

The Islamia university of Bahawalpur

Department of Geography
BS Geography 6th Semester: Economic Geography

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Course Outline/Topics

1. Definition, scope and importance of economic geography
2. Production, exchange and consumption
3. Classification of economic activities
4. Approaches to the study of economic geography
5. Economic growth and economic development (Rostow model)
6. Human resources (growth and distribution of human population over the globe, and problems of expanding population)
7. Classification and main features of renewable and non-renewable resources
8. Forestry: forest activities, geographic conditions and global distribution of forests. Environmental and economic benefits of forests, problems associated with forest destruction and remedial measures
9. Main features of fishing activity, geographic conditions and distribution/location of world's leading fishing regions. Associated problems and future of fishing activity
10. Agriculture: Definition, importance and relationship of agriculture with geographic environment
11. Main types of agriculture, subsistence and commercial agriculture, and regions of agriculture
12. Power resources: Classification, main features and world distribution of coal and petroleum
13. Manufacturing industries: types and organization.
14. Factors effecting location of industries, location theories and distribution of world's major industries
15. Transportation system: Main features, need and importance for economic development
16. World trade of major commodities

Books Recommended

1. Neil Coe, Philip Kelly and Henry W. C. Yeung, 2013, Economic Geography: A Contemporary Introduction, Amazon.
2. Andrew Wood and Susan Roberts, 2010, Economic Geography: Places, Networks and Flows, Amazon.
3. Yuko Aoyama, James T Murphy and Susan Hanson, 2010, Key Concepts in Economic Geography, Amazon.
4. Paul Knox, John Agnew and Linda McCarthy, 2008, The Geography of the World Economy, Amazon.
5. Truman, A. Hartshorn and Jhon W. Alexander, 2007, Economic Geography, Prentice Hall.
6. Neil Coe, Philip Kelly and Henry W. C. Yeung, 2007, Economic Geography: A Contemporary Introduction, Amazon.
7. Khan, F. K., 1998, An Introduction to Economic Geography, 11th Edition, Saleem Publishing House, Karachi.
8. Sadhukhan, S. K., 1986, Economic Geography: An Appraisal of Resources, S. Chand and Co. Ltd. New Delhi.
9. Pounds. N., 1981, Success in Economic Geography, John Murray, London.

1. Definition and Scope of Economic Geography

Economic Geography is an important branch of Human Geography which deals with the study of the spatial distribution of economic activities over the world. This subject focuses on to the study of the production, exchange, and consumption of the output of economic activities. In simplest words economic geography can be defined as ‘the study of spatial distribution of economic activities under the influence of various geographic factors’. Economic geography, thus, analysis place to place variations in the distribution of economic activities concerned with the production, exchange and consumption of resources.

Economic Geography is the study of man and his economic activities under varying sets of conditions. Geographers are of different opinions as regarding the definition of the subject.

In fact, different authorities have defined Economic Geography in a variety of ways but their opinions converge at a common point of accord, where it means the study of the spatial distribution of man’s economic activities in relation to its environment, be it physical or non-physical.

According to Dudley Stamp, Economic Geography “involves consideration of the geographical and other factors which influence man’s productivity, but only in limited depths, so far as they are connected with production and trade.”

E. W. Zimmermann pointed out that, Economic Geography deals with the economic life of man with relation to environment.

R. S. Thoman in his book ‘The Geography of Economic Activity’ has remarked, “Economic Geography may be defined as an enquiry into the production, exchange and consumption of goods by people in different areas of the world. Particular emphasis is placed on the location of economic activity upon asking just why economic functions are situated where they are in this world.”

J. MacFarlane describes Economic Geography as the study of “influence exerted on the economic activity of man by his physical environment, and more specifically by the form and structure of the surface of the land, the climatic conditions which prevail upon it and the spatial relations in which its different regions stand to one another.”

In the words of Hartshorn and Alexander: “Economic Geography is the study of the spatial variation on the earth’s surface of activities related to producing, exchanging and consuming goods and services. Whenever possible the goal is to develop generalizations and theories to account for these spatial variations.”

Surpassing all, Chisholmes says that Economic Geography is presumed to “form some reasonable estimate of the future course of commercial development,” as determined by geographical factors.

According to J. W. Alexander ‘economic geography refers to the study of spatial variations in all activities that men engage in the world over related to producing, exchanging and consuming items of values’.

Aims and Scope of Economic Geography

Economic Geography is the study of the place, distribution and spatial organization of economic actions across the world. It represents a traditional subfield of the discipline of Geography. However, in recent decades, also many economists have approached the field in ways more typical of the discipline of economics.

Economic Geography has taken a variety of approaches to many different subject matters, including but not limited to the place of industries, economic agglomeration, transportation, economic development, real estate, gentrification, ethnic economies, gendered economies, core periphery theory, the economics of urban form, the relationship between environment and economy and globalization.

Economists, such as Paul Krugman and Jeffery Sachs have also analyzed many traits related to economic geography. Krugman has gone so far as to call his application of spatial thinking in international trade theory the “new economic geography”, which directly competes with an approach within disciplines of geography that is also called new economic geography.

Economic geography is sometimes approached as a branch of anthropogeography that focuses on regional system of human economic activity. Study may focus on production, exchange, distribution and consumption of item of economic activity. Allowing parameter of space time and item to vary, a geographer may also examine the flow of material, commodity, population and information from different parts of the economic activity system.

Thematically economic geography can be divided into several sub disciplines such as;

1. Geography of Agriculture
2. Geography of Industries

3. Geography of International Trade
4. Geography of Resources
5. Geography of Transport & Communications
6. Geography of Finance.

With the rise of the New Economy, economic inequalities are rising spatially. The new economy generally characterized by Globalization, rising of Information and Communication Technology, growth of knowledge goods, feminization has enabled economic geographers to study social and spatial division caused by the arising of New Economy including the emerging digital divide.

We may consider the Earth as the abode of Man and its resources are his legacy. Being most dynamic, man is never satisfied with mere living. He has always tried to refine his living conditions and environment. He is; never satisfied with the simple food, nature has provided him; he has devised ways for preparing food.

His shelters are not merely designed for simple protection, but should also be comfortable in every aspect and must match with the modern style. In fact, man satisfies not only his physical needs but also his cultural needs.

These inclinations or intentions of human mind have led to the exploitation of the earth's resources in a number of ways down from days of Paleolithic society till the present time, but always within certain limits imposed by Nature. One unique feature of man is that, he understands the laws that govern the functioning of Nature and makes use of them in his own way of life. The study of the manner of exploitation of the earth's resources and the limits set by physical environment is the proper scope of Economic Geography. It 'deals with the productive occupations and attempts to explain why certain regions are outstanding in the production and exportation of various articles and why others are significant in the importation and utilization of these things'. In this study of interdependence of production, emphasis should be given upon the degree of human initiative and the nature of physical forces enacting to shape certain life-patterns. They should be studied not in isolation but as a comprehensive system of interaction between man and nature.

However, it is not content only with the analysis of the present pattern of productive occupations, it also studies their dynamics, for global resources change not only in response to increasing knowledge, improved skills and techniques, but also, perhaps more importantly, in relation to changing socio-political objectives. Thus, Economic Geography is a much-embracing subject.

It not only aims at the understanding of different natural phenomena but also takes cognizance of racial traits and customs, advantages of an early start, availability of capital and labour, accumulated technical knowledge and skilled management, stability of governments, government aids or hindrances in the form of tariffs, subsidies or urbanization schemes and so on.

The fundamental differences in the life-styles of various societies in different parts of the world largely stem from the diversity in the physical environment, especially climate. Climatic condition differs quite distinctly from one region to another with the resultant differences in human needs. People living in cold countries, thus, require warm clothes; those in hot countries require scanty and light clothing.

People of monsoonal countries of South-East Asia take rice and fish as their staple food, those in temperate regions prefer wheat. The inhabitants of the temperate regions are more energetic and industrious than those of the warm tropical countries. Such differences in man's basic life patterns can be explained only in terms of their varying natural conditions.

Initially, at the dawn of human civilization, man's needs were certainly very limited and so easily supplied by his habitat. Even at present, a primitive man's needs remain few. He satisfies his needs by the articles which are easily obtainable from his immediate surroundings. In contrast, a 'civilized' man's needs are great and complex. They cannot be satisfied near-at-hand; they need to be supplemented from far and wide.

In fact, none of the modern countries of the world are self-sufficient. The civilized man, therefore, depends a lot on the supplies of far-away regions. This gives rise to commerce. So, we may comment that the function of Economic Geography is to study the manner in which trade and commerce are related to the earth on which they are transacted.

'Thus, Economic Geography investigates the diversity in basic resources of the different parts of the world. It tries to evaluate the effects that differences of physical environment have upon the utilization of these resources. It studies differences in economic development in different regions or countries of the world. It studies transportation, trade routes and trade resulting from this development and as affected by the physical environment.

The problem of economic resources has become more complex today with millions starving and unemployed. Such problems are more acute in the countries and among people who believe in material rather than spiritual progress. A man born and brought up under western civilization

believes in creature comforts. He tries, by all means, to improve his life-style which is based on competition.

This competitive attitude gives rise to socio-economic problems. Economic Geography, therefore, also aims at resolving such problems by better and efficient utilization of limited resources through rational, systematic, scientific and long-term planning.

Humboldt, a famous 19th century German geographer, remarked that, 'the diversified riches of the earth are a vast source of human enjoyment, and, therefore, man's highest development requires that we put these riches into a common world stream of understanding and use.' This can only be achieved through the study of Economic Geography.

According to H. H. McCarty;

Economic Geography concerns with the solution of economic problems. Hence, the student of Economic Geography must be trained along four principal lines:

1. Recognize problems and state them in a manner.
2. Develop hypotheses that promise solutions to those problems.
3. Test the adequacy of these hypotheses in providing solutions for these problems.
4. Relate tested hypotheses to other generalizations in the body of theory.

In this way Economic Geography contributes to international understanding. It, undoubtedly, broadens our knowledge and outlook to a great extent and enables us to acquire a humanistic view-point. It is essential for the liberalization of our education system for the future citizens of the modern world, so that, with its help and under its influence, he might work for true global understanding between different nations.

Importance of the Study of Economic Geography

The main objective of Economic Geography is, as expounded, to examine man's economic achievement in terms of production and consumption in the light of his environment. To assess the relative importance of the study of this branch of geography, we have to evaluate the purposes that it serves.

Economic Geography, fundamentally, maintains a very close relation with man's economic welfare as other social sciences do; but the approach is radically different. Through various stages of interpretation and analysis it, in the final stage, attempts to point out the potential for development of a region, occupied by a certain group of people.

Disparity in the state of economic well-being and level of production is a common phenomenon. In order to eliminate such disparity, mobilization of resources is imperative. A careful study of the situation has to be undertaken before any move is initiated to mobilize resources to resolve problems. Economic Geography accomplishes this job.

The above condition may further be elaborated. The idea of the Damodar Valley Corporation was inherited from the Tennessee Valley Authority of USA. But the DVC failed to maximize the relative benefits as the TVA did.

At the time of installation of the multipurpose river valley project in the Damodar Valley area only the aspects of physical setting were compared, ignoring totally the cultural elements like the level of technology, industrialization, capital availability etc.

Thus, due to lack of proper cultural setting, the DVC failed to reap the same degree of benefit as the TVA. Because of latitudinal locations, climatic conditions in parts of Canada are almost similar to those of the CIS. The level of technological development also bears identity.

Under this identical framework, introduction of a more cold-resisting variety of wheat, developed in either of these countries can also meet with a similar degree of success. On the other hand, the early British colonial settlers in Ceylon (presently Sri Lanka) committed a great mistake in their attempt to introduce oat, barley, and wheat cultivation in the country while both the climatic as well as the pedogenic conditions were, by no means, conducive to those crops.

Drastic transformation of the existing pattern of culture by another is not scientifically justified. A pattern of culture evolves out of the dynamic interaction between man and nature. Despite the physical identity between two countries, culture of one country may not fit that of another.

Stages of past growth or heritage play a very decisive role in shaping the present destiny of man. It is, therefore, important to note that the factor of heritage, be it natural or cultural or human, should not be overlooked since any enforced evolution or imposition of culture may bring disastrous results.

Economic Geography makes a comparatively humble and integrated approach to such problems. It describes a country or region in terms of its natural, human and cultural environments with relation to man's economic way of life. A certain set of geo-economic conditions led to the development of the Japanese method of cultivation.

Prior to the introduction of such productive system of agriculture in India a careful examination of India's agrarian infrastructure is necessary; otherwise, mere adoption of such system may not produce fruitful results.

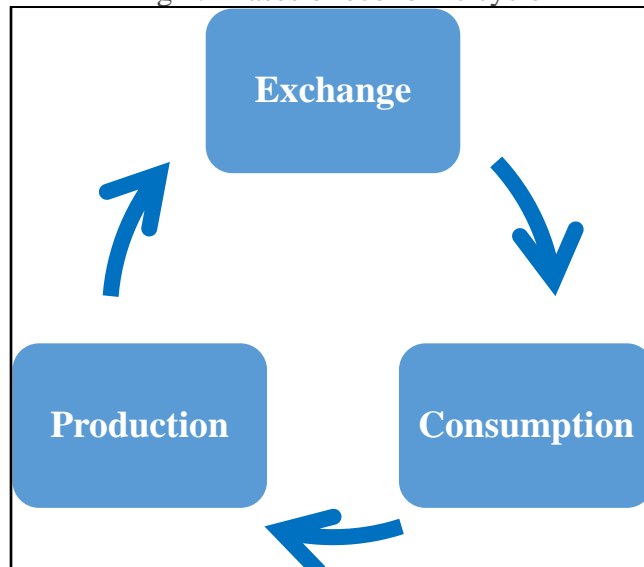
Economic Geography serves the purpose of identifying the influence that the environment exerts on man through the preservation of the multiple geo-economic conditions of different parts of the world. Any attempt that aims at the balanced development of economy could not succeed without the complete understanding of the man-environment inter-relationship.

Without any such knowledge economic relationship is bound to end up in a fiasco. It is a fait accompli. Economic Geography, therefore, serves as an essential tool for reducing and finally eliminating world societies' disparity gaps by scientific study of their economic resources, modern needs and cultural heritages.

2. Production, Exchange and Consumption

All economic activities can be grouped into three categories, namely, production, exchange and consumption. These are in fact the major phases through which economic cycle is completed (Fig 1).

Fig 1: Phases of economic cycle



Economic Geography focuses on the distribution of production, exchange and consumption activities. The economic geographer wishes to display the spatial distribution of these economic activities and to understand why they are located as they are. A significant part of this understanding lies in recognizing how economic activities are interrelated in particular areas and how the activities are tied to other economic activities at other locations.

1. **Production**

This phase of economic cycle includes following activities;

- Primary production includes age-old activities of production which are directly and indirectly taken from the earth such as hunting animals and gathering wild products; extracting minerals from the earth's crust; fishing from rivers, lakes and oceans; and growing trees. In general, five primary activities recognized are: agriculture, cattle grazing, forest production, hunting and fishing, and mining and quarrying.
- Secondary production increases the value or usefulness of a previously existing item by changing its form. Such activities include manufacturing and commercial agriculture.
- Tertiary production involves the service sector rather than the tangible goods. In tertiary production no particular article is directly related, various kinds of aids are rather used for transport, distribution and primary and secondary production.
- Quaternary services represent special type of services such as financial, health, education, information, data processing, etc.
- Quinary activities include high -level managerial and executive administrative services both public and private. Research scientists, legal authorities, financial advisers and professional consultants are included in this category.

2. **Exchange**

Exchange services are essential for goods produced. It is through exchange that a product reaches to its consumer. The following services are included in exchange activities

- Transportation and distribution services.
- Exchanging services and ideas by telecommunication or face-to-face contact.
- Satisfying the needs of people by changing their location (passenger transportation).

- Warehousing and distribution.
- Wholesale trade marketing activities.
- Retail trade marketing activities.

These exchanges increase the value of an item because of transportation and other services provided and also play an important role in modern economies.

3. Consumption

A third aspect of all the economic activities involves the consumption of goods and services. The term ‘consumption’ refers to the final or direct use of goods and services to satisfy the wants and needs of human beings. This aspect, i.e., geography of consumption has largely been ignored by the economic geographers in the past. But now, there is a growing interest among economic geographers to study spatial aspects of consumer behaviour.

The above mentioned activities are having functional interrelationship at various stages of economic production. This functional interrelationship is related to secondary and tertiary production through various services. The direct or indirect functional relation of all the resources of production depends upon location, relief, climate, soil and technical know-how of those areas. Just as the various aspects of primary production have established functional interrelationship with one another, in the same way, all the factors of secondary production have established functional relation with the factors of primary production.

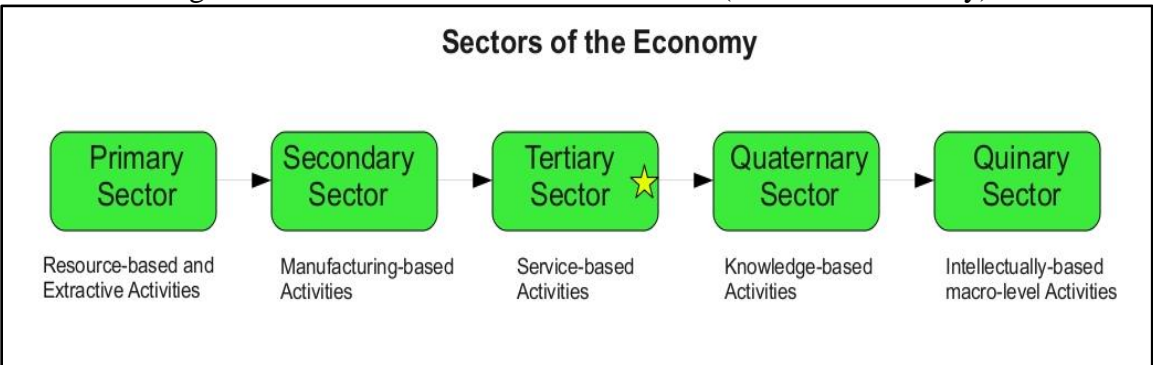
In the same way tertiary production has functional relation with the primary and secondary production. This functional interrelationship of production not only changes the form and utility of material but also effects a transformation in their ownership and value.

3. Classification of economic activities

Human activities which generate goods or income are known as economic activities. These economic activities or sectors of economy are broadly grouped into primary, secondary, tertiary activities. Higher services under tertiary activities are again classified into quaternary and quinary activities (fig 2). Examples of various types of economic activities are given in fig 3.

A nation’s economy can be divided into various sectors (economic activities) to define the proportion of the population engaged in the activity sector. This categorization is seen as a continuum of distance from the natural environment. The continuum starts with the primary sector, which concerns itself with the utilization of raw materials from the earth such as agriculture and mining. From there, the distance from the raw materials of the earth increases.

Fig 2: Classification of economic activities (sectors of economy)



1. Primary economic activities

Primary activities are directly dependent on environment as these refer to utilization of earth’s resources such as land, water, vegetation, building materials and minerals. The primary sector of the economy extracts or harvests products from the earth. The primary sector includes the production of raw material and basic foods. Activities associated with the primary sector include agriculture (both subsistence and commercial), mining, forestry, farming, grazing, hunting and gathering, fishing, and quarrying. The packaging and processing of the raw material associated with this sector is also considered to be part of this sector.

In developed and developing countries, a decreasing proportion of workers are involved in the primary sector. About 3% of the U.S. labor force is engaged in primary sector activity today, while more than two-thirds of the labor force was primary sector workers in the mid-nineteenth century.

People engaged in primary activities are called red-collar workers due to the outdoor nature of their work.

People engaged in primary economic activities = Red-collar workers

2. Secondary economic activities

Secondary activities add value to natural resources by transforming raw materials into valuable products.

The secondary sector of the economy manufactures finished goods. All of manufacturing, processing, and construction lies within the secondary sector. Activities associated with the secondary sector include metal working and smelting, automobile production, textile production, chemical and engineering industries, aerospace manufacturing, energy utilities, engineering, breweries and bottlers, construction, and shipbuilding. People engaged in secondary activities are called blue collar workers.

People engaged in secondary economic activities = Blue-collar workers

3. Tertiary economic activities

Tertiary activities include both production and exchange. The production involves the 'provision' of services that are 'consumed. Exchange, involves trade, transport and communication facilities that are used to overcome distance.

The tertiary sector of the economy is the service industry. This sector provides services to the general population and to businesses. Activities associated with this sector include retail and wholesale sales, transportation and distribution, entertainment (movies, television, radio, music, theater, etc.), restaurants, clerical services, media, tourism, insurance, banking, healthcare, and law.

In most developed and developing countries, a growing proportion of workers are devoted to the tertiary sector. In the U.S., more than 80% of the labour force is tertiary workers.

People engaged in tertiary economic activities = Pink-collars

4. Quaternary economic activities

The quaternary sector of the economy consists of intellectual activities.

Activities associated with this sector include government, culture, libraries, scientific research, education, and information technology.

Quaternary activities are specialized tertiary activities in the 'Knowledge Sector' which demands a separate classification. There has been a very high growth in demand for and consumption of information based services from mutual fund managers to tax consultants, software developers and statisticians. Personnel working in office buildings, elementary schools and university classrooms, hospitals and doctors' offices, theatres, accounting and brokerage firms all belong to this category of services. Like some of the tertiary functions, quaternary activities can also be outsourced. They are not tied to resources, affected by the environment, or necessarily localized by market.

People engaged in quaternary economic activities = White-collars

5. Quinary economic activities

Quinary activities are services that focus on the creation, re-arrangement and interpretation of new and existing ideas; data interpretation and the use and evaluation of new technologies. Often referred to as 'gold collar' professions, they represent another subdivision of the tertiary sector representing special and highly paid skills of senior business executives, government officials, research scientists, financial and legal consultants, etc. Their importance in the structure of advanced economies far outweighs their numbers. The highest level decision makers or policy makers are the people who perform quinary activities.

Some consider there to be a branch of the quaternary sector called the quinary sector, which includes the highest levels of decision making in a society or economy. This sector would include the top executives or officials in such fields as government, science, universities, nonprofit, healthcare, culture, and the media.

An Australian source relates that the quinary sector in Australia refers to domestic activities such as those performed by stay-at-home parents or homemakers. These activities are typically not measured by monetary amounts but it is important to recognize these activities in contribution to the economy.

People engaged in quinary economic activities = Gold-collars

Fig 3: Examples of economic activities

PRIMARY	SECONDARY	TERTIARY	QUATERNARY	QUINARY
Extracts or harvests products from the earth, includes raw materials and basic foods: <div><div></div> Agriculture. <div></div> Mining. <div></div> Forestry. <div></div> Farming. <div></div> Grazing. <div></div> Hunting. <div></div> Gathering. <div></div> Fishing. <div></div> Quarrying.</div>	Manufactures finished goods: <div><div></div> Metal working and smelting. <div></div> Automobile production. <div></div> Textile production. <div></div> Chemical and engineering Industries. <div></div> Aerospace manufacturing. <div></div> Energy utilities. <div></div> Engineering. <div></div> Breweries and bottlers. <div></div> Construction. <div></div> Shipbuilding.</div>	The service industry: <div><div></div> Retail and Wholesale sales. <div></div> Transportation and distribution. <div></div> Entertainment. <div></div> Restaurants. <div></div> Clerical services. <div></div> Media. <div></div> Tourism. <div></div> Insurance. <div></div> Banking. <div></div> Healthcare. <div></div> Law.</div>	Consider intellectual activities: <div><div></div> Government. <div></div> Culture. <div></div> Libraries. <div></div> Scientific research. <div></div> Education. <div></div> Information technology.</div>	It's a branch of quaternary sector which includes the highest level of decision making in a society or economy: <div><div></div> Government. <div></div> Science. <div></div> Universities. <div></div> Nonprofit. <div></div> Healthcare. <div></div> Culture. <div></div> Media.</div>

4. Approaches to the study of economic geography

There are several approaches to the study of Economic Geography but some most important of them are given here (figs 4).

- 1. Regional approach
- 2. Topical approach (includes activity approach and commodity approach).
- 3. Historical approach
- 4. Inductive approach
- 5. Deductive approach
- 6. System approach
- 7. Integrated approach

These approaches provide general guide lines to conduct study regarding various topics of the subject.

