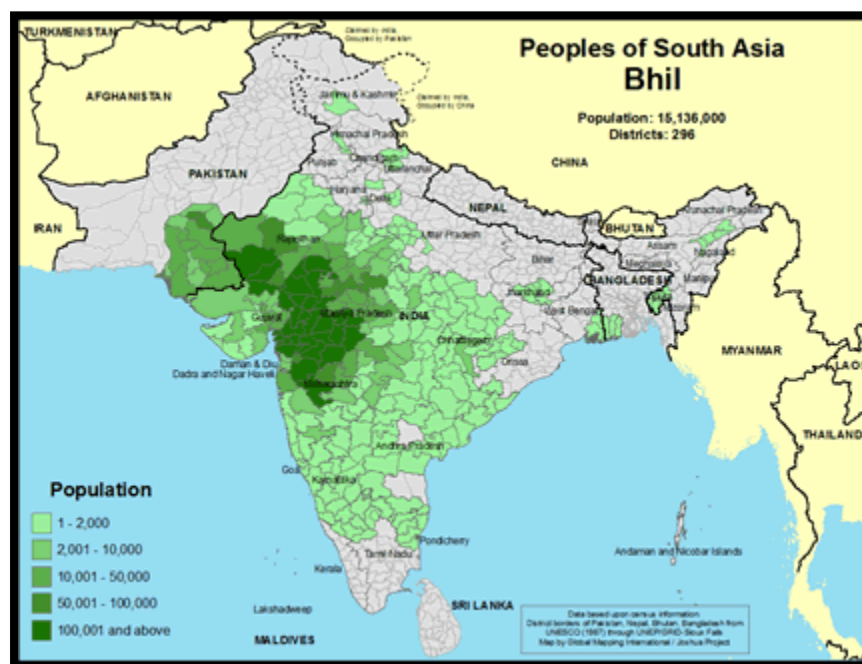
About 40 percent of the Bhils speak Bhili and its allied dialect called Wagdi or Vaghri and these speakers belong to Dungarpur and Banswara districts. The Bhils living in other areas appear to have taken to local dialect. Bhili is influenced by Gujarati and neighbouring languages such as Marathi, Malvi, Vagadi and Mewari. Major Erskine writing about the erstwhile Rajputana in 1908 traces the origin of the Bhil is from Dravidian word Bilu for a

bow, which is the characteristic weapon of the bhil tribe .the bhil have several legends regarding their origin.

14.3.1.1: Habitats

A cluster of settlements with total affinity of cultural attributes in the forest interior is known as Pal. The Pal too is a scattered settlement, having more or less identical surroundings. These comprise hundred huts and cover a large area divided into number of villages. Besides geographical base a Pal definitely denotes a culturally and physically from the plains. The Bhils of the Pal would not give daughter in marriage to the Bhils of plains.

Map 14.1: - Distribution of the Bhil tribe



Source: - Google images.

One of the major requirements of the Bhils is wood and bamboos which they use for various purposes. Besides thatch, mud, and tiles, the Bhils make use of bamboos & wood for house construction. They need more and more houses because of individual family system and raises partition even during the period when family head is alive. The walls of their houses are either made of split bamboo plastered with mud or of wood interwoven with leaves and thatch.

14.3.1.2: Society

The Bhils includes the sub-tribal group of Bhil-Garasia, Dholil-Bhil, Dungri-Garasia, Mewari Bhil, Rawal Bhil, Tadvil Bhil, Bhagaliala, Bhilala, Pawra, Vasava, Vasave.

When a grown up son marries, he is separated from his parents and establishes a new family. A separate piece of land is allotted to the son for his maintenance on which he alone operates. The Bhil family, therefore, is essentially a family of procreation. It consists of a male-head, his wife or wives and unmarried children. It is governed by the father or the eldest male member of the family in the absence of father. Family tensions leading disputes between husband and wife are settled by the village elders. Beyond the primary social unit of the Bhil society, namely, the family, there is a larger frame work of social network based on both agnate and cognate relationship.

Image 14.1:- Bhil Tribe women



Source: - Google image

Bhils are organized into a number of patrilineal exogamous totemic groups or clans Atakthat rest in the friction of common descent from a founding ancestor who lived so far in the distant part as to be mythological. The members of each clan live for most part in separate pals and observe the rules of exogamy. The clans name indicates that the persons are agnatically related to all those who bear the same name and further; it enables the member of the tribe at the time of martial contracts to enforce the exogamous injections.

Traditionally the Bhils practice polygyny. Marriage among Bhils is not a sacrament. For a Bhils, both male and female getting married is a mark of adulthood and maturity. Young or old, a Bhil must have a wife and he does obtain one either through a negotiated marriage or through *nata* or through elopement .the sexual relation among the bhil are mainly guided by

the tribal norms for selection of the partner and by the norms which forbid the members to marry anyone who is not a member of the tribe. The Bhil pay first consideration to the amount of bribe-price or Dapa. After having decided this, there are several other considerations which receive their attention.

Image 14.2:- Bhil Men while Dancing



Source: - Google Image

Bhils do not attach any importance to the virginity of the girl. Cases of adultery are not uncommon. If a man detects another man committing adultery with his wife the adulterer is asked to compensate the loss by paying both in cash and kind. When a girl menstruates for the first time, no ceremony is observed. Neither is she considered to be polluted. If a woman is barren, she has no status in the family, tribe and village. When a child is born, mother is given goat's milk. A daughter is not welcome to the family as she is a bride-price. The birth of a son is a matter of joy and happiness. Dead bodies are cremated except in the cases of those who die in infancy or of small pox or leprosy. When a person dies, the body is first given bath and dressed in new clothes.

The rituals and religion of the Bhils have been influenced by the Hindu contact but this they continue to recognize most of their religious traits. Among the major god and goddesses the bhil take *mahadeo* as supreme living and creator of life and universe. Bhairav or Bheron is a powerful deity. For a few decades the *bhagat* movement among the bhil is introducing some new socio-religious values from outside. Some values inculcated through Christianity also mark the convert-bhil families. The rituals of the Bhils have been influenced by Hindu contacts.

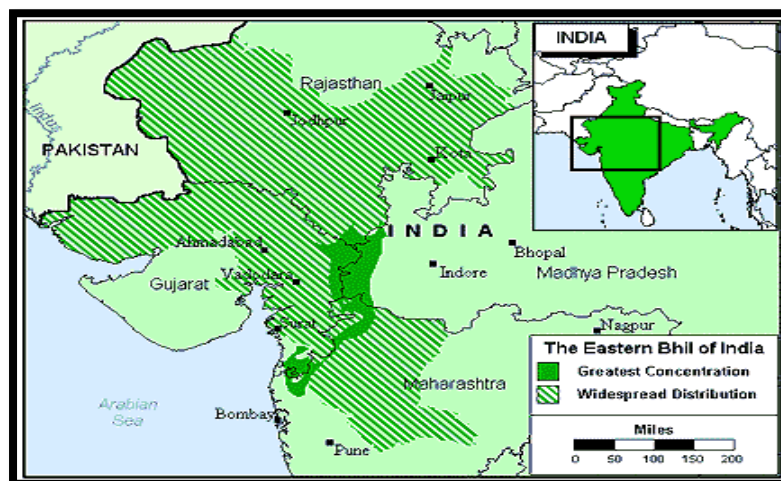
Every bhil village of Rajasthan has a headman called *Gamete or Patel or Mukhi*. Through the position of headman is hereditary, its nomenclature may vary. In most of the cases it holds true that the headman belongs to the oldest or numerically dominant clan in the village. To be bhil, the village headman is leader, guide and philosopher.

In case of bigger and widely scattered bhil village, having number of *Phalas* or level. Every Phala, in such cases, has its headmen, who are otherwise responsible to the village headman. For all walks of life, there is provision of traditional or customary laws, and the same are made use of in resolving conflicting matters. Provision of positive and negative sanctions, traditionally defined for various categories of behavior, is there and the bhil

14.3.1.3: Economy

The Bhils in the past earned their livelihood from forest, forest produce and game. The life style of bhil is largely dependent on the forest as earlier mentioned in habitat section. If the Bhils did not get enough to eke out a living through the forest they took recourse to theft. At a larger stage he adopted a settlement way of practiced agriculture. The land with him meagre and devoid of any irrigation facility continued to keep him poor and pauper. They did not have marketable surplus. Agriculture is solely dependent on monsoon. During times of illicit sale of forest wood was his easily available source of livelihood. Viewed from such perspective it would be said that before the introduction of market economy the Bhils had a system of production which did not have any surplus. Till very recently they were characterized by a subsistence economy.

Map 14.2: - Bhil tribe Map Eastern Side of India



Source: - Google image

Size of land holding becoming smaller and smaller. This has resulted into the migration of Bhils to the tehsil and district head quarters. A few of Bhils have taken to entrepreneurship. The new trend observable in the bhil economy shows its diversification from agriculture. There are rich and elite Bhils. There are Bhils belonging to middle classes. And at the lowest there are Bhils who are buried in dire poverty, Illiteracy and backwardness.

14.3.2: SANTHALS

The santhals are the largest tribal community in India and other are Gond and the Bhil. The total population in India santhals is around 69, 50,000. These are distributed around in the Bihar, Jharkhand, west Bengal, and Odisha. They are also distributed in the area of Bangladesh, Nepal, Bhutan and other foreign countries. They communicate in their Santali language which belongs to Austro- Asiatic family. They communicate with outsider in Hindi and Bengali language. Santhals have long head and flat nose. Their complexion varies from dark brown to black in colour santhals usually have curly hair.

14.3.2.1: Habitats

Santhals typically live in their own villages, laid out on a street pattern, and numbering from 400 to 1000 inhabitants each. While separate villages are preferred, various groups sometimes live more or less separately in the tribal or low-caste quarter of mixed village or towns. Santhals never live in untouchable quarters. In the large industrial towns of the Indian coal and iron belt, there are separate santhals quarters. Santhals houses are mud structure, but they are sturdily built and often decorated with floral designs. Roofs are tiled and slope toward all four sides. House have verandas and at least two rooms; the “inner room” (chitar) contains the ancestors and the granary protected by them. The main post (Khunti), located at the centre of the house, to which sacrifices are made on building the house, is of considerable ritual importance.

14.3.2.2: Economy

The Santhal are very much dependent on the forest products for their livelihood. The Santhal village is characterized mainly by linear settlement and the homes are built with the help of mud whose walls are neatly decorated with flowers, animals and the like.

The Santhal mainly depend on agriculture and its related activities for their livelihood. Beside they are very fond of hunting games, fishing to nearly ponds and river. Both male and female take part in agriculture and grow crops like rice, millet, different kinds of pulses, vegetables etc. they cultivate with the help of plough, leveller, sickle and other implements. The domesticated of crow, fowl, pig, goat etc. support economy at greater extent. The quality of agriculture land is not so good and they are mostly small and marginal farmers. Now days many people are engaged in white collar job like in schools, colleges, factories, central and state government departments etc.

Map 14.3:- Santhal tribes Distribution in India

Source: - Google Image.

Due to the impact of industrialization, urbanization, modernization, spread of communication and education and other factors are considerably changed. Many people holding respectable job in the government sectors. Although they are agriculturists, the hunting and fishing also supplement their economy to some extent. But gradually disappear of the forest due to deforestation, the hunting and collecting economy is gradually vanishing. They were very fond of ethno medicine for the treatment of the diseases. They believe evil spirit, evil-eye for the causes of diseases. The medicine men called ojha treat the patients by herbal medicine as well eital medicine.

14.3.2.3: Society

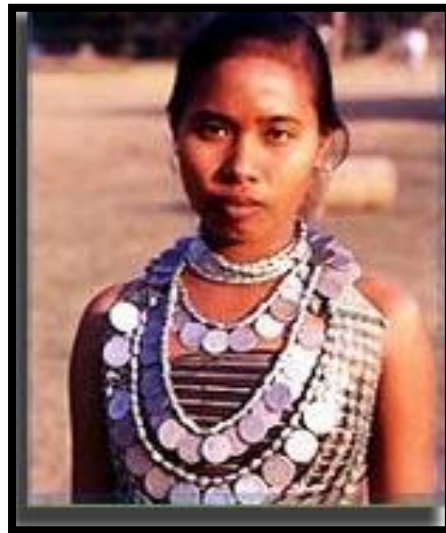
The Santhal are endogamous and divided into exogamous clans (Paris) like Oren, Hembrom, Tudu, hansda, kinsda, kisku, Murmum, Baske, Andi etc. The clans (Paris) are again divided into sub-clans (Khunt). The clan is totemic in nature and these totems are a kind of bird, an animal, a kind of grass of some kinds of plants. The respective clans (Paris) members show respect by not killing that animal or not eating the plants. They fallow rule of Patrilocl residence after marriage. The property is inherited from father to son. The joint families were prevalent in earlier days. Now a days the nuclear families are more in number than joint families. The remarriage (Sanga) is also permitted. Their kinship is of classificatory type i.e. some terms are used to designate the relatives of the

same generation or sex. The bride price is given to bride's father before the marriage which is both in cash and kind.

The Santhal believe in *bongas*, both malevolent, which reside in their surrounding hills, forest, and rivers. The Bongas are named as Marang-buru, Jaherera, Bhakta-bonga and the like. They offer puja by sacrificing fowls and other associated rituals at the Jaherthan which is place at the bottom of tree. Due to close association with rituals at the Jaherthan, which is a place at the bottom of a tree? Due to close associations with the neighbouring Hindus, their religion has undergone changes to some extent. Now days, they are used to visit the Durga Puja, Kali Puja festivals.

The festival like Karam, Hariar, Sohrae, Gomah, Eroksim and so on are observed by the santhals with great enthusiasm.

Image 14.3: - Santhal Tribe women



Source: - Google image

The santhals have their traditional council which settles the disputes conflicts ad confrontations and looks after the customary laws. The traditional council consists of Manjhi, Jog-Manjhi Naike (Priest), Kudum- Neake (helping partner of the priest), Paranik (assistant headman), Jog-Paranik (assistant of the priest) and Godet (messenger). The head man called Manjhi.

Image 14.4: - Santhal Tribe Dancing in their Festival



Source: - Google image

The post is hereditary in nature. The Jog–Manjhi and he also proceeds over the marriage and death ceremonies of the community people cast vote to elect the members of the Gram Panchayat. The community people initially seek judgment from their traditional panchayat for any dispute. When the people are not satisfied with the decisions of the traditional panchayat then they go to the court for seeking judgment.

Although many changes have taken place in the socio-economic life, still they have retained the common sentiment, norms, values, and ritual to a considerable extent regarding their own community.

Image 14.5: - Santhal Tribe Dancing in Their Festival West Bengal.



Source: - Google Image.

14.3.3: TODAS

Todas are one of the primitive tribes of Tamil Nadu. The Toda people call themselves as olh, while other community people refer them as Todas, Toras, and Thodaru. The name Toda has possibly been derived from the word Tur, the sacred tree of Todas. The Government of India recognized them under the name Todas and given the status of Scheduled Tribe and also identified them as one of six Primitive Tribal Groups of Tamil Nadu. Their total population in Tamil Nadu, according to 1981 census, is 874.

14.3.3.1: Habitats

In Nilgiri district, Todas are living in 59 munds (hamlets), consisting of 219 households. Most of the munds are located at the higher altitudes of Nilgiris i.e., about 5600 feet to M.S.L. The Nilgiri district is a mountainous region situated at the junction of Eastern and Western Ghats, extends over an area of 2549sq.kms in between the Karnataka State on the north, Kerala state on the west and the Coimbatore district of Tamil Nadu at the east and south.

Image 14.6: - Structure of House of Toda Tribe in India



Source: - Google image

14.3.2.2: Society

The Toda speak Toda language among themselves and Tamil, Kannada and Badaga languages with other communities. A few Todas speak English. It must, they say, have separated from the mother language before the beginning of Tamil records that is something before the beginning of the Christian era. The Toda are white (fair) in colour, being tall, strong built and well-shaped. The striking feature about the women is the arrangement of the hair which is

dressed in ringlets and flows waving down to the shoulders. The traditional garment of the Todas is known as Poothukuli, multi coloured shawl, embroidered by their women. There are many stories about the origin of the Todas. Nothing definite is known about this tribe until 1819 when Nilgiris was discovered by the Europeans.

The Toda are traditionally lacto-vegetarians, their diet consists mainly of milk and its natural form and also its products and millets and cereals. The Toda community is divided into two endogamous divisions, known as tharthazoll (Tordas) and thevelioll (Tevielosh). These divisions are further divided into different exogamous sects or clans. A typical Toda family referred by them as kwidbil consists of father, mother, and their children. They follow a classificatory system of kinship. Being a patrilineal society, the mode of residence among them is patrilocal. Rules of inheritance among them is male equigeniture i.e., the right of inheritance is restricted to the sons only. The household head will be always a man i.e., the husband and father of the nuclear family of the grown son of a widow.

Marriage is initiated in childhood and completed at maturity, when the husband takes his wife from her parental home to his own hamlet, but in ritual terms the children are as truly married as adults". Thus it will be observed that Toda parents arrange marital alliances of their offspring before the children are two or three years old, which is referred as early betrothal.

Image 14.7: - Married couple of Toda Tribe



Source: - Google image

In the past, the Toda followed the polyandrous form of marriage. When a marriage was arranged between a boy and girl, she automatically become the wife of all the brothers of the boy even those unborn at the time of the initial union. Now days, as observed, polyandry as a marriage arrangement has almost disappeared from the Toda community and infanticide, which was practiced earlier, is not known to the younger generation of the Toda. Divorce and remarriage are permissible among them.

Toda women have to deliver her child in her husband's house, but now days most of the Toda women deliver in hospitals. Naming ceremony takes place before the pen (buffalo

shed) and ear-piercing ceremony in a nearby Hindu temple. The rite of defloration marks the attainments of girl's womanhood. Through the Toda are enumerated as Hindu but their faiths, mode of worship differ from those of other Hindus. Women are neither allowed near their traditional temples nor are they allowed to participate in any religious rituals. The religion of Toda is not directly attributes to the Hindu customs and norms. Being pastoral tribe, Toda concept of religion is associated with the dairy and buffalos. The Toda priest for the temple maintains self- discipline and renunciation and leads a celebrate life. They also have a conical shaped temple called as boa. Their principal goddess is Tokisya. Now a day Todas visit Hindu pilgrim centres like Palani, Madurai, Sabarimala etc. some Toda have embraced to Christianity. They have given up many tribal customs.

Image 14.8: - Toda Tribe Women in their Traditional Dress.



Source: - Google image

14.3.3.3: Economy

The Toda were purely a pastoral people. They engaged themselves in tending and rearing of large herds of buffaloes mainly for milking. It has been said that, a Toda's worldly wealth is judged by the number of buffaloes he owns. Todas started the selling of milk to the traders and to Nilgiri district co-operative Milk Producers union. In the past agriculture was completely unknown to Todas. Then British government of India in 1929 allotted two acres of land for each adult male Toda for potato cultivation and then slowly they started to cultivate tea, coffee and vegetables. The Toda women are experts in embroidery work. In the past, the embroidery was confined to their traditional types of dress, Poothuliki, but now a days besides Poothukuli, they embroider other items for sale as table cloths, placemats, bed sheets and covers.

etc. at present, the Toda have adjusted to the new political and economic environment and even adapting the ways of neighbouring prosperous non-tribal ethnic groups. The Todas are aware of development schemes for tribal by the government and the relevance of the reservation policy.

Image 14.9: - Main source of Income for Toda Tribe in India Animal Husbandry

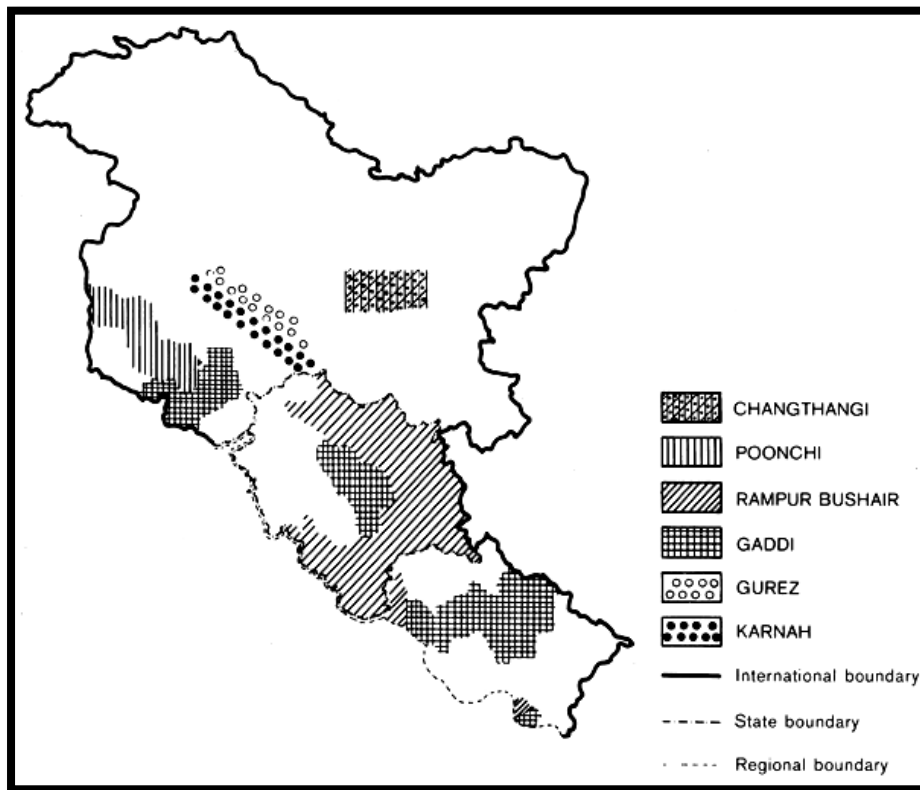


Source: - Google Image

14.3.4: GADDIS

Gaddi, a Schedule Tribe of Himachal Pradesh, are found mostly concentrated in Bharmouri sub Tehsil of Chamba District a place popularly known as Gaderon meaning the home of Gaddis. They are also found along certain foothills of Dhaula in Kangra and Mandi. Occupying an area between Dhauladhar and Pir Panjal, their territorial distribution is mostly confined in Western Himalaya. The overall geographical character of the area is so mountainous, rugged and dissected by numerous hills streams and rivulets that one hardly finds that one hardly finds any expanse of leveling ground. Proclaiming themselves as a Rajputs, the Gaddis trace their origin to the plains from where they fled to remote inaccessible hills to escape persecution at the hand of Muslim invaders. They speak Bharmouri or Gadiali and their script is *tankari* which today is dying script known to few old people. The younger generation adopted Devanagari as their script.

Map 14.4: - Distribution of Gaddis Tribe in India

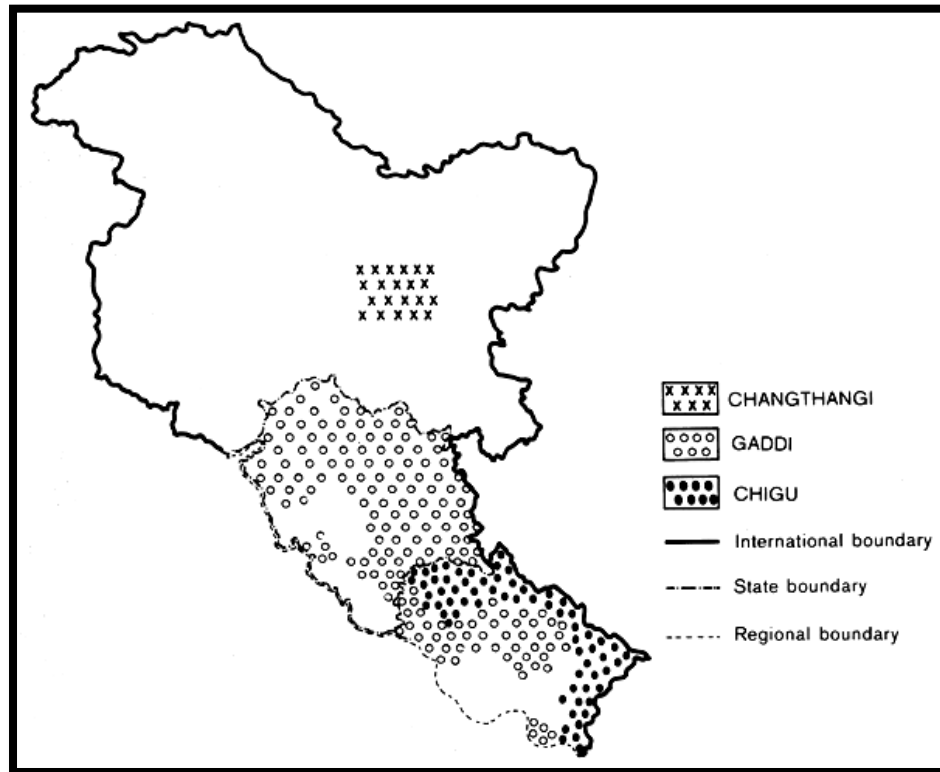


Source: - Google Image

14.3.4.1: Society

Gaddi in fact is a generic term given to the indigenous population of Goderon i.e. Bharmour in Chamba district which include swarnas like Brahman, Rajput, Khatri, Thakur, Rathis and non-swarnas namely Hali, Sippis, Rehara, Bhadhi, Dom. Though all are regarded as Schedule Tribes by virtue of their occupying a scheduled area yet the latter group is also enumerated separately as scheduled castes. Thus they enjoy a double status both as a tribe and as a schedule caste in this area. However, Gaddis themselves do not perceive the swarnas in their fold and treat them as menials and serving low caste.

Map 14.5: - Distribution of Gaddis Tribe with Other tribe of Northern India.



Source: - Google image

Among the high castes it may be mentioned that the Brahmins during the native kings' rule were bestowed with free gift of land, donation and other privileges. Presiding as ritual specialist and purohits of the rulers, they enjoyed a status superior to that of Rajputs.

Image 14.11: - Gaddis Tribe people Dancing in their Festival



Source: - Google Images

Earlier they were not required to till their land but as time changed, and the privileges withdrawn they cultivate their own field and officiate as family purohits for Rajputs and other clean castes during ritual ceremonies and social-religious function. They are further divided into number of exogamous gotras like Vashishta, Bharadwaj, Gautam which in turn divided into number of also based on the peculiar characteristic of their ancestors.

Next to the Brahmans are the Rajputs and its allies namely Khattris, Thakurs, Ranas and the Rathis. Who are not only numerically dominant but also socially, economically and politically the most powerful. It should be mentioned that the status of the Rathis is not at par with Rajputs and Thakurs because the term implies a loss of status as they might have been the class of progenies born out of the remarried widows. With the passage of time Rathis have been accepted though loosely within the broader Rajput fold and inter-marriages among all these groups has come to be an accepted norm though each one of it is broadly an endogamous division. Inter-caste relation especially among the clean caste is fairly relaxed. They eat drink and smoke together and may also intermarry. It may be mention that intermarriage among Brahmans and Rajput section are not uncommon. However, relation with unclean caste socially low castes is severely limited.

Image 14.12: - Gaddis tribal people rear Goats



Source: - Google images

While contracting marital alliance they avoid the gotras up to three generations on the father's and mother's side. There is no restriction to marry the same village if gotras exogamy is maintained. They also don't like to marrying into the family where a daughter or a sister has been given marriage except where exchange marriage i.e. bata is a practiced by those who cannot afford to pay a handsome bride price. Among the various modes of acquiring mates,

marriage by negotiation is popularly known as *biyah* or *darm-punn* which is the most common.

Gaddis are basically monogamous and if instance of polygamy are quoted as only among families where the first wife has failed to produce a male issue. A second marriage is usually contracted after obtaining consent of the first wife. Divorced thought not common is permitted on the grounds of identity, cruelty and incompatibility. In the event of divorce being initiated by the wife's side, the bride price locally called *Reet* or *lag* has to be returned to the husband together with penalty as imposed by their caste panchayat. Similarly, if a widow marries outside the family of husband, her paramour has to pay back the entire sum received as bride price with heavy penalty. It is not the case when husband seeks divorce or remarries after the death of the wife.

Gaddis family and kinship is basically patterned on patriarchal system. Succession from father to son and the inheritance follows patrilineal line of the descent. Gaddis have two type of inheritance i.e. *mundaband* where it is shared the property is equally divided among all the sons and *chundaband* where it is shared equally among the wives which is subsequently divided among their male offspring. In Gaddi society, an illegal child called *chakhahndu* born to a widow long after the death.

14.3.4.2: Habitats

Historically, Gaddis are known to have occupied one of the most inhospitable geographic regions in the world- highland in the shadows of the mighty dhauladhara and the middle Himalaya- but over the last century they have also made lower areas in Himachal Pradesh their home, and have in fact ventured out across the world as global citizens, nevertheless maintaining their inherent ethnic identity. In Himachal Pradesh, Gaddis are mainly are mainly settled in the Ravi and Budil river basins in Bharmaur, and scattered across Kangra, Chamba, Mandi and Kullu district on the outer foothills of the Dhauladhar mountains and also on the fringes of the Pir Panjal ranges. Their habitat offers breath taking landscape coloured with hills, cliffs, streams, rivulets and even thick jungles.

Image 14.13: - Type of house structure used by the Gaddis Tribe



Source: - Google Image.

A sizable number of Gaddis families have land and assets on either side of the dhauladhars and some families still follow the near ritualistic practice of migrating to Kangra valley from Bharmaur during winters.

