UNIT 1 ❑ SCOPE, CONTENT AND RECENT TRENDS IN ECONOMIC GEOGRAPHY

Structure

1.1 DEFINITION

Geographers define geography in several ways. Some believe that the way man lives in a place is greatly influenced by landforms, climate and soils. A few believe that human activities are determined by geographic factors. In spite of differences of opinion, all geographers will probably agree that geographic study may well include an examination of spatial patterns on the surface of the earth.

Spatial patterns and their variation have profound significance for human life. Geography analyses and explains variations in activities over space. Economic Geography is the study of the spatial variation on the earth's surface of activities related to production, exchange and consumption of goods and services. Whenever possible the goal is to develop generalizations and theories to account for these spatial variations. This definition was given jointly by Hartshorn and Alexander. Prof E.W. Zimmermann pointed out that "Economic Geography deals with the economic life of man with relation to environment". 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".

In pursuit of its aims, the economic geographer answers to three questions : [1] Where is the economic activity located? [2] What are the characteristics of the economic activity ? To what other phenomena is the economic activity related? The first question relates to the location. Maps provide the answer to the question "where". If no such map exists, the Geographer will have to construct one because maps are the basic tools and are essential in understanding of areal relationships. The idea of pattern or distribution may facilitate one grasp of the concept of location. A pattern is the arrangement of an element over the face of the earth. The world pattern of

population, for example, reveals some densely populated areas in China and India, some areas of less extreme density in U.S.A. and Russia and some sparsely settled areas in North Africa and central Australia. The second question decides the significant characteristics of the economic activity and their description. For example, what are the characteristics of tea plantation that distinguish the regions devoted to it ? How many acres do the plantation farm occupy ? What kinds of buildings are on them ? How much tea is produced ? In what respects are these regions different from rice or wheat growing areas? Careful observation of the various aspects will enable the geographer to distinguish the tea producing regions both from regions of contrasting activities and from other regions of tea production. Then in terms of these characteristics a Geographer finally decides where to draw the boundary of the distinctive region on his map. In answer to the third question there are four ways to investigate the relationships: [1] One useful approach is through an analysis of cause and effect. [2] Some Geographers concentrate on relationships with physical and cultural phenomena. [3] An alternative approach is to consider relationships within a region and those between regions. [4] Finally, some Geographers prefer to study relationships in terms of correlations.

1.2 SCOPE, CONTENT AND OBJECTIVES

Different points of view are held as to the meaning, approach and objective of the subject. Economic Geography deals with the problems of making a living. It belongs more to the field of human than to physical geography. Special emphasis is laid on economic production and trade. According to Ellsworth Huntington, "Economic Geography deals with the distribution of all sorts of materials, resources, activities, institutions, customs, capacities and types of ability that play a part in the work of getting a living. Farming, manufacturing and trade are the main methods of getting a living. Hence, Economic Geography combines three main phases agricultural, industrial and commercial-but mining, lumbering and fishing must also be considered. Economic Geography, like other branch of Geography cannot be separated from physical geography. Its main problem is to discover ways in which the distribution of physical conditions influences the distribution of the methods by .which people satisfy their needs for food, clothing, shelters, tools and other products."

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. According to Jones and Darkenwald "Economic Geography 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 studies as a comprehensive system of interaction between man and nature. It is not only content with the analysis of the present pattern of production and productive occupations, it also studies their dynamics. Global resource pattern changes not only in response to increasing knowledge, improved skills and technique but also, perhaps more, in relation to charging socio-political scenario. 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 managements, stability of Governments, Government aids or hindrances in the form of tariffs, subsidies or urbanization schemes and so on.

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. Disparity in the state of economic being and competitive attitude of many countries give rise to socio-economic problems. Economic Geography also aims at resolving such problems by better and efficient utilization of limited resources through rational, systematic, scientific and long-term planning. Economic Geography serves as an essential tool for reducing and finally eliminating world society's disparity gaps by scientific study of their economic resources, modern needs and cultural heritages.

1.3 APPROACHES TO ECONOMIC GEOGRAPHY

Among the several methods of studying Economic Geography, the four most important approaches are :

I. Regional Approach
II. Systematic or Commodity Approach
III. Activity approach
IV. Principles Approach

Regional Approach : In considering this popular approach, the world, a continent or even a country or a state may be divided into geonomic regions. The basic advantage of this approach is that it gives a better and comprehensive knowledge

of the different parts of unit, their relationship to each other and to the units as a whole.

Systematic or Commodity Approach : This approach provides a systematic description and interpretation of the distributional pattern of individual resources or commodity (eg. Wheat, rice, tea) or an industry (eg. Iron and steel industry, cotton textile). As observed by W. Smith "it analyses the whole sequence of their development and catches them on their march to progression or retrogression".

Activity Approach : This approach aims at dividing man's basic economic activities into three categories— Primary, Secondary & Tertiary, Primary activity is connected with nature and includes agriculture, forestry, fishing, hunting etc. Secondary activity depends on the process of converting the primary products into more usable ones like all branches of manufacturing industries. Tertiary activity sets up a link between primary and secondary activities such as trade and transportation.

Principles Approach : In this approach generalizations are made about man and his environment on the basis of analysis of facts at a specific time point. Generalizations like "Plains invite occupancy, mountains repel settlements" are made. This approach enhances the clarity of reasoning and depth of analysis. All these approaches have their own merits and limitations. Any single approach is therefore incompetent to give a complete picture of the economy of a country or a region.

1.4 RECENT TRENDS IN ECONOMIC GEOGRAPHY

The Economic Geography of the world has changed a lot in the last 25 years. During this period, the world economy mushroomed in size & complexity. At the same time, greater interdependence among nations added new dimensions to the world system. Major new work forms emerged as the post industrial economy revolutionize the job market. The propelling force in economic growth became information and technology in the place of traditional raw materials and smokestack industries.

New forms of management and organization developed to shape and lean these changes. The world become particularly aware of Japanese business practices in the 1980s. The most visible and influential institution associated with business activity remained the multinational corporation, much larger than before. Governments became more actively involved in promoting economic development. World inflation rates accelerated in the 1970s, an energy crisis emerged, and a crisis of finance gained momentum as the disparities between the developed and developing countries increased in the mid-1980s. Several newly influential groups of countries became important in the global market place. These included "the Organisation of petroleum exporting countries (OPEC) block, the newly industrializing countries (NICs), the Organisation

of Economic Cooperation and Development group (OECD) and the European Economic Community (EEC).

World trade became a crucial factor in the development process. More and more goods were "international" in the sense that comlex combinations of management, raw materials, technology, and semi processed goods, from many countries, interacted to create them. As the less developed countries climbed the technology ladder, they began producing products at home to substitute for previously imported items and eventually began exporting more sophisticated products as well. In turn, the more developed nations moved to knowledge- intensive activities such as electronics integrated circuits, robots, areospace, telecommunications and biogenetics.

To finance this process, nations bought and sold one another's products at an accelerating and unprecedented pace. Unfortunately, aberrations in the process have occurred, such as protectionism in the form of import restrictions or tariffs to insulate declining activities in some nations. The more developed nations generally financed the expansion of activity in less developed areas by extending credit, leading to growing dependency on the major powers by the third world countries.

The comprehensive measures called for in the NIEO (New International economic Order) will dominate the agenda of economic geographers in developing countries throughout the world. The measures of the NIEO are grouped under five headings in the UN resolution-international trade, transfer of real resources, science and technology, industrialization, and food and agriculture. The concerns of economic geography in the 1990s and beyond must also include the heartland-hinterland problems at a hierarchy of scales from local to global. The way in which economic geographers perceive these problems of growth and distribution reflects the development of the discipline over the century. Although a history of the subject is of interest for its own scale, it is also important if we are to understand the context in which economic geographers view the issues of current global concern.

Classification of Economies : The economy is the system of production & consumption, including the means of decision making and the allocation of resources in a particular country. Economic, categorization can be made [A] by per capita propensity to exchange, [B] by level of economic development and [C] by political-economic affiliation.

[A] Classification by Per capita propensity to exchange— It can be approximately measured by (1) money income (2) real income. Money income indicates the average amount of money actually received by each member of an economy over a given period. The real income indicates the actual value of average money income to each person expressed in terms of what that money will buy in the economy of which he is member. Using this per capita real income as the master criterion, the world economies can be classified into 3 categories: (1) commercial, (2) commercial-

subsistence, and (3) subsistence-with-some-commerce. This represents a declining order of propensity to exchange.

The commercial economies account for nearly one-fifth of the world's people. The countries with the highest per capita propensity to exchange, nearly all of which are politically independent, are the manufacturing and commercial nations of NW Europe and their younger offshoots in North America, South Africa and Oceania.

Commercial-subsistence economies, involving about one third of the world's population, are particularly conspicuous in Latin America, countries and West Asia, northern Africa, eastern-Europe, Russia and the island nations of the Far East. Politically they tend to be either entirely or partially independent. Few of them are controlled completely by foreign capitals.

Nearly one-half of the world's people living under subsistence or subsistence-with-some-commerce conditions are found largely in the low latitudes of Africa and in eastern and southern Asia. Recent world trends towards nationalism are affecting many of these countries. Among the large countries that contain the basic ingredients for raising their levels of economic activity are Communist China, India, Indonesia and Pakistan. They make up the lion's share of the world's most underfed, ill-clothed, ill-housed and yet rapidly multiplying inhabitants.

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[B] Classification by level of economic development— Following this method economies can be classified in two levels development: [i] those which are economically and technically advanced and [ii] those which are economically and technically underdeveloped.

A multitude of criteria have been employed to determine level of economic development. Of these, two appear to generalize the results— (a) the percentage of a country's labour force in agriculture and (b) the per capita gross national product.

Accordingly Chile, Argentina, and Uruguay are placed into the underdeveloped category while Poland, Venezuela and Kuwait one grouped into the technically advanced ones.

[C] Classification by political-economic affiliation— The degree of public and private ownership is the key features of economies under this category. Accordingly there are two types— [i] economies of subordinate affiliates and [ii] economies of sovereign nations.

Economies of subordinate affiliates are controlled mainly by their mother countries, with the rigidity and degree of that control varying with the status of the dependency. There are two affiliates— affiliates of non-communist countries and affiliates of communist countries. The first category includes colonies and overseas territories. All communist nations operating independently, namely Russia belong to the second category.

Among the world's sovereign states, ownership of the means of production and exchange is primarily public or semi-public. The USA alone stands as a major nation where private ownership is outstandingly championed. The non-communist European nations are characterized by government ownership and government policy is dominant in formulating and executing economic arrangements.

Although they contain less than one-third of the world's people the technically advanced countries tend to dominate economic affairs, using their methods and instruments of scientific and technological know-how of capital accumulation, of a higher standard of living and of outright political ownership.

Spatial Organisation of economic activities : Beginning in the 1950s. Economic Geography made new attempts in creating a theoretical approach and in building on the workshop economies and in relying heavily on quantitative methods to understand the "spatial organization" of economic system. Spatial organization is the aggregate pattern of use of space by a society. It refers to the relative internal location of the elements in a spatial distribution: the location of each element relative to each other element and the location of each element relative to all the other elements together.

In order to explain the spatial structure and national economic development.

J. Friedmann suggested a simple model. The model shows the stages of spatial organization, a national economy passes through a primaitive per-industrial society to industrial maturity. The four stages in its progress are illustrated as-

(1) A spatial pattern of separate cities, each in an enclave isolated from the others.

(2) At the time of incipient industrialisation the pattern is dominated by a single strong center or core, surrounded by an extensive periphery.

(3) The care-periphery situation is gradually transformed as strong peripheral sub-centers emerge alongside the single national center. Inter-metropolitan peripheries now replace the previous national periphery. The sub-centers bring further resources into the national economy, thus enhancing the growth potential of the economy.

(4) Finally, a functionally interdependent system of cities appears. Inter metropolitan peripheries are completely absorbed and full integration of the economy is achieved, thus minimizing regional imbalances and maximizing the nation's growth potential.

Sectors of economy-Primary, Secondary, Tertiary— It is convenient to divide the many forms of economic activity into three groups known as primary, secondary and tertiary.

Primary activities are those related to the extraction from the nature. They include age-old activities such as hunting animals, gathering and collecting forest products, extracting minerals and fuels from the Earth's crust, fishing from the rivers, lakes and oceans, and harvesting trees. All these activities yield raw materials for subsequent processing. Primary producers may be labeled "red-collar" workers due to the outdoor nature of their work.

Secondary activities embrace all forms of manufacturing and processing of raw materials. Secondary production increases the value or usefulness of a previously existing item by transforming its form. Such activities include manufacturing and industrial efforts. The farmer, for instance, applies seeds, fertilizers and modern technology in the form of harvesting and cultivating in the agri cultural farm to increase the yields of crops. Steel makers turn iron into metals in blast furnaces. Generation of power also falls under this category because it uses raw materials like coal, oil, uranium etc to produce energy. This group is collectively known as the blue collar labour force.

Tertiary activities include all the services other than primary and secondary activities. Tertiary production involves the service sector rather than tangible goods. This work refers to a range of personal and business services involving a rapidly growing share of the labour force in highly developed countries. Retail clerks, barbers, beauticians

and secretaries all fall into the personal and business service categories as a group and they have been described as pink-collar workers.

Quaternary services represent a special type of service work, focusing on professional and administrative services including financial and health service work, information processing, teaching and government service and entertainment activity. Specialized technical, communication and motivation and leadership skills provide the common thread linking these activities. Practically all quaternary activity occurs in office building environment or specialized environment provided by schools. theaters, hotels and hospitals. This group has been termed as the white-collar work force.

The quinary activities, the upper most one in hierarchy. remains more restricted in size in comparison to the other groups of activities. The most visible persons in this group include chief executive officers and other top-management executives in both government and private service. Research scientists, legal authorities, financial advisers and professional consultants who provide strategic planning and problem-solving services belong to this group. Most of these high order analytical and managerial activities occur in larger urban centers or in close proximity to large University/medical or research centers. An appropriate label for this group is the "gold-collar" works.

1.5 CLASSIFICATION OF ECONOMIC ACTIVITIES

A. Production

1. **Primary :** harvesting and exploring the nature (agriculture, forestry, mining) fishing.
2. **Secondary**
   Increasing the value and usefulness of primary items by transforming their form and nature (manufacturing industries and activities)
3. **Tertiary :** Services (Clerical, personal, business). Trade and commerce.
4. **Quaternary :** financial, health, entertainment, education, information and data-processing services, middle management administrative service; government service.
5. **Quinary**
   (a) High-level managerial and executive administrative positions (public and private)
   (b) Scientific research and development services.

B. Consumption : Use of commodities civic amenities and services by human beings to satisfy needs and wants.

by Transportation and distribution services :

(a) Increasing the value of commodities by changing their location (freight transportation).

(b) Exchanging services and ideas by telecommunication or face-to face contact.

(c) Satisfying the needs of people by changing their location (passenger transportation)

(d) Warehousing and distribution function.

(e) Wholesale trade.

(f) Retail trade

1.6 SUGGESTIONS FOR FURTHER READING

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UNIT 2 ❑ NATURAL RESOURCES : ITS CLASSIFICATION AND SPATIAL DISTRIBUTION.

Structure

2.0 INTRODUCTION

A resource is something material or abstract that can be used to satisfy human want or deficiency. So, the existence of a resource depends on its value to human. What makes a thing a resource is not its intrinsically valuable properties but the fact that a given society express a desire for it and is willing to pay for it. In 1933, Prof. E. W. Zimmermann promulgated his famous "concept of Resource". The word resource does not refer to a thing or a substance but to a function which a thing or substance may perform or to an operation in which it may take part, namely, the function or operation of attaining given end such as satisfying a want".

2.1 CLASSIFICATION OF RESOURCE

A. In general, resources are classified into two groups on the basis of existence a) Material resources b) Non-material resources. Material resources are tangible substances, eg., coal, petroleum, iron ore, copper, water etc. Non-material resources are intangible substances, eg. health condition, culture, ethics, freedom, environmental harmony etc. Material resources are freely bestowed by nature. Non-material resources are cultivated by human beings with the help of increasing knowledge.

Material resources may again be sub-divided into two groups :

(i) Organic resources like forest, fish, livestock etc. ,

(ii) Inorganic resources like iron-ore, manganese, mica etc.

B. On the basis of durability or nature of availability resources may be classified into two groups :

1. Fund or exhaustible resources— this is not everlasting and exhausted for ever after use, eg. coal, petroleum, uranium etc.

2. Flow or inexhaustible resource— here supply of resource remains unchanged even after renewed use, e.g., river water, sea-wave, sunshine, airflow etc.

C. On the basis of ownership, resources may be divided into three groups:

(i) International or world resource : This is owned by global population, i.e., the total resources owned by all individuals and nations. The sum total of all material and non-material resources comes under this category.

(ii) National resource : This is the sum total of resources of the inhabitants of the nation and resources of the nation itself.

(iii) Individual resource : Both tangible resources, i.e, property, money, wealth and intangible resources, i.e. knowledge, wisdom, health etc. owned by any individual is known as individual resource.

D. On the basis of availability or frequency of occurrence, resource can be classified into two groups : i) ubiquitous ii) localized. Ubiquitous type of resources are found everywhere, eg. sunshine, air etc. Localized resources are available only in some places, eg. petroleum iron ore etc. These resources are sometimes rare, for example water in a desert area. Some resource is unique in the sense that it is available only in one place, for example, cryolite is found only in Greenland.

E. On the basis of resource aspects, resource can be classified into

(i) Natural resource— all the components of nature having functionability and utility, eg. sunshine, water, forest, soil, minerals etc.

(ii) Human resource— Physical power and brain power of man comprise human resource.

(iii) Cultural resource— Different aspects of culture which contribute to the development of the society and which have positive functionability are known as cultural resources, e.g. Education

Classification of Resources

Basis of classification	Type of Resource	Examples
A. Existence	1. Material	Iron ore
	2. Non-material	Freedom
B. Nature of availability	1. Fund	Coal
	2. Flow	Sunlight
C. Ownership	1. International	World population
	2. National	Natural wealth
	3. Individual	Individual property
D. Frequency of occurrence	1. Ubiquitous	Air
	2. Localized	Gold
E. Resource Aspect	1. Natural	Minerals
	2. Human	Knowledge
	3. Cultural	Education

2.2 SPATIAL DISTRIBUTION OF RESOURCES

Forest :

Forests are close association of plants. The economic activities of man are greatly influenced by forests. Man gets food, fuel, fibre, timber, drugs, nuts, tan materials, cork, rubber etc. from forests. Forest indirectly affects climate, stream flow, soil conditions and thus influence agriculture, grazing, recreation and wild life.

Forests are very unevenly distributed over the globe. Spatially, forests are not very homogenous. The major factors influencing its growth are :

(a) Temperature— A monthly average temperature of 6°c is necessary for plant growth. Excessive cold or very high temperature is detrimental to plant generation.

(b) Rainfall— Various types of plants grow in different areas having different amount of rainfall. Hydrophytes are water loving plants and grow in excessive water condition. Xerophytes require very little water and grow in arid condition.

(c) Soil— Soil provides basic, life -sustaining forces to the plant, Texture, porosity, permeability and retentive capacity of soil determine the different types of vegetation. The chemical composition of the soil favours the growth of different plants.

(d) Altitude— This factor affects plant growth as the temperature falls with the rise in the altitude. Plant species differ with the variation in the elevation.

(e) Wind— Excessive flow of wind restricts the growth of trees due to increase

in the transpiration. Strong winds like typhoons, cyclones, tornedo etc may kill the trees. Sea breeze sometimes favours the growth of certain types of trees.

(f) Slope— Slope changes the quality of vegetation on the windward and leeward sides of the mountains. Gentle slope favours the growth of certain types of plant.

(g) Sunlight— Generally, sunlight favours the growth of plants by supplying chlorophyll necessary for plant food. The assessment of FAO (Food & Agricultural Organisation) in 1990 revealed that around 40% of the earth's landmass (about 5.1 billion hectares) were covered by woodlands and forests. Among this, only 3.4 billion hectares can be designated as forest while 1.7 billion hectares are scrub, woodlands or bush. The most important forest is the tropical forests which occupy nearly 1.8 billion hectares of land in 1990, the tropical rainforests alone covering 714 million hectares. The temperate forest is in the second position covering an area of 2.4 billion hectares in 1990. The standard and widely accepted classification of forests with their climatic parameters and major species is given below.

Forest Type	Climate Type	Rainfall & Temperature	Major Tree species	Distribution
I Tropical Forest a) Tropical Moist evergreen Rain forest	Equatorial Region	200-250cm 27°-28°C	Mahogany Rubber, Iron wood, Rose-wood, Palm, ebony etc.	South America, Mid Africa, SE Asia, Equatorial region
b) Tropical Deciduous Forest	Tropical Monsoon	100-200cm 23°-29°C	Teak, Sandal, Sal, Khair, Sissu etc.	S&SE Asia, S.America, & Parts of S. Africa
II. Temperate Forest a) Mediterranean Forest	Mediterranean Climate	50-100cm 18°-25°C	Oliv. Oak, Cork, Myrtle etc.	Mediterranean Coast, California, in USA.Cent Chile SE Australia.
b) Temperate broad-leaved Deciduours and Mixed Forest	Mid-latetude warm Temperate region	Less than 50cm16°c	Oak, Maple, Elm, Birch, Walnut etc.	Cent & South Europe, Russia & Parts of USA
c) Coniferous soft-wood Forest	High-latitude cold temperate region	30-50 cm avg. 10°C	Pine, Fir, Birch, Spruce, Lirch, Hemlock etc.	Extensive regions of N Asia N. Europe

Animal Resource :

Animal resources are important in the economic life of mankind even since the dawn of civilization. The animals and their products are used as the source of food, as a source of dairy product, as motive force and as a source of raw materials. In different cultural landscapes, man started using his animals in different manners. Degree of dependence of human economy on animal use is controlled by different spatial factors. Utilization of animals in different spatio economic regions are—

1. Nomadic herding— This type of pastoral nomadism is prevalent in the arid and semi-arid regions of the world. Animals are used as the source of meat, milk and means of transportation. Camels, sheep, horses and cattles in different parts of Africa and Asia, Yak in Himalayan high altitudes and Reindeer in polar region are sometimes the only earthly possession of the local people.

2. Livestock ranching— In areas of hostile climate and difficult terrain, people are engaged in pastoral ranching. Hordes of catties, goats, sheep are raised for commercial purposes. Dairy products, meat, hide and wool are extracted and sold in the market. This economic activity is widely practised in parts of Argentina, USA, Venezuela and Australia.

3. Mixed Farming— In this farming, animals are reared side by side crop cultivation in the same plot of land. In this capital-intensive highly organised agriculture, sometimes crops are cultivated for animal consumption. This type of farming is widely practised all over Western Europe and N. and S. America. Infertile grasslands like Praire in N.America, Pampas in S.America and Veld in S.Africa are suitable for mixed farming.

4. Dairy farming— In this farming, livestock are reared scientifically to extract milk. This capital and labour intensive farming is prevalent in Western Europe, Australia, New Zealand, North America, Canada and Parts of S. America. Manufacture of different milk products are also included in dairy activity.

The spatial concentration of commercial livestock grazing is controlled by several physico-economic and climatic factors like topography, climate, nature and quality of grassland, economy of the region and the use of animate energy. Grazing grounds can be classified into two broad types.

1. Commercial grazing in temperate grasslands— Australia and New Zealand are traditionally famous for livestock rearing. Australian grassland (Downs) supports millions of livestock, particular/ sheep, that provide wool and animal meat. In New Zealand the major livestock products include wool, milk, butter, cheese, leather etc. Grazing in North America covers vast stretches of land in western part of Canada and USA specially in Alberta, Nevada and Texas. This region produces beef, pork and mutton. In S. America, the Pampas of Argentina and Uruguay are famous for commercial livestock ranching and Argentina is the largest exporter of dairy product and wool. South African grassland veld is famous for sheep rearing.

2. Commercial grazing in tropical grasslands— African Savanah supports a large number of wild animals. The tribal people own large number of cattle population, but grazing is still at its primitive level. Here the grassland is vast and extensive. American grasslands are smaller and they include Lanos of Venezuela, Savanah of Bolivia, Campos in Brazil and El. Gran chako of Argentina. Commercial cattle-rearing is prevalent in the interior parts of these areas.

Power Resources :

Power resource is considered as an index of any country's economic development and its importance is ever increasing. On the basis of the pattern and nature of use and its distribution, power resources may broadly be classified into two groups - a) conventional and (b) non-conventional. Conventional power resources include coal, petroleum, natural gas, nuclear power and hydelpower. Non-conventional power resources are sunlight, wind, geothermal energy, tidal energy, bio-gas etc. Petroleum is the most important source of energy (39.4%), followed by natural gas (23%), coal (22.3%) hydelpower (7.1%), nuclear power (6.6%) and others (1.6%) . The following table shows the reserves of major conventional sources of energy, 1999.

Reserves of Major Conventional Sources of Energy, 1999

Coal (million Tonnes)		**Petroleum (billion barrels)**		**Natural Gas (billion cubic meters)**	
Country	Total recoverable Reserve	Country	Reserve	Country	Reserve
1. U.S.A.	249,993	1. Saudi Arabia	263.5	1. Russia	48,127
2. Russia	56,978	2. Iraq	112.5	2. Iran	22,996
3. China	114,472	3. U.A.E	97.8	3. Quator	8,493
4. Australia	90,382	4. Kuwait	96.5	4. UAE	6,002
5. India	74,718	5. Iran	89.7	5. Saudi	5,789
6. Germany	66,986	6. Venezuela	72.6	6. USA	4,739
7. South Africa	55,322	7. Russia	48.6	7. Vnezuela	4,034
8. Ukraine	34,349	8. Libya	29.5	8. Algeria	4,521
Others	145,212	Others	206.1	Others	41,084
World	987,362	World	1,016.8	World	145,785

Coal :

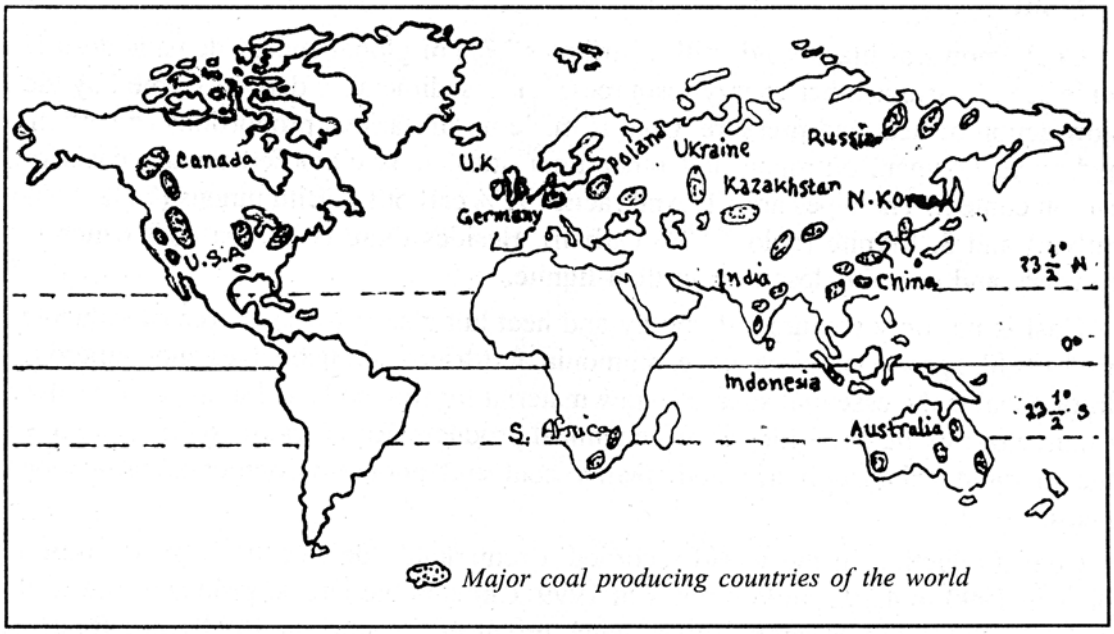
Coal, known as black gold, still contributes 27% of global energy demand despite wide use of various other energy resources. It is a sedimentary deposit formed by the slow action of heat and pressure. Coal is made up of various proportions of carbon, hydrogen, Oxygen, Nitrogen and other impurities. It is classified on the basis of carbon content. The types are - 1. Anthracite (92% carbon) 2. Bituminous (74% -85% carbon) and 3. Lignite (below 50% carbon). Besides there is Brown coal which is powdery and contains less carbon than lignite.

Coal is not only a source of energy and heat but also it is the source of valuable products like gases, tar, pitch, coke, ammonia, fertilisers, synthetic dyes and numerous drugs. Coal is the essential source of raw material for iron and steel industry. It is also a source of raw material for various chemical products. Reserves of coal is declining due to rapid exhaustion of good quality coal and poor environmental protection measures.

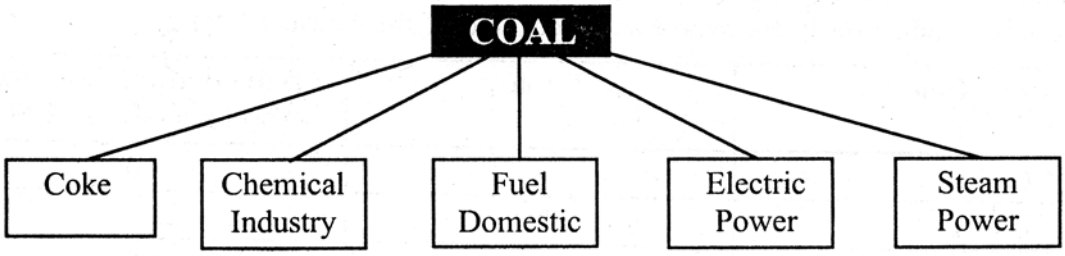
Coal production in the world recorded a remarkable decline from 4886 million tones in 1990 to 4,292 million tones in 1999. China is the largest producer fallowed by USA, India and Australia other major producers of coal in 1999 were Russia, South Africa, Germany, Poland, Ukraine and N. Korea. The following table shows the coal production in the world as percentage of the World's total.

Country	**Rank**	**Production** (as % of the World's total) in 1999
China	1	23.6
U.S.A.	2	23.2
India	3	6.9
Australia	4	6.8
Russia	5	5.8
South Africa	6	5.2
Germany	7	4.8
Poland	8	4.0
Ukraine	9	1.9
N. Korea	10	1.8

World Production- 4297 million tonnes
Source : Energy Statistics, U.N.O., 1999



Major uses of coal



China is the largest consumer of coal in the World, followed by U.S.A, India, Russia, Germany and Poland. Australia is now the largest exporter of Coal. The other notable exporters are Canada, South Africa, Poland etc. Bangladesh, Nepal, Italy, Japan import bulk of the international coal trade. Conservation of coal is essential for sustainable development. Conservation measures may include reduction of consumption, expansion of its functional value and the prevention of its wastage.

Petroleum :

Petroleum is the inflammable mixture of hydrocarbons having a complex composition, variable density and colour. Impurities like sulphur compounds and nitrogenous substances may be present in the petroleum and as such there are different grades of oil- paraffin based, asphalt based and mixed based. Paraffin-base is the lightest and the best quality crude oil (gasoline & petrol). Asphalt base is heavier with less commercial significance. Mixed base is an intermediate type.

Petroleum is of animal and vegetable origin. Rocks of marine oxygen, sedimentary

rocks like substances, shale's and limestones contain petroleum. It occurs in strata which are not too folded and faulted. Three structures are favourable for the oil accumulation- the anticline, the fault and the stratigraphic trap. In order to locate oil-bearing strata, structural studies of underlying rocks, core boring and sounding are resorted to.

The importance of petroleum is extremely great .It has revolutionised the entire transport network-road, rail, water and air transport. Motor vehicles and aero planes use petrol or gasoline & buses, trucks & locomotives use diesel and gasoline are used in gas turbines to produce electricity. Natural gas contributes 23% of the global energy production. There is no substitute of Mobil as lubricating oil. Almost all chemical and petro-chemical industries use petroleum byproducts as raw material. Kerosene and liquified petroleum gas (LPG) are used worldwide as cheap fuel for domestic purpose. Besides there are many usable petro-chemical byproducts-plastics, detergents, synthetic rubber, synthetic fibers, perfumes, chemical fertilizers, insecticides, dyes, paints, varnishes etc.

Global distribution of crude oil is grossly imbalanced. Some regions like Middle East contains 60% of global reserves while SE Asia & Latin America are practically devoid of crude oil. This situation causes great political stress and strain. The following table shows the crude oil reserves of the main oil producing countries in 1990.

Crude oil Reserve- 1990

Country	Reserve (million tons)
Mexico	6,906
U.S.A.	3,560
Canada	720
Venezuela	8,604
Norway	1,025
Great Britain	535
Russia	6670
Libya	3150
Nigeria	2400
Algeria	1800
Saudi Arabia	35,620
Kuwait	13,358
Iraq	13,417
Iran	12,700
UAE	12,300
China	726
Indonesia	810

Production of crude oil in the world has increased by 8.8% during 1990-1999. Middle East has maintained its supremacy as an oil producing region. Position of Soudi Arabia as an oil producing country has been improved from 3rd to 1st. USA has become 3rd and its production is declining. After the dissolution of USSR oil production in Russia has steadily been declined but in 1999 it held 2nd position as an oil producing country. Saudi Arabia, USA & Russia together accounted for 30% of the world's total production in 1999. The accompanying table shows the oil production in the world.

Country	**Production of oil (as % of the world's total)**			
	1990		**1999**	
	Rank	**%**	**Rank**	**%**
Saudi Arabia	3	10.6	1	11.9
Russia			2	9.2
U.S.A	2	12.2	3	8.9
Iran	4	5.1	4	5.4
China	5	4.6	5	4.9
Norway	12	2.8	6	4.6
Mexico	6	4.2	7	4.4
Venezuela	7	3.5	8	4.3
U.K.	10	3.0	9	4.1
Iraq	9	3.4	10	3.
World's Production : 60.57m. barrels per day			65.87m barrels per day	

Source : Energy Statistics, UNO, 1999

U.S.A. is the single largest consumer of petroleum in the world which accounted for 25.7% of world's total consumption in 1998. Japan is second with a consumption of 7.5%. Other major consumers are china (5.6%), Germany (4.0%) & Russia (3.3%). In U.S.A., consumption grew by 9.2%. Among the leading petroleum consumers, growth of consumption is found to be the highest in China. India was the 12th largest petroleum consumer in the world in 1998 accounting for 2.5% of the world's total consumption.

Hydelpower :

Hydelpower is the energy harnessed from running water. The contribution of hydel power in the world energy production is immense and ever-increasing. Power generation from running water has been made possible by

a) Rotating turbines— contain Kinetic energy of swiftly flowing water.

b) Dynamo— Changes the kinetic energy into electrical energy

c) Cement— helps large constructions to tame the mighty rivers

Hydelpower generation requires a difference in height between the place where water is found and the place where it can be let down. The height is secured in there ways. The first is by building dams across rivers. The second is to take advantage of drops or falls or steep gradient in the riverbed and the third is by diverting the water from one basin into another river basin at a lower attitude.

Favourable factors for the development of hydelpower —

Physical factors—

a) The catchment area of the river must have regular and abundant rainfall or snow-melt water throughout the year. Mere ruggedness of topography is not sufficient unless and until there is steady volume of water.

b) The temperature must remain above the freezing point.

c) Water must be silt free as siltation reduces workability and life span of the machines.

d) All hydel-power stations require large dams to store water in huge reservoirs. Natural lakes and water bodies within the rivers may save this expenditure.

e) An impermeable rock structure is necessary to retain the stored water & prevent any large-scale seepage.

f) Large space and sparse population are prerequisites for hydel projects.

g) Climatic and geological stability is essential. Droughts, floods and earthquakes are potential threats to the survival of the plant.

h) Presence of forest in the nearby areas reduces soil erosion, lessens the probability of landslide and enhances rainfall in the area.

Socio-economic factors—

a) A nearby densely populated area is ideal where demand of electricity is large and which can provide viable market.

b) Lack of substitute energy source is helpful in some way. Coal and oil deficiency in Japan, Norway, Sweden compelled then to develop hydropower stations.

c) Huge amount of capital investment is necessary for work force, raw materials & massive construction work for a long-drawn period.

d) Improved modern technology is a prerequisite in the intricate construction of hydro-power station.

e) As construction requires huge and varied machinery and construction materials, easy transportation and smooth communications are the prerequisites for project works.

Hydro power potential and world production

The total known exploitable hydropower potential of the world is 4 million megawatts. The following table shows the known exploitable potential of the top ten countries in 1995.

Country	Known Potential (in '000 Megawatt)
1. China	2,168
2. C.I.S	2,016
3. Brazil	1,116
4. Indonesia	709
5. Canada	614
6. Zaire	530
7. Columbia	418
8. Peru	412
9. Argentina	390
10. U.S.A	376

It is estimated that as a continent Africa ranks first in the Known exploitable potential by accounting 30% of the world's total. But there lies a large gap between the potentiality and utilization. On the basis of installed capacity Europe comes first followed by North America. On the basis of actual production North America comes much ahead of Europe indicating a very high rate of utilization of the installed capacity. The following table shows the production of hydropower in the major countries of the world.