Fig 4: Approaches to the study of economic geography

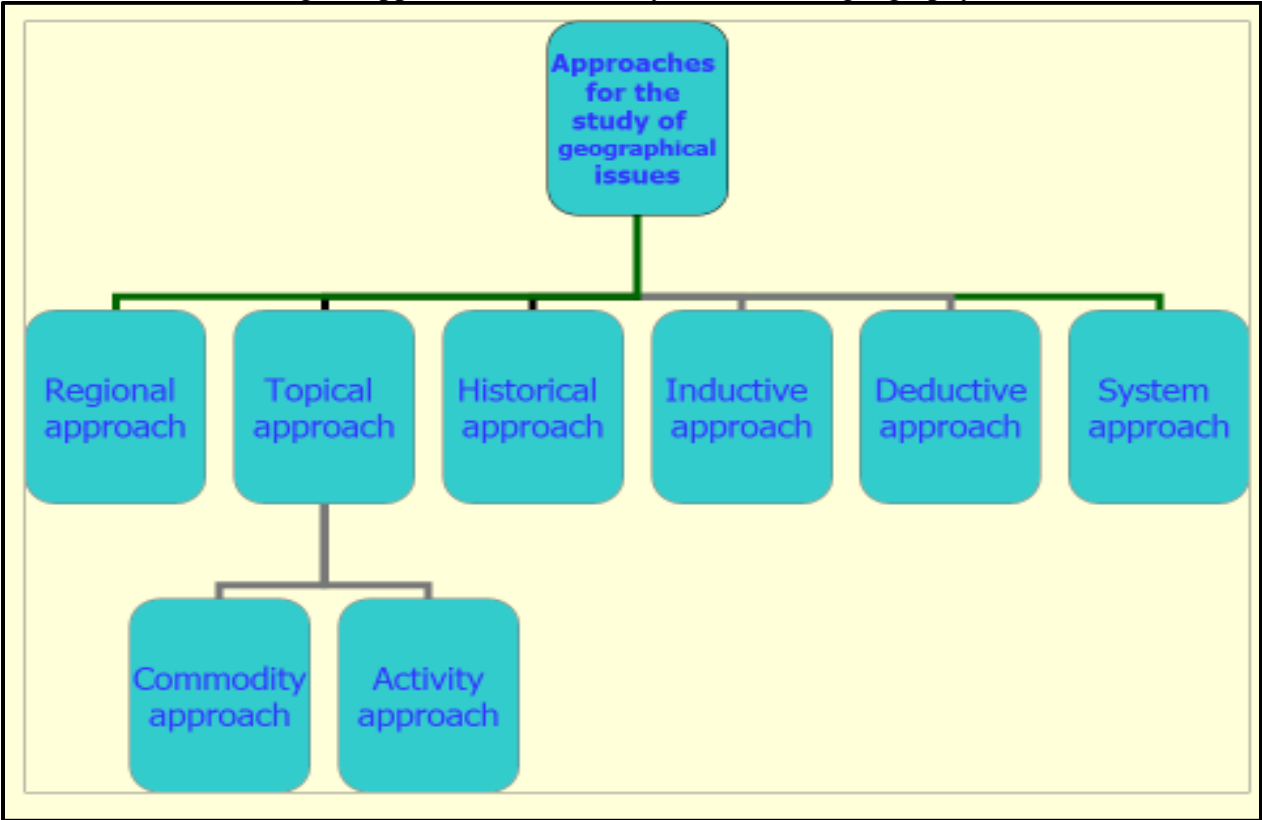


Fig 5: Regional approach

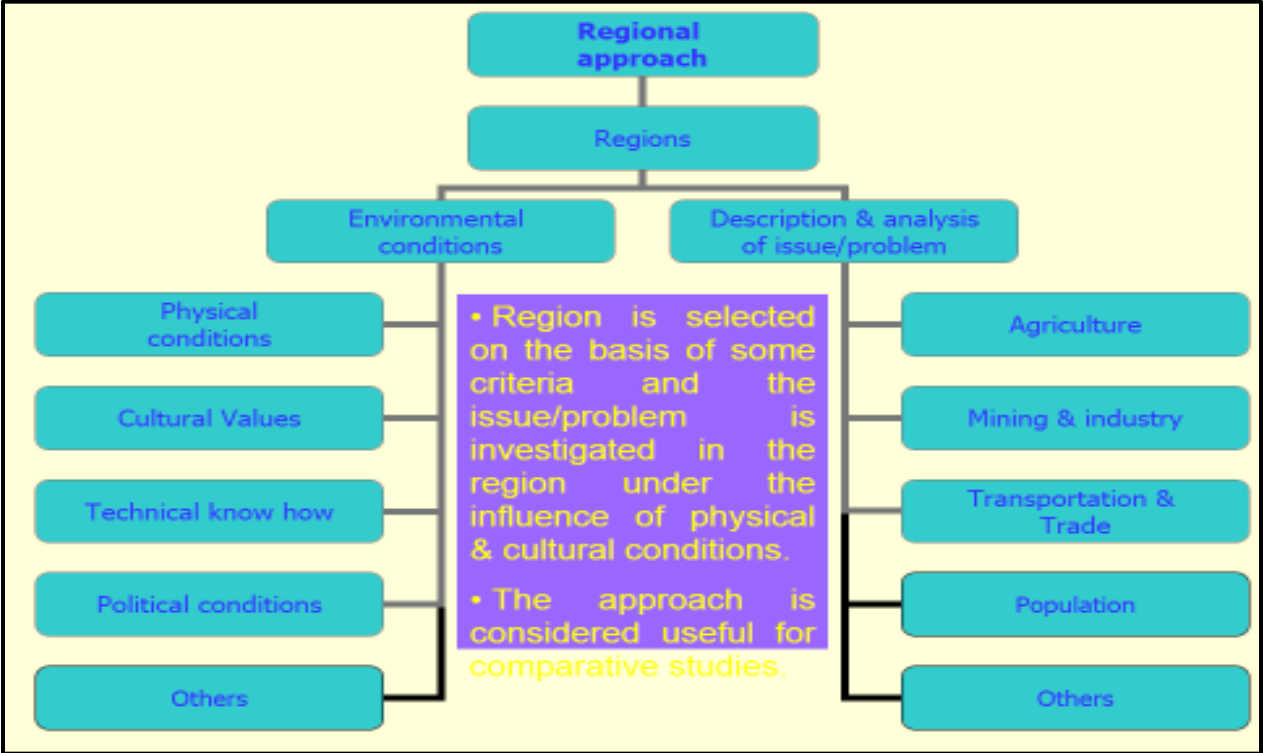
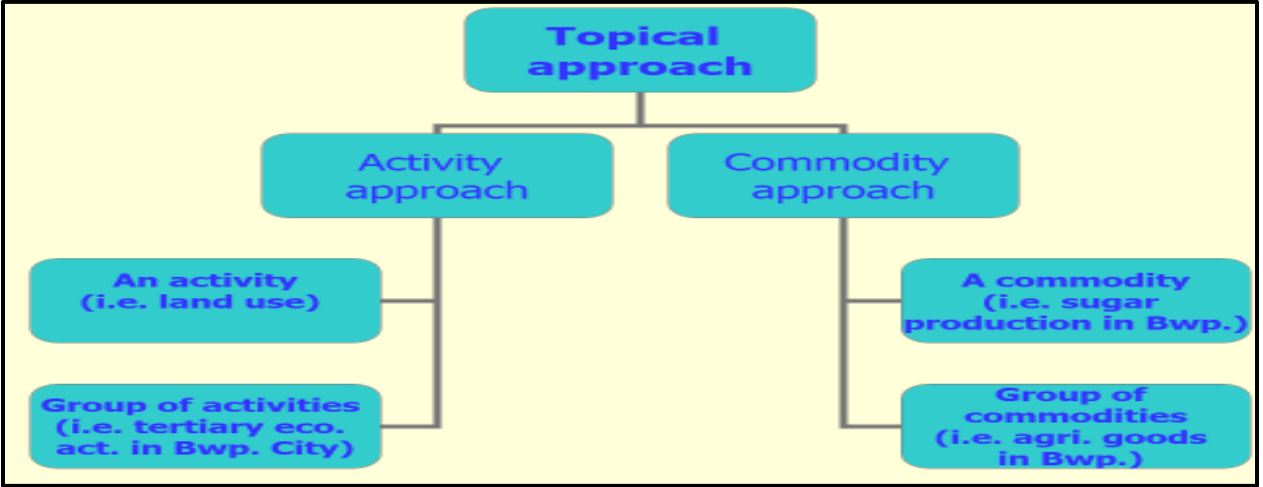


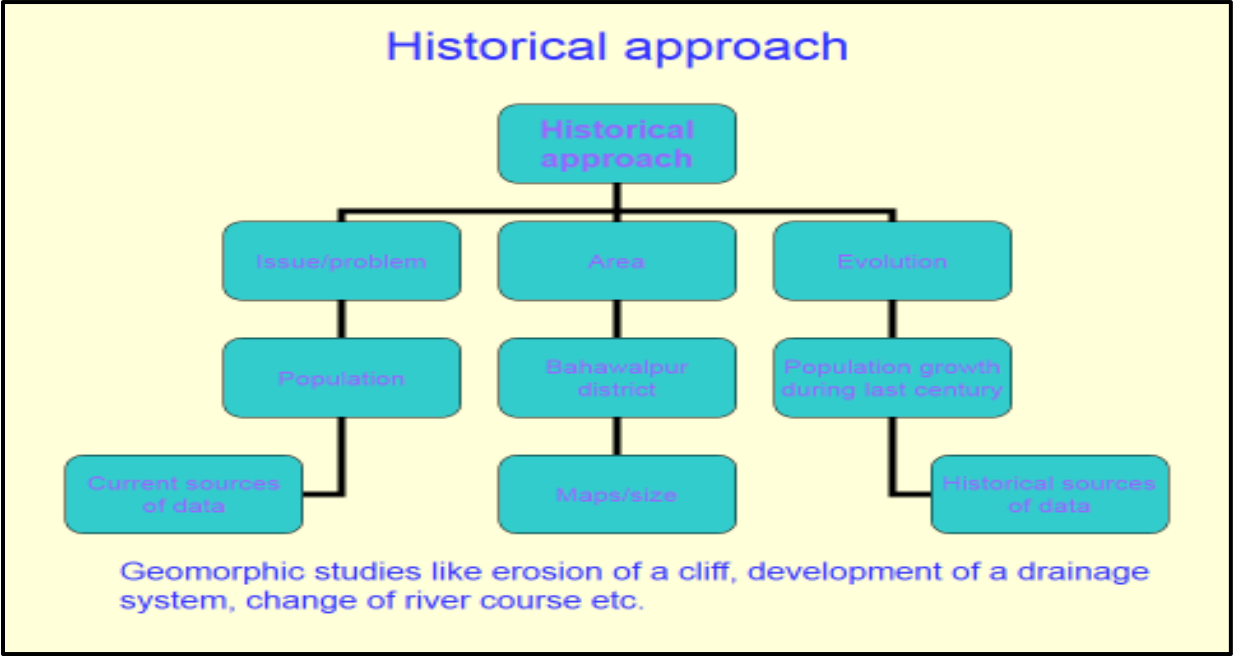
Fig 6: Topical approach



Way of investigation of topical approach is based on following four questions;

- What? (Topic/problem)
- Where? (Location/delimiting)
- How? (Characteristics)
- Why? (Factors)

Fig 7: Historical approach



Inductive approach

Inductive approach, also known as inductive reasoning or inductive logic, is a type of reasoning which involves moving from a set of specific facts to a general conclusion. It can also be seen as a form of theory-building, in which specific facts are used to create a theory that explains relationships between the facts and allows prediction of future knowledge. The premises of an inductive logical argument indicate some degree of support (inductive probability) for the conclusion but do not entail it; i.e. they do not ensure its truth. Induction is used to ascribe properties or relations to types based on an observation instance (i.e., on a number of observations or experiences); or to formulate laws based on limited observations of recurring phenomenal patterns. Induction is employed, for example, in using specific propositions such as:

- This ice is cold (or all ice I have ever touched was cold).
- This billiard ball moves when struck with a cue. (or of one hundred billiard balls struck with a cue, all of them moved).

To infer general propositions such as:

All ice is cold.

All billiard balls move when struck with a cue.

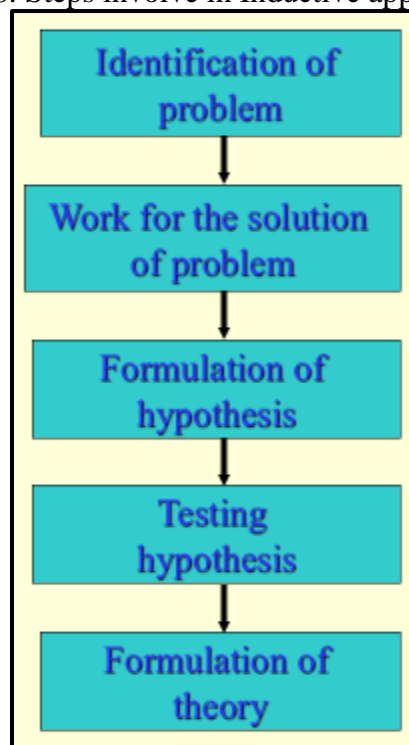
Another example would be:

$3+5=8$ and eight is an even number. Therefore, an odd number added to another odd number will result in an even number.

While using inductive approach a geographer must be trained along following four principal lines (fig 8);

1. To recognize problems and to state them in such a manner that they can be solved
2. To develop hypothesis that promise solutions to those problems
3. To test the adequacy of these hypothesis in providing solutions for the problems under consideration
4. To relate tested hypothesis to other generalization in the body of theory

Fig 8: Steps involve in Inductive approach



Deductive approach

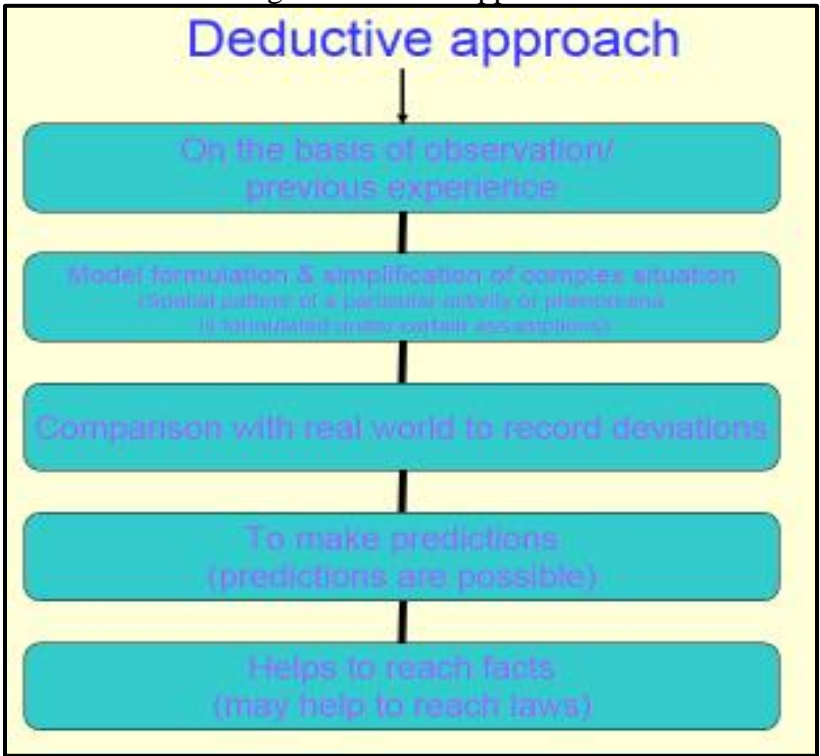
Deductive reasoning was first described by the ancient Greek philosophers such as Aristotle.

Drawing conclusions by applying rules or principles; logically moving from a general rule or principle to a specific solution.

Deductive methods involve beginning with a general concept or given rule and moving on to a more specific conclusion. Solving a math problem or conducting a science experiment is just like the mysteries presented by this method. Clues are presented concerning the conclusion and using the information given as well as previous knowledge, you can solve the mystery

Deductive reasoning is the process of reaching a conclusion that is guaranteed to follow, if the evidence provided is true and the reasoning used to reach the conclusion is correct. The conclusion also must be based only on the evidence previously provided; it cannot contain new information about the subject matter.

Fig 9: Deductive approach

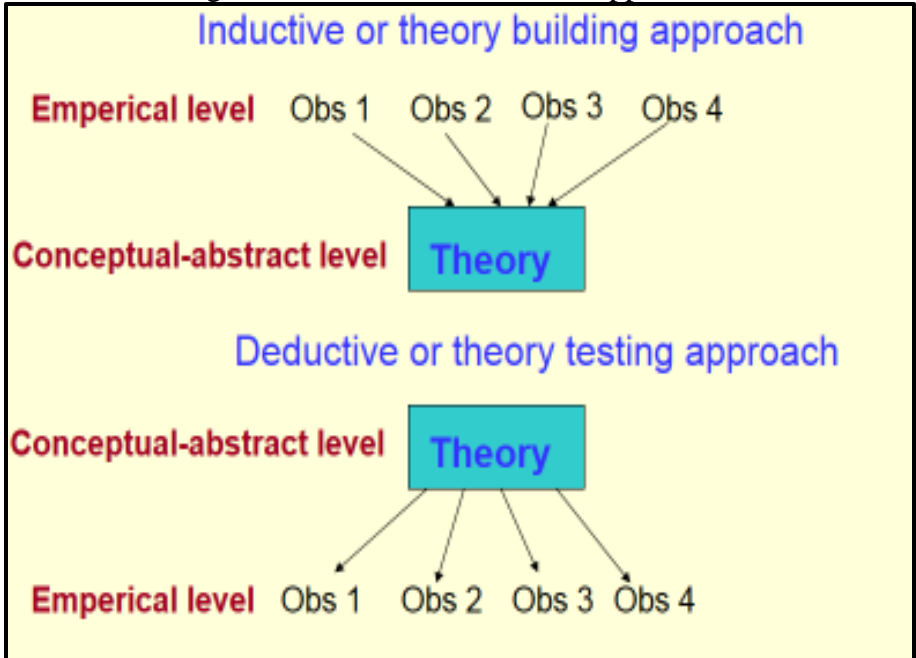


Comparison of inductive and deductive approaches

Inductive reasoning works from observation (or observations) toward generalizations and theories. This is also called a “bottom-up” approach. Inductive reason starts from specific observations (or measurement if you are mathematician or more precisely statistician), look for patterns (or no patterns), regularities (or irregularities), formulate hypothesis that we could work with and finally ended up developing general theories or drawing conclusion. In a conclusion, when we use Induction we observe a number of specific instances and from them infer a general principle or law. Inductive reasoning is open-ended and exploratory especially at the beginning. On the other hand, deductive reasoning is narrow in nature and is concerned with testing or confirming hypothesis.

Deductive reasoning works the other way. It works from the "general" to the "specific". This is also called a "top-down" approach. The deductive reasoning works as follows: think of a theory about topic and then narrow it down to specific hypothesis (hypothesis that we test or can test). Narrow down further if we would like to collect observations for hypothesis (note that we collect observations to accept or reject hypothesis and the reason we do that is to confirm or refute our original theory). In a conclusion, when we use deduction we reason from general principles to specific cases, as in applying a mathematical theorem to a particular problem or in citing a law or physics to predict the outcome of an experiment.

Fig 10: Inductive and deductive approaches



System approach

Sometimes geographers study phenomena's considering them complete systems. System is a set of interdependent objects and the relationship between them. The system may work in cyclic manner. The system may be of regional, national, or global level. Examples; transportation system, education system, political system, administrative system, agricultural system, land use system, economic system, industrial system, and so on.

The term "systems" is derived from the Greek word "synistanai," which means "to bring together or combine." The term has been used for centuries. Components of the organizational concepts referred to as the "systems approach" has been used to manage armies and governments for millennia. However, it was not until the Industrial expansion of the 19th and 20th centuries that formal recognition of the "systems" approach to management, philosophy, and science emerged.

As the level of precision and efficiency demanded of technology, science, and management increased the complexity of industrial processes, it became increasingly necessary to develop a conceptual basis to avoid being overwhelmed by complexity. The systems approach emerged as scientists and philosophers identified common themes in the approach to managing and organizing complex systems.

Four major concepts underlie the systems approach:

- **Specialization:** A system is divided into smaller components allowing more specialized concentration on each component.
- **Grouping:** To avoid generating greater complexity with increasing specialization, it becomes necessary to group related disciplines or sub-disciplines.
- **Coordination:** As the components and subcomponents of a system are grouped, it is necessary to coordinate the interactions among groups.
- **Emergent properties:** Dividing a system into subsystems (groups of component parts within the system), requires recognizing and understanding the "emergent properties" of a system; that is, recognizing why the system as a whole is greater than the sum of its parts. For example, two forest stands may contain the same tree species, but the spatial arrangement and size structure of the individual trees will create different habitats for wildlife species. In this case, an emergent property of each stand is the wildlife habitat.

The systems approach considers two basic components: elements and processes.

Elements are measurable things that can be linked together. They are also called objects, events, patterns, or structures.

Processes change elements from one form to another. They may also be called activities, relations, or functions. In a system the elements or processes are grouped in order to reduce the complexity of the system for conceptual or applied purposes.

Depending on the system's design, groups and the interfaces between groups can be either elements or processes. Because elements or processes are grouped, there is variation within each group. Understanding the nature of this variation is central to the application of systems theory to problem-solving.

Ecosystems are composed of elements and processes. (These are usually referred to as ecosystem structures and functions or the patterns and processes of an ecosystem.) As an example, the elements of a forest ecosystem might include trees, shrubs, herbs, birds, and insects, while the processes might include growth, mortality, decomposition, and disturbances.

Some systems are open with respect to certain elements or processes. The elements or processes can flow into or out of the system. For example, an automobile engine is "open" with respect to gasoline which flows in, and an exhaust (oxidized gasoline) flows out.

Other systems are closed with respect to certain elements or processes. The elements or processes do not leave the system. For example, an automobile engine is largely "closed" with respect to lubricating oil--the oil does not leave the engine.

Ecological systems are open systems with respect to most elements and processes. They receive energy and nutrient inputs from their physical environment and, at the same time, cycle nutrients back out of the system. They are also open to outside influences such as disturbances (e.g., hurricanes, ice storms, fires, insect outbreaks).

Most systems contain nested systems; that is, subsystems within the system. Similarly, many systems are subsystems of larger systems.

Integrated approach

None of the above mentioned approaches is exclusive. They overlap considerably. These approaches use data, quantitative techniques, and GIS techniques. All the approaches have their merits and demerits. No single approach can fulfill the complete requirements of a study. Thus, a unified/integrated approach can give better results.

5. Economic growth, economic development and Rostow model

Economic growth and economic development

In general, the terms “Economic Growth” and “Economic Development” are used to express the same idea i. e., “Economic Advancement”. But the term economic development is more comprehensive in its scope. Growth means persistent increase in per capita income. While development includes growth and structural changes like, infrastructural, social and political in the country.

Economic growth

The term economic growth is only concerned with raising income level and volume of production of goods and services.

According to Micheal P. Todaro

“Economic growth is a steady process by which the productive capacity of the economy is increased over time to bring about rising levels of national output and income”.

According to Simon Kuznets

“Economic growth may be defined as a long term process wherein the substantial and sustained rise in real national income, total population and real per capita income takes place”.

Essentials of Economic Growth

- Above definitions are showing following basics of economic growth:
- Economic growth is a long run process; it includes a period of decades.
- Economic growth shows higher rate of increase in real per capita income than rate of growth of population.
- Economic growth is always linked with large increase in productive ability of the economy.
- Economic growth is connected with the fair distribution of income and wealth.
- Economic growth is attached with the reduction in poverty and unemployment.

Economic development

The basic feature of economic development is to raise income level and improve the human being.

Simple Definition

“It refers to the process whereby the total supply of goods and services of the society increases leading towards improved living standard.”

According to Micheal P. Todaro

“Development must be conceived (considered) for as a multi-dimensional process involving major change in social structures, popular attitudes and national institutions as well as the acceleration of eco-growth, the eradication (end) of poverty and reduction of inequality of wealth.”

Structural Changes of Economic Development

Economic development represents following structural changes in various sectors of the country:

- There is a change in the occupational structure. In economic development there is decrease in the share of labour force in primary sector (farming, fishing and mining etc.) and increase in the share of labour force in secondary sector (industry etc.).
- There is a change in the structure of national output. The contribution of primary sector in the national output falls and the share of secondary and tertiary (3rd) sector slowly go up.
- There is a change in the structure of industrial production. There is an increase in the production of capital goods and decrease in the production of consumer goods.
- There is a change in the structure of foreign trade. The share of primary goods in exports decreases and the share of capital goods in imports increase. Accordingly, in economic development there is an increase in exports of manufactured and final goods. Similarly, there is decrease in the imports of consumer items.
- There is a change in the structure of technology. In the economic development modern and advanced techniques are used in all the sectors of economy.
- There is a change in the social and institutional sector. Due to economic development there is an increase in the self-esteem and living standard of the population.

Conclusion

We conclude that, normally the terms economic growth and economic development are used for the explanation of encouraging changes in the economic achievements of a country.

Economic Growth = Annual increase in per capita income
 Economic Development = Economic Growth + Structural Changes

Economic Growth is a narrower concept than economic development. It is an increase in a country's real level of national output which can be caused by an increase in the quality of resources (by education etc.), increase in the quantity of resources & improvements in technology or in another way an increase in the value of goods and services produced by every sector of the economy. Economic Growth can be measured by an increase in a country's GDP (gross domestic product).

Economic development is a normative concept i.e. it applies in the context of people's sense of morality (right and wrong, good and bad). The definition of economic development given by Michael Todaro is an increase in living standards, improvement in self-esteem needs and freedom from oppression as well as a greater choice. The most accurate method of measuring development is the Human Development Index which takes into account the literacy rates & life expectancy which affect productivity and could lead to Economic Growth. It also leads to the creation of more opportunities in the sectors of education, healthcare, employment and the conservation of the environment. It implies an increase in the per capita income of every citizen. Economic Growth does not take into account the size of the informal economy. The informal economy is also known as the black economy which is unrecorded economic activity. Development alleviates people from low standards of living into proper employment with suitable shelter. Economic Growth does not take into account the depletion of natural resources which might lead to pollution, congestion & disease. Development however is concerned with sustainability which means meeting the needs of the present without compromising future needs. These environmental effects are becoming more of a problem for Governments now that the pressure has increased on them due to Global warming. Economic growth is a necessary but not sufficient condition of economic development.

Rostow's Model of economic growth

The **Rostow's Stages of Economic Growth** model is one of the major historical models of economic growth. It was published by American economist Walt Whitman Rostow in 1960. The model postulates that economic growth occurs in five basic stages, of varying length:^[1]

- Traditional society
- Preconditions for take-off
- Take-off
- Drive to maturity
- Age of High mass consumption

Rostow's model is one of the more structuralist models of economic growth, particularly in comparison with the 'backwardness' model developed by Alexander Gerschenkron, although the two models are not mutually exclusive. Rostow argued that economic take-off must initially be led by a few individual sectors. This belief echoes Ricardo's comparative thesis and criticizes Marxist revolutionaries' push for economic self-reliance in that it pushes for the 'initial' development of only one or two sectors over the development of all sectors equally. This became one of the important concepts in the theory of modernization in social evolutionism.