14.3.4.3: Economy

In order to earn their daily bread the Gaddis are taking to so many different types of occupation these days. They are not only sticking to live stock rearing and agriculture. They even sell mules, horses, sheep and goats to earn money. However, a part of the community is even endowed with tinkers, farmers and weavers. There was a time in the past when the major Gaddis population crushed millets and even carried loads to earn money for their living. Gaddis females are craftswomen and they weave a variety of woollen fabrics. They sort the wool fibres as per the length. Then wash, clean and comb the wool. The combed wool is spun with the help of a spinning wheel called charkha and the wool is finally woven handloom called as Rachh or khadi. These woollens are generally woven for personal needs as well and to sustain in the harsh weather. These woven ethnic products are not so popular in the local market and they do not get the correct values if sold.

14.4 CONCLUSION

The tribes in India have paid and are paying a big price for the country. They are subsidizing the cost of development through sacrifice of their land, tradition and cultures so that the urbane can enjoy secure lifestyle. The increasing population, economic development and expansion of diversified job opportunities, income generating scheme by the government organisation has changed the employment pattern among Indian tribes. These Indian tribes absorbed many customs and tradition of the locals. As results, their costume, food and living habits have gradually under gone a complete metamorphosis and have their originality. These tribes are on an average of extinction from its age old occupation and its getting more inclined towards a settled and comfortable life.

14.5 SUMMARY

All above discussion about four India tribes have many difference and some of similarities as these tribe are from the India only. Gaddis are living in cold climate region of India where other three are from non-cold climatic region of India. The rituals and religion of the Bhils have been influenced by the Hindu contact but this they continue to recognize most of their religious traits. Traditionally the Bhils practise polygyny. Marriage among Bhils is not a sacrament. For a Bhils, both male and female getting married is a mark of adulthood and maturity. Every bhil village of Rajasthan has a headman called *Gamete or Patel or Mukhi*. The Bhils in the past earned their livelihood from forest, forest produce and game. Till very recently Bhils were characterized by a subsistence economy. Santhals houses are mud structure, but they are sturdily built and often decorated with floral designs. Roofs are tiled

and slope toward all four sides. House have verandas and at least two rooms; the “inner room” (chitar) contains the ancestors and the granary protected by them. The Santhal mainly depend on agriculture and its related activities for their livelihood. Beside they are very fond of hunting games, fishing to nearly ponds and river. Both male and female take part in agriculture and grow crops like rice, millet, different kinds of pulses, vegetables etc. The Santhal are endogamous and divided into exogamous clans. The Toda are traditionally lacto-vegetarians, their diet consists mainly of milk and its natural form and also its products and millets and cereals. The Toda community is divided into two endogamous divisions, known as *tharthazoll* (Tordas) and *thevelioll* (Tevielosh). These divisions are further divided into different exogamous sects or clans. Toda followed the polyandrous form of marriage. The Toda were purely a pastoral people. They engaged themselves in tending and rearing of large herd of buffaloes mainly for milking. Gaddis are basically monogamous and if instance of polygamy are quoted as only among families where the first wife has failed to produce a male issue. A second marriage is usually contracted after obtaining consent of the first wife. Inter-caste relation especially among the clean caste is fairly relaxed. They eat drink and smoke together and may also intermarry. It may be mention that intermarriage among Brahmans and Rajput section are not uncommon.

14.6 GLOSSARY

Tribe: - A common definition for a tribe is a group of people that all have common ancestry, or common ancestor, a common culture and live in their own common culture and live in their own enclosed society. Other names for tribe can be clan and family.

Habitat: - A habitat is an ecological or environment area that is inhabited by a particular species of animal, plant, human being. The word habitat has been in use since about 1755 and derives from Latin word “habere” means to have or to hold.

Economy: - An economy is a system of organization and institute that either facilitate or play a role in the production and distribution of good and service in society.

Society: - A large group of people who live together in an organized way, making decision about how to do things and sharing the work that needs to be done. All the people in a country, or in several similar countries, can be referred to as a society.

Patrilineality: - Paterilineality refers to the organization of family relationships in societies by lines of descent from a person’s male ancestors. The term derives from the Latin word *Pater* (“father”) and *linea* (“thread”). A Patrilineal consist of the generations of male descendants.

Exogamous:- Exogamy is a social arrangement where marriage is allowed only outside a social group. The social group define the scope and extent of exogamy, and the rules and enforcement mechanism that ensure its continuity.

Monogamous: - Monogamous define practicing or advocating monogamy. Monogamy is a form of relationship in which an individual has only one partner during their lifetime or at any one time.

Polygamy: - Polygamy defines the practice or condition of having more than one spouse especially wife, at one time.

14.7 ANSWER TO CHECK YOUR PROGRESS

1. What are similarities and differences to study economy of all above mentioned tribes?
2. How society of Toda tribe different from the Santhal tribes?
3. Briefly describe the habitat, economy and Society of Bhil tribe in India.
4. Give important facts about Gaddis tribe for habitat, economy and society.

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14.10 TERMINAL QUESTIONS

1. Discuss in detail the habitat, economy and Society of Gond tribe in India.
2. Discuss in detail the habitat, economy and Society of Bhil tribe in India
3. Discuss in detail the habitat, economy and Society of Santhal tribe in India.
4. Discuss in detail the habitat, economy and Society of Toda tribe in India

UNIT 15 - HABITAT, ECONOMY AND SOCIETY OF UTTARAKHAND TRIBES

15.1 OBJECTIVES

15.2 INTRODUCTION

15.3 HABITAT, ECONOMY AND SOCIETY OF BHOTIAS, THARUS, BUXAS, JAUNSARI

15.4 CONCLUSION

15.5 SUMMARY

15.6 GLOSSARY

15.7 ANSWER TO CHECK YOUR PROGRESS

15.8 REFERENCES

15.9 SUGGESTED READINGS

15.10 TERMINAL QUESTIONS

15.1 OBJECTIVES

After reading this unit, you will be able to:

- Know about the comprehensive information on habitat of Uttarakhand tribes.
- Know about the comprehensive information on economy of Uttarakhand tribes.
- Know about the comprehensive information on society of Uttarakhand tribes.

15.2 INTRODUCTION

Scheduled tribes are important constituents of Uttarakhand Population and culture. Bhotias, Buxas, Jaunsuari, Tharu and Raji are the major tribes of Uttarakhand which resides in the different parts of the state. Besides there are also other tribes like Shoka, Kharwar, Mahigiri and Banrawat who makes the culture of Uttarakhand rich and diverse. Udham Singh Nagar has the highest population of scheduled tribes in Uttarakhand. Rudryaprayag has the minimum number of population of scheduled tribes. In this unit we will be talking about habitat, economy and society of Uttarakhand tribes.

15.3 HABITAT, ECONOMY, AND SOCIETY OF UTTARAKHAND TRIBES

15.3.1 Bhotias

It is believed that, *'Bhotias'* are a transhumane community of semi-mongoloid race of Tibetan origin and residing in the upper Himalayan valleys of Sikkim, Tripura, Uttarakhand, Uttar Pradesh, Himachal Pradesh, Jammu & Kashmir, Ladakh, Arunachal Pradesh and West Bengal (Fuchs, 1982). Bhotiya, derives its name from the word "*Bod*", which is the Classical Tibetan name for Tibet. They show close racial and cultural affinity to the Tibetans and probably for this similarity the Bhotia region is called as "*Bod*" or "*Bhot*" which is a corrupt form of "*Bod*", which means "*Follower of Buddhism*" (Srivastava, 1952-53).

Basically they are an occupational caste of nomadic shepherds and have mongolian features and are known as "*Pahari*" or "*hill people*" in northern India. The Bhotia are divided into six sub-groups, the "*Bhot*", "*Bhotia*", "*Bhutia*", "*Tibbeti*" (*Sikkim & Arunachal*) "*Butt*" and "*Buttola*". In Northern Sikkim, where the Bhotia are a majority, they are known as the "*Lachenpas*" or "*Lachungpas*", meaning inhabitants of "*Lachen*" (big hill in Tibetan) or "*Lachung*" (small hill in Tibetan) respectively.

Fig. 15.1: Bhotia woman



Source: Google

The 10 major Bhotia groups in the state are i.e. Johari, Juthora, Darmia, Chudansi, Byansi, Marccha, Tolcha, Shoaka, Chhapra (Bakhria) and Jad. The tribal population of Bhotia community is 8.13 % and inhabited in about 18.70 % of area of the country. During summer seasons Bhotia lives at higher altitudes in Himalaya and come back down hills in the villages during winter season with their cattle. They are nomadic pastoralists and traded wool, salt, saffron, deer musk, silajit, mica and animal skins with Tibetan.

Large numbers of caravans of mules, yaks would travel into Tibet with Indian goods when the snow melted they bartered their goods for local Tibetan merchandise to be sold in India. The Bhotia people of Uttarakhand once lived on the border of India and Tibet but when Indo-Tibetan border was closed in 1962 the Bhotia moved across into India.

15.3.1.1 Habitat

Bhotia tribe is nomadic tribes which keeps on moving from places to places and mostly live either in the high mountain ranges, which remain snow covered for about five months, or the lower mountain ranges with rich flora and ample rainfall. Their settlement has been mainly found in Johari tehsil of Pithoragarh, and in Chamoli district of Vishu-Ganga Valley. Most of their settlements are found in villages i.e. Mana, Vanakuli, Oudh, , Tolcha and Niti. A traditional Bhotia home is rectangular in shape. The Bhotia have a stone shrine outside the house where they burn incense (made of pine) and scented dried leaves of rhododendron that grow in the region as an offering to the deities. Due to tough terrain mostly their house is made up of wood and stone and having a small door. They keep few numbers of utensils (aluminum and brass), traditional agricultural tools (Solta, Jabra and Kaandiyaan). Winter house of Bhotias are known as “*munsa*” or “*gunda*” and summer house is called “*mait*”.

Fig. 15.2: A deserted Bhotia House in Garhwal



Source: Personal Survey, 2016 (Mana Village, Uttarakhand)

15.3.1.2 Economy

The economy of the Bhotias is an aggregation of many elements such as a highly developed trade organization, subsistence agricultural activities, well developed handicraft, pastoralism and regional sources of income. High altitude based habitat provide them very little land. Thus, the scope for intensive agriculture is very thin (Das, 1982). They have two settlements, the upper/summer (May-June to October-November) settlement where they stay and cultivate limited varieties of crops like Buckwheat; in lower or winter settlement, where they stay for rest of the year. Here they cultivate wheat, paddy, Maize, Jowar, Potato, etc. They engaged in organized trade with Tibet. The main items exported are food grain, sugar, jiggery, spices, tobacco, cotton, cloths, corals, beads etc. The main items of imports are borax, wool, etc. The impact of physiographic environment and trade with Tibet had been so great on the Bhotia socio-cultural life; that they had to resort to seasonal nomadism which forced them to build a distinct socio-economic culture. Pastoralism has been closely related to Bhotia trade economy. The animals like sheep, goat, ponies, yak and jibus are of immense use for these people. Associated with trade, another element of economy is woolen industry. They have been become specialized for manufacturing the woolen materials like *Thulma*, *Gudma*, *Lawa*, *Danna*, *Galicha*, *Asan* etc. The marketing of these woolen materials are generally done in the trade fairs.

15.3.1.3 Society

Experts observe that the Bhotias have a casteless society, but Atkinson remarks that “the Bhotiyas of Jughar acknowledge only two castes, Brahmans and Rajput. The principal clan of Bhotia Brahmin in Juhar is Dobedhiyas, Pathaks, etc., while in Rajputs they are Toliyas, Martolias, etc. There are no Brahmans in the Darma Patties”. (The Himalayan GAZETTER: Volume:III, Part 1, Edwin T. Atkinson).

Family

The Bhotias live in both joint and nuclear families. They are traditional in their living and gives utmost respect to their culture, customs and rituals. Bhotia women are self-reliant, sturdy and

independent. They equal with their men in work and play and are good wives and competent mothers. For the intermingling of the sexes, the Bhotias have a unique system. Unmarried boys and girls in the community and married girls who are childless have a club, which is located in a house called “rang bang kuri” (club house). When they meet here, the whole night is passed in singing and dancing. The rang bang plays an important part in bringing young people together.

Marriages are arranged by parents who exercise complete control over their children and there are no priestly ceremonies or feasting. The bridegroom is normally given a present or goats. Polygamy is practiced sometimes but child marriage and widow marriage are rare. They have hardly any property, excepting a few cattle. The inheritance goes to the sons. The Bhotias are not stringent about marriage and a woman can remain unmarried if she so chooses. In fact, many women prefer to remain unmarried if they cannot find a suitable match. Monday is considered inauspicious for weddings and none take place on this day. At a wedding, pretence is always made that the bride will never go to her husband voluntarily and has to be carried by force.

As a part of the celebrations the bridegroom's father invites the bridegroom's friends for a feast at night. Later, the party proceeds to the bride's village and carries her away from the rang bang for a short distance. Here they call the bridesmaids to join them and then proceed to the bridegroom's house. On entering the house, the village elders produce their dalangs or cones of dough with liquor, which are given to the bride and bridegroom for consuming. This is followed by a feast. The next ceremony, the formal rite of datu, then ensues. The bridegroom and the bride exchange the dough and fish given them and by this they are bound in wedlock.

Death ceremonies are more elaborate. Children who have not outgrown their milk teeth are buried, the head placed northwards. Those dying a bit older are cremated. The dead body is placed in a white bag, with the knees touching the chin. The bag is then placed on a bier. A white cloth - cotton for a man and woolen for a woman - is tied to the front of the bier so that the spirit of the deceased can be guided in the next world.

The funeral procession is led by a young boy or girl holding burning faggots, followed by the women, then the bier and finally the villagers carrying fuel for the cremation, which is usually held by the side of a stream. The corpse is placed facing east and before it is burnt, the cloth bag is slit and a piece of precious metal is put into the mouth to purify the corpse. A bone of the deceased is collected on the next day and placed in a hole in the place in the village where the bones of dead persons are interred. The same night, a funeral feast is given and a special provision of food is made for the departed person, some rice and other food are put just outside the deceased's house, thrice daily until the “*dhurung*” ceremony is over.

15.3.2 Tharus Tribe

Tharu is a dominant tribe of the state. The major concentration of the Tharu tribal population has been observed in the Tarai region of Uttarakhand and Uttar Pradesh. There are many beliefs about their original habitats. Some believe that Tarai is not original home of Tharus but the Thar Desert of Rajasthan as the name suggests. They claim themselves to be the descendants of Ranas

of Chittor. Agriculture is the main occupation of the Tharus and they grow rice, maize, wheat, barley, lentil, peas, potatoes, sugarcane and mustard as their main crops. Vegetables, tobacco and bananas are grown in kitchen gardens along with chilies and spices. They keep cows, buffaloes, sheep, goats, pigs, fowls and pigeons. They are fond of dogs as pets. Women do the largest part of the sowing, weeding and harvesting. While the men are engaged in fishing and hunting of boars and deer etc.

Foraging and gathering is done extensively to collect wild berries, nuts, wild bulbous and tuberous roots and leaves as vegetable food, and a variety of herbs and plants for medicinal use. They are skilled craftsmen. They collect a variety of grasses and wood for various miscellaneous purposes like weaving of baskets, mats construction of houses, rope making, herbs for brewing drinks, and for religious ceremonies. They have also keen interest in carpentry, masonry and manufacturing of agricultural equipments. Now, the Tharus have opted for Government service, private jobs, agricultural labourer and business of small scale are some subsidiary sources of their income. Tharu society is patriarchal. In spite of patriarchic system the women have a dominant role. They have respectable position in the family and have a full authority to run the house freely. Tharus prefer joint family system especially among the families holding big lands.

Fig. 15.3: A Tharu woman



Source: Google

Tharus have strong traditional panchayat organization to settle their disputes on the basis of a common code of conduct. Among the Tharus child marriage is common and socially sanctioned practice. Divorce has a social approval. Widow re-marriage is also permissible. Tharus have monogamous marriages which are usually settled with negotiations. Tharus are Hindu by religion. They worship all deities of the Hindus along with a pantheon of their own ancient gods. The Tharus are illiterate tribe. They are reluctant to send children to school. Instead, children work as cattle herders and earn two meals a day by grazing cattle in jungle. They do not recognize the advantages of education for the future generations. However, they

take more interest in sending children to those government sponsored primary schools which give financial assistance as scholarship, clothes, shoes etc

15.3.2.1 Habitat

Tharu tribes are mostly found in the villages of Khatima, Kichchha and Nanakmattha blocks of Udham Singh Nagar District. Besides Uttarakhand it is also found in the districts of Lakhimpur, Siddarth Nagar, Bahraich and Maharajganj. In Bihar it is found in the district of West Champaran, East Champaran and Darbhanga. It is also found in the tarai-bhabhar region of Nepal i.e. Bhenchi to Mahakali River. Their house is made up of wood, leaves and narkul and presence of temple in front of stockyard is a marked feature of a typical house of Tharu tribe.

15.3.2.2 Economy

The economy of Tharu tribe is basically based on agriculture and livestock rearing. They plant rice, corn, lentils and mustard. They also collect forest products such as wild fruits, vegetables, medicinal plants and sell to the tourists. They also do fishing and pisciculture for their consumption. Since they are considered as a lazy people they don't perform other main economical activities.

15.3.2.3 Society

Tharu society is patriarchal in nature and prefers joint family system. However the women play a dominant role. They consider themselves as the descendent of Maharana Pratap Singh. This tribe has strong traditional Panchayat organisation in order to settle their disputes. They follow a monogamous marriage. This tribe has mongoloid affinity. Divorce requires a social approval. They are meat eaters and are also fond of liquor. The Tharus followed Hindu religion, but after all they purely a tribal community by anthropological point of view. Tharu people worship mainly their tribal Goddess called as "*Bhuiyan or Bhumsen*" with other Hindu God & Goddess. They don't have any unique language. They speak Bhojpuri, Maithali, Nepali, Mixed pahari language and Awadhi language. They are quite, simple, and honest in nature. They believe and worship different ghost and soul of their forefathers. They establish one god in the courtyard of their home and they are called "kali, nagaryaa, devi, bhumiya or bada baba". They offer wine, chicken, goat, pig and buffalo to make happy their god and the soul of their forefather.

They practice four rituals during the marriage ceremony- (i) apna- paraya (engagement ceremony), (ii) baat-katti (people from groom side go the bride house before 10-15 days of marriage with sweets to fix the date of marriage), (iii) marriage (mostly happens on Sunday or Thursday. Groom brings five clothes, fishes, curd in a vessel and one pot of water with an earthen lamp which keeps on lightning and this lightning earthen lamp is kept in the house of bride. Bridegroom takes seven round "*bhouri*" around this lightning earthen lamp to perform the marriage rituals. After marriage bride goes to grooms home for one day then comes back with her brother or father to her home), (iv) chala (bride comes back to the groom house during chaitr or baishakh after two-three months and keep staying there forever).

15.3.3 Buksa Tribe

Buksa, also known as Bhoksa, are indigenous peoples living mainly in Uttarakhand and Uttar Pradesh. They are mostly concentrated in Dehradun, Uddhamsingh Nagar and Nainital districts in the Kumaon foothills of the outer Himalayas. They are also found in the Bijnor district of Uttar Pradesh, where they are known as "*Mehra or Mehri*". Buksa called themselves the descendent of "*Patwar Rajput*". They are having short height with small eyes, heavy eyelids, broad face, thin lips and small nose. They have broad jaw with thick beard and mustaches. They don't have any specific language. They speak the language where they are living.

15.3.3.1 Habitat

Buxas tribes are mainly found in tarai bhabhar region of in Bajpur, Gadarpr, and kashipur of Uddam Singh Nagar, Ramnagar of Nainital, Duggada of Pauri Garhwal, Vikashnagar of Dehradun, and Uddham Singh Nagar. Their highest concentration is found in Nainital and Uddham Singh Nagar. The ghettos of Buxas are called "*Buksad*".

15.3.3.2 Economy

Buxas are considered as a backward class in terms of economy. They do practice agriculture and rear livestock on small scale. It's not wrong to say that they still do subsistence agriculture mainly. They also weave woolen clothes and sell them to the tourists.

15.3.3.3 Society

Buxas tribe is very strongly built and lives in a great harmony. Both joint family system and nucleated family system is found in this tribe. They don't do marriage outside their tribes and marriage only happens when both boys and girls becomes mature and adult. They considered themselves the devotee of goddess "*devi*". There is one "*gram kheri devi*" temple in the house of each sarpanch or village Pradhan and it is believed that this "*gram kheri devi*" protect their livestock and agriculture from devils or any disaster. "*Gram devi kheri*" also protect them from the devil soul, demon and diseases. Thus all villagers do perform rituals and offer sacrifice to "*gram devi kheri*" after every two years.

Buxas tribes also pray "*sakariya devi*". They believe and practice black-magic and tantra-mantra. The person who is master of tantra-mantra is called "*bhararey*". They are found of the meat of deer and wild boar. Male people drinks wine a lot but they don't allow their female counterparts to drink.

Buxas can be classified into five sub-categories (i) jaduwansi (ii) panwar (iii) partaja (iv) rajwansi and (v) tunwar. They don't do marriage in their clan as it is restricted by their head of the family.

15.3.4 Jansuari Tribe

Jaunsari tribe is the largest tribal group of Uttarakhand. The entire population of the state is scattered throughout the state and mainly lives in Chakrata and Vikasnagar tehsils of Dehradun.

They claim themselves to be the descendents of “*Pandavas*”. This tribe of Indo-Aryan family is famous for their different and colorful dress, socio-culture and well off economic conditions. They offer prayers to Hindu god and goddess. Their main god is called “*Mahasu*” which is considered as the incarnation of lord Shiva.

15.3.4.1 Habitat

Jansuari tribe is mainly found in the villages of chakrata and vikashnagar tehsil of Dehradun district. They are also found in the uphill of kalsi, lakha mandal, Jaunsar Bhambar. They give importance to their house and build three or four storey house. They make sculpture and design on the pillars and walls of the house. They mostly use timber of deodar tree for constructing their house but these days they are also using klin-bricks and cements in construction. Mostly houses are built near the water source and agriculture field. Their roof shades are made up of slate, tin or sometimes deodar tree branches. Vegetables and fruits are grown in the courtyard of the house which shows the healthiness of the tribe.

15.3.4.2 Economy

Jaunsari tribe is well skilled tribe. Their primary economic activities are agriculture and rearing livestock. But being good skilled labors they also do activities of knitting, making of chord, making vessels with the help of bamboos, and bags with the skin of dead animals, especially of goat.

15.3.4.3 Society

It is believed that Jansuari is the descendents of Padavas. This tribe is divided in three categories. First category consists of Brahmin and Rajput who are rich and the owners of land and do agriculture. Second category has iron-smith, gold-smith, and priests. This category is on progress with the help of their labour and skill. Third category represents the economically weaker section of the society but with the help of their hard labour and skill they are also enjoying better position in the society now.

To deal with the fight in the society they have a local system called as “*khumri*”. There is one representative from every household in khumri for fair judgment. To deal with the fight at village level there is “khat khumri system” which is a symbol of healthy democratic in the society.

Earlier the tribe was exercising polyandry system which has become past and replaced by monogamy. Still practice of polyandry can be found in the upper hills but rarely. At present three system of marriage is found in Jaunsari – (i) Beveki (ii) Beidodiki and (iii) Bajdia.

Fig. 15.4: An old couple of Jansuari



Source: Google

Beveki is a simple marriage system without any showoff. In Beidodiki close relatives are invited to celebrate the marriage. While Bajdia is a pomposh marriage in which relatives of groom comes with music and dance to the bride house for marriage. Earlier a cow used to be given as dowry and the horn of the cow were painted with silver.

15.4 CONCLUSION

Tribal groups of Uttarakhand make the culture of the state rich and diversified. The four main tribes found in Uttaranchal Bhotias, Tharus, Buksas, and Jaunsari. '*Bhotias*' are a transhumane community and residing in the upper Himalayan valleys of Sikkim, Tripura, Uttarakhand, Uttar Pradesh, Himachal Pradesh, Jammu & Kashmir, Ladakh, Arunachal Pradesh and West Bengal. Basically they are an occupational caste of nomadic shepherds and have mongolian features and are known as "*Pahari*" or "*hill people*" in northern India.

15.5 SUMMARY

During summer seasons Bhotia lives at higher altitudes in Himalaya and come back down hills in the villages during winter season with their cattle. Marriages are arranged by parents who exercise complete control over their children and there are no priestly ceremonies or feasting. While Tharu is a dominant tribe of the state and their population has been observed in the Tarai region of Uttarakhand and Uttar Pradesh. There are many beliefs about their original habitats. Some believe that Tarai is not original home of Tharus but the Thar Desert of Rajasthan as the name suggests. They claim themselves to be the descendants of Ranas of Chittor. Agriculture is the main occupation of the Tharus and they grow rice, maize, wheat, barley, lentil, peas, potatoes, sugarcane and mustard as their main crops. Vegetables, tobacco and bananas are grown in kitchen gardens along with chilies and spices. They keep cows, buffaloes, sheep, goats, pigs,

fowls and pigeons. They are fond of dogs as pets. Women do the largest part of the sowing, weeding and harvesting. While the men are engaged in fishing and hunting of boars and deer etc.

Buksa, also known as Bhoksa, are indigenous peoples living mainly in Uttarakhand and Uttar Pradesh. They are mostly concentrated in Dehradun, Udhamsingh Nagar and Nainital districts in the Kumaon foothills of the outer Himalayas. They are also found in the Bijnor district of Uttar Pradesh, where they are known as “*Mehra or Mehri*”. Buksa called themselves the descendent of “*Patwar Rajput*”. They are having short height with small eyes, heavy eyelids, broad face, thin lips and small nose. They have broad jaw with thick beard and mustaches. They don't have any specific language. They speak the language where they are living.

Jaunsari tribe is the largest tribal group of Uttarakhand. The entire population of the state is scattered throughout the state and mainly lives in Chakrata and Vikasnagar tehsils of Dehradun. They claim themselves to be the descendents of “*Pandavas*”. This tribe of Indo-Aryan family is famous for their different and colorful dress, socio-culture and well off economic conditions. They offer prayers to Hindu god and goddess. Their main god is called “*Mahasu*” which is considered as the incarnation of lord Shiva.

15.6 GLOSSARY

Transhumance - The seasonal migration of livestock, and the people who tend them, between lowlands and adjacent mountains.

Pastoralism - The practice of herding as the primary economic activity of a society.

Nomadism – a member of a people or tribe that has no permanent abode but moves about from place to place, usually seasonally and often following a traditional route or circuit according to the state of the pasture or food supply.

Polyandry – The practice or condition of having more than one husband at one time

Monandry - The practice or condition of having one husband at a time

Bajdia – A pomposh marriage system in Jaunsuari

“**Buksad**” - Ghettos of Buxas

15.7 ANSWER TO CHECK YOUR PROGRESS

1. Where Bhotias are found in India?
2. What are the other subtribes of Bhotias?
3. Where Tharus are found in India?
4. What are the major rituals of Tharus tribe?
5. Where Buxas are found in India?
6. What are the sub-castes of Buxas?
7. Where Jaunsari are found in India?
8. What are the different marriage systems in Jaunsari?

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15.10 TERMINAL QUESTIONS

1. Who are Bhotias? Explain the marriage rituals of the community.
2. Who are Tharus? Explain the religious rituals of the community.
3. Who are Buxas? Explain the religious rituals of the community
4. Who are Jaunsar? Explain the marriage rituals of the community

LAB WORK QUANTITATIVE TECHNIQUES

BLOCK- 1 REPRESENTING STATISTICAL DATA

UNIT 1 - DIAGRAMS AND GRAPHS

1.1 OBJECTIVES

1.2 INTRODUCTION

1.3 GENERAL RULES FOR CONSTRUCTING DIAGRAMS & GRAPHS

1.4 LINE DIAGRAM, BAR DIAGRAM, PYRAMID DIAGRAM, SQUARE DIAGRAM, BLOCK DIAGRAM, WHEEL DIAGRAM

1.5 CONCLUSION

1.6 SUMMARY

1.7 GLOSSARY

1.8 ANSWER TO CHECK YOUR PROGRESS

1.9 REFERENCES

1.10 SUGGESTED READINGS

1.11 TERMINAL QUESTIONS

1.1 OBJECTIVES

After reading this unit, you will be able to:

- To know about general rules for constructing diagrams & graphs
- To know about Line diagram, bar diagram, Pyramid diagram, Square diagram, Block diagram, Wheel diagram.

1.2 INTRODUCTION

Diagrams and graphs are the most important elements in practical geography. In Geography, data are represented in several ways. Sometimes the same data are shown in several ways, and also several data are shown in the other way. Of these there are two methods to show statistical data as diagram and graph. If some geographical fact, instead of being written, is shown by pictures even a common man can understand it.

A Geographer is required to represent various kinds of statistical data on a map. He makes use of various types of statistical diagrams to represent the statistical information. Like diagrams, statistical data may also be represented by graphs. Graphs involve the drawing of regular lines – smooth or curved, each point on them being determined by two co-ordinates. For convenience squared papers are used, which are popularly called graph papers. The graphs are, however, notable for their accuracy and exactness. Whereas there are also few usefulness of diagrams the discussion on it in detail are as-

USEFULNESS OF DIAGRAMS

The following are the advantages of these diagrams-

1. Any man without reading the data tables, can find out from these diagrams what has been shown there.
2. These diagrams look beautiful. So even that man who is not interested in reading can enjoy and get information to related topic by looking at them.
3. Relative comparison can be easily made with the study of these diagrams.
4. Any fact can be explained easily.
5. Less time is taken in getting them prepared.
6. The entire data which when expressed in numerical form may be unwieldy and require a number of pages to write down, are made visible at a glance.
7. Lastly, The diagrams help in deriving the required information in less time and without any mental strain.