Hydelpower production as % of the world's total

Country	1990		1999	
	Rank	%	Rank	%
Canada	1	13.56	1	13.05
Brazil	4	9,44	2	11.73
U.S.A	2	13.36	3	11.72
China	5	5.77	4	8.54
Russia			5	6.06

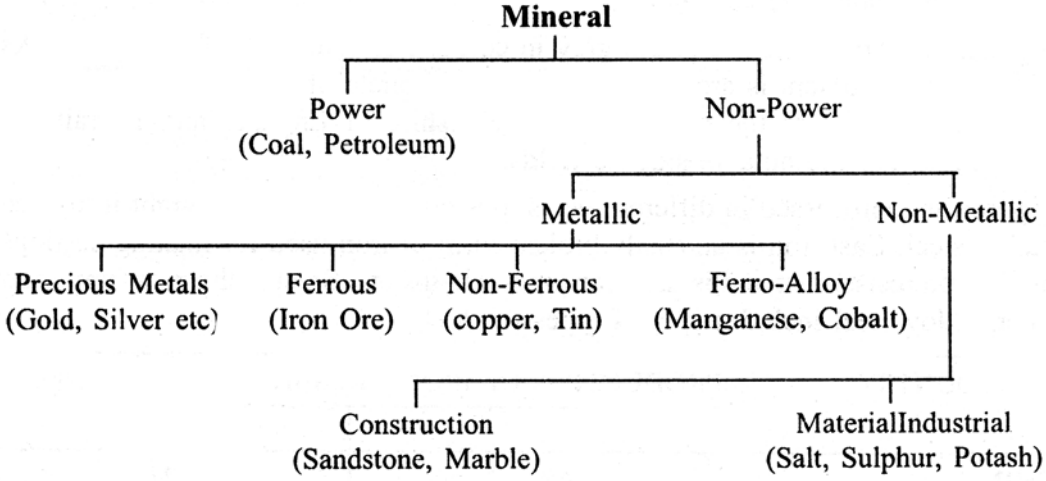
Country	1990		1999	
	Rank	%	Rank	%
Norway	6	5.53	6	4.60
Japan	7	4.08	7	3.26
India	9	3.27	8	3.10
France	10	2.44	9	2.75
Sweden	8	3.31	10	2.66
World generation 2,167 billion Kw Hours			2,607 billion Kw hours	

Source : Energy Statistics. U.N.O., 1999

MINERAL RESOURCES :

A mineral is a natural substance of inorganic origin with definite chemical and physical properties. Minerals sometimes occur on the earth's crust but mostly they are buried below the surface. The extent of exploitation of minerals depends on (1) size of the deposit, (2) depth, amount & location of the deposit (3) economic need of the people, (4) level of industrial development, (5) geological structure & (6) technical knowledge and ability to extract and process the mineral resources.

Broadly, minerals can be classified into the following groups:



Mining and the processing of minerals exert tremendous impact on the economic wellbeing of a country in a number of ways-

1) They provide employment opportunities.
2) They attract population to be settled around the mining sites.
3) They stimulate the development of transportation

4) They open new scope for export earnings
5) They extend the scope for the development of domestic industries.

IRON ORE :

1) Iron ore is the most common metallic mineral. Since industrial revolution, use and production of iron ore received priority in the developed industrialized nations. According to usage, functionability and composition, iron ores are principally of four major types.
2) HEMATITE— This is reddish in colour & derived from sedimentary rocks. Average iron content is between 60 to 75%. Industrially, this is the most important type of ore and is generally mined by open cast method. It is found in Great Lake Regions of USA, Orissa in India etc.
3) MAGNETITE— It is the richest among all iron ores with little impurities & the iron content varies between 70-72.5%, the colour varies between brown to black. It is found in igneous and metamorphic rocks. Its excellent magnetic properties make it suitable for electrical industry. It is found in Bailadila (India), Magnitogorsk (Russia) etc.
4) LIMONITE— This is a brown coloured ore found in sedimentary rocks. Iron content varies between 50-65%. Because of its low iron content, it is only mined in places where rich ores are scarce. It is found in Alabama (USA), Japan, France etc.
5) SIDERITE— The ore is ash-grey in colour and found in sedimentary rocks. The iron content is around 40%. It is a carbonate of iron and in many areas it is found near the coal fields. Lincolnshire of England and Lorraine of France are the notable siderite fields.

Pig iron is reprocessed in different ways to produce cast iron, wronght iron, steel and alloy steel. Cast iron is an easily broken form of iron used for making castings. Wronght iron resists rust and is used for pipes, chains etc. Steel is the most important product. Alloy steel includes special types of steel.

COUNTRY	PRODUCTION OF IRON ORES IN MILLION TONNES	
	1980	2000
CHINA	68	215
BRAZIL	115	190
AUSTRALIA	96	158
RUSSIA		80
INDIA	42	68

COUNTRY	PRODUCTION OF IRON ORES IN MILLION TONNES	
	1980	2000
USA	71	61
UKRAINE		50
CANADA	49	34
SOUTH AFRICA	26	30
WORLD	891	1010

IRON ORE PRODUCTION IN THE WORLD

Iron & steel industry is the largest consumer of iron ores. The production of ore declined from 902 million tonnes in 1975 to 861 m. tonnes in 1985 due to the recession in the steel industry. But with the revival in the demand for steel, the production of ore increased to 1010 m. tonnes in 2000. China, Brazil, Australia, Russia and India together accounted for 70.3% of the world's total production.

Total reserve of iron ores in the world is 140 billion tonnes. China has the largest reserve of 25 billion tonnes which is 18% of the world's total reserve. On the basis of reserve of iron ores, first five countries are China, Ukraine, Russia, Australia & U.S.A.

2.3 CONSERVATION AND MANAGEMENT OF RESOURCES

Conservation means "to preserve", "to retain intact or unchanged". Resource conservation is the conservation of natural resources, be they plants, animals, nature in general, landscape resources and even the whole environment. The modern conservation movement was initiated by a concern about forest depletion & soil erosion in the USA in the 19th century. Among the types of conservation the first is the conservation of ecological and scientific values. Wildlife or nature conservation is basic to the maintenance of the scientific and ecological value of organic resources. Problems of wildlife conservation include the identification and management of endangered species. Closely related to wildlife conservation is that of wilderness preservation. The second is the conservation of biological values whose central theme is the concept of sustained yield. Sustained yield implies the maintenance of optimal production under a given level of use. Sustained yield in forestry, fishing and agriculture alike require that the rate of cropping does not exceed that of resource renewal. The third is the conservation of aesthetic values. Modern intensification of land use and expansion of outdoor recreation has stimulated increasing concern for the aesthetic value of organic resources. The problem basic to the conservation of aesthetic values is that of the perception of beauty. Conservation of aesthetic qualities tends to con-

flict with that of biological/economic values. The fourth is the conservation of environmental quality. Modern conservation has become synonymous with the maintenance of environmental quality of which pollution control is the most crucial point. The main problems of pollution control are the establishment and maintenance of environmental standards.

Finally, it is to be noted that the conservation of resources and of environmental quality are very closely interdependent. With respect to the whole problem of curbing resource depletion and pollution, humans do not lack the technical know-how. The main difficulty is that they have not yet learnt to cope with the national and international economic, political & social implications of ecosystem conservation.

2.4 CHANGING NATURE OF ECONOMIC ACTIVITIES

The history of Economic Geography is an ever changing one and may be divided into four distinct periods, each provided a different approach to the subject.

I. In the first period Economic Geography traced its roots to commercial geography which had grown up as the Western European nation expanded their trading relationships and empires across the globe. Commercial geography reached its zenith in the work of G.G.Chisholm who founded the school of geography at the University of Edinburgh in 1908 and published a book "Handbook of Commercial Geography" in 1925. This book provided a precise account of world production and trade. Chishlom also identified forces of concentration and deconcentration. The forces of deconcentration or decentralisation would ultimatley lead to a more equal worldwide distribution of industrial activity.

II. The search for better explanations led next to a more theoretical Economic Geography in the United states where it focused on the study of the relationships between economic activity and the physical environment. By the 1920s the field was well established and a journal "Economic Geography" appeared in 1925. This new Economic Geography was concerned with "environmentalism" or "environmental determinism"- the theory that economic differences were caused by environmental factors, failed to explain the diversity of economies in similar physical environments, and ignored the freedom of individuals to make their own choices, within limits, of what they produced.

This environmentalist idea was clearly expressed by W.M.Davis in 1906. To him human society was an organism that survived by adjustment to the physical environment, the nature of its growth was environmentally prescribed. E.Huntington in his book "civilisation and climate" published in 1915 argued that climate was the decisive factor in health and physical and mental efficiency, and that since a civilisation is the result of the energy, efficiency, intelligence, and genius of the population, ergo,

climate is the "mainspring" factor in the progress or regress of civilisations, J,Russel Smith (U.S.A) and T.Grifith Taylor (Australia) were all determinists and maintained an active correspondence with Huntington. They believed that it is the duty of geographers to study nature's plan, and to see how best their national area may be developed in accord with temperature, rainfall, soil etc. whose bounds are quite beyond our control in any general sense. The idea of the interdependence of culture and nature was also developed by the French geographer Vidal de la Blache in his book "Principles of Human Geography" in 1926. William Von Royen in his book "Economic Geography" in 1942 also indicated that "differences in productive activities are often results of differences in environment".

III. A third Economic Geography emerged that concerned itself with areal variation in production and the economic regions that resulted. Environmental determinism was almost abandoned by economic geographers and the American geographers became concerned with resources and the conservation of the environment and the majority of economic geographers from 1930 to 1960 returned once agin to a very descriptive approach. Economic Geography according to R.S.Thoman became "an inquiry into similarities, differences and linkages within and between areas in the production, exchange, transfer and consumption of goods and services". To J.W.Alexander, Economic Geography became "the study of the areal variation of the earth's surpace in mans' activities related to producing, exchanging and consuming wealth". In areal differentiation, definition and mapping of economic regions became an end in itself, the ultimate in descriptive generalisation.

IV. After World War II Economic Geography took new and different directions. The search for theoretical approach intensified. Social sciences became interdisciplinary. At this time, the computer technology began to revolutionize quantitative analysis and governments subsidized research particularly for planning and policy-oriented studies. Geographers rediscovered the classical economic theories of location of J.H.Von Thunen, Alfred Weber, Walter Christaller and August Losch. The locational analysis of Walter Isard called for the creation of a new discipline, "Regional Science". Location theory sought to describe economic landscapes created by "economic person" in which areal differntiation results not from differences in climate, soils or physiography, but instead from accessibility, transportaion costs,& economies of scale. Thjs new image of humanity (Economic person) has perfect knowledge of present circumstances and future events so that he or she has powers of perfect prediction, the goal being maximization of profits. Most location decisions with which this economic person must grapple involve tradeoffs which is a function of accessibility, rents and transportation costs.

But this image of "economic person" no longer satisfies economists or economic geographers. In reality, hunman behaviour displays "bounded rationality" in which

profit maximizing must be weighed against competing objectives. Hence, a new image of the decision-maker is being developed-the "satisficer image," with decisions based on limited knowledge and bounded rationality. Thus, the changing nature of Economic Geography is very much associated with the lessons and contributions of each of these four periods.

2.5 DETERMINANTS OF AGRICULTURE

Agriculture is the science and art of cultivating the soil & the rearing of livestock. Agricultural land is the most basic of the world's resources. Human beings are fed, clothed and sheltered from it. Prof. E.W.Zimmerman defined agriculture as "Agriculture covers those productive efforts by which man settled on land, seeks to make use of, and, if possible, accelerate and improve upon the natural genetic or growth processes of plant & animal life, to the end that these processes will yield the vegetable and animal products needed or wanted by man."

About 40% of 37 million acres of land in the world may be considered cultivable. The degree of availability of cultivable land is determined by a number of physical and socio-economic limitations. Physical limitations fix up the outer limit of cultivable land.

PHYSICAL FACTORS

[1] CLIMATE— Climatic factors exert the greatest control over the world distribution of agricultural types. The climatic elements which affect agriculture are-

a) TEMPERATURE-Temperature conditions determine the degree of warmth, the duration & the intensity of sunshine which affect crop maturity to a certain extent. Night frosts may damage the tender leaves of plants. Very low temperatures and heavy snow fall in the Arctic regions preclude any form of crop cultivation.

b) MOISTURE- Moisture is essential for plant growth. The amount of mousture, the distribution pattern during the year, the rate of evaporation and the conditions of relative humidity at the periods of sowing, growing and harvesting may or may not be conducive to the growth of agricultural crops.

c) WIND- Some plants are harmed by strong winds which may accelerate evaporation & physically damage the plant (e.g.- Cocoa cultivation in Brazil). On the other hand, sea breezes and light winds are often advantageous to certain plants like coconuts and coffee.

[2] TOPOGRAPHY— Configuration of the earth determines the flatness or ruggedness, degree and direction of slope etc. The most intensively cultivated parts of

the earth are the lowlands which ease cultivation and the use of machinery. Some crops like tea and coffee grow best on well-drained hill slopes. Steep slopes are prone to soil erosion.

[3] SOIL— Soil forms the physical support of plant and is fundamental to any form of agriculture. The composition of the soil is greatly dependent on the nature of the parent materials - i.e. the rock on which it was developed. Soil is either sedentary or transported and accordingly the composition varies. The fertility of the soil is often determined by the amount of humus present. Soil structure is dependent on the size of the soil particles. Aeration and water supply in the soil and the soil temperature are also important considerations for plant growth.

[4] BIOTIC FACTORS— Crop cultivation may be affected by weeds, parasitic plants, diseases insect-pests and animals. Some insects like bees & butterflies help plant pollination and earthworms assist in breaking down the particles and mixing the various layers. Fungal parasites also weaken and eventually kill plants.

[5] SOCIAL FACTORS— The type of farming practised depends on the culture of the farmers concerned, the type of crops produced and the yields obtained. For example, intensive wheat farming in Europe gives far greater yields than extensive wheat farming in the North American Prairies. Social factors also affect the type of crops grown. In Africa, tribal differences lead to agricultural differences. Masai tribe hates settled agriculture. Certain traditional crops are grown by certain people. The ownership and inheritance of land also affect the farm size and agricultural methods employed. In India, fragmentation of holding is a problem.

Some social and religious influences have profound effects on animal rearing, specially pigs & cattle.

[6] ECONOMIC FACTORS- Three kinds of economic controls are operative in all farming practices- (a) Operation costs, (b) Marketing expenses & (c) Government Policies.

Operation costs include purchase or rent of land, maintenance costs, recurring expenses, purchase of farm machinery, farm improvements, loans, mortgages, taxes etc.

Marketing expenses include freight charges by different modes of transport. It is also dependent upon the type of commodity (perishable or not) and the distance from the market Price fluctuation due to demand can be very violent. Overproduction may cause a glut.

Government policies may encourage the productivity and efficiency of farming by a system of guaranteed prices and subsidies to farmers. International agreements on major crops (like coffee, wheat) also affect farmers. By such agreements quotas are imposed on the producing countries so that supplies do not exceed demand.

Thus, agriculture becomes a function of a multiplicity of factors associated with different phases of culture and they vary both with time and space.

2.6 AGRICULTURAL REGIONS

Agricultural regions are not the natural regions. They are defined in terms of agricultural elements, that is, by crop, livestock, farming processes etc. The term agricultural region conveys that it is an uninterrupted area having some kind of homogeneity with specifically defined outer limits. Its homogeneity is determined by the criteria formulated and used. An agricultural region is created by the use of certain selective agricultural features that are relevant to a regional interest.

A primary basis of basic agricultural regionalisation may be the combination of crops and livestock which are raised. Further, the levels of agricultural productivity, extent of intensiveness in agriculture, degree of commercialisation, degree of subsistence level, types of farming practices, ensemble of structure and the diffusion of farm-technology may be considered as additional criteria for further subdivision within the basic regionalisation.

Any agricultural region involves two propositions-definition and delimitation. The definition takes into account structural attributes of agriculture, such as dominant crops, crop structure, crop and livestock association, farm processes, agricultural types etc. The delimitation involves drawing of maps in quantitative terms. There are various techniques which have been used from time to time for the delimitation of agricultural regions. These may be grouped into five distinct techniques: (1) normative; (2) empirical; (3) single element; (4) statistical (multi-element, new statistical and complex multi element); and (5) complete multi-facet (quantitative and qualitative)

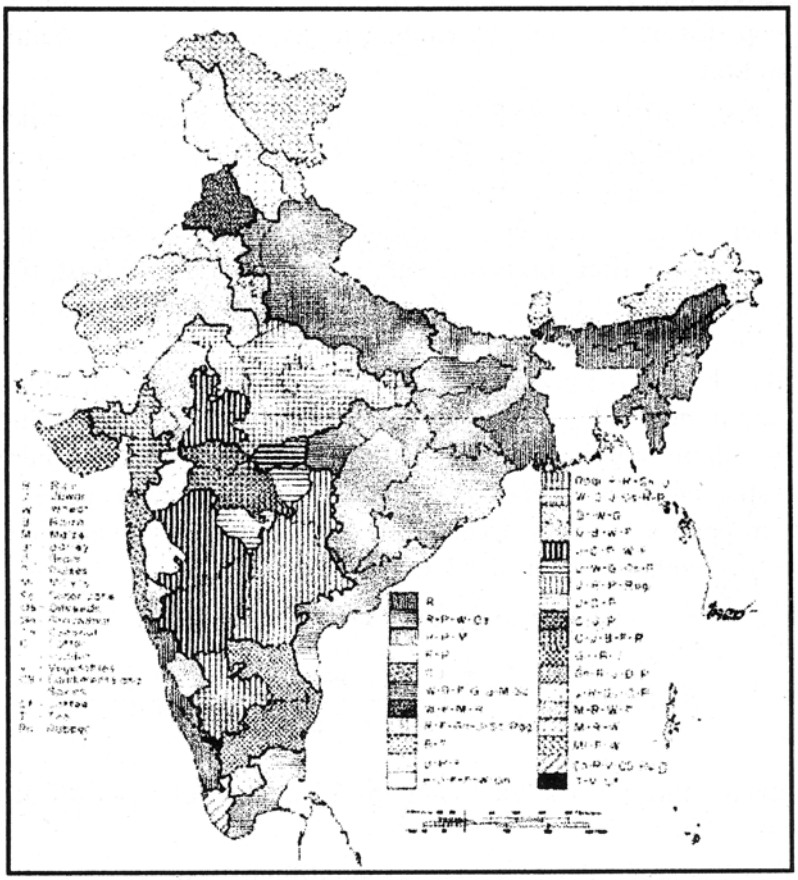
2.7 CROP COMBINATION

Agricultural geographers have worked out various statistical techniques which are an improvement on other techniques. The new statistical technique for agricultural regionalisation is a combination of two approaches - a) cluster analysis and b) combination analysis.

J.C.Weaver (1954) has pointed out three different lines in which crop -combination analysis may have more significance. Firstly, they are essential to an adequate understanding of individual crop geography, secondly, crop - combination in itself is an integrated reality that demands definitions and distributional analysis; thirdly, such regions are essential for the construction of the still more complex structure of valid agricultural regions.

Weaver proposed this technique to establish crop, livestock or enterprise combinations involving both the qualitative and quantitative aspects of crop production, livestock husbandry & functioning forms of agriculture. The technique involves comparing the actual propositions of the gross cropped hectareage occupied by different crops with abstract theoretical distributions' model wherein the gross cropped area is equally distributed amongst the different crops. The purpose is to establish the combinations where actual & theoretical distributions closely resemble each other. This situation arises when the standard deviation is the lowest. The least squares technique may be adopted for the derivation of crop combinations. Jasbir Singh (1976) applied it in Indian situation. The least square technique suggests that theoretical 4 crop combination in an enumeration unit is ideal where eleven crops are considered.

The least squares technique may be regarded as an important algorithm for establishing combination of homogenous crop farming or livestock raising only in those areas where they are practised as independent agricultural activity.



India : Ranked Crop Combination Regions

2.8 CROP DIVERSIFICATION

Crop diversification is a normal feature of stable agriculture & progressive farm management. This has been made possible by modern irrigation and the liberal use of fertilizers, HYV seeds, pesticides and mechanical technologies. Besides, there are other factors which force the cultivators to take crop diversification. First, Vagaries of weather compel the cultivators to saw a number of crops or practice a variety of enterprises on their a operational holdings so as to get some return under adverse conditions of weather. Second, rural life & the orthodox farm practices force them to obtain most of their domestic requirements from their holdings. Third, the agricultural experts are laying emphasis more on crop diversification for agricultural sustainability, maintaining soil health, & gainful employment at farm throughout the year.

The choice of cropping system is dependent primarily on physical variables & secondarily on technical & economic considerations, when physico -socio-economic conditions stimulate the growth of a variety of crops, farmers obviously tend to diversify the agricultural pattern. Crop diversification is important from the point of view of the steep rise of farm inputs. Consequently, each crop is bound to occupy only a small proportion of the arable land.

Many agricultural geographers have attempted to measure the indices of crop diversification and map them. Normally, it is assumed that if the number of crops grown in an unit is large, say about ten, each occupies only 10 percent of the cropped area. It means that the cropped area is distributed uniformly among all the ten crops. In such a case, crop diversification is of a very high degree. In contrast, if a particular crop occupies 100 percent of the cropped area, then there is no diversification at all. Here, monoculture or crop specialisation is the rule. It may be inferred that lower the value of the index, higher is the degree of crop diversification & vice-versa. In most parts of India, the number of crops grown varies from two to twelve. Suppose, in a regional unit "A" there are six crops occupying 30, 20,18,12, 8 & 6 percent of the cropped area respectively, & in the regional unit "B", three crops cover 67,20 &10 percent of the cropped area respectively. The degree of crop diversification in the former place (A) is higher than in the latter.

Bhatia (1965) has evolved a formula for measuring the index of crop diversification as

$$\text{Index of crop diversification} = \frac{\text{Percent of sown area under } \times \text{ crops}}{\text{Number of x crops}}$$

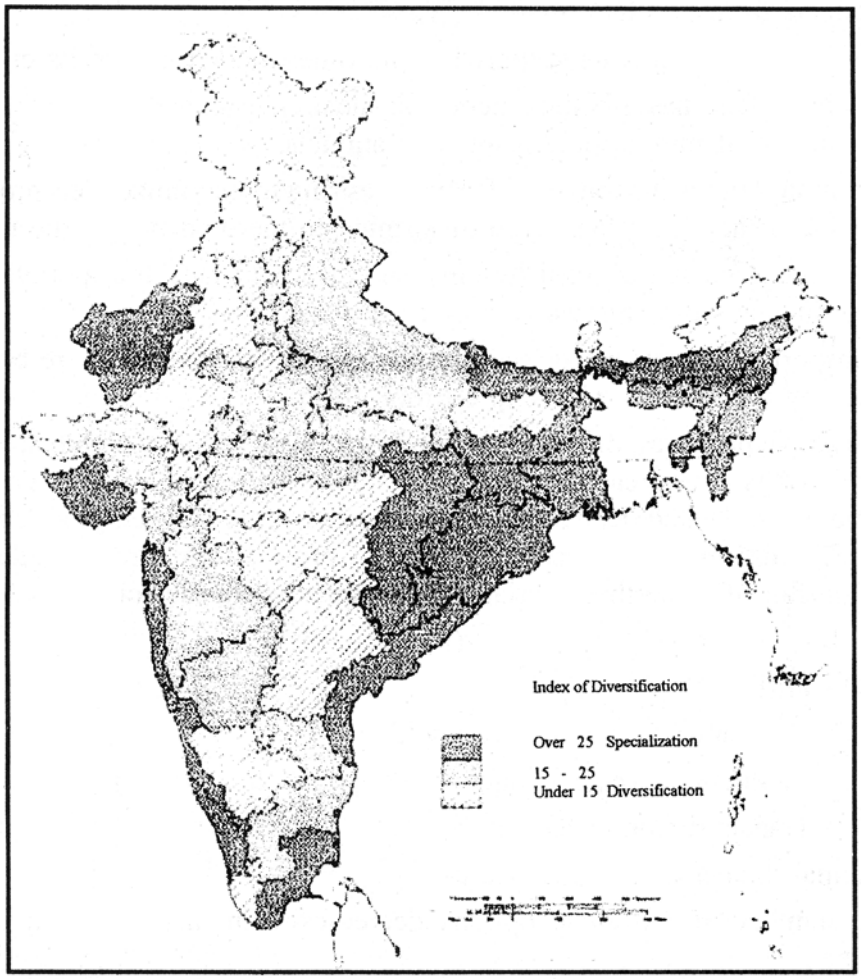
Where x crops are those crops which occupy 10 percent or more of the cultivated area in a regional unit.

Jasbir Singh (1976) used the formula in a modified form as

$$\text{Index of Crop Diversification} = \frac{\text{percentage of total harvested area under n crops}}{\text{Number of n crops}}$$

Where n crops are those which individually occupy 5 percent or more of the total harvested area.

The indices of crop diversification thus derived are mapped & exhibit a very significant spatial pattern of crop diversification in India.



India : Crop Diversification Regions

2.9 VON THUNEN'S MODEL AND IT'S RELEVANCE

The very first attempt to devise a scientific theory explaining the location of an economic activity can be credited to Johann Heinrich Von Thunen (1783-1850) of Germany. Both a scholar and a farm operator, Von Thunen formulated his famous

theory on the basis of 40 years' experience in managing an agricultural estate near the city of Rostock in Mecklenburg on the Baltic coast of East Germany.

His theory tries to account for the types of agriculture that will prosper around an urban market. The theory rests upon several assumptions:-

(1) There is an isolated area consisting of just one city and its agricultural hinterland. Such an area could be called "an isolated state".

(2) The city is the market for surplus products from the hinterland & receives products from no other area.

(3) The hinterland ships its surpluses to no other market except its city.

(4) The hinterland has a homogeneous physical environment favourable to the production of mid-latitude plants and animals.

(5) The hinterland is inhabited by farmers desiring to maximize their profits and capable of adjusting their type of farming to the demands of the market.

(6) The hinterland is traversed by only one means of land transportation. In Von Thunen's day this was the horse and wagon.

(7) Transportation costs are directly proportional to distance and are borne entirely by the farmers who ship all food fresh.

Given the above premises, different types of agriculture would develop around the city in discrete rings. The greatest distance from the city at which any given type of farming could be conducted depended on selling price at the market, production cost on the farm, & transport cost between the two. Any profit a farmer realized depended on the relationship of these three variables, as expressed in the formula

$$P=V-(E+T)$$

Where P= Profit

V= The value of commodities sold

E= Production expenses (labour, equipment & supplies)

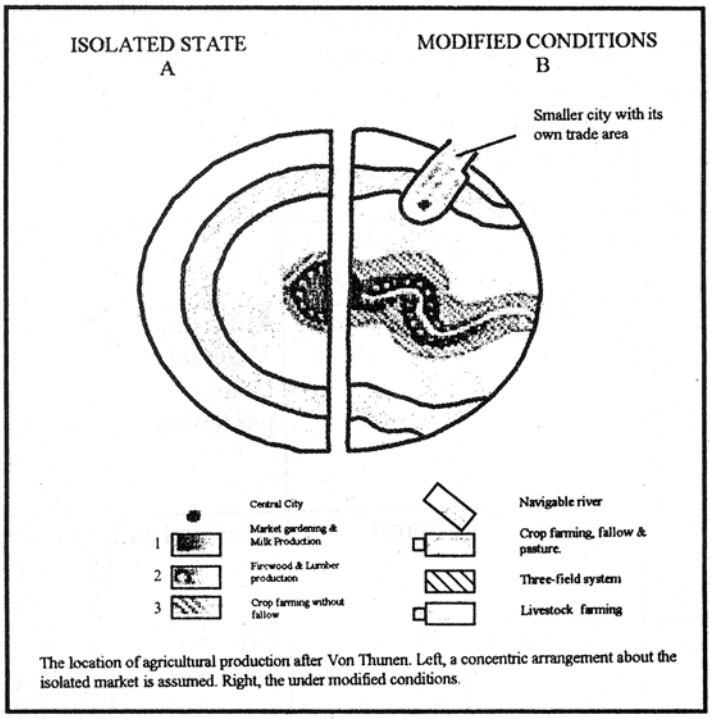
T= Transportation cost

Two principal themes of his theory are-

(1) The number of profitable options decreases with distance from the city market,

(2) There is a minimum distance within which a farmer would not choose to produce a given commodity because some other commodity yielded a greater profit.

From these two principles, Von Thunen postulated that six concentric zones of agriculture would develop around the market city on an isolated state A in the diagram



The location of agricultural production after Von Thunen. Left, a concentric arrangement about the isolated market is assumed. Right, the under modified conditions.

Zone 1 - The land nearest the market would be used to produce perishable items like milk and vegetables. These activities would be concentrated in the inner zone because of the slowness of transportation and the absence of food-preserving techniques.

Zone 2 - This zone would be specialized in producing wood, with firewood in much greater demand than lumber. According to Von Thunen, forestry yielded greater returns to the farmer near the city than did any other type of production except milk and vegetables.

Zone 3,4 &5 - These areas would tend to be devoted to grains and other crops. With distance from the city the intensity of cultivation would decrease. This is indicated by the proportion of fallow land - 0 in zone 3, 14% in zone 4 and 33% in zone 5.

Zone 6 - This would be the region of livestock farming. Marketed products would be of two types: Livestock which could be driven to market,, hence cutting transport costs almost to zero; and cheese, which is not highly perishable and which is valuable enough to be able to stand higher transport costs.

This theory would be modified by the presence of a navigable river and a smaller market city as illustrated in B in the diagram.

The following table has given a summarized version of the main characteristics of the rings of land use given by Von Thunen in his isolated state.

RING	AREA AS PERCENTAGE OF TATAL AREA OF ISOLATED STATE	RELATIVE DISTANCE FROM CENTRAL CITY (UNIT)	LAND-USE TYPE	MAJOR MARKETED PRODUCT	AGRICULTURAL ACTIVITY
0	Under 0.1	Under 0.1	Urban-industrial	-	-
1	1.0	0.1-0.6	Intensive agriculture	Milk and Vegetables (Market gardening)	Dairy and truck (horticulture and olericulture) farming; land heavily manured, and no land is left fallow.
2	3.0	0.6-3.5	Forest	Firewood and timber	Forestry (sylviculture): Firewood and timber production.
3	3.0	3.5-4.6	Intensive arable rotation	Rye and potatoes	6-year rotation: rye-potatoes-clover-barley vetch (bean like climbing plants, some of which are used as cattle feed); no land is left fallow, and cattle are stall-fed in winter.
4	30.0	4.6-34.0	Arable with long ley	Rye	7-year rotation: pasture-pasture-pasture-rye-barley-oats-fallow.
5	25.0	34.0-44.0	Extensive agriculture	Rye and animal products	Three-field arable system: area under rye, barley and fodder crops; fallow, and pasture
6	Over 37.9	44.0-100.0	Livestock ranching (beef)	Animal products	Mainly livestock raising, and some rye produced for on-farm consumption
7	Beyond	100.0	Wasteland	-	-

RELEVANCE

The highly empirical contents of Von Thunen's classical model can be understood in terms of the early years of his life & their influence on his locational ideas about agricultural activities. His model drew heavily for econometric analysis upon his farm accounts and many of the assumptions. His model has demonstrated certain properties of the agricultural landscape & provided a framework for location theorists like Weber (1909), Hoover (1936 &1948), Losch (1954), Dunn (1954) & Griffin (1973). Von Thunen's analysis is concerned with movement minimization in terms of cost, time and energy. Although the basic forces Von Thunen tried to explain in his theory are still operative, it is difficult to find examples today.

The ring model has been radically modified by changes in transportation characteristics, new technological achievements (refrigeration) & the replacement of firewood by certain substitutes (coal, gas, electricity etc.). Many of the needs of his time now seem obsolete. With improvements in transportation and reduction in transport cost, the radii of land use zones have become larger, but the concentric zones may still be recognised on a continental scale. At the small scale of farmstead & village, the ring effect still persists. Hence the movement continues to be measured in terms of time & man-days rather than freight costs.

In the less developed & underdeveloped countries the conditions may still be simi9lar to those of Von Thunen's isolated estate & there are several cases cited in geographical likerature where land use around a settlement is directly related to distance from the settlement. Moreover, the adoption of green revolution technology at all size classes, particularly in the intensively irrigated areas has disturbed the application of Von Thunen model in Indian context. His precondition was fully valid right up to the early decades of the 20th century. With changed conditions, the distance from the market is now only a cost factor. So, the classic Thiinian agro-spatial model is no longer operative in its original format.

2.10 GREEN REVOLUTION OF INDIA

Between 1947 and 1967, efforts by the Govt. of India at achieving food self-sufficiency were not entirely successful. In a perfect case of Malthusian economics, population was growing at a much faster rate than food production. This called for drastic action to increase yield and the action came in the form of Green Revolutions which took place from 1967 and 1978. It is a term applied to successful agricultural experiments in many third world countries. It was most successful in India.

There were three basic elements in the method of the Green Revolution:

1.Continued expansion of farming areas,

2. Double cropping in the existing farmlands,

3. Using seeds with improved genetics.

The area under cultivation was not enough to meet the rising demand for food . Though other methods were required, the expansion of cultivable land also had to continue. So, the Green Revolution continued with this quantitative expansion of arable lands.

Double cropping was a primary feature of the Green Revolution. Instead of one crop season per year, the decision was made to have two crop seasons per year. The first crop was based on natural monsoon and water for the second phase came from huge irrigation projects. Dams were built and simple irrigation techniques were adopted.

Using seeds with superior genetics was the scientific aspect of the Green Revolution. The Indian Council for Agricultural Research (ICAR) developed new strains of high yielding variety (HYV) seeds, mainly wheat and rice and also millet and corn.

The Green Revolution was a technology package comprising HYV seeds of two staple cereals (rice and wheat), irrigation and improved moisture utilisation, fertilisers and pesticides and associated management skills.

BENEFITS OF GREEN REVOLUTION

The Green Revolution resulted in a record grain output of 131 million tonnes in 1978-79. This established India as one of the world's biggest agricultural producers. Yield per unit of farmland improved by more than 30% between 1947 and 1979. The crop area under high yielding varieties of wheat and rice grew considerably during the Green Revolution. The production of millet and corn has also registered an increase. The Green Revolution also created plenty of jobs not only for agricultural workers but also industrial workers by the creation of related facilities such as factories and hydroelectric power stations. This improved the quality of life of the people in villages. India paid back the loans it had taken from the World Bank. This improved India's creditworthiness in the eyes of the lending agencies. India transformed itself from a starving nation to a food exporting country. The Green Revolution was one factor that made Mrs Indira Gandhi & her party INC a very powerful political force in India.

SHORTCOMINGS OF GREEN REVOLUTION

The Green Revolution, however impressive, has not succeeded in making India totally and permanently self-sufficient in food. Ever today, India's agricultural output sometimes falls short of demand. In 1998 and (2005) India had to import onions. Last year India imported sugar. The country has also failed to extend the concept of HYV seeds to all crops or to all regions. In terms of crops, it remains confined to foodgrains only. In regional terms, only the states of Punjab and Haryana showed the best results. The eastern Ganga Plains in West Bengal also showed reasonably good results but in other parts of India the results were not so impressive.

The Green Revolution has created some adverse impacts on the environment. The increasing use of agrochemical based pest and weed control in some crops has affected the surrounding environment as well as human health. Increase in the area under irrigation has led to rise in the salinity of the land. Although HYV seeds had their plus points, it has led to significant genetic erosion. By the 1970s the new seeds, accompanied by chemical fertilizers, pesticides and for the most part, irrigation, had replaced the traditional farming practices in the developing countries. The Green Revolution cannot therefore be considered to be successfull in all aspects.

UNIT 3 ❑ CLASSIFICATION OF INDUSTRIES

Structure

3.1 INTRODUCTION

Industries are diverse but they may be basically divided into - Primary, Secondary, Tertiary & Quaternary.

1. **Primary Industry**— These industries are concerned with extracting material direct from the earth (or sea) and do not involve the processing or fabrication of a finished product. They are located at the source of raw materials and can not be located anywhere else. The examples are - the production of metal from mineral ores, the production of power from coal and oil, the processing of agricultural commodities to form food stuffs or industrial raw materials etc. such industries also include the smelting of bauxite to make aluminum, the processing of latex to make rubber sheets or the pulping of logs to make paper.
2. **Secondary Industry**— These industries cover a very wide range of operations, varying greatly in complexity. Industries in this group are characterised

by the variety of their locations. Some are located with reference to the final purchaser; others are strongly tied to their raw materials, while some are in between these two extremes. They are sometimes subdivided into heavy industries; eg. engineering, metal goods, heavy chemicals, shipbuilding, locomotives and light industries; eg. electrical equipments, plastics, textiles, cosmetics and toilet articles. Basically they include all re-processing of partially manufactured goods to make more complex products; eg. the use of cloth in clothing, the use of iron parts in the manufacturing of machinery, the use of copper wire in the electronics industry and the use of paper to make books.

3. **Tertiary Industry**— Industries in this group are concerned with providing a service and tend to be located where services are required. Industries such as retailing are market oriented. Tertiary industry is not a branch of manufacturing at all but consist of sendees like trade, transportation, commerce, entertainment, personal service, tourism, administration and so on,
4. **Quaternary Industry**— These are concerned with the provision of information & expertise. Included in this group would be Universities, "think tanks", research establishments, the producer sendees, comprising planning, management, legal, financial, marketing and accounting services for large corporations & governments. Such activities also tend to be market oriented but could theoretically be located almost anywhere since information can be transmitted easily from place to place by electronic media. So it is potentially footloose.

There is another category called quinary which involves high-level decision making or control functions that manipulate the vast recourses of private business & governments.

Industries can also be classified as resource based industry and footloose industry.

3.1.1. Resource based and foot loose industries :

The resource based industries are tied with the source of raw materials and markets, eg. iron and steel industry, aluminium industry, cement industry etc.

Foot loose Industry— Today the basis of power for much industry is by means of the electricity grid. Electricity as a source of power has become virtually ubiquitous. It is found almost everywhere. This has laid geographers to coin the term "foot loose" to describe those industries, which are relatively united to localized sources of energy. In such industries, a set of production costs do not very much geographically and the manufacturer can suddenly go elsewhere with little or minimum loss in capital investment.

3.2 THEORIES OF INDUSTRIAL LOCATION

The distribution of industries over the world varies from each other on the basis of raw materials, the process of manufacturing, the resultant product and the markets. So, the locational preference will also differ. The studies primarily concerned about the spatial variation of industrial locations are known as industrial location theory.

GENERAL LOCATIONAL FACTORS :

The extreme complexities are involved in location decisions. The availability of raw materials, cheap labour, transport cost and proximity to market make the manufacturing cost differential between the places. If profit maximization is the chief objective of the plant owner, least cost location will be preferred. The different locations have different geo-economic character. The governing factors fall into two broad groups : (1) Geographical factors, (2) Socio-economic factors. The subdivisions are as follows :

Geographical factors :

a) Land, b) Raw materials, c) Climate, d) Water-resources, e) Fuel

Socio-economic factors :

a) Capital, b) labour, c) Transport facilities & charges, d) Demand, e) Market, f) Government patronage & policies etc., g) Tax structure, h) Management, i) Other factors.