Below is a detailed outline of Rostow's five stages:

1. Traditional society

- Characterized by subsistence agriculture or hunting and gathering; almost wholly a "primary" sector economy
- Limited technology
- A static or 'rigid' society: lack of class or individual economic mobility, with stability prioritized and change seen negatively

2. Pre-conditions to "take-off"

- External demand for raw materials initiates economic change;
- Development of more productive, commercial agriculture and cash crops not consumed by producers and/or largely exported
- Widespread and enhanced investment in changes to the physical environment to expand production (i.e. irrigation, canals, ports)
- Increasing spread of technology and advances in existing technologies
- Changing social structure, with previous social equilibrium now in flux
- Individual social mobility begins
- Development of national identity and shared economic interests

3. Take off

- Urbanization increases, Industrialization proceeds, Technological breakthrough occurs
- The "secondary" (goods-producing) sector expands and ratio of secondary vs. primary sectors in the economy shifts quickly towards secondary
- Textiles and apparel are usually the first "take-off" industry, as happened in Great Britain's classic "Industrial Revolution"

4. Drive to maturity

- Diversification of the industrial base; multiple industries expand and new ones take root quickly
- Manufacturing shifts from investment-driven (capital goods) towards consumer durables and domestic consumption
- Rapid development of transportation infrastructure
- Large-scale investment in social infrastructure (schools, universities, hospitals, etc.)

5. Age of mass consumption

- The industrial base dominates the economy; the primary sector is of greatly diminished weight in economy and society
- Widespread and normative consumption of high-value consumer goods (e.g. automobiles)
- Consumers typically (if not universally), have disposable income, beyond all basic needs, for additional goods

Rostow claimed that these stages of growth were designed to tackle a number of issues, some of which he identified himself; and wrote, "Under what impulses did traditional, agricultural societies begin the process of their modernization? When and how did regular growth become a built-in feature of each society? What forces drove the process of sustained growth along and determined its contours? What common social and political features of the growth process may be discerned at each stage? What forces have determined relations between the more developed and less developed areas; and what relation if any did the relative sequence of growth bear to outbreak of war? And finally where is compound interest taking us? Is it taking us to communism; or to the affluent suburbs, nicely rounded out with social overhead capital; to destruction; to the moon; or where?" Rostow asserts that countries go through each of these stages fairly linearly, and set out a number of conditions that were likely to occur in investment, consumption and social trends at each stage. Not all of the conditions were certain to occur at each stage, however, and the stages and transition periods may occur at varying lengths from country to country, and even from region to region.

Fig 11: Stages of development stated by Rostow

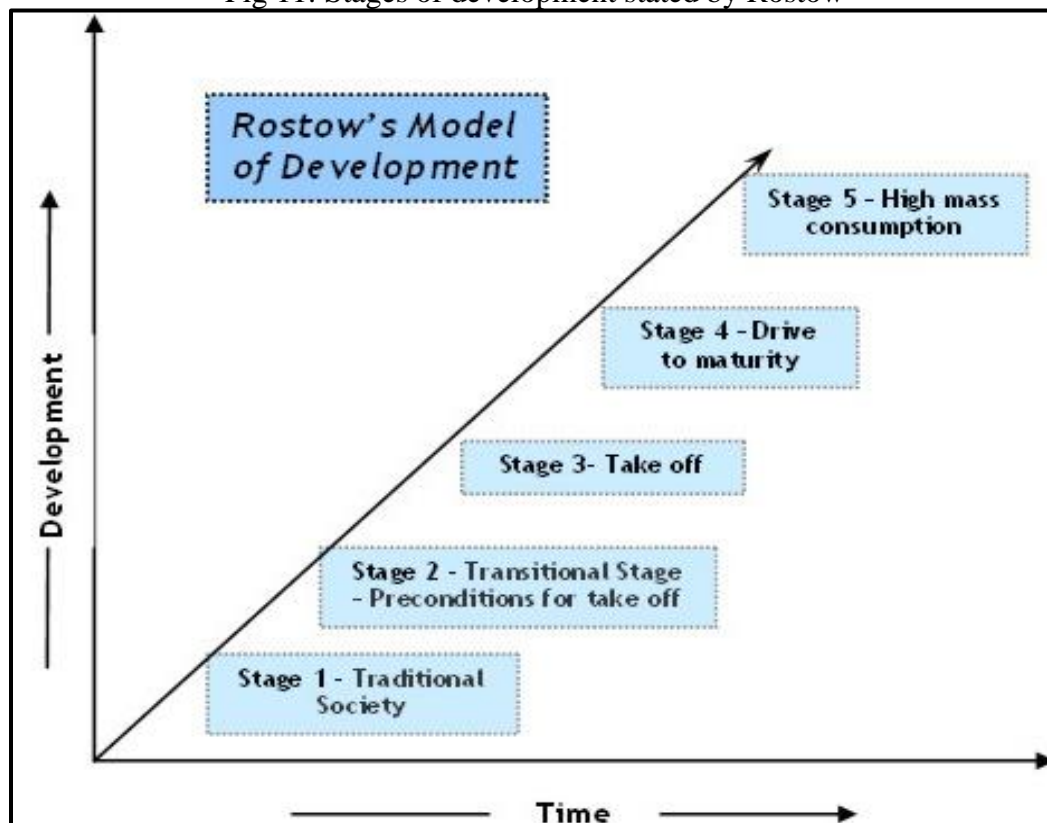


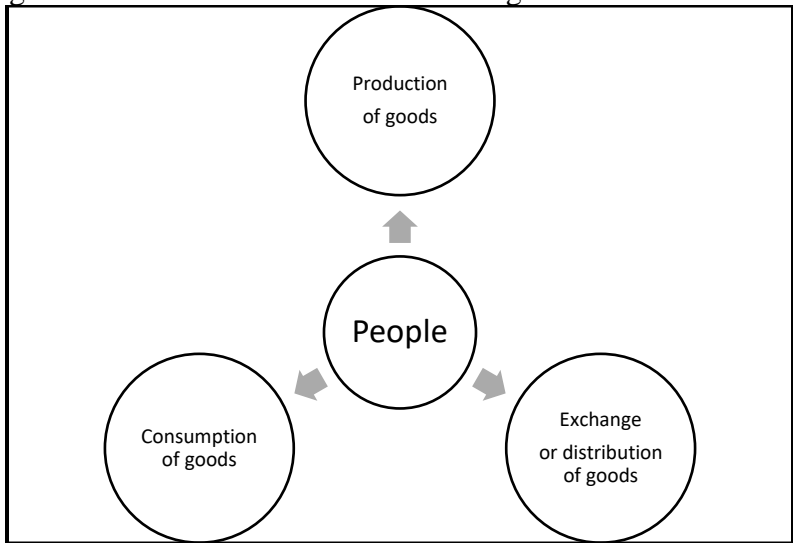
Fig 12: Main features of the stages of development stated by Rostow

	Primary Sector	Secondary Sector	Tertiary Sector
The Traditional Society	Vast Majority	Very Few	Very Few
Pre-conditions for Take Off	Vast Majority	Few	Very Few
Take Off	Declining	Rapid Growth	Few
The Drive to Maturity	Few	Stable	Growing Rapidly
High Mass Consumption	Very Few	Declining	Vast Majority

6. Human Resources

Human resources are very important to explore and utilize the natural resources. In economic geography, the study of human population becomes more important because people are the producer, distributor and consumer of resources (fig 13). In order to earn livelihood, people all over the world are engaged in different kinds of economic activities. Three aspects of human population, growth, distribution and problems resulting from rapidly expanding population are considered here.

Fig 13: Role of human resources in linkage of economic activities



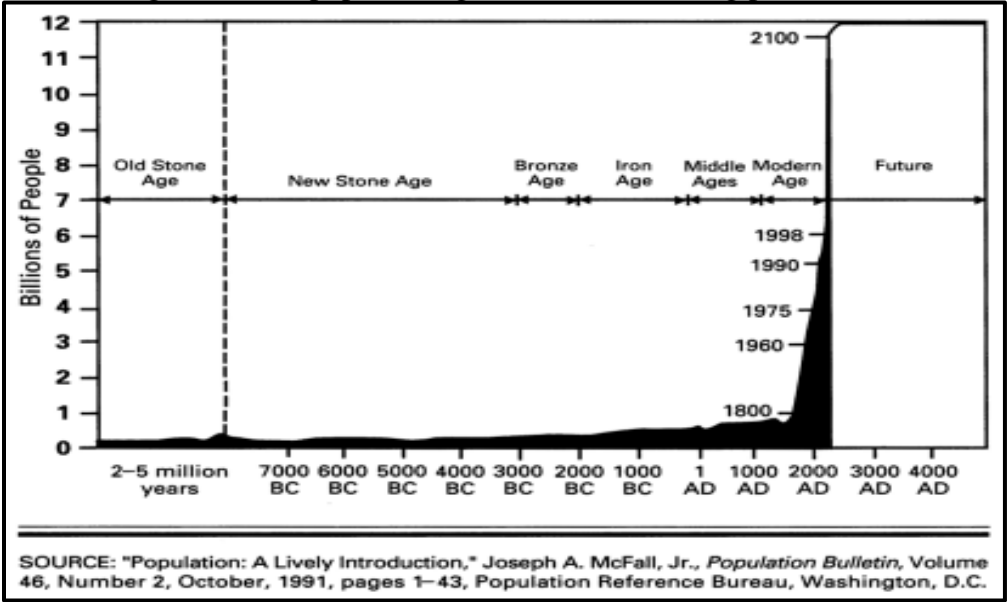
Population growth

Population growth refers to the growth of the human population in a particular area during a specific period of time. In the world population, individuals are added by natural increase while in the population of countries or individual areas, people are added due to both natural increase and migration. To understand world population growth temporally, it can be divided into following three distinctive phases;

1. Past population growth trends (mainly influenced by agricultural revolution, industrial revolution and revolution in medical sciences). Past population growth process (fig 14) can be divided in to following three phases;
 - Very very slow growth upto agricultural revolution of 8000 BC
 - Slow growth up to industrial revolution of 1750 AD
 - Accelerated growth started due to industrial revolution which was further geared up due to medical revolution of 1950s.
2. Present growth trends (Fast growth in LDCs and slow growth in MDCs is occurring). Follow world population data sheets of 2018 & 2019 available on internet.

3. Future predictions (Different possibilities have been pointed out by the experts). In this regard law of seventy stated as, population doubling time $PDT = 70/GR$ (PDT stand for population doubling time and GR stands for population growth rate), T. R. Malthus theory and Paul Ehrlich views can be helpful.

Fig 14: World population growth curve showing past trends



Past and present data shows that world population has grown at an increasing pace over time. At present it has reached to about 7.7 billion and growing at a rate of 1.2 percent per year. About 90 million individuals are added to it each year (table 1).

Table 1: World population growth

Billions of People on Earth	Year	Time Span
1 B	1800 AD	50,000 years
2 B	1930	130 years
3 B	1960	30 years
4 B	1975	15 years
5 B	1987	12 years
6 B	2000	13 years
7 B	2011	11 years
8 B	2025	14 years
9 B	2045	20 years

Experts currently project that Earth's population will reach just over nine billion by 2050, with virtually all growth occurring in developing countries. Future fertility trends will strongly affect the course of population growth. This estimate assumes that fertility will decline from 2.6 children per woman in 2005 to slightly over 2 children per woman in 2050. If the rate falls to 2.5 children per woman would increase world population to 10.6 billion by 2050. World population growth in the 21st century will be different from previous decades in several important ways.

- First, humans are living longer and having fewer children, so there will be high number of older people (age 60 and above) than very young people (age zero to four).
- Second, nearly all population growth will take place in urban areas.
- Third, fertility rates will continue to decline

All of these trends will affect nations' economic development. Senior citizens can be active and productive members of society, but they have many unique needs in areas ranging from medical care to housing and transportation. Growing elderly populations will strain social services, especially in countries that do not have well-developed social safety nets to guarantee adequate incomes for older citizens. In countries that have "Pay As You Go" social security programs,

increasing ratios of older to younger people may create budget imbalances because fewer workers are paying funds into the system to support growing numbers of retirees.

As societies age, demand for younger workers will increase, drawing more people into the labor force and attracting immigrants in search of work. Declining fertility rates allow more women to work outside of the home, which increases the labor supply and may further accelerate the demographic transition

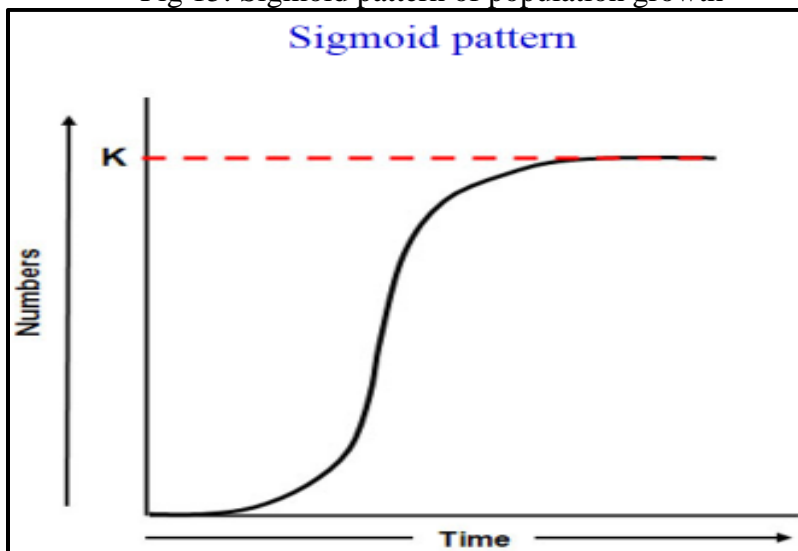
As fertility rates fall, some countries have already dropped below replacement level; the number of children per woman that keeps population levels constant when births and deaths are considered together over time (assuming no net migration). Replacement-level fertility requires a total fertility rate of about 2.1 to offset the fact that some children will die before they reach adulthood and have their own families (in a society with higher mortality rates, replacement-level fertility would require more births). Total fertility rates in most European and some Asian and Caribbean countries currently range from about 1.2 to 1.8, well below replacement level.

Some observers argue that declining fertility rates in both industrialized and developing countries will lead to a "birth dearth," with shrinking populations draining national savings and reducing tax revenues. However, societies can transition successfully from high mortality and fertility to low mortality and fertility with sound planning. Promoting good health standards (especially for children), expanding education, carefully opening up to international trade, and supporting older citizens through retirement are all policies that can help to offset the negative impacts on society of an aging population.

Among many future possibilities predicted by the experts, following three are commonly mentioned and discussed;

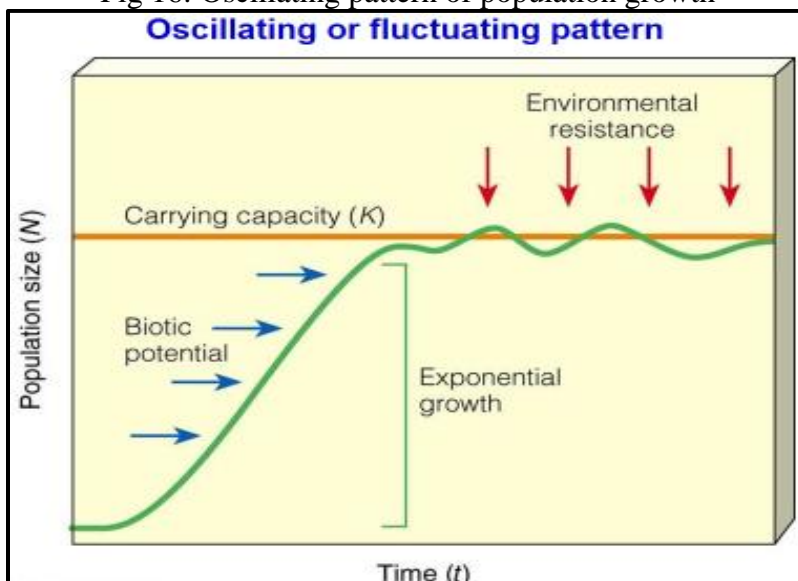
1. Sigmoid pattern of growth is possible if population remains within the limits of earth's carrying capacity (fig 15).

Fig 15: Sigmoid pattern of population growth



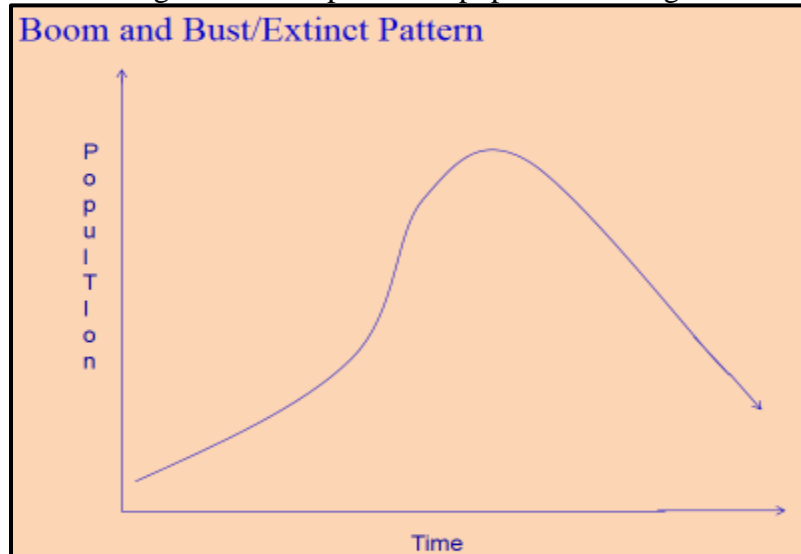
2. Oscillating or fluctuating pattern of growth is possible if population size fluctuate up and down the earth's carrying capacity following the production wise good and bad years (fig 16).

Fig 16: Oscillating pattern of population growth



- Extinct pattern of growth is possible if population declines to very low size due to serious problems like unlivable environment, diseases, famines, wars etc. (fig 17).

Fig 17: Extinct pattern of population change



Population distribution over the world

Presently, the Earth contains over 7.7 billion people. But these people are not evenly spread over the world's habitable surface. People are very unevenly distributed (fig 18). Where are all these people located? Many factors contribute to the geographic spread of population around the globe. Mainly following groups of factors control the distribution of population over the globe;

- Physical or environmental factors such as climate, terrain and topography, soils etc.
- Economic factors such as resources, trade, agriculture and other economic activities
- Social factors such as religion, norms, educational opportunities etc.
- Political factors such political boundaries, political stability, migration rules etc.
- Biological factors such as diseases, healthy environments, fertility rates etc.

However, broad general patterns of populations on earth can still be understood. Here the general characteristics of Earth's human population distribution are outlined. Highly uneven distribution of population is mainly due to uneven distribution of resources & marked variations in geographic environment.

In recent age industrialization, improved means of transportation & communication, trade, and urbanization are also the main factors affecting population distribution in the world.

- About 80% of the world population is concentrated on 20% of the land area on one side and 20% population is sparsely distributed on 80% of the land area on the other side.
- Another view exists that 20% of the land surface is too cold to live, 20% is too dry to live, 20% is too marshy, and 20% is too rugged. So, only 20% remaining land is habitable and 80% is uninhabitable.

The major population centers around the world include;

- East Asia (China, the Koreas, and Japan)
- South Asia (India, Pakistan, and Bangladesh)
- South East Asia
- Europe (Western, Eastern, and Southern Europe)
- North Eastern North America.

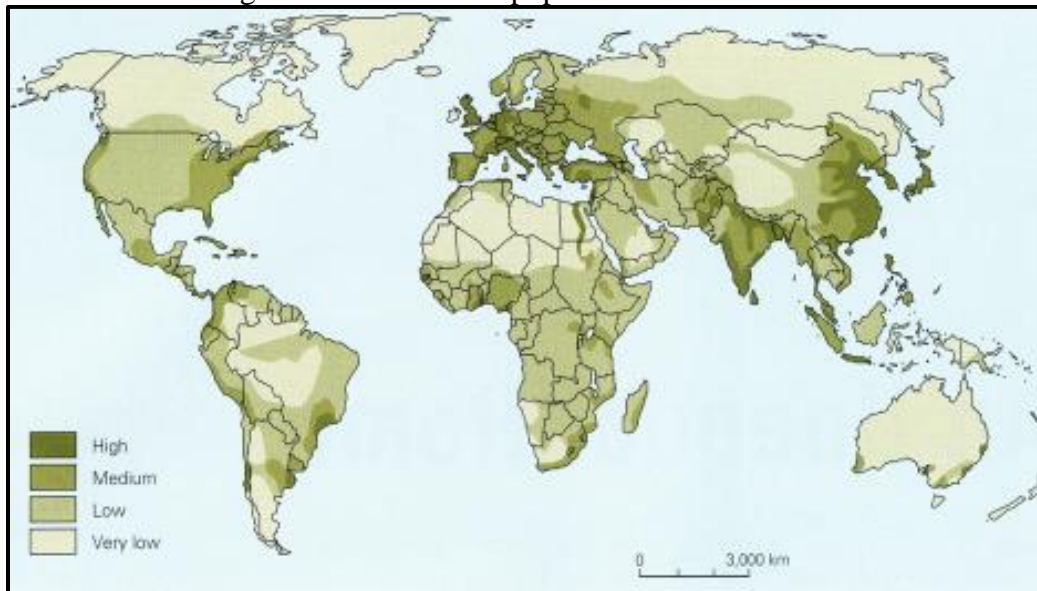
In fact, two countries each contain over 1.3 billion people: China and India. Since Earth's population is over 7.7 billion, this means that China and India each contain at least one-fifth of the Earth's total human population. Each major world region contains the following percentage of the Earth's total population;

- Asia (60.8 %)
- Africa (12.8 %)
- Europe (12.2 %)
- Latin America and the Caribbean (8.5 %)
- North America (5.1 %)
- Oceania (0.5 %).

While low-lying areas are more preferable for the locations of settlements, still a large portion of the Earth remains quite uninhabited. The sparsely population regions include northern and western North America, northern and central Asia, and interior South America, interior Africa, and the interior of Australia. Cities and urban regions have seen dramatic increases in population

over the last fifty years, with much growth continuing at present and into the future. Currently, over half of the Earth's population live in urban areas.

Fig 18: Distribution of population over the world



Problems of Expanding Population

Problems of expanding population can be dealt under following main headings;

1. Environmental problems like pollution, global warming, landscape changes, forest depletion, soil erosion, changes in ecosystem, changes in natural drainage system, acid rains etc.
 2. Social problems like increasing crimes, lack of educational facilities, social values changes etc.
 3. Economic problems like unemployment, food insecurity, shortage of water and other resources, shortage of residences etc.
 4. Political problems like implementation of law and order, administration of political entities, clashes and wars, increasing resource and boarder disputes, migration problems etc.
 5. Health and other biological problems like diseases, lack of health facilities etc.
- Children in the poorer countries die of illness at birth 5 times faster than those in the US.
 - About 500 million people all over the world are starving or ill-fed at the moment. 53% of the South Asian population is malnourished.
 - Vast areas of the world have poor sanitation and serious health problems. They don't need more population.
 - Half the women (and one third of the men) in the world cannot read and write. They won't improve their lot without education.
 - Crops and animals for food are placing a huge strain on the earth's soil and fertility.
 - Forests are chopped down for housing; wildlife faces extinction, the forests that used to be sinks soaking up carbon dioxide are no more.
 - A large population means more sewage and pollution, CFCs, car fumes, water pollution, carbon dioxide.
 - More people means more resources used up for food, clothing, housing, everything.
 - There are not enough doctors in Africa and Asia now. Diseases will spread rapidly with more population.
 - Inadequate fresh water for drinking as well as sewage treatment and effluent discharge. Some countries, like Saudi Arabia, use energy-expensive desalination to solve the problem of water shortages.
 - Depletion of natural resources, especially fossil fuels.
 - Increased levels of air pollution, water pollution, soil contamination and noise pollution. Once a country has industrialized and become wealthy, a combination of government regulation and technological innovation causes pollution to decline substantially, even as the population continues to grow.
 - Deforestation and loss of ecosystems that sustain global atmospheric oxygen and carbon dioxide balance; about eight million hectares of forest are lost each year.
 - Changes in atmospheric composition and consequent global warming.

- Irreversible loss of arable land and increases in desertification. Deforestation and desertification can be reversed by adopting property rights, and this policy is successful even while the human population continues to grow.
- Mass species extinctions from reduced habitat in tropical forests due to slash-and-burn techniques that sometimes are practiced by shifting cultivators, especially in countries with rapidly expanding rural populations; present extinction rates may be as high as 140,000 species lost per year. As of February 2011, the IUCN Red List lists a total of 801 animal species having gone extinct during recorded human history.
- High infant and child mortality. High rates of infant mortality are associated with poverty. Rich countries with high population densities have low rates of infant mortality.
- Intensive factory farming to support large populations. It results in human threats including the evolution and spread of antibiotic resistant bacteria diseases, excessive air and water pollution, and new viruses that infect humans.
- Increased chance of the emergence of new epidemics and pandemics. For many environmental and social reasons, including overcrowded living conditions, malnutrition and inadequate, inaccessible, or non-existent health care; the poor are more likely to be exposed to infectious diseases.
- Starvation, malnutrition or poor diet with ill health and diet-deficiency diseases (e.g. rickets). However, rich countries with high population densities do not have famine.
- Poverty coupled with inflation in some regions and a resulting low level of capital formation. Poverty and inflation are aggravated by bad government and bad economic policies. Many countries with high population densities have eliminated absolute poverty and keep their inflation rates very low.
- Low life expectancy in countries with fastest growing populations.
- Unhygienic living conditions for many based upon water resource depletion, discharge of raw sewage and solid waste disposal. However, this problem can be reduced with the adoption of sewers. For example, after Karachi, Pakistan installed sewers, its infant mortality rate fell substantially.
- Elevated crime rate due to drug cartels and increased theft by people stealing resources to survive.
- Conflict over scarce resources and crowding, leading to increased levels of warfare.
- Less personal freedom and more restrictive laws. Laws regulate interactions between humans. Law "serves as a primary social mediator of relations between people. The higher the population density, the more frequent such interactions become, and thus there develops a need for more laws and/or more restrictive laws to regulate these interactions. It was even speculated by Aldous Huxley in 1958 that democracy is threatened due to overpopulation, and could give rise to totalitarian style governments.