1.3 GENERAL RULES FOR CONSTRUCTING DIAGRAMS & GRAPHS

The following general rules should be observed while constructing diagrams:

1. **Title:** Every diagram must be given a suitable title. The title should convey in as few words as possible the main idea that the diagrams intent to portray. The title may be given either at the top of the diagram or below it.
2. **Proportion between width and length:** A proper proportion between the height or length and width of the diagram should be maintained. If, the height and width is too short or too long in proportion, the diagram would give an ugly look. While there are no fixed rules about the dimensions, a convenient standard as suggested by Lutz in the book entitled “Graphic Presentation” may be adopted for general use.
3. **Selection of scale:** The scale showing the values may be in even numbers or in multiples of five or ten, e. g. 25, 50, 75, or 20, 40, 60. Odd values like 1,3,5,7 may be avoided.
4. **Footnotes:** In order to clarify certain points about the diagram, footnote may be given at the bottom of the diagram.
5. **Index:** An index illustrating different types of lines or different shades, colours should be given so that the reader can easily make out the meaning of the diagram.
6. **Neatness and cleanliness:** Diagrams should be absolutely neat and clean.
7. **Simplicity:** Diagrams should be as simple as possible so that the reader can understand their meaning clearly and easily. For the sake of simplicity, it is important that too much material should not be loaded in a single material should not be loaded in a single diagram otherwise it may become too confusing and prove worthless.

Now you know the role of diagrams in geography and general rules for construction of diagrams. So we will discuss further, the next objective of the unit as the representation of the geographical or statistical data through different type of diagrams, the chief of which are shown in graphically. The detail descriptions are given below.

1.4 LINE DIAGRAM, BAR DIAGRAM, PYRAMID DIAGRAM, SQUARE DIAGRAM, BLOCK DIAGRAM, WHEEL DIAGRAM

DIFFERENT FORMS OF DIAGRAM

Geographical or statistical data may be represented in forms of diagrams in several ways. Classification of statistical diagrams in generally made on the basis of facts shown in them. Diagrammatic representation can be made in any one of the following methods:

- a) **One Dimensional Diagrams-** Sometimes only one fact is shown, they are called One Dimensional Diagrams. They are simple diagram and the distribution of only one fact is shown

in them such as rain, temperature, air pressure or the production of some particular thing. Their construction does not include made thinking consideration and complicity of scale. The example of one dimensional diagram is Bar Diagram and Line Diagram.

b) Two Dimensional Diagrams- It can be included in the second class; they require more calculation than One Dimensional Diagrams. They can be placed in the class of quantitative maps. Two Dimensional Diagrams are Rectangular Diagrams, Circle Diagrams, and Wheel Diagrams etc.

c) Three dimensional diagram- In the third class can be included Three Dimensional Diagrams. Their constructive needs much calculation and care. Volume shapes are used in Three Dimensional Diagrams. In these diagrams the amount of area and cube shapes is according to scale. In their construction care has to be taken of the scale too along with statistical calculation. Whose volumes are made proportional to the given figure viz., cubes, cylinders, blocks, and spherical diagrams etc.

d) Pictorial diagrams- such as pictures and statically maps.

As you know the above mention diagrams are the part of different dimensional diagrams so the detail description and method of construction of different types of diagrams are as:

LINE DIAGRAM

Line diagram mostly used when there is vast range of values in a table. In this diagram a straight line is draw on pre decided scale for each value of the table. These lines are drawn on horizontal or vertical axis with equal distance. To recognize the particular line there is need to write the name or year on it. Thus the diagram is good to compare between the production in different year or states but because of no thickness in the line diagram they are not looks attractive. The diagram can be exhibited on the graph paper.

Q.1 Construct the line diagram to represent the per capita income in different states of India.

Table 1.1.Per Capita Income in Different States of India, 1980

S.NO	Name of the State	Per capita income in Rupees
1.	West Bengal	1,130
2.	Uttar Pradesh	981
3.	Assam	960
4.	Rajasthan	913
5.	Orissa	843
6.	Madhya Pradesh	826
7.	Manipur	822
8.	Punjab	2,278
9.	Maharashtra	1,903
10.	Gujarat	1,623

11.	Tamil Nadu	1,350
12.	Himachal Pradesh	1,317
13.	Karnataka	1,267
14.	Andhra Pradesh	1,176

First arrange the table in descending order as-

Table 1.2. Per Capita Income in Different States of India, 1980

S.NO	Name of the State	Per capita income in Rupees
1.	Punjab	2,278
2.	Tamil Nadu	1,350
3.	Himachal Pradesh	1,317
4.	Karnataka	1,267
5.	Andhra Pradesh	1,176
6.	West Bengal	1,130
7.	Uttar Pradesh	981
8.	Assam	960
9.	Uttar Pradesh	981
10.	Assam	960
11.	Rajasthan	913
12.	Orissa	843
13.	Madhya Pradesh	826
14.	Manipur	822

CONSTRUCTION METHOD

It is point out before that arrange the data in descending order, so according to table 1.2, draw a perpendicular on the one side of diagram and mention the scale of per capita income. Now find out the length of line according to per capita income in different states and draw them on base line with equal distance. Now write the name of concerning state on each line. You can write the horizontal and vertical scale with diagram (Fig. 1.1).

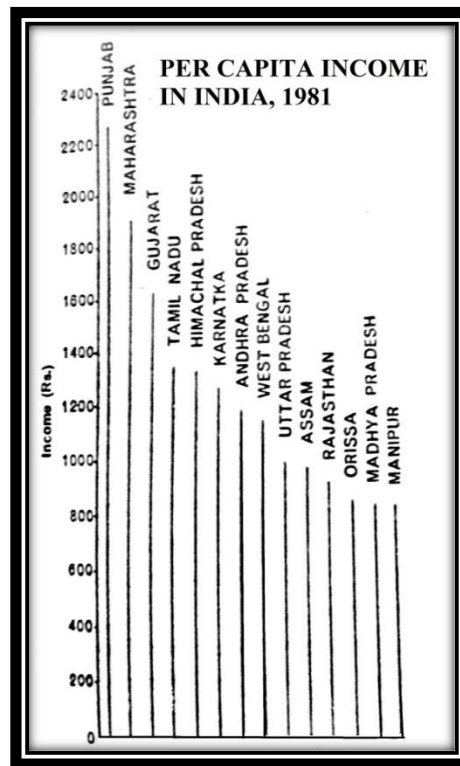


Fig. 1.1

BAR DIAGRAM

Representation of quantities by bars is the easiest and simple type of diagram. Bars may be shown by a straight line or like a pillar with some uniform width. The lengths of bars vary in proportion to the quantity to be represented on a selected scale. They may be vertical or horizontal simple or compound. Horizontal base is used for the simple reason that comparison of one bar with another can better be made in terms of height. In a single study all bars must be of the same uniform width, separated by equal intervening spaces. If a horizontally arrangement is chosen as in fig. 1.2, the date order should always be in sequence from top bar to bottom bar, again because the eye reads horizontal lines starting at the top and working down the page. The horizontal arrangement makes the setting out of names and numbers fairly easy, as there is plenty of space at the beginning or end of bars, whereas there is very limited amount of horizontal space beneath vertical bars as shown in (fig. 1.2). These are also called staircase bar diagrams.

Q.2 Construct a simple bar diagram to represent the following data:

Table 1.3. Sex Ratio in India, 1901 – 1981

Year	No. of Females after 1000 Males
1901	972
1911	964
1921	955
1931	950
1941	945
1951	946
1961	941
1971	930
1981	935

CONSTRUCTION METHOD

First draw a vertical and horizontal base line. Let it be one division on vertical line with the interval of 10. The highest figure is less than 980, so do not mark more than 7 divisions on the line. Marked this line with proposed scale such as one division = 920 females. Now make those divisions with proper scale such as 920, 930, 940 etc. as shown in fig. 1.2. Then divide the horizontal line from zero point with a suitable scale by comparing the figures for the various years. Draw vertical bars of equal-width, equal-distance and equal-spaced to show number of females per 1,000 males in various years as shown in fig. 1.2.

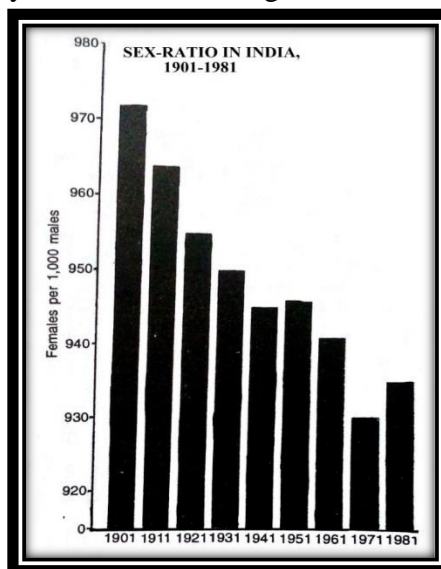


Fig. 1.2

PYRAMID DIAGRAM

The Pyramid diagram is virtually a variant of a bar graph, where columns, constructed to represent specific qualitative population data and are arranged in a tier structure. There are generally two types of pyramid e.g. simple and compound. Simple pyramid diagram is used to show the growth of total population of a country, on the other hand a compound pyramid diagram is used to show the rural and urban composition etc.

Q.1 Construct an age and sex pyramid from the following data-

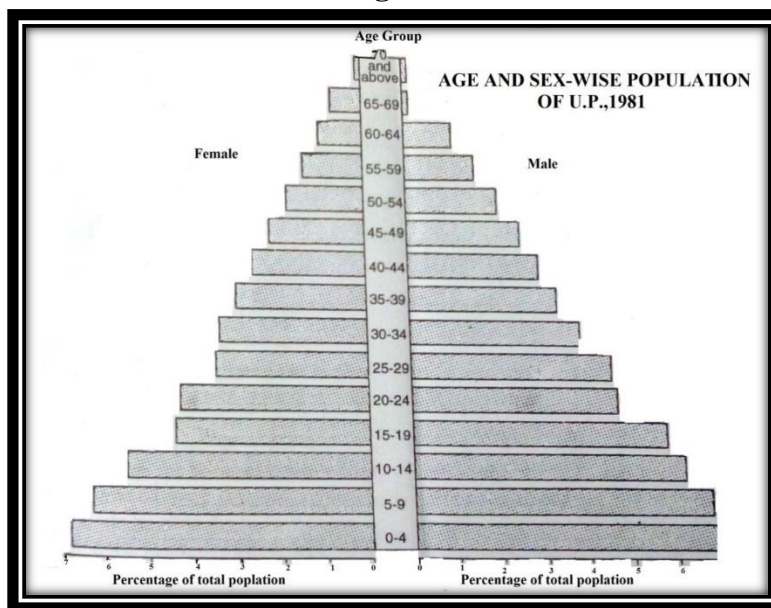
Table 1.4. Age and Sex –Wise Population of U.P, 1981

Age Group	% of Male	% of Female	Age Group	% of Male	% of Female
0-4	7.0	6.8	40-44	3.0	2.6
5-9	6.8	6.3	45-49	2.6	2.2
10-14	6.2	5.5	50-54	2.1	1.8
15-19	5.8	4.4	55-59	1.6	1.4
20- 24	4.7	4.3	60-64	1.1	1.0
25-29	4.6	3.5	65-69	0.1	0.7
30-34	3.9	3.4	More then 70	0.1	0.1
35-39	3.4	3.0			

CONSTRUCTION METHOD

For the scale of convenience convert the population into percentage on the horizontal plane. Simultaneously mark the age group on the vertical plane in such a way that the base representing the youngest group, the apex the oldest (Fig. 1.3).

Fig. 1.3



SQUARES DIAGRAM

It is an important two-dimensional diagram and use to show the production in rupees and quintals etc. It is point out that for construction of diagram, firstly you have to select the appropriate scale. So for the squares diagrams 1 square = 1000 quintals or 1,00,000 rupees etc. unit will select to calculate the number of squares for each value. After it, you will find out the number of squares. The important characteristic of square diagram is its easiness. you can prepare another table after calculation to calculate the numbers of squares. In order to avoid errors to the greatest extent, the same facts may be represented by grouping together a number of even-sized small squares. Each unit square may represent some conveniently selected quantity. Such a method is advantageous in comparison with the block method in two ways: (i) It is comparatively much more accurate; (ii) It may be easily commensurable by counting the number of unit square.

Q. 1. Make squares diagram on the data given below-

Table -1.5 Production of Food Grains in India, 1978-79

Grains	Production (Million Tons)	Grains	Production (Million Tons)
Rice	53.5	Maize	6.5
Wheat	35.0	Bajra	5.5
Jowar	11.5	Barley	2.0

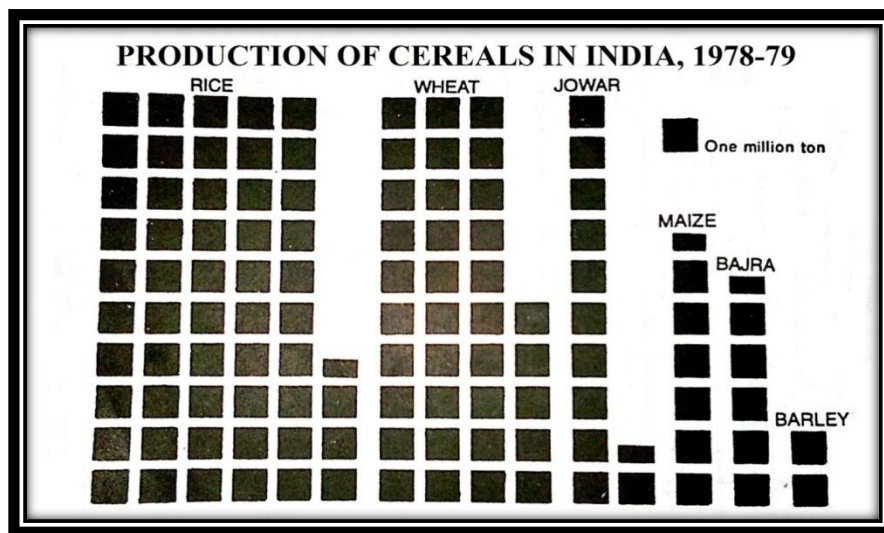


Fig. 1.4

CONSTRUCTION METHOD

If we take one square equal to one million ton production of grain then numbers of squares of rice, wheat, jowar, maize, bajra, and barley are 53.5, 35.0, 11.5, 6.5, 5.5, and 2.0 respectively and

114 for the total production (fig.1.4). Now draw the squares close to each other with equal distance with neatness.

BLOCK DIAGRAM

A block diagram is a technique which may be utilized to show effectively different types of landforms and their evolution. This technique was introduced by G.K. Gilbert and was used by W.M. Davis in the late 19th century. Blocks Diagram may be either simple, giving two dimensional effects like rectangles and squares, or they may be complex, producing three dimensional effects like cubical blocks- cylinders, spheres, etc. In the former case the area of the block proportionate to the quantity shown by it; in the latter the volume of the block is made to proportionate to the quantity represented. The former case the area of the block proportionate to the quantity represented.

In square diagram we select the scale to determine the no. of squares and a bunch of squares shows one item from the table. Whereas in block diagram only one block is made for one item and the side of square will find according to pre decided scale. The blocks are constructed with same distance, one block for one item. It should be constructed in descending order. This diagram is more useful when there is high range of interval among the data in table. The demerit of the diagram is that it is unable to present the correct picture in reference to proportion at a glance.

Q. 1. Draw block diagram to represent the data given in Table 1.6.

Table 1.6. Production of Food grains in India, 1970-71

Grains	Million Tons	Size of the Block	Size of one side of block
Rice	53.5	$\frac{53.5}{2} = 26.75$	$\sqrt{26.75} = 5.17$ unit
Wheat	35.0	$\frac{35.0}{2} = 17.5$	$\sqrt{17.5} = 4.18$ unit
Jowar	11.5	$\frac{11.5}{2} = 5.75$	$\sqrt{5.75} = 2.39$ unit
Maize	6.5	$\frac{6.5}{2} = 3.25$	$\sqrt{3.25} = 1.80$ unit
Bajra	5.5	$\frac{5.5}{2} = 2.75$	$\sqrt{2.75} = 1.65$ unit
Barley	2.0	$\frac{2.0}{2} = 1.00$	$\sqrt{1} = 1.00$ unit

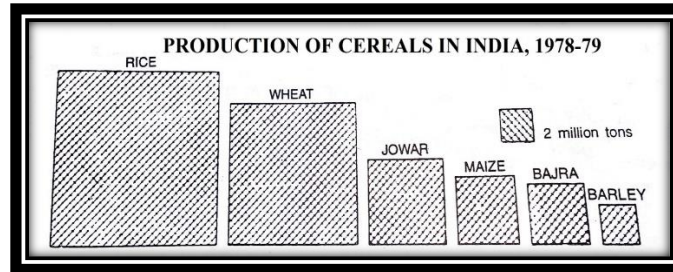


Fig.1.5

CONSTRUCTION METHOD

After calculation according to the size of the paper draw the blocks one by one according to assume size of the block, as 1 cm. square = 2 million tons. Now draw the bigger block of rice first than wheat, jowar, maize, bajra and barley respectively (fig. 1.5). Errors below 5 percent may be ignored.

WHEEL DIAGRAMS

These are called circular or wheel or pie diagrams and also known as areal diagrams. This type of diagram shows the distribution by a circle whose area is proportionate to the quantity represented. Just as bars and squares may be divided in order to represent component parts, similarly may be sub-divided into various sectors. It gives a good visual idea of the fact it represents and also looks pleasant; but it is not easily commensurable as the bar and the block. It has advantage over them in that it occupies less space than these, a fact which makes it more suitable for distribution maps.

Q.1 Construct a Wheel diagram to represent the data given in Table 1.7:

Table 1.7, Land Use in India, 1976-77

Classification of land	Area (crore hectare)	Classification of land	Area (crore hectare)
Forest	6.68	Fallow lands	2.40
Not available for cultivation	3.95	Cultivated land	14.02
Other uncultivated excluding fallow lands	3.36	Total	30.41

Now write the values of table in ascending order and, find out the angles in degrees:

Table 1.8, Land Use in India, 1976-77

Classification of land	Area (crore hectare)	Angle (degree)	Cumulative frequency (degree)
Cultivated land	14.02	$\frac{14.02 \times 360}{30.41}$	166 ⁰
Forest	6.68	$\frac{6.68 \times 360}{30.41}$	245 ⁰
Not available for cultivation	3.95	$\frac{3.95 \times 360}{30.41}$	291.8 ⁰
Other uncultivated excluding fallow lands	3.36	$\frac{3.36 \times 360}{30.41}$	331.6 ⁰
Fallow lands	2.40	$\frac{2.40 \times 360}{30.41}$	360 ⁰
Total	30.41	360 ⁰	360 ⁰

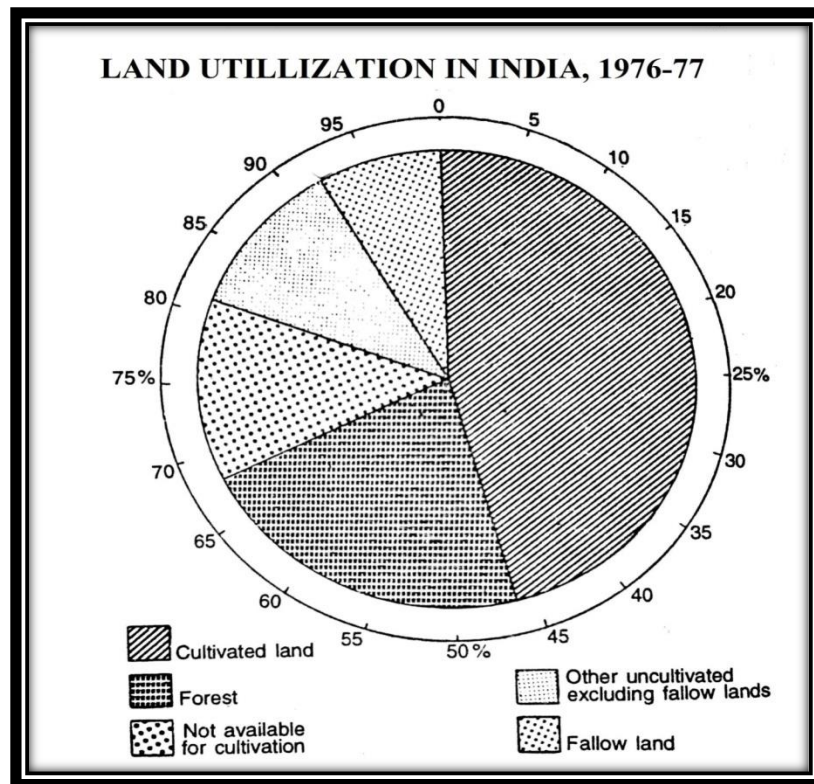


Fig.1.6

CONSTRUCTION METHOD

To represent this data in the form of a pie diagram, you have to first draw a circle with any radius. Sometimes circles are drawn to the proportion of the area or any other figures. To divide these circles into various sectors, the principle to note is that the areas of the sectors should be proportional to the areas of different states. Now, the areas of the sectors are proportional to the angles at the center. Therefore, 360° , the total number of degrees contained in a circle, are to be divided into proportional parts to get sectors of the required areas. It should be draw clockwise as firstly fallow lands 166° , forest 79° , not available for cultivation 46.8° , other uncultivated excluding fallow lands 39.8° , fallow lands 28.4° or through cumulative frequency 166° , 245° , 291.8° , 331.6° , 360° respectively (fig.1.6).

1.5 CONCLUSION

Thus we can say that statistical data provide raw materials for drawing, diagrams. Method of representation of statistical data depend upon the nature of data i.e. agricultural, the distribution of population and other statics in different years or intervals of time may be best shown by diagrams. A diagram may be defined as the representation of statistical data or a geographic element in a highly abstract and conventionalized form by laying emphasis on one selected element. Broadly the statistical diagrams can be classified into three groups as One dimensional e.g. bars and line diagrams, Two dimensional e.g. square, rectangular, circular diagram etc. and Three dimensional e.g. cube and spherical diagrams etc. Few very important merits of diagrams are prepared in very short time, attractiveness, effective impression, good for comparison between different variables and easy method of construction. Whereas few general rules should keep in mind during construction of diagrams as selection of title, proportion between width and height, selection of scale, index, neatness and cleanliness, selection of diagram etc. For example line diagram should use when there is shortage of time otherwise bar diagram gives better impression so it should be select. Pyramid diagram can better option to show more than two variables at a time, square and block diagram are again easy but time consuming methods yet, fulfill the general rule of diagram as simplicity on the other side wheel diagram is best option to show landuse classification or any type of classification in a particular region.

1.6 SUMMARY

As you know, the objectives for the unit was general rules for constructing diagrams & graphs and the representation of few diagram as line diagram, bar diagram, pyramid diagram, square diagram, block diagram, wheel diagram. So the importance of diagrams and definition of it followed by introduction, usefulness of diagrams was the another subheading to the unit the advantages of diagrams are well explained as any men without reading them, can find out fromthese diagrams what has been shown there. The diagrams look beautiful, attractive and

effective so the common man, who is not interested to read can enjoy and get information to related topic by looking at them. Now he can get the information very easily at a glance without any mental strain, in less time. According to general rules for constructing diagrams & graphs attractiveness and effectiveness in communicating the required information is first rule whereas proper headings, proper size as diagram must suit the size of the paper, signs and colours may be used to indicate different nature and aspects of diagram. Less use of words or numerical, In case any feature of the diagram has not been adequately made clear footnote and Index should be given. Different types of lines or shades should be given so that the reader can easily understand the diagram.

Line diagram, bar diagram, Pyramid diagram, Square diagram, Block diagram, Wheel diagram are few diagrams explained very well in the unit as Line diagram mostly used when there is vast range of values in a table. In this diagram a straight line draw on pre decided scale for each value of the table, and the per capita income in different states of India show that Punjab was on first position in per capita income among the given states and Manipur with lowest income is on bottom in the list, fig. 1.1 represents the comparatively study at one glance. Other diagrams are also showing the clear picture of related aspect of data.

1.7 GLOSSARY

Statistical data – Statistic is the branch of mathematics that deals with the collection, organization, analysis and interpretation of numerical data.

One Dimensional Diagram- A diagram in which the size of only one dimension i.e. length is fixed in proportion to the value of the data is called one dimensional diagram. Such diagrams are also popularly called bar diagrams. These diagrams can be drawn in both vertical and horizontal manner.

Two Dimensional Diagram - In two dimensional diagram the length as well as the width of the bars is considered. The important types of such diagrams are rectangles, squares and circles diagram.

Three dimensional Diagrams - Having, or seeming the three dimensions, i.e. depth, width and height. Spherical diagram, Cube diagram and block pile diagrams are the example of type of diagrams.

Square diagram - It is an important two- dimensional diagram and use to show the production in rupees and quintals etc. through squares .

Pyramid diagram – The Pyramid diagram is virtually a variant of a bar graph, where columns, constructed to represent specific qualitative population data and are arranged in a tier structure.

Wheel Diagram - This type of diagram shows the distribution by a circle whose area is proportionate to the quantity represented. It is divided in order to represent component parts, than

the areas of the sectors are proportional to the angles at the Centre. Therefore, 360° the total number of degrees contained in a circle and it is divided into different sectors according to table.

1.8 ANSWER TO CHECK YOUR PROGRESS

Q. 1. What are the general rules for constructing diagrams?

Q. 2. What are the chief advantages of diagrams?

Q. 3. Define two dimensional diagrams in Geography.

Q. 4. What is bar diagram? Draw a simple bar diagram to represent the following data

Per Capita Income in Rupees

Year	1950-51	1955-56	1960-61
Per capita income	251	281	330

Q. 5. What do you mean by wheel diagram in Geography? Construct a wheel diagram to show the given data.

Area in Square Kilometers

State	A	B	C
Area	14422	10321	8809

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1.11 TERMINAL QUESTIONS

Q.1 What is statistical diagram? What is the basis of its classification?

Q.2 Write the difference between diagram and graph.

Q.3 What is Pyramid diagram?

Q.4 Explain the Square diagram.

UNIT 2 - DISTRIBUTION MAPS

- 2.1 OBJECTIVES**
- 2.2 INTRODUCTION**
- 2.3 DOT METHOD**
- 2.4 PROPORTIONAL CIRCLES**
- 2.5 SPHERE METHODS**
- 2.6 CONCLUSION**
- 2.7 SUMMARY**
- 2.8 GLOSSARY**
- 2.9 ANSWER TO CHECK YOUR PROGRESS**
- 2.10 REFERENCES**
- 2.11 SUGGESTED READINGS**
- 2.12 TERMINAL QUESTIONS**

2.1 OBJECTIVES

After reading this unit you will be able:

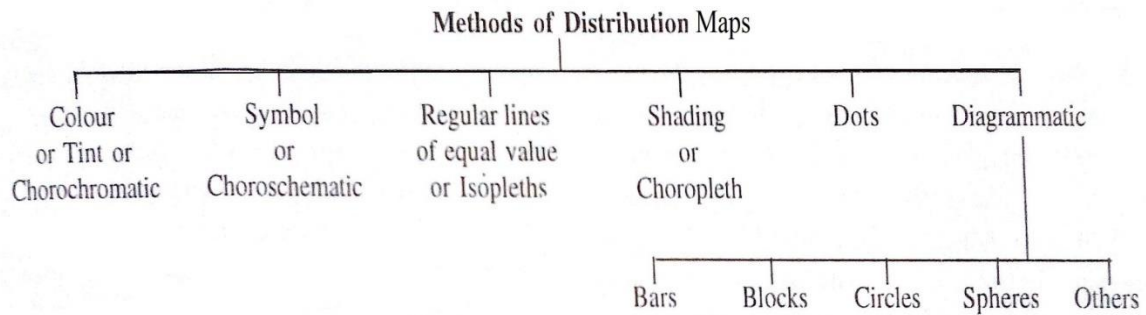
- To describe the Dot Maps.
- To explain the Proportional circles.
- To define and construction of Sphere methods.

2.2 INTRODUCTION

When the distribution of something is shown on a map, it is called a distribution map. For example, when we sketch on map, the distribution of some climate factor (temperature, air pressure), vegetation, soil, animal wealth, minerals, economic production, or population etc., that map will be called the distribution map of that particular thing. Such a map is called single factor map too. They are made with the purpose of showing the distribution of a particular thing too. So they are also called special purpose maps. The map showing the regional distribution of sources of energy will be called mineral map. Similarly the map showing the regional distribution of sources of energy will be called a map of sources of energy. So, the names of the various distribution maps will be related to the particular object the regional distribution of which distribution maps differ from topographical maps in that they show some one characteristics of the area. The questions of the exact location of any object or feature do not arise in such maps. It is the general appearance given by the surface distribution of something that is emphasized by these maps. In short the, distribution maps give the areal distribution of certain element.

KINDS OF DISTRIBUTION MAPS

Distribution maps are made to show the regional distribution of some particular thing. But all distribution maps do not merely show the regional spread of thing, i.e., we do not merely learn from them how far the area of something spreads, but some distribution map also show in what area of something is available in small or large amount. So distribution maps can be divided into two broadkinds :qualitative distribution maps and quantitative distribution maps; colour, symbol, isopleth, dots and diagrammatic maps are the sub-division techniques of qualitative and quantitative distribution maps according to flow chart.