We can discuss all these factors under the broad headings of -(A) Market, (B) Production Costs, (C) Agglomeration Economies and (D) Environmental Factors.

(A) Market :

For a growing number of industries, the market has become of increasing importance in the locational choice. The cost of transporting a manufactured product is normally higher than transporting a non-manufactured material. Furthermore, there is often a weight gain in the manufacturing process. A location near the market avoids the transport charge on materials added during manufacturing. Two basic reasons for market location are - the higher freight rate on the finished product & a weight gain in the manufacturing process. Another reason involves perishability and communication cost and convenience. A market location implies a desire to improve sales. If the sales revenue is high enough, a somewhat higher production cost can easily be accommodated.

(B) Production Costs :

Several elements of production costs are labour cost, labour availability, energy,

materials and other related factors. Labour is a major cost item. Manufacturing processes requiring highly specialized and skilled labour must pay high wages. There is always a tendency for industries that are labour - intensive but require unskilled workers to locate in low-wage areas (e.g garments making industry - tailoring)

The availability of labour is also a critical factor, especially skilled labour. A realistic option for a manufacturing plant is to locate in an area of surplus labour, where the wage rate is likely to be depressed and people will be willing to work for lower wages. Labour productivity is another consideration vital to the locational choice. If a labour force is available at a low wage rate and the productivity level of the workers is low, it may be more economical to select a location having higher productivity and higher wages.

Energy costs have been rising rapidly in recent years. Certain kinks of manufacturing are more energy - dependent than others (e.g. the aluminium industry). The degree that energy costs and availability vary geographically shapes the locational sensitivity of manufacturers to energy.

One of the major costs for manufacturing is the purchase of materials. Material costs will be specially significant in a region at an advanced stage of economic development. Suppliers who understand the material requirements of a manufacturing plant and who provide reliable, timely and convenient sendees play a vital role because most manufacturing operations require a consistent flow of material inputs.

Other related factors include access and cost of capital, tax advantages, community development, local amenities and personal considerations.

(C) Agglomeration Economies :

The term agglomeration implies a concentration of activities in one place. Economies mean savings. Agglomeration economies are those savings that result from concentrating economic activities in one place or adjacent to one another. Four kinds of agglomeration economies that result in profitability to an industrial firm are - transfer economies, internal economies of scale, external economies of scale and urbanization economies. Each of these concepts is important in understanding the location of manufacturing activity.

Transfer economies are the transportation savings that a plant gains by locating close to other plants. Plants may locate near one another to benefit from successive stages of production. When material sources and markets are dispersed for a manufacturing plant, a location at a strategic node on the transport network means a saving in transport costs.

Internal economies of scale arc the savings a particular plant enjoys from increasing its scale of operation or size. Size may be measured in number of employees, amount

of payroll, value added, or volume of output. As the size of the plant increases, the average production cost of the items manufactured normally decreases.

A third agglomeration advantage is external economies of scale or localization economies. These costs reductions come about from a spatial concentration of plants in the same industry. The scale economics arc external to a particular plant but internal to the specialized machinery replacement for its manufacturing operation.

Urbanisation economics occur when the average cost of production units is lowered as may industries develop in one place, such as a large urban area. Several industries share the burden of certain costs, and this results in a reduction of average costs to all. A large urban area has a large, flexible labour pool, well-developed commercial and financial services, such as fire and police protection.

(D) Environmental Factors:

Over the last several years, environmental factors have taken directly into account in the location decision either through the perception of the business person or through policy requirements at he state or local level. Environmental regulation will have a major and continuing effect on the location of manufacturing. The principal concerns arc with air, water, noise, solid wastes and land use. Four types of impact of environmental regulations on manufacturing arc - same site versus new site, regional development, changes in the location decision process and increased awareness of space.

On-site expansion normally involves less risk and uncertainty. The location of a new facility would probably result in longer delays than expansion on-site.

Areas that arc currently experiencing rapid regional development are likely to remain as industrial targets. Regions with relatively little industrial development may wish to protect their relatively unspoiled environment by excluding dirty industrial growth.

Environmental factors arc now recognized as important in the location decision process. Such items as waste disposal, water quality controls, and air pollution standards are now basic influences on location decision.

A final consequence of the greater environmental concern is the enhanced awareness of spatial factors. The focus is now more explicit for an increasing number of manufacturers. The increased awrarcncss of space should ideally result in a better pattern of location in the long run.

3.3 INDUSTRIAL LOCATION : WEBER'S MODEL

In order to explain the underlying influences on location as applied to all industries,

Alfred Weber, a German economist put forward general theory of industrial location in his book *"Theory of ike location of Industries"* in 1909. It was translated into English in 1929 and has since become a standard reference on the subject. His overall objective was to determine the minimum-cost-location for a manufacturing plant. Weber aims to explain the location of industrial activity in terms of three economic factors namely, transport costs, labour costs and agglomeration economies. His explanation is based upon finding the least-cost location for production.

Assumptions & Principles:

Wcbcr made three explicit assumptions which were retained throughout his analysis.

1. There is an uneven distribution of natural resources on the plain. Thus the raw materials, fuel and water needed for industrial productions may be found only in given locations.
2. The size and location of centers of consumption of the industrial products are given. The markets are thus points on the plain.
3. There are several fixed locations of labour where given wage rates operate. Labour is immobile and unlimited at these locations.

   There are other assumptions which are implied in his work.
4. The area has a uniform culture, race, climate, and political and economic system.
5. The entrepreneurs seek to minimize the total cost of production.
6. Conditions of perfect competition are assumed, whereby resources and markets are unlimited at their given location and no firm may obtain a monopolistic advantage from its choice of location.
7. Costs of land, building, equipment, interest and depreciation of fixed capital do not vary regionally.
8. There is a uniform system of transport over a flat surface.

Several terms introduced by Weber need to be defined. Ubiquities arc materials available everywhere, examples - water, sand, gravels etc. localized materials arc available only at specific locations, examples-coal, iron orc, bauxites etc. Weber also made a distinction between pure materials and weight-losing materials. Pure materials lose no weight in processing, example : Cotton. Weight losing materials import only a portion of their weight into the finished product: example : iron & steel.

Weber maintains that there are three regional factors which affect the costs of production. These are the cost of raw materials and the cost of transporting raw materials and finished products, and the cost of labour. The cost of materials varies, for example, according to the nature of the deposits and the difficulty of mining

them. He suggests that this variation should be reflected within the costs of transport of the materials. So his general regional factors affecting production arc reduced to transport costs and labour costs. He identifies another local factor called agglomeration or deglomeration economics. The first arc the savings to the individual plants that result from their operating in the same location. This is possible through the common use of auxiliary industries, financial services and public utilities. In a single firm location, these processes and services have to be borne by the firm at greater cost. Agglomeration economics also include linkages between firms, where there are flows of goods between the plants, the development of a specialist labour force, and savings owing to the bulk purchasing of materials and large-scale marketing of products. Weber suggests that many of these economies may be gained by the increased scale of production of one firm as well as by the clustering of several. Deglomeration economies involve the weakening of the agglomeration economies and specially, the increase in the cost of land owing to such a clustering of firms.

His analysis is divided into two major sections :

(1) The identification of the point of minimum transport costs. (2) A discussion of the circumstances under which production will be attracted away from this point owing to advantages gained from cheapest labour or agglomeration.

Transport costs—

Following Weber, the cost of transportation will be considered under two simplified conditions:

(A) One market and one source of material supply & (B) One market and two sources of material supply and involve Weber's classic locational triangle.

(A) One market and one source:

If the material is ubiquitous, the processing would take place at the market. If the material is pure, processing may occur at the market, the material site or any place in between. An intermediate location would entail an unnecessary additional handling cost. If the material is weight losing, the processing will locate at the material source to avoid transporting waste materials.

(B) One market & two sources:

In the first example of the locational triangle, Si & S2 are the two material sources & M is the market location. Because distances and costs between these three points are identical, we may assign each of the three distances a cost of, say $1.00. The processing will occur at the market, because the two needed materials can be shipped there at a total unit cost of $2.00. If processing were to locate at Si, there would be the cost of shipping one unit from S2 to Si ($1.00), the cost of shipping that same

unit, now processed, on to the market ($1.00), and the cost of shipping one unit of the material from SI, also now processed, to the market ($1.00). Thus the total transport cost, if processing were to locate at Si or S2 is $3.00 versus $2.00 per unit at the market.

The situation is different when we have two weight losing materials to be brought together in the processing centre. Let us assume that there is a 50 percent weight loss for each of the two materials. Let the cost of transporting one unit of the weight losing material be $2. If a market location is selected, one would have to ship one unit of material from both Si & S2 at total cost of $4.00. If Si is selected for processing, the cost of obtaining the material from S2 would be $2.00. No transport cost would be charged to get the material from Si & the cost to transport the product to market with the 50 percent weight loss would be $2.00. The market Si or S2 would have the same total transport cost.

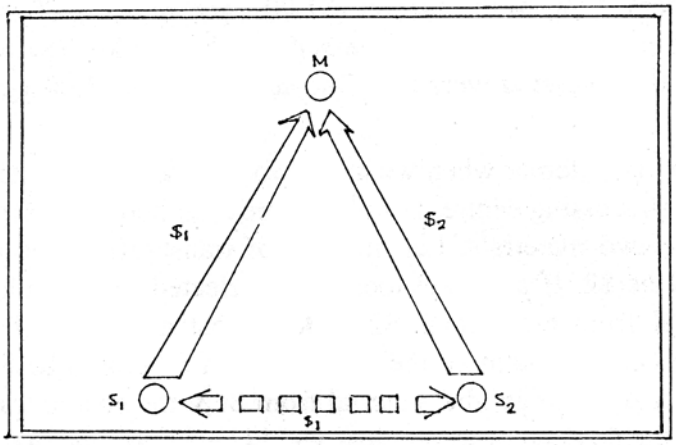
Weber was concerned with selecting the least-cost or optimum location. An intermediate location at P would be optimum, rather than M, Si or S2, where the transport cost at P would be less that $4.00. Besides, if one material had a greater weight-loss ratio than the other, the intermediate location for processing would be pulled towards the site of the greatest weight loss.

Labour Cost :

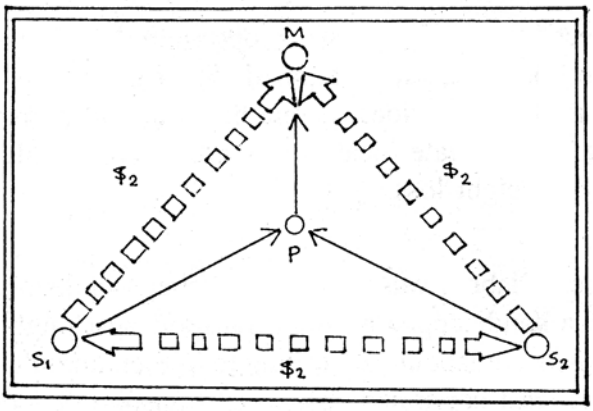
The geographic variation in the cost of labour was viewed by Weber as a distortion of the basic transport pattern. An area handicapped by high transport cost might be attractive to industry because of inexpensive labour. According to Weber, an industry would select the location that has the least combined cost when transport & labour are considered together.

To determine this location, Weber introduced two concepts - Isotim an Isodapane. Isotim is a line of equal transport cost for any material or product. Tn the diagram the isotims are given in $1.00 interval. The cost of shipping the finished products is shown by single line isotims. If one located processing at the material supply site (MX there would be a $4.00 transport charge to send the finished product to the market. The isotims for the material are shown by double lines. The cost of transporting the material to the market is only $2.00, with the market being the least cost location. The cost of moving the material is thus half that of shipping the finished product. So, the total transport cost at location X would be $2.00 to ship the product to market plus $1.00 to obtain the material from the source i.e. $3.00

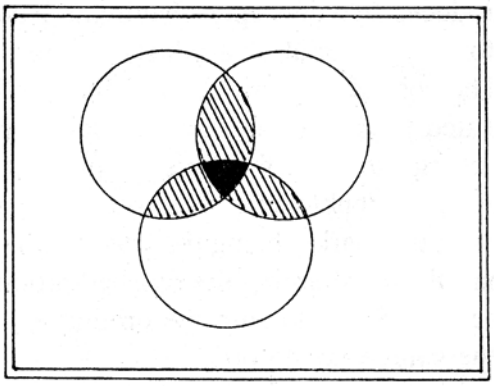
The Isodapane is a line of total transport cost. The isodapane is found by summing the isotims at a location. Once the isodapanes are determined and one is able to identify the point of least total transport cost, then the variation in labour costs can be considered in combination with the isodapanes. The reason for using isodapanes



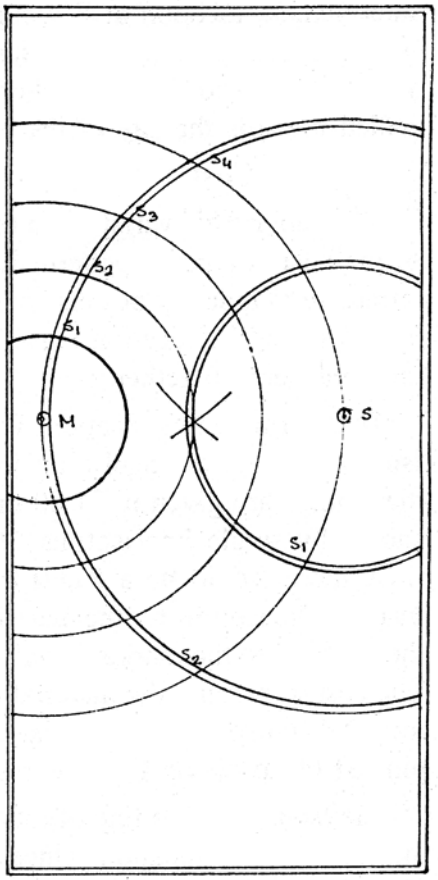
Weber's Locational Model with one market (M) and two source of raw material (S_1&S_2) supplies



Weber's intermediate location emphasis the least cost production location is at P



Where the critical isodapanes overlap, firms A, B & C can take advantage of agglomeration economics



Isotims, or lines of equal transport cost show that the market (M) is the optimum location for production

is to introduce the labour component into Weber's locational theory. In the diagram, the construction of isodapanes and the optimum location points are shown.

Agglomeration :

Weber recongised that agglomeration may operate as a distinct locational factor. He viewed agglomeration as the dollar savings per unit that would accrue to a plant from locating within a cluster of other plants. Weber saw agglomeration not as producing internal-scale economies, but rather external economies including urbanization economies. The figure illustrates the cost of three manufacturing plants, A, B & C, which have each independently located at their least cost point. Around each plant is drawn a critical isodapane. If each of these three plants could locate together, the agglomeration advantages would be just matched along these lines by the higher transport costs. Thus, all plants would benefit from agglomeration savings if they were to locate within the shaded triangle.

Criticism :

Weber's purpose was to provide a general theory of industrial location & in this regard his contribution has proved most valuable. His work, however, has a number of shortcomings that limit its application in explaining folly actual manufacturing location. His theory is a model hypothesis based on several premises which are possible only in the exceptional cases. So, the theory is an exception rather than rule. The difference between the capitalistic and socialistic economy, institutional factors and entrepreneurial decisions were not taken seriously by Weber. He did not effectively and realistically take into account geographic variation in market demand. He over emphasized on the role of transport cost. The transport costs are not proportional to distance & weight. Moreover, the intermediate locations necessitate added terminal charges. The advantage of the "break of bulk" location was also ignored by him. Labour is normally mobile and is not always available in unlimited quantity at any location. Many manufacturing plants obtain a very large number of material inputs and produce a wide range of products for many diverse markets, Weber's theory does not apply to such circumstances. In his agglomeration concept, Weber failed to consider the space problem, energy crisis and problems of civic amenities. The assumption of perfect competition in the concept of Weber is an ideal condition. In the long ran it is very difficult to sustain perfect competition in the region. Competition and price fluctuation in the economy is a natural phenomena. Weber failed to recongnise that.

3.4 AUGUST LOSCH'S THEORY OF PROFIT MAXIMISATION :

August Losch,, a German economist published his theory of profit maximisatiion in "Economics of Location" in 1954. Losch recognised the least-cost versus maximum-

sales approaches to location theory. He noted that "in a free economy, the correct location of the individual enterprise lies where the net profit is greatest". Net profit is the difference between sales receipts and minimum costs, and the entrepreneur's solution is to find the location where these differences are the greatest. According to Losch it is empirically impossible to examine all points in an area to determine cost and demand and hence "the place of greatest money profit". So, ignoring transport cost, labour cost and agglomeration cost, he emphasized more on the total production cost. To get the maximum profit, Losch emphasized most on the price reduction of the commodity. Any decrease of price would stimulate the volume of consumption. This can be illustrated by the following diagram. In this simple model, it is evident that when the price of the commodity drops from R to P the consumption increases from M to N.

Like Weber, Losch also considered certain assumptions for the success of his theory. In the presence of certain optimum conditions the maximum profit location may occur :

1. The area should be an extensive homogeneous plane where raw materials are distributed evenly.
2. The '"transport cost" is uniform and directly proportional in all the directions.
3. The people inhabiting the region have a general homogeneity either in taste, knowledge & technical skill.
4. There is no economic discriminations among the people. The economic and career building opportunities and open and uniform to all individuals.
5. The population distribution is very even and the area is self-sufficient in agricultural production.

To achieve homogeneity of economy within the region, the theory required some more conditions. These are as follows :

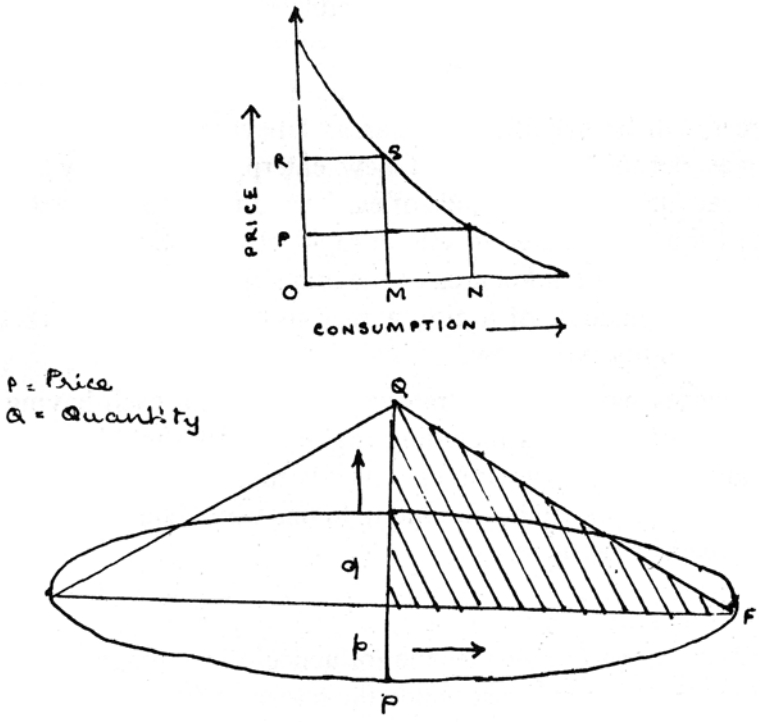
1. The entire area should be equally served by the factories. No area should be exempted from the supply, therefore, no new firm would dare to venture in the area.
2. There must be conformity in the range and quantum of profit. In case of abnormal profit, new firms may try to establish their own plant.
3. The location must satisfy both producer and consumer. The profit of the firm and satisfaction of the consumer must be optimum through the location.
4. There must be provisions for consumers to get the products from other adjacent areas.
5. The number of consumers, producers and areas should be well defined and not very extensive. Only a limited number of producers within a small area

will be able to overcome the complexities and satisfy completely the handful of consumers.

According to Losch, to get the desired result from the location and sustained growth of the industry, these conditions are pre-requisites.

Theory :

The major objective of Losch's location theory is to attain equilibrium in the producing area and the product and the ability of the producer. If a single entrepreneur enters in the production process, within a vast area, the distribution cost will be very high. But when several small producers are engaged in the production process in separate regions, the distribution cost will come down and due to increasing competition, efficiency of the product and cost of production will be lower. The profit will increase substantially.



To establish his theoretical model of the theory, August Losch proposed three distinct phases of development. The phases are as follows : -

(I) In the first phase Losch observed that if sufficient and symmetrical demand of a product prevails in the market, the market conditions may be explained by a demand cone. The above diagram illustrates that the effective demand of the particular product will be exactly same as the volume of the cone.

P is producer, and demand curve is lying on QF? P or price line, controlled jointly by transport cost and distance. The price increases from P to F. Along the Y axis or PO. demand of quantity is measured between PF and QF. When PF is taken as a measure of distance and is rotated about P, the circular market area is formed, bounded by the locus of points F, where the price becomes too high. Total sales are given by the volume of the cone produced by the rotation of POP. It is clear from the diagram that, away from the centre, with increasing distance, demand of the quantity drops drastically.

(II) In the second phase, within the vast rounded area, several factories will concentrate. The extensive market area will give a lucrative operational area. But despite the growing competition among the firms to capture larger share of consumer and larger market areas, there should be some void in the boundary zones and a certain amount of region will remain unserved or poorly served. The circular pattern of industrial hinterland in phase II will ultimately decide the future of the industry in that region.

(III) In the third phase of industrial location, the intermediate space between two market areas will be narrowed. The areas fall vacant between the different market areas become the target of new enterprises. As new firms set up within the vacuum, the hinterlands of earlier industries become reduced. The reduction of the market area results in rapid disruption of the early circular pattern. Gradually the market area of the industries attain a hexagonal shape. Thus around the nucleus of a city, numerous hexagons of market areas of different commodity will grow.

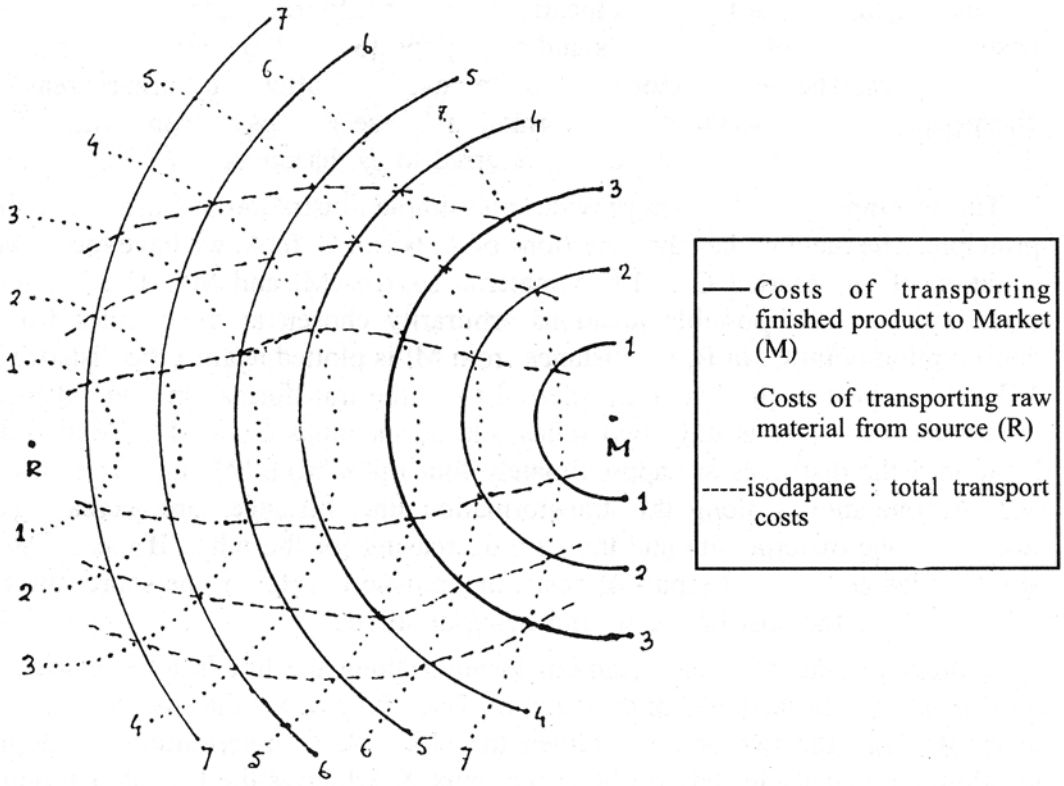
In this way, industries would concentrate within a region, each having different products. So, all types of materials including raw materials should be available on that point. Hence, any new industry would get its raw material nearby. Obviously, the total transport cost in that place will be minimum. In this way, "equilibrium conditions" as stated by Losch may be attained.

Criticism:

Losch was the first person to consider the influence of the magnified of demand on industrial location. He also emphasises upon the rate of competition as an important determinant of locational analysis. His theory has also a philosophical contribution on the motive of entrepreneur's role. His equilibrium concept is perhaps the greatest contribution among the location theories developed later on.

However, Losch's theory was not entirely flawless. His theory is essentially a simplified model of an ideal condition. In reality, only in a rare occasion, these events may occur. The assumed conditions of homogeneous plain region, equal distribution of raw materials and uniform transport rates never occur in reality. Therefore, according

to some critics, this theory is nothing but an intellectual exercise. Losch even assumed the cultural homogeneity and uniform taste of the people within the region and the idea is quite absurd. He ignored the variation of technological development of different regions. The difference in technical know how may offset the theoretical model. Political decisions also play an important role in the industrial location. Losch overlooked this point. The variation of the cost of raw materials and labour wage rates were not given proper weightage in this theory. He categorically separated the role and effect of agriculture and industry. But this difference is somehow arbitrary in nature. The abstract and optimum situation demanded by the theory may be available



The construction of isodopanes : one market, one raw material case with transport costs proportional to distance and no weight loss. Optimum location either at R or M, or if no extra handling charges anywhere along the line between R and M

in agriculture but not in the complex production process of modern manufacturing industries. Thus, Losch's theory is more practical in agriculture rather than in industry.

3.5 ISARD'S THEORY OF SPACE ECONOMY

Another major contribution to location theory was the publication of "Location and the Space Economy" by Walter Isard in 1956. Isard incorporated all relevant

locational and spatial factors into a general theory of the space economy. He considered all the costs of inputs and outputs over time and space as well as selling prices in order to create a more general theory. Isard developed his theory by integrating the works of Von Thunen, Weber and Losch. He linked his location theory to the general theory of economics through the substitution principle.

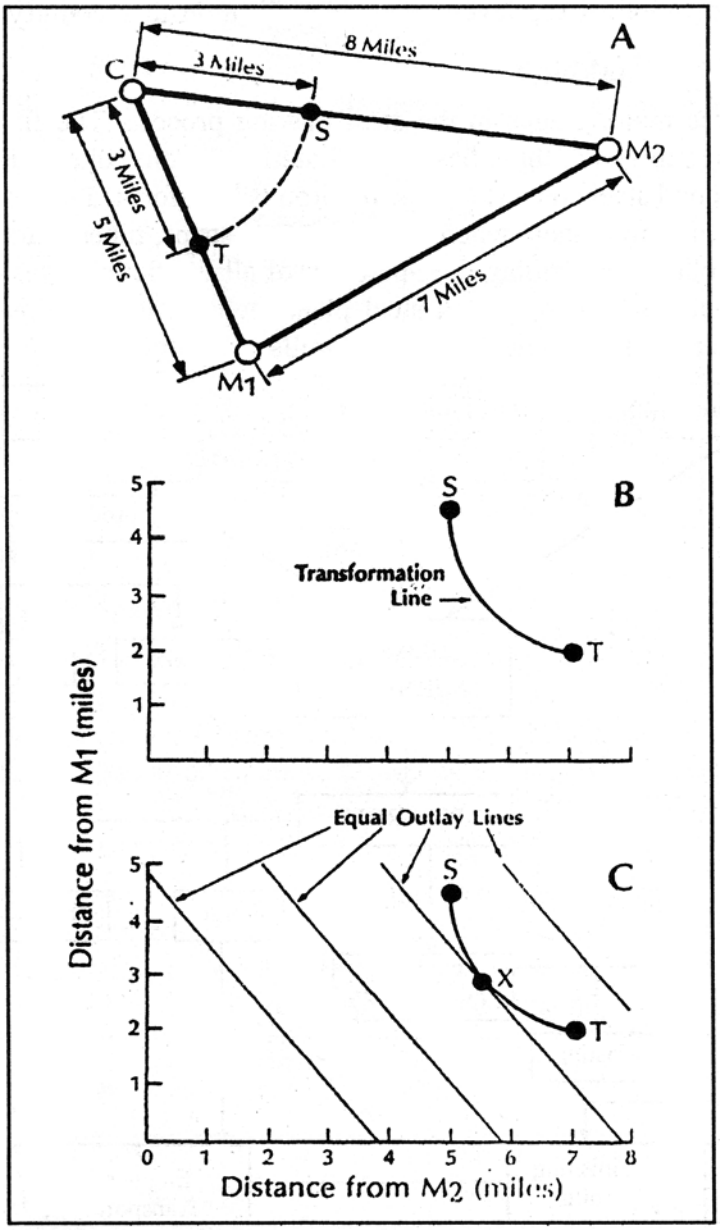
Isard's spatial equilibrium through substitution approach allows for substituting any of the factors in the production process, not just transportation. Cheap coal might be exchanged for higher cost natural gas in determining an optimum location for one firm, while another might respond to changing costs by adjusting the mix of its output. In general, Isard grouped locational factors into three categories : (1) transfer costs; (2) labour, power, tax costs and so on; and (3) agglomeration economies and diseconomies. The latter factor reflects the advantage offered by urban areas in the cheaper provision of services and information. These savings are somewhat offset by the increases in cost of other factors, referred to as diseconomies.

The accompanying diagram provides one simple illustration of Isard's substitution principle. The diagram has three sections of A, B and C. In A, we have the Weberian situation of one market C and two material sources Ml and M2. The line T to S represents a set of possible locations arbitrarily chosen at three miles from the consumption point C. In B, the distance from Ml is plotted against the distance from M2 with respect to the line T-S, referred to as the transformation line. At location T, distance from Ml is only two miles, but seven miles from M2. Conversely, at location S the distances are approximately four miles from Ml and five miles from M2. As one moves along this transformation line, distances are increasing with respect to one material site and they are decreasing for the other. If these distances are regarded as transport inputs or costs, the transport costs for one source are being substituted for the cost of the second material source.

In order to determine the optimum location along the line T to S, equal outlay lines are plotted on section C-of the diagram. These lines depict the costs of transporting materials from the two sources. Given the objective of determining the optimum location, the place selected will be at the point X, which is the lowest-cost point on the line T to S for that equal outlay line. Therefore, based on the simple example of substituting among locations at a three-mile distance from the consumption point, the optimum location will be at X with respect to transport costs from Ml and M2. The results of this analysis by Isard follow Weber, except for the conceptual emphasis on substitution.

Isard sought to create an overall theory based on the fusion of the frameworks of Von Thunen, Losch and Weber. He linked location theory with other branches of economic theory through the substitution principle. Greenhuts summarized the substitution approach to location theory as follows : "The event to which labour can

be substituted far capital or land and vice versa is basically the same problem as the selection of a plant site from among alternative locations." For example, given two equally advantageous sites for a factory, one may have cheaper land, the other cheapter labour. By locating on the cheaper land site, an entrepreneur would be substituting cheap land for cheap labour. Both locational and economic theory have as one objective the optimal allocation of resources.



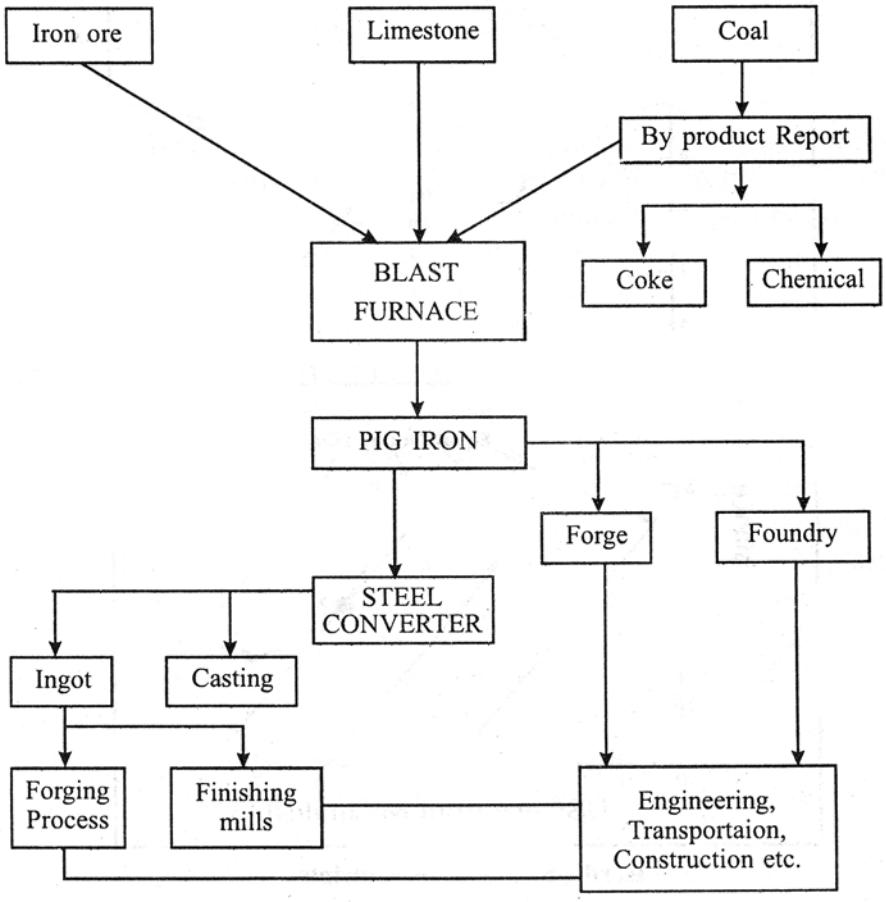
Isard's Substitution Principle

3.6 IRON AND STEEL INDUSTRY

The structure of modern industrial world is made of steel. Iron and Steel industry is the basic industry of any country. Most of the subsidiary industries like automobiles, locomotive, ship-building, machine-building and also manufacturing of chemicals are all directly linked up with the iron and steel industry. The extent of its growth gives a clear indication of the levels of industrialization in a country.

Process of steel making

There are three major stages in the steel making process. The first stage is the blast furnace stage in which three basic raw materials - iron, coke and limestone are placed. In the second steel converter stage pig iron is transformed into steel. The third stage is the finishing mill stage where plates, sheets, strips, tubes, bars, rails etc. are produced. Steel plants performing the operation of all the three stages are known as integrated steel plants. An integrated steel plant includes (i) coke ovens, (ii) blast furnaces, (iii) steel furnaces and (iv) rolling mills.



The history of Iron and steel industry is as old as human civilization. U.K. was first developed as the most dominating producer of iron & steel. Gradually, the production of U.S.A., Germany, USSR outplaced U.K. and they emerged as dominant iron and steel producing nations. After Second World War, Japan also joined in the fray. China and India are also making rapid strides to be leading producers of iron and steel.

World Review of Steel production—

Production of steel in the world after experiencing a recession in 1980s, recovered significantly in 1990s. Total production of crude steel increased from 724 million tonnes in 1992 to about 830 millions tonnes in 2001. China became the world's largest steel producer and continued to hold the position in 2001. Other leading producers are Japan, U.S.A., Russia and Germany.

Country	Crude Steel Production (million tonnes)							
	Production		Country	Production		Country	Production	
	1992	2001		1992	2001		1992	2001
1.China	80.94	141.39	4. Russia	67.03	57.53	7. Ukraine	41.76	33.11
2. Japan	98.13	102.86	5. Germany	39.71	44.80	8. India	18.12	27.29
3. USA	84.30	89.71	6. South Korea	28.05	43.85	WORLD	724.00	823.92

Source : International Iron and Steel Institute.

Iron and Steel Industry— CIS

In the post revolution period, the Soviet steel industry had achieved a remarkable expansion. From the early period of Stalin era, steel industry have experienced all-round government patronage. During the Second World War, however, the Soviet iron and steel industry were affected badly. However, within 1975, the country became the largest iron and steel producing nation in the world. Till now, the CIS has been able to maintain the performance in the same fashion.

The increase of the Soviet iron and steel output is indeed astonishing. In 1930, the output of pig iron was a mere 5 million tonnes, which went upto 10 million tonnes in 1934. From this period onwards, the Soviet steel industry had witnessed an unprecedented growth. The growth rate can be noticed from the table—

Annual Production (million tonnes)								
	1930	1936	1955	1965	1973	1983	1990	1996
IRON ORE	5	14	33	—	216.0	245.19	236.0	105
CRUDE STEEL	41	75	50	91.0	131.46	152.52	154.0	120

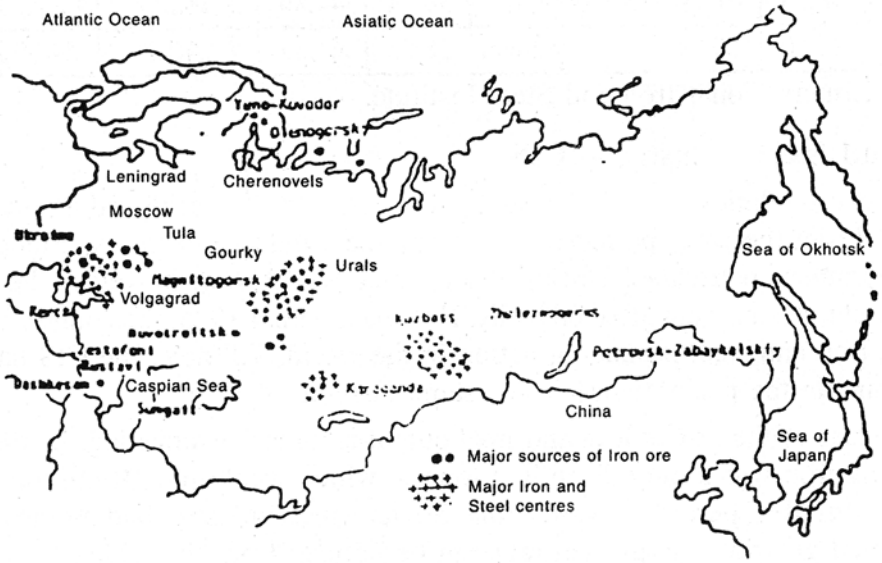
The consistent increase of iron and steel production enabled the country to retain the top position along the iron and steel producing countries. In 1996, the major constituents countries of CIS namely Russian Federation and Ukraine jointly produced 71 million tonnes of crude steel. Russian Federation and Ukraine produced 49 and 22 million tonnes of steel respectively and secured third and fourth position among steel producing countries.