7. Renewable and non-renewable resources

Anything which has some utility in human terms is called as resource. Our earth contains lot of natural resources which are divided into renewable and non-renewable resources. Natural resources are materials created in nature that are used and usable by humans. They include natural substances (e.g., soil, water) and energy supplies (e.g., coal, gas) that serve to satisfy human needs and wants (Barsch and Bürger 1996; Minc 1976).

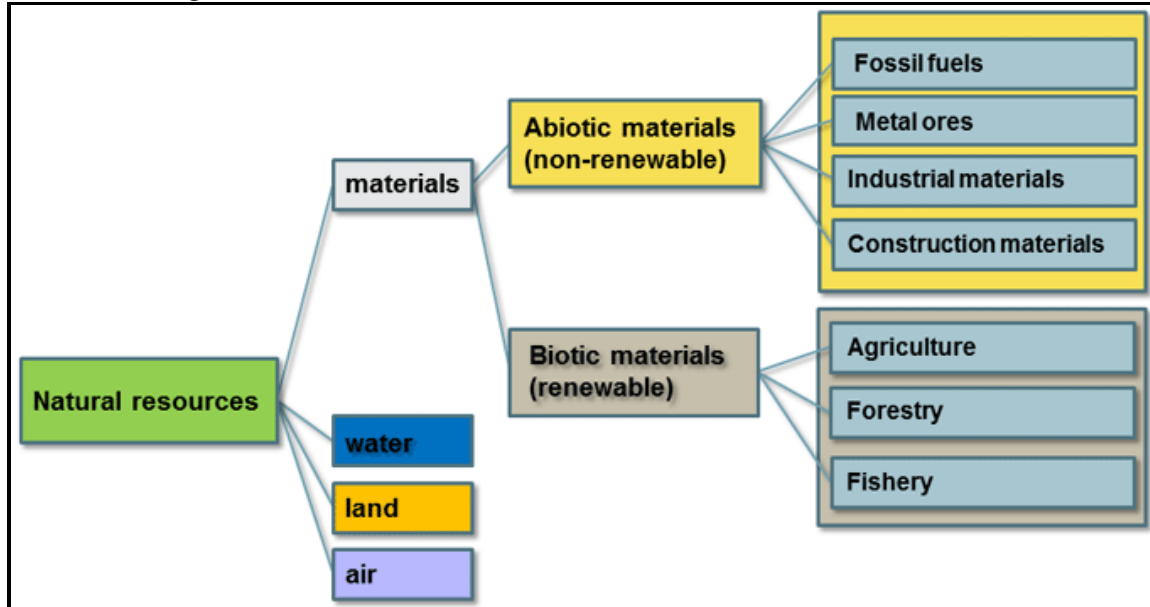
Materials occurring in the environment thus are nothing more than 'neutral matter' until people recognize their presence, attach great importance to them, and develop means to capitalize on them. Then the natural materials fulfill a function (Barsch and Bürger 1996; Mitchell 2002).

Natural resources are a component of the environmental setting. The environmental setting embraces the totality of materials, features and processes of landscapes. These environmental settings give the regions of the world their own, quite specific and distinctive settings with different options concerning the transmutations of materials and energy. The materials, features and processes which are usable constitute the potential of the landscape. By utilizing parts of this potential, humans give them a new function, a new purpose: they make them into a source of subsistence – into a natural resource (Barsch and Bürger 1996). As Zimmermann phrased this process; Resources are not, they become“(Zimmermann 1951).

Since this concept of natural resources was criticized as too anthropocentric, today many interpret resources much more broadly than in this functional or utilitarian sense. “In that context, resources are the abiotic, biotic and cultural attributes on, in or above the Earth” (Mitchell 2002, 6).

Natural resources can be classified in various ways. A commonly used one is the classification of natural resources according to their exhaustibility and regenerative power. Non-renewable resources are differentiated from renewable resources (Barsch and Bürger 1996). Renewable resources can replenish at the rate they are used, while nonrenewable resources have limited supply. Renewable resources include timber, wind, and solar while nonrenewable resources include coal and natural gas etc. (fig 19).

Fig 19: Classification of Renewable and non-renewable resources



Renewable resources are resources that are replenished by the environment over relatively short periods of time. This type of resource is much more desirable to use because often a resource renews so fast that it will have regenerated by the time you've used it up.

Think of this like the ice cube maker in your refrigerator. As you take some ice out, more ice gets made. If you take a lot of ice out, it takes a little more time to refill the bin but not a very long time at all. Even if you completely emptied the entire ice cube bin, it would probably only take a few hours to 'renew' and refill that ice bin for you. Renewable resources in the natural environment work the same way.

Solar energy is one such resource because the sun shines all the time. Imagine trying to harness all of the sun's energy before it ran out! Wind energy is another renewable resource. You can't stop the wind from blowing any more than you can stop the sun from shining, which makes it easy to 'renew.'

Any plants that are grown for use in food and manufactured products are also renewable resources. Trees used for timber, cotton used for clothes, and food crops, such as corn and wheat, can all be replanted and re-grown after the harvest is collected.

Animals are also considered a renewable resource because, like plants, you can breed them to make more. Livestock, like cows, pigs and chickens, all fall into this category. Fish are also considered renewable, but this one is a bit trickier because even though some fish are actually farmed for production, much of what we eat comes from wild stocks in lakes and oceans. These wild populations are in a delicate balance, and if that balance is upset by overfishing, that population may die out.

Water is also sometimes considered a renewable resource. You can't really 'use up' water, but you also can't make more of it. There is a limited supply of water on Earth, and it cycles through the planet in various forms - as a liquid (our oceans), a solid (our polar ice caps and glaciers) and a gas (as clouds and water vapor).

Liquid water can be used to generate hydroelectric power, which we get from water flowing through dams. This is considered a renewable resource because we don't actually take the water out of the system to get electricity. Like sunshine and wind, we simply sit back and let the resource do all the work!

A nonrenewable resource is a substance that is being used up more quickly than it can replace itself. Its supply is finite. Most fossil fuels, minerals, and metal ores are nonrenewable resources. A non-renewable resource (also called a finite resource) is a natural resource that cannot be readily replaced by natural means at a quick enough pace to keep up with consumption. An example is carbon-based fossil fuel. The original organic matter, with the aid of heat and pressure, becomes a fuel such as oil or gas. Earth minerals and metal ores, fossil fuels (coal, petroleum, natural gas) are considered non-renewable resources.

8. Forest resources

Forests are the associations of plants predominantly trees. An area with a high density of trees is called as forest. Forests are in fact plant communities covering large areas of globe and function as animal habitats, hydrologic flow modulator and soil conserver.

Earth is now poorer with its forest resources than it was in olden times when it remained unaffected by humans. Opinions differ about the original amount of forests. Jones and Darkenwald opined that about 25% of the earth’s surface was originally covered by forests and now reduced to 15%. John Boyed Orr estimated 40% original cover. About half is reduced due to ruthless cutting. Forests are not evenly distributed and don’t bear any physiological and morphological similarity i. e. vegetative cover of Tundra is completely from that of equatorial forests. Forest products are mainly obtained from following three major forest belts;

- A. Tropical forests (Hardwood forests): These forests are divided in to following two types;
 - 1. Tropical rain forests or Wet equatorial evergreen forests or Selva
 - 2. Tropical deciduous forests or Tropical monsoon forests
- B. Mid latitude or temperate forests (Hardwood forests): These forests are divided in to following two types;
 - 1. Mediterranean forests & scrubs
 - 2. Temperate broad leaved mixed forests or temperate deciduous forests
- C. Higher mid latitude forests (Softwood forests): These forests are also known as Coniferous or Taiga forests or Evergreen forests.

According to FAO forest cover in 2000 was about 3.86 billion hectors. Most of the forests are located in the areas of low population density and in the rough and uneven areas not suited for settlements, agriculture and other activities. Three countries Brazil, Russia & Canada contain about half of the world forest resources. Major types of world forests and their main features are given in table 2 and location and contributing countries are given in table 3.

Table 2: Main features of world forest resources

Forest types		Rainfall & average annual temperature	Climatic regions	Major species
A- Tropical forests (Hardwood) Future source of timber	1- Tropical rain forests or Wet equatorial evergreen forests or Selva	200-250cm 38°C	Equatorial climate	Mahogany, Rosewood, Palm, Rubber, Cinchona, Cocoa etc.
	2- Tropical deciduous forests or Tropical monsoon forests	100-200cm 27-32°C	Tropical Monsoon climate	Seal, Teak, Bamboo, Sandalwood
B- Mid latitude or Temperate forests (Hardwood) Past source of timber, Mostly cleared Produces 30% of the world wood	1- Mediterranean forests & scrubs	50-90cm 20-25°C	Mediterranean climate	Olive, Muttel, Ceder, Walnut, Chestnut, Maple etc.
	2- Temperate broad leaved mixed forests or temperate deciduous forests	50cm 16°C	Mid latitude temperate climate	Oak, Maple, Elm, Birch, Walnut etc.
C- Higher mid latitude forests (Softwood) Present source of timber Produces over 60% of the world wood	1-Coniferous or Taiga forests or Evergreen forests	30cm 10°C	Higher mid latitude cool temperate climate	Pine, Fir, Spruce, Birch, Larch, Cypress etc.

Table 3: Location of forests

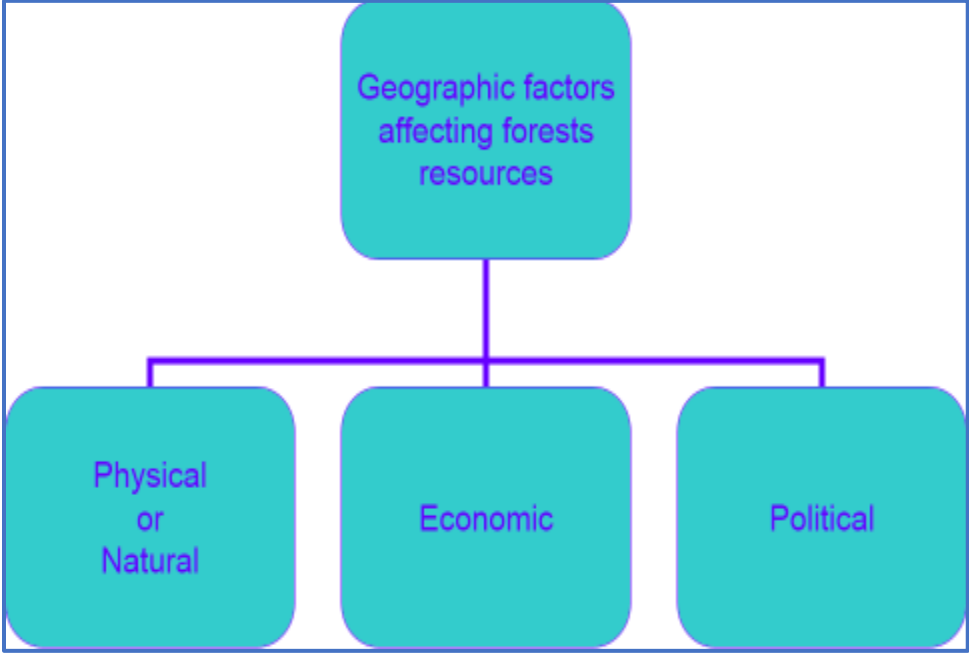
Forest location		Countries
1	Equatorial areas 0-10° latitudes	Brazil (Amazon valley of South America), Congo basin of Africa, Sri Lanka, Malaya, Indonesia, Coastal areas of Vietnam, Southern China etc.
2	Tropical monsoon areas 10-30° latitudes	Monsoon Asia, Southern Brazil, Northern Australia
3	Sub-tropical areas & temperate region 30-40° latitudes	Mediterranean countries, Central California, Central Chile, Southwestern South Africa, Downs of Australia
4	Higher mid latitudes region 40-75° latitudes	Northern Asia, Europe, Russia, Canada etc.

Factors effecting the distribution of forests

Forests are highly unevenly distributed because the geographic factors that control their distribution also vary significantly from region to region (fig 20). Following groups of factors mainly control the distribution of world forest resources;

- A. Physical factors or natural factors: These factors include climate, relief or physiography, soils, water bodies, and role of animals for wood transportation.
- B. Economic factors: these factors include demand for forest products, international trade, transportation, role of forest settlements, manufacturing, competition with agriculture etc.
- C. Political factors: These factors include government policies, taxes, land use etc.

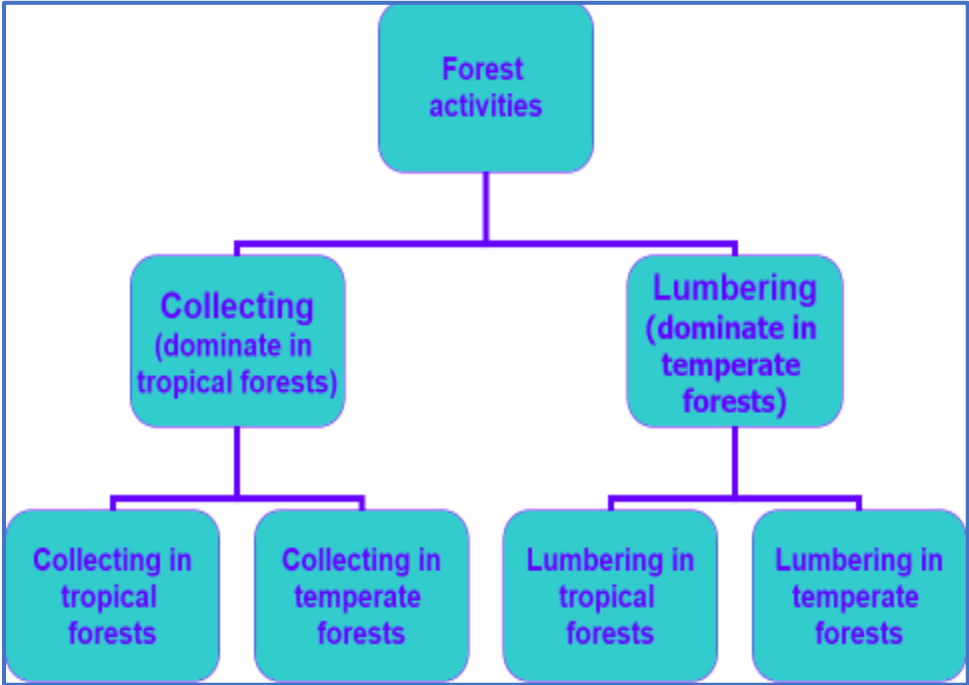
Fig 20: Factors controlling forest distribution



Forest activities are divided in to following two major types (fig 21);

- 1. Lumbering which is a process through which trees themselves are harvested to obtain timber used for various purposes.
- 2. Collecting which is a process through which forest products other than timber are obtained without cutting the trees.

Fig 21: Forest activities



Benefits of forests

Forest benefits are divided in to following two types;

- 1. Environmental benefits
- 2. Economic benefits

Environmental benefits of forests are;

- Long run and more valuable
- Maintain environmental systems like cycles of gases in atmosphere
- Check soil erosion
- Reduce noise pollution and other kinds of pollution
- Increase beauty & secrecy of nature
- Yield a pleasant environment for people to enjoy
- Regulate and ensure the stability of eco-systems & food webs
- Provide diverse biological environment to preserve wildlife

Economic benefits of forests include;

- Supply of more than 5000 commercial products like lumber, paper, turpentine etc.
- Provide fuel to most of the world population
- Forest activities provide employment to millions of people
- Provide too many consumer goods like paper, nuts, medicines etc.
- Provide too many capital goods like wood for ships, boats, tools, buildings etc.

Major uses of wood

Wood is the most major product of forests which is used for various purposes. It is mainly used as fuel, as building material, for making paper and pulp, furniture, plywood, railroad ties, ships and boats etc. Its consumption in different sectors is given in table.

Table 4: Major uses of wood

Uses	World	USA	Pakistan
Fuel	42%	16%	50%
Building material	40%	52%	25%
Paper & pulp industry	08%	22%	-
Furniture, plywood, railroad ties & others	10%	10%	25%

Problems of forest destruction

Major problems associated to forest destruction are;

- Cut over & shortage of wood and other products
- Disturbance of geological norm
- Erosion
- Sedimentation of dams & canals
- Floods
- Dust storms
- Pollution

Remedial measures

Remedial measures depend upon conservation of forests for which following methods are important;

- Aforestation is necessary in forest deficient lands (currently highest in Asia)
- Reforestation is necessary in cut over lands
- Sustained yield forestry that is based on following measures;
 - The rate of cut must not exceed the rate of growth (Japan, Germany, Sweden, USA achieved this balance.
 - Cutting must be small enough in extent so that surrounding trees may easily reseed the cut over segment.
 - Trees must be protected from three major enemies: fire, insects & diseases
 - Trees must be protected from plant eater animals.

9. Fishing activity

Broadly the term fishing is applied to the harvesting of all water creatures whether fish, mollusks and mammals. Term fisheries is used to denote all the developments and enterprises required to carry out fishing activity.

Some significant features

- One of the oldest occupations
- Still important & dominating occupation in many countries like Peru, Iceland etc.
- Millions of people are dependent on fishing for livelihood
- Cheapest source of proteins
- Major component of diet of many people in the world, specifically in countries like Iceland, Japan, China, Indonesia, Bangladesh etc.
- Annual fish catch in world is millions of tones
- Fishing is a wide spread activity
- Found in almost every part of the world where water bodies are available
- Fish has over 40,000 kinds (About 15,000 fresh water fish and 25,000 ocean fish types have been enlisted).
- Inland fishing is carried out in inland water resources like lakes, rivers, ponds etc. and contribute almost 20% of the total world's fish production.
- Ocean fishing is carried out in oceans and open seas and contribute about 80% of the total world's fish output.

Major commercial fishing regions

1. North Eastern Pacific
2. North Western Pacific
3. North Eastern Atlantic
4. North Western Atlantic
5. Waters between Asia & Australia
6. Pacific Coasts of Peru and Chile
7. Mediterranean Sea

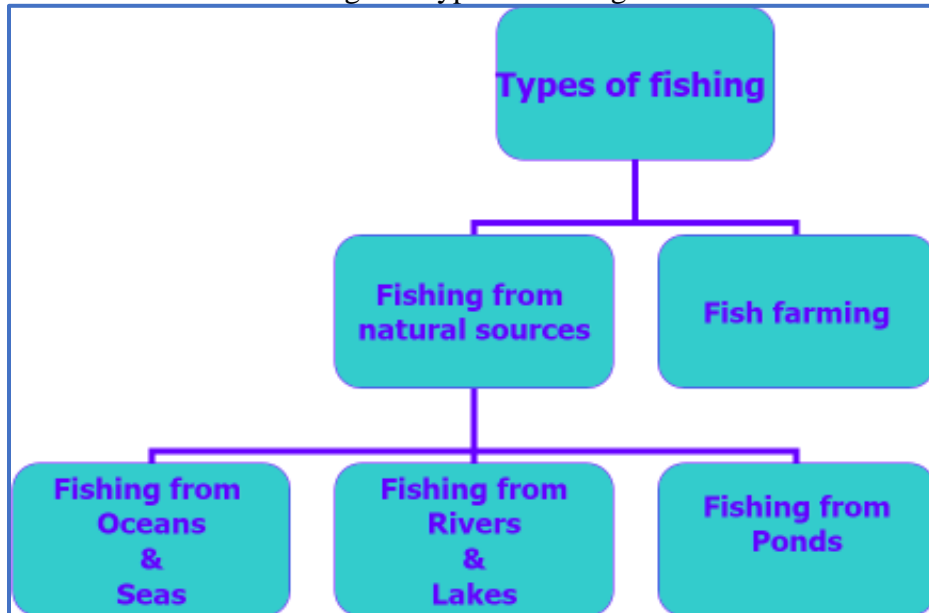
Minor regions

Too many;

1. All the countries flanking oceans or seas
2. Almost all rivers e. g. Mississippi, Amazon, Nile
3. Lakes e. g. Great Lakes of North America

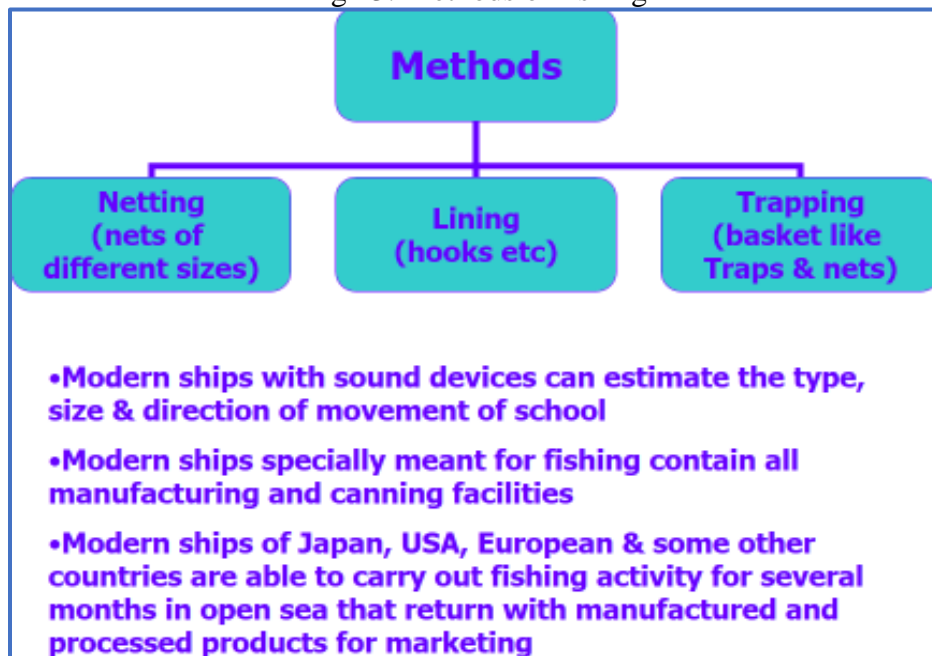
As regards types of fishing, it is carried out from natural water resources like oceans, seas, rivers, lakes, and ponds. Since last few decades, fish farming is also getting importance and contributing significantly in the total output of several countries like Pakistan (fig 22).

Fig 22: Types of fishing



To carry out fishing from oceans, seas, rivers and lakes etc. various methods are used. Some of the most common methods of fishing are given in fig 23.

Fig 23: Methods of fishing



Geographic factors influencing fishing activity

Various geographic factors control fishing activity in the world which are divided into following three groups;

1. Natural or physical factors: These factors include;
 - Shallow waters or continental shelves
 - Continental run-off
 - Mixed waters (convectional mixing, conflict of currents and upwelling)
 - Cool waters
 - Indented shorelines
2. Economic or market factors: These factors include;
 - Population density and demand for fish
 - Fishing ports
 - Dietary habits
 - Meat prices
 - Manufacturing and marketing
 - Other uses of fish like medicines, fertilizers, poultry feed etc.
 - Limited agriculture
3. Political factors: These factors include;
 - International trade of fish
 - International agreements and law of sea
 - Territorial conflicts

Problems of fishing activity

Fishing activity in the world is facing several problems. Some are mentioned here.

- Over fishing has caused a great depletion of this resource in many parts of the world, particularly in the waters of those countries which are engaged in fishing since long. Many species (e. g. halibuts, salmon, fur seals etc) are disappearing in different parts of the world
- About 70% of the fish population dies each year due to pollution, winter kills (cold) and predation. Out of 1.0 million fish 0.3 million survives at the end of first year, 90,000 by the end of second year, ... and only six by the end of 10 years.
- Industrial, municipal, acid and oil pollutants seriously damage fish population
- Sea lamprey- water worm-a parasite on fish 2-feet in length-destroys 20 pounds of fish during 4 years life cycle- St Lawrence river-lake Ontario-Lake Erie through Welland canal

Fish conservation

Food demands will grow in future and more food resources will be needed, therefore conservation of existing resources is necessary

- Fish is a flow resource and fishing is a robber activity, therefore, its conservation is necessary.
- Fish has been pulled without any planning and thought to replacement of the stock.
- Recent over fishing is the result increasing demands of rapidly growing population that has led to decline in both number and variety of fish.
- The wise and planned use of this resource is important need of the time otherwise it will be ruined fastly. An effective international move in this regard may prove useful. Some countries like UK, Norway, USA, Japan etc have already made moves at their own.
- Limiting the catch, use of coarser meshed nets, scientific research & planning, and formulation of strict rules are some of the important steps to be taken.

Future of fishing

- In future fish demand may increase because it is a major and cheaper source of protein
- Producing fish on farms is comparatively more economical than producing poultry and animals
- Fish farming and transplanting, therefore, may become more important in producing sufficient amount of food
- If scientists and researchers succeed in converting planktons to human food then aquaculture may supersede commercial fishing and compete agriculture, because one sq. mile plankton rich water can produce 4,000 tons of vegetative matter that is about 6 times higher than the yield (667 tones) of one sq. mile fertile wheat producing area.