CLASSIFICATION OF QUALITATIVE MAPS

The maps of qualitative areal distribution are of two general types:

1. **Maps of simple area distribution-** They show the area covered by a particular element. Thus, a map showing agricultural land uses, irrespective of the different types of agricultural uses found there is a map of simple areal distribution.
2. **Maps of Compounds areal distribution-** When a distribution maps shows the different types of the same element, it is a map of compound areal distribution. Thus, an agricultural land use map shows distinctly the distribution of various categories, such as land under crops, fallow lands, land under various types of forests, uncultivated lands, land under various types of forests, land not available for cultivation etc. belongs to this category.
3. **Qualitative Distribution maps-** Maps which show only the regional distribution of something or of its kinds and do not show their quantity amount are called qualitative distribution maps. So, from their maps one can learn in what regions of the country we can obtain something or its various kinds and species. From the distribution map soil we learn what kinds of soil is spread in what parts of the country. But these maps do not provide the quantitative knowledge of what quantity of soil is spread and in what regions. Quantitative distribution maps which show only regional spread can be divided into two kinds. Simple area distribution map and compound area distribution map.

METHOD OF CONSTRUCTION OF DISTRIBUTION MAP

There are many methods of making distribution maps. Some methods can be used for making qualitative and quantitative maps both, while there are some methods which can be used for making distribution maps of one kind only. For example, the naming method is used for qualitative distribution only while the dot method is suitable only for quantitative distribution maps. The following facts are to be taken into consideration to decide which method should be used while making distribution map.

1. The outline map that is to be used for distribution maps should have all political boundaries marked in it.
2. We should have complete knowledge of the things or facts the distribution of which is to be shown in the map, e.g., if the distribution of wheat is to be shown in a map of India, we should have the data of its required quantity in every state or district. Then only its correct distribution can be shown.
3. The data for making distribution maps should have been taken from reliable sources and there should be a reference of their source, year of publication and place of publication.
4. We should have a correct knowledge of the surface shapes, climate, soil, vegetation and water and habitats etc. of the area in which distribution is being shown. If the cartographer is not acquainted with these, he will not be able to show the proper and correct distribution in the map.

QUANTITATIVE DISTRIBUTION OR THEMATIC MAPS

Distribution maps of this kind, besides showing the area spread of some particular thing or of its kinds and species, also show in what quantity something or its various kinds are available in some area. Variable tendency of various materials is shown in these maps, e.g. the various tendencies of production can be shown in them.

Method of Making Quantitative Distribution Maps-

The following methods are used for the preparations of distribution maps:

- (a) Dot Method
- (b) Isopleths Method
- (c) Shade or Choropleth Method
- (d) Diagrammatic Method

2.3 DOT METHOD

When data are shown in distribution maps with dots, it is called dot method. In it all data are first converted into round figures. Then a scale is supposed, e.g., if one dot represents 500 hectares, we will divide every figure by 500 and the dots marked there will be as many as the figure thus obtained. To decide where the dots are to be placed we must consider the following points-

- (1) Special care is to be taken while making the dots on the map. The most important precaution is that production and other data should be shown only at the fixed places and within the limits.
- (2) While placing the dots special care should be taken that there are no dots in negative areas. Their distribution should be shown in positive areas only.

- (3) Dots should be placed in the map at those very places where that thing is produced e.g. if we have to show the distribution of some crop on the population, these dots will be placed in those very places where that crop grows or where the population resides. If the distribution of population is to be shown with the dot method, it should be noted with the help of the physical map of that area that there are no dots in the area of mountain, water map, swamp or desert or forest or other negative areas. If the data are related to production of crops, it should be noted that dots are placed on the map only at those places where the physical and climate conditions soil are suitable for production.
- (4) The size of dots should be the same in the map. The dots should not be smaller and larger on half dots.
- (5) The size of a dot should be such according to the scale of data and the sketch map of that region that while showing them in large numbers at a place of greater density the map should not grow black.
- (6) If the map of the region be small, the scale showing dot should be large, e.g., one dot equal to (ten lakh) one million. In the population in Report of 1951 the distribution of population was shown by the dot method for the first time in India. Urban population was shown with red dots.
- (7) The size of dots should be so fixed that there may be coalescence of dots in the areas of thickest density, i.e. dots may just one another. By doing like the variety of density of distribution in the map can be clearly seen at one sight.

The dot method has the following specialties-

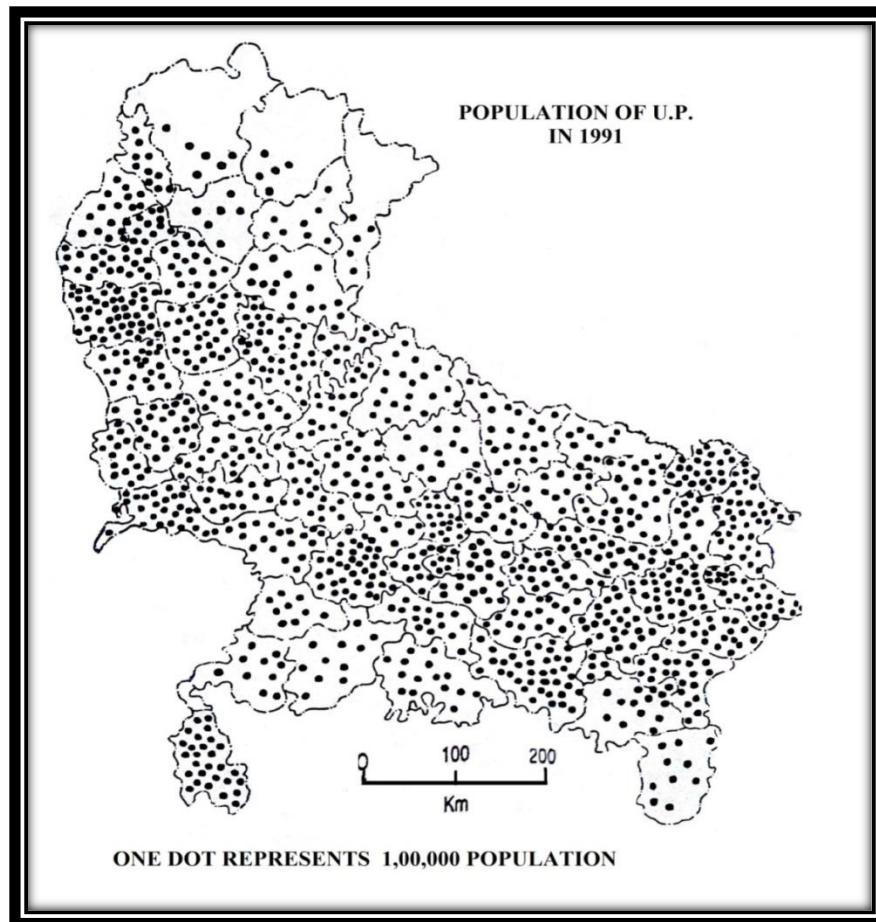
- (a) It is very simple and successful representation of distribution map. It is therefore that this method is quite in use and acceptable.
 - (b) This method does not give rise to any problem between political and geographical boundaries. It is equally useful for both.
 - (c) The construction of maps by the dot method is based on correct data and true information. So there are no mistakes of average in it.
 - (d) Generally only one thing is represented in one dot map, but the distribution of different things can be shown with different dots which can be smaller large in shape and the black, red, green colour may be use.
 - (e) There are some practical problems in depicting dots on the map, these are:
 1. How much or how many shall each dot represent?
 1. How big shall each dot be?
 2. Exactly how shall each dot be placed within the area?
 3. The scale of dots for such a map needs to be carefully chosen if it is to be effective.
- Q. 1. Show the given data of population distribution on the map of Uttar Pradesh:

Table- 2.1 Population of Uttar Pradesh, 1991

District	Population	District	Population	District	Population
Garhwal	664,986	Bahraich	2757,862	Kanpur Nagar	2493,291
Pithoragarh	560,442	Gonda	3574,214	Jalaun	1217,021
Almora	820,810	Barabanki	2425,309	Jhansi	1426,984
Nainital	1585,325	Faizabad	2983,808	Lalitpur	745,632
Bijnor	2,444,042	Sultanpur	2558,698	Hamirpur	1465,707
Moradabad	4104,266	Siddarthnagar	1706,634	Banda	1,874,541
Rampur	1,498,344	Maharajganj	1678,131	Fatehpur	1893,400
Saharanpur	2301,886	Basti	2757,735	Pratapgarh	221,253
Hardwar	1121,392	Gorakhpur	3043,825	Deoria	435,122
Muzaffarnagar	2928,927	Bareilly	2821,239	Mau	1418,872
Meerut	34,30,398	Pilibhit	1279,873	Azamgarh	3148,830
Ghazibad	2755,494	Shahjahanpur	1981,950	Jaunpur	3,207,048
Bulandshar	2826,427	Kheri	2413,878	Ballia	2249,964
Aligarh	3286,681	Sitapur	2850,059	Ghazipur	2462,867
Mathura	1921,714	Hardoi	2741,486	Varanasi	4839,752
Agra	2753,070	Unnav	2198,174	Mirzapur	1661,622
Firzabad	1532,223	Lucknow	2733,619	Sonbhadra	1068,730
Etah	2240,296	RaiBarelli	2320,709	Allahabad	4927,123
Mainpuri	1305,605	Farrukhabad	2414,491	Kanpur Dehat	2136,534
Buddaun	2440,135	Etawah	2113,144		

CONSTRUCTION METHOD

First take an outline map of Uttar Pradesh with boundaries of districts, the dots will mark in it. Now determine a scale for all data. Suppose one dot represents the population of one lakh. Then according to this scale there will be six dots for Garhwal. In the same way there will be 30 dots for Gorakhpur while placing dots you should have in your mind picture of the map of the district in which you are showing the population. Dots will be placed similarly in all states according to table 2.1 on the map. Negative areas should be left. Thus map of population distribution get prepared with dot method as shown in (fig. 2.1).

**Fig.2.1**

DIAGRAMMATIC METHOD

This implies the use of diagram to represent statistical data over the map, such as bars, blocks, circles, spheres, etc. The method of drawing bars and blocks diagrams has already been discussed in the previous chapter. Now, the main problems lies with their placing on the map. They are made to correspond with the exact localities whose data they represent. Such as the centers of circles and spheres would correspond to the site of the towns or the centre of the region they represent. The base of the bars too would be placed at the exact centre of the region or at any point to be so selected that it may lie, as far as possible, within the limits of the area concerned. This method is employed for some specific purposes: (1) certain facts can exclusively be represented by diagrams on the maps; the maps showing the land use in the different regions necessarily adopt circular diagrams; the populations of big towns in a population map may be best shown by spheres. (2) Besides, it various graphs for different subjects as distribution of weather elements; temperature, rainfall etc.

Now, after analyzing the technique of different methods of drawing distribution maps, it is equally important to study some particular types of these maps prepared on different systems

and their relative importance. The detail on proportional circles maps and sphere methods are here in detail, according to object of unit for your knowledge bank.

2.4 PROPORTIONAL CIRCLES

Proportional Circles Maps are used for displaying data in relation to the size of the circle. For the construction of this map first you must calculate the square root of your various data to get the radius. You might decide that 1mm is used to represent a radius of 1 million. So if you got radius for 5 lakh population =0.5 mm. You would then rule a radius of 5 mm. circles on the map.

Q.1 Show the population of principal cities of India with the help of data in given table.

Table – 2.2: Population of Major Cities of India, 1961

City	Population in Lakhs
Mumbai	42
Kolkata	30
Delhi	24
Hyderabad	12

Calculate the radii of various cities according to the formula given in the calculation of Table

2.2. Calculations in detail are as:

$$\text{Presumed radius } x = 3\sqrt{\frac{\text{any number}}{\text{Select number}}}$$

We, therefore, have the various radii for cities as:

$$\text{Radius for the population of Delhi, its population was 24, 00, 000} = 1 \text{ cm. } x3\sqrt{\frac{2400000}{1200000}} = 1.25 \text{ cm.}$$

$$\text{Radii for the population of Kolkata, its population was 30,00, 000} = 1 \text{ cm. } x3\sqrt{\frac{300000}{1200000}} = 1.35 \text{ cm.}$$

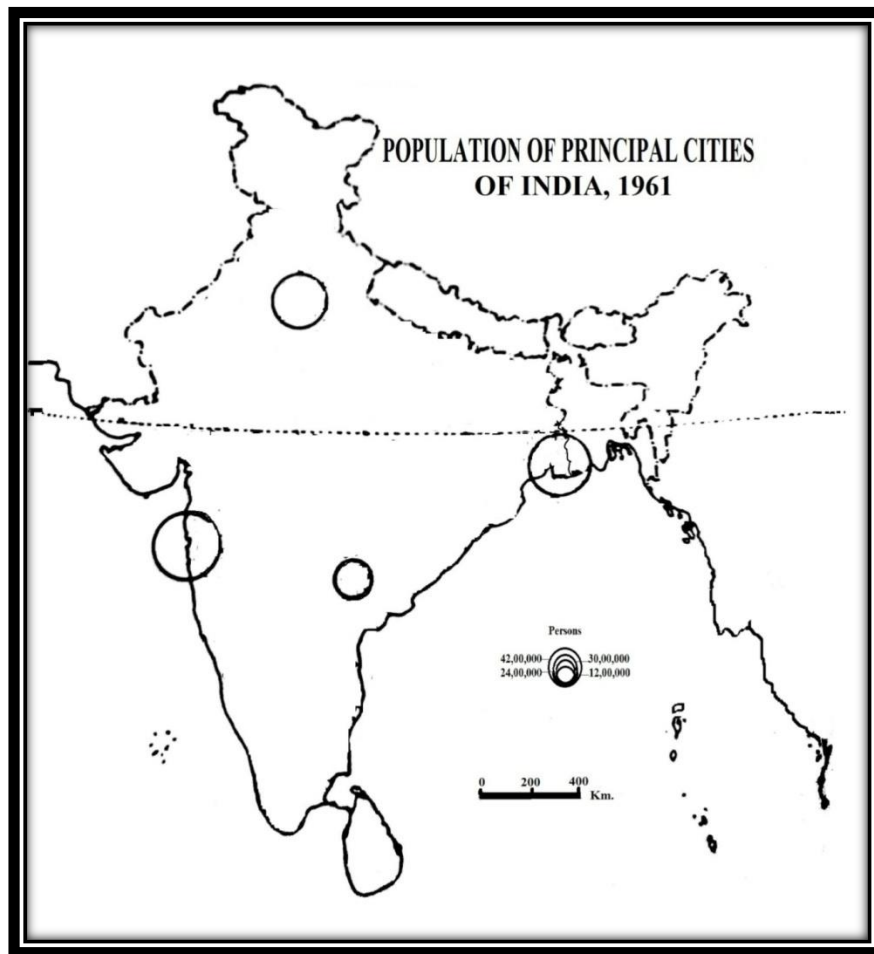
$$\text{Radii for the population of Mumbai, its population was 42,00,000} = 1 \text{ cm. } x3\sqrt{\frac{4200000}{1200000}} = 1.51 \text{ cm.}$$

Method of construction

For the preparation of Proportional circle map to show the population of given cities in 1961. You have need of data, political map of India, calculator, colour pencils and, the drawing compass. Now you decide the size of the circle for it you have to calculate the square root for each values to get the radius of each circle for example the largest circle will draw for Mumbai, which had 42,00,000 population the square roots of Mumbai which comes 3.5 lakhs just like this

we will calculate the data it will 1.51 cm. and 1.35 cm., 1.25 cm. and 1 cm respectively. Now draw the circle to find the center of Mumbai, Kolkata, Delhi and Hyderabad. Keep the title of the map on north side. It is the complete proportional circle map to show the population distribution in 4 major cities of India.

Fig. 2.2



2.5 SPHERE METHODS

In this method spheres represent the population of an area. The spheres are so drawn that their centers coincide with the exact location of cities. Table 2.3 gives the population of certain selected cities of India.

Table –2.3: Population of major cities of India, 1961

City	Population in Lakhs
Mumbai	42
Kolkata	30

Delhi	24
Hyderabad	12

Presumed radius of the smallest figure $x = 3\sqrt{\frac{\text{any number}}{\text{the smallest selected No.}}}$

Suppose 12,00,000 population are shown by a sphere of a presumed radius 1 cm.

Therefore radius of sphere for the population of Delhi, its population was 24,00,000

$$= 1 \text{ cm. } \times 3\sqrt{\frac{2400000}{1200000}} = 1.25 \text{ cm.}$$

$$= 1 \text{ cm. } \times 3\sqrt{2}$$

$$= 1 \text{ cm. } \times 1.25 = 1.25 \text{ cm.}$$

The cube root of 2 is 1.25

Radius of sphere for the population of Kolkata, its population was 30,00,000

$$= 1 \text{ cm. } \times 3$$

$$= 1 \text{ cm. } \times 3$$

$$= 1 \text{ cm. } \times 1.35 \text{ cm.}$$

In Log table the cube root for 2.5 is 1.35, Now for 30,00,000 the scale is 1 cm. $\times 1.35 = 1.35$ cm.

Radius of sphere for the population of Mumbai, its population was 42,00,000

$$= 1 \text{ cm. } \times 3$$

$$= 1 \text{ cm. } \times 3$$

$$= 1 \text{ cm. } \times 1.51$$

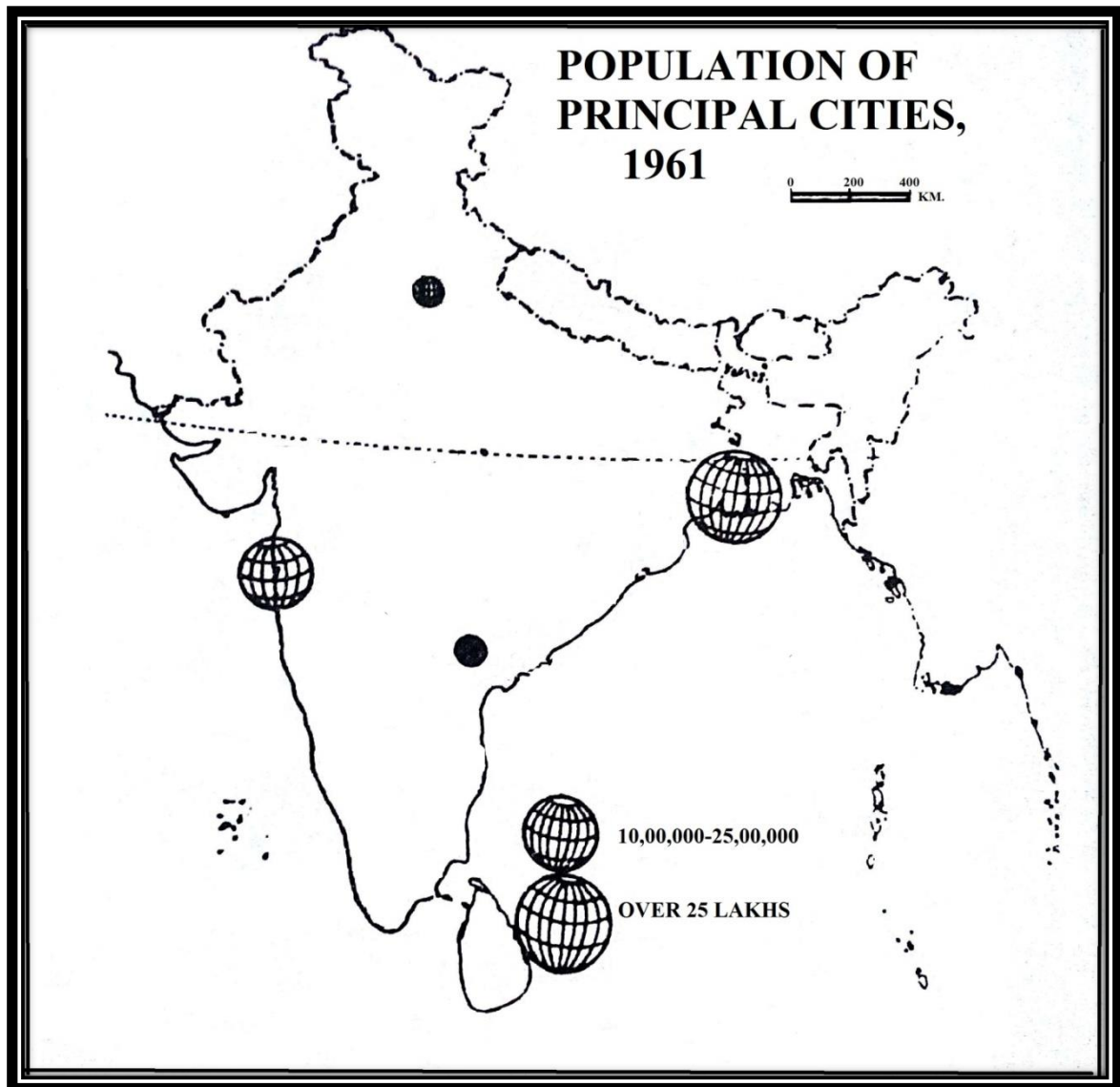
$$= 1.51 \text{ cm}$$

In Log table the cube root of 3.5 is 1.51 so that 42,00,000 the cube scale is 1 cm $\times 1.51 = 1.51$ cm.

METHOD OF CONSTRUCTION

First of all divides the each figure by 12 lakhs, the lowest figure in the table. Assuming that sphere of 1 cm. radius represents 12 lakhs population. Then the radius of other spheres will be calculated by the given formula. Now draw various spheres according to the radius scale for the preparation of sphere methods distribution map to show the population of four major cities in 1961. You have need of data, political map of India, calculator, colour pencils and, the drawing compass. According to calculation largest sphere will draw for Mumbai, which had 42, 00, 000 population the square roots of Mumbai which comes 3.5 lakhs and according to log table 1.51 is the value of cube root. Like this draw another spheres of 1.35 cm., 1.25 cm. and 1 cm radius respectively. Concentration over the center of Mumbai, Kolkata, Delhi and Hyderabad should keep in mind.

Fig. 2.3



2.6 CONCLUSION

Thus we can say that distribution maps represent the pattern of distribution of anyone element based on some definite statistical data. It may be qualitative or quantitative. Distribution of continuous variables like temperature, pressure, rainfall, etc. may be shown by distribution maps. are that dot method is the most important, useful and simple method of showing the distribution on the map. This method is particularly useful for showing absolute figures. Dots are put on the map to show the concerned distribution. Each dot is assigned a special value. The dots are put according to the actual distribution of the element to be shown. This method is used to show the distribution of population, livestock's, agricultural production of a certain crop, production o

minerals etc. The political map, relief map, drainage map, climatic map etc. are the basic maps for construction of dot map. This method is better than any other method of showing distribution because of its accuracy. More than one element can be shown on a single map by using multiple dot map method. Whereas it has also few demerits as the method requires a good deal of practice to draw it. This is useful for absolute figure only.

2.7 SUMMARY

As you know the unit is about role of distribution map in geography and dot method, proportional circles, sphere methods. So the development of unit is with the pre decided objectives. When the distribution of something is shown on a map, it is called a distribution map. For example, when we sketch on map, the distribution of some climate factor (temperature, air pressure), vegetation, soil, animal wealth, minerals, economic production, or population etc., that map will be called the distribution map of that particular thing. Distribution maps can be divided into two broad kinds : 1- Qualitative distribution maps and 2- Quantitative distribution maps.

Maps which show only the regional distribution of something or of its kinds and do not show their quantity amount are called qualitative distribution maps. Maps of simple area distribution and Maps of compounds areal distribution are two divisions of qualitative maps. Whereas, maps which show only the regional distribution and show their quantity amount are called quantitative distribution maps. Dot method and diagrammatic methods are the division of quantitative distribution maps. Dot method, circle method and spherical methods explain that these are the good technique to explain the distribution of population.

2.8 GLOSSARY

- 1. Thematic map** – the maps used to display geographical concepts such as density, distribution, gradients etc. are called thematic map.
- 2. Dot map** – It is a map type that uses a dot symbol to show the presence of a feature or phenomenon in an area.
- 3. Proportional circle map** -Proportional Circles Maps are used for displaying data in relation to the size of the circle.

2.9 ANSWER TO CHECK YOUR PROGRESS

- Q.1 What is distribution map?
- Q.2 Give few examples of distribution map?
- Q.3 Explain the use and types of distributional maps.
- Q.4 What is dot method?
- Q.5 What are the advantages and disadvantages of dot method?

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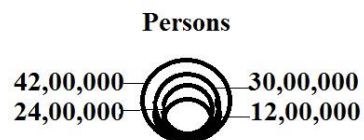
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2.12 TERMINAL QUESTIONS

- Q.1 What are thematic maps?
- Q.2 What is dot method?
- Q.3 How do you define the Proportional Circles method?
- Q.4 How will you explain Sphere methods in geography?



UNIT 3 - QUANTITATIVE METHODS

- 3.1 OBJECTIVES**
- 3.2 INTRODUCTION**
- 3.3 THEMATIC MAPS**
- 3.4 ISOPLETHS**
- 3.5 CHOROPLETH**
- 3.6 FLOW CHARTS**
- 3.7 CONCLUSION**
- 3.8 SUMMARY**
- 3.9 GLOSSARY**
- 3.10 ANSWER TO CHECK YOUR PROGRESS**
- 3.11 REFERENCES**
- 3.12 SUGGESTED READINGS**
- 3.13 TERMINAL QUESTIONS**

3.1 OBJECTIVES

The objective of practical geography course is to train the students in the art of representing demographic, socio-economic and any database of an area through simple statistical and cartographic techniques. Block-1 of practical geography primarily deals with representing statistical data through various cartographic techniques such as diagrams, graphs, maps, quantitative methods etc. In Unit-1, you have learned about representing statistical data through various forms of diagrams and graphs such as line diagram, bar diagram, pyramid diagram and square diagram etc. Unit-2 dealt with various types of distribution maps. In this unit (3), we would take up other cartographic techniques such as Isopleths, Choropleth and Flow Charts.

3.2 INTRODUCTION

Statistics and mathematics became integral components of geographical studies under the Spatial Science paradigm, known as the Quantitative revolution. Statistical data can be represented in various ways such as diagrams and maps. A diagram represents statistical data in an abstract and conventional form. A distribution map shows the spatial distribution of a geographic element on a map. As geographers are primarily concerned with spatial relationships, distribution maps are far more important in geographical studies. Distribution maps indicate the distribution of any particular feature in an area. Distribution maps help us to understand the distribution of different elements of the physical and biological environment in an area. Distribution maps can be classified into two main categories:

1. Non-quantitative Distribution Maps: These maps represent the spatial distribution of data without taking into consideration the quantities such as representing vegetation or soil of a region. The areas where objects are located are either shaded with a particular shade, colour or tinted. But when the areal distribution of more than one thing is to be shown, different shades or tints are used. The maps showing non-qualitative areal distributions by shading or tinting the areas are called *chorochromatic maps*. Non-qualitative areal distributions are also shown by symbols such as dots, circles, triangles etc.; index letters such as T for tea and R for rice and drawing or pictures of the objects. Since, these symbols do not represent quantities; these maps are termed as non-quantitative distribution maps.

2. Quantitative Distribution Maps: Maps that show the variation in the distribution of a quantity by symbols such as dots, shades, isopleths, squares, circles and spheres are called quantitative distribution maps. These maps represent the spatial distribution of data including the quantities such as total population, density, literacy rate etc. For example, the distribution of population may be shown by dots where each dot may represent a given number of persons. Likewise, economic data like production of crops, minerals etc. may be shown by distribution maps. Distributions of continuous variables like temperature, pressure, rainfall etc. are represented by lines of equal value such as isotherms, isobars and isohyets respectively.

3.3 THEMATIC MAPS

All the maps can be broadly grouped into two categories i.e. general and thematic. Between them thematic maps are more systematic. The study of thematic maps develops an understanding between the regional and temporal changes in a region. A thematic map is a type of map specifically designed to show a particular theme connected with a specific geographic area like demographic atlas of Uttarakhand. A thematic map is a map that emphasizes a particular theme or special topic such as the average distribution of rainfall in an area. They are different from general reference maps because they do not just show natural features like rivers, cities, political sub-divisions and highways. Instead, if these items are on a thematic map, they are simply used as reference points to enhance one's understanding of the map's theme and purpose. Within thematic *univariate map* is a map dealing with only one type of data and therefore looks at the occurrence of one type of event. This process would be good for mapping a location's rainfall. *Bivariate data mapping* shows the distribution of two data sets and models their correlations such as rainfall amounts relative to elevation. *Multivariate data mapping* is mapping with two or more data sets. For example a multivariate map could look at rainfall, elevation and the amount of vegetation relative to both.

3.3.1 TYPES OF THEMATIC MAPS

Although, cartographers can use these data-sets in many different ways to create thematic maps, there are five thematic mapping techniques that are used most often. The first and most commonly used of these is the *choropleth map*. This is a map that portrays quantitative data as a colour, shades or tint and can show density, percent, average value or quantity of an event within a geographic area. Sequential colours or shades on these maps represent increasing or decreasing positive or negative data values. Normally, each colour or shades also represents a range of values. We would learn more about the technique of choropleth mapping in section 3.5 of this unit. *Proportional or graduated symbols* are the next type of map and represent data associated with point locations such as cities. Data is displayed on these maps with proportionally sized symbols to show differences in occurrences. Circles are most often used with these maps but squares and other geometric shapes are suitable as well. The most common way to size these symbols is to make their areas proportional to the values to be depicted with mapping or drawing software. Another thematic map is the *isopleth or isarithmic map* and it uses isolines to depict continuous values like precipitation levels. These maps can also display three-dimensional values like elevation on topographic maps. Generally data for isarithmic maps is gathered via measurable points (e.g. weather stations) or is collected by area (e.g. tons of rice per acre by district). Isopleth maps also follow the basic rule that there is a high and low side in relation to the isoline. We would take up isopleth technique in detail in section 3.4 of this unit. A *dot map* is another type of thematic map and uses dots to show the presence of a theme and display a spatial pattern. On these maps, a dot can represent one unit or several, depending on what is being depicted with the map. Finally, *dasymetric mapping* is a complex variation of the choropleth map

and works by using statistics and extra information to combine areas with similar value instead of using the administrative boundaries common in a simple choropleth map. One more techniques would be taken up in section 3.6 of this unit namely flow charts.