Distribution

The industry first took its birth in Moscow region some 300 years back. After revolution subsequent exploration of new iron and coal deposits encouraged the decentralization of the industry to the remote areas.

The location of Soviet steel industries are mostly controlled by raw material availability. In fact, the total transport cost for raw material assemblage in this country is often so high, that this may be regarded uneconomic in any country other than socialist economy.

Iron and Steel Industry in the Former Soviet Union Industry



The major iron and steel producing countries are :

1. The South District,
2. The Ural Region
3. The Kuznetsk Basin
4. The Central District
5. The Other Centres,

1. The Southern district.— This is one of the oldest iron-steel producing centre in the CIS. The existence of Krivoy Rog iron ore and Donbas coal belts within the region gave the industry a tremendous fillip. The Yelenovke limestone, Nikopol manganese, and Kirch iron ore were considered as added advantage of the area.

The iron-steel districts of both the Krivoy Rog and Donbas had a symbolic relationship regarding raw material supply. According to the reciprocal relationship, Donbas coal is used in Krivoy Rog and after unloading coal, it collects Krivoy Rog iron ore for Donbas steel industry. Therefore, both the centres became mutually benefited and overall transport cost is reduced.

2&3. The Ural— Kuznetsk region— This region was primarily based on nearby iron ore deposits. It was one of the oldest iron-steel districts in the CIS. The real development of the Ural region, however, began after the introduction of 'combine' system with Kuznetsk. In fact, during the middle of 20th century, two giant plants were erected, one each at the Urals and Kuznetsk. The iron ore based plants of Magnitogorsk in Ural and coal based plants of Novo Kuznetsk in Kuznetsk basin became an instant success.

4. The Central district— The region is located around the capital city of Moscow. Perhaps this is the only market based iron and steel region in the CIS. The development of the Moscow-Tula industrial region forced the planners to set up iron and steel centres in this region.

5. The other regions— Besides these traditional centres, new iron and steel producing centres have developed around Kursk magnetic anomally, Electrostal, Cherepovets, Kolpin, Leningrad, Vertsilya, Liyapaya in the east and Yarmak, Kuzbass and Petrovsk-Zabaykalsky in the south central region.

Iron and Steel Industry—United States

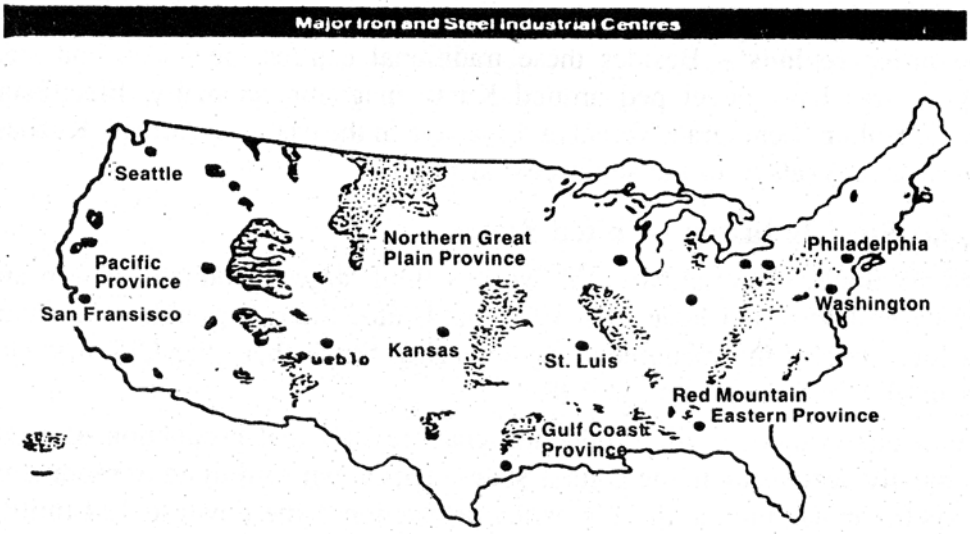
The United States of America is the world's third largest producer of iron and steel, next to the USSR and Japan. Till 1974, the United States was able to maintain its top postion among the manufacturing countries. Since then, the CIS first surpassed it in 1978 and then Japan in 1983.

A general observation on the production chart reveals that production of crude steel is gradually decreasing in the United States. This downward trend of production was first visible in the middle of 70's, when production came down to 124 million from 132 million between the periods 1973 to 1978.

However, keeping pace with production, the consumption volume in the country has also come down. In 1992, the total consumption of crude steel in the USA was 93.33 million tonnes or 13.7 per cent of the world total. Except the CIS no other country in the world consumes such a large amount of crude steel.

Trend of Crude Steel Production in the USA							
	1960	1967	1973	1978	1983	1992	1996
Crude Steel production (in million tonnes)	107.00	115.00	115.00	115.00	76.76	84.32	95
Crude Steel production (in million tonnes)	---	---	144.12	145.01	94.01	93.33	107

The set-back received by the US steel industry in recent decades was not very unexpected. According to US exports, the growing competition among the developing countries to capture international market, protection and subsidies introduced to safeguard their home market were the principal reasons for their unprecedented growth. On the other hand, because of historic reasons, the US steel industries have developed certain problems of their own. The unscientific Tittsburg plus policy' and the introduction of multiple basing point system restricted the spontaneous development of new industrial centres. The US steel industry, as a whole, suffered a lot in the absence of spontaneous growth.



Apart from these, most of the US plants are old, uneconomic and poorly managed. On the other hand, new entrants like Japan, using sophisticated, fuel and cost efficient production machinery largely reduced the cost of production. A strict vigil on quality and use of scrap as raw material largely helped the countries like Japan to achieve a tremendous success and curb the US monopoly on the iron and steel industry.

Distribution

After the construction of first iron and steel plant at Massachusetts in 1629, the US steel industry had undergone a sea-change through last 350 years or more and now placed in a cross road. It is not the distribution but the tendency of dispersal is of greater importance. The major iron and steel region in the USA may be classified as follows—

1. Youngstown-Wheeling-Johnstown iron and steel region
2. Lower Great Lakes region
3. Eastern region
4. South-East region
5. The Western region

1. Youngstown-Wheeling-Johnstown region— The region was once regarded as the world's iron-steel capital. At that time, Pittsburg iron-steel industry was unparalled in the world. The nearby Pittsburg coal and Lake Superior iron ore, wonderful transportation network and excellent marketing facilities favoured the growth of this region. This region attained success and fame, that even after the decline of this industry, to protect the industry, US Government introduced the infamous Tittsburg Plus' policy.

2. Lower Great Lakes region— Gradually, with the passage of time, Pittsburg lost its eminence as a steel centre. From the early period of 20th Century iron-steel industry in USA started shifting towards the southern part of Great Lakes. Besides Lake Erie, new steel centres developed at Buffalo, Erie, Cleaveland, Detroit and at Lorrin.

To serve the western and southern market, massive steel plants were developed in the Chicago-Gary district and at Duluth. The greatest advantage of this region is that it lies within the route of Lake Superior and Mesabi iron ore deposits and Appalachian coal. This break of bulk situation or advantage of loading-unloading enabled the region to get both iron ore and coal at a much cheaper rate. The good transportation system either by water through lakes or train was added advantage. Till recently, this industrial zone gown at a tremendous speed.

3. Atlantic Coastal region— Initially, iron steel industry developed here, around the iron ore mines of the Adirondacks, and Cornwall area. Though the iron ore deposits were exhausted very soon, the steel industry continued to grow. The nearby large market provided excellent opportunity to grow vigorously.

The most important steel centre in this region are the Maryland, Sparrows Point and Pennsylvania. Sparrows Point and Maryland are two old plants, initially developed for the nearness of the Virginia coal.

Entire steel industry collects coal from Pennsylvania and Virginia mines and iron ore from Lake Superior, Adirondacks and Cornwall areas.

4. The South-Eastern region— This region extends from the Virginia on the east to Albania on the south. From the early days of steel making, steel plants were developed around Kentucky, Virginia and Tennessee. This area, particularly the Albama-Birmingham concentration have proximity of both iron ore and limestone deposits of Red Mountain and extensive deposits of good quality coal situated within the region. Among these deposits, Warrior ore deposits in the Birmingham region is notable. The cheap, abundant labour also gives the region a distinct advantage over its competitors. However, lack of market is a problem to this industry.

5. The Western region— This region extends from Colorado in the interior to the California on the West. Among the steel region in the USA, this region is new one. Only after Second World War, for strategic reason, the government had set up steel mills. Later on, steel industries were developed Fontana in California and Provo in Utah. Initially, iron ore was collected from Wyoming and coal from Colorado.

The Government-owned steel cooperation constructed a steel plant at Geneva to manufacture machines for military purpose.

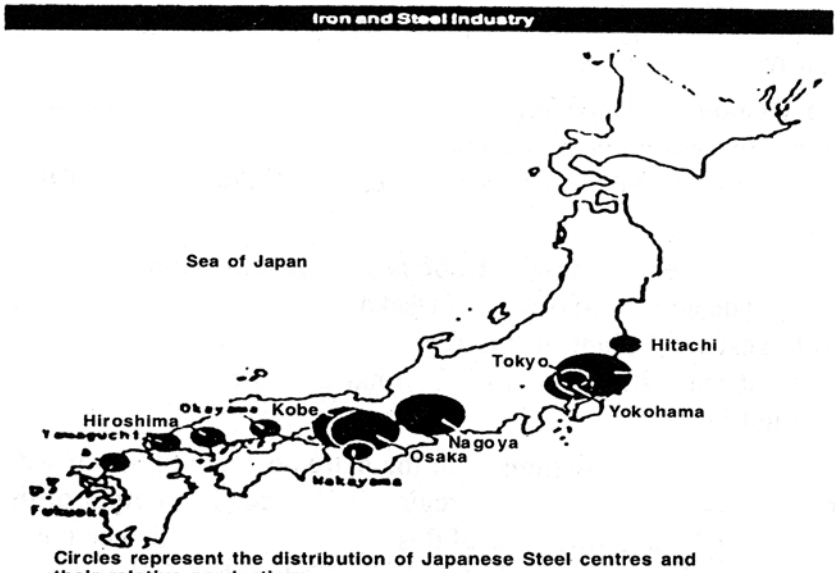
The plants situated at California collects coal from Sunny side in Utah and iron ore from single Mountain.

Iron and Steel Industry—Japan

The steel industry in Japan had witnessed a complete metamorphosis in its not too long history. Like all other industries, the iron and steel industry was also devastated completely by Second World War. But, from the complete destruction, soon it was revived and touched the pre-war levels of production. The growth rate increased in such a pace that, within a few years, it surpassed the production of Great Britain, Germany and France. This tremendous increase of steel production was made possible by the complete reformation of the industrial set-up.

Without having any of the required raw materials, the growth and expansion of Japanese Steel Industry is indeed a perplexing phenomenon. Compared to any other country, the per capita steel production in Japan is the highest in the world. Almost all of the Japanese steel manufacturing units are very large as well as integrated. Japan is having some of the highest steel producing units in the world, each producing more steel than the combined output of even some developed countries.

The beginning of the iron and steel industry in Japan dates back to the middle of 18th Century. The Sino-Japanese War and heavy military demands of the Second World War came as a blessing to the Japanese steel industry. To meet the growing demand from foreign countries, as well as in the home, the iron and steel industry in Japan had undergone a complete modernization and rapid expansion programmes. In this period, manufacturers started using scrap as a raw material. The iron ore was obtained-from China, Australia and India at a much cheaper rate. Just before the on-set of Second World War, production recorded a new high of 8 million tonnes.



Circles represent the distribution of Japanese Steel centres and their relative productions

Second World War completely devastated the Japanese iron and steel industries. In the subsequent years, rapid recovery from war devastation was the priority of Japanese industry. The period between 1950-1970, Japanese industry was able to double its production. The overall industrial boom in the country and latest technology adopted in the steel manufacturing process, made Japan one of the leading steel producing country in the world.

The hard working labour force, national pride of the Japanese people, cost reduction in the manufacturing process and ready market in the third world countries helped Japan to secure an enviable position among the world's steel manufacturing circles.

Distribution of Iron and Steel Industries in Japan

The spatial distribution of Japanese steel producing centres may be sub divided into six principal regions. These are :

1. Tokyo-Yakohoma Area
2. Nagoa Region
3. Osaka-Kobe Region
4. Fukuoka-Yamaguchi Region
5. Oka-Yamaha Region
6. Hokkaido Region.

1. The Tokyo-Yokohoma Region— Tokyo, the centre of politics, culture, economy, transportation and all other aspects of Japan, naturally attracted large iron and steel industries within its fold. Hitachi is another industrial area around. Tokai also provided all facilities to the iron and steel industries at the beginning. The reclamation of

Tokyo Bay provided large extensive plane land for steel manufacturing units. The Tokyo-Chiba region grew very fast as a major iron and steel centre.

2. Nagoa Region— Nagoa region is now popularly known as the 'Detroit' of Japan. This region had witnessed a massive growth of industries within the period 1950-1960. At present, this region contributes nearly 20 per cent of the total value of shipments.

3. Osaka-Kobe Region— Osaka-Kobe is another large agglomeration of iron and steel industries. The combined output of Osaka and Kobe surpassed all other region's output. The largest steel plant in this region is located in the South-East of Osaka, at Wakayama. At least 70 per cent of the total output of this region is exported to the foreign countries.

4. Fukuoka-Yamaguchi Region— In the extreme south of Japan within Kyushu and western most end of Honshu, this region is located. The output of this region is not very large, though the growth rate of this region is very high. The initial advantage of this industry was the nearness of Chikulo coalfields. The Dokai bay situated very near, provided easy water transportation to import the iron ore from China and export of the products to the foreign countries.

5. Oka-Yamaha Region— Oka-Yamaha steel centre is one of the newest steel centres in Japan, situated in between Osaka-Kobe and Hiroshima. Though the present production is not very large, introduction of latest technology and government incentives made this industrial region one of the most up-coming steel producing centres in Japan.

6. Hokkaido Region— Hokkaido, which is not very famous for industrial developments, possesses the single iron and steel producing centre near Muroran. The coal fields of Ishikari, Kushiro and Romai initially attracted the entrepreneurs to set up iron and steel industry at Muroran. The fluxing material and manganese are collected from Kamino-Kuni region of Hokkaido.

The total Japanese production of crude steel in 1992 was 98.13 million tonnes, while consumption of steel in that period was 99.15 million tonnes. In production, Japan secures first position in the world, while in consumption it ranks second, next to CIS.

Iron and Steel Industry - China

The People's Republic of China is the largest producer of iron and crude steel. The country is now producing more steel than Japan and United States. Regarding consumption China secures third position in the world, next to the Japan and United States of America. In 1996, China produced 100 million tonnes of crude steel. However, in that year, total consumption of steel was lower i.e. 71.0 million tonnes.

Since 1973, growth of steel production in China was spectacular, within a span of 15 years China was able to increase its production of crude steel to 217 per cent. In that period consumption increased 300 per cent. This growth rate clearly reveals the rapid peace of industrialization that is now going on in China.

Trend of Crude Steel Production in the China
[Production in million tonnes]

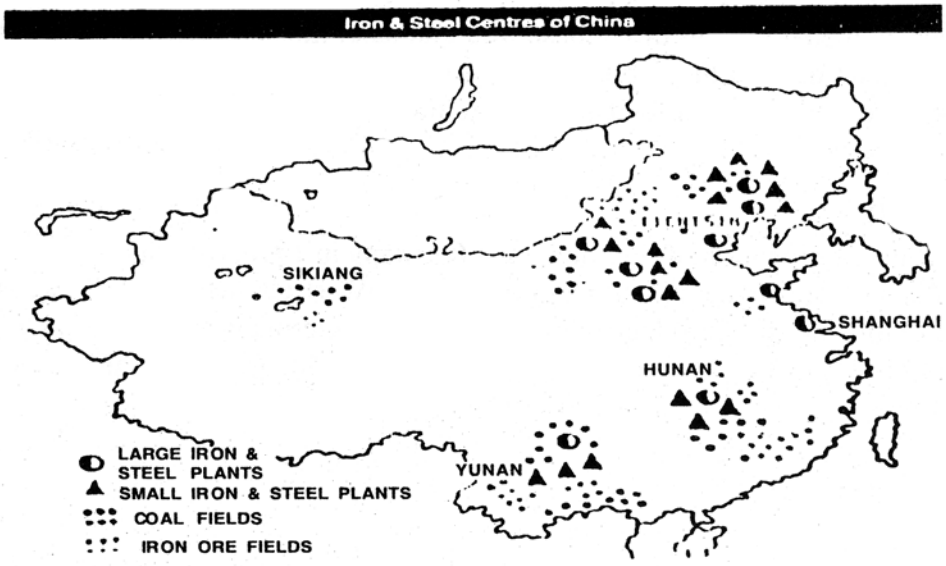
	1960	1967	1973	1978	1983	1992	1996
Crude Steel production	18.5	17.0	27.26	31.78	39.95	80.0	100
Crude Steel production	-	-	25.08	42.51	51.91	71.04	95

Source : US Bureau of Mines

Development

The history of iron and steel making in China is very old. The initial development basically of cottage industry level. The indigenous technique of fabrication was highly developed. The scale of production was not very significant.

The modern blast furnace was erected in China only in 1890. In the first half of the 20th century, the political turmoil and repeated foreign aggression hindered the growth of small scale steel furnaces. However, in this period, the Japanese established their control over Manchuria. To consolidate their economic position Japanese people started the construction of modern steel plants over Manchuria. These plants were short-lived. After Second World War due to dearth of capital and raw materials, most of the factories were closed.



Distribution

The iron-steel centres in China are located in three separate regions. These are :

1. Southern Manchuria
2. Northern China
3. Yangtze Valley.

1. Southern Manchuria— This is the oldest steel producing area in China. The oldest steel plant is located at Anshan. This plant, which was destroyed by the Russians and Chinese Communists, was later revamped. The plant was first designed by Japanese colonialists. Considering the location of raw materials, this plant is ideally situated. Coal is supplied from Fushan coal deposits and iron ore and limestone is obtained locally. During the initial period, this iron-steel plant was regarded as the largest steel plant in China, though at present production is not very satisfactory. Old and obsolete machines and back-dated technology are the major problems of this steel plant.

2. Northern China— Northern China iron and steel producing region stretches from Paotow to Shantung. Large steel plant are located at Shantung, Beijing and Shensi. Coal is obtained from Yangku, iron ore is available in the vicinity. Two large steel plants came into functioning one each near Anyang and Yellow river valley.

3. Yangtze Valley— Of late, this region became the undisputed leader of iron and steel production. This region stretches from Sanghi to Chungking. The major iron and steel plants are located at Chungking, Wuhan and Sanghi. Coal is obtained in the south of Nan-Chang and Chungking. Several hydro-electricity plants in the region provide energy to the plants. The extensive deposits of iron ore in southern Yangtze river provides uninterrupted supply. Most of the plants in this region are integrated.

The phenomenal growth of Chinese iron and steel industry after 1970 enable the country to meet most of the domestic consumption. Considering the large reserves of iron ore, coal and domestic demand, the future of Chinese iron and steel industry "Seems to be very bright.

Germany

After the re-unification of East and West Germany in 1990, the country is now one of the major steel producing nations in the world. West Germany was, however, all along a dominant steel producing nation. In 1996, Germany produced 42 million tonnes of crude steel and secured fifth place in the world. The production of steel in this part was very consistent. In 1978, it was fourth largest producer of crude steel.

Trend of Crude Steel Production and Consumption - Germany [In million tonnes]							
	1940	1953*	1975*	1980*	1985*	1992	1996
Crude Steel production	20	13	46.89	51.15	48.35	39.77	42
Crude Steel production	-	-	25.08	42.51	51.91	71.04	95

Source : US Bureau of Mines, World Bureau of Metal Statistics (UK)
* Data are for West Germany

Germany., as a whole, is rich in reserve. The vast coal deposits of Ruhr valley and upper Silesia and enormous iron ore deposits of Lahnsieg, Ergburg provided excellent opportunities to develop iron-steel industry in the early period. Though the quality of iron ores is of inferior grade, coal deposits are very superior in quality. Apart from domestic iron ore, the country had every opportunity to import coal from neighbouring countries. Before the out break of the Second World War, German steel production went up to 20 million tonnes. The large-scale import of pig iron enabled the country to expand its steel industry very rapidly.

Most of the German steel output comes from the Great Ruhr industrial area. The extensive deposits of good quality coal within the region, presence of Ergberg and Lahn-Sieg iron ore and excellent import facilities through good transportation network helped immensely for the rapid growth of Ruhr iron and steel industry.

France

France maintains a key role in the production of iron and steel. In 1996, France was able to produce crude steel of 18 million tonnes. Since 1973, production of steel is gradually decreasing in France, because of the declining demand of crude steel in modern manufacturing industries.

Trend of Crude Steel Production and Consumption [In million tonnes]									
	1913	1929	1950	1960	1973	1978	1983	1990	1996
Crude Steel production	2.30	6.5	5.8	12.2	25.26	22.84	17.62	19.02	18
Crude Steel production	-	-	-	-	19.31	16.00	14.00	17.56	17

Source : US Bureau of Mines. World Bureau of Metal Statistics, World Resources -1998-99,

The large and very good quality Lorraine iron ore and imported coal from adjacent Ruhr basin of Germany prompted rapid development of iron and steel industry in France. At least three regions emerged as major iron and steel producing districts. These are :

1. The Lorraine Region.
2. The Denain-Anzin Region
3. The Central France Region

The Lorraine iron-steel region contributes most of the product. Here, Minette ore deposits are of very good quality. Coal is also obtained from nearby Moselle area. Though most of the coal is to be imported from neighbouring countries. The reduction of coal requirement in modern techniques adopted by the plants enabled the region to grow at a faster rate in the middle of the century. The major plants are located around Rombas, Knutange and Moselle.

Great Britain

Great Britain was the pioneer country in steel making. For centuries, the country achieved such a fame that at one time it alone contributed half of world's iron and steel production. The country is now not able to retain herself within the list of top ten iron and steel producing nations in the world, though it secures 10th place in the world regarding consumption.

Since 80's, the production of United Kingdom fell short of 15 million tonnes. Its consumption, however, is greater than 15 million tonnes. The country is now deficient in iron and steel production. In 1996, the country produced only 17 million tonnes of crude steel and consumed 17.5 million tonnes.

During the early period of growth the industry used charcoal as fuel, but after the middle of 18th century the discovery of good quality coking coal helped to raise the production level. Within middle of 19th century the iron and steel industry in the country developed so much that output of the industry equaled three-fourths of world production. The industrial revolution and subsequent inventions of different new steel producing techniques, enabled the country to raise its production rapidly. At the end of 19th century, though production of Britain gradually increased but the relative share of its production to the world's share declined considerably, mainly because of the rapid growth of production in other countries particularly USA, Germany, Japan. The production of USA exceeded Britain in the year 1890. By 1935 the country became fourth, lagging behind to USA, Germany and CIS.

Though most of the old plants are now not in the production. The original distribution of Great Britain were as follows :

1. Northern Region - (a) North-East Coast, (b) North-West Coast, (c) Scottish Low-land.

2. Eastern Region - (a) Northumberland-Durham, (b) East Midland, (c) North Lincolnshire.
3. Western Region - (a) Cumberland, 9b) Lancashire, (c) West Midland.
4. Southern Region - (a) South Wales.

At present, most of the old, worn out manufacturing units are closed and only twenty five odd units are producing steel. The largest among them is British Steel Corporation.

The depletion of the British coal and iron-ore deposits forced the industries to migrate near coastal regions. The continuous mining through several centuries exhausted the deposit and cost of mining also increased substantially. Now British coal and ores are costlier than imported ore. The major steel plants are located in Glasgow, Teesside in the North-West Hartlepool and Consett in the north-east. South Yorkshire, South Lancashire, Stanton Starely Corby and West Midland in the central region and South Wales, Port Talbot in the south-west and London in the south-east.

Italy

Italy is a consistent producer of iron and steel. In 1988, the country secured seventh position in the production of crude steel. Since 1973, there has been a consistent output in Italy. The country is entirely deficient in raw materials like coal and iron ore. Almost entire industry is dependent on the imported iron and coals. As a late-starter, Italy got the advantage of high technology. Most of the mills use electric furnace and basic oxygen process. Half of the Italian output is contributed by a giant public sector company.

Italian iron and steel industry is currently dependent on imported iron ore. The country imports iron ore from Sweden, Brazil and Australia. Nowadays most of the steel is produced from scraps. Formerly coal had to be imported from UK and Germany; now cheap hydel power substituted coal. The major industries are mostly located along the coast. Important industries are situated at Naples, Genoa, Aosta and Trieste.

Trend of Crude Steel Production and Consumption
[In million tonnes]

	1973	1978	1983	1986	1992	1996
Crude Steel production	20.99	24.28	21.67	22.9	24.9	28
Crude Steel production	23.65	19.60	18.82	20.5	26.59	27

Source : US Bureau of Mines, World Bureau of Metal Statistics, World Resources 1992-93

Other countries

Europe— The other major European steel producing nations are Poland, Belgium, Luxemburg, Spain, Holland, Sweden etc.

Poland— Poland is the 15th largest iron and steel producing country in the world. Poland is a surplus producing country. The vast Silesian coal help Poland to build up a massive steel plant near Nova-Huta and Krakow. The country is deficient in iron ore. It has to import iron ore from CIS and Sweden.

Czechoslovakia— Iron and steel industry is moderately developed in this country. The greatest steel plant in the country is Skoda steel plant.

Sweden— Sweden is very rich in her iron (ore reserve. Energy is obtained from cheap Hydel-power. Swedish steel is of very high quality. The best quality steels are generally exported. This country is not self-sufficient in ordinary steel production.

Holland— This country is deficient in both iron ore and coal. As most of the steel plants are new, productivity rate is very high. The country has to import large amount of steel for domestic consumption.

Belgium and Luxemburg— The reciprocal relationship or symbiotic system of transportation of Luxemburg ore and Belgium coal helped both the countries mutually. The combined production of the two country exceeded 15 million tonnes of steel in 1990.

AUSTRALIA— Australia is very rich in coal deposits. Most of the steel plants are new in Australia. So, the productivity is very high. The important steel plants are New Castle and Part Keembfa.

ASIA— Apart from Japan, China and India the other countries are not very developed in steel production.

SOUTH AMERICA— In South America, the major steel producing countries are Brazil, Argentina, China, Uruguay and Venezuela.

Trend of Production and Consumption of Crude Steel in Major Producing Countries

Countries	Production (in million tonnes)					Consumption (in million tonnes)				
	1973	1980	1985	1990	1996	1973	1980	1985	1990	1996
China	_	37.12	46.72	66.1	101	—	43	71.5	68.4	74
Japan	119.3	111.4	105.3	110.34	99	78.98	79	73.4	99	99
U.S.A	136.8	101.5	80.07	89.73	96	144.12	114.43	105.6	105.4	106
Russian Federation	131.5	244.7	247.7	236.0	49	137.5	197.8	203.8	199.7	×
Germany	49.5	51.15	48.35	43.9	42	35	44.6	40	40	41
Korea Republic	1.16.	86	13.6	23.1	39	3.26	6.1	11.3	21.5	27

Countries	Production (in million tonnes)					Consumption (in million tonnes)				
	1973	1980	1985	1990	1996	1973	1980	1985	1990	1996
Italy	21	23	24	23	28	24	27	22	28.5	27
Brazil	7.2	15.4	20.5	20.6	26	×	×	×	×	V
France	---	---	---	---	18	---	20	15	18	17
U.K.	---	---	---	---	17	---	16	14	17	15
India	---	10.4	12.2	15.3	14.6	---	10.8	14.4	21.7	24

* Data before 1996 refer to U.S.S.R.
Source - World Resource - 1996-1997, 1998-1999, U.N.M.B.S.

Trend of Crude Steel Production—Brazil [In million tonnes]					
	1973	1978	1983	1992	1996
Crude Steel production	7.15	12.11	14.66	24.0	25

Source : US Bureau of Mines, World Bureau of Metal Statistics, World Resources 1992-93

Brazil — The development of the production of steel in Brazil is spectacular. The consumption of steel within the country is very low. Therefore, Brazil is able to export bulk of her steel production. Most of the steel industries are located around Sao-Paulo and Curumba. Brazil possesses vast amount of iron ore. The largest of these deposit is located near Minas-Geraes. Most of the mills obtain energy from hydel power plants.

NORTH AMERICA— Apart from United States, Canada and Mexico are two other noteworthy steel producing nations in North America.

Canada— The Canadian steel industry is not very old. Most of the iron and steel centres are developed around Lake Ontario, Sydney, Nova Scotia. Canada is self-sufficient in the production of iron ore and coal. Most of the coal reserves are located with Nova Scotia and iron ores are located around Sydney. Apart from that, steady supply of iron ore and coal from adjacent USA enable Canada to develop a large steel industry. Some of the major steel plants are, Hamilton, Sault Ste, Ontario, Sydney, etc.

Mexico— Mexican steel industry is as old as American steel industry. The largest steel platn is located at Mouterrey. The others are Monclova, Coahuila, Piebras

Negras, and Colima. The Coal is obtained from Salivas area and iron ores from Durango.

AFRICA— Africa contributes insignificant amount of iron and steel. The largest producer in Africa in South Africa. The major producing centres are located at Transvaal and New Castle.

Present Production Trends

During last two decades the total steel output of the world increased considerably. There was a big production slump in 1983 when the production came down to 662.79 million tonnes and again registered a sharp increase and the production in 1988 became 721.32 million tonnes. The top ten producing countries namely, CIS, Ukraine, Japan, USA, China, Germany, Brazil, Italy, France, Republic of Korea, and Poland constituted bulk of the production. In 1973, the countries produced 76.4% of the total production which was slightly decreased to 73.06% in 1983, and again marginally dropped to 71% in 1996. So, it can be said that production of iron and steel is largely concentrated in some selected countries.

Though there has been steady increase of world production in the volume of iron and steel production, the production of crude steel in traditional countries like USA, Japan, Italy, Germany is gradually decreasing. Iron and steel industry is no longer considered the mainstay of the industrial economy. The use of scrap as raw material largely reduced the requirement of pig iron production. The technology oriented industries like automobiles, computers require very low amount of fresh steel. In developed countries of Western Europe and USA, the traditional industries suffered massive set-back. So, output of steel also declined, keeping pace with decreasing market.

The Third World countries, meanwhile, are advancing rapidly in the production of crude steel. Asian countries like South Korea, India and Brazil of South America are rapidly expanding their iron and steel industry.

International Trade

USA is the traditional iron and steel exporting country. The other exporters are Japan, Germany, Netherlands, Italy, Belgium and Luxemburg. At present, Japan is the largest exporter of steel followed by Germany, France, Belgium, Luxemburg, Netherlands, South Korea, Italy, USA and Taiwan. These countries export more than 80 per cent of the international export.

3.7 TEXTILE INDUSTRIES

Textile industries mostly produce articles of cloth ing using variety of raw materials like cotton, jute, flax, hemp, wool, silk etc. Besides, there are synthetic fibres derived from wood pulp, cotton linters etc. The important branches of textile industries are :

1) The cotton textile industry
2) The woollen textile industry
3) The artificial fibre or rayon industry

The Cotton Textile Industry :

It is one of the oldest industries of the world. The real development of this industry started in the 18th century after a series of British inventions such as Hargreaves' spinning jenny, Crompton's mule, Cartwrighfs powerloom and subsequent inventions of steam engine and cotton gin. These inventions led to a rapid growth of cotton mills industry in U.K. Subsequently it spread to other countries and today the industry is most widespread throughout the world. Almost every country in the world is now engaged in the manufacture of textile products.

The cotton textile industry is a labour-intensive agro-based industry. Though the requirement of labour is entirely dependent on the technological advancement of the country, compared to other industries, labour involvement is very high. The cotton textile industry involves processes like (i) ginning (ii) carding (iii) spinning, (iv) weaving and (v) dyeing and bleaching. The process of ginning separates seed from the fibre. By carding the fibres are made parallel to each other. Spinning Yields the yarn and weaving yields the cloth. When a single cotton mill does all the operations, it is called a composite mill. Otherwise there may be mills specialized with one or two of these functions.

Location of the Industry

Any unplanned industrial concentration, in its advanced stages, has to face several socio-economic disadvantages. A scientific and planned location is only able to maximize profit by minimizing the cost Cotton textile industry is no exception. To reduce the total expenditure of production and marketing, and sustainable growth in future, the industry has to find out the least cost location. Like other manufacturing industries, the cost of labour, market and transport plays pivotal role in the selection of industrial location.

According to Weberian terminology, cotton as a raw material is pure in nature. It has been estimated that weight loss of raw cotton during manufacture is negligible. For example, one tonne raw cotton produces one tonne of yarn. This amount of yarn

also produces one tonne of cloth. As there is no weight loss of raw material in the manufacturing process, according to Weberian hypothesis, raw material cannot exert significant influence on the locational pattern.

In this case, cotton textile industry may be located either in market, raw material or in any intermediate location. Whatever be the location, transport cost would not change.

As transport cost is unable to exert any considerable pull, the other factors like wage rate of labour, market facilities, availability of raw material, climate, power and agglomeration of industries determine the location.

The general trend of the location of textile industry reveals that three types of location are preferred by the entrepreneurs. These are :

1. The textile centres located within market.
2. The textile centres located within raw material source.
3. The textile centres developed between those two regions.

According to least cost location concept, the market location should be most preferred. If power and cheap labours are available within market, the production cost will be minimum. The market situated within cotton producing area will, of course, be most lucrative location. However, this is a rare combination. Bombay, Ahmedabad in India, Shanghai in China, Tashkent in CIS and Atlanta in USA represent this type of location.

Formerly, climate used to play dominant role in the location of cotton textile industry. Most of the industries in last centuries were developed in regions of mild and humid climate. In dry regions, breakage of thread was the major obstacle for both weaving and spinning. The classical example of climate guided locations were in Bombay in India and New England in USA.

Textile goods, particularly demand of clothings, are always fashion-guided. In most of the cases, textile goods are conspicuous in nature. With the passage of time, fashion of the society and taste of the consumer changes markedly. To keep pace with the changing fashion and to be aware of the modified taste of consumer textile mills, which produce clothings, set up their units near the market. For example, in its early growth, US textile mills were established in New England, i.e., vicinity of the. market; though the bulk of the cotton were produced in the southern states. Since Tsarist period, cotton is largely grown in the Asiatic CIS but textile mills were primarily concentrated in its European counterpart, mostly in the Moscow-Tula and Ukraine market region.

So, regarding the localization of cotton, the factors are complex. The factors of localization varies spatially. Even the social and economic conditions of the region controls the site selectlion. The reasons are also very dynamic in nature. Unlike other

industries, locational factors are also not static. In fact from time to time, locational pattern changes, For example, the New England State in USA is no longer an ideal location for the growth of the industry. It has lost much of its earlier advantages. The industry has been shifted towards the cotton growing areas of southern USA. In Russia, a migratory trend of textile mills towards the Astatic cotton growing tracts has been visible. In India, for instance, the Bombay-Ahmedabad textile centres be also loosing their previous significance and new centres are being set up around the local markets.

A historical analysis of the locational pattern reveals that, at its earlier period of growth textile mills were developed towards raw material source, because at that time transportations system was ill developed. Away from the cotton growing region, availability of raw cotton was also very low. Naturally, due to higher demand, prices of raw cotton was high at the distant places. But in its second phase of development, rapid progress of transportation system facilitated easy accessibility within the region. At that time, price of raw cotton became same both near the raw material source and the market. Naturally, market became favourite for plant location. The importance of raw material gradually lost its previous importance.

The importance of power in the localization of cotton textile industry cannot be under-estimated. At initial period of development, textile industries were mostly located adjacent to water source. But with the introduction of coal, water site was no longer important.

At that time, wage rate of the labours was very low. The wage rate of the labour was an important consideration for the location. A slight hike of the wage rate made a lot of difference between one place and another. For example, New England textile centres in USA shifted towards Piedmont because of prevailing wage rate._

In some cases, specialization in a particular product and the general quality of the product helped a lot to a sustain development. In these case textile industry thrive for export market. The development of Lancashire region in England and Tokyo-Yokohama in Japan depended heavily on foreign market.

The Recent Trend in Localization

The recent trends in the development of textile industries are distinctly different in developed countries like USA, Japan, UK, and developing and underdeveloped nations like China, India, Bangladesh etc. But the general observations revealed that the basic trends in location of textile and apparel industry is diffusion.

In highly developed countries of Western Europe, Japan and USA, production of traditional goods is no longer important. These countries now concentrate on the production of quality goods rather than coarse fibre production. The import of "primary" products from underdeveloped countries are cheaper to produce it within

the countries. These imported goods are treated as raw materials and used for quality production. The technical know-how of the developed countries are cheaper to produce it within the countries. These imported goods are treated as raw materials and used for quality production. The technical know-how of the developed countries are now acting as their capital. The restricted technology creates an advantage to the advanced nations. So, the role of underdeveloped countries are now considered to be a mere raw material supplier.

The automation and high wage rate of the labour forced the countries to adopt a capital intensive manufacturing activity, rather the former labour intensive activity.

But, compared to the other manufacturing activities, cotton textile still require comparatively low amount of capital. The traditional top-ranking nations in cotton textile industries, like USA and Japan, are now facing steep competition from the emerging countries like Taiwan and South Korea.