10. Agriculture

Definition

Agriculture is differently defined in different countries i.e. in some countries the term agriculture is applied for crops cultivation only while in others crop cultivation and animal domestication both are termed as agriculture.

- The term agriculture is applied to the purposeful tending of crops and livestock in order to produce food and fiber.
- Tillage of soil to produce crops and livestock is called agriculture.
- Cultivation of soil to produce food and fiber is called agriculture.
- In broader sense agriculture refers to all human activities related to the cultivation of soil and to those activities that are directly dependent upon the soil such raising of animals
- According to some people tillage of soil and all other activities that are directly dependent upon it are termed as agriculture.
- According to McCarty and Lindberg “agriculture is the purposeful tending of crops and livestock”.
- According to Wheeler and Muller “agriculture is the deliberate tending of crops and livestock in order to produce food and fiber”.

Some significant features of agriculture

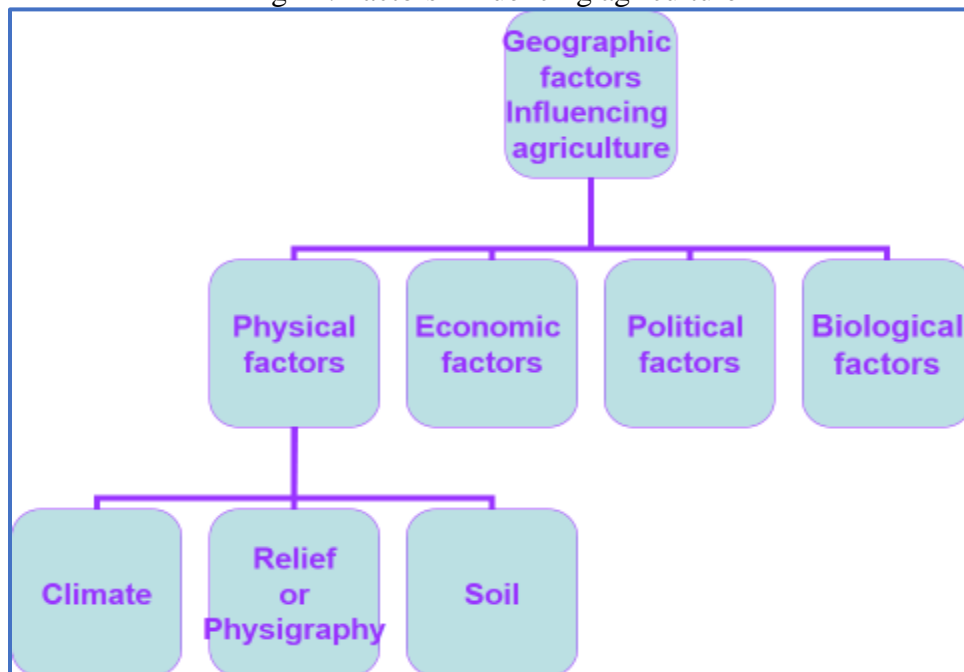
- Agriculture is one of the oldest occupations.
- It provides goods for almost all the basic human needs.

- Agriculture provided the base of sedentary mode of human life and origin of permanent settlements.
- This important sector of economy has largest employment ratio in the world (50-70%).
- It provides base for the development of other sectors of economy.
- It is a wide spread activity found almost all the accessible areas of the world.
- It occupies largest proportion of area as compared to other economic activities.
- In future too, it expected to be the largest occupation in the world.

Geographic factors influencing agriculture

Several factors influence agriculture and determine its type (fig 24). Usually following groups of factors are considered to be more influential in determining the type of agriculture and the crops to be produced. For example tropical areas characterized with warm moist climatic conditions are suitable for plantation farming in which mostly tree and perennial crops are produced.

Fig 24: Factors influencing agriculture



1. Physical or environmental factors influencing agriculture

- Climate (temperature, precipitation, winds, rate of evaporation etc.)
- Relief or physiography
 - Degree of evenness of the areas
 - Altitude of the farmland
 - Slope and aspect
- Soils (types, profile and characteristics)

2. Economic factors influencing agriculture

- Capital
- Labour
- Transportation
- Mechanization and methods of cultivation
- Specialization
- Input prices
- Market price of the product
- Marketing system
- Research institutions
- Irrigation system
- Size of land holding
- Political factors
- Biological factors

3. Political and social factors influencing agriculture

- Govt. policies
 - Tax policies
 - Tariffs and import restrictions
 - Import and quota restrictions
- Political system
 - Kolkhoz- collective farms (crops)

- Sovkhoz- State farms (cash payment)
- Dietary habits
- Traditions
- Land tenure system
- Peasant system

4. Biological factors influencing agriculture

- Crop ecology
- Hybrid and high yielding varieties
- Product life cycle
- Pests and insects
- Crop diseases

11. Main types and regions of agriculture

Types of agriculture

In response to marked differences in physical, economic, social and other conditions of the areas many different types of agriculture are practiced in the world

Following factors can be selected as the basis for agricultural classification;

1. Physical conditions of the areas
2. Socio-economic conditions
3. Cultural groups
4. System under which agriculture is practiced such as;
 - Tribal system
 - Feudal system
 - Capitalist system
 - Socialist/communist system
5. Purpose of agriculture
 - To produce for local needs
 - To produce for other regions

Classification No. 1

Commonly agriculture is classified into following groups (See detail in F. K. Khan, An Introduction to Economic Geography);

1. Shifting cultivation

It is also known as Swidden agriculture. It is a form of agriculture, used especially in tropical Africa, in which an area of ground is cleared of vegetation and cultivated for a few years and then abandoned for a new area until its fertility has been naturally restored. Shifting cultivation is preparing ground in a large plot or area and cultivating mostly food grains and vegetables fruits etc. till the soil fertility is lost. Then the field is burnt and cultivation shifted to another place or area. Shifting cultivation systems are designed to adapt to the soil and climatic characteristics of the Amazon basin- low soil fertility, high precipitation, and fast leaching of nutrients. Shifting cultivation is practiced by nearly 250 million people, especially in the tropical rain forests of South America, Central and West Africa, and Southeast Asia.

2. Intensive subsistence farming

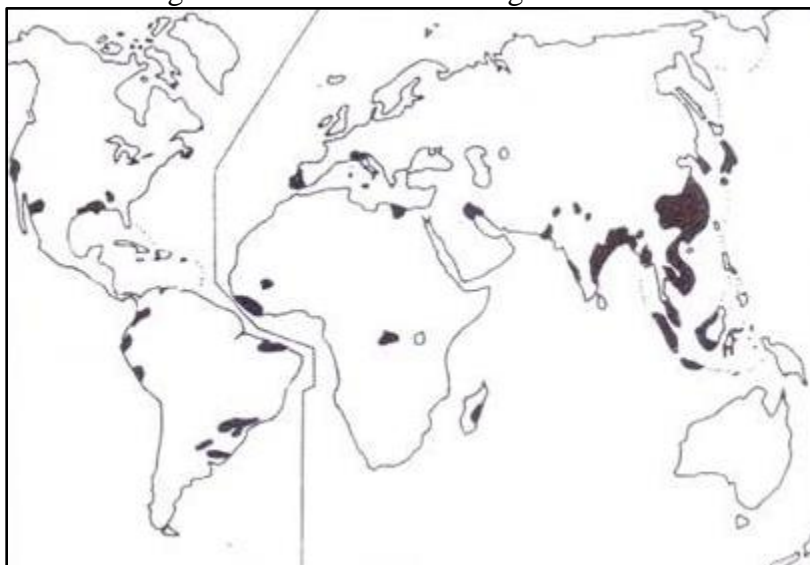
Intensive subsistence agriculture is a type of farming done primarily by hand, or with beasts of burden on small plots of land. This type of farming only produces enough output to support the farmer's family, not for commercial sale. Space constraints require every bit of land to be used. There are two types of the intensive subsistence agriculture. One is dominated by wet paddy and the other is dominated by crops other than paddy, e.g., wheat, pulses, maize, millets, sorghum, kaoling, soya-beans, tubers and vegetables. The main characteristics of the intensive subsistence agriculture are as follows;

- Very small holdings
- Farming is very intensive:
- Much hand labour is entailed
- Use of animal and plant manures
- Dominance of paddy and other food crops

Intensive rice farming is very important in the world. Rice is the world's leading food crop, cultivated over an area of about 155 million hectares with a production of about 596 million tonnes (paddy). In terms of area and production it is second to wheat. It provides

about 22 per cent of the world's supply of calories and 17% of the proteins. The world distribution of rice-producing areas has been depicted in fig 25. The greatest rice-producing country in the world is China. India is the second largest rice-producing country in the world. Indonesia is the third largest rice-producing country in the world. Next come several other countries like Bangladesh, Japan, Brazil, USA, etc.

Fig 25: Intensive rice farming in the world



3. Mixed farming

Mixed farming is a type of farming which involves both the growing of crops and the raising of livestock. The cultivation of crops alongside the rearing of animals for meat or milk defines mixed farming. Mixed farming is an agricultural system in which a farmer conducts different agricultural practice together, such as cash crops and livestock. The aim is to increase income through different sources and to complement land and labour demands across the year. Mixed farming has therefore become the basis for modern agriculture. Mixed farming systems provide farmers with an opportunity to diversify risk from single crop. Mixed crop and livestock farming is the most common form of commercial agriculture in the United States west of the Appalachians and east of 98° west longitude and in much of Europe from France to Russia.

4. Commercial grain farming

Commercial grain farming is an extensive and mechanized form of agriculture. Commercial grain farming is an extensive and mechanized form of agriculture. It was the invention of farm machinery which enabled farmers to cultivate grain on a large scale, and there is a marked specialization in wheat monoculture in many areas. This is a development in the continental lands of the mid-latitudes, which were once roamed by nomadic herdsman. Wheat and maize are the most common crops of commercial grain farming. Farmers of Asia, Europe, temperate grasslands of North America generally practice this type of farming. Plantation farming— Plantation farming is a mix of agriculture and industry and is practiced across a vast area of land. The major world regions of commercial grain farming are shown in fig 26. The largest one, in Eurasia, stretches from Kiew in southern Russia to Omsk in western Siberia in a width of about 1,000 km from Caucasus to Saratov on the Volga River. In North America, there are several areas of commercial grain farming. The largest area runs from Alberta, through Saskatchewan and Manitoba to Dakotas. Another centre is in Kansas and spills over into neighbouring states. Smaller regions appear in eastern Washington and Oregon, eastern Illinois and northern Iowa. In South America, Argentina has a large region of commercial grain farming. Australia has two areas, one in the south-west and another in the south-east. In fact, commercial grain farming is a mid-latitude activity and mostly done in between 30° to 55° N and S latitudes. Following are the main characteristics of this type of agriculture;

1. Specialization in single crop

Commercial grain farming is highly specialized and generally one single crop is grown. In most commercial grain regions that crop is wheat. Both winter wheat and spring wheat is grown in these areas.

2. Farms are very large

The wheat farms in mid-latitudes are very large, ranging from 240 to 16,000 hectares. Though, average size of the farm in the USA is about 400 hectares. In these areas land is cheap that makes it possible for a farmer to own very large holdings.

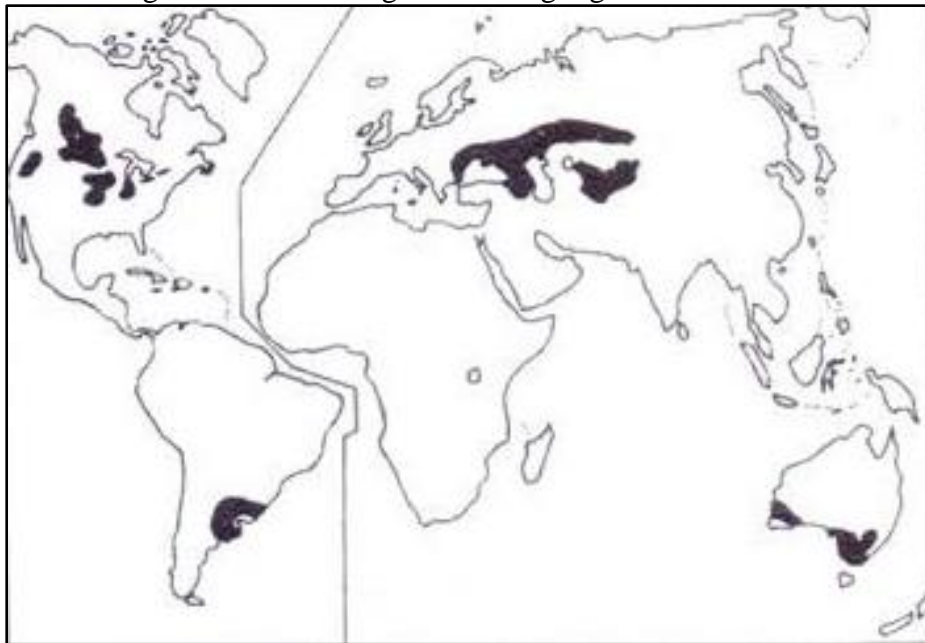
3. **Highly mechanized**

The commercial grain farming is highly mechanized. Cultivation from ploughing to harvesting is often entirely mechanized. The use of tractors ploughs drills and combines harvests which reap, thresh, winnow and sack the grain all in one operation is common.

4. **Low yield per acre but high yield per man**

In this farming wheat grown gives comparatively low yields. The average yield is seldom more than 1,700 kg per hectare, whereas under intensive cultivation the yield is more in many countries. But because of mechanization, less labour force is required; therefore, yield per man is high.

Fig 26: Commercial grain farming regions of the world



5. **Plantation farming**

Plantation agriculture is a form of commercial farming where crops are grown for profit. Large land areas are needed for this type of agriculture. Countries that have plantation agriculture usually experience tropical climate with high annual temperatures and receive high annual rainfall. Plantation agriculture is the product of colonialism. Plantations have been developed in response to a demand in Europe for foods, spices, fibers, and beverages, which because of climatic constraints, could be produced only in the tropics or sub-tropics. The specialized commercial cultivation of cash crops on estates or plantations is a very distinctive type of tropical agriculture and is found in many parts of Asia, Africa and tropical and sub-tropical America. A plantation is a large-scale farm that specializes in cash crops. The crops grown include cotton, coffee, tea, cocoa, sugar cane, sisal, oil seeds, oil palms, rubber trees, and fruits.

6. **Truck farming**

Truck farming or market gardening is the relatively small-scale production of fruits, vegetables and flowers as cash crops, frequently sold directly to consumers and restaurants. Main crops grown are vegetables, flowers and fruits including tomatoes, strawberries, peaches, oranges, cabbage, carrots, lettuce, melons, etc. Increasing urban populations and growing urban demands for perishable products have further promoted this type of farming. The diversity of crops grown on a small area of land, typically from under one acre (0.4 ha) to a few acres, or sometimes in greenhouses distinguishes it from other types of farming. Such a farm on a larger scale is sometimes called a truck farm. A market garden is a business that provides a wide range and steady supply of fresh produce through the local growing season. Commercial gardening, also known as truck farming or commercial agriculture, is the production of fruits, vegetables, flowers, and citrus as cash crops. It is primarily for sale off the farm products and is mainly used in MDC's.

7. Nomadic herding

Nomadic herding or Nomadic pastoralism is a form of pastoralism when livestock are herded in order to find fresh pastures on which to graze. It is one of the most ancient forms of herding is nomadic herding. Nomadic herders roam in small tribal or extended family groups and have no home base. True nomads follow an irregular pattern of movement, in contrast with transhumance where seasonal pastures are fixed. It is a practice that entails moving from one place to another with cattle in search of pasture. Pastoralists sell their animals to get products that they don't produce, and they also depend on the animals for food. This activity is mainly found in arid and semiarid parts of Africa, Asia, and Europe, and in the tundra regions of Asia and Europe. In Africa, nomads herd cattle, goats, sheep, and camels. In the tundra, they usually herd domesticated reindeer.

8. Livestock ranching

Livestock ranching is the practice of raising and breeding animals on large pieces of land. Cows and sheep are the most common animal found on ranches. Most of the meat we eat comes from livestock farms. Livestock, farm animals, with the exception of poultry, in many countries the category encompasses primarily cattle, sheep, goats, horses, donkeys, and mules and other animals, such as buffalo, oxen, llamas, or camels, may predominate in the agriculture of other areas. The ranching and livestock industry is growing faster than any other agricultural sector in the world. Ranching is common in temperate, dry areas, such as the Pampas region of South America, the western United States, the Prairie Provinces of Canada, and the Australia.

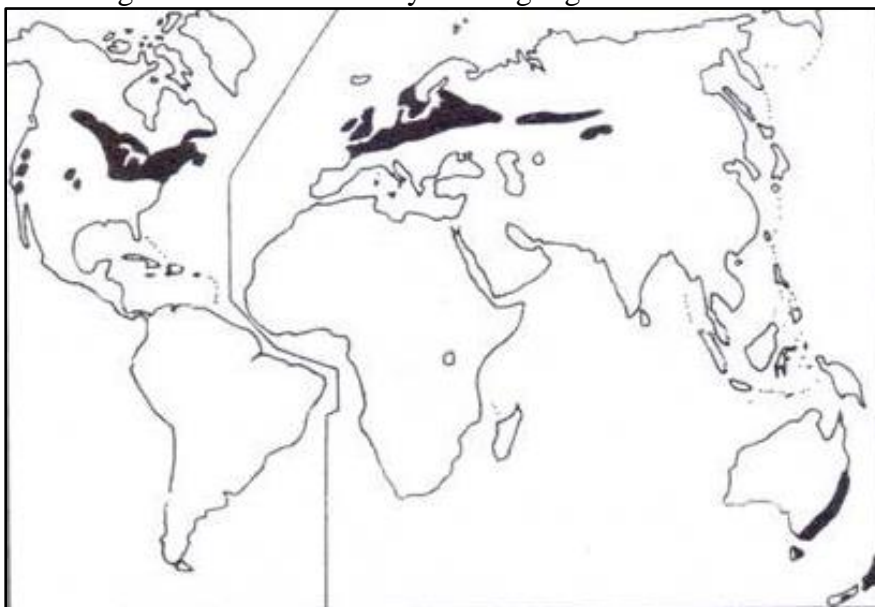
9. Dairy farming

Dairy farming is a type of agriculture in which dairy products mainly milk is produced. It is mainly practiced for long-term production of milk, which is processed, either on the farm or at a dairy plant, either of which may be called a dairy, for eventual sale of a dairy product. The spatial distribution of dairy farming in the world is widespread. But following three main regions of commercial dairy farming are important.

- The largest is in Western Europe, a belt extending about 3000 km from Atlantic Coast almost to Moscow.
- The second dairy region that of Anglo-America, is likewise a belt, this one beginning at Atlantic Coast to the Prairie Provinces of Canada.
- The third region is the Australia-New Zealand region.

The other dairy regions are smaller and located in South Africa and South America. In Asia, dairying has developed in Japan, South Korea, China, India, Pakistan, etc., but most of the production is consumed locally. Fig 27 depicts the world distribution of dairy farming.

Fig 27: Commercial dairy farming regions of the world



Classification No. 2

On the basis of purpose of production agriculture can be divided into following two types namely subsistence farming and commercial farming (table 5).

Table 5: Comparison of subsistence and commercial agriculture

Subsistence farming	Commercial farming
1. Under developed farming	Cash based developed farming
2. Low capital investment	High capital investment
3. Less use of technology	High use of technology
4. Survival oriented	Profit oriented
5. Little marketing and spontaneous trade	Large market and frequent trade
6. Involve in internal market	Involved in external market
7. Small in efficient producing unit	Large efficient producing unit
8. Low political support	High political support
9. Farmer lives from hands to mouth	Farmer plans long term basis
10. Varied poly culture	Specialized division of crops and labour

Classification No. 3

Based on utilization of land agriculture is divided into following two types' namely extensive farming and intensive farming (table 6).

Table 6: Comparison of extensive and intensive agriculture

Extensive farming	Intensive farming
1. Found in thinly populated areas	Found in highly populated & industrialized areas and around urban centers
2. Low input applications	High input applications
3. Low investment	High investment
4. Low per acre production	High per acre production
5. Mostly grains and other food crops are produced (These crops having long time storage capacity).	Market gardening & perishable goods are produced
6. There is definite fallow periods	There is no fallow periods

Agricultural regions

From 1925 onwards a series of studies about agricultural regions continent by continent appeared in AEG (American Economic Geography). Important studies were conducted in 1936 by W. D. Jones & Derwet Whittesley

Whittesley identified 13 types/regions in the world with the help of following five functional characteristics;

1. Crop and livestock combinations
2. Methods employed to produce crops & livestock
3. The intensity of application to the land, of labour, capital, and organization
4. The method of disposal of farm products
5. The farm buildings and structures commonly found necessary to carry on agricultural activities

Following regions were identified;

1. Nomadic herding (rough & dry parts of Africa and Asia)
2. Livestock ranching (parts of Americas, Australia & New Zealand)
3. Shifting cultivation (tropical areas)
4. Rudimentary sedentary tillage (parts of Asia & South America)
5. Intensive subsistence tillage with rice dominant (Monsoon Asia)
6. Intensive subsistence tillage without paddy rice (S. E. Asia, N. Africa, Egypt, Western Sudan, Mexico)
7. Commercial plantation culture (Malaysia, Indonesia, Brazil)
8. Mediterranean agriculture
9. Commercial grain farming (North America, Argentina, Australia, Russia, Central Asia)
10. Commercial livestock and crop farming (Europe, New Zealand)
11. Subsistence crop and stock farming (Northern Europe, Russia)
12. Commercial dairy farming (British Isles, New Zealand, N. E. N. America)
13. Specialized horticulture (urban centers)

12. Power/energy resources

Power resources are the means of energy supply essential for the proper functioning of various economic and other activities such as to run the vehicles, industries, tube-wells, many other machines and appliances. Thus, they are essential for the survival of economies. Energy resources can be classified in several ways (figs 28 & 29). For example they are roughly classified in three categories: renewable, fossil, and nuclear. Fossil energy resources are obtained from dead plant and animal deposits created over the long history of the planet. These resources are vast, but are not renewable. Energy resources are used in almost every field of life such as transportation, manufacturing, agriculture, trade activities etc. When we talk about residential uses of energy resources, these are the most basic uses of energy. They include watching television, washing clothes, heating and lighting the home, taking a shower, working from home on your laptop or computer, running appliances and cooking.

Fig 28: Classification of energy resources based on use and availability

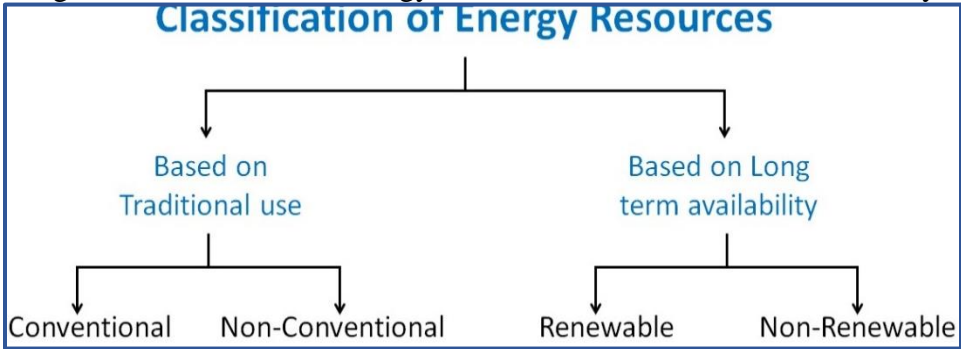
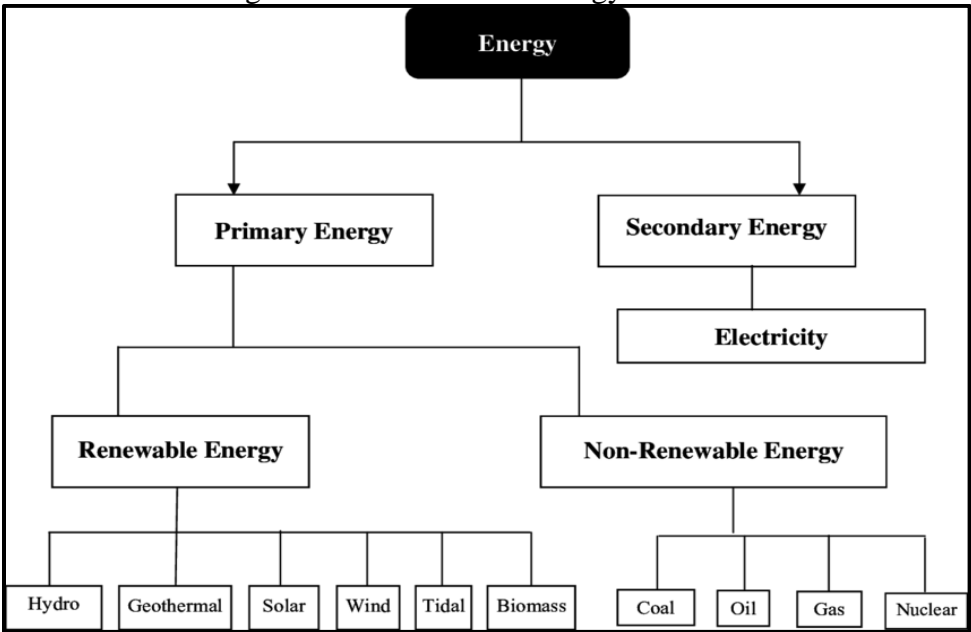


Fig 28: Classification of energy resources

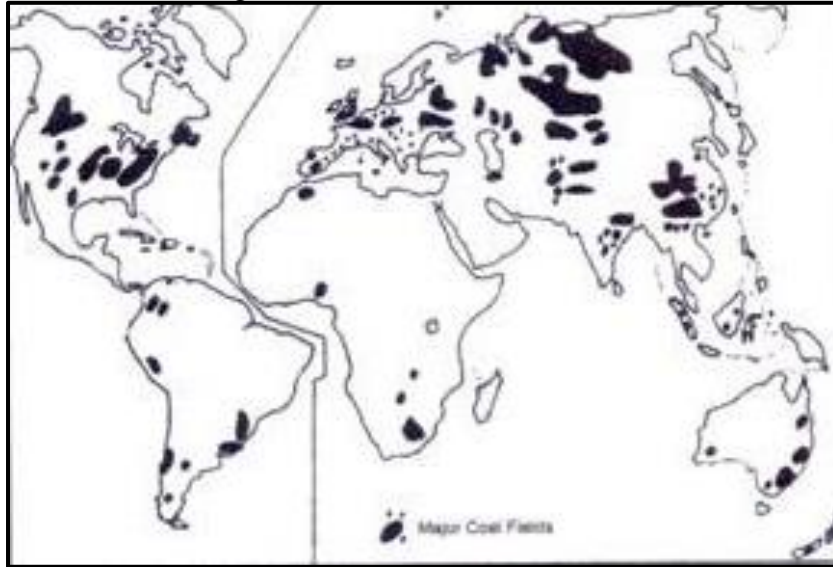


Although several conventional and non-conventional energy resources are in use but for the development of the economy of any country coal, petroleum, natural gas, and electricity are the most important resources.