3.4 ISOPLETHS

The term isopleth has been derived from Greek word *isos* meaning ‘same’ and *plethron* meaning ‘measure’. Thus isopleths are lines joining places of equal value on a map. This value may be in the form of quantity, intensity or density. An isopleth map generalizes and simplifies data with a continuous distribution. It shows the data as a third dimension on a map, thus isopleth maps are more common for mapping surface elevations, amounts of precipitation, atmospheric pressure and numerous other measurements that can be viewed statistically as a third dimension. The third dimension is shown by a series of lines called isopleths which connect points of equal value. The isopleth interval is the difference in value between two adjacent isopleths. The values of the isopleths drawn on the map are always multiples of the intervals. Isopleths never cross or divide, starts from one corner of a map and end at another corner and sometimes form enclosed circles. Isopleth maps show a range of quantity. They show data as a third dimension on a map, making them good for weather data. Radar maps, temperature maps and rainfall maps are all isopleths maps. Isopleth maps usually have ranges of similar value filled with similar colors or patterns, showing changes over space. Some of the examples of isopleths are as follows:

- **Isobar:** lines connecting points with equal atmospheric pressure at a given time or on average over a given period.
- **Isotherms:** lines connecting places with same temperature at a given time or on average over a given period.
- **Isohyets:** lines connecting areas of equal rainfall at any given time or on average over a given period.
- **Isohaline:** lines connecting areas of equal salinity at any given time or on average over a given period.
- **Isoseismic:** lines connecting areas of equal seismic intensity at any given area or an average over a given period.

3.4.1 ISOPLETH MAPS

Maps on which quantities are represented by isopleths are called *isopleth maps*. Isopleth maps differ from choropleth maps in that the data is not grouped to a predefined region like a state or country. Temperature, for example, works better as an isopleth map than a choropleth map because temperature is continuous but does not change abruptly at any point. Isopleth maps also require a large amount of data for accurate drawing. These maps can take two forms:

- Lines of equal value are drawn such that all values on one side are higher than the “isoline” value and all values on the other side are lower, or
- Ranges of similar value are filled with similar colours or patterns.

This type of map is ideal for showing gradual change over space and avoids the abrupt changes which boundary lines produce on choropleth maps. Relief maps should always be in isopleth form for this reason. To draw isopleth maps, data of the stations are noted near the points showing the positions of the stations on the map. The intervals at which the isopleths are drawn are selected keeping in view the difference in quantity of the highest and the lowest value. The number of isopleths and their values are then fixed. Isopleths should neither be very closely packed nor very widely apart. Isopleths are drawn one by one keeping in mind that an isopleth runs through the stations representing quantities of the same value or is interpolated proportionately between them. Sometimes, as critical isopleth (showing the middle value) is drawn first to facilitate the drawing of the other contours. The spaces between the consecutive isopleths are many times shaded to show the varying values. For example, the shade becoming darker as the value increases and vice versa. This brings in more clarity of distribution. It may be noted that the shades here do not stand for density per unit area and, therefore, these shades should not be confused with choropleths. The isopleths when drawn close together indicate a sharp change in the values and when drawn wider apart they show a gentle change. The disadvantage of isopleths is that they are unsuitable for showing discontinuous or ‘patchy’ distributions and a large amount of data is required for accurate drawing. Figure-1 presents an example of isopleth map depicting areas with equal amount of annual rainfall in India.

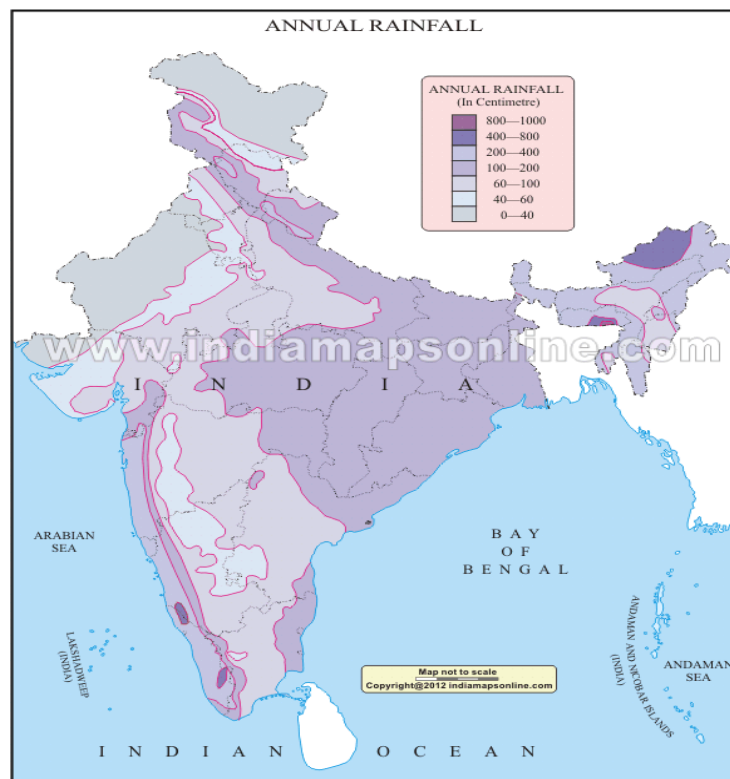


Figure 1: Isopleth Map Depicting Annual Rainfall in India

Source: www.indiamapsonline.com

3.4.2 DRAWING ISOPLETHS AND INTERPOLATION

To understand the patterns and distribution of various natural phenomena such as temperature, relief, rainfall, air pressure, population density etc., we need proper tools and mapping techniques for analyzing and displaying the spatial patterns. One way to display the data would be to simply plot the values on a map. However, it is very difficult to look at such a map and visualize spatial patterns. It would just look like a bunch of numbers scattered over an area. Isopleth is one of the common methods of displaying such data and the map produced using the method of Isopleth is called an Isopleth map. An isopleth map typically shows number of lines, often wavy or forming concentric irregular loops or other patterns. An isopleth connects places that all have the same value of whatever quantity is plotted. Each isopleth has a value associated with it and is usually labeled with that value. Isopleth maps show lines with values at regular intervals, including some standard reference value. The isopleth interval should be chosen so that the map shows enough isopleths to reveal the pattern clearly without being crowded with too many lines.

In order to draw isopleths, we employ a method known as interpolation. “Interpolation is a process that uses measurements that we have made about some phenomenon (e.g. precipitation, elevation or mineral content) at particular locations (i.e. a sample of all of the possible locations for which we have available measurements) to make predictions about that phenomenon at other locations where we don’t have measurements”. There are many reasons that we may often have a sample of data to work with. For example, there is limited numbers of weather stations that make the meteorological measurements. In such scenario, we have data for particular points but we would like to be able to see spatial patterns of the said phenomena for all locations within a region. Hence, we need to employ some method of interpolation in order to predict measures for all locations. The basic idea behind interpolation is that we should expect places that are near our sample locations to have values that are more similar to the sample values than places that are not near the sample locations.

Various types of interpolation that you may come across are: interpolation from points to other points, lines, areas and surfaces. Interpolation to points and lines often uses a simple method of interpolation called *linear interpolation*. This method was commonly used by cartographers for creating isoline maps before mapping become computerized and is used by cartographers to create isolines from data surfaces in secondary interpolation. The basic idea behind *linear interpolation* is based on the idea that we can use a sequence of values to predict the values at locations where we don’t have a value. Although linear interpolation methods were first developed for analyzing time series, we can apply the same principles in a spatial context by considering the distance between two points.

FACTORS AFFECTING INTERPOLATION OUTPUTS:

Regardless of the type of interpolation method you may choose to use, there are numbers of factors that can affect the quality of the interpolated outputs:

- **Number of sample points:** Generally, the greater the number of sample points you have, the more accurate your interpolated surface will be, as the set of location is more likely to include locations whose values are important for defining the surface.
- **Location of sample points:** Similarly, the location of sample points can have an important impact on the end result of the interpolation. Often, samples are not evenly distributed over the region of interest, and may be biased to places where data collection is relatively easy. If there are no samples in a region of high variability, the interpolated surface may not be very accurate.
- **Edge effects:** Finally, edge effects can be quite important. Edge effects arise when there are no sample points to one side of a non-sampled region. The lack of samples may bias the estimate that the interpolation method makes of a non-sampled region, leading to large inaccuracies. In other words, the interpolation method is no longer (predicting missing values within a region), but is now extrapolating (predicting values in areas where there is no sample data).

STEPS IN DRAWING ISOPLETHS:

When drawing an isopleth, you cannot expect it to pass directly through many surface weather stations because it is rare for an actual observation to match your isopleth value exactly. However, every place has a temperature, pressure, rainfall etc. When drawing isopleths, you usually have to interpolate values between observations. Here is a simple step by step instruction for interpolating isopleths-

1. Decide what isopleth values you will draw. That is, choose a standard reference value and an isopleth interval, which together define the set of possible contours that you may draw.
2. On the map, find the highest and lowest values overall from among those values plotted. These define the range of values that your isopleths will cover and also interval. The isopleth with the highest value that you can draw will not exceed the highest value plotted on the map and the lowest value will not be less than the minimum plotted value. For example, if the lowest temperature plotted on the map is 8.7°C, then the lowest possible isopleth can be 5°C. Similarly if the highest temperature plotted is 44.2°C, then the highest possible isopleth could be 45°C.
3. To start, draw either the isopleth with the highest value possible or the lowest value. Following these steps, you should find a value close to your desired isopleth value and then draw from one pair of observations to another until you reach the edge of the plotted values on the map. It may sometimes pass directly through an observation plotted on the map, but mostly would pass through the plotted observations. Isopleths should be drawn as smoothly as possible and each isopleth should be given a label on either end as well as somewhere in the middle. It is important to remember that isopleths can never cross or intersect each other. Near single highest value it makes circular form.

4. Repeat the above mentioned step for the next isopleth value. This time, you would be able to interpolate between observations and previously drawn isopleths. Continue until you have drawn all possible isopleths. It should be kept in mind that in some instances, you may need to draw more than one isopleth of the same value.

5. You can label the places with higher values as 'H' and lower values as 'L', so to distinguish locations with high and low value on the map.

3.4.3 IMPORTANT FEATURES OF ISOPLETH MAPS

- Isopleth maps show gradual change and patterns over a large spatial area.
- Lines join places of equal values along their length.
- Uses fixed intervals so changes can be easily identified.
- Can add colour/density shading to enhance patterns/trends.
- Can be superimposed onto a base map.

3.4.4 ADVANTAGES OF ISOPLETH MAPS

1. Isopleths are more scientific than other methods of showing distribution and effectively show the distribution and variations.
2. This is especially useful for climatic maps such as isobars, isotherms, isohyets etc. and is known as the main tool for the meteorologists.
3. It is very easy to determine the gradient (rate of change) with the help of isopleth maps. When isopleths are wide apart, they show low gradient but they are closer together they show high gradient.
4. Isopleth lines are independent of political boundaries and best suited to show the natural pattern of distribution of an element.
5. Isopleth is the most suited method for showing elements with transitional values. This is one of the reasons that isopleth maps are invariably used to show the distribution of temperature, pressure, other climatic elements and density.

3.4.5 DISADVANTAGES OF ISOPLETH MAPS

1. The drawing of isopleths often needs interpolation which is a difficult process.
2. The method often suffers from lack of sufficient data.
3. There can be variations in the location of each isoline.
4. The shading implies equal values between the isolines which is misleading.
5. Requires data for a large number of locations but many times it is available for selected stations.

3.5 CHOROPLETH

The choropleth mapping technique, which uses “ranges” or “graduated colour”, is a type of thematic mapping that focuses usually on a single theme with data summarized by statistical or administrative areas. The name of this technique is derived from the Greek words *choros* – space and *pleth* – value. These are maps where areas are shaded according to a prearranged key and each shade or color type represents a range of values. Population density information, expressed as population per square km. is appropriately represented using a choropleth map. Choropleth maps are also appropriate for indicating differences in land use, like the amount of agricultural land, recreational land or type of forest cover and other production. Figure 2 and 3 presents some common examples of choropleth maps.

Figure 2: Example of Choropleth map of Alaknanda Basin

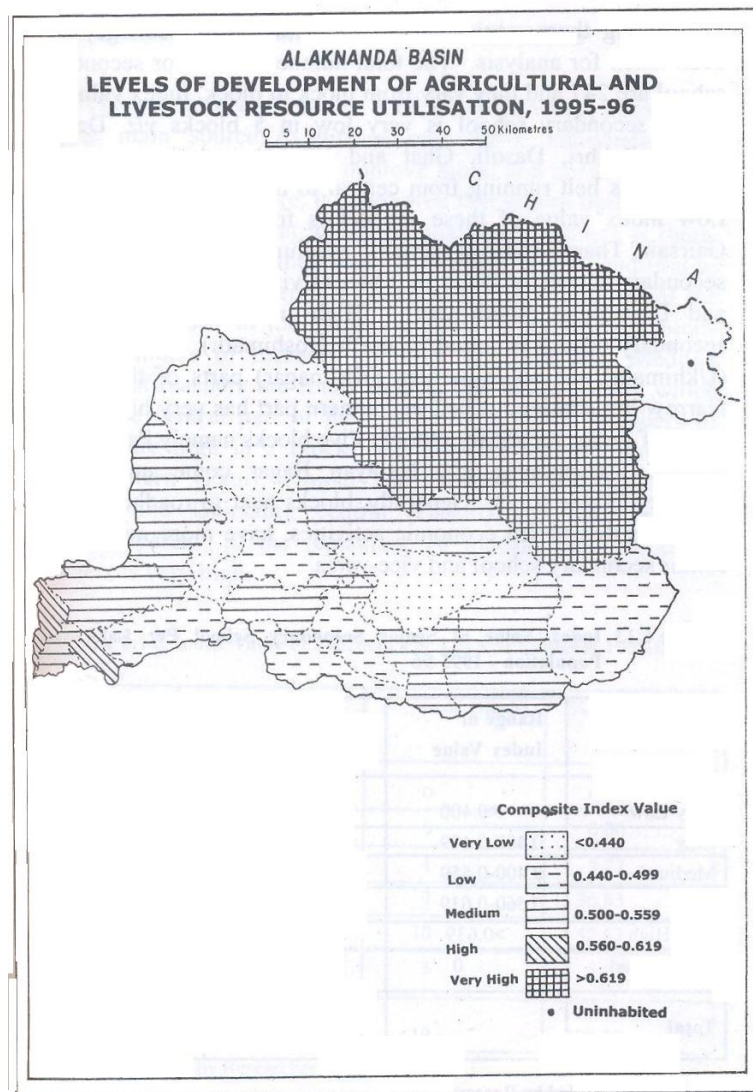
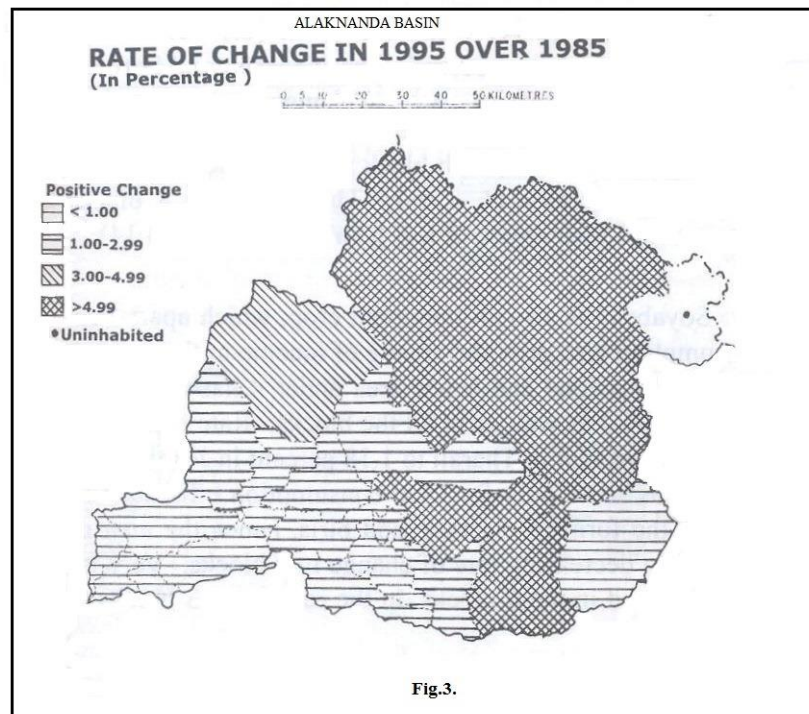


FIG. 2

Source: Author

Figure 3: Choropleth map of Alaknanda Basin

Source: Author

3.5.1 DATA USED IN THE CHOROPLETH TECHNIQUE

The choropleth is a common technique for representing data for areas by variations in shading or pattern that represent classes of data. There are two types of data summarized by areas: totals (or absolute values) such as total population; or derived values (or ratios) such as density of population, or average value of dwelling. There is a general rule stating that unless areas have similar sizes, absolute values should not be used for the choropleth map. Using choropleth mapping for areas that vary in size, can lead to misleading maps. Ratios show the relationship between two quantities, and using them eliminates the influence of area, so that the map becomes meaningful by portraying accurately the distribution of features. The most commonly used ratios are averages, proportions (percentages) and densities. Some of the ratios are independent of area (spending on food as percent of total expenditure), others involves area in their calculation, for example population divided by area to obtain the density of population. Data used for choropleth maps are then standardized in one or another way to allow the comparison of distributions across areas.

The choropleth technique is only useful when the form of data is appropriate. Firstly, data should be discrete, with a single value representing each area. Continuous phenomena should not be mapped using a choropleth. Data must be derived values (rates and ratios) representing numerical (quantitative) differences on an interval or ratio scale of measurement. Mapping totals is inappropriate and leads to a meaningless map. Most choropleths have unequal areas. This very

simple difference leads map readers to alter their impression of the pattern they see with precedence given to large areas over small areas. This masks uniform distributions at a minimum and sorely distorts the relative high and low data densities in the map. Data needs to be normalized to account for unequal areas with typical measures being, for instance, per capita, percentage or per 100,000 people. For an un-classed choropleth, there is no need to categorize data. Each value can be assigned its own unique colour along the chosen symbol scheme.

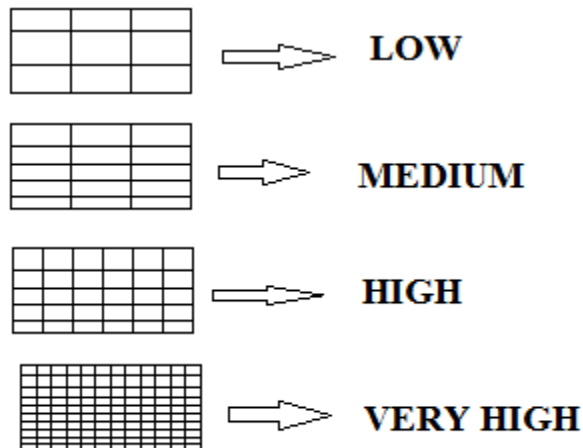
The Class-intervals : The varying average values per unit-area are divided into some classes or groups such as 0-50, 50-100, 100-150, 150-200, 200-250 and so on. The difference between the two figures of a class, which is 50 in this case, is known as class-interval. It should also be noted here that every class has the same class-interval of 50 which is called *regular class-interval*. When the class intervals are different for each class, they are called *irregular class-intervals*. The class interval is chosen keeping in view the lowest and the highest values and with an aim to form realistic patterns. While selecting the class intervals, it should be kept in mind that the intervals are neither too small nor too big. If the class-interval is too small, it would result in too many classes which would further lead to a large number of shades, making the map unnecessarily confusing. Similarly, if the class interval is too large, it would lead to very few classes which will evidently mask many important details. In general, it is reasonable as well as convenient to have 4 to 6 classes for a choropleth map. Apart from above mentioned class interval method, other methods are as follows—

- (i) Less than 50, 50-100, 100-150, more than 150.
- (ii) 0.0- 49.99, 50.00 – 99.99, 100.00 -149.99, 150.00 – 199.99

Symbols : A shading scheme should be designed so that the upper and lower data values are symbolized at the extremities of a linear gradient through a suitable colour or shade space. Each value in the data array between the two extremities will then be assigned its own unique colour and the area shaded accordingly. This results in a map with many different colours or shades. Different magnitudes of data are represented through variation in the lightness (or value) of the symbols' colour scheme, lower data values are lighter and larger data values are darker. To put it simply, you can choose any colour/ shade scheme (which usually consists of shades of one colour) where the lightest and darkest shades represent the lowest and highest data values. It should also be kept in mind that generally, when one goes from light to dark shades, it depicts low to high values respectively. However, the this type of colour / Shades scheme can be reversed depending on the objective of the map, for example, one can use dark shades to depict areas with lowest sex ratios in order to attract more attention to the case.

Example of Shades:





Map Use : The Choropleth map is one of the most frequently used maps in geography. It uses a colouring/ shading scheme (different colours or a graduated colour scale) inside defined areas on a map in order to show value levels and indicate the average values of some property or quantity in those areas. When viewed, the map reader should be able to efficiently recognize the patterns of high and low and areas of relative similarity, while at the same time seeing which end of the spectrum they are viewing. At the very least, relative differences should be obvious and the reader should be able to determine often unique detailed patterns due to the lack of data classification. We visually interpret the symbols as lighter or darker (less or more) so we perceive darker symbols as meaning ‘more’. For a bi-polar colour scheme we view data as tending to one end of the measured scale or another around a middle value. The multi-scale characteristic of a web map means we can design the map to reveal more contexts by adding labels at larger scales to aid interpretation.

3.5.2 ADVANTAGES OF CHOROPLETH MAPS

- They can effectively be used to report area values at virtually any scale, from global to local- and the data can be thought about in many different ways at many different levels of analysis, from general overall patterns to the detection of details.
- It is helpful for finding intriguing hot spots, detecting relationships between the encoded variable and geographic location (and the many variables entangled with location).
- The levels of shading/colour can represent a range of values on a map.
- It has visually effective i.e. one can see a large amount of information and general patterns.
- This technique is significant for geographical analysis as it uses countries, states or regions as the base units.
- Groupings can be flexible to accommodate the spread of values.

3.5.3 DISADVANTAGES OF CHOROPLETH MAPS

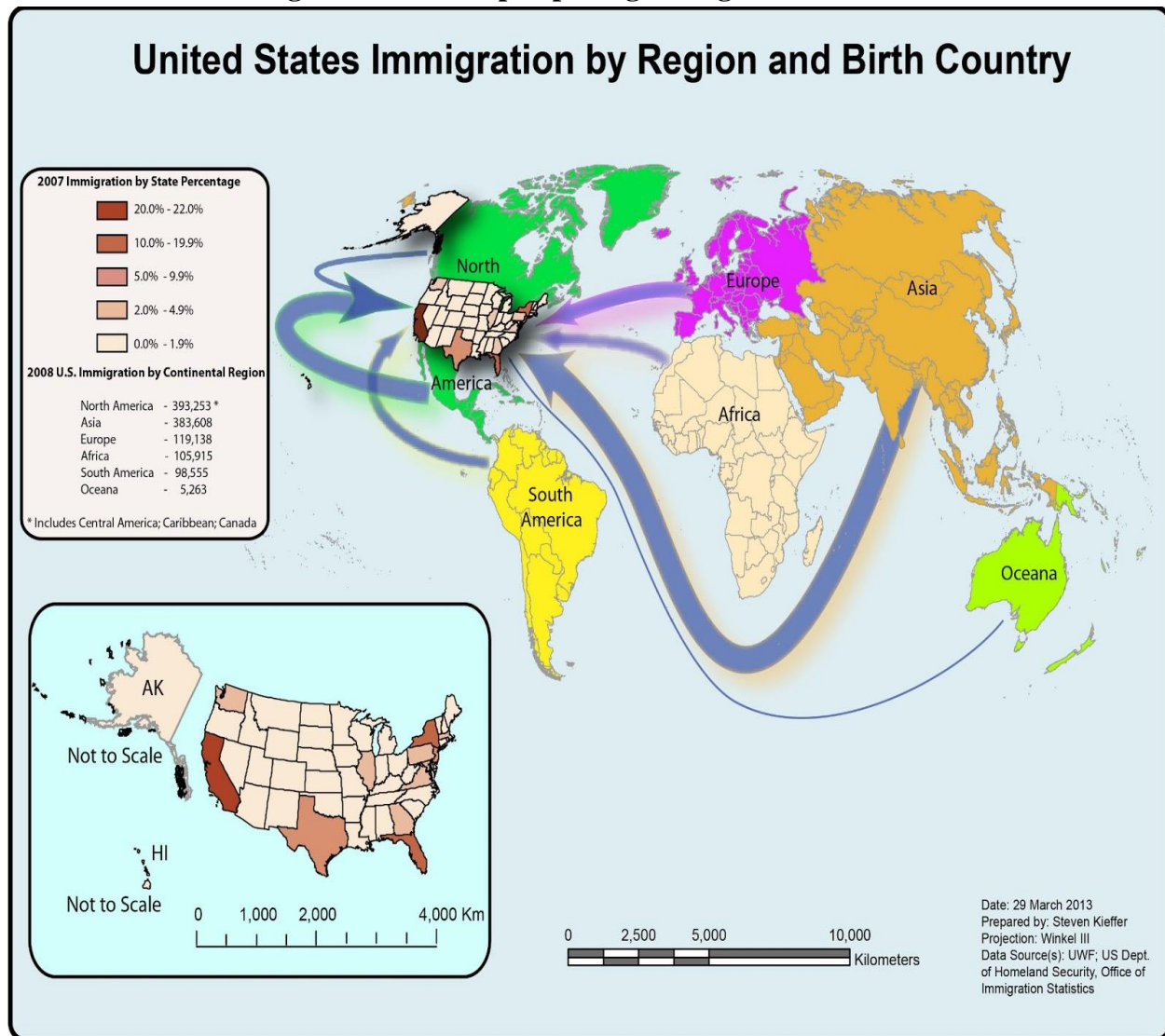
- Since the choropleth map uses an average number to represent defined areas, the viewer can not gain detailed information or perspective on any area's internal conditions.
- Interval/class sizes need to be carefully chosen.
- They give false impression of abrupt change at the boundaries of shaded areas.
- Choropleths are often not suitable for showing total values. Proportional symbols overlays (included on the choropleth map above) are one solution to this problem.
- Shadings are dependent on the size of the administrative areas selected. It can be difficult to distinguish between different shades.
- Variations within map units are hidden, and for this reason smaller units are better than large ones.
- We tend to pay more attention to the larger area on the map, despite the fact that it can have lower value. For example, we tend to equate the visual importance of each area with its geographic area rather than with the number of people living in there, giving sparsely populated areas great visual emphasis.
- Map assumes the whole region/area has the same value, but there could be variations.

3.6 FLOW CHARTS

Cartographic flow maps are graphical representations for portraying the movement of objects, people, goods or traffic network from one location to another. Flow chart is a combination of graph and map. It is drawn to show the flow of commodities or people between the places of origin and destination. Transport flow map, which shows number of passengers, vehicles etc., is a common example of a flow chart. These charts are drawn using lines of proportional width. Flow maps can reduce visual clutter by merging single representations of movement. Flow maps are also fast to produce and simple to understand. Many government agencies prepare flow maps to show density of the means of transportation on different routes. Such flow maps/charts are generally drawn to represent two types of data: 1) the number and frequency of the vehicles as per the direction of their movement and 2) the number of the passengers and/or the quantity of goods transported. As it distorts the original shape, it is also known as cartogram.