To resist the invasion of foreign products, textile industry is becoming more and more knowledge intensive. Least cost factor also plays a dominant role. The innovations of synthetic fibres are posing major problems for the growth of textile industry. To face this steep competition, improved variety of looms like shuttle less loom and air-jet looms were introduced for higher production. The omnipresent market of cotton textile industries throughout the world is, perhaps, responsible for the dispersed or diffused nature of cotton textile industry.

Distribution United States

The United States of America is one of the front-runners among the textile manufacturing countries. The country maintained her lead position in textile production.

The first cotton mill was established with Rhode Island in 1790. Since then, numerous industries were set up in the USA.

The development of the US textile industry had gone through two distinct phases. The first phase of development had experienced the ascendancy of New England areas as a seat of cotton textile industry and the second phase was the tragic downfall of New England and rise of the southern states as textile producer.

Development during first phase :

In the late 18th century, New England and adjacent areas were developed at a very rapid pace. The areas bounded by the Merrimac river and Fall river grew at a faster pace. The adjacent areas of the Massachusetts, Providence attracted a large number of cotton mills within its territory.

Several factors proved advantageous for this massive growth of New England at that period. These were :

1. Development of water power from small, turbulent streams.

2. The skilled labourers were available in the vicinity. They had the traditional expertise of spinning and weaving. The local inhabitants collected and gained the knowledge from the emigrants of Great Britain.
3. The facilities of export and import of materials through the ports of Boston and Providence.
4. The humid climate of New England. The climate of New England was most suitable for spinning.
5. Large financial help from the local urban tycoons.
6. Cheap female worker from the surrounding regions.

Despite all these advantages, New England region gradually lost all of its glory. The industry started shifting from this region to the southern part of the country.

The cotton was then largely imported from the southern cotton growing districts. In south the absence of the advantages enjoyed by New England was liable for the poor growth of textile industry. But the supremacy of the New England area did not last long. The initial advantages of low price of land, cheap lahour and port advantages lost their significance with the passage to time. The machines became obsolete, cost-benefit ratio became unfavourable due to low productivity, the increasing rent of the land, high wage rate, housing problem switch over to electric power from traditional water power and above all dearth of raw material supply posed obstacles to the New England textile mills. These mills became obsolete.

From the very early periods, the southern Piedmont planes of Georgia, Florida, Carolina, Albania, Virginia, Tennessee and Kentucky were the producers of most of raw cotton in the country. To ensure the steady supply, textile mills gradually shifted towards cotton-growing regions. The major reasons for migration of the textile mills to the southern states are as follows :

1. Easy access to abundant raw cotton within reach.
2. Relative advantage of transport facilities, due to proximity and assured availability.
3. Relative advantage of labour cost played a vital role in the development of the southern textile mills. The surplus agricultural labours were absorbed in the industry at a much cheaper rate than New England.
4. Development of electric power in the southern states also played a vital role in shifting the industry.
5. The new textile mills in the south adopted latest technology and sophisticated machines for the production. Therefore, quality of the product was superior than the new England counterpart.
6. The low trade union activity.

At present, the southern textile centres have a distinct superiority in the textile production. The textile plants in the Georgia and both the Carolinas are dominating the U.S. textile industry.

Present position :

In spite of the overall growth of the US industry, in recent years it is facing keen competition from the upcoming textile producing countries like Japan, Taiwan, Korea and India. The low production cost gives these countries distinct advantage over the US textile industry.

CIS :

The first textile plant in the former Soviet Union was established in Ivanovo, near Moscow. Since then, the industry has undergone a sea-change in production.

After the downfall of Tsarist period, sound policy of Communist regime, large domestic market and excellent productivity rate per worker enabled the country to increase the existing capacity many more times. The decentralization policy of the new rulers forced the industry to disperse in the interior region from its former Moscow-Tula-Ivanovo-Oblast location.

The increased cotton production in the Ukraine, Caucasus, Kazakh Upland and Crimea attracted number of industries. The old industries were modernized and uneconomic plants were closed down. The age-old Moscow-Tula textile centres started" to produce quality goods instead of large-scale production. New centres have developed near Taskent, Stalinabad, Askabad, Kirovabad and Georgia. At present, there are 13 million looms working in the CIS with an annual production of more than 8,000 million square metre cloths.

Japan :

Prior to the industrial boom after Second world War, cotton textile industry was the fore runner among the various industries. Despite the loss of relative importance, textile industry still constitute more than 12 per cent of the value of total industrial production of Japan, Japanese textile producing centres are very small. Most of the yarn production comes from innumerable small centres, scattered all over the country.

The beginning of textile industry in Japan dates back to 1876, when the first textile mill took its birth in the vicinity of S. Kyushu. Till the outbreak of Second World War, Japanese textile industry grew at a much faster rate. During the initial period, Chinese yarn market imported bulk of the Japanese product.

After Sino-Japanese ware and two subsequent World Wars, Japan lost much of her Chinese yarn trade. Due to shrinkage of international demand of Japanese textile

product, the industry had no other options left but to look towards home market. Due to massive industrialization in Japan, purchasing power of the people decreased considerably. Gradually Japanese textile industry became more and more dependent on national market. Due to rise of workers, wage rate, high production cost, average price of Japanese textile products have gone up and Japan concentrated more on the manufacturing of quality products.

Japan has to import almost all of the raw materials needed in textile industry. The pioneer attempts to set up industries were made around cotton growing tracts of Nobi and Kante regions. Now the major textile centres are located at Chukyo, Hanshin, Toyama, Kyushu and Keihin and also at Osaka and Nagoya.

Spatially, majority of the cotton mills are located within the northern half of Japan. The bulk of the textile goods are produced in following regions : (1) The Kwanto Plain, (2) Nagowa, (3) The Kinki Plain, and (4) Along the Northern Coast.

After the complete destruction of the industry during Second World War, it took only fifteen years for complete revival of the industry. In fact, within 1960, the textile export increased in such a rate that Japan itself was forced to curb the export. As the industry became more and more export-oriented, textile establishment gradually shifted towards coasts. At the beginning of the decade of 1990s, old obsolete mills closed down their productions. The new mills with updated machineries- came into the same. Most of the Japanese textile mills are now using the latest technologies. Soon, Japan became the exporter of not only textile products but also textile machines.

China

This is one of the oldest type of manufacturing industry in China. It provides employment to a large section of working force. Since very old days, weaving and spinning was normal practice of village weavers. Most of the output was contributed by cottage industries. The over-all development of cotton textile industry in China is indeed a recent phenomena. Till the end of Second World War, production of textile goods in China were insignificant and China was considered as the largest single textile market in the world. After the take over of Communists, proper efforts were taken to develop national textile industry.

Distribution

The textile mills are distributed throughout China. The dominant centers are Shanghai, Manchuria, Tienshan, Beijing, Chuang, Nanchang and Lanchow.

Shanghai is the oldest centre. At its initial stage of development, foreign capital, technology and management were responsible for the growth.

The Manchuria textile unit were mostly developed by the colonial Japanese. During Second World War and Communist Movement, most of these mills were destroyed.

During Five Year Plan period, stress was given for the development of smaller units. Several units were developed within Yangtze river valley. At present, more than 55 per cent of the mills are concentrated within the rectangle formed by Tientsin, Shantung, Shanghai and Kaiteng. In the southern Hwangho river valley, Honanfu is the major textile centre, when quality goods are produced. In the Yangtze river valley, textile mills are concentrated within Chungking and Hankow. The Beij ing-Hankow industrial conurbation including the smaller towns of Paoting, Singta, Chengchow, emerged as leading textile centres.

Of course, among all the textile-producing centres, Shanghai was most important. At second stage, this region produced more than 70 per cent of the Chinese textile production. The emergence of different textile centres lowered the relative importance of Shanghai, but it still maintains dominating role in textile industry. The adjacent Hankow region now produces huge amount of textile products. The Wushan integrated textile plants contribute significant amount of cotton products.

The Cotton textile units were set up very recently. As the plants are modern, output of textile goods per worker is very high in this region.

The United Kingdom

The Industrial Revolution in the 18th century gave the impetus to the development of cotton textile industry in Great Britain. The subsequent invention of spinning machines encouraged the growth. The humid climate and local skilled labour helped a lot during the initial period of development. The cotton textile industry in the United Kingdom attained such a high fame that at end of 19th century the country became the undisputed leader of the cotton textile industry. The early centres were developed around Scottish lowlands, Nottingham Ireland and Lancashire. Gradually, several factors were responsible for the development of Lancashire in its early phase. The factors were :

1. The optimum climatic condition of Lancashire with mild humid climate.
2. Skilled local labours and cheaper wage rate.
3. Abundant water resource in the proximity and the softness of water.
4. Presence of coal within Pennine hill range.
5. Low development of other industries.
6. Cheap price of the land.
7. Undulating rolling plain land and low development of agriculture.

All these factors helped immensely for the early growth of textiles in Lancashire region. Lancashire region alone contributed 50 per cent of the World's production till First World War. Since then, the relative position of Lancashire textile industry decreased considerably. The overall decrease of consumption of cotton goods in UK, loss of overseas market and emergence of new textile-producing nations like China,

Japan, India and worn out condition of the mills were the principal reasons for the large-scale decline of Lancashire cotton industry.

The growing trade union activities, low productivity of the labour, outdated machines and use of substitute materials gave several blow to Lancashire industry.

Since Second World War, the industry was able to revive some of its lost ground though the early dominance was gone for ever.

Germany

Germany is one of the leading producers of cotton textile. It is the seventh largest producer of textile goods. The history of cotton textile industry in Germany is quite old. Initially, the industry was set up depending upon imported cotton. Most of the industries were developed along the Rhine river valley. The Rurh industrial region soon became a leading textile centre. Unlike Great Britain, German textile centres were dispersed in nature and smaller in sale. Apart from Westphalia, Rurh, the other textile centres are situated within the urban markets of Frankfurt, Munich, Bremen, Zwickaw, Chemnitz, Hamburg and Wupper river valley.

Other Producing Countries

Among the other producing countries, Italy, France, Switzerland, Belgium, Poland, Spain in Europe, Brazil, Mexico in American continents and HongKong, Egypt Bangladesh, Pakisthan in Afro-Asian continents are important.

The French cotton textile industry had a long history. From the beginning, France was deficient in raw cotton production. The textile industry in France was developed on imported cotton, particularly from USA. The industry is concentrated in the north-eastern industrial region. The major textile-producing centres are Belford, Kolman, Nansi etc. France is self-sufficient in the production of textile goods.

Italy is the other major textile-producing country in Europe. Italian industry was basically market-oriented. Ample cheap labour and sufficient hydro-electricity helped the industry to glow. The major textile centre are Naples, Milan, Bergamo etc.

In Switzerland, northern part of the country possesses some noted cotton textile centres. The most important centre is Saint Galen. In South America, Brazil is the most important textile-producing nation. Most of the textile factories are new. It is the major supplier of cotton made goods in entire Latin America. The textile mills are located around the urban centres of De Janeiro, Sao Paulo, Rio Grande and Minas Geraes.

Mexico is the other cotton textile manufacturing country. Larger textile units are concentrated around Mexico city and Arizona.

Production and Trade

Though the textile industry is one of the most diffused industry in the world and

developed throughout the world, bulk of the production comes from few countries in the world. The traditional producing countries like China, Japan, CIS and India contribute most of the production; but, due to heavy demand within the country, export of these countries are gradually coming down. In fact, the newly developed countries like Taiwran, South Korea, Hongkong, Singapore, Brazil and Mexico exports more than half of the total export of manufactured textile goods. The rapid development of synthetic fibres in the developed countries like USA, Japan, South Korea. Germany and CIS largely reduced the production of cotton textile products. The cheap rate of the products from new countries also reduced the export of leading countries.

According to the available figure of 1998-99, six countries comprising China, India, CIS, USA, Japan and Italy produced 73.26 per cent of the world's production in 1996. China secured first position in the production of cotton textile clothings followed by India, C.I.S., USA and Japan. The production of different countries are given in the Table.

Japan is the leader of the export of cotton textile products. Nowadays Taiwan, Hongkong and South Korea also export substantial amount of textile products. India and Germany, after meeting their domestic requirement, export some amount of textile products.

Production of Cotton Textile Clothes - 1996

Sl.no.	Countries	Production (million sq. mts.)
1.	China	18,300
2.	India	17,175
3.	U.S.A.	3,750
4.	Russia	1,005
5.	Japan	916
6.	Egypt	630
7.	South Korea	338
8.	Turkey	450
9.	Pakistan	307
10.	Romania	190

Source : Statistical Year Book- 1988

3.8 THE WOOLLEN TEXTILE INDUSTRY

The woollen manufacturing industry is perhaps older than cotton textile. Long before Industrial Revolution, woolen industry developed mostly at a local and cottage industry level. Since then, the industry had experienced a complete metamorphosis. The present day woollen factories mostly use sophisticated machines.

Location

Wool, as a raw material, is impure in nature. During process, weight loss ratio is quite high. So, the industry should be located, at least in theory, near raw material source. Though the general distribution of woollen industry all over the world suggests that market exerts maximum influence on the locational pattern. Most of the highly productive woollen manufacturing units are located within the markets of Western Europe. On the other hand, the principal wool producing areas of southern hemisphere are not very developed in the manufacturing of woollen goods.

Raw wool is prepared in the temperate and sub-tropical areas. Though sheep ^rearing is a popular occupation in the sub-tropical countries, specially by nomadic herders, most of the woollen product is generally consumed by high latitude people. Most of the raw wools are produced in the region of :

1. The Oceania region, comprising New Zealand and Australia.
2. The Latin American region, comprising Peru, Argentina, Uruguay, Colombia and Bolivia.
3. The South African region.

These three regions together contribute more than half of the raw wool requirement of the world. Though sheep rearing and wool production is highly developed in this region, woolen industry as such is not very developed in the region. Several geo-economic reasons are responsible for the poor development of woollen industry within the wool producing regions. The major reasons are :

I. The countries like New Zealand, Australia, Argentina is situated in the sub-tropical region. The winter is not too harsh. The local consumption is, therefore, not very high.

II. These countries are industrially ill-developed. The necessary infrastructure for woolen industry is absent.

III. These sparsely populated countries cannot provide large market.

IV. The manual labour is expensive and inadequate in these countries.

Distribution

The bulk of the wool is produced by a handful of developed countries; e.g., C.I.S., USA, Japan, UK, Germany, China, France and Italy. Almost all the countries in Europe produce at least some amount of wool.

The major consumers are also the countries of Europe, USA and Canada. Europe alone consumed more than half of the wool products. Though Europe is moderately developed in her wool industry, it is a deficit country in wool supply, as demand exceeds the production . The harsh, chilly cold in the greater part of the year is the principal reason for the high demand of woolen goods. On the other hand, Asian

countries, like Japan and China, possess milder climate and export sizable amount of woollen product. The leading woollen goods producing countries are : Soviet Union, Japan, United States, United Kingdom.

CIS

The CIS is having innumerable sheep and goat population. In 1998, the number of sheep and goat population in CIS was 147.74 million. Four-fifth of this number is sheep. Sheep is mostly reared for the extraction of raw wool.

The woollen industry is one of the oldest type of manufacturing activity in former Soviet Union, dating back to Tsarist period. The early century were developed around Volga basin and around Moscow.

Gradually, new centres started production of woollen goods. The central region and Leningrad region developed sound woollen manufacturing units. The early factors that favoured uninterrupted growth of the industry in former Soviet Union were :

1. The ready market for woollen products all over Soviet Union.
2. The traditional base of the industry since Tsarist period.
3. Abundant supply of raw wool from sheep rearing communities.

This country is more or less self-sufficient in wool production. After installation of communist regime, a planned and co-ordinated effort was undertaken to make Soviet Union self-reliant in wool production. For balanced development of the industry, dispersion of the industry, particularly to the remote Asiatic parts, was undertaken on priority basis. As a result several new centres were developed. Notable among these are Kharkhov in Ukraine, Caucasus and Kazakstan. The leading woollen goods manufacturing centres are Moscow-Tula, Leningrad, Central region, Kazakstan and Caucasus.

After Second World War, however, growth of woollen industry remained stationary for quite a few years. Since 1955, production of woollen goods gradually picked up and in very recent years it crossed 900 million yards.

Japan

The traditional hand woollen type of wool manufacturing process was largely replaced by machine after 1925. The growth of Japanese woollen industry was very high, even in the early period of growth. The rapid rise of Japan, in woollen industry, checked the absolute supremacy of UK and USA in the Asian wool market. Considering the number of people in this industry and total volume of production it is one of the major manufacturing industries in Japan. The major wool producing centres are located within Tokyo-Yokohoma, Nagoya, Kobe, Hemaji, Osaka, Nagasaki etc.

The major factors that encouraged the all-round progress of woollen industry in its early period of development are :

1. Availability of cheap power resources, particularly hydel power.
2. High productivity rate per worker
3. Low cost of production
4. Low consumption within the country.

Japan now secures third position in the manufacturing of woollen goods in the world. The rise of synthetic fibre production greatly hampered the continuous growth of woollen industries.

United States

Manufacturing of woollen products in one of the oldest manufacturing industry in USA. The woollen manufacturing provided large scale employment to the people, in its early phase of development. Woollen goods has a market all over USA, specially for clothings.

The early centrs of woollen production developed near new England region. Massachusetts and Rhode Island are the reputed centres. The other renowned centres are Pennsylvania, New York, Wisconsin, Georgia and New Jersey.

The factors responsible for early localizations of woollen industries were :

1. Large-scale sheep rearing in northern grasslands.
2. Favourable cooler climate
3. Easy availability of hydel power
4. Steady market and available skilled workers, particularly, the people migrated from Lancashire, U.K.

Like cotton textile industry, woollen industry is USA had also experienced a massive migration from New England to Southern states particularly to Carolina, Georgia and Florida. The productivity and quality of southern mills are far better than its northern counterpart.

United Kingdom

The United Kingdom pioneered in the production of woollen goods. The first woollen industry was developed as early as 13th century. At its early period of growth, Yorkshire became the leading centre of production. Subsequently, new centres were developed in Mid-lowland and Lancashire. In the latter state, the industry experienced further dispersion in Scottish lowland, South Wales and Ireland. The early localization factors were :

1. The climate of Yorkshire was ideal. The soft-water supply was an added advantage.
2. The abundant power supply from Penine coal and hydel power.
3. Cheap and skilled labour supply.
4. Steady market not only in Britain but also in abroad.

Unlike cotton textile, which declined rapidly, woollen goods production in Britain survived and produced consistently, though its relative dominance has gone down considerably. The rise of demand in home market helped immensely for the survival of woollen industry in United Kingdom.

At present, important producing centres are Leeds and Bradford. UK is now not self-sufficient in raw wool production.

Other Producing Nations

Among the other producing countries, Italy, Germany, Poland, Romania, former Yugoslavia in Europe and China and India in Asia are noteworthy.

In between the two World Wars, Germany had made spectacular progress in wool production. The great war came as a severe blow and most of the plants were completely devastated. After the war, West Germany regained some of its old reputation in the production of woollen goods. However, after 70's emergence of new countries outpaced West Germany production. Combined output of both the Germanics exceed many top ranking countries. Most of the woollen producing centres are located in Saxony, Westphalia and Ruhr region.

Italy has emerged as one of leading producers of woollen goods. Even in recent years, production surpassed Japan and China. Most of the plants are located at Naples and Po river valley.

China, in Asia, is traditionally famous for the production of woollen goods. It now secures third position in the woolen production. Shanghai, Canton are the major producing centres.

India is also one of the leading nations in the manufacture of woollen goods. The huge number of sheep reared all over India provides raw wool to the industry. Most of the woollen products are manufactured in the north-western states. Major manufacturing centres are Ludhiana, Simla, Kanpur, Bhatinda, Dhariwal and Jullundhar.

Trade

Major wool and wool product exporting countries are Japan, Italy, USA and former Yugoslavia, USA, Canada, France are the major buyers of woollen goods.

Production of Woollen Goods

Sl.No.	Countries	Production [(million sq. mts.) 1992]	Percentage of world production
1.	CIS	746	23.2
2.	China	610	12.5
3.	Italy	475	11.5

Sl.No.	Countries	Production [(million sq. mts.) 1992]	Percentage of world production
4.	Japan	370	8.7
5.	USA	215	4.6
6.	India	165	4.3
7.	Poland	143	4.0
	World	3700.00	100

Source : Statistical Year Book - 1996

Artificial Fibre of Rayon Industry

Artificial fibres, popularly known as rayon, may be produced through different ways. The raw materials used for the manufacturing process also varies markedly. Broadly, all artificial fibres may be sub-grouped into two :

1. The fibres produced from agro-products, specially wood.
2. The fibres produced from chemical fibres, like nylon, dacron etc.

Whatever be the raw material, cellulose is the principal component of the manufacturing process. The major constituents of the raw materials are wood, caustic soda, acetic acid, ether etc.

Development

It is very difficult to ascertain the birth place of rayon manufacturing, but it is certain that first units were established somewhere in Europe, possibly in UK. Before the Second World War, several factories had already started production in UK, Germany and France. In 1910, first rayon manufacturing plant took its birth in USA near Pennsylvania.

In the first phase of development of artificial fibre manufacturing. United Kingdom dominated totally. At that period, UK was the only exporter of raw cotton. But, like many other industries, supremacy of Britan in rayon production did not last long. New countries gradually were able to develop their indigenous industry. Apart from European countries and USA, Japan soon started production of artificial fibres.

Locational Factors

Preparation of chemical fibres involve three-tier process of raw material processing and preparation of cellulose, manufacture of fibres from cellulose and knitting of the fibres.

This is a complex process which requires tremendous technological advancement and enormous capital

The uninterrupted supply of raw materials, e.g. fossil fuels, transportation of raw material, skilled technical workers and huge investments are pre-requisites for the establishment of a chemical fibre plant. The availability of these discerns the location of the industry.

Distribution

Of late, several countries have started production of artificial fibres but still traditional countries hold the key to the magnitude of production. In this technology based industry, only countries having' sound technical backgrounds are dominating the scene. The major producing countries are Europe as a whole, USA, Japan, Former Soviet Union, India and China.

Europe

Europe was the pioneer in artifical silk manufacturing. In fact, most of the early patents were exclusively reserved by European countries. The traditional producers are United Kingdom, Germany, France, Italy, Belgium, Sweden and Holland.

The dearth of raw cotton inspired the manufacturing of rayon during its early growth. The high degree of technological prosperity, huge capital and general industrialization of the country helped immensely for the rapid growth of manmade fibre in those countries.

The major centres of production in Europe are Ruhr valley, Dortmund and Westphalia industrial zone in Germany, Marshei and Paris region in France, Naples in Italy and Central England.

United States

USA is now the largest producer of artificial silk. All early attempts to manufacture rayon, before 1910, have failed miserably due to patent dispute. Most of the product comes from Appalachian region. The Appalachian coal, nearby hydel power, easy transport, skilled labour and general development of manufacturing industry within the area promoted rayon industry in this region. The leading producing states are Pennsylvania, Georgia, Arkansas, Alabama and North & South Carolina.

Recently, Japan is posing a threat to US rayon industry due to its cheaper rate of the products.

CIS

Soviet Union is another leading producing nation of artificial fibre. Most of the factories here, are new and constructed very recently. Improvement of Soviet rayon industry in recent decades were spectacular. The major producing centres are Moscow-Tula, Ural and Ukraine region.

Japan

Japan was the only country, besides Europe and USA, to start production of rayon in as early as 1915. The early growth of chemical fibres, specially rayon was spectacular. In 1965, Japan was able to multiply its production 100 times more than 1915. The major factors which favoured this growth were :

1. American financial and technical assistance.
2. Patriotic zeal of the labour force and its cheaper rate
3. Use of sophisticated technology.

The major producing centres in Japan are :

1. Fukai Region
2. Ishikari Region
3. Kwanto Plain
4. Kyoto Region

The other leading rayon-producing countries are China, India, Korea, Taiwan etc.

Trade

Japan is the largest exporter of artificial fibre, followed by USA, Germany, UK, Taiwan and Korea.

Asian giants like Japan, Korea and Taiwan now contribute more than half of export. Major importing countries are African, Middle East and countries of Oceania

3.9 ALUMINIUM INDUSTRY

Bauxite, the raw material to aluminium occurs most frequently in tropical areas having clay limestone rocks exposed to weathering. Bauxite can be converted into aluminium by producing an intermediate product, alumina. To produce alumina, bauxite is crushed, washed, pumped into pressure tanks, heated and subjected to a precipitation process using caustic soda to remove impurities, such as iron and silica. It is then cooled and dried in large furnaces to drive off moisture and reduce weight. A weight loss of 50 per cent occurs in this process. For this reason, concentration often occurs near the raw material source.

An electrolysis smelting process next converts the white powder alumina substance to aluminium. Alumina is dissolved in a cryolite bath and "direct electrical current is passed through it by means of carbon electrodes to complete the operation. Because of the large electrical power needs, the industry seeks cheap electrical power locations. Aluminium smelting facilities are therefore oriented to the availability of cheap electricity rather than to raw materials or markets.

Major uses of Aluminium

(1) Aircraft manufacturing— Lightness and toughness of aluminium have made it an essential metal for the manufacturing of aircraft.

(2) Structural uses— Aluminium is highly resistant to corrosion. So it has been used for all construction purposes like walls, door and window frames and internal fittings. It is also used in the construction of railway wagons, automobiles and ships.

(3) Electrical goods— Aluminium is a good conductor of electricity and is used for the manufacture of electrical cables.

(4) Food packing— It is conveniently used for the manufacturing of food containers and aluminium foils are used for wrapping and packaging of food stuffs.

(5) Aluminium alloys— Alloying aluminium with copper makes it as strong as steel.

Alloying aluminium with silicon makes it highly ductile and shock resistant.

Several countries with plentiful and cheap electrical power have significant aluminium processing activity even though they possess neither the raw material supplies nor final markets. Canada and Norway fit this circumstances. Other leading aluminium producers in the world, including the United States, Japan and West Germany, possess large markets and significant production but little raw material. The Soviet Union stands alone as a major bauxite producer, aluminium manufacturer and major consumer.

Rank	Nation	Production	Percent of World Total
1.	United States	3,857	23
2.	Soviet Union	2,535	15
3.	Canada	1,414	8
4.	Australia	939	6
5.	West Germany	820	5
6.	Norway	785	5
7.	Brazil	600	4
	Sub total	10,950	66
	World Total	16,928	100

World Aluminium Production,
1985 (thousands of short tons)

Source : American Bureau of Metal Statistics, 1986 (thousands of short tons)

Aluminium consumption domination by the U.S.A., Japan and Russia overwhelms the use in other areas of the world, but Western Europe also provides a significant market. In addition to the aircraft assembly industry, a wide variety of fabricators use aluminium. U.S. factories now use more aluminium than any other metal except iron.

Together with third-world domination of bauxite production, the multinational corporations control the aluminium industry as a whole. Six integrated corporations, all based in developed countries, accounted for over 70% of the bauxite output of market economics. These six firms include the Aluminium Company of America (Alcoa), Pechiney Ugine Kuhlman from France, Swiss Aluminium., the Aluminium Company of Canada (Alcan) and Reynolds Metals Co. (United States). Historically, these corporations became involved in bauxite production due to the large capital and sophisticated technology requirements of the industry, although resources were not locally available in developing areas. By integrating vertically from mine through refining to fabrication and recycling, these firms also limited their risk exposure.

Today, cost factors tend to favour developing areas for the manufacturing process, specially if cheap electrical power can be obtained. The market for aluminium is also growing rapidly in these areas. Trans-national corporate control continues, although several firms now possess minority partners from the host country. The potential for developing grass roots based integrated operations exists in only a few countries, such as Brazil and India, but partial integration does occur frequently.

Distribution

U.S.A. : The alumina factories clustered in the south central part of the United States include six mills strung along the Gulf coast from Texas to Alabama, and two in Arkansas. These factories consume three types of raw materials : bauxite, fuel and caustic soda. These mills feed on bauxite arriving by water, the main source regions being Jamaica, the Dominican Republic and Surinam. After processing, alumina can be shipped by rail.

A rational pattern of spatial development occurred with the U.S. aluminium industry, which has experienced five major developmental phases in various parts of the country. The first aluminium - processing plants occurred in New York State at Niagara Falls and Massena where cheap hydropower could be harnessed. In the second phase, two plants came into being in the Tennessee Valley Authority (TVA) region and they also took the advantage of cheap hydroelectric power. In the third phase, a wave of four plants built in the Pacific north-west "during World War II and they also took advantage of relatively inexpensive electrical power in that region. This area has remained a major producer, leading the United States in output. The fourth phase of development in the aluminium industry emerged after World War II with new sites located in Texas and the plants depended on locally produced lignite

as a source of electrical power. The fifth and most recent trend in the U.S. aluminium industry reflects the growth of smelters in the Ohio river valley to take advantage of cheap thermal electrical power sites near coal mines. These sites have the further advantages of being near the northeastern market and accessible to Ohio River barge transportation.

Canada

Canada provides an example of a region that has become a dominant world producer even though completely lacking native ore and having scarcely any domestic market. Although lacking in bauxite, Canada maintains aluminium mills at the extreme eastern and western parts of the country, near cheap electrical power sites. The first plant was established in 1901 near Quebec. Alumina for the plant come from Germany. This mill still operates but limited water power restricts expansion. In 1926, Aluminium Limited of Canada (Alcan), which operated the Shawinigan Falls concentrator, built a new plant at Arvida in a forested wilderness 120 miles NE of Quebec on the Saguenay river. Here a local alumina mill was opened in 1928. Bauxite arrives by ocean freighters from Jamaica and Guyana at Port Alfred.

Western British Columbia also claims a large aluminium mill at Kitimat, a development lured to a west, rugged wilderness, again by potential waterpower resources. Here the direction of flow of a stream (Nechako river) has been reversed to cause it to fall down the western side of the mountain. Electricity thus generated at Kemano moved 50 miles downstream to the Kitimat mill site, which is accessible to ocean vessels delivering alumina and bauxite.

European Countries :

The aluminium industry came to France in 1886 with France and Germany the early leaders. Today, France, along with Greece, still supplies a large portion of the bauxie for western European mills. In the production of alumina and aluminium, Norway, France and Germany pace the continent. Germany serves as the largest link in a chain of aluminium manufacturing nations that encircle the Alps. The largest single producer is Norway, which, like Canada, lacks both ore and markets but is blessed with power resources. Europe accounts for about 12 per cent of the worlds' bauxite output and 20 per cent of the refined aluminium.

CIS

Before World War II the Soviet Union had two aluminium factories, the bigger one at Zaporozhye and the smaller one at Volkhov. The German army destroyed both of these factories. A third plant was established at Kamnesk, on the eastern flanks of the southern Ural Mountains, to take advantage of bauxite in the Urals and local lignite for thermal electricity. A fourth mill at Stalinsk came into existence using bauxite from

Kuzbass field and machinery evacuated from Volkhov. After the war, the Russians rebuilt the Volkhov and Zaporozhye mills, using machinery expropriated from Germany and a large new mill built at Krasnoturinsk topped the bauxite reserves of the Mount Urals. To take advantage of the hydroelectric potentials of dams on the rivers Yenisey and Angola, the Soviets have built new aluminium smelters at Beatsk and Krasnoyarsk. Another plant located near Irkutsk at the southern end of lake Baykal and a plant at Sayanogorsk dramatically increased the capacity in Sibera. Today Sibera accounts for 60% of the country's' aluminium production.

Japan

Japanese aluminium refineries are widely dispersed throughout the country in smaller coastal cities, from Hokkaido Island in the North to Shikoku in the south. Many of these facilities occur near locally produced coal, which provides inexpensive thermal electrical power. The largest plant was located at Toyama on the pacific coast of Central Honshu. But, aluminium production is a "sunset" industry in Japan today, suffering from higher energy costs and significant production cutbacks are occurring.

3.10 THE CHEMICAL INDUSTRY

The chemical industry is comparatively a new addition to the manufacturing world. The prosperity of chemical industry in the national economy is the true reflection of the simultaneous development of the industries like engineering, metallurgy and several other manufacturing activities.

Process of Manufacturing

Chemical industry, as such, differs widely in terms of raw material, process and product from region to regin.

Raw. materials vary widely, ranging from nitrate, potash, salt, coal, petroleum, natural gas, caustic soda, sulphur, alchohol, phenols etc. The peculiar characteristics of chemical industry is that, final product of a industry may be used as raw materials to another industry.

The industry is the outcome of sophisticated technology. The process involved are intricate and very complex. The production process requires tremendous precision. The multiplicity of products and by products make the task even more difficult. There are very few industries in the world, where such a wide variety of products are prepared. The important products are divided into two broad groups : organic and inorganic.

The organic chemicals are mostly derived from coals, wood, petroleum etc. On the other hand, the minerals and other non-organic products are used in the production of inorganic chemicals.

Some of the chemicals produced are fine or pure in nature, while others are gross or impure. For instances, drugs and pharmaceutical products are pure but fertilizers are gross products.

Factors of Location

The chemical industry is considered as 'knowledge intensive high technology industry'. The technological advancement and attainment of know-how is a prime requisite for this type of industrial development. It has been observed that only countries having sound economic base and high degree of industrial growth were able to build up big chemical plants.

Another factor that prohibits the setting up of chemical plants are 'patents', occupied by multinational companies. The exclusive right on design and processes, by these companies, are the principal reasons for concentration of industries in some selected countries.

Raw materials used for the manufacture of chemicals are bulky and weight-losing. So some of the plants develop within raw material source. But, as the products are mostly expensive and basically used in other industries, market plays the decisive role in the localization of the plant. Several raw materials are generally used in this indusrry. It is obtained from different sources. It is most unlikely that all the raw materials will be available on a single place. The market or port locations are preferable, because of the availability of all the raw materials.

The other factors influencing the location of heavy chemical industries are all traditional in nature. These factors are :

1. **Power Supply**— Abundant power supply is necessary for the manufacture of chemical products. Formerly, coal, petroleum or hydel power sources influenced the location buf now due to the adaptation of energy efficient technique, the influence of power sources have greatly been reduced.
2. **Capital**— Chemical industry is the capital intensive industry. Most of the plants are largely automated. These expensive plants require huge investment.
3. **Land**— Market and raw material sources exert pull on the location of chemical industry. Availability of land is also a significant factor which sometimes influences the location.
4. **Transport and Communication**— Most of raw materials used in chemical plants are bulky and weight loosing. It is desirable to have a good transportation network. Water-side location is a favoured location.

Classification of Chemical Products

The products of chemical industries are broadly divided into two major groups

like organic and inorganic. But, according to the quality and use of the products, chemical industry is distinctly divided into -

1. **Heavy Chemicals**— Heavy chemicals are mostly manufactured from mineral deposits or industrial by-products. The major products are acids and alkalis. The acid group comprises sulphuric acid, nitric acid, acetic acid, hydrochloric acid etc. and alkalis comprises chlorine, caustic soda, soda ash, sodium salts, ammonia, urea and different fertilizers etc.
2. **Light Chemicals**— Numerous chemicals are included in this type of chemicals. Among these, soap, detergents, perfumes, cosmetic, dyes, plastic, explosives, pesticides and insecticides are important. These materials are all costly and require tremendous care during production.

The United States Bureau has made the following standard industrial classification:

(1) Industrial inorganic and organic chemicals : Alkalis and chlorine, industrial gases, coal for crudes, dyes, dye intermediates, organic pigments, inorganic pigments, other industrial organic chemicals - Chemicals as acetic, formic, synthetic perfume and flavouring materials etc. Other industrial inorganic chemicals - inorganic salts of sodium, potassium, aluminium, calcium, magnesium, etc.

(2) Plastic materials and synthetic resis, synthetic rubber, synthetic and other manmade fibres, except glass.

(3) Drugs : Biological products, medical chemicals and botanical products; pharmaceutical preparations.

(4) Soap, detergents and cleaning preparations, perfumes, cosmetic and other toilet preparations : Soap and other detergents, except specially cleaners. Specially cleaning, polishing and sanitation preparations, except soap and detergents. Perfumes, cosmetics and other toilet preparations.

(5) Paints, varnishes, lacquers, enamels and allied products.

(6) Gun and wood chemicals.

(7) Agricultural chemicals : Fertilizers, agricultural pesticides, other agricultural chemicals, as soil conditioners and trace elements.

(8) Miscellaneous chemical products : Glue and gelatin, Explosives, Printing ink, Fatty acids, Carbon black.

Distribution of Chemical Indsutry

As chemical industry is completely a knowledge intensive industry, it has concentrated only in areas where since and technology is highly developed. Besides this, the stability of economy and steady demand of the product are the other major considerations for the establishment of chemical industry. The global chemical industry

is mostly controlled by few multinational companies as they have the patent right of the products and the processes. The major producing countries are Untied States, CIS, Germany, France, Italy, Britain, Belgium, Japan, India, China, Israel, Brazil, Australia etc.

United States

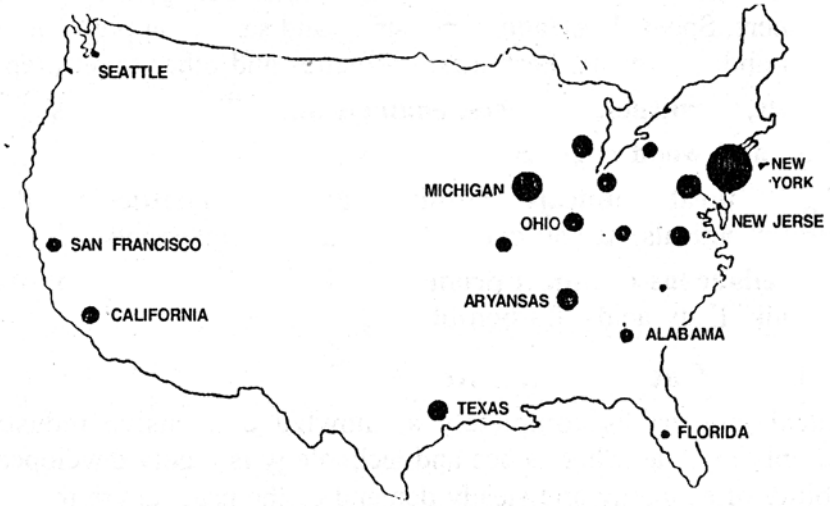
The United States of America secures first position in the output of chemical products. They provide more than 20 per cent of the world's output. Several reasons are responsible for the supremacy of US chemical industries. These are :

1. High degree of industrial development and stable economy.
2. The development of science and technology.
3. Abundant raw material reserve.
4. Steady demand of the products.