World’s production and distribution of coal

Coal is most important and one of the oldest commercially used energy resource. It is produced in many countries of the world but its important producers are China, USA, India, Australia, South Africa, Russia, Indonesia, Poland, Kazakhstan, Columbia, Canada, Germany, Vietnam, UK and Ukraine (fig 29). World coal reserves in 2018 stood at 1055 billion tonnes and are heavily concentrated in just a few countries: US (24%), Russia (15%), Australia (14%) and China (13%). Almost 80 percent of the world's recoverable coal resources are controlled by seven countries: the United States (about 27 percent), Russia (about 18 percent), China (about 13 percent), India (about 7 percent), Ukraine (about 4 percent), Kazakhstan (about 4 percent), and South Africa (about 3 percent). There are four major types of coal namely peat, lignite, bituminous and anthracite. Major user sectors of the coal are iron and steel manufacturing industry, thermal power generation plants, brick making industry, steam making and domestic users.

Fig 29: World distribution of coal



1. China

China ranks first in the world in coal production. Nearly 38 per cent of world's coal output is from China. All types of coal are found, including anthracite, bituminous coal and lignite. Although coal occurs in every province of China, but its greatest concentration is in Shanxi and Shaanxi (Shansi and Shensi). The following are the main coalfields of China (fig 30);

1. The Shansi Shensi fields

These are largest coalfields of China, which produce about 40 per cent of China's coal. The good quality of coal seams in this area is more than 10 meters thick.

2. The Shantung-Hopei fields

Around Shantung and Hopei medium grade coals are found.

3. The South-Eastern coalfields

This coalfield extends from Hupei to Fukien. This area produces some inferior variety of coal.

Fig 29: Distribution of coal in China



4. The South-Western coalfields

Several small and isolated coal mines are distributed over Sikiang and Yunan region.

5. The Manchurian fields

These coalfields are scattered in the north-eastern region of China. The coalfields are located in the provinces of the Liaoning, Heilungkiang, Kirin and Chosen areas. This coal is of inferior grade but reserves are substantial.

2. USA

The United States of America is the second largest producer of coal in the world. It produces about 17 per cent coal of the world. The coal regions of USA are distributed in whole of the country as shown in fig 31. The main coal-producing areas of USA are as follows;

1. The Appalachian Coalfields

The Appalachian Coalfields, reaching almost without a break from northern Pennsylvania into northern Alabama, contain the finest bituminous coal lands of the world. On this basis this

coalfield is also known as Eastern Interior bituminous coalfield. This coalfield falls into three groups:

2. The Northern Appalachian Coalfield

Pittsburgh is the most important mining centre in north Appalachian Coalfield. The Pittsburgh Coalfield has an area of about 1200 sq km with many workable seams which are 2 to 4 meters thick.

3. The Central Appalachian Coalfield

The Central part of this Appalachian Coalfield in West Virginia, eastern Kentucky, Tennessee, and part of Virginia was not developed so early because it was more difficult to access, but many mines were opened there after 1915. The Central Appalachian Coalfields have several fairly thick seams.

4. The Southern Appalachian Coalfield

The Southern most of these Appalachian Coalfields is in Alabama near Birmingham. This coalfield and the nearby deposits of iron ore and limestone are the basis of Birmingham's steel industry. This Coalfield is very accessible to adjacent markets and hence has greater development than any other field South of Kentucky.

5. Eastern Interior Coalfields

The Eastern Interior Coalfield is situated in Southern Illinois, Southern Indiana and Western Kentucky of USA and is famous for bituminous coal. The bituminous coal is not of as good quality as that of the Appalachian fields, but it is useful for steam and domestic purposes.

6. Northern Interior Coalfields

Michigan State is now the centre of coal mining in the interior province, but Chicago remains the organizing centre of the iron and steel industry, not only of the Lake Superior region but in North America as a whole. Gary is another iron and steel town in Michigan coalfields.

7. Western Interior Coalfields

This field, like its counterpart, the Eastern Interior field across the Mississippi, has important coal deposits of bituminous and sub-bituminous. The coal in Western Interior field is below average in quality. The Principal Coalfields being worked in Western Interior are Arkansas, Oklahoma, Kansas, Missouri, Eastern Nebraska and south western Iowa.

8. Southern Interior Coalfields

The Southern Interior Coalfield is of little importance even locally because of the poor quality. Southern Interior is the extension of western fields in Texas. In the western interior and south western fields extending from Central Iowa to Central Texas are beds of bituminous coal that crop out along the eastern margin, where small quantities are mined for local consumption. It is traversed by the Mississippi and its tributaries, in the bed of which the coal crops out in numerous places.

9. Rocky Mountain Coalfields

Most of the lignite coal is found in Rocky mountain field, which occurs in various scattered localities. Only two-thirds of the United States coal comes from western fields, along the eastern rim of Rockies in Colorado, Wyoming, Idaho, Arizona, Utah and Montana. The reserves of the Rocky mountain province are enormous, but actual production is small.

10. Pacific Coast Coalfields

In the extreme far west of the United States between Sierra Nevada and Ellenburg in California, Oregon and Washington, are the most extensive fields, covering more than 2000 sq km and producing low grade coal.

Fig 31: Distribution of coal in USA



3. India

India is the third largest coal-producing country in the world. Its production is 7.2 per cent of the total world production of coal. The Indian coalfields can be broadly grouped as follows;

a. Gondwana Coalfields

1. The Damodar Valley Coalfields:

- (i) Jharia,
- (ii) Ranigang,
- (iii) Bokaro,
- (iv) Giridih and
- (v) Karanpura

2. The Mahanadi Valley Fields

3. The Godawari Valley Fields (Singareni)

b. Tertiary Coalfields in Assam and Rajasthan:

Practically 97% of the coal supplies of India are derived from the Gondwana rocks. Among the states, Madhya Pradesh, Chhattisgarh, Jharkhand, Bihar, Odisha, Andhra Pradesh, Maharashtra and West Bengal are the main producers of coal.

4. Australia

Australia ranks 4th in coal production in the world and its contribution in world's production is 6 per cent. In 2007, it produced 251 million metric tons of coal. The largest coal producer in Australia is New South Wales, which contributes more than half of the Australian production.

The other notable coal-producing regions are Queensland, Victoria and Tasmania. Both bituminous coal and lignite are produced in Australia.

5. Russia

Russia is the fifth largest coal-producing country of the world. Its share in world production is 5 per cent. The main coal-producing areas are Kuznestsck basin, Ural-region, Moscow-Tula region, Pechora basin, Eastern Siberia and Northern Siberia.

1. Kuznestsck basin is a coal region of southern Siberia and produces about 25 per cent of the country's bituminous coal.
2. Moscow-Tula region produces about 22 per cent of country's output. But most of the coal produced in this region is of low grade.
3. Pechara basin is having limited quantity of coal but it is of high grade.
4. Eastern Siberia is a vast coal region. In this region Kansk-Achinsk, Minusinsk and Irkutsk are the main coal-producing areas.
5. Northern Siberia is also having large coal deposits. The coal deposits are found in Tunguska, Lena and Taimyar basins located in the Northern Siberia. Ural Region is also an important coal-producing region.

6. Europe

In Europe coal-producing countries are Poland, Germany, United Kingdom, France, Belgium and the Netherlands.

1. Poland

Poland is now an important coal-producing country not only of Europe but also of the world and ranks 9th in the world. It produces 2.5 per cent of the world's coal output. The major coalfields of Poland are Upper Silesia, Krakow and Dombrowa. Anthracite coal is mined in Walbrzych of Oder basin.

2. Germany

Germany is another main coal-producing country of Europe. Ruhr, Saar, Saxony and Silesia are the main coalfields of Germany. The Ruhr Region is having good quality of coking coal. The coal belt of this region is 65 km long and 16 km wide and it extends in the east and west of Ruhr. Saar Region is having bituminous coalfields. Its main deposits are in Rhineland. Saxony Coalfield is located in eastern part of Germany. Halle, Magdeburg and Leipzig are the main coalfields.

3. United Kingdom:

There was a time when UK was the largest coal producer in the world. But its production declined gradually due to high production cost, low productivity, competition with other energy sources and other countries and also due to great depth of coal mines. The main coalfields of UK are:

(a) The Scottish Lowlands

Situated between Grampian highland and Southern highland, this Clyde basin is one of the oldest and consistent coal-producing regions. The major sub-regions are:

(1) Ayrshire,

(2) Glasgow, and

(3) Fifeshire. The coal of this region has helped immensely in the development of the numerous industries nearby.

(b) Northumberland-Durham Region

Situated in the eastern slope of Penine range, this area still contributes significant amount of good quality coal.

(c) South Wales

High quality coal is sent to the industries in Bristol and Somerset region.

(d) Lancashire

Huge amount of bituminous and coking coal is produced.

(e) Yorkshire

Scattered coal deposits are found in Warwickshire, Nottingham region.

(f) West Midland

Here important coalfields are South Staffs, Potteries, etc.

4. Belgium

Besides Franco-Belgian coalfields, Kempenland mines also contribute some coal. Belgium was a major producer of coal but presently production is suffering due to depletion of deposits.

5. France

France is self-sufficient in coal-production. Most of its coal is extracted from Central Massif Nord, St. Etienne region.

7. Kazakhstan

Kazakhstan is now considered to be an important coal-producing country. This country is believed to have huge reserves of unexploited coal. It is now the 9th largest coal-producing country in the world. Major coal deposits here are;

1. Karaganda Basin

It is comparatively a new field where production started only in 1970. Most of the mines are located conveniently, so cheap transportation of coal to industrial regions of Ukraine is an added advantage.

2. Ekibastuz Basin

Coal mining started here in the 1950s. It is, practically, a continuation of Karaganda coal mines, situated in the north-eastern part of Kazakhstan. The output of this coal-field is increasing significantly.

7. Ukraine

Ukraine is having 10th place in the coal production of the world. After separation from former USSR, coal production has suffered badly but, again, after some government assistance, coal production started increasing.

The major coalfield is Donetsk basin or Donbas. It is one of the oldest mining regions and has been contributing significantly since 18th century. These mines produce 90 per cent of the Ukraine coal production. The mines are however, very deep and production cost is significantly high.

South Africa is the leading coal-producing country of the world and ranks 5th in the world. During the last few years coal production in South Africa has witnessed a significant increase. Much of its coal production comes from Transvaal, Natal and Cape Province. The major coal mines are Middleburg, with bank and New Castle.

Apart from above mentioned countries other significant coal-producing countries are South Korea, North Korea, Vietnam, Indonesia, Philippines, Thailand, Pakistan and Malaysia in Asia; Canada, Zimbabwe, Zaire, Mozambique, Zambia and Nigeria in Africa; Chile, Peru, Columbia, Brazil and Argentina in South America.

World's production and distribution of petroleum

Petroleum and mineral oil are at present the most important energy fuels. Oil is extremely important for transportation, heat production and the chemical industry. Crude petroleum also known as crude oil occurs in the marine sedimentary rocks. Generally, porous rocks namely sandstone, limestone and shale hold it. Being lighter than water, it collects in the anticlines which when folded gently offer favourable sites for the accumulation of oil.

Mineral oil is obtained from those decomposed tiny marine creatures, minute plants and animals which were buried under the sediments several crore years ago. Oil is generally found in wells at the dome-like structures of sedimentary rocks. The global occurrence of petroleum is very patchy, and there are sound geological reasons for this. The most significant is the distribution of continental and oceanic crust because source rocks are confined to continental crust, including continental shelves. Elsewhere, and mainly concealed beneath the world's great oceans, vast areas of oceanic crust have no source rocks and therefore no petroleum potential. The possibility

of getting oil in igneous and metamorphic rocks is generally ruled out because tremendous heat and pressure involved in the formation of such rocks would destroy any oil if it happened to be there. So areas where they predominate, such as Scandinavia and the Canadian Shield are poor in petroleum resources. The oil producing countries in the world can be grouped into following five geographical regions (fig 32).

(a) American region

This region possesses less than 20% of the global oil reserve. The major producing countries are U.S.A., Canada and Mexico in North and Central America, Venezuela in South America.

(b) European region

This region holds only 15% of the world's oil reserve. Much of the oil is confined within Eastern Europe and Russian Fed. The leading producing countries are Russia, Ukraine, Norway, U.K., Romania etc.

(c) Far Eastern region

This region has very little reserve, i.e., less than 6%. The bulk of the reserve is in China, Indonesia and India.

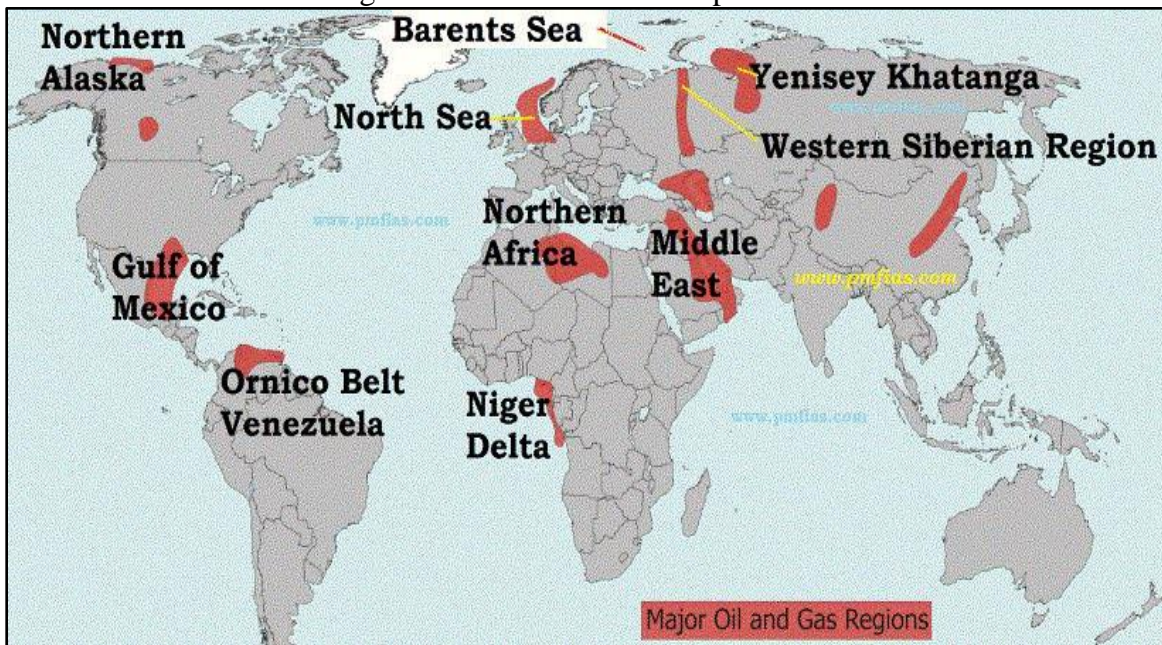
(d) African region

This region holds less than 8% of the global oil reserve, mostly in countries adjacent to Middle East like Libya, Nigeria, Algeria and Egypt.

(e) Middle Eastern region

This region witnessed more exploration and discoveries of new petroleum reserve in the 1990s. The recoverable reserve of the area rose to 60% of the global reserve in 1997, from 50% in 1990. Saudi Arabia alone possesses 24% of the total global reserve, followed by Kuwait (7.5%), Iraq (7.5%), Iran (5.8%) and U.A.E. (5.2%).

Fig 32: World distribution of petroleum



(a) American Region

1. United States of America

According to an estimate of United Nation's statistical office in 2005 present proven recoverable reserve of crude oil in USA is 3,600 million tons or only 2.4 per cent of the world's total. As far as consumption of crude oil is concerned, USA secures the top position in the world. The annual consumption exceeds one-fourth of the world's production. However, the domestic production falls short of consumption. The annual production in 2004 was more than 334 million tons.

To meet the growing demand of the country, USA is constrained to import a large amount of crude oil redundant. Though the relative share of the US crude oil production has declined considerably since the last century, even at present it is the second largest producer of petroleum, after the CIS.

The US and the world, in general, witnessed a remarkable achievement when the first oil well was opened at Titusville, near Pennsylvania by Colonel E. L. Drake in 1859. The inauguration of this 69 feet oil well had ushered in a new era in energy resources of the world. The major oil producing districts of USA may be subdivided into following six regions (fig 33).

- I. The North-eastern Region
- II. The Central Region
- III. The South-eastern Gulf Region
- IV. The Rocky Mountain Region

- V. The South-western Region
- VI. Kuparuk Field in Alaska

Fig 33: Distribution of petroleum in USA



I. The North-eastern Region

This is the oldest of the crude oil regions on earth, stretching from Tennessee to New York in the north east. The oil wells are scattered over the states of Tennessee, Kentucky, Ohio, Illinois, Indiana, West Virginia, Pennsylvania and New York. The oil extracted from this field is of very fine quality and can match with the best oil in the world.

II. The Central Region

The central oil-bearing region covers the states of Oklahoma, Kansas, Texas and Missouri. Some of these fields contribute handsomely to the national oil output. Texas alone contributes more than one-fourth of the US oil output and ranks first in the country. Oklahoma, the other leading oil-producing states, produces more than 5 per cent. Perhaps this is the only oil field in USA where all grades of crude are available. The productions of New Mexico and Arkansas are insignificant.

III. The South-eastern Gulf Province

The oil fields of southern Texas, Louisiana, Mississippi, Alabama, Georgia and Florida contribute significantly to the national oil output. The production of these fields is consistent over the years. The structure of the subterranean oil fields is folded. The anticlinal crest on the faulted traps contains crude oil. This asphalt based oil is valuable for industrial purpose.

IV. The Rocky Mountain Region

The Rocky Mountain region contains an enormous amount of petroleum reserve. North Dakota, Montana, Wyoming, Utah, Colorado and New Mexico have several small oil-fields. Due to the inaccessible nature of the terrain, hostile climate and depth of the oil wells the average production from these oil wells is not very satisfactory.

V. The South-Western Region

In the south-western part of the United States, just the Gulf of California, considerable amount of crude oil is extracted from the wells. These oil-fields are of the oldest in United States. San Joaquin Valley and Los Angeles basin oils are of superior quality.

VI. The Kuparuk Oil-field in Alaska

This is a new oil-field where production started in the '80s. The production from this oil-fields is now gaining momentum. It has been estimated that the total reserve of this field may exceed the reserve of even the north-eastern region. Due to the severe oil crisis in the last couple of decades, the United States was deliberately looking for a major break-through to curb the growing dependence on the OPEC. The Kuparuk field in Alaska, therefore, increased its production very rapidly. Within a span of only a decade, the production of this field surpassed the traditional fields like California, Oklahoma. The average production of this field is around 700 million barrels each year, one-fifth of the total US output.

Despite the massive oil production within its territory, USA is not self-sufficient in oil production. It has to import large amounts of oil from different countries like Saudi Arabia, Nigeria, Mexico, Canada and Venezuela among other countries.

2. Canada

First oil well discovered at Leduc near Edmonton in 1947. Since then, Canada emerged as a leading oil-producing country and secured 13th position in 1996. It is a surplus-producing coun-

try and exports some of its production. Alberta province provides three-fourths of its petroleum production. The other producing state is Saskatchewan.

Noted oil fields are Pembina, Calgary, Red water and Edmonton. Few smaller deposits found in British Columbia and Manitoba. Recent oil discoveries at Grand Bank and Athabaska region consolidated the position of Canada as an oil-producing nation.

3. Mexico

Oil production in Mexico witnessed several ups and downs in the 19th century. Tampico and Tuxpam, the two oil fields, started production as early as in 1901. Sometimes in the 1930s, Mexican production touched 30 million tons, nearly one-third of the then world output. But, since then, depletion of oil reserve and restrictions on further exploration by foreign companies and subsequent nationalization of the oil industry, gave tremendous blow to Mexican oil production.

During the 1970s however, Mexican oil production increased substantially and secured 8th position in 1997. Among the newly discovered oil-fields are Tehuantepec in the south and Campeche sound in the Gulf of Mexico.

4. Venezuela

Venezuela is a leading oil-producing country. In 1997, it secured 7th position in oil production. Till 1960, Venezuela was the second-largest oil producing country but, since then, its relative dominance in world oil production declined.

The two leading oil-fields in Venezuela are Maracaibo Bay and Orinoco Basin. In Maracaibo production started as early as 1918, it still produces the bulk of Venezuelan oil. The other important oil-fields are Guurica, Officina, Temblador and Barinas.

Venezuela exports a sizable portion of its oil production to U.S.A. and Europe.

5. Columbia

Columbia is self-sufficient in petroleum production.

Maracaibo basin and Magdalena valley. Few important oil-fields are Patrolea, Convenas and Barranca Bermeja. Columbia exports huge amount of petroleum to U.S.A. and European countries.

6. Peru

Peru is not a significant oil-producing country. Much of its oil production comes from Piura, Zorritos, Lobitos and Negritos. It exports some amount of its production.

7. Argentina

In 1990s, Argentina has become a leading oil-producing country in S. America. The oldest oil-field in the country is Comodoro Rivadavia field in Patagonian peninsula. Other fields are Neuquen, Mendoza, Oran and Tartagal.

8. Chile

Punta Arenas and Tierra del Fuego are the two noted oil-fields. Chile is self-sufficient in petroleum production.

Two other petroleum producing countries in S. America are Bolivia and Ecuador.

(b) European Region

Europe contains nearly 15% of the global oil reserve. Much of the oil is lying in C.I.S. and adjacent to North Sea region, in the countries like U.K., Denmark, Norway. Besides, Russia and Romania in Eastern Europe are also traditional producers.

1. Russian Federation

Despite all the political turmoil in the country in the 1990s, the country still manages to hold third position in the global production of petroleum. But, 60 to 90 percent of the high-yield deposits of the country has drastically depleted due to over-exploitation. Even after the decline of production, Russia still remains a leading exporter of petroleum.

The major petroleum fields are

(a) Volga-Caspian region-the largest oil field in Russia; high grade oil extracted. Though much of the good quality oil has already been extracted, still it supplies a huge amount.

The region extends from Caspian Sea, through Black Sea coast to the Volga basin.

Major oil-fields are located at Grozny, Maikop, Prikumsk, Zhirnovsk, Elshanka, Ishimbai etc.

(b) Kamchatka-Sakhalin region, now considered to be the largest producer of oil in the country. Okha is the major oil field in Sakhalin. Due to inaccessible nature of the terrain and hostile climate, much of its reserves are yet to be properly tapped.

(c) Ob-Lena basin is large, scattered oil-fields with sizable reserves. Major oil-fields are Sovetskoe, Tyumen etc.

(d) Pechora region, Ukhta and Pashnya are the two important oil-producing fields.

2. Ukraine

Ukraine is not a significant oil producing country. Much extracted from Dnieper basin and Crimean peninsula.

3. United Kingdom

After the discoveries (1980s) of few new oil-fields in the continental shelf of North Sea, Great Britain again became a major producer of petroleum. In 1997, it secured 9th place in the global oil production.

The largest oil deposits occur at Brent near Shetland Island, followed by Forties, Claymore, Piper, Auk and Orkney. U.K. now exports large volume of its crude oil.

4. Romania

Romania is a traditional petroleum-producing country. After many years of continuous oil extraction, most of the wells have dried-up.

Eastern slope of Carpathian Mountains has the largest oil-fields. The major oil-wells are located at Ploesti, Bacau, Dambovitza Valley.

5. Norway

Norway is now the second-largest petroleum producing country in Europe, next to Russia. The remarkable increase of production owes to the discovery of large extensive oil-fields in the North Sea shelf. Most of these fields are new, so Norway will continue to remain a leading producer in the years to come. It is now the 7th largest oil-producing nation in the world.

Some of the important oil fields in Norway are NOME, Oseberg and Ekofisk etc.

6. Other European Countries

France, Netherlands, Poland and Germany also produce some amount of petroleum.

(c) Far Eastern Region

This region comprising countries like China, Indonesia, Myanmar (Burma), India, Pakistan, Japan etc., is holding only 6% of the global oil reserve and cannot be considered a significant oil-producing region.

1. China

Despite late start, increase of oil-production in China in recent years is a spectacular event. From a deficient-producing country, it has emerged as the 5th largest producing country in the world in 1997. The opening of exploration site to multinational companies during the Deng era (1980s), paid rich dividends and several new oil-fields were discovered in various areas.