Flow maps depict the movement of phenomena between geographic locations. Phenomena can represent the movement in geographical space of both tangible (e.g. people, bank notes, and goods) and intangible objects (e.g. energy, ideas, and reputation). The links in a flow map are called flow lines and describe the movement of objects from one location to another. To illustrate migrants flows, the network can be represented as a Flow Map Layout, where links sharing the same destination (i.e. flow lines) are aggregated and their thickness represents the sum of the moving migrants (i.e. flow magnitude)

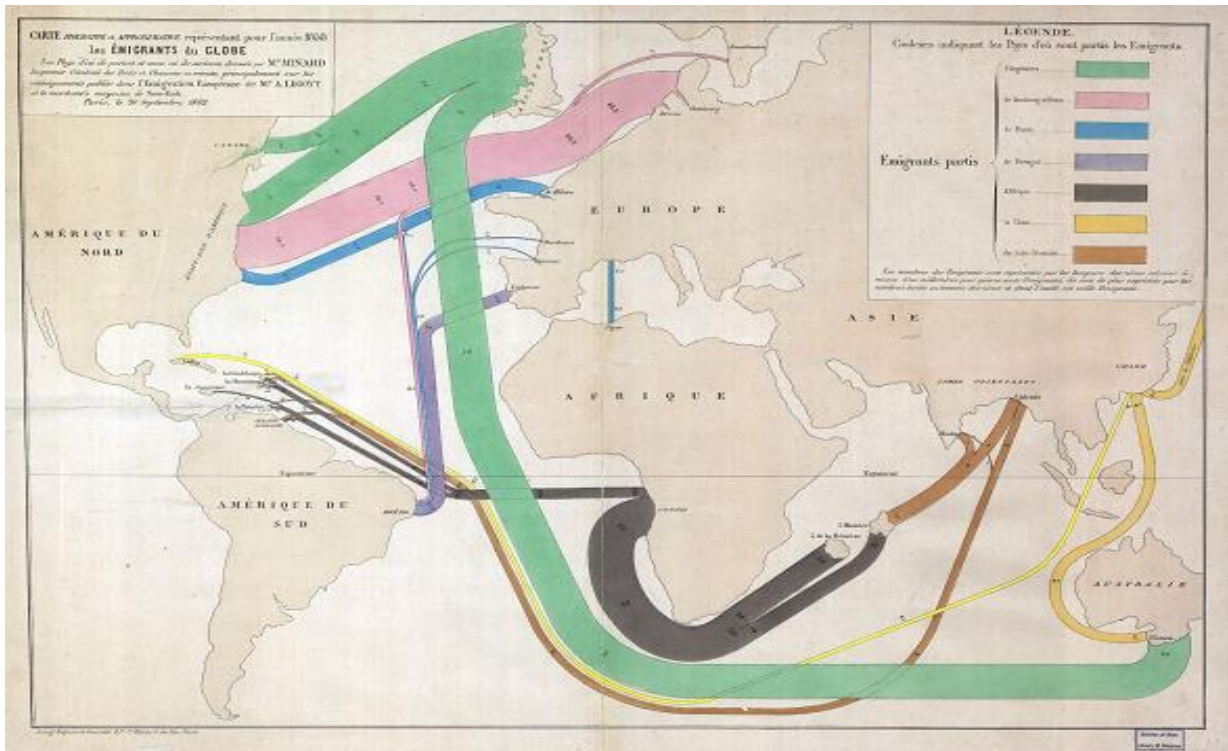
Figure 4: Flow Map depicting Immigration to USA



Source: Steven Kieffer (2013)

3.6.1 HISTORICAL BACKGROUND

The first flow map representation was created by Henry Harness in 1837 and then popularized by Charles Minard around 1850. The concept of creating flow maps by placing stroked lines on top of a geographic map dates back more than 150 years to the seminal visualizations of Charles Joseph Minard (Figure 5). It shows the emigrants of the World in 1858. The color of the flow lines identifies their origin.

Figure 5: The Emigrants of the World by Charles Joseph Minard (1858).

Source: Retrieved from <http://cartographia.wordpress.com/category/charles-joseph-minard/>; taken from Nikola Sander, Guy J. Abel, Ramon Bauer and Johannes Schmidt (2014) p.5.

Minard is considered a pioneer in the use of graphics in engineering and statistics, mainly due to his map on the subject of Napoleon's disastrous Russian campaign of 1812. The hand-drawn map depicts the origins, destinations and volumes of migration flows in 1858, with one millimeter equaling 1,500 people. The colored lines in this flow map represent information contained in a migration matrix on place, direction and volume. Minard's flow map is relatively effective and visually appealing because it shows only a small number of flows.

3.6.2 TYPES OF FLOW MAPS

All the flow maps/ charts can be grouped into three categories namely radial, network and distributive. *Radial flow maps* show relationships between one source and many destinations and use separate lines radiating out from a starting point to show movement. *Network flow maps* depict the quantity of flow over an existing network. These types of flow maps are most frequently used to show transportation and communication networks. *Distributive flow maps* are maps that show relationships between a single source and many destinations like a radial flow map. However, in these maps normally a large single line is produced from one source and that split into many smaller lines as they reach their destination.

3.6.3 DRAWING FLOW MAPS

Flow charts or Flow-line maps are used to depict the quantity of goods or services moving between centres. They are ideal for representing various flows such as the volume of vehicle traffic between centres, the volume of airline traffic between cities, the amount of trade between commercial centres, or the number of telephone calls between two or more locations. The links between centres are depicted by quantitative linear symbols i.e. lines with varying widths which are scaled to the volume carried. For example, if 1 mm of line thickness corresponds to 10,000 passengers or to one million of metric tonnes of coal etc. then 3 mm of line thickness might correspond to 30,000 and 3 million of metric tonnes respectively. The scale used to set the thickness of the flow line depends on the range of values to be shown. An appropriate scale will show all values from maximum to minimum without cluttering the map. It is important to choose the scale carefully and often takes trial and error to reach satisfactory conclusion. In any case, flow-line maps should always include a key so that the user can relate the symbol to the actual volume. Flow lines may follow actual transportation routes such as roads or railroads or they may simply indicate the destination/origin of flows by straight or curved lines. Some may specify the direction of flow by arrow heads while in others direction of the flow is unimportant. In some other maps, flows in each direction may be shown by splitting the flow line into two sub-flow-lines.

Example: Constructing Flow Map of Train movements in and around Delhi

Requirements for the Preparation of a Flow Map

- (a) A route map depicting the desired transport routes along with the connecting stations.
- (b) For construction of flow map of train movement in and around Delhi the data pertaining number. of trains of selected routes of Delhi and adjoining service areas is required. If we want to create a flow map depicting passenger flow, we would need data on no. of passengers travelling in trains along with the point of origin and destination of their movements. Similarly, we can create a flow map of goods transported by trains by extracting data on quantity of various goods along with the point of origin and destination of the movements.
- (c) The selection of a scale through which the data related to the quantity of passengers and/or goods or the number of trains is to be represented.

Steps of constructing the Flow Map

- (a) Take an outline map of Delhi (or any centre) and adjoining areas in which railway line and the nodal stations are depicted.
- (b) Select a scale to represent the number of trains. For example, here we consider that the maximum number is 50 and the minimum no. is 5. We choose a scale where 10 mm = 50 trains. After this, we need to calculate the width of the flow arrows depicting other values through this calculation: (maximum symbol size) x (value/maximum value). In case of calculating the width for the value 5, the method would be - $(10) \times (5/50) = 1\text{mm}$. The maximum and minimum numbers will be represented by a strip of 10 mm and 1 mm thick lines respectively on the map. We would further employ the same method to calculate the width of flow arrows depicting other values.

- (c) Plot the thickness of each strip of route between the given rail route.
- (d) Draw a terraced or stair like scale as legend and choose distinct sign or symbol to show the nodal points (stations) within the strip.

3.6.4 ADVANTAGES OF FLOW MAPS

Cartographic flow maps are graphical representations for portraying the movement of objects, such as people, goods or traffic network, from one location to another. On the one hand, flow maps can reduce visual clutter by merging single representations of movement. On the other hand, flow maps are also fast to produce and simple to understand. Some of the major advantages of flow maps are:

- Flow maps are good for showing directions (all) and size of movements (flow). It shows movement of people, goods, transport etc. and can also show volume and direction of movement.
- Flow maps are able to give a good visual impression of movement as they reduce visual clutter. This makes them very simple to understand.
- The scale/width of lines in flow maps is proportional to value.
- Flow maps can be superimposed onto a base.
- When properly designed, flow maps are beneficial because “they allow cartographers, GIS analysts and map users alike to easily see the differences in magnitude of a wide variety of items across space with very little map clutter” (Phan, et al). This in turn allows businesses to see where the majority of their products are going, commuters to see traffic patterns, and meteorologists to see wind patterns and so on.
- Another important thing to note about flow maps is that they can use and display both qualitative and quantitative data. For qualitative data the maps usually display symbols of uniform width that just show movement with arrows. This data is a connection of some sort and it is not based on magnitude. Quantitative flow mapping uses lines and symbols of different widths and sizes to show changes in magnitude between areas.

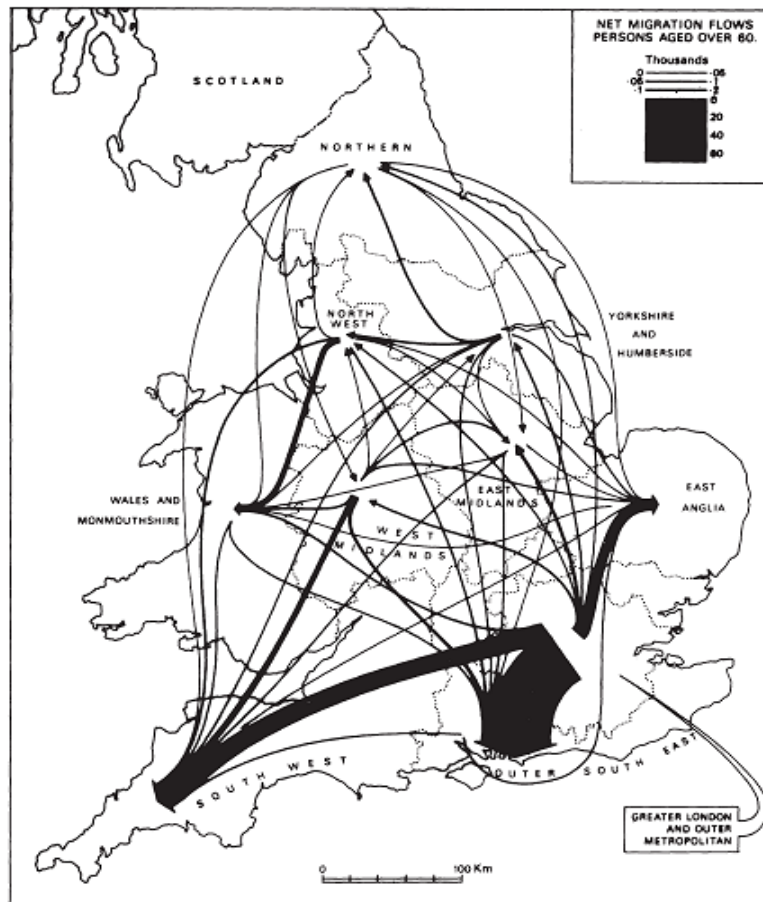
3.6.5 DISADVANTAGES OF FLOW MAPS

1. One of the main drawbacks of flow maps is that they work well only for small datasets with limited complexity. If the database is too large and complex, it often leads to cluttering in the flow map which makes the map very difficult to understand. Figure 6 provides an example of a cluttered flow map with overlaying arrows indicating the size and direction of flows. In this map, London comes out to be the dominant centre as an origin of elderly migration in England. Despite recent improvements in geographic information systems, the graphical features of flow maps have changed little since the seminal works by Minard and Ravenstein (1885) in the 19th century. In the scenario of network infrastructure, nodes are usually located over a map or a globe. In this way, it is easy to detect redundant connections or to find badly placed connections.

Such representation is also used in the context of climate networks, airport connections, mobility data, and social networks because in all the cases the geographic context is important.

2. Another disadvantage of flow maps is that in order to achieve a clear image, the real distance and direction may be distorted which may lead to misinterpretation. Flow maps also lack precise interpretation unless statistical data is added to the map.

Figure 6: Net Inter-Regional Migration Flows of those aged 60 or more(1961-66).



Source: Law & Warnes (1976, p. 464); taken from Nikola Sander, Guy J. Abel, Ramon Bauer and Johannes Schmidt (2014) p.6.

3.7 CONCLUSION

In this unit, we have learned some very important cartographic techniques such as Isopleths, Choropleth and Flow Charts/maps. Statistics and mathematics are integral components of geographical studies. Geographers employ many forms of statistical data in order to better understand and analyze spatial distribution and patterns of various phenomena. Such data can be represented in various ways such as diagrams and maps. Learning the proper ways to display or represent data is just as important as learning the proper statistical techniques to analyze data. As geographers are primarily concerned with spatial relationships, distribution maps are far more important in geographical studies. Distribution maps indicate the distribution of any particular

feature in an area and help us to understand the distribution of different elements of the physical and biological environment in an area. As discussed in this unit, isopleth, choropleth and flow maps are significant types of distribution maps used in geographical studies.

3.8 SUMMARY

Choropleth, Isopleth and Flow maps are crucial mapping techniques for representing spatial distributions and patterns. Isopleth maps are most suited for representing various natural phenomena such as temperature, rainfall, relief, salinity etc. Choropleth maps are one of the most common types of distribution maps that can effectively represent various socio-economic phenomena over regional as well as global level. Flow maps, on the other hand, are excellent in depicting movements (of people as well as goods and services) across space and can display both qualitative and quantitative spatial data. Hence, these mapping techniques are absolutely essential for geographers.

3.9 GLOSSARY

Distribution maps: Distribution maps indicate the distribution of any particular feature in an area and help us to understand the distribution of different elements of the physical and biological environment in an area. Distribution maps can be classified into two main categories- quantitative distribution maps and non-quantitative distribution maps.

Isopleths: Isopleths are lines joining places of equal value on a map which may be in the form of quantity, intensity or density. An isopleth map generalizes and simplifies data with a continuous distribution. Isopleth maps are more common for mapping surface elevations, amounts of precipitation, atmospheric pressure etc.

Interpolation: Interpolation is a method of constructing new data points within the range of a discrete set of known data points. In other words, interpolation is the method employed in which we use measures of a particular phenomenon at particular locations to make predictions about that phenomenon at other locations where we don't have measurements.

Gradient: The amount by which values may vary across each unit of distance in a direction perpendicular to isopleths is called the gradient.

Class-interval: Class interval is the size of each class into which range of a variable is divided, as represented by the divisions of a bar diagram or choropleth map etc. In other words, we group large amount of data into different classes to better understand the distribution; and the range of such class of data is called the class interval.

3.10 ANSWER TO CHECK YOUR PROGRESS

1. Define isopleths and provide examples of isopleth maps.
2. What is choropleth technique and what are the common uses of choropleth maps?
3. What are flow charts/maps and why we use these maps?

4. Why flow charts are known as cartogram?

3.11 REFERENCES

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3.12 SUGGESTED READINGS

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3.13 TERMINAL QUESTIONS

1. What do you understand by interpolation method in isopleth mapping technique? Provide a simple step by step example of isopleth interpolation.
2. How do we calculate class intervals for choropleth mapping technique?
3. How do we draw flow lines for flow maps? Elaborate with a simple example.
4. What are the advantages and disadvantages of isopleth, choropleth and flow maps?

BLOCK-2 STATISTICAL METHODS

UNIT 4 - MEASUREMENT OF CENTRAL TENDENCY

4.1 OBJECTIVES

4.2 INTRODUCTION

4.3 MEASURES OF CENTRAL TENDENCY (MEAN, MEDIAN, MODE)

4.4 CONCLUSION

4.5 SUMMARY

4.6 GLOSSARY

4.7 ANSWER TO CHECK YOUR PROGRESS

4.8 REFERENCES

4.9 SUGGESTED READINGS

4.10 TERMINAL QUESTIONS

4.1 OBJECTIVES

After reading this unit you will be able to:

- To determine the single value and describe the characteristic of the entire group.
- To reduce mass information or mass complex data into single value.
- To make useful for making decision in planning.
- To know the simple way to calculate complex information.

4.2 INTRODUCTION

One of the most popularly used set of summary figures is known as measures of location, which are often referred to as averages, measures of central tendency or central location (Lawrence J. Kaplan). An average is sometimes called a 'measure of central tendency' because individual values of the variable usually cluster around it (Crum and Smith). An average value is a single value within the range of data that is used to present all of the values in the series. Since the average is somewhere within the range of the data, it is sometimes called measure of central value (Croxtton Cowden). Average is an attempt to find one single figure to describe whole of figure (Clark). The single value is the point of location around which the individual items cluster. Types of averages: There are following important types of averages;

1. Arithmetic Mean
2. Median and
3. Mode

4.3 MEASURES OF CENTRAL TENDENCY(Mean, Median, Mode)

4.3.1 MEAN

Arithmetic Mean: Arithmetic Mean is the number obtained by dividing the total value of different information by their numbers. This method is popular in daily life. There are two kinds of arithmetic mean;

- a. Simple arithmetic mean,
- b. Weighted arithmetic mean.

Mean: Calculation of simple arithmetic mean;

- a. Series of Individual observations
- b. Discrete Series;
- c. Continuous Series

Series of Individual observations is easy to calculate. We divide the total values by numbers of observation.

For Example;

$$\bar{x} = \frac{x_1 + x_2 + x_3 + \dots + x_n}{N}$$

$\bar{x} = \frac{\sum x}{N}$; where \bar{x} = Arithmetic mean,

$\sum x$ = sum of all values of the variables ($x_1 + x_2 + x_3 + \dots + x_n$),

N = Numbers of observations.

Direct Methods:

Q. No.01: Calculate the arithmetic mean of the daily income of the employees.

Employee: 1 2 3 4 5 6 7 8 9 10

Income: 25 20 35 55 30 50 40 60 45 65

Solution: Calculate the arithmetic mean.

Employees	Income
1	25
2	20
3	35
4	55
5	30
6	50
7	40
8	60
9	45
10	65
Total	$\sum X = 425$

Where; $\bar{x} = \frac{\sum x}{N}$ $\sum x = 425$; $N = 10$

$$\bar{x} = \frac{425}{10} = 42.5 \text{ Answer}$$

Q. No. 02: Calculate the arithmetic mean of the marks in Geography.

Students	A	B	C	D	E	F	G	H	I	J	k
Marks	15	12	18	24	22	30	25	16	26	28	14

Solution:

Students	Marks
A	15
B	12
C	18
D	24
E	22
F	30
G	25
H	16
I	26
J	28
K	14
Total	$\sum x = 230$

Where; $\bar{x} = \frac{\sum x}{N}$ $\sum x = 230$; $N = 11$

$$\bar{x} = \frac{230}{11} = 20.90 \text{ Answer}$$

Assumed mean method (short cut method): Assumed methods can be applied when the items in series are less.

Steps:

1. Decide assumed mean (A).
2. Calculate the deviation from assumed mean ($X - A = d$)
3. Do total of deviation (d).
4. Apply formula;

$$\bar{x} = A + \frac{\sum d}{N}$$

Q. No. 01: Calculate the arithmetic mean of the marks in Statistics.

Students	A	B	C	D	E	F	G	H	I	J	k
Marks	15	12	18	24	22	30	25	16	26	28	14

Solution: Assumed mean (A)=20

Students	Marks(X)	X-A=d
A	15	-5
B	12	-8
C	18	-2
D	24	4
E	22	2

F	30	10
G	25	5
H	16	-4
I	26	6
J	28	8
K	14	-6
Total		$\sum d = 10$

Where; $\bar{x} = A + \frac{\sum d}{N}$ $\sum x = 10$; $N = 11$

$$\bar{x} = 20 + \frac{10}{11} = 20.90 \text{ Answer}$$

B- Discrete series of data: Multiply the variables by their respective frequencies to get sum of the product. Obtained total value is divided by the number of observations (total frequency).

Steps:

1. Multiply the frequency with variables (fx).
2. Find the sum of the products ($\sum fx$)
3. Divide the product by number of observations ($\sum f = N$)
4. Apply formula;

$$\bar{x} = \frac{\sum fx}{\sum f} = \frac{\sum fx}{N}$$

Q. No. 01: Calculate the arithmetic mean of the marks in Statistics.

Students	5	8	2	4	2	10	5	4	6	8	6
Marks	15	12	18	24	22	30	25	16	26	28	14

Solution:

Marks (x)	No. of Students (f)	fx
15	5	75
12	8	96
18	2	36
24	4	96
22	2	44
30	10	300
25	5	125
16	4	64

26	6	156
28	8	224
14	6	84
	$\Sigma f=60$	Σfx = 1300

Where; $\bar{x} = \frac{\Sigma fx}{\Sigma f} = \frac{\Sigma fx}{N}$ $\Sigma fx = 1300$; $\Sigma f = N = 60$

$$\bar{x} = \frac{\Sigma fx}{\Sigma f} = \frac{1300}{60} = 21.67 \text{ Answer}$$

Step Deviation Method: All deviations by assumed mean are divided by common factor.

Apply formula;

$$\bar{X} = A + \frac{\Sigma fd}{N} \times c$$

Where; A = Assumed mean

N = Numbers of observations

c = Common factor

f = frequency

d = $\frac{X-A}{c}$; step deviation

Σfd = Sum of product

Q. No. 01: Calculate the average marks of students in Statistics.

Students	5	8	2	4	2	10	5	4	6	8
Marks	10	15	20	25	30	35	40	45	50	55

Solution: Assumed mean = 25

Marks (X)	No. of Students (f)	X-A=d	$\frac{X-25}{5}$ (d)	fd
10	5	-15	-3	-15
15	8	-10	-2	-16
20	2	-5	-1	-2
25	4	0	0	0
30	2	5	1	2
35	10	10	2	20
40	5	15	3	15
45	4	20	4	16
50	6	25	5	30
55	8	30	6	48

	N=54			$\sum fd = 98$
--	------	--	--	----------------

Where; $\bar{X} = A + \frac{\sum fd}{N} \times c, A = 25, \sum fd = 98, N=54$ and $C= 5$

$$\bar{X} = 25 + \frac{98}{54} \times 5$$

$$\bar{X} = 25 + \frac{490}{54}$$

$$\bar{X} = 25 + 9.07 = 34.07$$

Answer: Average marks in statistics is 34.07.

Continuous data series:

Calculation method in continuous series is the same as discrete series. Mid-point of various class intervals is required in continuous series. The equation to find out the mid-points is:

Mid- Point = $\frac{l_1+l_2}{2}$; where ' l_1 ' is lower limit of class and ' l_2 ' is upper limit of class.

Direct method:

1. Calculate mid- point (m).
2. Multiply frequency with mid-point (fm).
3. Sum up the product ($\sum fm$).
4. Divide product ($\sum fm$) by total number of observations(N)
5. Use following formula:

$$\bar{X} = \frac{\sum fm}{N}$$

Q. No.01 :Find out the mean of the marks of students.

Marks	0-10	10-20	20-30	30-40	40-50	50-60	60-70	70-80	80-90
Students	4	5	8	7	10	12	6	5	3

Solution :

Marks (x)	No. of students (f)	Mid-point (m)	f.m
0-10	3	5	15
10 -20	4	15	60
20-30	5	25	125
30-40	6	35	210
40-50	9	45	405
50-60	8	55	440

60-70	7	65	455
70-80	5	75	375
80-90	3	85	255
	N= 50		$\sum fm = 2340$

$\bar{X} = \frac{\sum fm}{N}$ where; $\sum fm = 2340$ and $N = 50$.

$$\bar{X} = \frac{2340}{50} = 46.8$$

Answer: mean marks of the students are 46.8

Short cut method:

1. Calculate mid- point (m).
2. Decide assumed mean (A)
3. Find out the deviation from assumed mean ($m-A=d$)
4. Multiply deviation with frequency (fd).
5. Sum up the product (fd).
6. Divide product ($\sum fd$) by total number of observations(N)
7. Use following formula:

$$\bar{X} = A + \frac{\sum fd}{N}$$

Q. No.01 :Calculate arithmetic mean of the marks of students by short cut method.

Marks	0-10	10-20	20-30	30-40	40-50	50-60	60-70	70-80	80-90
Students	4	5	8	7	10	12	6	5	3

Solution: Assumed mean (A) = 40

Marks (x)	No. of students (f)	Mid-point (m)	m-A (d)	fd
0-10	3	5	-35	-105
10 -20	4	15	-25	-100
20-30	5	25	-15	-75
30-40	6	35	-5	-30
40-50	9	45	5	45
50-60	8	55	15	120
60-70	7	65	25	175
70-80	5	75	35	175

80-90	3	85	45	135
	N= 50			$\sum fd = 340$

$$\bar{X} = A + \frac{\sum fd}{N} \text{ Where; } \sum fd = 340 \text{ and } N = 50.$$

$$\bar{X} = 40 + \frac{340}{50}$$

$$\bar{X} = 40 + 6.8 = 46.8$$

Answer: mean marks of the students are 46.8

Step Deviation method:

1. Calculate mid- point (m).
2. Decide assumed mean (A)
3. Find out the deviation from assumed mean (m-A=d)
4. Divide deviation by common factor $\frac{m-A}{C}$
5. Multiply step deviation with frequency (fd).
6. Sum up the product (fd).
7. Divide product ($\sum fd$) by total number of observations(N)
8. Use following formula:

$$\bar{X} = A + \frac{\sum fd}{N} \times C \text{ (where } C = \text{Common factor)}$$

Q. No.01 :Calculate arithmetic mean of the marks of students by step deviation method.

Marks	0-10	10-20	20-30	30-40	40-50	50-60	60-70	70-80	80-90
Students	4	5	8	7	10	12	6	5	3

Solution: Assumed mean (A) = 40, Common factor = 10

Marks (x)	No. of students (f)	Mid-point (m)	m-A (d)	$\frac{m-A}{10} = d$	fd
0-10	3	5	-35	-3.5	-10.5
10-20	4	15	-25	-2.5	-10
20-30	5	25	-15	-1.5	-7.5
30-40	6	35	-5	-.5	-3
40-50	9	45	5	.5	4.5
50-60	8	55	15	1.5	12
60-70	7	65	25	2.5	17.5
70-80	5	75	35	3.5	17.5

80-90	3	85	45	4.5	13.5
	N= 50				$\sum fd = 34$

$$\bar{X} = A + \frac{\sum fd}{N} \times C \quad \text{Where; } \sum fd = 34 \text{ and } \sum f = N = 50, C = 10$$

$$\bar{X} = 40 + \frac{34}{50} \times 10$$

$$\bar{X} = 40 + 6.8 = 46.8$$

Answer: mean marks of the students are 46.8

Charlier's Accuracy Check: *Charlier has given formula to check accurate calculation of arithmetic mean by the short cut method and the step deviation method in a frequency distribution.*

$$\text{Formula ; } \sum f(d + 1) = \sum fd + \sum f$$

Q. No.-01: Calculate the mean of given marks and apply Charlier's accuracy check to verify the calculation.

Marks	0-10	10-20	20-30	30-40	40-50	50-60
Students	5	6	18	10	8	3

Solution:

Marks (X)	Students (f)	m	m-15	(m-15/10) d	fd	F(d+1)
0-10	5	5	-10	-1	-5	0
10-20	6	15	0	0	0	6
20-30	18	25	10	1	18	36
30-40	10	35	20	2	20	30
40-50	8	45	30	3	24	32
50-60	3	55	40	4	12	15
	N=50				∑fd = 69	∑f(d + 1)=119

Apply Charlier's test;

Formula ; $\sum f(d + 1) = \sum fd + \sum f$

$$119 = 69 + 50$$

119=119 Hence, the calculation is correct

$$\bar{X} = A + \frac{\sum fd}{N} \times C$$

$$\bar{X} = 15 + \frac{69}{50} \times 10$$

$$= 15 + 13.8 = 28.8$$

Hence Mean Marks 28.8=29 Answer

Properties: Mean;

1. The calculation of arithmetic mean is simple.
2. It is easy to calculate and understand.
3. It is defined correctly without personal bias.
4. It is good for comparison.
5. It is not determined graphically.

4.3.2 MEDIAN

Median is the central positional average of a given data. Value of the arranged data which divides the whole data into two equal parts is called median. According to Connor," the median is that value of the variable which divides the group into two equal parts, one part comparing all values greater, and the other values less than the median."The middle item of the arranged data is called the median.

Rules;

1. Data should be arranged in an ascending or descending order.
2. Data may be divided into two parts, one less than the central value and the other more than the central value.
3. The number of items (n) is odd; the median will be the value of $(\frac{N+1}{2})$ th item.
4. The number of items (n) is even, there will be two middle item $(\frac{N}{2})$ th and $(\frac{N}{2} + 1)$ th item.

1. Formula of Median is $= L_1 + \frac{\frac{N}{2}-cf}{f} \times i$
2. Compute cumulative frequencies (cf).
3. L_1 = Lower limit of median group.
4. f = frequency of the median group.
5. cf = cumulative frequency of the preceding class of the medium class.
6. i = Class interval of the medium group.

A. Discrete series of data;

Q. No.01: Calculate median of the following distribution.

Marks(X)	10	20	30	40	50	60	70	80	90
Students(f)	2	4	5	8	11	9	6	3	1

Solution:

Marks	Students (f)	c.f.
10	2	2
20	4	6
30	5	11
40	8	19
50	11	30
60	9	39
70	6	45
80	3	48
90	1	49
	$\sum f = N = 49$	

Apply formula:

$$\text{Med} = \text{Size of } \frac{N+1}{2} \text{th item}$$

$$= \frac{49+1}{2} = \frac{50}{2} = 25^{\text{th}} \text{ item}$$

Answer: medium marks=25

Continuous series of data:

Q. No.01: Calculate median of the following distribution of marks.

Marks(X)	0-10	10-20	20-30	30-40	40-50	50-60	60-70	70-80	80-90
Students(f)	2	4	5	8	11	9	6	3	2

Solution:

Marks	Students (f)	c.f.
0-10	2	2
10-20	4	6
20-30	5	11
30-40	8	19
40-50	11	30
50-60	9	39
60-70	6	45
70-80	3	48
80-90	2	50
	N=50	

Apply formula: Where $\sum f = N$

Med = Size of $\frac{N}{2}$ th item

$$= \frac{50}{2} = 25\text{th item}$$

Medium size = 25 item

Formula of Median is $= L_1 + \frac{\frac{N}{2} - cf}{f} \times i$

Median lies in the group 40-50.

$L_1 = 40$ (Lower limit of median group).

$f = 11$ (frequency of the median group).

$cf = 19$ (cumulative frequency of the preceding class of the medium class).