The distributional pattern of US chemical industries reveals that this industry is mostly diffused and scattered over entire United States. The largest agglomeration of chemical industries is visible in the northern states of Pennsylvania, Ohio, Kentucky, Indiana, Tennessee, Albama, Virginia etc. Some industries often require products of other chemical industries. This symbiotic relationship between the chemical plants forced most of the industrial establishments to settle within the same region. The other reasons are the presence of nearby market, excellent transport facilities and availability of all kinds of raw materials within their periphery.

The Atlantic coastal tracts ranging from New York, New Jersey, Maryland to the south-eastern state of Florida contribute more than 70 per cent of the chemical output. Of late, states of southern USA are heading for rapid development of chemical industry.

Major Chemical Producing Regions of U.S.A.



Each dot represents relative volume of production

Different states of the USA are now specializing on different products like Tennessee on fertilizer and Texas on petro-chemicals and Pennsylvania on heavy chemicals.

Heavy chemical industry in USA is one of the oldest and most consistent in production among all others. Sulphuric acid production is, by far, most important both in output and demand. It is one of the basic raw materials used in other chemical industries throughout United Sates. The other important heavy chemical products are caustic soda, ammonia and chlorine.

All these heavy chemical products have a large and ready market throughout USA. The light chemical plants are the major buyer of these products.

Light chemical industry includes various products ranging from detergents, toilet products to pharmaceuticals. These products are secondary in nature and mostly produced from the basic or heavy chemical products. Several multinational giants control this industry in USA. The internationally famous companies are now operating from USA:

USA is also leading producer of drugs and pharmaceuticals. It is single largest pharmaceutical producing country in the world.

Petrochemical industry is a comparatively new addition in the chemical industry in USA, but its present shape and rate of expansion is really remarkable. Different plastics, P.V.C., synthetic rubber is produced in a large scale. The polymerization process, developed in USA during 70's, evolutionized the concept of chemical industries. At present, USA contributes more than 10 per cent of the petro-chemical output of the world.

The country earns a sizable amount of revenue from the export of all kinds of chemical products.

Fertilizer production in USA is an age-old industry. This country produces enormous amount of fertilizer, comprising NPK group and sulphur products. The eastern half of the country produces more than 80 per cent of the total fertilizer production in United States. United States exports considerable amount of nitrogen, phosphate and potash fertilizers.

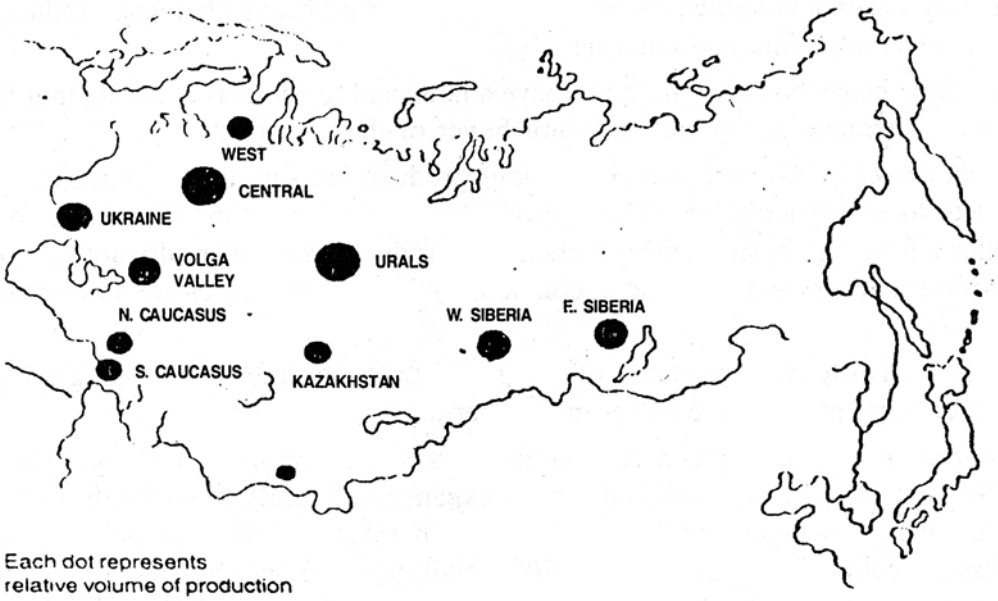
CIS

The heavy chemical industry is one of the most important and prestigious industry in Soviet Russia. The co-ordinated development of national industry is closely related with the growth of chemical industry.

Though CIS is richly endowed with all the necessary raw materials for the development of chemical industry, it was poorly developed in Tsarist period. The early chemical producing centres were largely concentrated around Moscow-Tula industrial centres, St. Petersburg and Ukraine region, including Donbas, Odessa. At

that time, fertilizer, acids, soda and other necessary products were insufficient in CIS. The perplexing fact is that, due to underexploitation of mineral resources within the country, the country had to,import raw materials like potassium, different salts and phosphates from Germany, Chile and Morocco.

Major Chemical Producing Regions of U.zS.S.R.



Each dot represents relative volume of production

During the plan period, special care was taken to improve heavy chemical industry. The mammoth industrialization of the country naturally boosted the demand of chemical goods, specially fertilizer, acid and soda. In the production of heavy chemical products like sulphuric acid, caustic soda and fertilizers, CIS is now the second largest producer in the world next only to USA.

Distribution

The most important fact about CIS chemical industry is its self-reliance on indigenous raw materials. The major products of chemical industry in CIS are plastic, rayon, nitrogen, synthetic dyes, rubber and acids.

The locational factors that played important role in the growth of the industry were :

1. Presence of huge amount of raw materials within the national territory. CIS is self-sufficient in the production of potassium, appetites, phosphate, sulphur and almost all the salts. Production of these raw materials are also satisfactory.

2. The vast market within the country. The huge demand of chemical products in other industries.
3. Government patronage and provision of financial assistance.

Special care was taken for the decentralization of the industry even in the remotest places of CIS. The areas to become leading chemical producing centres are N Ukraine, Volga, Siberia, Urals, Armenia, Kazakhstan and Central Asia.

Some of the industries preferred raw material location. The industries using coke and non-ferrous materials to produce nitrogen and potash fertilizers developed near Ukraine, West Siberia and Urals. The industries producing sulphuric acid were concentrated around Ukraine, Caucasia and Moscow-Gorky area.

The largest concentration of heavy chemical industry, however, occurred near petroleum producing areas near Volga, Ukraine, Caucasus, Baku and Ural regions.

In different plan period, at least 175 new chemical plants were established and more than 150 pre-existing plants were thoroughly modernized. The maximum number of chemical plants were located around Moscow, Leningrad, Kuznetsk. The Petroleum and gas based plants are located in Urals, Ukraine and Bukhara in Asia. Even as far as Omsk and Krasnoyarsk in Siberia became chemical producing centres in recent periods.

The raw material based industries are located in Kola peninsula and Berezniki on local apetite ore, Solikansk in potassium ore and Urals near phosphate ore. Donetz basin is famous but of loose confederation CIS and related political turmoil greatly disrupted growth of chemical industry.

Japan

With the meteoric rise in all branches of industry in last couple of decades, Japan also made considerable progress in heavy chemical industry in recent years. The infrastructure and productivity of per worker is significantly higher than the European countries. It has been estimated that, in near future production of Japan may exceed even the productions of USA.

The origin of heavy chemicals industry in Japan is not very old. Only after First World War, Japan stared to establish some of its chemical plants. But since then, rapid growth of this industry was very phenomenal. With Herculean effort, Japan was able to rebuild its chemical industry within a very short period. Even before 1968, Japan surpassed its pre-war production level.

Most of the Japanese chemical plants are either newly constructed or completely re-built, so output and productivity is very high. All the plants are new, modernized and automated.

Japan is deficient in raw materials. More than 80 per cent of its factories are

entirely dependent on imported raw materials. The only raw material abundant in Japan is sulphur, deposited extensively by volcanic eruptions. Most of the chemical plants in Japan are located within the industrial agglomerations of 'Osaka-Kobe', Tokyo-Yokohoma, Nagoya, Hemagi and Kyushu.

United Kingdom

It is one of the oldest chemical-producing nations of the world. Though the relative share of UK in the world output is gradually declining. It still holds an important position in the world chemical production. The major factors responsible for the early growth of the industry were :

1. Huge good quality of coal reserve at that time.
2. Large salt, potash and petroleum by-products from oil refineries.
3. Availability of cheap hydel and thermal power.
4. Large market both at home and abroad.

The chemical industry in Britain is widely diffused. The leading producing centres are Lancashire^ Glasgow, Manchester, Birmingham, Yorkshire, etc.

Italy

Italy is now considered as a leading producer of both light and heavy chemical products. The growth rate in the industry is quite high. Several reasons are responsible for the development of chemical industry in Italy. These are :

1. The presence of vast amount of raw materials within the country, including limestone, dolomite, sulphur and potash.
2. The availability of cheap hydel power.
3. Good transport system and market facilities. The major chemical centres in Italy are Naples, Milan, Tarney, etc.

Germany

Germany has the traditional supremacy in chemical production. The erstwhile West Germany was a consistent producer of several chemical products, including caustic soda, soda ash, nitric and sulphuric acid etc. The major reasons for the high development of the industry in the country were :

1. The economic stability and research facilities.
2. Availability of several raw materials like salts, potash, limestone, dolomite, sulphur etc.
3. Development of thermal power from the adjoining coal deposits.
4. Extensive market facilities.

The major chemical industries are concentrated in Ruhr industrial agglomeration,

Bavaria and Elbe area. Larger concentration occur in Munich, Frankfurt, Strassfurt etc.

France

Of late, France has emerged as a leading chemical-producing nation. The strong industrial infra-structure, abundant coal reserve, high development of petroleum refinery industry, presence of several raw materials, like salt, dolomite, limestone and potash, within the country has facilitated the growth of chemical industry in France.

The industry is well-developed in regions of Lorraine, Marsai, Bordo etc.

China

Chemical industry, as such, is a very new phenomenon in China. After the take-over of the Communist, proper emphasis was given to self-reliance in every industry. Special care was taken to increase the production of caustic soda, soda ash, sulphuric acid, hydrochloric acid and nitric acid. The effort was so sincere that at last three decades production increased threefold.

The major chemical-producing centres in China are located in its northern part. The urban centres of Nanking, Shanghai and Shantung contributes maximum of the chemical output. The other noted chemical factories are located at Manchuria, Fushun, Penki, Dairen and Anshan. The largest of the plants are locatd at Manchuria. Some of the plants only specialize in the production of items, e.g. Dairen plant in soda ash, caustic soda, Mukden plant in Ammonium sulphate, urea and phosphate products etc. Chungkiang in Yangstze valley is famous for the production of fertilizers.

India

India is now one of the leading manufacturers of chemical products. The urban centers of Delhi, Kolkata, Chennai, Bangalore, Kanpur, Ahmedabad are leading producing centres.

Other Countries

In the present era, several other countries have developed their own chemical industry. The other leading producers are Spain, Belgium, Poland, Canada, Australia etc. Most of these countries concentrated on the production of fertilizers, caustic soda, soda ash and different heavy-chemical products.

PRODUCTION OF HEAVY CHEMICALS IN SELECTED COUNTRIES 1997-98
(in thousand metric tons)

Countries	Sulphuric Acid	Hydrochloric Acid	Nitric Acid	Caustic Soda	Soda Ash
USA	34978	2515	7368	9886	1670
USSR (Old)	22450	-	-	2810	4910
(1991) West Germany	4735	906	2900	3280	1406
East Germany	4678	105	-	420	850
UK	3500	135	2700	-	-
France	4600	300	3100	1340	1400
Japan	6440	500	650	2800	1500
India	2266	200	520	590	598
Spain	4020	142	890	420	316
Poland	3268	65	2113	460	680
Canada	3280	158	-	1040	-
Italy	2967	525	1039	990	710

Source : U.N. Statistical Year Book & Monthly Bulletin of Statistics

PRODUCTION OF CHEMICAL FERTILIZER IN SELECTED COUNTRIES 1997-98
(in thousand tonnes)

Countries	Nitrogen Fert (N)	Super Phosphate ($P_2 0_5$)	Potash Fert (K_2O)
USSR (1991)	12004.2	7685.6	8531.0
USA	14244.0	10500.0	843.0
France	250.0	129.0	-
Germany	1290.0	200.0	3278.0
Japan	869.0	307.0	-
Holland	1700.0	340.0	-
Poland	1469.4	428.6	-
Italy	693.8	257.6	-
UK	800.0	90.0	538.0
India	8768.8	2616.4	-
China	18898.0	6074.3	115.0
Australia	240.0	300.0	-

Source : U.N. Statistical Year Book and Monthly Bulletin of Statistics.

3.11 INDUSTRIAL COMPLEX (REGIONS)

The spatial distribution of manufacturing industries shows a distinct trend of localization towards a few selected areas on earth. These areas have not developed haphazardly but have developed gradually, stage by stage through many years. Agriculture and other primary occupations are of minor importance in these areas. Some of these industrial regions are confined within political boundaries and a few have extended beyond the limit of the countries. The agglomeration of industries occur in countries where general level of industrialization is high and a sound infrastructure exists. The industrial regions have developed at some favourable sites.

(1) Where coal or more recently hydro-electric power has been available.

(2) Where raw materials are available or produced.

(3) In or near large centres of population where there is an abundant labour supply and a good consumers' market.

(4) At good trading locations to which both raw materials and labour can be brought at reasonable expenses, and from which the finished products can readily be shipped to wide market.

These factors are interrelated and in a particular industrial district, one or more than one of these advantages may be available. The entire region is thoroughly connected by well developed transportation and communication systems. The presence of favourable climate, flat land, use of machines and above all human skill and culture are some of the original factors which may help the growth of an industrial region. Besides, the availability of capital and organizational capacity are also very important factors.

Within such wide industrial regions sometimes comparatively small but more closed and compact industrial areas develop wherein factories and urbanization continue for miles together almost without any break. Such smaller areas are better termed as industrial district/complex rather than industrial regions.

According to geographical concentration, industrial regions may be subdivided into following groups.

A. North American region, comprising of U.S.A. and Canada.
B. European region consisting of the industrial regions of highly developed European countries like U.K., Germany, France, Italy etc.
C. The regions of Soviet Union/CIS.
D. Asian regions, comprising of the industrial regions of China, Japan, India, etc.

The USA

1. The North-Eastern industrial region with the following districts—
    i) Pittsburg-Wheeling-Cleveland,
    ii) New York - Philadelphia - Baltimore
    iii) Southern New England
    iv) Detroit and the surrounding area
    v) Southern Lake Michigan
2. The Southern Industrial region with Piedmont district.

Europe

1. The North-West European Industrial Region comprising of
    i) Scottish Lowland
    ii) New-Castle and the surrounding areas
    iii) East Pennine
    iv) Midland
    v) Lancashire
    vi) South Wales
    vii) North France - Belgium
    viii) The Ruhr
    ix) Saxony - Bohemia
    x) Silesia
    xi) The Swiss Plateau
    xii) The Po valley of North Italy

Soviet Union/CIS

1. The Soviet European Industrial Region which includes -
    i) The South Ukraine
    ii) The Central Industrial district around Moscow
    iii) Leningrad and the nearby area
    iv) The Volga region
2. The Urals
3. The Kuznetsk (basin) Region
4. The Caucasus region
5. The Soviet Central Asia (around Tashkent)
6. The Soviet Far East Region

Asia China

1. In around Mukden
2. The lower Yangtze valley

Japan

1. Tokyo- Yokohama (The Kwanto plain)
2. Osaka-Kobe-Kyoto (The Kinki district)
3. Nagoya area
4. North Kyushu

India

1. The Eastern Industrial zone including Kolkata, Asansol, Burdwan Jamshedpur, Siliguri.
2. The Western Industrial Zone including Mumbai and Ahmedabad.
3. Northern Zone around Delhi, Haryana and West Punjab
4. Southern Zone including Chennai, Bangalore, Coimbatore, Madurai etc.
5. Central Zone including Nagpur, Bhilai, Bhopal, etc.

3.12 SELECTED INDUSTRIAL REGIONS OF THE WORLD

USA

USA is the most dominant industrial super-power in the world. The total contribution of industry in the national Gross Domestic Product (GDP) in 1995 was 31 per cent of the total, i.e. $6952.020 million. The value of Merchandise import and export in 1996 was $814,888 and $575,477 respectively. At least 26% of the populations are directly or indirectly involved in manufacturing activities.

Achievement of this industrial supremacy has become possible due to her natural, human and cultural background. The USA is a vast country with an area of 3 million sq. miles. Moderate climate, long coast line, natural waterways, productive soils, extensive plains, forest and fishing grounds are some of her unique natural endowments. Her immense reserves of coal, petroleum and nuclear and hydro-electric potentialities and huge deposits of important minerals, like iron ore, copper, bauxite etc. have given the opportunity for a mechanical revolution. Originally people came here from different countries of West Europe and they brought with them advanced culture and technological skill. They all merged together to form a mighty nation. This has given her opportunity to have a strong and stable Government, which always fostered individual initiative, general education, scientific researches and economic growth. The country possesses the world's fourth biggest population of about 200 million, among many varieties of manufacturing units, iron and steel, engineering, automobiles, locomotives, aero planes and machine building, chemicals, textiles, paper and food processing are more important. Among the many industrial regions of the country, the most important is the North East Industrial Region which is discussed below -

The North-East Industrial Regions

In North America a great industrial region has emerged in the North-eastern part of the United States. This region covers only one-tenth of the country's land area, yet, it contains half of the U.S. population and three-fourths of her manufacturing industries. A number of historical, geographic and economic factors are responsible for the growth of this region.

(a) The region facing Europe attracted earlier settlers leading to a rapid growth of population having skill and finance.

(b) Coal and petroleum of the North Appalachian area, water power of New England States, iron-ore of the Mesabi range and various other minerals of this area have been very important factors for the growth of industries here.

(c) Excellent transportation facilities have been provided by the Great Lake system, rivers and by a net-work of man-made canals, roads and railways.

(d) Behind this region to the south and west lies a vast agricultural hinterland, rich with raw materials.

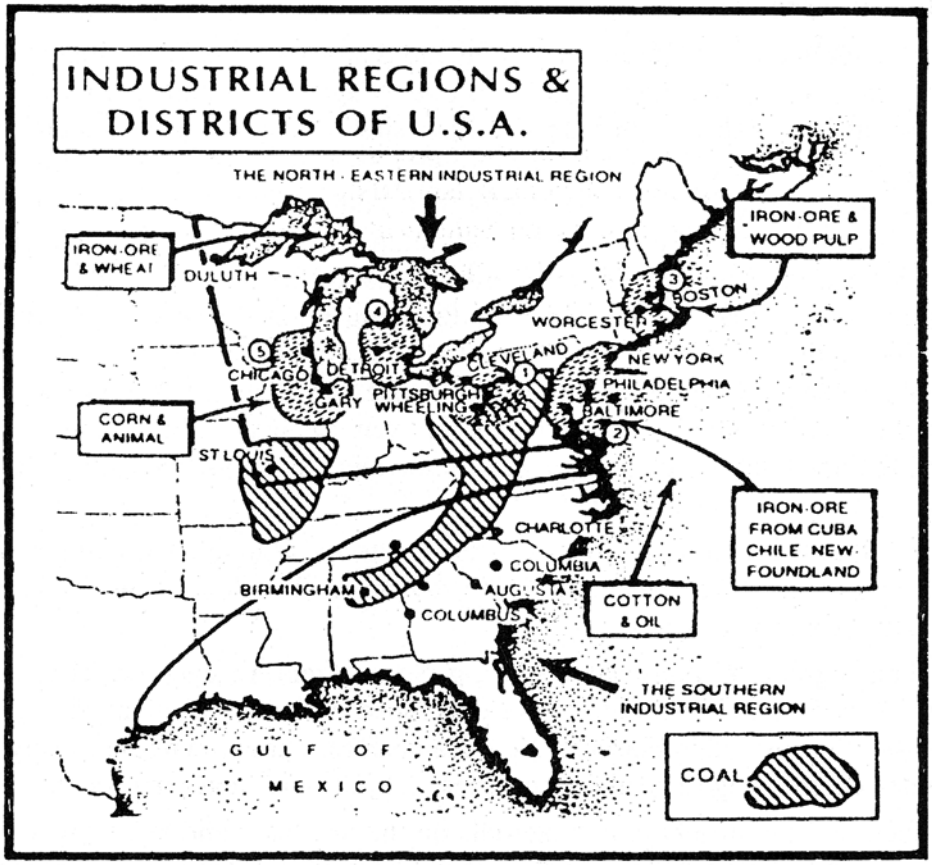
(e) The dense population provides an enormous market.

Within this region a number of industrial districts have developed within thicker concentration of manufacturing industries. They are as described below.

(i) Pittsburgh-Wheeling Cleveland District (or the Pittsburgh District)

This industrial district has developed on the North Appalachian coal-fields of Pennsylvania and Ohio. Pittsburgh stands at the junction of the rivers Monongahela and Allegheny (forming the river Ohio). The entire coal region is drained by these rivers and their tributaries. The most common sights of these rivers are the barges with cargoes of fuel for Pittsburgh industrial district. High-grade coking coal and easy transportation facilities are the two most important factors which have helped the development of this industrial district. Here iron and sted industry dominates specially in Pittsburgh, Youngstown and Wheeling. Numerous associated steel fabricating industries have also developed in this area which extend up to Cleveland on the Lakeshore. Iron-ore from the Lake Superior district can be obtained here cheaply through the Great Lake water routes.

It has easy access to the markets both in the Atlantic coast and in the Western interior. Pittsburgh has also important glass and textile industries. Arkon is the largest rubber manufacturing centre of the world. East Liverpool is noted for pottery.



(ii) New York- Philadelphia-Baltimore District

Besides these big cities of New York, Philadelphia and Baltimore, this area includes most of the northern New Jersey and a considerable portion of eastern Pennsylvania. It is within easy reach to the Appalachian coal-fields of West Virginia and Pennsylvania. Easily available -coal, port facilities, dense population and good trading locations are the factors for the growth of this area with highly diversified industries.

Baltimore has iron and steel, clothing, tinware, petroleum and copper refining industries. Philadelphia has textiles, foundry products, electrical apparatus, petroleum and sugar refining, cigar, leather goods manufacturing and other. In East Pennsylvania, iron and steel, foundry products, locomotives, silk, rayon and knitted goods are important. In New Jersey centres, skill and rayon, electrical apparatus, pottery, refining of petroleum and copper are important. New York has highly diversified industries. Clothing and fur manufactures are specially important. Foundry products, electrical apparatus, chemicals, perfumery, knitted goods, textiles, printing and publishing are other important industries of New York.

(iii) Southern New England States

Due to earlier settlement the New England States are densely populated. This area is deficient in coal. Yet, the Niagara falls, the .Niagara river and innumerable streams flowing into the Atlantic provide excellent sites for hydro-electric stations. In the past, cotton used to be collected at the ports of New England States and then exported. Thus have developed here important cotton centres. Later, with the aid of hydro-electricity, textile industries have developed. Now, coal is also brought here by rail or by coastal shipping. The coniferous forest of the North has encouraged paper and pulp industry. Boot and shoe manufacturing is also a very important industry here. The textile industry is facing severe competition from the cotton-belt centres of the South. The shoe-making industry also faces competition from western centres situated nearer the sources of raw materials. New England industries are now highly diversified due to hydro-electricity, population and its geographic location in relation to the great north-eastern market.

The cotton textile industry is in Massachusetts and Rhode Island. Important towns are Lawrence, Lowell, Manchester and Providence. Textile machine-building is important in Worcester.

Of late, a group of industrial towns, e.g. Spring-field, Bridge-port, Hartford, New-Haven, New Britain-Bristol etc., have developed in the Connecticut Valley of Western Massachusetts and in Southern New-Hampshire. These towns are mostly engaged in lighter engineering and other machines, copper wire, aeroplanes etc.

In fact, for lack of local raw materials on the one hand and availability of hydro-electricity and skilled labour on the other, the New-England states are now more devoted to such industries which demand more power and skill and lesser raw materials.

(iv) Detroit District

The city of Detroit stands on the river Detroit. The carriage building industry was important here due to original hardwood forest near Grand Rapids. The New mid-western population and its convenient location with reference to iron and coal have made it the greatest automobile centre of the country. Here have developed centres like Lansing, Flint, Pontiac, Jackson with specialization in the manufacture of motor vehicles, iron and steel, foundry products, machine tools, wire, paints and such other things directly or indirectly associated with automobile manufacturing.

(v) The Southern Lake Michigan District

This district includes the great industrial centre of Chicago with cities of Milwaukee, Gary and South-Bend. It has developed due to -

(a) easy access to iron-ore of the Upper Lake districts, and the coking coal of Ohio and Pennsylvania.

(b) proximity and access to the big and growing western interior market with excellent transport connections.

Here have developed iron and steel and its closely associated industries, e.g., foundry, railway car building, locomotive, equipments, farm machinery, electrical machinery, power engines, wire, motor vehicles and various other industries. Because of extensive agricultural hinterland Chicago has become the greatest meatpacking centre of the U.S.A.

Europe

The industrial heart of continental Europe occupies the west-central portion of the mainland, from the North Sea shores eastward to central Poland and from the Po valley northward to southern Sweden. This great territory contains most of the manufacturing plants of Europe. The area shows a strong correlation between high population density and manufacturing and between manufacturing and transportation. This part contains most of the large cities and leading ports of Europe. This region contains a highly productive farmlands and expansive stretches of forests. Among the many sub-regions, the Ruhr district of West Germany is the most promising industrial area of Europe.

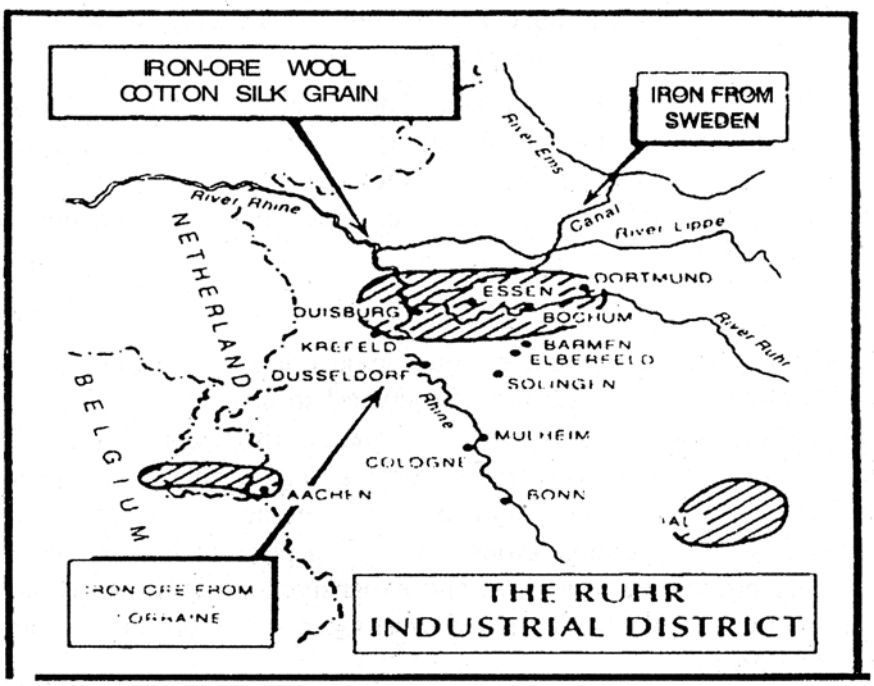
The Ruhr Industrial District

The Ruhr industrial district is an oblong area of land measuring 75 miles east west and 40 miles north south and containing more than a dozen of industrial cities. The position of the Ruhr relative to other countries and to different transportation routes is significant. The Rhine, the most heavily trafficked river in the world, flows along the Western end, which is only 10 miles from the Dutch border. Within the region, three small rivers flow into the Rhine. The region is served by efficient canal networks.

The Ruhr now the industrial core of Germany has grown up comparatively recently , within the past 100 years. Normally the Ruhr leads Europe in the production of coal and steel. It manufactures all kinds of metal products, from large machineries of knives and needles. It has also important textile and chemical industries.

The reasons for the growth of this area may be listed as :

1. The Ruhr basin contains the largest (coking) coal deposit in whole of Europe. It is of excellent quality and tremendous quantity.
2. The area lies in the heart of the great industrial concentration of Europe.
3. The perfect inland waterways presented by the Rhine system and canals, and a co-ordinated developed of other transportations systems,
4. The German skill and ingenuity.
5. Earlier capital from the traders of cologne.



Indeed, the keynote of industrial growth of the Ruhr region lies in its highly integrated and co-ordinated transportation arrangements with an excellent inland waterway system. Iron-ore is brought here from Sweden, Lorraine, Spain, Algeria, Tunisia and Austria. Cotton, wook, raw silk and grains are brought here from raw-materials relatively an easy task. The area is drained by the river Rhine and its tributaries, such as the Ruhr and Lippe. River, canals and railways supplement each other in the distribution of raw materials and manufactured goods. It has 3000 miles of railroad in every 100 square miles of area. There is hardly a factory which does not stand on some water channel. With the exception of Lorraine's iron-ore, all other heavy and bulky goods move principally by water. The Rhine is navigable by sea-going vessels even up to Cologne.

The main industrial area is to north of the Ruhr, stretching from Duisburg to Dortmund. Essen, Bochum Gelsenkirchen, Dortmund, Dusseldorf and Duisburg are all important steel centres having steel plants, heavy engineering and machine-building works. Solingen, Hagen and Remscheid are famous for cutlery and weapons. Barmen and Elberfeld are important textile centres, specially woolen. Krefeld has silk textile industry. With the by-products of coking industry and with local deposits of potash, chemical works and dye-stuff plants have developed in many towns of this area. The chemical industry is rather widely distributed here among larger cities like Duisburg and Dusseldorf.

During World War II, the allied military strategy was to pulverize the Ruhr. Al-

though recovery in the Ruhr was back to pre-war production levels; since then it has surged above them. This astonishing recovery epitomizes the ideal interplay of numerous geographic factors : Central location to large population, location atop a high-grade coal field, land for easy transportation, especially by rivers and canals, and nearness to the sea. Above all, Ruhr is peopled with an unusually energetic and ingenious folk. With such endowments, the Ruhn could hardly be repressed.

Soviet Union/CIS

The Socialist Revolution (1917) marked a turning point in Russian industry. Before that date the Russian economy was agrarian. An extremely high percentage of the workers were farmers and most farming was at a subsistence level. Victorious in their Revolution, the communist rulers formulated a long-range industrial strategy : first, to increase the role of manufacturing in the Russian economy, and second, to enlarge the role of steel and machinery industries within the industrial structure. These goals were eventually combined with goals for agriculture, mining, and all other phases of the economy in a series of five year plans. Locationally, there has been a pronounced shift to the east. Before the Revolution there was comparatively little manufacturing east of the Moscow area. Roughly 80 per cent of Soviet manufacturing takes place in European Russia and the Urals. There are several dispersed manufacturing regions like the Soviet European Industrial region consisting of Ukraine, Moscow-Tula-Gorki, Leningrad and Volgograd. Besides there are Urals, Kuznetsk, Tashkent, Caucasus etc.

The CIS is one of the mighty industrial power of the world. In 1995, industry contributed nearly 40 per cent of the gross national product in Russian Federation. Nearly 47 per cent of work forces in 1991 were engaged in manufacturing industry. Broadly speaking, the Soviet power resources and raw materials are rather widely scattered. But her policy was towards extreme concentration and to build up a few large-scale integrated plans for achieving lower operation cost even at the expense of higher transportation charges on fuel and raw materials. Transportation cost for long distance movement of coal, iron-ore and other raw materials was found too high. Therefore the Govt. had changed its subsequent plans and a policy of industrial dispersal has been followed with a view

1) to have fuller utilization of power resources and raw materials locally.
2) to save transportation cost by developing industries near sources of raw materials and power.
3) to promote a well-balanced industrial development throughout the country.
4) to have greater security in respect of strategic consideration.

Since then the extension of industries in the underdeveloped areas has been emphasized. Industries have been developed behind the Urals, in Siberia, in Central Asia, in the Far East and also in the Caucasus region. But till now industries have been more vigorously developed in the European part.

The Soviet European Industrial Region

The region is bounded by Leningrad, Kiev, Odessa, Rostov, Volgograd and Moscow. It includes some of the oldest and largest industrial areas of the Union. The following factors have helped the development of industries here.

(a) The area is near the great industrial countries of Europe and it had some manufacturing activities even before the coming of socialism.

(b) The huge coal reserve of the Donetz basin, the brown coal deposits of the Moscow basin and the giant hydroelectric installations on the Dnieper and Volga have been the principal sources of power.

(c) The region is rich with minerals and agricultural raw materials.

(d) This is the most densely populated part of the Union. More than half of her people live here.

(e) The rivers Volga, Don, Dnieper and the Black Sea together with a net-work of man-made canals, roads and railways have made the transportation easier. The entire region may be sub-divided into a number of important industrial areas. They are as described below.

(i) The South Ukraine

It includes the Donetz basin coal-field area, the Dnieper industrial area, Krivoi Rog and the north shore of the Black Sea. Coal of the Donetz basin, iron-ores of Krivoi Rog and Kerch, various other minerals and agricultural raw materials, splendid transportation facilities provided by the Black Sea, the Dnieper, Don and Volga and a dense population are the factors for the growth of industries in the southern Ukraine.

Iron and steel manufacturing is the principal industry of this area. It has developed remarkably in the Donetz basin towns, e.g., Donetsk, Kramatorsk, Voro-shilovgrad, Artemovsk, etc. It has also developed on iron-ore centres of Krivoi Rog and Kerch. Many steel plants have again developed on the Black sea coast.

Engineering industries have developed extensively throughout this area. Machines of every description are built up here. Voroshilovgrad and Donetsk specialize in locomotive building ; Kiev, Odessa and Rostov-on-Don in agricultural machineries. Due to cheap hydroelectricity from the Dnieper Dam, Zaporozhe has high-grade steel alloys, machine tools, ball bearings, tractors and aluminium manufacturings. A little away from this area towards north is the city of Kharkov with its highly developed engineering industries.

Chemical industry has developed here as an off-shoot of the coking coal industry in the Donetz basin. Deposits of salt have further helped its growth. Chemical fertilizer industry is important specially for beet cultivation in this area.

In Ukraine coal, metal and chemicals form, as it were, a single combine. It has also important sugar factories and cotton mills.

(ii) Moscow-Tula-Gorki

This area has developed around Moscow and is roughly bounded by Kalinin, Smolensk, Tula, Ryazan, Gorki and Yaroslavl. This is the most highly developed industrial area of the Soviet Union. It has developed not because of local raw materials but because of its central geographical position, transportation connections, dense population and skilled labour. The brown coal of the Moscow basin, coal from the Ukraine and oil from the Volga-Ural and Caucasus regions are utilized as sources of power. Additional power is also supplied from the gigantic hydro-electric installations to the south-east of Kuibyshev and Volgograd. The area has unique transport relations with different parts of the country. It is drained by the rivers Volga and Oker. About a dozen of railway lines radiates to different directions from Moscow. Moreover, it has extensive road and waterway connections. Numerous diversified industries have developed here among which steel milling, engineering, textiles and chemicals are the most prominent.

Steel mills : With the help of imported coke and local iron-ore and scrap, small and scattered steel plants have developed in Moscow, Tula, Gorki and Lipetsk. The local steel production can meet only a fraction of the local demand for engineering industries.

Engineering : This area is particularly remarkable for engineering industries. Production of machine tools, instruments, lathes, ball-bearings and various types of machines is carried on in Moscow and nearby towns. Automobile manufacturing is important in Moscow, Gorki and Yaroslavl; locomotive in Kolomna; railway coach building in Kalinin; and agricultural machines, synthetic rubber and auto-tyres in Yaroslavl.

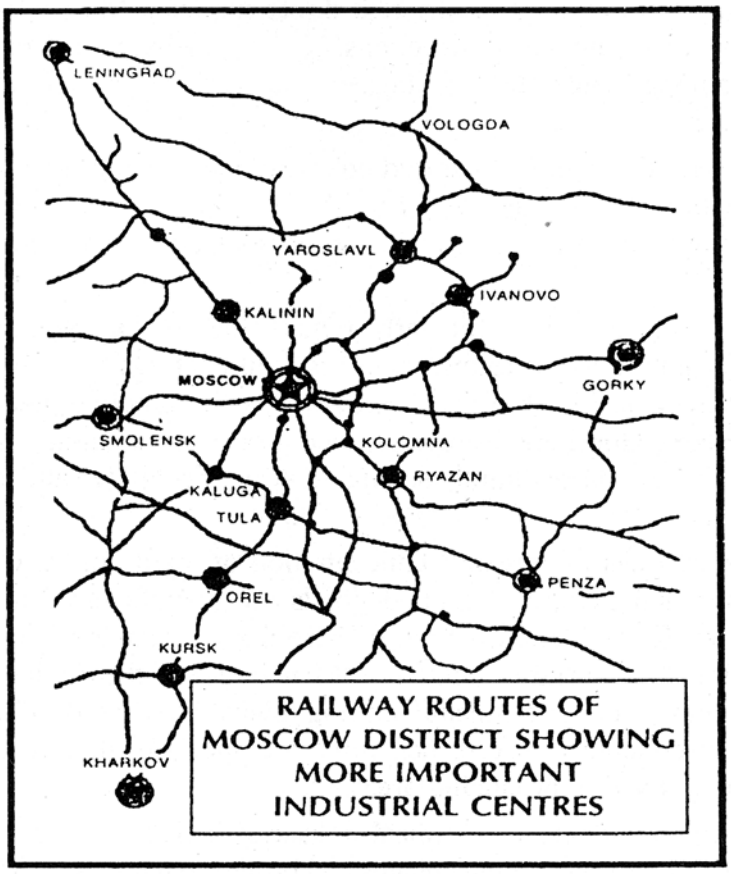
Textile : This area has the greatest concentration of textile mills. Cotton fabric, woolen, silk, linen and variety of knitted goods are manufactured here. Linen is available locally while raw cotton is brought here from central Asia. Ivanovo is the principal cotton mill centre and is called the 'Manchester of the Soviet Union'. It is surrounded by a number of cotton-manufacturing towns. Moscow itself is also a very important textile producing centre. Linen mills are specially important in Kalinin which is surrounded by flax producing areas.