Till 1970, the average annual production of petroleum in China was far less than 10 million tons. In 1997, 70 oil wells distributed all over the country produced over 160 million tons of petroleum. The major oil fields are situated at Karamai and Lengue in Sinkiang, Taching or Dakang in Hailungkiang and Inner Mongolia. Hubai, Sichuan, Tarim basin and Yanchang are other notable reserves. Apart from on-shore oil-wells, China is also able to explore some off-shore oil-fields in South China Sea and Bo Hai Bay.

2. Indonesia

Indonesia is the second-largest oil-producing country in Asia, next to China. In 1997, it produced nearly 80 million tons of oil. Most of the oil-fields are scattered in different islands.

Some of the important oil-fields are Palembang in Sumatra, Djambi, Pengkalan, Balikpapan, Rantau etc. Indonesia, an active member of OPEC, exports huge amount of oil. Some of the oil fields are jointly owned by the government and multinational oil companies.

3. Japan

Japan is an insignificant producer of petroleum. Some oil is extracted from the shallow shelf of Japan Sea. Two notable oil-fields are Akita and Niigata of Honshu Island. Japan produces only 5% of its internal demand —rest is imported.

4. India

India is not self-sufficient in petroleum production, though there has been significant improvement in her oil production. In the late 90s, Indian oil production varied between 25-35 million tons.

Indian oil wells are primarily distributed in four major regions;

- (a) North-Eastern
- (b) West Indian
- (c) Bombay High
- (d) South Indian

(d) African Region

Geological structure, i.e., presence of igneous and crystalline rocks, prohibited accumulation of crude oil in most parts of Africa. Only Sahara and sub-Sahara region like Libya, Algeria, Nigeria and Egypt possess some oil deposits, amounting less than 8% of the global reserve.

1. Libya

Since the discovery of oil in 1957, Libya became a consistent producer of petroleum. The total oil reserve of Libya is around 3% of global reserve. Bulk of the product is exported to foreign countries. The leading oil-fields in Libya are Dahra, Beda & Zelton at Gulf of Sidra. Annual production in 1997 was over 80 million tons.

2. Algeria

Algeria is another significant producer of petroleum where much of the national income comes from oil-export. Leading oil-fields in Algeria are Edjile, Hassi Massaud and Hassi R'Mel.

3. Nigeria

Niger delta in Nigeria contains enormous amount of oil. Boguma, Okrika and Bonny are the leading producers. It also exports a good amount of crude oil.

4. Egypt

Egypt is self-sufficient in oil production Major oil-wells are confined in Ras Matarma, Ras Gharib in Sinai Peninsula.

(e) Middle-East Region

The re-evaluation of reserve estimates (1994) revealed that the Middle-East now possesses 65% of global petroleum reserve. It is 15% up than the previous estimate (1990). This is largely because of new discoveries. This overwhelming dominance of reserve is well-reflected in production pattern and marketing strategies of this region. Even if the present consumption pattern remains, supremacy of Middle-East in the global oil-trade will remain for good few years to come. The first oil well was opened up in 1908 near Masjid-I-Suleiman by Anglo Iranian Oil Company. Since then, several big multinational companies like Aramco, Shell joined in the race. Soon, arid, static economy of Middle-East witnessed a massive boom. Since 1960, Middle-East oil production started to grow by leaps and bounds and soon the region outranked all other regions in the volume of oil production. Productivity of the unit wells here outranked all other regions too. During the 1970s, this region witnessed another upheaval. Political unrest, recurrence of war, border disputes, disputes over the ownership between multinational oil companies and state governments, emergence of pan-Islamism and other social tensions resulted in nationalization of most of the oil-wells. Not only internal tensions rocked the region, the superpowers also tried to exert their influence over the territory. The strategic importance of these oil-fields increased with the depletion of oil-fields in other regions. The geo-political situation, growing rivalry between Arab-Israelies, and social transformation due to affluence made the region the melting pot in the world.

The highly developed Western Europe, USA, Japan, and developing countries like India and Zaire, import much oil from Middle-East. The leading producing countries are Saudi Arabia, Iran, Iraq, Kuwait and U.A.E.

1. Saudi Arabia

In the 1990s, Saudi Arabia secured first position in global oil production. According to revised estimates, the country possesses one-fourth of the total recoverable oil reserve of the world. If the present rate of extraction goes on, the country will remain the largest producer for decades to come.

The first oil well in Saudi Arabia started operation only in 1938, at Dammam. Ever since the oil exploration begun, U.S. companies, particularly Aramco, dominated the entire operation. The oil wells are situated in two separate regions, on-shore and off-shore.

Among the inland locations, major oil fields are Ghawar, Abquaiq, Qatif, Dammam, Ain Dar, Abu Hadriya, Kharsaniya etc. Some of the important off-shore fields, situated in the continental shelf, are Abu Safah, Safania, Manifah etc. Ghawar in Saudi Arabia is the largest oil-field in the world which spreads over 10,000 sq. km. area.

Most of the oil of Saudi Arabia is generally sent to Ras Tanura and Sidon for refinement. Some of the crude is also transported through pipelines.

2. Iran

Iran is the 4th largest oil producer in the world. The country contains over 7% of the global crude reserve. The first oil well in Middle-East started production in Masjid-I-Sulaiman in as early as 1908. The other notable oil-fields in Iran are Naft-I-Shah, Aghajari, Lali, Bahregan, Naft- I-Shafid, Meyden-I-Naftun, Gach Saran, Haft-I-Kel etc. In 1951, all oil-wells in Iran were nationalized. The initiation of Islamic rule and ouster of the Shah of Iran disrupted oil-production for a brief period. Subsequent war with Iraq and bitter relationship with U.S.A. also hampered oil production. Despite the brief isolation period from international market, Iran is again back as a leading exporter of oil. Much of its oil is refined in Abadan and Kermanshah.

3. Iraq

Iraq has more than 7% of the world reserve of petroleum. It was the 8th largest petroleum producing country in 1997. Prolonged 7-years' war between Iran and Iraq, border disputes and

subsequent war with Kuwait (1990) and the U.S.A.-led force in 1991 devastated oil industry in Iraq. The economic sanctions and sanctions against oil export has practically stopped oil export from Iraq. Major oil-fields in Iraq are Kirkuk and Mosul in the north, Daura in centre and Az Zubayr in the south. Occasional war and continued U.N. financial embargo has restricted Iraq's further increase of oil production.

4. Kuwait

Kuwait has 8% of the oil reserve of the world. The oil-fields are situated almost over entire Kuwait!

The major oil-fields are Mina-al-ahmadi, wafra, Burgan, Magwa Sabriya, Mingish etc. Here, oil production started only in 1947 but, since then, the country never looked back. Only in the 1990s the invasion of Iraq and subsequent war damaged badly most of the oilfields. It exports more than 98% of its output.

5. United Arab Emirates (UAE)

The confederation of U.A.E. possesses around 10% of the world reserve. The constituting countries are Abu Dhabi, Dubai, Shajah, Ajman etc. The leading oil-fields are at Fateh, Bu-Musa, Al Bundag, Bu-hasa, Murban etc. Most of these oil-fields are located at coastal and offshore regions.

6. Other Producers

Qatar is a significant oil producer in Middle-East. Here, major oil-wells are Doha, Jebel, Jakrit etc.

Aooli in Bahrain, Fanud, Chara in Oman are other significant oil-fields in Middle-East.

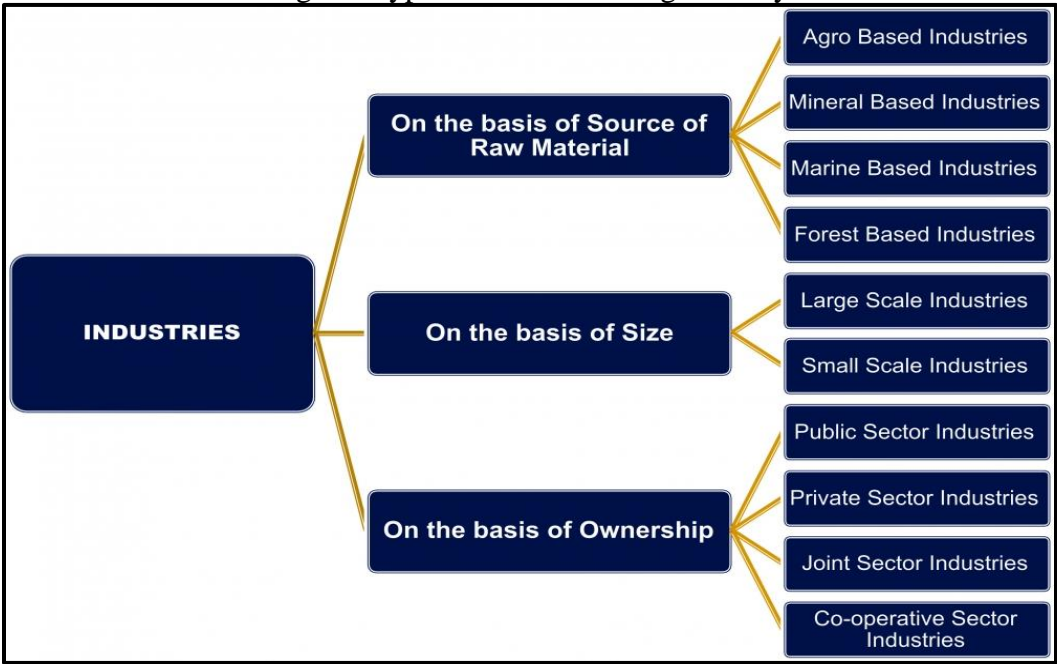
13.Manufacturing industries

Manufacturing: Production of goods in large quantities after processing the raw materials into more valuable products is called manufacturing. Any industry that makes products from raw materials by the use of manual labor or machinery and that is usually carried out systematically with a division of labor. In a more limited sense, manufacturing denotes the fabrication or assembly of components into finished products on a fairly large scale.

Importance of Manufacturing

Manufacturing industries help in modernizing agriculture; which forms the backbone of our economy. Apart from this, manufacturing industries also reduce the heavy dependence of people on agricultural income. This becomes possible because of creation of new jobs in secondary and tertiary sectors. Industrial development helps in eradication of unemployment and poverty. Export of manufactured goods expands trade and commerce and brings in much needed foreign exchange. A country with high level of manufacturing activities becomes prosperous. Manufacturing industries are divided in to several types (fig 34). Among the most important manufacturing industries are iron & steel, textile, chemicals etc.

Fig 34: Types of manufacturing industry



Classification/types of Industries

1. On the basis of raw materials:

Agro Based Industries: Cotton, woolen, jute, silk textile, rubber, sugar, tea, coffee, etc.

Mineral Based Industries: Iron and steel, cement, aluminium, petrochemicals, etc.

2. According to their main role:

Basic or Key Industries: These industries supply their products or raw materials to manufacture other goods, e.g. iron and steel, copper smelting, aluminium smelting.

Consumer Industries: These industries produce goods which are directly used by consumers, e.g. sugar, paper, electronics, soap, etc.

3. On the basis of capital investment:

Small Scale Industry: If the invested capital is up to Rs. one crore, then the industry is called a small scale industry.

Large Scale Industry: If the invested capital is more than Rs. one crore, then the industry is called a large scale industry.

4. On the basis of ownership:

Public Sector: These industries are owned and operated by government agencies.

Private Sector: These industries are owned and operated by individuals or a group of individuals.

Joint Sector: These industries are jointly owned by the government and individuals or a group of individuals.

Cooperative Sector: These industries are owned and operated by the producers or suppliers of raw materials, workers or both. The resources are pooled by each stakeholder and profits or losses are shared proportionately.

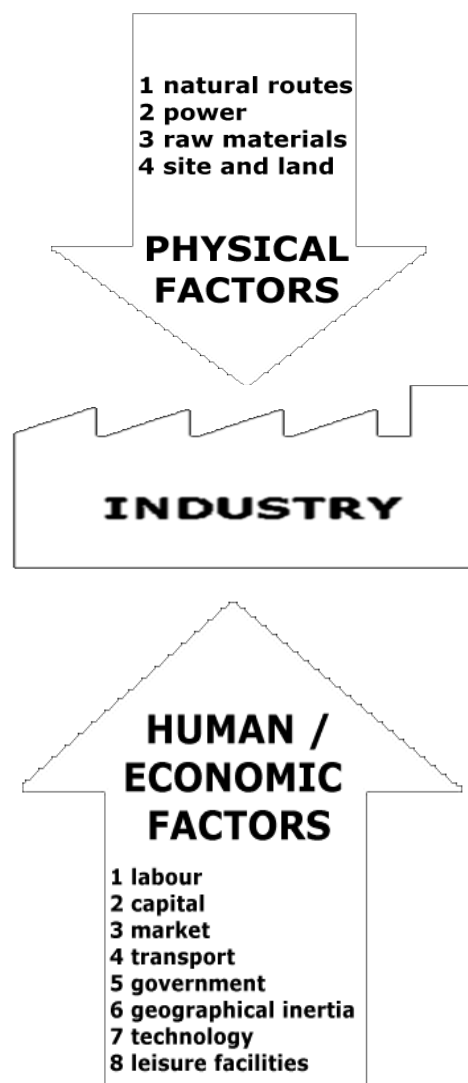
5. Based on the bulk and weight of raw materials and finished goods:

Heavy Industries: Iron and steel.

Light Industries: Electronics

14. Industrial location factors

Industrial location factors are those considerations, which are made by industrial managers when deciding on the ideal location for their industry or business. The diagram below shows that these are divided into two main categories - human / economic and physical factors. The factors outlined below are not exhaustive, there are many more and the location factors depend on the time, industry and area.



Sometimes, industries are located in or near cities. Cities provide markets and also provide services like banking, insurance, transport, labour, consultants, etc. Many industries tend to come together to make use of the advantages of an urban centre. Such centre is then called as agglomeration economy. In the olden period, most of the manufacturing units were located in places which were near the ports, e.g. Karachi.

A. Physical Factors

1. Natural Routes

Natural routes such as rivers and passes are important to industry because of access. Although it is not as important for industries to be able to locate near a river for transport reasons any more, it can be essential to have a river for cooling water, etc.

2. Power

The original reason for this being a location factor was that industry had to be close to trees, which could be burnt as a source of power. Now the source could well be coal, though it has diminished in importance due to electricity being so widely available.

3. Raw Materials

Still the primary location factor, the importance of raw materials is obvious. It is particularly important for industries to locate close to their raw material(s) source(s) if they are bulky and / or large in number to reduce transporting costs. With Hi-Tech industries, where few bulky raw materials are required, this is less important and the industry can be classed as 'footloose' - able to locate away from their raw materials, as transport costs are not prohibitive.

4. Site and Land

All industries need land in some way. The amount and relief of that land is important. Large, heavy industries such as iron and steel factories need huge amounts of cheap, flat land away from major urban areas, whereas smaller industries may only need a small amount of cheaper land on industrial estates on the edge of towns and cities. For the tourism industry, site and land take on a different meaning: it may mean the location of a hotel, though more likely, it may refer to the scenery, etc.

B. Human/ Economic Factors

1. Labor

Labor refers to the people working in the industry. It is important that an industry locates near to a source of labor (such as an urban center) or provides the transport for people to get to work.

2. Capital

Capital refers to the money needed not only to set up the industry in the first place, but the 'working capital' that keeps it going from day-to-day. Profits therefore have to be made, so that the industry can continue to work, so the location of the industry in terms of capital is dependent on other factors such as market. Investments in the industry need to be sought too, this can affect the decision on the location of an industry - close to people or bodies that can make that investment.

3. Market

Market is the place where an industry's goods are sold for profit. The market can be local, regional, national or international (or a combination). The market will depend on the sphere of influence and size of the industry. A local shop for instance will only have a small market whereas a multi-national company (such as ICI) will have a huge international market.

4. Transport

Transport is an important consideration for labor, but more importantly for raw materials and shipping of the finished 'product' to their markets or consumers. Transport considerations may be roads (especially motorways), railways and / or airports.

5. Government Policies

The laws, restrictions and inducements that governments introduce can have a huge impact on the location of industry. The Assisted Areas Scheme for instance, provided tax relief, paid for new buildings and equipment and rent free premises for a fixed period in an attempt to encourage industry to locate in areas designated as 'Development Areas' (where there was high unemployment and industrial decline). Other influences from government include the IDC - 'Industrial Development Certificate', issued by government to tell an industry where it could locate, etc.

6. Geographical Inertia

Geographical Inertia refers to an area that has become known for a particular industry or product. This could influence an industry making that product to locate there as it could guarantee customers.

7. Technology and infra-structure

Technology has been a big influence on industry for many years now. Access to technology (such as robots for making cars) would influence an industry to locate near a supplier of such an important part of the production process, and a consideration would be someone to repair it if it fails.

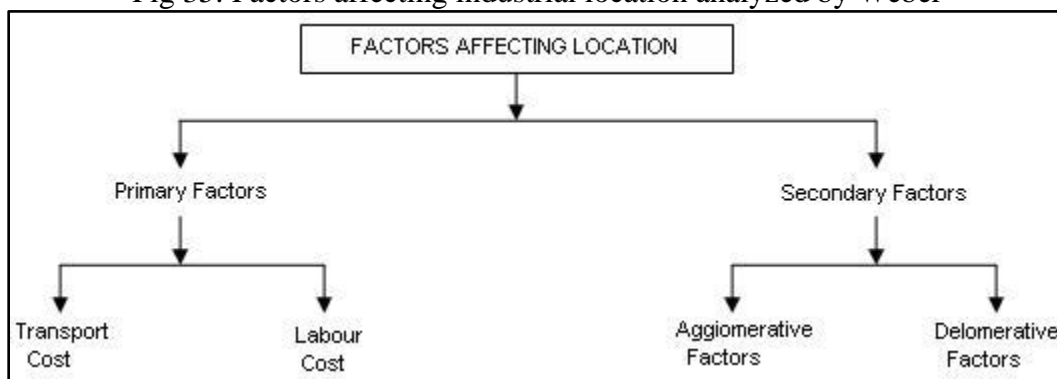
8. Leisure Facilities

Not only do employers have to consider the source of their workers (see labor) but where they will relax after work. A stressed and tired workforce leads to illness and labor supply problems. Ensuring there are leisure facilities (such as pubs, gyms, restaurants, etc.) in a nearby urban center, or actually on the industrial site, ensures relaxation facilities, leading to a less stressed and more productive workforce.

Alfred Weber Theory of Industrial Location

Alfred Weber, a German economist, enunciated a systematic theory of industrial location in 1909. Weber's theory of location is purely deductive in its approach. This theory is based on the 'least cost principle' which is used to account for location of a manufacturing industry. The theory is based upon a single, isolated country with homogeneous conditions. Some of the natural resources in this setting are found everywhere, while some have fixed locations. The workforce has fixed locations. Transportation costs, in this situation, are a function of cargo weight and the distance. Demand is uniform throughout for all products, hence, there is uniform price for all products at all locations. He analyzed the factors that determine the location of industry. The theory claims that the costs will get influenced by transportation costs, labour costs and by the agglomeration factor (fig 35).

Fig 35: Factors affecting industrial location analyzed by Weber



Assumptions of theory

Weber's theory is based on several assumptions. Some basic assumptions are given below;

1. A country or region is homogeneous in terms of culture, climate, topography, race of people, technical skills of the people and political system.
2. Raw materials are two types: i) Ubiquitous-water air, sunshine etc. and ii) Localized- iron ore, coal etc. a) Pure raw material b) Impure raw material.
3. There are fixed locations of labour where wage rates are fixed and labor is immobile and unlimited.
4. Transport cost is directly proportional to the weight and distance travelled.
5. Product of goods in a market is unlimited demand and perfect competition exists.

1. Role of Transportation Costs

1. One market and one raw material condition gives rise to three situations.

(i) Raw Material Available Everywhere (Ubiquitous RM)

The best location in this situation is the market, as that will simply eliminate the transportation costs for the manufacturing unit.

(ii) Raw Material Fixed and Pure:

The manufacturing unit, in this case, should be located either at the market or at the source.

(iii) Raw Material Fixed and Gross (I.E. It Loses Weight On Processing):

The best location will be at source.

2. One market and two raw materials (R_1 , R_2) condition gives rise to four situations.

(i) Both R_1 and R_2 are found everywhere: here, the best location will be at the market, as in that case, lowest transportation costs would prevail.

(ii) R_1 is fixed, R_2 is found everywhere, and both are pure: the best location would be at the market, because then, transportation charges for R_1 only will have to be paid.

(iii) Both R_1 and R_2 are fixed and pure: the best location will be at the market, because in that case lowest aggregate transportation charges will prevail.

(iv) Both R_1 and R_2 are fixed and gross: this is a complex situation, for which Weber introduced the “locational triangle”. Two raw materials- R_1 and R_2 and market (M) form the three modes of this triangle. The transportation charges are a product of the cargo weight and the distance carried by transportation. Thus, a pull is being exerted on the location by each of these three modes. It is seen that the weight-losing manufacturing processes like iron smelting tend to be located near the source of raw materials, while the weight-gaining ones like baking tend to be located near the market (fig 36a).

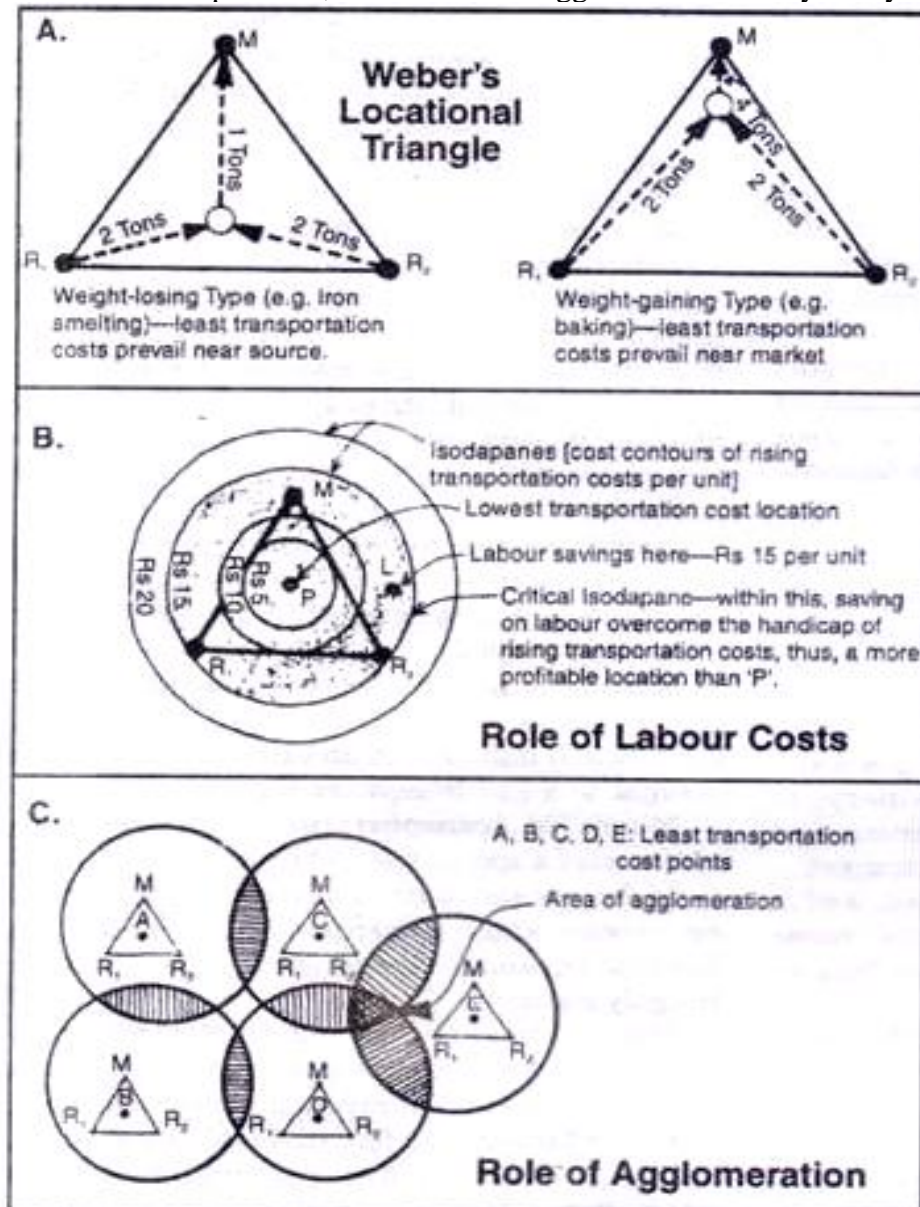
2.Role of Labour Costs

To determine the role of locational pattern of labour force on manufacturing location, Weber’s locational triangle is placed in concentric pattern of rising transportation costs outwards from the centre (fig 36b). It is assumed that the labour force is dispersed outwards and the distance from the centre represents savings on account of labour costs decrease and a point (L) comes where the savings on labour cost overcome the handicap of rising transportation costs. This is a more profitable location than ‘ F ’ which is the lowest transportation cost location.

3. Role of Agglomeration

The coming together or agglomeration of industries offers cuts in production costs if two or more industries operate in the same location (fig 36c).

Fig 36: Role of transport cost, labour cost and agglomerations analyzed by Weber



Criticism/Evaluation of Weber's Theory

Weber's theory has been criticized heavily by many. It revolves around transportation costs and misses the point that the freight rates may not always be directly proportional to the distance. These rates may not also be similar for raw materials and finished goods. Weber, in his theory, seems to have over-emphasized the supply factors while ignoring the demand factors. Main objections on his theory are as follows;

1. Transport costs do not rise proportionally with distance and weight
2. Perfect competition of market rarely exists.
3. Weber ignored the spaced problem, high cost of land and high rent in the industrial area.
4. Historical factors do not have been considered in the location of industry.
5. Impact of price fluctuation does not consider.
6. Break of bulk point do not has been considered.
7. Homogeneous areas have been questioned.