$i = 10$ (Class interval of the medium group).

$$\text{Median} = L_1 + \frac{\frac{N}{2} - cf}{f} \times i$$

$$\text{Med} = 40 + \frac{25 - 19}{11} \times 10$$

$$= 40 + \frac{6}{11} \times 10$$

$$= 40 + \frac{6 \times 10}{11}$$

$$= 40 + \frac{60}{11}$$

$$= 40 + 5.45 = 45.45$$

Answer: Median marks = 45.45

Q. No.02: Calculate median of the marks in geography. It is out of 50 marks.

Marks	0-5	5-10	10-15	15-20	20-25	25-30	30-35	35-40	40-45
Students(f)	1	2	3	8	12	15	10	3	2

Solution:

Marks in Geography	Students (f)	c.f.
0-5	1	1
5-10	2	3
10-15	3	6
15-20	8	14
20-25	12	26
25-30	15	41
30-35	10	51
35-40	3	54
40-45	2	56
	N=56	

Apply formula: $\sum f = N$

Med = Size of $\frac{N}{2}$ th item

$$= \frac{56}{2} = 28\text{th item}$$

Medium size = 28 item

Formula of Median is $= L_1 + \frac{\frac{N}{2} - cf}{f} \times i$

Median lies in the group 25-30.

$L_1 = 25$ (Lower limit of median group).

$f = 15$ (frequency of the median group).

$cf = 26$ (cumulative frequency of the preceding class of the medium class).

$i = 5$ (Class interval of the medium group).

$$\text{Median} = L_1 + \frac{\frac{n}{2} - cf}{f} \times i$$

$$\text{Med} = 25 + \frac{28 - 26}{15} \times 5$$

$$= 25 + \frac{2}{15} \times 5$$

$$= 25 + \frac{2 \times 5}{15}$$

$$= 25 + \frac{10}{15}$$

$$= 25 + 0.67 = 25.67$$

Answer: Median marks in Geography = 25.67

Properties: Median;

1. Median is an average of position
2. It is simple to calculate and understand.
3. It can be determined graphically.
4. It is not affected by extreme value.
5. It is useful in a distribution of unequal class.

Miscellaneous Questions of Mean and Median:

Q. NO. 01: Calculate the mean and median of the following distribution.

Area of House (m)	0-50	50-100	100-150	150-200	200-250	250-300
No. of Household	25	56	82	90	10	12

Solution: Calculation of Mean and Median, where assumed mean=125.

Area of House in meter	Mid Value (m)	Frequency (f)	$\frac{m-A}{50} = d$	fd	c.f.
0-50	25	25	-2	-50	25
50-100	75	56	-1	-56	81
100-150	125	82	0	0	163
150-200	175	90	1	90	253
200-250	225	10	2	20	263
250-300	275	12	3	36	275
		N = 275		$\sum fd = 40$	

$$\begin{aligned} \text{Mean} &= A + \frac{\sum fd}{N} \times C \\ &= 125 - \frac{40}{275} \times 50 \\ &= 125 - 0.73 \end{aligned}$$

$$= 125 - \frac{200}{275}$$

Answer = 124.27

Median = Apply formula: $\sum f = N$

Med = Size of $\frac{275}{2}$ th item

$$= \frac{275}{2} = 137.5 \text{ th item}$$

Medium size = 137.5 item

$$\text{Median} = L_1 + \frac{\frac{n}{2} - cf}{f} \times i$$

$$= 100 + \frac{137.5 - 81}{82} \times 50$$

$$= 100 + \frac{56.5}{82} \times 50$$

$$= 100 + 34.45$$

Answer = 134.45

4.3.3 MODE

The word mode comes from French la mode which means fashion.

Definitions:

A.L. Bowley -“Mode is that value of the graded quantity at which the instances are most numerous.”

Zizek- “The value occurring most frequently in a series of items and around which the other items are distributed most densely.”

Coxton and Cowden- “The mode of a distribution is the value at the point around which, the items tend to be most heavily concentrated. It may be regarded as the most typical of a series of values.”

Continuous data;

Formula;

$$M_0 = L_1 + \frac{f_1 - f_0}{2f_1 - f_0 - f_2} \times i$$

Where, M_0 =Mode

L_1 = lower limit of modal class

f_1 = freuency of the modal class

f_0 = frequency of the class preceding the modal class

f_2 = frequency of the class succeeding the modal class

i = class interval of the modal class

Q. No.01: Calculate Mode of the marks in Geography.

Marks	0-5	5-10	10-15	15-20	20-25	25-30	30-35	35-40	40-45
Students(f)	1	2	3	8	12	15	10	3	2

Solution:

Marks in Geography	Students (f)
0-5	1
5-10	2
10-15	3
15-20	8
20-25	12
25-30	15
30-35	10
35-40	3
40-45	2
	N=56

$$M_0 = L_1 + \frac{f_1 - f_0}{2f_1 - f_0 - f_2} \times i$$

Where, M_0 =Mode

$L_1 = 25$, lower limit of modal class

$f_1 = 15$, freuency of the modal class

$f_0 = 12$, frequency of the class preceding the modal class

$f_2 = 10$, frequency of the class succeeding the modal class

$i = 5$, class interval of the modal class

$$M_0 = 25 + \frac{15 - 12}{2 \times 15 - 12 - 10} \times 5$$

$$M_0 = 25 + \frac{3}{30 - 12 - 10} \times 5$$

$$M_0 = 25 + \frac{3 \times 5}{30 - 22}$$

$$M_0 = 25 + \frac{15}{8}$$

$$M_0 = 25 + 1.875 = 26.875 \text{ Answer}$$

4.5 SUMMARY

Q. No.01: Calculate Median and Mode marks in Geography.

Marks	0-5	5-10	10-15	15-20	20-25	25-30	30-35	35-40	40-45
Students(f)	1	2	4	12	15	10	7	3	2

Solution:

Marks in Geography	Students (f)	c.f.
0-5	1	1
5-10	2	3
10-15	4	7
15-20	12	19
20-25	15	34
25-30	10	44
30-35	7	51
35-40	3	54
40-45	2	56
	N=56	

Apply formula: $\sum f = N$

Med = Size of $\frac{56}{2}$ th item

$$= \frac{56}{2} = 28\text{th item}$$

Medium size = 28 item

$$\text{Median} = L_1 + \frac{\frac{n}{2} - cf}{f} \times i$$

$$\text{Median} = 20 + \frac{28 - 19}{15} \times 5$$

$$= 20 + \frac{9 \times 5}{15} = 20 + \frac{45}{15} = 20 + 3 = 23 \text{ Answer}$$

$$\text{Mode} = L_1 + \frac{f_1 - f_0}{2f_1 - f_0 - f_2} \times i$$

$$M_0 = 20 + \frac{15 - 12}{2 \times 15 - 12 - 10} \times 5$$

$$M_0 = 20 + \frac{15}{30 - 22}$$

$$M_0 = 20 + \frac{15}{8} = 20 + 1.87 = 21.87 \text{ Answer.}$$

4.6 GLOSSARY

Mean - Mean refers to the average that is used to derive the central tendency of the data in question.

Median - To find the median, we arrange the observations in order from smallest to largest value. If there are an odd number of observations, the median is the middle value. If there is an even number of observations, the median is the average of the two middle values.

Mode - The mode is a statistical term that refers to the most frequently occurring number found in a set of numbers.

4.7 ANSWER TO CHECK YOUR PROGRESS

Q. No.01: Calculate the mean, median and mode of the attendance of students.

Attendance	58-60	60-62	62-64	64-66	66-68	68-70	70-72	72-74
Frequency	1	2	9	48	131	102	40	17

Solution : Assumed mean = 65

Attendance (X)	Mid value (m)	Frequency (f)	$\frac{m - 65}{2}$ (d)	fd	cf
58-60	59	1	-3	-3	1
60-62	61	2	-2	-4	3
62-64	63	9	-1	-9	12
64-66	65	48	0	0	60
66-68	67	131	1	131	191
68-70	69	102	2	204	293
70-72	71	40	3	120	333
72-74	73	17	4	68	350

		N=350		$\sum fd=507$	
--	--	-------	--	---------------	--

Mean:

$$\bar{X} = A + \frac{\sum fd}{N} \times C$$

$$\begin{aligned} &= 65 + \frac{507}{350} \times 2 \\ &= 65 + 2.89 \\ &= 67.89 \text{ Answer} \end{aligned}$$

Median:

$$\text{Median} = \frac{N}{2} \text{ item} = \frac{350}{2} = 175$$

$$175^{\text{th}} \text{ item} = 67$$

Median class is 66-68

$$\text{Median} = L_1 + \frac{\frac{N}{2} - cf}{f} \times i$$

$$\begin{aligned} &= 66 + \frac{175-60}{131} \times 2 \\ &= 66 + 1.76 \\ &= 67.76 \text{ Answer} \end{aligned}$$

Mode: Mode lies in the class 66-68

$$M_0 = L_1 + \frac{f_1 - f_0}{2f_1 - f_0 - f_2} \times i$$

$$\begin{aligned} M_0 &= 66 + \frac{131-48}{262-48-102} \times 2 \\ M_0 &= 66 + 1.48 \\ M_0 &= 67.48 \text{ Answer} \end{aligned}$$

4.8 REFERENCES

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4.9 SUGGESTED READINGS

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4.10 TERMINAL QUESTIONS

1. Why arithmetic mean is commonly used measure of central tendency?
2. What is statistical average?
3. What is meant by central tendency?
4. What is mean of frequency distribution?
5. What is median?
6. What is mode?
7. Calculate the average marks of students in Statistics.

Students	4	7	3	4	3	19	5	4	6	8
Marks	15	20	24	25	30	36	42	44	51	56

8. Calculate the mean, median and mode of the attendance of students.

Attendance	55-60	60-65	65-70	70-75	75-80	80-85	85-90	90-95
Frequency	5	4	10	45	126	100	43	16

UNIT 5 - MEASURES OF DISPERSION

5.1 OBJECTIVES

5.2 INTRODUCTION

5.3 STANDARD DEVIATION, MEASURES OF VARIABILITY

5.4 CONCLUSION

5.5 SUMMARY

5.6 GLOSSARY

5.7 ANSWER TO CHECK YOUR PROGRESS

5.8 REFERENCES

5.9 SUGGESTED READINGS

5.10 TERMINAL QUESTIONS

5.1 OBJECTIVES

Objective of measuring Dispersion;

- To determine the data is homogeneous and consequently the reliability of the average.
- Dispersion helps analysis why large dispersion happens and this may help to control the dispersion itself.
- To comparing the two or more series with regards to disparities or differences. The greater degree of dispersion would mean lack of uniformity while a low degree of dispersion would indicate high uniformity.
- A measure of dispersion is useful in the correlation and regression etc.

5.2 INTRODUCTION

It is the square root of the means of squared deviations from the arithmetic mean. Therefore, it is known as root mean square deviation. Standard deviation is the square root of the arithmetic average of the deviations measured from the mean. It is denoted by small Greek letter (σ).

DEFINITIONS

1. Dispersion is the degree the degree of the variation of variables about the central value. -D. C. Brooks and W. F. L. Dick.
2. Dispersion is a measure of the extent to which the individual items vary.- Prof. L. R. Connor.
3. The degree to which numerical data tend to spread about an average value is called the variation or dispersion.-Spiegel.
4. Dispersion is the measure of the variation of the items.-A. L. Bowley.
5. The Measurement of the scatterness of the mass of figures in a series about an average is called measure of variation or dispersion.-Simpson & Kafka.

SIGNIFICANCE OF MEASURE VARIATION

1. Determine the reliability of an average.
2. The control of the variability.
3. Compare two or more series with their variability.

USES OF RANGE

1. Quality control
2. Fluctuation in the rainfall and temperature.
3. Weather forecast.

4. Day to day life

5.3 STANDARD DEVIATION, MEASURES OF VARIABILITY

Methods of measuring Variation;

1. **Range:** Range is the difference between largest and the smallest value in the distribution;

Range = L-S, Where L= Largest item and Smallest item.

$$\text{Coefficient of range} = \frac{L-S}{L+S}$$

Q. No. :01- Calculate Range and coefficient of Range of the Marks.

Marks: 8, 10, 12,16, 20, 25,30, 36.

Solution: Range = L-S =36-8= 28 Answer.

$$\text{Coefficient of Range} = \frac{L-S}{L+S} = \frac{36-8}{36+8} = \frac{28}{44} = 0.64 \text{ Answer}$$

2. **Quartile Deviation:**

Quartile deviation is measures of range of parts. Quartile deviation is based on the fifty (middle) percent of the distribution. It is divided into four equal parts by Q_1 , Q_2 and Q_3 . Further it is calculated the range between Q_3 and Q_1 , which is middle fifty percent of the distribution. It is necessary to arrange data in ascending order.

Deciles :Deciles divide a series into ten equal parts.

Percentiles : Percentiles divide series into one hundred parts.

Formula;

$$\text{Quartile Range} = Q_3 - Q_1$$

Where Q_3 =Third Quartile

Q_1 = First Quartile

$$\text{Quartile Deviation (Q.D.)} = \frac{Q_3 - Q_1}{2}$$

$$\text{Coefficient of Quartile Deviation} = \frac{Q_3 - Q_1}{Q_3 + Q_1}$$

Where; First Quartile (Q_1) is $\left(\frac{N+1}{4}\right)$ and Third Quartile (Q_3) is

$$= 3 \left(\frac{N+1}{4}\right).$$

Steps to follow;

1. Arrange frequencies in ascending order.
2. Calculate cumulative frequencies.
3. Calculate first quartile and third quartile.
4. Apply formula: $Q.D. = \frac{Q_3 - Q_1}{2}$

Q. NO. 1: Calculate coefficient of quartile deviation from following data;

X:- 51, 52, 53, 54, 55, 56, 57, 58, 59, 60.

f :- 2, 4, 6, 12, 10, 15, 4, 3, 2, 5.

Solution:

X	f	$c.f.$
51	2	2
52	4	6
53	6	12
54	12	24
55	10	34
56	15	49
57	4	53
58	3	56
59	2	58
60	5	63

$$Q_1 = \text{size of } \left(\frac{N+1}{4}\right) = \left(\frac{63+1}{4}\right) = 16.$$

Where 16th item is 54.

$$Q_3 = \text{Size of } 3 \left(\frac{N+1}{4}\right) = 3 \left(\frac{63+1}{4}\right) = \frac{3 \times 64}{4} = 48$$

Where 48 item is 56.

$$\text{Quartile Deviation (Q.D.)} := \frac{Q_3 - Q_1}{2}$$

$$= \frac{56 - 54}{2} = 1 \text{ Answer}$$

$$\text{Coefficient of Quartile Deviation} = \frac{Q_3 - Q_1}{Q_3 + Q_1}$$

$$= \frac{56 - 54}{56 + 54} = .018 \text{ Answer}$$

Q. No.2- Calculate lower and upper quartile, 5thdecile and 16th percentile of the following information.

S. No. – 1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11.

Marks: - 40, 50, 60, 65, 70, 75, 78, 80, 85, 90, 95.

Solution:

Lower Quartile;

$$Q_1 = \text{size of } \left(\frac{N+1}{4}\right) = \left(\frac{11+1}{4}\right) = 3$$

Size of 3rd items = 60

Lower Quartile is 60 Answer

Upper Quartile;

$$Q_3 = \text{Size of } ^3\left(\frac{N+1}{4}\right) = \dots^3\left(\frac{11+1}{4}\right)$$

$$= \frac{3 \times 12}{4} = \frac{36}{4} = 9$$

Size of 9th items = 85

Upper Quartile is 85 Answer.

5th Decile

$$D_5 = \text{Size of } ^5\left(\frac{N+1}{10}\right) = \dots^5\left(\frac{11+1}{10}\right)$$

$$= \frac{5 \times 12}{10} = 6$$

Size of 6th item = 75

5th decile is 75 Answer

16th Percentile

$$P_{16} = \text{Size of } ^{16}\left(\frac{N+1}{100}\right) \text{ item}$$

$$= \dots^{16}\left(\frac{11 + 1}{100}\right)$$

$$= \frac{16 \times 12}{100} = 1.92$$

= Size of 1.92th item

= Size of 1st item + 0.92 (Size of 2nd item)

= 40 + 0.92 (50-40)

= 40 + 9.2 = 49.2

16th percentile is 49.2 Answer

Mean Deviation (Average deviation);

Mean deviation of a series is the arithmetic average of the deviation of the various items from measure of mean, median or mode.

Q. N. 03- Calculate mean deviation and its coefficient.

Marks: 10, 60, 50, 30, 75, 55, 45, 65, 30, 80.

Solution: Calculation of Mean Deviation

Deviation from mean ignoring sign (+, -), $\bar{X} = 50$	
Marks	D
10	40

60	10
50	0
30	20
75	25
55	5
45	5
65	15
30	20
80	30
Σx = 500	$\Sigma D = 170$

$$\text{Mean } (\bar{X}) = \frac{\Sigma x}{N} = \frac{500}{10} = 50$$

$$\text{Mean Deviation from mean (M. D.)} = \frac{\Sigma |D|}{N} = \frac{170}{10} = 17$$

$$\text{Coefficient of M. D.} = \frac{M.D.}{\text{Mean}} = \frac{17}{50} = 0.34 \text{ Answer}$$

Standard Deviation

A: Discrete Series/data:

Actual Mean methods:

Q. N0.01: Calculate Standard deviation of the following data;

8, 10, 12, 15, 16, 20, 22, 25, 30, 32

Solution: Steps to calculation of Standard deviation;

Value-x	$(X-\bar{X})= x$	x^2
8	-11	121
10	-9	81
12	-7	49
15	-4	16
16	-3	9
20	1	1
22	3	9
25	6	36
30	11	121
32	13	169
$\Sigma x=190$		$\Sigma x^2=612$

Steps:

- 1- Calculate the actual mean of frequencies.
- 2- Find deviation of the value from mean $(X-\bar{X})=x$
- 3- Square the deviation x^2 and total it $\sum x^2$.
- 4- Divide total by numbers of observations
- 5- Apply formula;

$$\sigma = \sqrt{\frac{\sum x^2}{N}} \text{ where } ; \sum x^2 = 612, N=10$$

$$\sigma = \sqrt{\frac{\sum x^2}{N}}$$

$$\sigma = \sqrt{\frac{612}{10}}$$

$$\sigma = \sqrt{61.2} = 7.82 \text{ Answer}$$

Q. N0.02: Marks of two subject Geography and Statistics in ten regular evaluations are given. Find out which out of two subjects is consistent in scoring.

Geography(X): 26, 28, 30, 35, 44, 50, 55, 60, 64, 68.

Statistics(Y): 20, 34, 44, 56, 64, 70, 30, 72, 50, 60.

Solution: Compare the coefficient of variation to find out which of the subject is more consistent.

Geography X	$(X-\bar{X})$ x	x^2	Statistics Y	$(Y-\bar{Y})$ Y	Y^2
26	-20	400	20	-30	900
28	-18	324	34	-16	256
30	-16	256	44	-6	36
35	-11	121	56	6	36
44	-2	4	64	14	196
50	4	16	70	20	400
55	9	81	30	-20	400
60	14	196	72	22	484
64	18	324	50	0	0
68	22	484	60	10	100
$\sum x=460$		$\sum x^2 = 2206$	$\sum y=500$		$\sum y^2 = 2808$

Calculate mean;

$$\bar{X} = \frac{\sum x}{N} = \frac{460}{10} = 46$$

$$\bar{Y} = \frac{\sum y}{N} = \frac{500}{10} = 50$$

Geography: $\sigma = \sqrt{\frac{\sum x^2}{N}}$ where ; $\sum x^2 = 2206$, $N=10$

$$\sigma = \sqrt{\frac{2206}{10}} = 14.852$$

$$C.V. = \frac{\sigma}{\bar{X}} \times 100 = \frac{14.852}{46} \times 100 = 32.288 \text{ Answer}$$

Statistics: $\sigma = \sqrt{\frac{\sum y^2}{N}}$ where ; $\sum y^2 = 2808$, $N=10$

$$\sigma = \sqrt{\frac{2808}{10}} = 16.757$$

$$C.V. = \frac{\sigma}{\bar{Y}} \times 100 = \frac{16.757}{50} \times 100 = 33.514 \text{ Answer}$$

Since coefficient of variation (C.V.) is less in the case of Geography (X) hence marks in Geography is more consistence.

b. Assumed mean method:

Q. N0.03: Calculate Standard deviation of the following data;

8, 10, 12, 15, 16, 20, 22, 25, 30, 32

Solution: Steps to calculation of Standard deviation;

Assumed mean = 20

Value-x	(X- \bar{X})= d	d^2
8	-12	144
10	-10	100
12	-8	64
15	-5	25
16	-4	16
20	0	0
22	2	4
25	5	25
30	10	100
32	12	144
N = 10	$\sum x = -10$	$\sum d^2 = 622$

Where; $\sum d^2 = 622$, $\sum x = -10$, $N=10$

$$\sigma = \sqrt{\frac{\sum d^2}{N} - \left(\frac{\sum d}{N}\right)^2}$$

$$\sigma = \sqrt{\frac{622}{10} - \left(\frac{-10}{10}\right)^2}$$

$$\sigma = \sqrt{62.2 - (-1)^2}$$

$$\sigma = \sqrt{61.2} = 7.82 \text{ Answer}$$

Q. N0.04: The instrument of Geography lab is 180 arranged according to the size of instrument as under. Calculate Standard deviation and its coefficient.

Measurement(X): 0-10, 10-20, 20-30, 30-40, 40-50, 50-60, 60-70, 70-80, 80-90

No. of Instruments (f): 8, 10, 12, 30, 40, 30, 25, 15, 10.

Solution:

Measurement(X)	f	Mid point(m)	(m-45)/10 =d	fd	fd ²
0-10	8	5	-4	-32	128
10-20	10	15	-3	-30	90
20-30	12	25	-2	-24	48
30-40	30	35	-1	-30	30
40-50	40	45	0	0	0
50-60	30	55	1	30	30
60-70	25	65	2	50	100
70-80	15	75	3	45	135
80-90	10	85	4	40	160
	N=180			$\sum fd = 49$	$\sum fd^2 = 721$

Formula $\sigma = \sqrt{\frac{\sum d^2}{N} - \left(\frac{\sum d}{N}\right)^2} \times i$

$$\sigma = \sqrt{\frac{721}{180} - \left(\frac{49}{180}\right)^2} \times 10$$

$$\sigma = \sqrt{4.005 - 0.074} \times 10$$

$$\sigma = \sqrt{3.931} \times 10$$

$$\sigma = 1.9826 \times 10 = 19.826 \text{ Answer}$$

Coefficient of Standard can be obtained by dividing standard deviation by mean.

$$\bar{X} = A + \frac{\sum d}{N} X i$$

$$\bar{X} = 45 + \frac{49}{180} \times 10 = 45 + 2.722 = 47.722$$

$$\text{Coefficient of Standard Deviation} = \frac{\sigma}{\bar{X}} = \frac{19.286}{47.722} = 0.4154 \text{ Answer}$$

C: Continuous Series (data):

Steps:

1. Calculate the actual mean of frequencies (\bar{X}).
2. Find deviation of the mid-point from mean ($m - \bar{X}$) = x
3. Multiply deviation with respective frequencies.
4. Square the deviation (x)² and total it $\sum fx^2$.
5. Divide total by numbers (total) of observations.
6. 'x' is also used as 'd'.

7. Apply formula; $\sigma = \sqrt{\frac{\sum fx^2}{N}}$

Q. N0.05: Calculate Standard deviation of the following data;

Marks (X): 12-16, 16-20, 20-24, 24-28, 28-32, 32-36, 36-40, 40-44, 44-48.

Students (f): 2, 3, 4, 5, 4, 3, 2, 2, 1.

x	f	m	fm	x	x ²	fx	fx ²
12-16	2	14	28	-14	196	-28	392
16-20	3	18	54	-10	100	-30	300
20-24	4	22	88	-6	36	-24	144
24-28	5	26	130	-2	4	-10	20
28-32	4	30	120	2	4	8	16
32-36	3	34	102	6	36	18	108
36-40	2	38	76	10	100	20	200
40-44	2	42	84	14	196	28	392
44-48	1	46	46	18	324	18	324
	26		$\sum fm =$ 728				$\sum fx^2 =$ 1896

Solution: where m = mid-point, $(m - \bar{X}) = x = (m - 28)$

$$\bar{X} = \frac{\sum fm}{N} = \frac{728}{26} = 28, \text{ where, } \sum fm = 728, N = 26$$

Standard Deviation:

$$\sigma = \sqrt{\frac{\sum fx^2}{N}}$$

$$\sigma = \sqrt{\frac{1896}{26}}$$

$$\sigma = \sqrt{72.92} = 8.54 \text{ Answer}$$

Q. N0.04: Calculate Standard deviation of the following data;

Marks (X): 12-16, 16-20, 20-24, 24-28, 28-32, 32-36, 36-40, 40-44, 44-48.

Students (f): 2, 3, 4, 5, 4, 3, 2, 2, 1.

Solution: Assumed mean= 30

where, m = mid-point, $(m - \bar{X}) = d = (m - 30)$

x	f	m	fm	d	d ²	fd	fd ²
12-16	2	14	28	-16	256	-32	512
16-20	3	18	54	-12	144	-36	432
20-24	4	22	88	-8	64	-32	256
24-28	5	26	130	-4	16	-20	80
28-32	4	30	120	0	0	0	0
32-36	3	34	102	4	16	12	48
36-40	2	38	76	8	64	16	128
40-44	2	42	84	12	144	24	288
44-48	1	46	46	16	256	16	256
	26		$\sum fm = 728$			$\sum fd = -52$	$\sum fd^2 = 2000$

$\bar{X} = 30$ (Assumed mean), where, $\sum fm = 728$, $N = 26$,

$\sum fd = -52$, $\sum fd^2 = 2000$.

Standard Deviation:

$$\sigma = \sqrt{\frac{\sum fd^2}{N} - \left(\frac{\sum fd}{N}\right)^2}$$

$$\sigma = \sqrt{\frac{2000}{26} - \left(\frac{-52}{26}\right)^2}$$

$$\sigma = \sqrt{76.92 - (-2)^2}$$

$$\sigma = \sqrt{76.92 - 4}$$

$$\sigma = \sqrt{72.92}$$

$$\sigma = 8.54 \text{ Answer}$$

5.4 CONCLUSION

The relationship between Quartile deviation, Mean Deviation and Standard Deviation is fixed in normal distribution. Arithmetic Mean +/- Quartile Deviation covers 50 percent of the items. Arithmetic Mean +/- Mean Deviation covers 57.51 percent of the items. Arithmetic Mean +/- Standard Deviation covers 68.27 percent of the items. These relationships are applicable to only normal distribution.

5.5 SUMMARY

Standard deviation is based on every item of the series. Sampling does not affect very much to Standard deviation. Sometimes understanding Standard Deviation becomes difficult because of complex calculations. It showed more weight to extreme values than less value.

5.6 GLOSSARY

Standard Deviation- The standard deviation is a statistic that measures the dispersion of a dataset relative to its mean and is calculate as the square root of the variance.

Dispersion- It tells how spread out numbers is from the mean.

5.7 ANSWER TO CHECK YOUR PROGRESS

1. What is Quartile deviation?
2. What is Standard deviation?
3. What do you understand by variability?

5.8 REFERENCES

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2. Sons Educational Publishers, New Delhi.

5.9 SUGGESTED READING

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4. Shah N M. (1995) Statistics : Theory and Practice, Arya Book Depot, Delhi, India.

5.10 TERMINAL QUESTIONS

1. Calculate Standard deviation from the following students (X) and Marks (Y).
X:- 1, 2, 3, 4, 5, 6, 7, 8, 9, 10.
Y:- 54, 62, 63, 65, 68, 71, 73, 78, 82, 84.
2. Calculate arithmetic mean and standard deviation from the following frequency.
X:- 0-10, 10-20, 20-30, 30-40, 40-50, 50-60, 60-70
Y:- 8, 12, 14, 16, 10, 6, 5.
3. Calculate standard deviation from the following frequency.
Size: 4, 5, 6, 7, 8, 9, 10.
Frequency: 6, 12, 15, 28, 20, 14, 5.
(Ans: 1.541).
4. Calculate arithmetic mean and standard deviation from the following frequency by assumed mean method.
Size: 4, 5, 6, 7, 8, 9, 10.
Frequency: 6, 12, 15, 28, 20, 14, 5.
(Ans: 1.541)
5. Calculate arithmetic mean and standard deviation from the following frequency by step deviation method.
Value: 140, 145, 150, 155, 160, 165, 170, 175.
Frequency: 1, 4, 15, 30, 36, 24, 8, 2.
(Ans:6.59).
6. Calculate coefficient of Standard deviation, variance, and coefficient of variation of the following data. Compare the variability of performance in geography of two semester exam from their average performance.
Ist Semester: 17, 19, 19, 21, 19, 23, 30, 28, 26, 28, 25, 21.
IInd Semester: 112, 110, 120, 117, 113, 108, 104, 102, 105, 105, 109, 115.
(Answer: Standard Deviation: 4.123, Coefficient of Standard deviation: 0.1793)
7. Calculate the median, third quartile, 7thdecile and 70 percentile of the following marks of the students.
Marks: 0-10, 10-20, 20-30, 30-40, 40-50, 50-60, 60-70, 70-80.
No. of students: 3, 10, 17, 7, 6, 4, 2, 1.
(Answer: median: 27.05, Third quartile: 40.83, 7th decile: 37.14, 70th percentile: 37.14)

UNIT 6 - CORRELATION AND REGRESSION

6.1 OBJECTIVES

6.2 INTRODUCTION

6.3 (A) KARL PEARSON RANK DIFFERENCE METHOD

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6.1 OBJECTIVES

After reading this unit, you will be able to:

- Establish degree of relationship between two variables. Example; humidity and rainfall. Crop production and rainfall.
- Discuss the types and range of correlation.
- Calculate correlation among the variables.
- To represents data in pairs (x, y) .