Chemicals : A great variety of chemical industries including dyes and fertilizers have developed. Local deposits of phosphates and brown coal are used. Moscow is the most important centre of the chemical industry.

Manufacturing of rubber, leather-tanning, boot, shoe, starch and alcohol are other industries of this area.

(iii) Leningrad

It is the only permanent Russian port facing European countries. The city stands alone as an industrial giant surrounded by a vast hinterland scarcely having any manufacturing activities. Like Moscow, Leningrad also lacks local supplies of coal and raw materials. Indsutries have developed here due to its geographical position, transport connections and skilled labour. In technical efficiency Leningrad surpasses all other industrial areas of the country and this has been an important factor for its prominence. Local hydroelectric stations and coal from the Pechora valley supply the power. Machines, tools, ships, paper, textile and chemicals are the most important items of the country's ship-building, 50 per cent of electrical equipment and 35 per cent of paper are manufactured here. It has also fur, shoe, rayon and furniture industries. For paper and rayon industries, it obtains softwood from the northern forest and for engineering industry, it obtains steel from Ukraine.



RAILWAY ROUTES OF MOSCOW

(iv) Volgogad (the Volga Region)

Volgograd (the new name of Stalingrad) is a major industrial centre on the Volga.

It is situated in the heart of agricultural region. Industries are in the area of thirty miles up and down along the river Volga and they include metallurgical works, manufacturing of tractors, oil refining, ship-building, machine building and lumber yards. Coal and steel are obtained from the Donetz basin, and oil is obtained from Baku. From the northern forest timber is floated down the river Volga. Importance of this area has increased with the construction of Volga-Don Canal. Kuibyshev, Saratov, and .Voronezh are important riverside industrial towns of this area.

Asian Region Japan

To-day Japan is one of the highly industrialised countries of the world. Four major islands of the country are Hokkaido, Honshu, Shikoku and Kyushu, and including Ryuku the total area comes to about 3,71,857 sq. kms. Eighty-four per cent of her area is covered by hills and mountains. There are dangers of active volcanoes and devastating typhoons. Japan does not possess a strong resource base for manufacturing. She lacks minerals and raw materials. Her coal is non-coking. Iron-ores, copper, lead and zinc are inadequate as well as inferior in quality. Raw cotton and wool are totally absent. Yet the country is now world's third biggest producer of steel, largest producer of ships, second biggest producer of woolen fabrics and the foremost exporter of textiles. In fact, modern industrial development of Japan, in spite of her natural handicaps, is unprecedented. The country has recorded the highest rate of industrial growth in post-war period. Japan now dominates almost all key industries. At present 35% of the working people are engaged in manufacturing activities. In 1995, manufacturing in Japan contributed 38 per cent of the country's G.N.P.

The geographic location of the country, her long and indented coast-line, vigorous forests, fertile soils, rich and extensive fishing grounds have, however, created a natural environment favourable for economic progeress. The moderate climate with well-distributed rainfall has not only helped agriculture but has also presented in ideal condition for extensive development of hydro-electricity in this mountainous country. The manufacturing industries of Japan depend largely on imports of raw materials and exports of finished goods.

Japan is an outstanding example of a nation which has reached industrial eminence on the basis of cultural aptitudes. Japanese people are highly intelligent, skilful and hard-working. Quick adaptability to c' anging circumstances is their special characteristic.

Only with 16 per cent level land Japan has a prodigious population of 100 millions. Nowhere else on the earth surface can one find such incredible human density on arable and habitable plains. Japanese people with their inherent skill simplified the process of production, broke them up, where possible, to fit suitably with her traditional home workshop and small factories. Extensive development of hydro and thermal electricity has made the task easier. About 98 per cent of houses in Japan have

electric connections. Nearly half of her industrial workers are engaged in these small factories and home workshops which are now well-equipped with power-driven machines. Western-style large factories are found only in big cities and in the fields of steel, ship-building, heavy engineering, heavy chemicals and yarn spinning.

Thus, the introduction of modern system of production did not very much disturb the old organisational pattern and old social order of the country. She did not encounter the chaotic period of transition. This has led to lower labour cost and lesser labour disputes. Workers always try to up-keep the family tradition of efficiency.

The centralized and the decentralized sectors of industries always work in close cooperation. One is complementary to the other. Industrial organizers of Japan are more efficient and practical-minded. They are particularly keen about internal and external market demands. With a population of 100 millions, Japan has a fairly big internal market.

Being fully aware of country's economic position Government has always been helpful towards her commercial and industrial development. It is due to Government's effort that the country has attained to-day cent per cent literacy. Many of Japan's key industries have had their origins under Government ownerships. At present, though there is no state-owned factories, industries get patronage and backing from Government in the form of loans, export subsidies and technical counsel. In post-war period Government has brought rapid rate of progress by introducing plans and programmes.

In short, water power, human skill, government backing, coexistence of centralized and decentralized sectors and superior organizing ability are the principal factors behind Japan's industrial success.

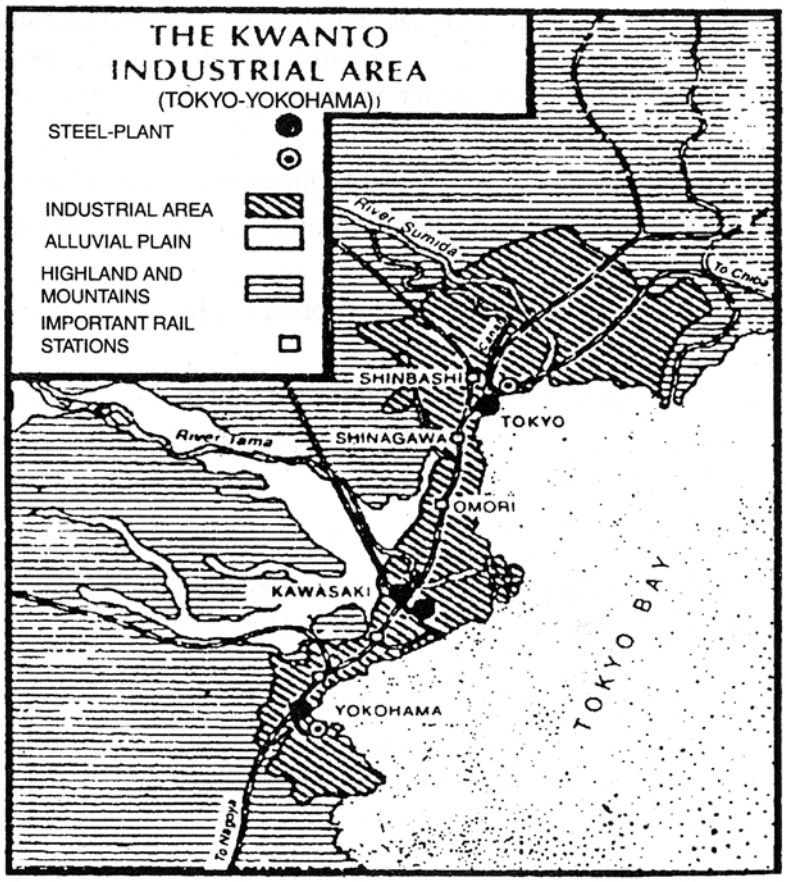
For years textiles were the most outstanding industry. In recent years steel mills, ship-building and chemicals have become more important.

The only industrial belt of the country runs through central Japan from Tokyo to northern Kyushu. It is about 700 miles long. Four industrial districts punctuate this industrial belt: e.g.

(1) The Kwanto Plain,
(2) The Kinki Plain,
(3) Nagoya and
(4) Northern Kyushu

The Tokyo-Yokohama Region or the Kwanto Plain : This industrial region covers the areas of two prefectures, namely Tokyo and Kanagawa. The entire region gradually developed taking base of two separate core, Tokyo on one hand and Yokohoma the other. The industrial boom of Japan and shortage of plane land forced the areas to merge with one another. Even in recent period, industry invaded into the neighbouring prefectures of Satima and Chiba.

At present, this area produces nearly 26 per cent of Japanese industrial products. At lest 25 per cent of the total working population in Japan are engaged in this industrial connurbation.



Inspite of heavy agglomeration of industries in Tokyo-Yokohoma area, a change of decentralization is discernible in the zone. At present, 5 out of 7 industries are selecting its location beyond Tokyo-Yokohoma region. The reasons liable for this decentralization trends are - (1) a heavy congestation in the area, which resulted escalation of land price, high wage rated labours, worn out condition of the old and outdated machinery etc. (2) high land value and shortage of land, (3) stiff competition etc.

In this famous industrial region, almost all types of industries are found. In Tokyo and adjacent territories of Yokohoma, Kawasaki, the major products are : iron and steel, refined oil, petro-chemical, heavy chemical, cement, footwear, toys etc.

The eastern Tokyo, where industry first flourished, is still producing the traditional items. But most of the production is on the cottage industry level.

Along the coast lines of Tokyo Bay, the heavy manufacturing industries are located. Due to growing shortage of space for the new industrial ventures, efforts are on to reclaim the lands from the sea. In the west of Tokyo, new industrial centres like Fugigawa and Zame were developed to meet the growing demand of industrial space. The oldest and most productive Tokyo-Yokohama industrial region possesses some distinct relative advantage over the other industrial regions of the country. These reason are :

(a) The rare flat lands of Kwanto region, unparallel in mountainous Japan.

(b) Wonderful communication network, through rail, road and water ways with the rest of Japan.

(c) Presence of coal resources in nearby Joban coalfield initially favoured the growth of the industry.

(d) The abundant supply of skilled labour at a much cheaper rate.

(e) Rugged mountain rivers provided water resources for industrial purpose and hydel power generation.

CHINA

China is gradually becoming one of the most dominant industrial powers in the world. In the year 1995, China produced 48 per cent of her GDP from industrial sector. During this year, China handled the trade of merchandise product worth $138,833 million import and $151,047 million of export.

The real development of industry in China began only after the installation of Communist rule in 1949. At present, (1990) 15 per cent of the labour force in China are engaged in manufacturing activities.

Chinese industrial system had gone through a complete transformation in last 50 years of Communist Rules. Old industrial policies were discarded and new policies were adopted States power is supervising industrial development of the country in a planned manner. Eradication of regional imbalance and dispersion of the industries were encouraged. Basic industries like iron-steel, chemicals, textiles were given priority.

On the basis of concentration of industries and their output, Chinese industrial regions may be sub-divided into following regions :

1. The Manchuria Region
2. The Yantze Valley Region
3. The North China Region
4. The South China Region
5. Other Regions.

The Manchuria Industrial Region— Even prior to Communist regime, Manchu-

ria developed as a industrial region. Several factors were responsible for the growth of this region. These were, developed agricultural hinterland, good transportation network, skilled labour local capital and Japanese participation.

The setting up of Anshan steel plant in 1917 initially boosted the industrial growth. The Penki, Kungyuan, Heilungkiang, Kirin, Linkow steel plants were gradually established. During 1960, Manchuria was able to contribute half of the Chinese iron-steel production. For availability of Fushun, Pehpiao coal, Penki, Kungchuling iron ore, not only iron and steel industry, several other metallurgical industries like machine building and heavy engineering industries were set up in Mukden, Harbin, Fushun and Dairen.

Besides, ferrous industries, heavy chemical plants were also developed in Manchuria.

INDIA

Since independence (1947), India has gradually emerged as a moderately industrialized nation. In some fields of manufacturing activity, Indian advancement is really spectacular. It is now considered as one of the leading industrialized country in the world.

In 1995, industry contributed 29 per cent of the Gross Domestic Product. In 1980-81, 13 per cent of the total labour force were engaged in industry, which slightly increased to 16 per cent in 1990-91.

Spatially, Indian manufacturing establishments are mal-distributed. Some states are having very high concentration, while other regions are devoid of industries. It has been observed that regions situated in the plain, fertile lands and colonial heritage are historically having sound industrial base. Due to the failure of new centres to complete with old traditional centres, almost a status quo is maintained even today. Of late, some new industrial centres were evolved, specially around the steel cities.

Among the states, Maharashtra contributes largest amount of industrial products, followed by Gujarat, Tamil Nadu, West Bengal, Uttar Pradesh, Bihar, Karnataka etc.

According to the regional concentration of industries, Indian manufacturing regions may be sub-divided into six broad regions. These six regions are :

1. The Calcutta Conurbation.
2. The Bombay-Poona Megalopolis.
3. The Ahmedabad-Vadodara Region.
4. The Southern Industrial Region.
5. The Damodar Valley Region.
6. The Capital Regions.

1. The Calcutta Conurbation— Broadly, a narrow strip running from Banshberia

and Naihati in the north to Budge Budge and Uluberia in the south along the river Hooghly may be taken as the demarcating line of this oldest and vast industrial region in India. Several suburban and satellite townships were developed within this region. Notable among these are Howrah, Liluah, Bally, Uttarpara, Hind Motor, Konnagar, Rishra, Srirampur, Chandannagar, Bandel, Uluberia in the western bank and Budge Budge, Birlapur, Dum Dum, Belghoria, Sodepur, Titagarh, barrackpur, Shyamnagar, Naihati in the eastern bank of river Hooghly..

The major industries located in this region are jute mills, cotton textiles, chemicals, drugs and pharmaceuticals, engineering, machine tools, automobiles, tobacco, food processing, eather, fabrication, paper, match, etc.

Several factors proved to be advantageous for the growth of these industrial regions. These were : (1) The port facilities of Calcutta, (2) Calcutta was then the seat of administration and capital of imperialist power. (3) Good transportation, through rail, road and water ways. (4) The proximity of the region towards mineral belts of Chotanagpur plateau. (5) Large market within Calcutta metropolis. (6) Extensive hinterland over eastern India. (7) Development of science and technology in renaissance period. (8) Cheap, available labour force from adjoining Bihar, Uttar Pradesh. (9) Enterpreneurial ability of the foreign and national bourgeoisie etc.

2. The Bombay-Poona Megalopolis— This region stretches from Bombay metropolis to Poona in the south. Major indusrial centres are Andheri. Belapur, Thane, Kalyan, Pimpri and Poona. This is the biggest industrial agglomeration in India. The major manufacturing items produced here are : Textile, drugs and pharmaceuticals, chemical, petro-chemical, paper, leather engineering, fertilizer and precision instruments.

The major factors responsible for the growth of this industrial region were (1) Development and growth of Bombay port (2) Development of communication system through rail and road. (3) Vast hinterland. (4) Managerial and entrepreneurship ability of Parsee Bhatia people. (5) Huge capital from foreign and indigenous source. (6) Development of science and technology in the region. (7) Cheap power resources. (8) Cheap labour from Konakan and other regions etc.

3. The Ahmedabad-Vadodara Region— Due to growing congestion and related problems, cotton textile industry gradually shifted from Bombay and grew in this region. Later on numerous other industries like petrochemical, chemical, fertilizer and engineering factories were evolved. The other centres of manufacturing industries are Varuch, Surat, Kalol etc. Exploration of petroleum in this region gives it a distinct advantage. This is one of the highly growing industrial regions in India.

4. The Southern Industrial Region— The extensive industrial region of South India is popularly known as Madras-Combatore-Bangalore region. This is also an old region.

The major products of the region are textile, sugar, engineering, refinery, chemical, drugs and pharmaceuticals, automobiles, fertilizer etc. The reasons for the development of the region are (1) The facilities of export-import through Madras Port, (2) Easy communications through rail and road, (3) Large hinterland etc.

5. The Damodar Valley Region— The mineral-rich area of Chotannagpur area is now one of the most developed industrial region in India. The availability of local coal, iron ore, bauxite, limestone, manganese, mica and other minerals, attracted a large number of minerals based industries. Besides mineral, proximity to Calcutta market, cheap labour and high demand also facilitated the development.

The major industrial areas are steel cities of Jamshedpur, Durgapur, Bokaro, Burnpur, Hirapur, Kulti, Asansol; coal centres like Raniganj, Jharia, Dhanbad and township Ranchi etc.

Apart from iron-steel, heavy engineering, metallurgical, glass, ceramics, machine tools, alloy steel, agricultural machinery, etc. are produced in this region.

6. The Capital Regions— Adjacent to the Delhi metropolitan area, several industrial establishments developed. This' is the new industrial area, compared to the others. The major centres of production are Faridabad, Gaziabad, Mathura, Saharanpur etc.

The major products of the region are textile, engineering, leather, drugs and pharmaceutical, petroleum refinery, toilet and cosmetic products, detergents etc.

Other Regions— Besides these major industrial regions, numerous isolated industrial centres have developed in India. Among these Kanpur, Lucknow, Meerut, Allahabad, Varanasi, Jalandhar, Patiala, Jaipur, Bilaspur, Cuttack, Bhubaneswar, Hyderabad, Trivandrum, Alleppe, Quilon etc. are important.

Besides these major industrial regions, there are some isolated and scattered indsurial centres in Asia. Among these notable are Seoul, Chongtu, Taejon, Taegu, Pohang, Ulsal and Kwangju in South Korea, small islands like Hong Kong and Singapore are important. Of the smaller centres Karachi in Pakistan, Kualalampur in Malaysia and Kuwait are important.

UNIT 4 ❑ TRANSPORTATION—MODES OF TRANSPORT

Structure

4.1 INTRODUCTION

Transportation is the movement of goods and people from place to place. Communication, the movement of ideas from place to place, is also a type of transportation.

From the standpoint of value, there are two types of transportation. The first is economic transportation by which goods and people are carried for the purpose of economic profit. Such transportation is a change in place utility - the value of commodity is worth more after it has been transported from region of production to that of consumption. Transportation accounts for increase in value by moving commodities to location of demand.

Non-economic transportation includes all movements which are carried on for some purpose other than economic profit. Recreational travel and military logistics are two examples.

The significance of transportation in economic geography cannot be overemphasized. In its own right transportation is an important geographic element - a spatial variable by which regions can be delimited and their characteristics studied and in terms of which relationships can be analysed, such as relationships among route location, traffic flow and other phenomena. In addition, organized transportation is a geographic factor - an influence on the location of other economic activities. Without means of transport there would be no commercial coal mining, no commercial surplus production and no commercial lumbering or fishing. In fact, without

commercial transportation, the world's economy would remain at a subsistence level and regional specialization yielding exchangeable surpluses would be impossible.

Transportation involves two aspects : (a) a vehicle or unit of conveyance & (b) a medium upon which to move. The form of one transport mode differs from that of another because of the technological differences between them. The necessary requirements of any mode of transport are : (1) route, (2) vehicle, (3) motive power and (4) terminal.

Route :

All modes of transport require some form of route, the way, course or track on which to operate. Both roads and railways, the basic forms of land transport cannot take place without the construction of suitable route ways. Rail transport requires a more specific route in the form of a special track and other operational infrastructure like signalling equipments etc. Sea and air transport are free from construction of route ways and can be operated in a natural environment. The inland water transport requires the construction of canals. The construction of pipelines involves heavy initial investment and maintenance.

Vehicle :

There is a requirement for the conveyance of persons or goods by any means of transport. As a result of man's increased technological knowledge and expertise and his demand for increased speed and improved carrying capacity, there is an ever-increasing complexity in the character of the vehicles. The animal driven vehicles are still popular, so is the bicycle. The auto vehicles have now become an intetral part of our transport system. The railway locomotive, ships and aeroplanes are the principal vehicles serving the entire world community. There is a variation in the carrying capacity of different vehicles.

Motive power:

Motive power is necessary to drive the vehicle. There are two main sources of power for transport : coal and oil. The invention of steam engine and the harnessing of stream power affect the forms of transport to a great extent. With this development transport became available on a mass basis. The air transport is exclusively based on oil products for their source of power. The use of electric driven engines in railways has enhanced the speed. The cost of motive power is a determining factor for the user. Air transport is the most expensive of all forms of transport.

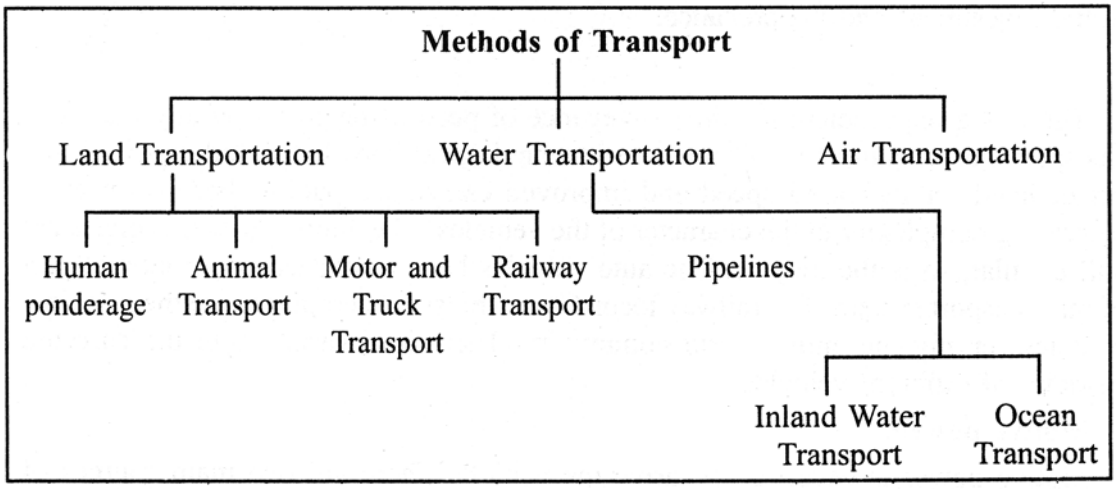
Terminal:

The terminal provides access to the transport route or network. It is also a point to which motion ends. In rail transport, the terminus is the station at the end of the line. For bus, the bus stop is the terminal. The terminals are designed according to the mode of transport, their location, capacity and importance in relation to overall

transport network. The sea terminals are very complex. They are ports with their docks, wharves, warehouses, custom offices etc. For air terminals, there are arrangements for the take off and landing of aircraft.

4.2 MEANS AND MODES OF TRANSPORT

Modes and means are interrelated and integral part of any transport system. Transportation can be classified on the basis of power, route and vehicles. On the basis of power, the significant categories are (i) man and animal power used as a force in transportation; (ii) mechanical power in the form of force driving automobilies, trains, ships, aeroplanes etc. and (iii) physical power like wind or running water facilitating movement of goods. The classification on the basis of nature of routs are (i) the land routes including transportation by path or track, road, rail and pipeline, (ii) water routes including inland and oceanic routes and (iii) air routes. Similarly, according to mode of transport, it can be classified into (i) man and animal, (ii) wheeled vehicles driven either by man or animal, (iii) automobiles, (iv) railways and (v) ship or plane.



Roads :

A road is a symbol of motion. In the reconstruction of a region, roads play a positive role. Roads are the veins and arteries of a country through which every improvement circulates. No other form of transport is able to provide such a comprehensive door-to-door or origin-to-destination service nor does any other mode have such an extensive route network. Road transport also provides a feeder or connection with other modes. Road transport is important for its flexibility. Motor vehicles can supply services over public highways on even or uneven terrain or on poor roads. Traffic in "smalls" can be sent daily and easily by road service, for example milk, eggs, vegetables etc. Now every country of the world is having a dense network of roads. The efficiency of a road depends on is maintaining a surface on which wheels will run without obstruction. The

relative cost of road as compared with rail transport depends on - (i) the length of the haul, (ii) possibility of obtaining return loads, (iii) the liability of the goods carried to damage or pilferage, (iv) the class of commodity to be transported, (v) the volume of traffic offering and (vi) the service rendered. In the present state of economy, roads are most suitable means of transport.

Railways :

Railways is a product of the Industrial Revolution and afterwards become a predominant mode of inland transport. Railways solved two important needs : (i) the economic carriage by land of materials in bulk and bulky commodities and (ii) the relatively rapid movement of large numbers of people and goods. The rails always revolve around its fixed track. This provides guidance for the wheels and also enables very heavy loads to be carried. There are national and international railways. Some intercontinental railways are also in function. The trains are powered either by diesel oil or electricity. In recent years, in order to achieve increased speeds, a continuous welded track has replaced the traditional rails. The design of carriage units has promoted a better ride for passengers. The main advantage of rail is the movement heavy, bulky goods, mineral ores etc. Because of heavy capital investment, the railway must be used up to capacity. Capacity depends on a combination of train load, average speed and the frequency of the service.

Ocean Transport :

The sea offers a ready-made carriageway for ships which requires no maintenance. Ships can travel within a limited numbers of constraints. Because of floatability and reduced friction, ocean vessels are capable of carrying far greater loads and weights than can be handled by train. Ships try to keep certain lanes because of (i) physical conditions and (ii) economic considerations. The Suez and Panama canals have revolutionized the pattern of sea trade. The Red Sea-Suez-Mediterranean route has become the most important in the world. Ocean shipping has now become a landmark in heavy load transportation between all parts of the world.

Inland waterways :

Inland movement by water is undertaken by either natural waterways (rivers) or artificial waterways (canals). Such movement is governed by depth, width and direction of waterways and by such physical impediments as rapids, waterfalls, swiftness of flow and seasonal freezing. The principal disadvantages of inland waterways are (i) rivers may involve devious journeys and may flow in the wrong direction; (ii) navigable rivers may be interrupted by falls or rapids; (iii) change in river levels and winter freezing may cause discontinued services; and (iv) canal construction involves heavy capital investment and regular maintenance. Six major navigable systems of inland waterways are - the rivers of the western and central Europe, the Volga-Don system, the North American rives, the Amazon system, the Panama-Paraguay system and the Chinese waterways.

Airways :

Air communication belongs to the twentieth century. Air routes are theoretical and aircrafts are not tied to the surface. All transport is controlled by terminals and prevailing weather conditions. Air routes are determined by : (i) adequate ground facilities for operation: and (ii) availability of traffic for economic working. Air transport is still very costly and this limits its use. It is best suited for the carnage of commodities which are low in bulk but high in value. Air services are of two main kinds : (i) short-distance services operating within a country, called domestic services; (ii) long-distance services like trans-continental and trans-oceanic flights, called international services. There is a world wide network of air routes providing very good and speedy transport services.

Pipelines :

A pipeline is a line or conduit of pipe of variable diameter and length and traditionally used for carrying liquid or gas from a point of supply to a point of consumption. The first successful pipeline made of cost iron was laid down in Pennsylvania (USA) in 1865. Today nearly half a million kilometers of oil pipeline exist in the world together with a small distance of natural gas pipeline. Pipelines require maintenance against external rusting and internal corrosion. Pipelines are used for transporting - (i) liquids and gases; (ii) solids in suspension; (iii) solids by pneumatic pressure and (iv) materials enclosed in capsules.

4.3 TRANSPORT COST :

In dealing with transport costs distinction must be made between private costs and social costs. Private costs are the costs incurred by the individual or transport operator in providing a particular service. Social costs are the costs imposed on society as a whole through an individual making a trip or a transport operator providing a service. These costs are not paid for by the user - social costs are incurred as a result of external effects of the transport activity.

Private transport costs are made up of three elements—

(i) Track costs— of providing and maintaining a surface cover which transport services can opeate;

(ii) Running costs— the cost of purchasing, maintaining and operating a vehicle to run on the track surface;

(iii) Interchange costs— the cost of providing facilities at the beginning and completion of a journey.

The two broad categories of transport costs are (1) Fixed costs or Inescapable costs and (2) Variable costs or Escapable costs.

Fixed costs : These are costs which are incurred before any traffic at all passes.

They include the costs : (i) of providing the infrastructure (i.e., the roads, the port or the railway line); (ii) of providing, equipping and staffing the terminal facilities (i.e., bus depots, railway stations or airports); (iii) of providing managerial, administrative and maintenance staff and their offices and workshops. These costs are inescapable because they can not be avoided except by abandoning the whole operation. They also do not vary with the level of traffic, but remain independent of it. A railway signal-box must be manned (and thus incurs wage costs) whether there is one train or six trains per hour over the lines.

Variable Cost : These are costs incurred by the actual movement of traffic and they vary with the level of the traffic passing. They include the cost of fuel, crew wages and the maintenance of vehicles. For example, the replacement of worn bus tyres or routine inspection of an aircraft after a flight. They are called escapable because they can be avoided or escaped by not running a particular train, suspending a particular flight or a private motorist leaving his car in the garage and walking to the office/shops.

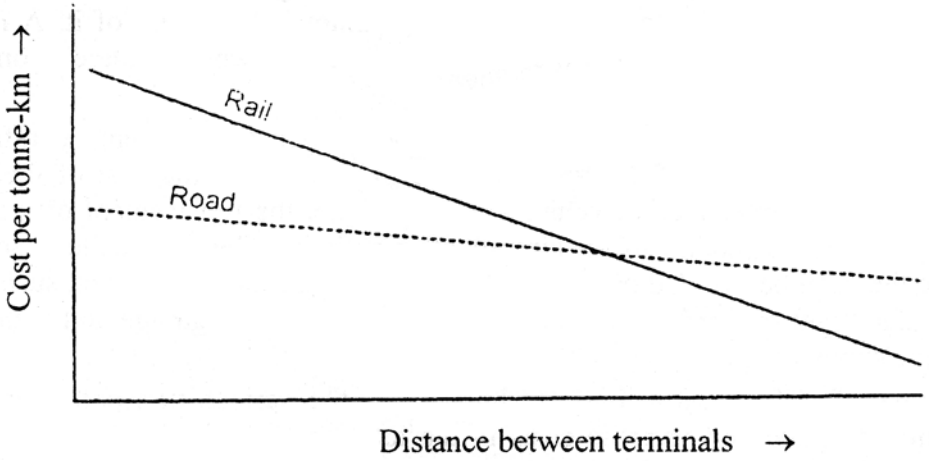
Because of differences in basic technology of the various transport modes, the proportion of fixed and variable costs in the total costs varies between the nodes. 44% of railway costs are fixed and 56% variable. In contrast, road transport is characterized by a much lower proportion of fixed costs in its total costs (which may be higher, equal to or lower than rail costs in a given situation). On average 22% of road haulage costs are fixed and 78% are available. The identification of fixed and variable cost for the main modes of transport is shown in the table below -

Fixed and Variable Costs of the Main Modes of Transport

Mode	Fixed Costs	Variables Costs
Private car	Insurance, road fund tax, depreciation, interest	Petrol, oil, vehicle maintenance and tyres.
Public Service vehicle	Administrative and workshop overheads, depreciation, interest, insurance and licences	Fuel oil, lubricants, maintenance and cleaning labour costs.
Rail	Track, administrative and technical overheads, terminal costs, depreciation and interest	Fuel, vehicle servicing and maintenance, labour costs.
Air	Terminal and engineering overheads, insurance, depreciation and interest, central administration	Fuel, landing fees, certain servicing costs and labour costs.
Sea	Terminal and engineering overheads, insurance, depreciation and interest	Fuel and oil, in- voyage maintenance, crew costs and expenses

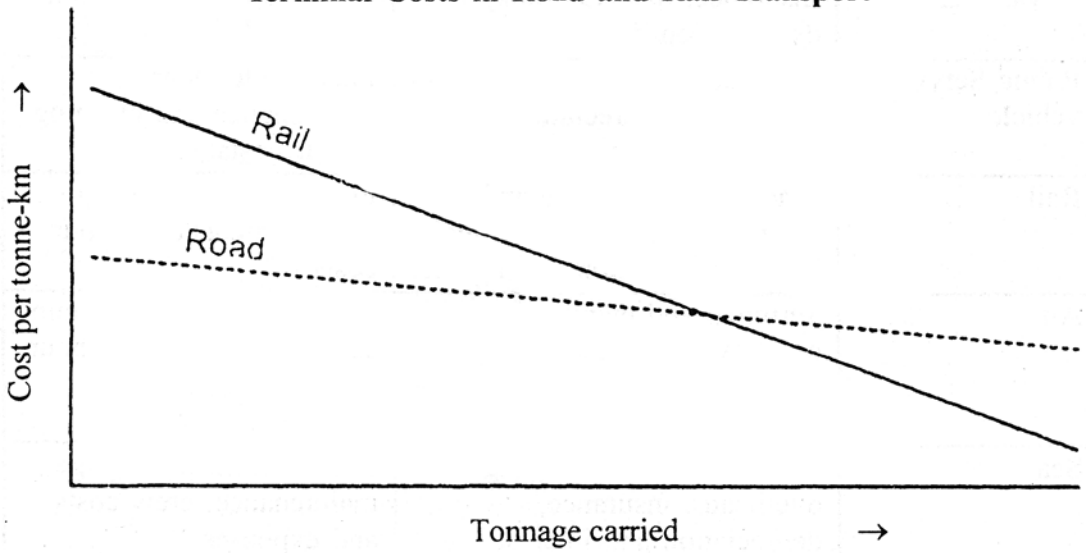
The transport costs per unit varies with the increase in traffic, it falls off rapidly in case of rail than road. If traffic is light, unit costs of rail are definitely high, but if flows are very heavy, unit costs are greatly reduced and rail becomes very competitive.

Unit Costs in Road and Rail Transport



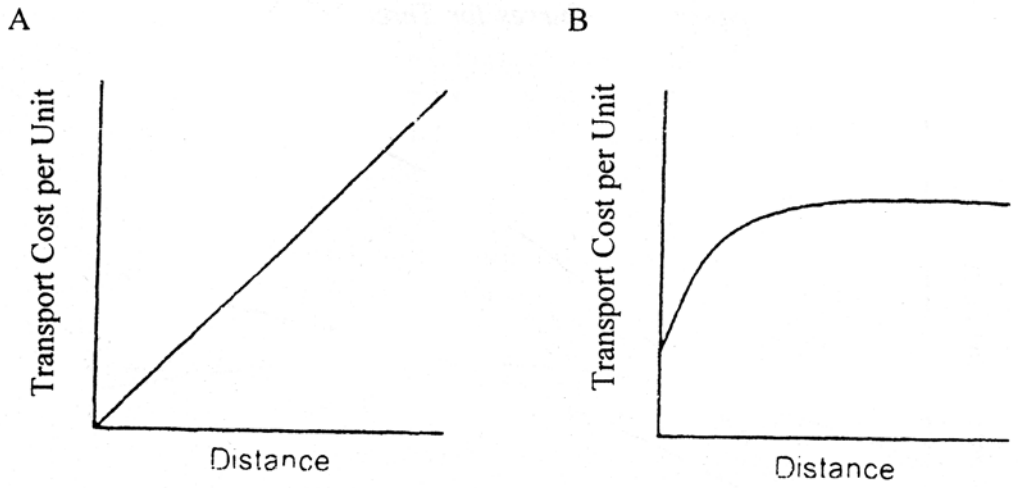
All transport operation also give rise to terminal costs and line haul (over the road) costs. Terminal costs are those associated with loading and unloading the commodities and the accompanying paperwork. The terminal costs are both fixed and variable. The proportion of terminal costs in the total costs varies between modes. In road haulage the terminal costs can be negligible. On the other hand, to send goods by rail may entail conveying them by lorry or truck from factory to goods depot, loading them into wagons and reversing the process at the other end.

Terminal Costs in Road and Rail Transport



The transport costs are also proportional to distance. Each additional unit of distance adds an equal increment of cost to total transportation costs as shown in the figure below -

Transport Cost Curves (A) Proportion to distance;
(B) Less than proportion to distance



Marginal and Average Costs : Marginal cost is the additional cost incurred in order to produce one more unit of output. Marginal cost may be incurred by carrying an extra passenger on a bus with seats to spare or another tonne of goods on a half empty lorry or of a wagon on a freight train. It may even mean allow 25 trains in a day instead of 20. Marginal costs are therefore time linked and it may be of short-run or long-run nature. It does not represent constant additional to total costs. Upto the capacity of the transport unit or transport mode (bus, aircraft, train, ship), any further increase in traffic incurs negligible marginal costs. Then there is a sharp increase at the point, where a second unit becomes necessary. Marginal costs do vary between modes of transport.

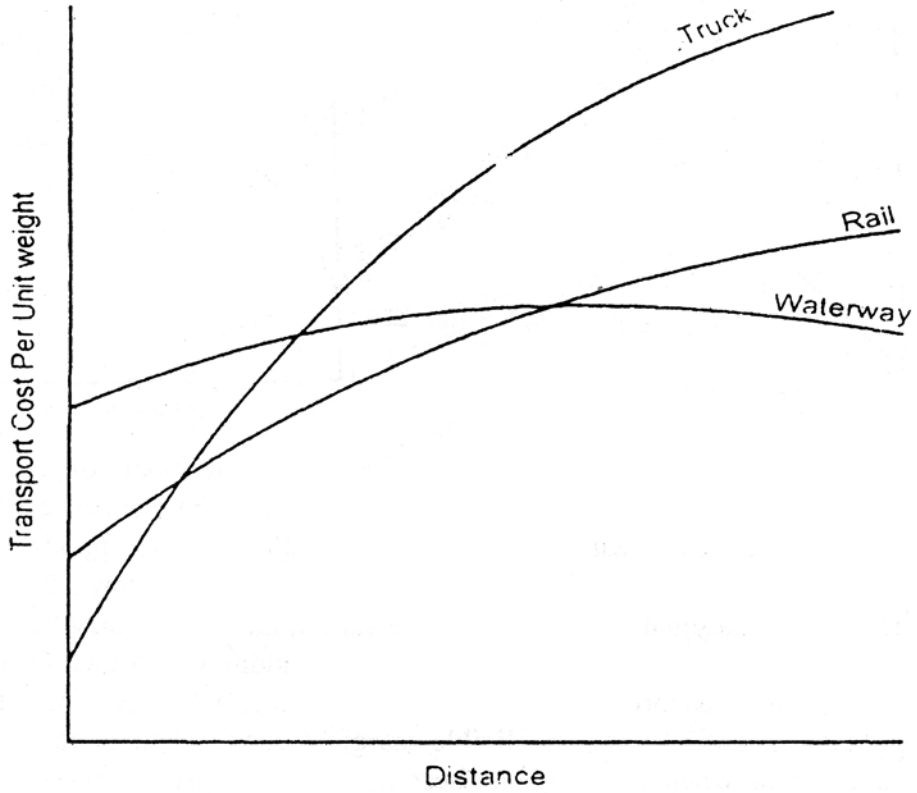
Average costs are obtained by dividing the total costs of the operation by the work done, expressed in terms of passenger-km, tonne-km or transport-unit-km. Average costs will of course vary with output, for greater the product the more the fixed costs can be spread.