Still, credit must be given to Weber for laying bare the fact that transportation costs are the most fundamental factor in deciding the location of the manufacturing industry. His theory is important because of its pioneering nature and its effects on later researchers. The real test of theory is that it should accord with reality and empirical studies as Isard's work on US Steel Industry and Smith's works on weight-losing in Britain have, however, shown the validity of many Weber's conclusion

15. Transportation system

Transportation is one of the most significant spatial phenomena's of the globe. It provides the vital links between producers and consumers by overcoming the barrier of geographic distance between them. The term 'transportation system' is used to refer to the equipment and logistics of transporting passengers and goods. It covers movement by all forms of transport, from rails, cars and buses to boats, aircraft and even space travel.

Modes of Transportation

These most common five modes of transport are: railways, roadways, airways, waterways and pipelines.

Transport modes are designed to either carry passengers or freight, but most modes can carry a combination of both. For instance, an automobile has a capacity to carry some freight while a passenger plane has a belly hold that is used for luggage and cargo. Each mode is characterized by a set of technical, operational and commercial characteristics. Technical characteristics relate to attributes such as speed, capacity, and motive technology while operational characteristics involve the context in which modes operated, including speed limits, safety conditions or operating hours. The demand for transport and the ownership of modes are dominant commercial characteristics.

1. Road transportation

Road transport means transportation of goods and personnel from one place to the other on roads. Road is a route between two destinations, which has been either paved or worked on to enable transportation by way of motorized and non-motorized carriages. The cost of construction, operating cost and maintaining roads is cheaper than that of the railways. Sometimes road transport is the only way for carrying goods and people to and from rural areas which are not catered to by rail, water or air transport. Delivery of goods between cities, towns and small villages is made possible only through road transport. Road infrastructures are large consumers of space with the lowest level of physical constraints among transportation modes. However, physiographical constraints are significant in road construction with substantial additional costs to overcome features such as rivers or rugged terrain. While historically road transportation was developed to support non-motorized forms of transportation (walking, domestic animals and cycling at the end of the 19th century), it is motorization that has shaped the most its development since the beginning of the 20th century. Road transportation has an average operational flexibility as vehicles can serve several purposes but are rarely able to operate outside roads. Road transport systems have high maintenance costs, both for the vehicles and infrastructures. They are mainly linked to light industries and freight distribution where rapid movements of freight in small batches are the norm. Yet, with containerization, road transportation has become a crucial link in freight distribution.

Advantages

1. **Less Capital Outlay:** Street transport required a great deal less capital Investment when contrasted with different methods of transport, for example, railroads and air transport. The cost of developing, working and keeping up streets is less expensive than that of the railroads. Streets are by and large developed by the administration and neighbourhood specialists and just little fees are charged for the utilization of streets.
2. **Way to Door Service:** The remarkable favourable position of street transport is that it gives way to entryway or distribution centre to stockroom benefit. This decreases cartage, stacking and emptying costs.

3. **Adaptable Service:** Road transport has an incredible preferred advantage over different methods of transport for its adaptable administration; its courses and timings can be balanced and changed to individual prerequisites without much bother.
4. **Appropriate for Short Distance:** It is more economical and speedier for conveying merchandise and individuals over short distances. Delays in travel of merchandise by virtue of moderate stacking and taking care of are maintained a strategic distance from. Products can be stacked direct into a street vehicle and transported straight to their place of goal.
5. **Less Packing Cost** When contrasted with different methods of transport, the goods transported via road require less complicated packing. Products transported by road transport require less pressing or no pressing in a few cases too.
6. **Fast Speed:** On the off chance that the products are to be sent instantly or rapidly, road transport is more suited than the railroads or water transport. Likewise much time is squandered in booking the merchandise and taking conveyance of the products if there should be an occurrence of railroad and water transport.
7. **Less Cost:** Street transport not just requires less beginning capital venture, the cost of operation and upkeep is likewise relatively less. Regardless of the possibility that the rate charged by road transport is somewhat higher than that by the railroads, the real compelling expense of transporting merchandise by engine transport is less. The genuine cost is less on the grounds that the road transport spares in pressing expenses and the costs of halfway stacking, emptying and charges involved in taking care of shipment.
8. **Private Owned Vehicles:** Another advantage of street transport is that a lot- number of specialists can stand to have their own particular road transport vehicles and start their own particular transport companies to send the items as per the requisites of the individual or the business.

Disadvantages

1. **Irregular Nature:** Engine transport is not as dependable as rail transport. Amid blustery or surge season, streets wind up plainly unfit and dangerous for utilize.
2. **Mishaps and Breakdowns:** There are more odds of mishaps and breakdowns in road transport. Consequently, road transport is not as protected and safe as rail transport.
3. **Inadmissible for Long Distance and Bulky Traffic:** This method of transport is inadmissible and exorbitant for transporting shoddy and cumbersome merchandise over long separations.
4. **Moderate Speed:** The speed of engine transport is similarly moderate and constrained.
5. **Lack of Organization:** The street transport is nearly less organized. All the more regularly, it is unpredictable and undependable. The rates charged for transportation are likewise precarious and unequal.

2. Rail transportation

In this mode of transport, vehicles (rails) run on tracks called railroads. It is one of the most important, commonly used and very cost effective modes of commuting and goods carriage over long, as well as, short distances. Since this system runs on metal (usually steel) rails and wheels, it has an inherent benefit of lesser frictional resistance which helps attach more load in terms of wagons or carriages. Trains are powered by an engine locomotive running on electricity or on diesel. Complex signaling systems are utilized if there are multiple route networks. Rail transport is also one of the fastest modes of land transport. Trains are fast and the least affected by usual weather turbulences like rain or fog, compared to other transport mechanisms. Rail transport is better organized than any other medium of transport. It has fixed routes and schedules. Its services are more certain, uniform and regular compared to other modes of transport. Adaptations include passenger railways, underground (or over ground) urban metro railways and goods carriages. Railways are composed of a traced path on which wheeled vehicles are bound. In light of recent technological developments, rail transportation also includes monorails and maglev. They have an average level of physical constraints and a low gradient is required, particularly for freight. Heavy industries are traditionally linked with rail transport systems, although containerization has improved the flexibility of rail transportation by linking it with road and maritime modes. Rail is by far the land transportation mode offering the highest capacity with a 23,000 tons fully loaded coal unit train being the heaviest load ever carried. Gauges, however, vary around the world, often challenging the integration of rail systems.

Advantages

1. **Faster than road transport:** The trains are operating at a higher speed than that of road vehicles. This is because of one track for the trains.

2. Suitable for bulky goods: Railways are more suitable for bulky and heavy goods. The trains can carry huge load. The railways freight for carrying such goods is comparatively less. Also, the goods can reach safely.
3. Economical for long distances: The trains are economical for long distances. They are also convenient for longer distances. The journey for passengers is also comfortable. This is because there is no jerk or bumps as compared to Road Transport.
4. Full protection to goods: The trains operate full protection to goods from sun, rain, wind, dust, etc. Therefore, it is always advisable to send the goods by trains especially during monsoons.
5. Regularity: The trains operate regularly. The railways have a fixed schedule of running the trains. There is often more reliability of trains as compared to road Transport. There are chances of less accident.

Disadvantages

1. Huge investment: The railways require huge investment. This is because the cost of a train is many times higher than that of a road vehicle. Also, the construction of the tracks involves a lot of money.
2. High overhead cost: The railways have to incur high overhead costs. This is because of maintenance of trains and tracks. Also, the salaries paid to the technical and other staff is quite high as compared to the salaries of road drivers and others.
3. Government monopoly: In India, railways are operated and managed by the government. At times, the railway authorities are negligent in their duties. They also do not provide personalized services.
4. Lacks door-to-door service: Railways cannot provide door-to-door service. The rail service is available along the railway routes only. It is only the Road Transport that can provide door-to-door service.
5. Less coverage: The railways operate mostly in urban and semi-urban and industrial towns and cities. They do not operate in remote rural areas because of high costs.

3. Maritime or water transportation

Water transport is the process of transport a watercraft, such as a barge, boat, ship or sailboat, over a body of water, such as a sea, ocean, lake, canal or river. } Ship transport is primarily used for the carriage of people and non-perishable goods, generally referred to as cargo. Ship transport is often international by nature. It is frequently undertaken for purposes of commerce, recreation or military objectives. When a cargo is carried by more than one mode, the transport is termed intermodal or co-modal. Ship transport is used for a variety of unpackaged raw materials ranging from chemicals, petroleum products and bulk cargo such as coal, iron ore, cereals, and bauxite. So called 'general cargo' covers goods that are packaged to some extent in boxes, cases, pallets, barrels, etc. With physical properties such as buoyancy and limited friction, maritime transportation is the most effective mode to move large quantities of cargo over long distances. Main maritime routes are composed of oceans, coasts, seas, lakes, rivers, and channels. However, due to the location of economic activities, maritime circulation takes place on specific parts of the maritime space, particularly over the North Atlantic and the North Pacific. The construction of channels, locks, and dredging are attempts to facilitate maritime circulation by reducing its discontinuity, but such endeavors are highly expensive. Comprehensive inland waterway systems include Western Europe, the Volga / Don System, the St. Lawrence / Great Lakes system, the Mississippi and its tributaries, the Amazon, the Panama / Paraguay and the interior of China.

Maritime transportation has high terminal costs since port infrastructures are among the most expensive to build, maintain and operate. These high costs also relate to maritime shipping where the construction, operation, and maintenance of ships is capital intensive. More than any other mode, maritime transportation is linked to heavy industries, such as steel and petrochemical facilities adjacent to port sites. Yet, with containerization, maritime shipping has become the linchpin of globalization, allowing trading a wide range of goods and commodities.

Advantages

1. Low Cost: Rivers are a natural highway which does not require any cost of construction and maintenance. Even the cost of construction and maintenance of canals is much less or they are used, not only for transport purposes but also for irrigation, etc. Moreover, the cost of operation of the inland water transport is very low. Thus, it is the cheapest mode of transport for carrying goods from one place to another.
2. Larger Capacity: It can carry much larger quantities of heavy and bulky goods such as coal, and, timber etc.

3. **Flexible Service:** It provides much more flexible service than railways and can be adjusted to individual requirements.
4. **Safety:** The risks of accidents and breakdowns, in this form of transport, are minimum as compared to any other form of transport.

Disadvantages

1. **Slow:** Speed of Inland water transport is very slow and therefore this mode of transport is unsuitable where time is an important factor.
2. **Limited Area of Operation:** It can be used only in a limited area which is served by deep canals and rivers.
3. **Seasonal Character:** Rivers and canals cannot be operated for transportation throughout the year as water may freeze during winter or water level may go very much down during summer.
4. **Unreliable:** The inland water transport by rivers is unreliable. Sometimes the river changes its course which causes dislocation in the normal route of the trade.

Unsuitable for Small Business: Inland water transport by rivers and canals is not suitable for small traders, as it takes normally a longer time to carry goods from one place to another through this form of transport.

4. Air transportation

Air routes are practically unlimited, but they are denser over the North Atlantic, inside North America and Europe and over the North Pacific. Air transport constraints are multidimensional and include the site (a commercial plane needs about 3,300 meters of runway for landing and take-off), the climate, fog, and aerial currents. Air activities are linked to the tertiary and quaternary sectors, notably finance and tourism, which lean on the long-distance mobility of people. More recently, air transportation has been accommodating growing quantities of high-value freight and is playing a growing role in global logistics.

5. Pipelines

Pipeline transport is the mode of transportation of goods or material through a pipe. Liquids and gases are transported in pipelines and any chemically stable substance can be sent through a pipeline. Pipelines exist for the transport of crude and refined petroleum, fuels such as oil, natural gas and bio-fuels - and other fluids including sewage, slurry, water and beer. Pipelines are useful for transporting water for drinking or irrigation over long distances when it needs to move over hills or where canals or channels are poor choices due to considerations of evaporation, pollution, or environmental impact. Even solids can also be transported through pipelines after converting them into slurry.

Pipeline routes are practically unlimited as they can be laid on land or underwater. Their purpose is to move liquids such as petroleum products over long distances in a cost-effective fashion. The longest gas pipeline links Alberta to Sarnia (Canada), which is 2,911 km in length. The longest oil pipeline is the Trans-Siberian, extending over 9,344 km from the Russian arctic oilfields in eastern Siberia to Western Europe. Physical constraints are low and include the landscape and pergelisol in arctic environments. Pipeline construction costs vary according to the diameter and increase proportionally with the distance and with the viscosity of fluids (from low viscosity gas to high viscosity oil). The Trans Alaskan pipeline, which is 1,300 km long, was built under difficult conditions and has to be above ground for most of its path. Pipeline terminals are very important since they correspond to refineries and harbors.

Advantages

1. They are ideally suited to transport the liquids and gases.
2. Pipelines can be laid through difficult terrains as well as under water.
3. It involves very low energy consumption.
4. It needs very little maintenance.
5. Pipelines are safe, accident-free and environmental friendly.

Disadvantages

1. It is not flexible, i.e., it can be used only for a few fixed points.
2. Its capacity cannot be increased once it is laid.
3. It is difficult to make security arrangements for pipelines.
4. Underground pipelines cannot be easily repaired and detection of leakage is also difficult.

Transport costs

The study of the economic aspects of transport or in other words transport economics is of prime importance both to economists as well as to geographers. Until recently, geographers have tended to ignore the fundamental importance of cost and price as influences, but now they intend

to study the economic aspects realizing that an efficient transportation system in many ways is the lifeblood of the economic system. Therefore, the study of the nature of transport costs and pricing, at least in so far as they affect the spatial patterns of transport phenomena, is a basis to transport geography. There are two broad categories of transport costs. They are terminal costs or fixed costs (usually called by economists as inescapable costs) and movement costs or variable costs (escapable costs). Transport costs are the costs internally assumed by the providers of transport services. They come as fixed (infrastructure) and variable (operating) costs, depending on a variety of conditions related to geography, infrastructure, administrative barriers, energy, and on how passengers and freight are carried. Three major components, related to transactions, shipments and the friction of distance, impact on transport costs.

Transport costs have significant impacts on the structure of economic activities as well as on international trade. Empirical evidence underlines that raising transport costs by 10% reduces trade volumes by more than 20% and that the general quality of transport infrastructure can account for half of the variation in transport costs. In a competitive environment where transportation is a service that can be bid on, transport costs are influenced by the respective rates of transport companies, the portion of the transport costs charged to users. Transport costs are generally divided into the following types;

1. **Fixed or terminal costs:** These are costs, which are incurred before any traffic at all passes. These costs are related to the loading, transshipment and unloading. Two major terminal costs can be considered; loading and unloading at the origin and destination, which are unavoidable, and intermediate (transshipment) costs that can be avoided. For complex transport terminals, such as ports and airports, terminal costs can involve a wide array of components, including docking / gate fees, handling charges and pilotage / traffic control fees.
2. **Variable or Line haul costs:** Costs that are a function of the distance over which a unit of freight or passenger is carried. Weight is also a cost function when freight is involved. They include labor and fuel and commonly exclude transshipment costs.
3. **Capital costs:** Costs applying to the physical assets of transportation mainly infrastructures, terminals and vehicles. They include the purchase or major enhancement of fixed assets, which can often be a one-time event that can be amortized over several decades. Since physical assets tend to depreciate over time, capital investments are required on a regular basis for maintenance.

Terminal cost is lowest in case of road transportation, medium on railway transportation and highest in water transportation. Thus for short distances (up to D_1), road transportation is a beneficial option, for intermediate distances (up to D_2) rail transportation is appropriate, and for longer distance up to thousands of kilometers, water transportation is the best option (fig 37 & table 7).

Fig 37: Comparison of cost structure for road (C1), rail (C2) and water transport (C3).

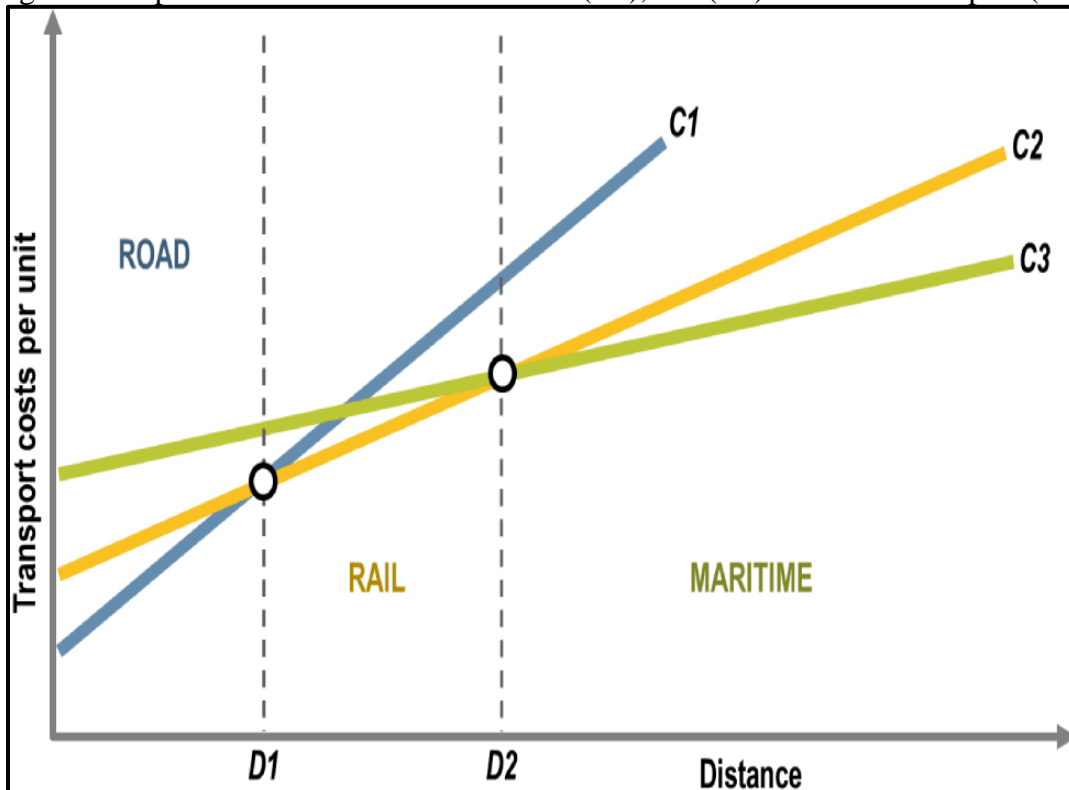


Table 7: Comparison of cost structure for different modes of transportation

Mode	Fixed Costs	Variable Costs
Rail	High- Equipments, Terminals , Tracks ,etc	Low
Road	Low-Highway provided by government	Medium-Fuel , Maintenance, etc
Water	Medium-Ships and Equipment	Low-As capacity is huge
Pipeline	Highest-Right of the way , construction, Equipment for control station and Pumping capacity	Lowest-Insignificant labour costs
Air	Low-Aircraft and cargo handling systems	High- Fuel, labour, Maintenance

16. World trade

Definition

Trade is the exchange of goods and services between countries. Goods bought into a country are called imports, and those sold to another country are called exports. Developed countries have a greater share of global trade than developing countries.

Trade flow

Trade flow means flow of imports and exports, their components and direction. Trade flow analysis helps to examine pattern of trade, trend of flow, concentration or the extent of diversification, and improvements required in particular destinations, value and supply chains. Trade flows are in fact the buying and selling of goods and services between countries. Trade flows measure the balance of trade (exports-imports). This is the amount of goods that one country sells to other countries minus the amount of goods that a country buys from other countries.

Brief overview of world trade

Over the last two centuries trade has grown remarkably, completely transforming the global economy. Today about one fourth of total global production is exported. Understanding this transformative process is important because trade has generated gains, but it has also had important distributional consequences. From a historical perspective, there have been two waves of globalization. The first wave started in the 19th century, and came to an end with the beginning of the World War-I. The second wave started after the World War-II, and is still continuing. Trade transactions include both goods (tangible products that are physically shipped) and services (intangible commodities, such as tourism and financial and other services). The production chains for these goods and services are becoming increasingly complex and global. According to recent estimates, about 30% of the value of global exports comes from foreign inputs. Most trade theories in the economics literature focus on sources of comparative advantage. These theories postulate that all nations can gain from trade if each specializes in producing what they are relatively more efficient at producing, based on their strengths. The empirical evidence shows that comparative advantage is indeed relevant; but it is not the only force driving incentives to specialization and trade.

Types of trade

There are two main types of trade which are further subdivided into several other types (fig)

1. Internal or home or domestic trade occurs within the country
2. External or foreign or international trade occurs between the countries

Internal trade

There are three types of international trade: Export Trade, Import Trade and entrepot trade.

Internal trade is also known as Home trade. It is conducted within the political and geographical boundaries of a country. It can be at local level, regional level or national level. Hence trade carried on among traders of Delhi, Mumbai, etc. is called home trade. Internal trade can be further sub-divided into two groups such as;

1. Wholesale Trade: It involves buying in large quantities from producers or manufacturers and selling in lots to retailers for resale to consumers. The wholesaler is a link between manufacturer and retailer. A wholesaler occupies prominent position since manufacturers as well as retailers both are dependent upon him. Wholesaler act as an intermediary between producers and retailers.
2. Retail Trade: It involves buying in smaller lots from the wholesalers and selling in very small quantities to the consumers for personal use. The retailer is the last link in the chain of distribution. He establishes a link between wholesalers and consumers. There are different types of retailers small as well as large. Small scale retailers includes hawkers, pedlars, general shops, etc.

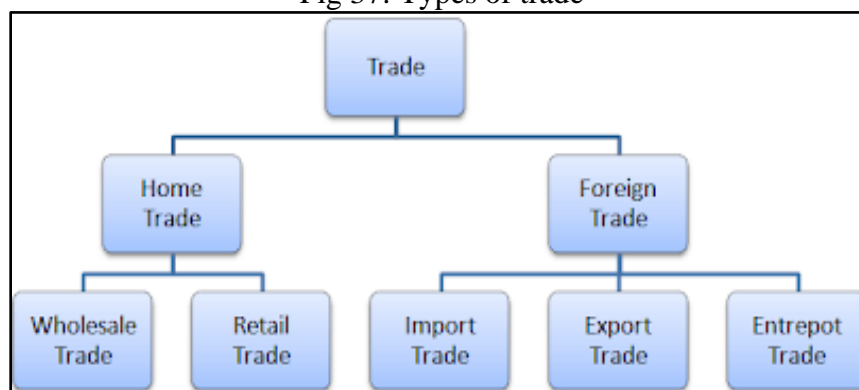
External Trade

External trade also called as foreign trade. It refers to buying and selling between two or more countries. For instance, If Mr. X who is a trader from Mumbai, sells his goods to Mr.Y another trader from New York then this is an example of foreign trade.

External trade can be further sub-divided into three groups, viz.

1. Export Trade: When a trader from home country sells his goods to a trader located in another country, it is called export trade. For e.g. a trader from India sells his goods to a trader located in China.
2. Import Trade: When a trader in home country obtains or purchase goods from a trader located in another country, it is called import trade. For e.g. a trader from India purchase goods from a trader located in China.
3. Entrepot Trade: When goods are imported from one country and then re-exported after doing some processing, it is called entrepot trade. In brief, it can be also called as re-export of processed imported goods. For e.g. an Indian trader (from India) purchase some raw material or spare parts from a Japanese trader (from Japan), then assembles it i.e. convert into finished goods and then re-export to an American trader (in U.S.A).

Fig 37: Types of trade



Causes of trade

There are several factors which are considered to responsible of the world trade. Some most important factors due to which international trade takes place are;

1. Differences in geographic conditions
2. Differences in natural resources
3. Differences in technology
4. Differences in resource endowments
5. Differences in human skills
6. Differences in demand
7. The presence of economies of scale
8. The presence of government policies.

World trade pattern

Developed countries have a greater share of global trade than developing countries. Usually they export valuable manufactured goods, while developing countries export cheaper raw materials.

Developed countries export manufactured goods such as electronics and cars and import cheaper primary products such as tea and coffee etc. Trading blocks, such as the European Union, dominate the world exports. Agricultural goods mainly flow northward and manufactured goods mainly flow southward. Major importers of the world according to the cost of imports are USA, China, Germany and Japan and major exporters are china, USA,

The greatest volume of trade occurs between the developed, rich countries, especially between industrial leaders such as Germany, Japan, the United Kingdom and the United States.

Major traded goods

There is a long list of goods that enter in world trade channels. Some of the highly traded goods are liquid commodities include energies such as oil, natural gas, precious metals such as gold and silver and agricultural products such as cotton, soybeans, corn and wheat.

Balance of trade (BOT)

The balance of trade is the difference between the value of a country's imports and exports for a given period. The balance of trade is also referred to as the trade balance or the international trade balance. For any economy current asset, the balance of trade is one of the significant components as it measures a country's net income earned on global assets. The current account also takes into account all payments across country borders. The balance of trade is the largest component of a country's balance of payments. It helps determine whether or not a nation's current way of life is sustainable. When a country imports more than it exports. That means they consume more than they produce. A country's trade balance is positive (meaning that it registers a surplus) if the value of exports exceeds the value of imports. Conversely, a country's trade balance is negative, or registers a deficit, if the value of imports exceeds that of exports. The fundamental cause of a trade deficit is an imbalance between a country's savings and investment rates.

Following formula is used to calculate the balance of trade of a country;

$$\text{Trade Balance} = \text{Country's Exports} - \text{Country's Imports.}$$

OR

$$TB = X - M$$

Where X stands for exports and M stands for imports

International trade is influenced by endowments and productivity, demand, trade policy, exchange rates, foreign currency reserves, inflation, competitiveness, growing globalization, tariffs and trade barriers, transportation costs, languages, cultures, various trade agreements affect companies by its decision to trade internationally.

Good Luck Students of BS Geography 6th Semester

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