6.2 INTRODUCTION

Correlation is defined by different scholars. According to Simpson & Kafka, Correlation analysis deals with the association between two or more variables. YaLun Chou defined Correlation analysis attempts to determine the degree of relationship between variables. When the relationship is of the quantitative nature, the appropriate statistical tools for discovering and measuring the relationship and expressing it in brief formula is known as correlation by Croxten and Cowden. It is used to measure the degree of relationship between two variables.

6.3 (A) KARL PEARSONS RANK DIFFERENCE METHOD

Karl Pearsons Coefficient of Correlation:

The Value of the coefficient of correlation is always fall between +1 and -1.

Kinds of correlation: Positive and Negative correlation

Positive correlation: When changes in two variables increase or decrease in one direction in relationship is called positive correlation.

Negative Correlation: When changes in two variables increase or decrease in opposite direction in relationship is called negative correlation. The value of one variable increases and another decreases.

1. If $r = +1$, It is perfect positive correlation between variables.
2. When $r = -1$, It is perfect negative correlation between variables.
3. If $r = 0$, It means there is no relationship between the variables.
4. When value of r between $+ .75$ to 1 is high positive correlation

Positive correlation	Value	Negative correlation	Value
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High	+ .75 to 1	High	- .75 to 1
Moderate	+ .25 to .75	Moderate	- .25 to .75
Low	+ 0 to .25	Low	- 0 to .25

The method is used to calculate coefficient of correlation is known as Pearson's coefficient. It is used to measure the degree of relationship between two or more variables. It is denoted by r .

Steps to do:

1. Calculate arithmetic mean of X and Y values.
2. Find out the deviation of X and Y and denote by small x and small y .
3. Square the small x and small y and total it separately ($\sum x^2$ and $\sum y^2$).
4. Multiply these calculated deviation of small x and small y and find out the total ($\sum xy$).
5. Apply the following formula;

$$r = \frac{\sum xy}{\sqrt{\sum x^2 \cdot \sum y^2}}$$

Where $x = (X - \bar{X})$ and $y = (Y - \bar{Y})$, $\bar{X} = \frac{\sum X}{N}$, $\bar{Y} = \frac{\sum Y}{N}$

$r =$ the Correlation coefficient

$\sum xy =$ Multiplication of deviation of x and y series and calculation of the total.

$\sum x^2 =$ Square the deviation of x and calculate the total.

$\sum y^2 =$ Square the deviation of y and calculate the total.

Q. No.-01: Calculate coefficient of correlation from the following data.

S. No.	1	2	3	4	5	6	7	8	9	10
X	10	15	20	22	28	30	35	35	40	45
Y	15	15	20	20	25	35	35	40	45	50

Solution:

S. No.	X	Y	$x = (X - \bar{X})$	x^2	$y = (Y - \bar{Y})$	y^2	xy
1	10	15	-18	324	-15	225	270
2	15	15	-13	169	-15	225	195
3	20	20	-8	64	-10	100	80
4	22	20	-6	36	-10	100	60
5	28	25	0	0	-5	25	0
6	30	35	2	4	5	25	10

7	35	35	7	49	5	25	35
8	35	40	7	49	10	100	70
9	40	45	12	144	15	225	180
10	45	50	17	289	20	400	340
	$\Sigma X = 280$	$\Sigma Y = 300$		$\Sigma x^2 = 1128$		$\Sigma y^2 = 1450$	$\Sigma xy = 1240$

Solution:

$$r = \frac{\Sigma xy}{\sqrt{\Sigma x^2 \cdot \Sigma y^2}}$$

Where $x = (X - \bar{X})$ and $y = (Y - \bar{Y})$,

$$\bar{X} = \frac{\Sigma X}{N} = \frac{280}{10} = 28,$$

$$\bar{Y} = \frac{\Sigma Y}{N} = \frac{300}{10} = 30$$

$$r = \frac{\Sigma xy}{\sqrt{\Sigma x^2 \cdot \Sigma y^2}}$$

$$r = \frac{1240}{\sqrt{1128 \times 1450}}$$

$$r = \frac{1240}{\sqrt{1635600}}$$

$$r = \frac{1240}{1278.905} = 0.9695$$

Answer: It is high positive correlation.

Q. No.-02: Calculate coefficient of correlation from the following data.

S. No.	1	2	3	4	5	6	7	8	9	10
X	10	10	15	20	25	30	35	40	45	50
Y	10	8	12	18	22	25	25	30	35	45

Solution:

S. No.	X	Y	$x = (X - \bar{X})$	x^2	$y = (Y - \bar{Y})$	y^2	xy
1	10	10	-18	324	-13	169	234
2	10	8	-18	324	-15	225	270
3	15	12	-13	169	-11	121	143
4	20	18	-8	64	-5	25	40

5	25	22	-3	9	-1	1	3
6	30	25	2	4	2	4	4
7	35	25	7	49	2	4	14
8	40	30	12	144	7	49	84
9	45	35	17	289	12	144	204
10	50	45	22	484	22	484	484
	$\sum X = 280$	$\sum Y = 230$		$\sum x^2 = 1860$		$\sum y^2 = 1226$	$\sum xy = 1480$

Solution:

$$r = \frac{\sum xy}{\sqrt{\sum x^2 \cdot \sum y^2}}$$

Where $x = (X - \bar{X})$ and $y = (Y - \bar{Y})$,

$$\bar{X} = \frac{\sum X}{N} = \frac{280}{10} = 28$$

$$\bar{Y} = \frac{\sum Y}{N} = \frac{230}{10} = 23$$

$$r = \frac{\sum xy}{\sqrt{\sum x^2 \cdot \sum y^2}}$$

$$r = \frac{1480}{\sqrt{1860 \times 1226}}$$

$$r = \frac{1480}{\sqrt{2280360}}$$

$$r = \frac{1480}{1510.086} = 0.980$$

Answer: It is high positive correlation

Q. No.-03: Calculate coefficient of correlation from the following data.

S. No.	1	2	3	4	5	6	7	8	9	10
X	10	15	20	22	28	30	35	35	40	45
Y	50	45	40	35	35	25	20	20	15	15

Solution:

S. No.	X	Y	$x = (X - \bar{X})$	x^2	$y = (Y - \bar{Y})$	y^2	xy
1	10	50	-18	324	20	400	-360
2	15	45	-13	169	15	225	-195
3	20	40	-8	64	10	100	-80
4	22	35	-6	36	5	25	-30

5	28	35	0	0	5	25	0
6	30	25	2	4	-5	25	-10
7	35	20	7	49	-10	100	-70
8	35	20	7	49	-10	100	-70
9	40	15	12	144	-15	225	-180
10	45	15	17	289	-15	225	-255
	$\sum X = 280$	$\sum Y = 300$		$\sum x^2 = 1128$		$\sum y^2 = 1450$	$\sum xy = -1250$

Solution:

$$r = \frac{\sum xy}{\sqrt{\sum x^2 \cdot \sum y^2}}$$

Where $x = (X - \bar{X})$ and $y = (Y - \bar{Y})$,

$$\bar{X} = \frac{\sum X}{N} = \frac{280}{10} = 28$$

$$\bar{Y} = \frac{\sum Y}{N} = \frac{300}{10} = 30$$

$$r = \frac{\sum xy}{\sqrt{\sum x^2 \cdot \sum y^2}}$$

$$r = \frac{-1250}{\sqrt{1128 \times 1450}}$$

$$r = \frac{-1250}{\sqrt{1635600}}$$

$$r = \frac{-1250}{1278.905} = -0.977$$

Answer; It is high negative correlation.

Q. No.04: Calculate coefficient of correlation from the following data

X	12	18	23	27	30	35	35	40	43	47
Y	45	40	38	35	32	30	27	23	18	12

Solution:

S. No.	X	Y	$x = (X - \bar{X})$	x^2	$y = (Y - \bar{Y})$	y^2	xy
1	12	45	-19	361	15	225	-285
2	18	40	-13	169	10	100	-130
3	23	38	-8	64	8	64	-64
4	27	35	-4	16	5	25	-20
5	30	32	-1	1	2	4	-2
6	35	30	4	16	0	0	0

7	35	27	4	16	-3	9	-12
8	40	23	9	81	-7	49	-63
9	43	18	14	196	-12	144	-168
10	47	12	16	256	-18	324	-288
	$\sum X = 310$	$\sum Y = 300$		$\sum x^2 = 1176$		$\sum y^2 = 944$	$\sum xy = -1032$

Solution:

$$r = \frac{\sum xy}{\sqrt{\sum x^2 \cdot \sum y^2}}$$

Where $x = (X - \bar{X})$ and $y = (Y - \bar{Y})$,

$$\bar{X} = \frac{\sum X}{N} = \frac{310}{10} = 31$$

$$\bar{Y} = \frac{\sum Y}{N} = \frac{300}{10} = 30$$

$$r = \frac{\sum xy}{\sqrt{\sum x^2 \cdot \sum y^2}}$$

$$r = \frac{-1032}{\sqrt{1176 \times 944}}$$

$$r = \frac{-1032}{\sqrt{1110144}}$$

$$r = \frac{-1032}{1053.633} = -0.97946$$

Answer: It is high negative correlation.

Calculation of Correlation Coefficient by Direct Methods

One of the methods to calculate Correlation Coefficient is without taking deviations variables either from actual mean or assumed mean. It can be calculated with actual X and Y Value. The formula in such a case is;

$$r = \frac{N \sum XY - (\sum X)(\sum Y)}{\sqrt{N \sum X^2 - (\sum X)^2} \sqrt{N \sum Y^2 - (\sum Y)^2}}$$

Q. No. 01: Calculate the coefficient of correlation by direct method.

X	1	2	3	4	5	6	7	8	9	10
Y	10	11	12	13	14	15	16	17	18	19

Solution:

X	X^2	Y	Y^2	XY
1	1	10	100	10
2	4	11	121	22
3	9	12	144	36
4	16	13	169	52
5	25	14	196	70
6	36	15	225	90
7	49	16	256	112
8	64	17	289	136
9	81	18	324	162
10	100	18	361	190
$\Sigma X=55$	$\Sigma X^2=385$	$\Sigma Y=145$	$\Sigma Y^2=2185$	$\Sigma XY=880$

$$r = \frac{N \Sigma XY - (\Sigma X)(\Sigma Y)}{\sqrt{N \Sigma X^2 - (\Sigma X)^2} \sqrt{N \Sigma Y^2 - (\Sigma Y)^2}}$$

Where $\Sigma X=55, \Sigma X^2=385, \Sigma Y=145, \Sigma Y^2=2185, \Sigma XY=880$

$$r = \frac{10 \times 880 - 55 \times 145}{\sqrt{10 \times 385 - (55)^2} \sqrt{10 \times 2185 - (145)^2}} = \frac{8800 - 7975}{\sqrt{3850 - 3025} \sqrt{21850 - 21025}}$$

$$r = \frac{825}{\sqrt{825 \times 825}} = \frac{825}{825} = 1$$

Ans: It is perfect positive correlation

Q. No. 02: Calculate the coefficient of correlation by direct method.

X	11	12	13	14	15	16	17	18	19	20
Y	16	15	14	13	12	11	10	9	8	5

Solution:

X	X^2	Y	Y^2	XY
---	-------	---	-------	----

11	121	16	256	176
12	144	15	225	180
13	169	14	196	182
14	196	13	169	182
15	225	12	144	180
16	256	11	121	176
17	289	10	100	170
18	324	9	81	162
19	361	8	64	152
20	400	5	25	100
$\Sigma X=155$	$\Sigma x^2=2485$	$\Sigma Y=113$	$\Sigma Y^2=1381$	$\Sigma XY=1660$

$$r = \frac{N \Sigma XY - (\Sigma X)(\Sigma Y)}{\sqrt{N \Sigma X^2 - (\Sigma X)^2} \sqrt{N \Sigma Y^2 - (\Sigma Y)^2}}$$

Where; $\Sigma X=155$, $\Sigma x^2=2485$, $\Sigma Y=113$, $\Sigma Y^2=1381$, $\Sigma XY =1660$

$$r = \frac{10 \times 1660 - 155 \times 113}{\sqrt{10 \times 2485 - (155)^2} \sqrt{10 \times 1381 - (113)^2}}$$

$$r = \frac{16600 - 17515}{\sqrt{24850 - 24025} \sqrt{13810 - 12769}}$$

$$r = \frac{-915}{\sqrt{825} \times 1041} = \frac{-915}{\sqrt{858825}} = \frac{-915}{926.728} \quad r = -0.987$$

Answer: It is high negative correlation.

6.3 (B) SPEARMAN RANK CORRELATION

Rank correlation is also known as Spearman's Rank correlation. British Psychologist Prof. Charles Spearman has given this difference method. When certain factors can not measure precisely in qualitative terms, this method is useful. For example quality, honesty, intelligence etc.

Formula $rk = 1 - \frac{6 \Sigma D^2}{N^3 - N}$

Where; rk=coefficient of rank correlation,

ΣD^2 =the total of the squares of the differences of corresponding ranks,

N=Numbers of pairs of observations

Steps:

1. Calculate the difference of two ranks (R_1-R_2) and denote by D .
2. Square the differences (D) and find out the total ($\sum D^2$)
3. Apply the formula; $rk = 1 - \frac{6\sum D^2}{N^3-N}$

There are two types of calculation;

- (a) Rank are Given
- (b) Rank are not given

Case-I: When Ranks are given

Q. No.01 : In a map making competition two judges rank the 10 students. Calculate the rank correlation coefficient.

Judge-I	1	2	3	4	5	6	7	8	9	10
Judge-II	10	9	8	7	6	5	4	3	2	1

Solution: Calculate the rank correlation coefficient.

Rank by Judge-I (R_1)	Rankby Judge-II(R_2)	(R_1-R_2) D	D^2
1	10	-9	81
2	9	-7	49
3	8	-5	25
4	7	-3	9
5	6	-1	1
6	5	1	1
7	4	3	9
8	3	5	25
9	2	7	49
10	1	9	81
N=10			$\sum D^2=330$

$$rk = 1 - \frac{6\sum D^2}{N^3-N} \text{ Where; } \sum D^2=330, N=10$$

$$rk = 1 - \frac{6\sum D^2}{N^3 - N}$$

$$rk = 1 - \frac{6 \times 330}{1000 - 10}$$

$$rk = 1 - \frac{1980}{990}$$

$$= 1 - 2 = -1$$

Answer: Hence, there is perfect negative correlation.

Case-II: When Ranks are not given;

Q. No.02: In a map quiz competition, two judges rank the 10 students. Calculate the rank correlation coefficient.

X	12	14	16	10	11	15	8	20	9	18
Y	24	16	20	15	12	28	10	14	15	30

Steps:

1. Assign ranks to given data
2. Arrange data (X and Y) in ascending order.
3. Lowest rank is one in ascending order and follows.
4. Calculate the difference of two ranks (R_1-R_2) and denote by D.
5. Square the differences (D) and find out the total ($\sum D^2$)
6. Apply the formula; $rk = 1 - \frac{6\sum D^2}{N^3-N}$

Solution: Calculate the rank correlation coefficient.

X	Rank by Judge-I (R_1)	Y	Rank by Judge-II (R_2)	(R_1-R_2) D	D^2
12	5	24	8	-3	9
14	6	16	5	1	1
16	8	20	7	1	1
10	3	18	6	-3	9
11	4	12	2	2	4
15	7	28	9	-2	4
8	1	10	1	0	0
20	10	14	3	7	49
9	2	15	4	-2	4
18	9	30	10	-1	1
N=10					$\sum D^2=82$

$$rk = 1 - \frac{6\sum D^2}{N^3-N} \quad \text{Where; } \sum D^2=82, N=10$$

$$rk = 1 - \frac{6\sum D^2}{N^3 - N}$$

$$rk = 1 - \frac{6 \times 82}{1000 - 10}$$

$$rk = 1 - \frac{492}{990}$$

$$rk = 1 - 0.496 = +0.504$$

Answer: It is moderate correlation

Merits of Rank Method;

1. It is easy to calculate in compared to Karl Pearson’s method.
2. Rank method is only method for finding the degree of correlation.
3. Rank method is useful for qualitative nature of data (intelligence, beauty, honesty, dignity etc.)
4. The answer of Karl Pearson’s and Spearman’s Rank will be same if values are not repeated.

Demerits of Rank Method;

1. This method is only useful for individual observation rather than frequency distribution.
2. It is not good for find out correlation in a grouped frequency distribution.
3. It is based on rank only.
4. It is not suitable for more than 30 item values.

6.4 CORRELATION: CONCURRENT DEVIATION METHOD

Concurrent Deviation Method of correlation is the simplest of all the methods. Directions of change of X variable and Y variables have to find out in this method. The formula of the concurrent method;

$$r_c = \pm \sqrt{\pm \left(\frac{2C - n}{n} \right)}$$

Where r_c coefficients of Correlation, C is number of positive sign and multiply D_x and D_y and add it to get C.

n = Number of pairs of observations compared.

Steps to follow;

1. Find out the direction of change of X and Y variables.
2. If second value is increasing in compare to first value put sign + (positive).
3. If second value is decreasing in compare to first value put sign – (negative).
4. If second value is constant or same in compare to first value put sign 0 (zero).
5. Follow the same process for other value.
6. Denote D_x for X and D_y for Y value.
7. Add the only positive (+) sign to determine the value of C.
8. n will be one less than to total observation. If total observation is 11 then n will be 10.
9. The significant of \pm sign inside the under root and outside the under root.
10. It is not considered the –(negative) sign under the root because value multiplied with the minus (-) sign inside would make it positive.

Q. No. 01: Calculate the correlation coefficient of concurrent deviation from following.

X	50	45	40	44	42	48	52	56	56
Y	55	50	45	48	46	58	25	25	36

Solution: Calculation of correlation by concurrent deviation method where n will be 8.

X	D_x	Y	D_y	$D_x D_y$
50		55		
45	-	50	-	+
40	-	45	-	+
44	+	48	+	+
42	-	46	-	+
48	+	58	+	+
52	+	25	-	+
56	+	25	0	0
56	0	36	+	0
				C= 6

Apply formula; $r_c = \pm \sqrt{\pm \left(\frac{2C-n}{n} \right)}$

$$r_c = \pm \sqrt{\pm \left(\frac{2X6-8}{8}\right)} r_c = \pm \sqrt{\left(\frac{4}{8}\right)} = 0.707 \text{ Answer}$$

Significance:

1. It is the simplest method.
2. If the number of variable is very large apply this method to get quick idea of degree of relationship.
3. Limitation of the method does not differentiate between small and big changes.

6.5 REGRESSION

Objectives : To estimate the unknown value from known value.

Introduction:

Regression is the measure of the average relationship between two or more variables in the original units of the data. A measure of the relation between the mean value of one and corresponding values of other variables.

Regression analysis is a method for estimating the unknown values of one variable from known values of another (Fransis Galton). Regression describes the functional relationship between dependent and independent variables. It is useful to estimates one variables from another. Correlation of two variable scan be determined by Regression lines and coefficient of regression. Linear regression is used for predictive analysis. Regression estimates are used to describe data to explain the relationship between dependent variable and independent variables.

The simplest form with one dependent and one independent variable is defined by the formula $y = c + bx$,

Where y = estimated dependent, c = constant, b = regression coefficients, and x = independent variable.

There are two regression lines. These two regression lines consists two regression equations and two regression coefficients. Regression equations are algebraic expressions. These equations are:

X on Y regression equation: $X_c = a + bY$

Y on X regression equation: $Y_c = a + bX$

The value of ‘a’ and ‘b’ in the equations can be obtained by solving the following two equations.

These two equations are called normal equations. They are:

X on Y regression equation ($X_c = a + bY$)------(I)

$$\sum X = Na + b \sum Y$$

$$\sum XY = a \sum Y + b \sum Y^2$$

Y on X regression equation ($Y_c = a + bX$)------(II)

$$\sum Y = Na + b \sum X$$

$$\sum XY = a \sum X + b \sum X^2$$

Q. NO. 01: Calculate regression equations of the following data.

X	1	2	3	4	5	6	7	8	9	10
Y	10	9	8	11	12	13	12	14	15	16

Solution: Calculation of equations: X on Y and Y on X.

X	Y	X^2	Y^2	XY
1	10	1	100	10
2	9	4	81	18
3	8	9	64	24
4	11	16	121	44
5	12	25	144	60
6	13	36	169	78
7	12	49	144	84
8	14	64	196	112
9	15	81	225	135
10	16	100	256	160
$\sum X$ = 55	$\sum Y$ = 120	$\sum X^2 = 385$	$\sum Y^2 = 1500$	$\sum XY = 725$

1. Regression equation of X on Y

$$X_c = a + bY$$

Two normal equations are:

$$\sum X = Na + b \sum Y \dots\dots\dots(i)$$

$$\sum XY = a \sum Y + b \sum Y^2 \dots\dots\dots(ii)$$

Substitute the values:

$$55 = 10a + b120 \dots\dots\dots(i)$$

$$725 = 120a + b1500 \dots\dots\dots(ii)$$

Multiply the equation (i) by 12

$$660 = 120a + b1440 \dots\dots\dots(iii)$$

$$725 = 120a + b1500 \dots\dots\dots(iv)$$

Subtract equation (iv) from (iii)

$$-65 = -60b$$

$$b = \frac{-65}{-60} = 1.08$$

Substitute the value of b in equation (i)

$$55 = 10a + b120$$

$$55 = 10a + 1.08 \times 120$$

$$55 = 10a + 129.6$$

$$10a = 55 - 129.6$$

$$10a = -74.6$$

$$a = \frac{-74.6}{10}$$

$$a = -7.46$$

Therefore the regression equation X on Y is:

$$\text{Answer: } X_c = -7.46 + 1.08Y$$

1. Regression equation of Y on X

$$Y_c = a + bX$$

Two equations are:

$$\sum Y = Na + b\sum X \dots\dots\dots (i)$$

$$\sum XY = a\sum X + b\sum X^2 \dots\dots\dots (ii)$$

Substitute the values:

$$120 = 10a + b55 \dots\dots\dots (i)$$

$$725 = 55a + b385 \dots\dots\dots (ii)$$

Multiply the equation (i) by 7

$$840 = 70a + b385 \dots\dots\dots (iii)$$

$$725 = 55a + b385 \dots\dots\dots (iv)$$

Subtract equation (iv) from (iii);

$$115 = 15a$$

$$a = \frac{115}{15} = 7.67$$

Substitute the value of 'a' in equation (i);

$$120 = 10a + b55 \dots\dots\dots (i)$$

$$120 = 10 \times 7.67 + b55$$

$$120 = 76.7 + b55$$

$$120 - 76.7 = b55$$

$$43.3 = b55$$

$$b = \frac{43.3}{55} = 0.787$$

Therefore the regression equation Y on X is:

Answer: $Y_c = 7.67 + 0.787X$.

Q. No. 02: Marks obtained by students of Geography and Statistics in B.A (H). Find out the regression coefficient of students.

Marks in Geography(X)	46	42	44	40	43	41	45
Marks in Statistics(Y)	40	38	36	35	39	37	41

Solution: Calculation of equations: X on Y and Y on X.

X	Y	X^2	Y^2	XY
46	40	2116	1600	1840
42	38	1764	1444	1596
44	36	1936	1296	1584
40	35	1600	1225	1400
43	39	1849	1521	1677
41	37	1681	1369	1517
45	41	2025	1681	1845
$\sum X$ = 301	$\sum Y$ = 266	$\sum X^2 = 385$	$\sum Y^2 = 10136$	$\sum XY = 11459$

1. Regression equation of X on Y

$$X_c = a + bY$$

Two normal equations are:

$$\sum X = Na + b \sum Y \dots\dots\dots(i)$$

$$\sum XY = a \sum Y + b \sum Y^2 \dots\dots\dots(ii)$$

Substitute the values:

$$301 = 7a + b266 \dots\dots\dots(i)$$

$$11459 = 266a + 10136 \dots\dots\dots(ii)$$

Multiply the equation (i) by 38;

$$11438 = 266a + b10108 \dots\dots\dots(iii)$$

$$11459 = 266a + b10136 \dots\dots\dots(iv)$$

Subtract equation (iv) from (iii)

$$-21 = -28b$$

$$b = \frac{-21}{-28} = 0.75$$

Substitute the value of 'b' in equation (i); $\sum X = Na + b \sum Y$

$$301 = 7a + 0.75 \times 266$$

$$301 = 7a + 199.5$$

$$7a = 301 - 199.5$$

$$7a = 101.5$$

$$a = \frac{101.5}{7}$$

$$a = 14.5$$

Therefore the regression equation X on Y is: $X_c = a + bY$

Answer: $X_c = 14.5 + 0.75Y$

1. Regression equation of Y on X

$$Y_c = a + bX$$

Two equations are:

$$\sum Y = Na + b \sum X \dots\dots\dots(i)$$

$$\sum XY = a \sum X + b \sum X^2 \dots\dots\dots(ii)$$

Substitute the values:

$$266 = 7a + b301 \dots\dots\dots(i)$$

$$11459 = 301a + b12971 \dots\dots\dots(ii)$$

Multiply the equation (i) by 43

$$11438 = 301a + b12943 \dots\dots\dots(iii)$$

$$11459 = 301a + b12971 \dots\dots\dots(iv)$$

Subtract equation (iv) from (iii);

$$-21 = -28b$$

$$b = \frac{-21}{-28} = 0.75$$

Substitute the value of 'a' in equation (i); $\sum Y = Na + b \sum X$

$$266 = 7a + 0.75 \times 301$$

$$266 = 7a + 225.75$$

$$266 - 225.75 = 7a$$

$$40.25 = 7a$$

$$a = \frac{40.25}{7} = 5.75$$

Therefore the regression equation Y on X is: $Y_c = a + bX$

Answer: $Y_c = 5.75 + 0.75 X$.

6.6 CONCLUSION

Both correlation and simple linear regression can be used to examine the presence of a linear relationship between two variables providing certain assumptions about the data are satisfied. The results of the analysis, however, need to be interpreted with care, particularly when looking for a causal relationship or when using the regression equation for prediction. Multiple and logistic regression will be the subject of future reviews.

6.7 SUMMARY

Correlation and regression analysis are related in the sense that both deal with relationships among variables. The correlation coefficient is a measure of linear association between two variables. Values of the correlation coefficient are always between -1 and +1. A correlation coefficient of +1 indicates that two variables are perfectly related in a positive linear sense, a correlation coefficient of -1 indicates that two variables are perfectly related in a negative linear sense, and a correlation coefficient of 0 indicates that there is no linear relationship between the two variables. For simple linear regression, the sample correlation coefficient is the square root of the coefficient of determination, with the sign of the correlation coefficient being the same as the sign of b_1 , the coefficient of x_1 in the estimated regression equation.

Neither regression nor correlation analyses can be interpreted as establishing cause-and-effect relationships. They can indicate only how or to what extent variables are associated with each other. The correlation coefficient measures only the degree of linear association between two variables. Any conclusions about a cause-and-effect relationship must be based on the judgment of the analyst.

6.8 GLOSSARY

Regression Line - Regression analysis is a set of statistical process for estimating the relationships among variables

Rank Difference - The relationship between ranking of different ordinal variables or different rankings of the same variable, where a ranking is the assignment of the ordering labels, first, second, third etc.

6.9 ANSWER TO CHECK YOUR PROGRESS

1. What do you mean by correlation?
2. What do you mean by Rank correlation?
3. Discuss Karl Pearson methods of correlation.
4. What do you mean by Regression?

6.10 REFERENCE

1. Gupta S. P. (2004) Statistical Methods, Sultan Chand and Sons, Educational Publishers, New Delhi .

6.11 SUGGESTED READINGS

1. SarkarAshis (2013) Quantitative Geography. Techniques and Presentation, orient BlackSwan, New Delhi.
2. Bloor, M and F. Wood(2006) Keywords in Qualitative Methods: A Vocabulary of Research, Concepts Publication; New Delhi.
3. Gregory, S (1963) Statistical Methods and Geographers, Longman, London.

6.12 TERMINAL QUESTIONS

1. Calculate Karl Pearson's coefficient of correlation and the regression equation from following data.
X: 15,18,21,24,27,30,36,39,42,68
Y: 25,25,27,27,31,33,35,41,41,45
2. Calculate the coefficient of concurrent deviation from the following.
X: 60, 55, 50, 56, 30, 70, 40, 35, 80, 80, 75.
Y: 65, 40, 35, 75, 63, 80, 35, 20, 80, 60, 60.
3. The data relate to age of students of statistics and the number of days they reported sick in a month.
Age (X): 18, 19, 20, 21, 22, 23, 24, 25, 26, 27, 28
Sick Days (Y): 1, 0, 2, 5, 2, 4, 6, 5, 7, 8, 7.
4. Calculate regression equation of X on Y and Y on X of following data.
X: 1,2, 3, 4,5,6, 7, 8, 9.
Y : 9, 8, 10, 12, 11, 13, 14, 16,15.
5. Calculate the coefficient of rank correlation between X and Y.
X: 36, 56, 20 , 65, 42, 33, 44, 53, 15, 60.
Y: 50, 35, 70, 25, 58, 75, 60, 45, 89. 38.