4.4 COMPARATIVE COST ADVANTAGE :

Two factors influence the rate difference for alternative transport modes; terminal costs and line haul (or over-the-road) costs. These costs of course vary with the type of commodity being moved. But it is also possible to generalize about the level of

terminal costs by mode of transportation. Comparing water, truck and rail, terminal costs for water transport are obviously highest because of the expense of developing and maintaining a harbour and the cost of labour and equipment for the loading and unloading operations. The cost of loading a truck is not very great and involves much less costly equipment than the other modes. This leaves rail terminal costs somewhere between water and truck.

Idealised Transport Cost Curves for Three Transport Mode



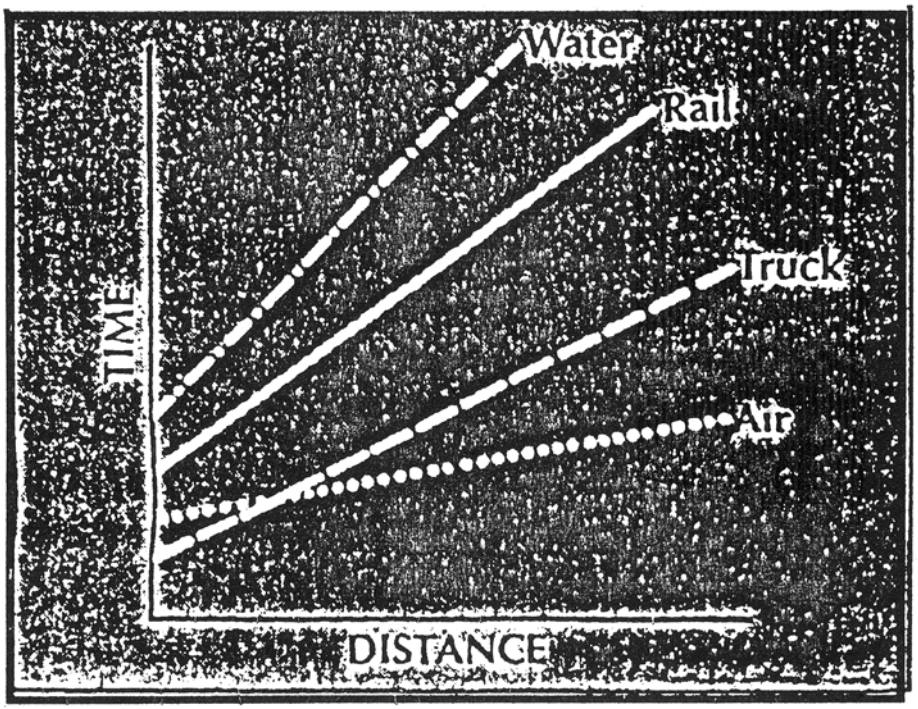
The variable form of the relationship between movement costs and intervening distance is very interesting. The tapering off of movement costs with distance varies from one transportation medium to another. In general the taper is more marked in those media which incur heavy handling costs at points of origin and destination. A rail road, for example, must collect the freight on a truck, transport it to the railroad, unload it on to a flat car, move it to its railroad destination, unload it again, and then transfer it by truck to its ultimate destianation. By comparison, the handling costs incurred by a truck company are minimal.

Clearly, over a short distance, truck transportation of commodities is cheap, and this is reflected in the prices offered to the customer. For longer distances, however,

railroad transportation is cheaper per unit of distance travelled. For still longer distances water transportation comes into its own. In a sense, therefore this cost structure preserves a certain complementarity among the different media, with the trucking companies feeding goods over short distances to railheads where they will be transferred over longer distances for possible oceanic shipment overseas or to another point in the nation.

Line-haul costs, in contrast to terminal costs, vary with distance; but, because of the tapering effect already discussed, they are not linearly related to mileage. Water movement is invariably the least expensive whereas over-the-road operating costs are highest for truck. Once again, rail transport falls in between. Looking at the distances at which each of the three modes are most competitive, it is seen that truck transportation, owing to low terminal costs, is the lowest cost mode at short distances. Beyond cetain distances, water is the most economical form of transport and it is, of course, the dominant mode in world trade.

The freight rate is only one factor a shipper must consider in choosing among alternative transport modes. Another equally important factor is service. Transportation service implies a great many things, including speed of delivery, scheduling convenience, avoidance of damage and reliability. The figure below illustrates how four modes, with air cargo now added, stack up, on the average, with respect to speed of service, probably the most important service consideration. Loading time is indi-



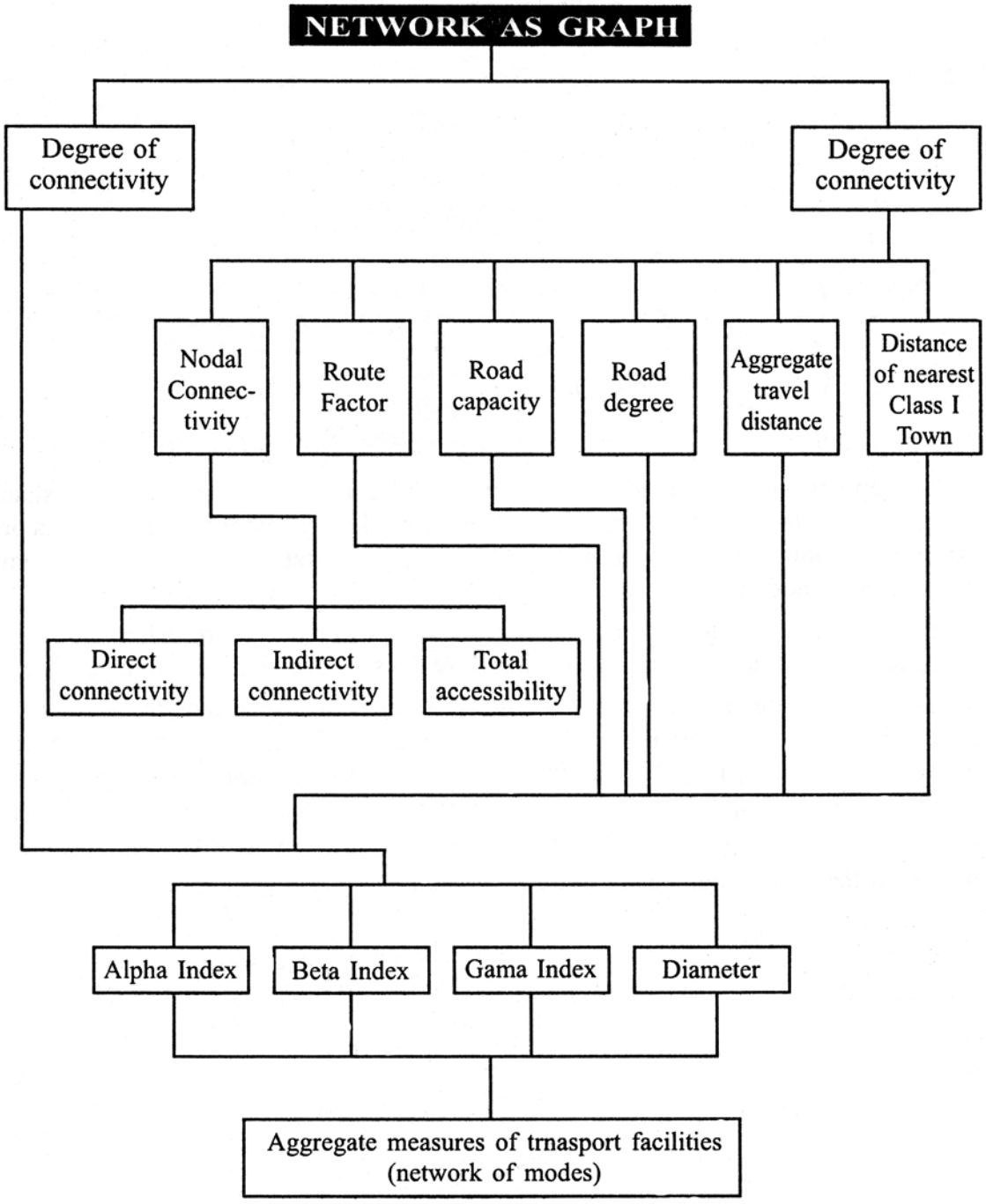
cated where the respective lines meet the vertical axis. The lines themselves show total delivery time as it increases over distance. Loading time is highest for ocean shipping, followed by rail, air and truck. Movement time as opposed to loading time, naturally favours air by a sizable margin. Water and rail again are slow in moving freight whereas truck service is, by contrast, fast.

All in all. the mode possessing the greatest advantages, considering both cost and service, is the motor truck. Air shipments occur primarily as emergency services. For example, when an auto assembly plant is running short of fenders, it is willing to pay the high air-transport cost to avoid the significantly higher cost of shuttling down the plant for lack of parts. High value goods per unit of weight may be sent with air freight when speed of delivery is of primary importance. Cut flowers for example are being flown in daily from the Netherlands and Colombia to several metropolitan areas in the United States. Rail and water transport compete for long distance movement of bulky items (low in value per unit of weight) for which speed of delivery is not particularly crucial. The railroad's advantage over water movement is in its more articulated network, which serves more areas and in its somewhat greater speed of delivery. Pipeline transport is however, closely associated both functionally and financially with the petroleum industry.

Every transportation network has an areal arrangement or layout, known as its spatial pattern. Such a pattern may be referred to as a spatial structure. By studying a network's structure or pattern of routes, one can gain much insight into the economic geography of the area the network serves. Although no two transport networks are exactly alike in spatial arrangement, there are similarities in structure that reflect the function the networks serve. Three basic measures of a network's spatial structure are important in the location of economic activity. They are accessibility, connectivity and circuity.

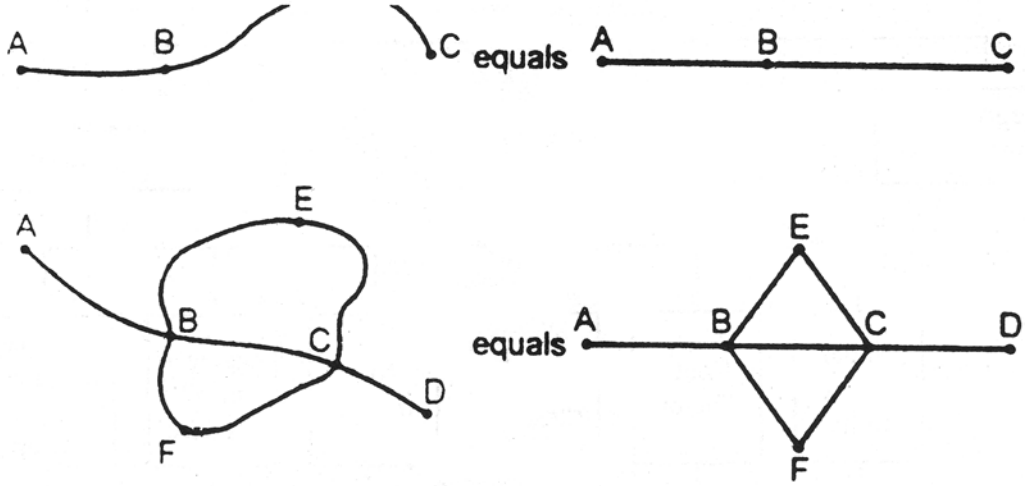
The analysis of transport network is based on graph theory. The network of transport in an area is very important from the point of view of human interaction and is an important indicator of the level of its development. Application of graph theory in the analysis of transportation network has been attempted by many authors, namely Eular in 1736, Konig in 1936, Robinson & Bainford in 1978.

The regional transport network analysis is done by developing topological map. A topological map or graph reduces a transport network to its simplest form. In such a map the line patterns or networks are described in terms of their topological characteristics. They are dependent upon continuity, relative locations and systematiza-



tion of lines and junctions. The figure below depicts topological transformation of actual routes. It provides a basis for the measures of the structural properties of the transportation system.

Topological Equivalence



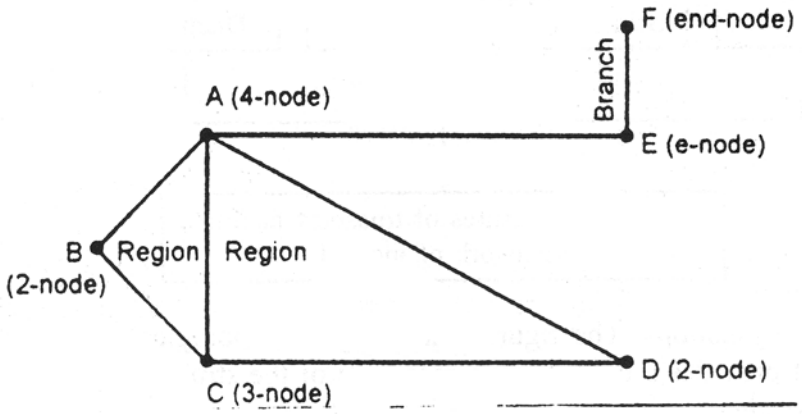
In a topological map, the following elements have been identified, which translate the observed relationships of networks into numerical and symbolic form. Vertices or nodes - The points which form the basic elements of a graph are commonly known as vertices or nodes.

Edges or links - The lines connecting the vertices or nodes are called edges or links. Regions or faces - The areas enclosed by lines are referred as regions or faces.

Nodes are located at the junctions of two or more areas. According to the number of junctions affected, they are termed 2nd node, 3rd node etc. where a node occurs at the end of an arc, i.e., at a terminus, it is called an end-node.

Arcs are lines, representing routes, which link nodes. One arc only may link two nodes. An arc leading to an end-node is termed a branch. A path is a collection of routes. In the above figure ABCD forms a path.

Network Diagram



Circuits are formed by a closed path. In the above figure ABCDA & ACDA are circuits. A circuit which does not contain any other circuits is called a fundamental circuit (ABC A or ACDA). It is different from ABCDA which is made up of two other circuits.

A region or a face is an area bounded by a fundamental circuit thus in the figure above, there are two regions.

A network is said to be connected when it is possible to reach a vertex from any other vertex by following the lines or the edges connecting the different vertices. Otherwise, the graph is considered to be unconnected.

4.5 CONNECTIVITY AND ITS MEASUREMENT

'The connectivity of a network may be defined as the degree of completeness of the links between nodes" (Robinson and Bamford, 1978). It is indicative of the complexity of the spatial order that imposes on the region it serves. The greater the degree of connectivity, the more efficient is the network system.

K.J. Kansky (1963) has studied the structure of transportation networks, developed several descriptive indices for measuring the connectivity of networks, i.e. alpha, beta, gamma indices and cyclomatic number.

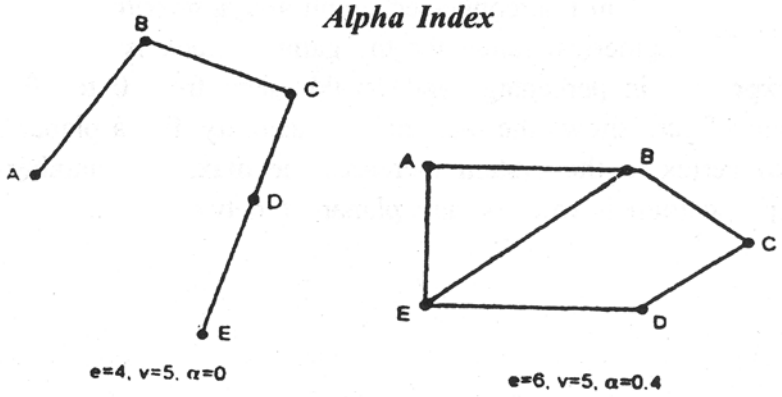
Alpha Index

One of the most useful measure of the connectivity of a network is the alpha index (a). The alpha index may be defined as

$$\alpha = \frac{\text{actual circuits}}{\text{maximum circuits}} \text{ or } \alpha = \frac{e - v|+1}{2v - 5}$$

where e is the number of edges, v is the number of vertices. The alpha index gives the range values from 0 to 1, that is from 0 to 100 per cent. The higher the index, the greater is the degree of connectivity in the network. The figure below shows two networks having the same number of vertices (5) but different structures. In the case of first network, the alpha index is zero (0) and in the second network, it is 2/5 = 0.40.

Alpha Index



e=4, v=5, α=0 e=6, v=5, α=0.4

Beta Index :

The beta index (P) is a very simple measure of connectivity. It is calculated by dividing the total number of edges or arcs in a network by the total number of nodes.

Thus.

$$\beta = \frac{\text{area}}{\text{nodes}} \text{ or } \beta = \frac{e}{v}$$

The beta index ranges from 0.0 for networks, which consist of nodes with no arcs, through 1.0 and greater where networks are well connected. The beta index will give a measure of connectivity regardless of the size of the area involved. Some characteristics of p index are -

(i) β value for tree types of structures and disconnected networks would always be less than 1. It would be zero (0) when there are no edges in the network,

(ii) β value for any network structure with one circuit would always be zero (0).

(iii) β value exceeds 1 for a complicated network structure having more than one circuit.

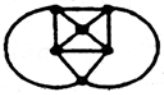
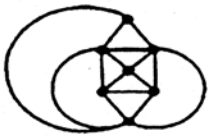
Gamma Index

The gamma index (y) is a ratio between the observed number of edges and vertices of a given transportation network. For a non-planar graph, the gamma index has been defined as :

$$\gamma = \frac{e}{3(v-2)}$$

Network connectivity as measured by gamma index, indicates the degree by which the network deviates from an interconnected graph and approximates in maximally connected graph. The numerical range for the gamma index is between 0 and 1. This may be expressed in percentage and would range from 0 to 100 per cent. The accompanying figure shows the maximal connectivity. For a planar graph, the addition of each vertex to the system increases the maximum number of edges by three. This proposition is true for any planar or network with more than two vertices.

Maximal Connectivity: The relationship between the number of nodes (v) and the maximum nunibcr of linkages (e) in a planar graph is always c = 3 ('v - 2). The inclusion of one additional node to a netivork of more than 2 nodes increases the number of possible linkages by a 'value of 3. There is no intersection of linkages except at a node.

Vertices	Maximum Number of Edges	Diagramatic Representation
3	3	
4	6	
5	9	
6	12	
7	15	

Cyclomatic Number :

Cyclomatic number is a different way of measuring connectivity. This is based upon the condition that as soon as a connected network has enough arcs or links to form a tree, then any additional arcs will result in the formation of circuits. Thus, the number of circuits in a connected network equals the total number of arcs minus the number of arcs required to form a tree, i.e. one less than the nodes or vertices. It may be written as :

Cyclomatic number = a – (n-1)

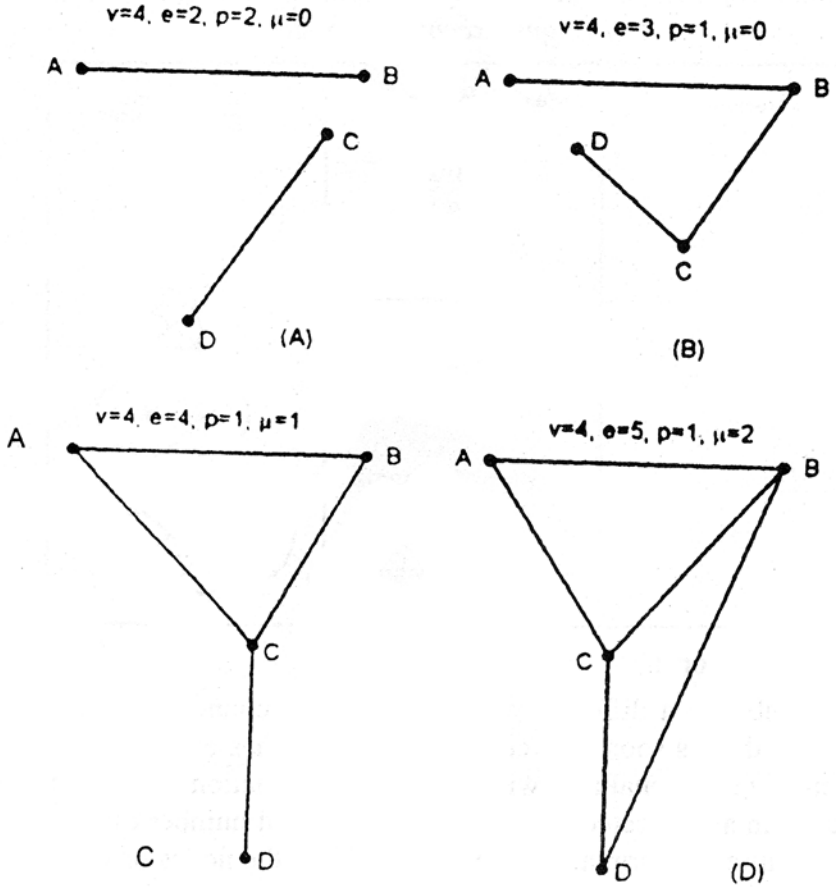
or = a – n+1

Where a equals the number of arcs and n the number of nodes. This formula applies to a connected graph, where there happens to be two or more sub graphs. Then the formula for cyclomatic number is a - n+x where x equals the number of sub graphs. This has also been expressed as :

Cyclomatic number (μ) = e - v +p where e = number of edges or arcs, v = number of vertices or nodes, p = number of non-connected sub graphs. The relationship of the cyclomatic number with the network structure has been examined through the figure below. In a tree type graph, it has a cyclomatic number of 0. As the graph moves closer and closer to a completely connected state, the cyclomatic number

increases. The limitation of the cyclomatic number arises since it depends upon the number of vertices and edges only.

Cyclomatic Number



4.6 ACCESSIBILITY

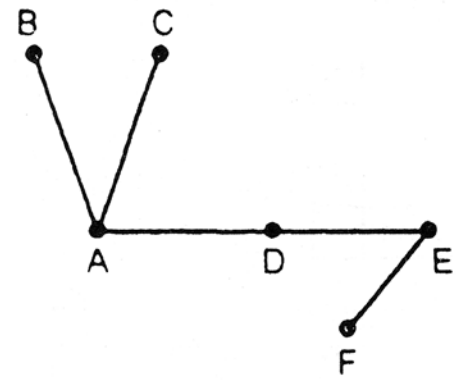
One of the most important attributes of a transportation network is accessibility, and the geographers are particularly concerned with accessibility as a locational feature. Accessibility is the case of movement among the nodes or points on the network. Several methods have been used to measure or to represent the accessibility. The traditional method is to measure the distance along the routes or from centres. Thus an area adjoining to a route or centres is more accessible and inaccessibility increases with the distance from routes or centres. Within a network, accessibility can be measured in three ways : (i) by shortest path matrix; (ii) by the associated number and (iii) by the Shimbel Index.

The shortest-path matrix method follows the number of arcs used in the shortest-path between all possible pairs of nodes. Any network may be represented as a matrix with rows as set of origins and the columns as set of destinations. The number of rows and columns would correspond to the number of nodes in the network. It is assumed that the horizontal rows of a matrix are identified as a set of origin nodes and the vertical columns of the matrix are defined as a set of destination nodes. Each cell entry in the matrix may be used to record some information on the relationship between a pair of nodes.

Any node which is well connected to other nodes in a network is said to be accessible. The figure below shows five nodes linked together by a series of arcs and it can be seen at a glance that node A is the most accessible. But such assessment is not possible in more complex network involving larger number of nodes and alternative routes. In such cases, accessibility can be found out by compiling a matrix commonly known as shortest path matrix as demonstrated in the figure below.

Accessibility: Shortest Path Matrix

(a)



(b)

	To A	B	C	D	E	Total
A	0	1	1	1	2	5
B	1	0	2	2	3	8
C	1	2	0	2	3	8
D	1	2	2	0	1	6
E	2	3	3	1	0	9

In this matrix, a count is made of the number of arcs separating the various nodes and inserting the appropriate number in appropriate box. For example, the number of arcs separating A from B, C, D and E respectively is 1, 1, 1 and 2 and E from A, B, C and D respectively is 2, 3, 3 and 1. The totals of each row can be added up and the lowest total indicates the node, which is most accessible. In this case, ;A' is having a total of 5 (lowest) thus most accessible, while WE* is the least accessible with highest total of 9.

Topologically, accessibility can be measured in three ways :

(i) by shortest path matrix - the number of arcs used in the shortest path between all possible pairs;

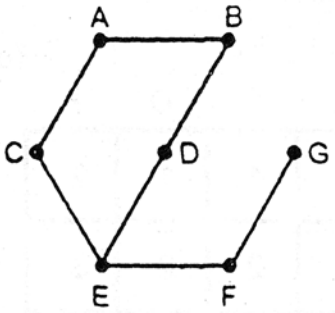
(ii) by the associated number - the number of arcs needed to connect a node to the most distant node from it; and

(iii) by the Shimbel Index, derived from the shortest path matrix, which indicates the number of arcs needed to connect any node with all the other nodes in the network by the shortest path.

The figure below indicates the accessibility, as measured by associated number and Shimbel Index.

Accessibility: Associated Number and Shimbel Index

(a)



(b)

	A	B	C	D	E	F	G	Associated number	Shimbel index
A		1	1	2	2	3	4	4	13
B	1		2	1	2	3	4	4	13
C	1	2		2	1	2	3	3	11
D	2	1	2		1	2	3	3	11
E	2	2	1	1		1	2	2	9
F	3	3	2	2	1		1	3	12
G	4	4	3	3	2	1		4	17

From the figure, a shortest path matrix has been prepared in the appropriate squares. The number of arcs has been taken as the shortest path between all the paired nodes. The top row of figures in the matrix gives the number of arcs in the shortest paths from node A to all other nodes; the second row from node B to all others; and so on. Since the associated number is the number of arcs needed to connect a node to the most distant node from it, the associated number is the highest number in each row, for example, in row A, 4 and in row F, 3. Thus E, with an associated number 2, is the most accessible of all nodes. If we add up all the associated numbers and divide the total by the number of nodes, we get the mean associated number and a low mean figure (in this case 23/7 = 3.3).

Shimbel Index can be derived from the shortest path matrix. The total of each row gives the Shimbel Index. In the figure, A & B are having Shimbel Index of 13, C and Dll, E9, F12 and G17. Since E is having lowest value of all the rows, it is most accessible of all the nodes by the Shimbel Index 9.

Usually, the more centrally located a node is on a network, the more accessible is the node to other nodes. Hence, we expect accessibility, centrality and economic growth to be geographically correlated.

Networks also differ in degree of circuity. Circuity is simply the difference between the desire line distance, represented by a straight line between nodes, and the actual route distance. A circuity index may be calculated for each node on a network by finding the total circuity involved in going from that node to all other nodes on the network. This index is an indication of the geographic efficiency of the network and of the nodes. Economic activity will shy away from locations with high circuity values.

Throughout the world, there is a close association between networks and economic development. In fact, transportation networks are integrated parts of economic systems. Any change in the networks spatial structure has an impact on the economic system as there is an adjustment in the accessibility, connectivity and circuity of nodes. Likewise, a change in the economic system, such as rapid growth in part of a region, affects the network. Expansion or improvement of the network may be necessary. Geographers continue to gain a better understanding of the complex interdependencies between transport networks and the economic systems they serve by examining network impact on economic activities.

4.7 IMPACT OF GLOBALISATION ON INDIAN ECONOMY

Globalisation is the buzzword of the moment, the most talked about and perhaps the least understood concept of this new millennium. Environmentalists, human rights advocates, trade unionists, third world farmers and citizens groups decry it at meetings of the world's power elite but it is a historical inevitability.

The entanglement of diverse cultures and economies, now known as globalization has been spreading for centuries and the world has been shrinking as a result. But the old story of globalization has developed a new twist sparked by the rapid rate of technological change over the last 25 years. The micro-electronics revolution has irrevocably changed the essence of human contract on earth. Distances are shrinking and information is spreading faster than ever before. The Internet and the world wide web have helped this process, enabling business to communicate more smoothly and efficiently. Globalisation has integrated the various world economies without creating any obstacles in the free flow of goods, services, technology, capital and labour. It has four parameters :

(1) Reduction of trade barriers to permit free flow of goods and services among nation-states;
(2) Creation of environment in which free flow of capital can take place among nation-states;

(3) Creation of environment, permitting free flow of technology; and
(4) Creation of environment in which free movement of labour can take place.

Thus, basically globalization signifies a process of internationalization plus liberalization. In nutshell, globalization is considered as the engine of growth, technical advancement, raising productivity, enlarging employment and bringing about poverty reduction along with modernization.

Trade :

One of the principal aims of globalization is to expand trade in goods and services. This trade expansion did not occur uniformally across all countries, with the industrialized countries and a group of 12 developing countries accounting for the lions share. During the 13 year period (1990-2003), India's merchandise exports increased at the rate of 9.1% per annum (from $17.97 billion to $55.98 billion), while that of China and Mexico were 16.2% and 11.4% respectively. However, compared to the world average annual exports of 6.1% during the period, India did benefit from globalization in increasing its export growth rate.

India's performance in service sector exports was relatively much better, Service exports increased from $4.6 billion in 1990 to $37.7 billion in 2003, indicating an annual average growth rate of 17.5% during the period.

India's exports of goods and services together increased from $22.50 billion in 1990 to $93.7 billion in 2003, indicating an annual average growth rate of 11.6%. As a consequence. India's share in world exports of goods and services improved from 0.53% in 1990 to 1.01% in 2003.

There is no doubt that India has gained as a consequence of globalization in improving its share of world exports of goods and services to 1.0% but considering the size of its economy, the gain is much smaller when compared with other countries like South Korea, Mexico and China (See the table).

Table : Globalization and its Impact on India

Exports of Merchandise and Services of Selected Countries of the World

MERCHANDISE EXPORTS	Exports of Merchandise USS million		% of World Exports		Average Annual Growth Rate
	1990	2003	1990	2003	
India	17,969	55,982	0.51	0.73	9.1
China	62,091	437,899	1.77	5.78	16.2
Brazil	31,414	73,084	0.90	0.96	6.7
Mexico	40,711	165,396	1.16	2.18	11.4
South Korea	65,016	193,819	1.85	2.56	8.8
World	3,505,243	7,578,698	100.0	100.00	6.1

	Exports of Merchandise USS million		% of World Exports		Average Annual Growth Rate
	1990	2003	1990	2003	
EXPORT OF SERVICES					
India	4,610	37,732	0.61	2.18	17.5
China	5,748	46,375	0.77	2.68	17.4
Brazil	3,706	9,591	0.49	0.55	7.6
Mexico	7,222	12,572	0.96	0.73	4.3
South Korea	9,155	31,502	1.22	1.82	9.9
World	7,49,408	1,729,132	100.00	100.00	6.6
EXPORT OF MERCHANDISE AND SERVICES					
India	22,579	93,714	0.53	1.01	11.6
China	67,839	4,84,274	1.59	5.20	16.3
Brazil	35,120	82,675	0.83	0.89	6.8
Mexico	47,933	177,968	1.13	1.91	10.6
South Korea	74,171	225,321	1.74	2.42	8.9
World	4,254,651	9,307,830	100.00	100.00	6.2

Source : Compiled and Computed from the data provided in World Bank, World Development Indicators (2005)

Foreign Investment Flows :

Globalisation leads to a greater flow of foreign investment in two forms - foreign direct investment (FDI) and foreign portfolio investment (FPI). FDI helps to increase the productive capacity of the economy and FPI is of a more speculative nature and is thus very volatile. The data (given in the table below) reveals that during the period 1990-91 and 1994-95, the share of FDI in total investment inflow was onlu 24.2% and that of FPI was 75.8%. For the five year period (1995-96 to 1999-2000), the proportion of FDI in total investment improved to 54.8% and the share of FPI was still high at 45.2%. During the next 4 year period (2000-2001 to 2004-2005) the share of FDI and FPI were 48.8% and 5 1 .2% respectively.

Year	Foreign Direct Investment	Foreign Portfolio Investment	Total USS billion
1990-1991 to 1994-1995	2441 (24.2)	7645 (75.8)	10086 (100.0)
1995-1996 to 1999-2000	13139 (54.8)	10853 (45.2)	23992 (100.0)
2000-2001 to 2004-2005	25169 (48.8)	26450 (51.2)	51619 (100.0)

It implies that as a matter of policy, the host country can depend on a regular inflow of FDI if it creates a conducive climate for the purpose. These inflows help to enlarge the productive capacity of Indian economy. Data reveals that there are five high priority sectors, namely, energy, telecommunications, electrical equipments including computer software and electronics, transportation and metallurgical industries which are attracting FDI ianflows.

Employment Situation :

The employment situation in India has worsened in the era of globalization. The rate of growth of employment which was 2.04 percent per year during 1983-94 declined to a low level of 0.98 percent during the period 1994-2000. This was largely a consequence of a negative growth rate of employment in agriculture which absorbed about 65 percent of total employed workers as also a sharp decline in community, social and personal services to 0.55 percent during 1994-2000 as against 2.90 percent during 1983-94. This was the consequence of neglect of agriculture and shedding the load of excess employment in the public sector by imposing a continuous ban on recruitment and not filling up the vacated posts after retirement of the public sector employees.

Table : Growth of employment by sectors in India

Sectors	1983-1994	1994-2000
Agriculture	1.51	–0.34
Mining and quarrying	4.16	–2.85
Manufacturing	2.14	2.05
Electricity, gas and water supply	4.50	–0.88
Construction	5.32	7.09
Trade	3.57	5.04
Transport Storage and Communication	3.24	6.04
Financial Services	7.18	6.20
Community and personal services	2.90	0.55
Total	2.04	0.98

Source : Govt of India, Planning Commission (2001), Report of the Taskforce on Employment opportunities.

The organized sector which was considered as the engine of growth failed to generate enough employment. During 1994-2000, employment growth in the organized sector was merely 0.53 percent. The growth of employment in the public sector

was negative (-0.03 percent) and that of the private sector was of the order of 1.87 percent. But since the share of the public sector in organized sector employment was of the order of 69 percent, enlargement of private sector employment failed to effectively offset the deceleration in the public sector. Consequently, the share of the organized sector which was 7.93 percent in 1983 declined to 7.08 percent in 1999-2000.

Thus, Globalisation pushed workers from the organized sector to swell the ranks of workers in the unorganized sector. The workers in the organized sector are relatively better paid than those in the unorganized sector. They enjoy better job security and other benefits. Within the organized sector, jobs in the public sector receive much higher wages and accompanying benefits than those in the private sector for similar skills. Globalisation, therefore, increased the process of informalisation of the economy. It has led to a process of casualization of workforce.

Inequality and Poverty :

Cheap imports lead to the closure of a large number of vulnerable small enterprises, they have adversely affected the informal economy as well as agriculture. As a consequence of globalization, the poor, the assetless and unskilled workers were the losers, and the rich endowed with capital and human capabilities have been the winners.

There is no doubt that poverty has declined from 36.0 percent in 1993-1994 to 26.1 percent in 1990-2000, though at a relatively decreasing rate in the post liberalization period. There is a rise in inequality or relative deprivation. The growth rates in per capita expenditure point to a significant increase in rural-urban inequalities at the all India level. There has been significant increases in differences in wage/salary incomes between those in rural and urban sectors.

Regarding social deprivation it is noted that decline in poverty among scheduled castes (SCs) and scheduled tribes (STs) has been slower than in other categories during 1993-1994 and 1999-2000. In the year 1999-2000, the proportion of population below poverty line among SCs and STs were 36 and 44 percent as against 16 percent in the case of other categories.

The main reason for the slow decline in poverty reduction is the geographical pattern of growth promoted by the policies of liberalization, privatization and globalization.

Weakening of the welfare states in favour of markets :

The advocates of globalization have been propagating a minimal rate for the state and a maximum role for the markets. Pressure of multinational companies, the IMF and World Bank force governments to take decisions about privatization of public enterprises, opening of FDI in several sectors, such as retail trade, consumer goods

like potato chips, hurting small and medium enterprises leading to their closure and resultant unemployments. Globalisation has also resulted in widening inequalities between the forward and backward states in India and also within groups have helped to create an elite. As a result, exclusion of marginalized groups, the poor and the assetless is taking place. It has also laid to declining earnings of unskilled labour, destruction of environment and deprivation of basic human rights including the right to work and rights at work place. Globalisation has led to more insecurity of workers, increased militancy of employers against workers and enhanced the phenomenon of lock-outs.

Adverse effects :

Globalisation has the potential to bring major improvements in productivity, innovation and creativity. But it is being overshadowed by a corporate led plan for economic integration which threatens to undermine the whole project. Instead of helping build a better world for all, the current free market model is eroding both democracy and equity.

Gaps between rich and poor are widening. The poor did not benefit from policies of liberalization and globalization and only a small section of the population pocketed all its benefits. The lives of the educated and rich had been enriched by globalization. The information technology sector (IT) was a particular beneficiary. But the benefits had not yet reached the socially deprived and rural poor. Regional disparities have been widened, decision making power is concentrated in fewer and fewer hands, local cultures are wiped out, biological diversity is destroyed, regional tensions are increasing and the environment is nearing the point of collapse. That is the sad reality of globalization, an opportunity for human progress whose great potential has been thwarted. Instead we have a global economic system which feeds on itself while marginalizing the fundamental human needs of people and communities.

4.8 SOME STRATEGIES AND POLICY FRAMEWORK

Economists believe that with appropriate policies, higher output growth and higher employment growth objectives can be simultaneously furthered. This will also raise the productivity level of the economy which can have a positive and significant impact on poverty reduction. The Central government should provide the much needed resources for infrastructural development. Once infrastructures are in place, it would be possible to attract private sector investment. Such a vision of development of backward states would help to achieve the goal of balanced regional development and lead to reduction in regional disparities. A much greater effort in terms of both monetary and non-monetary resources has to be made so as to promote employment growth and social security, education and health and an effective poverty alleviation

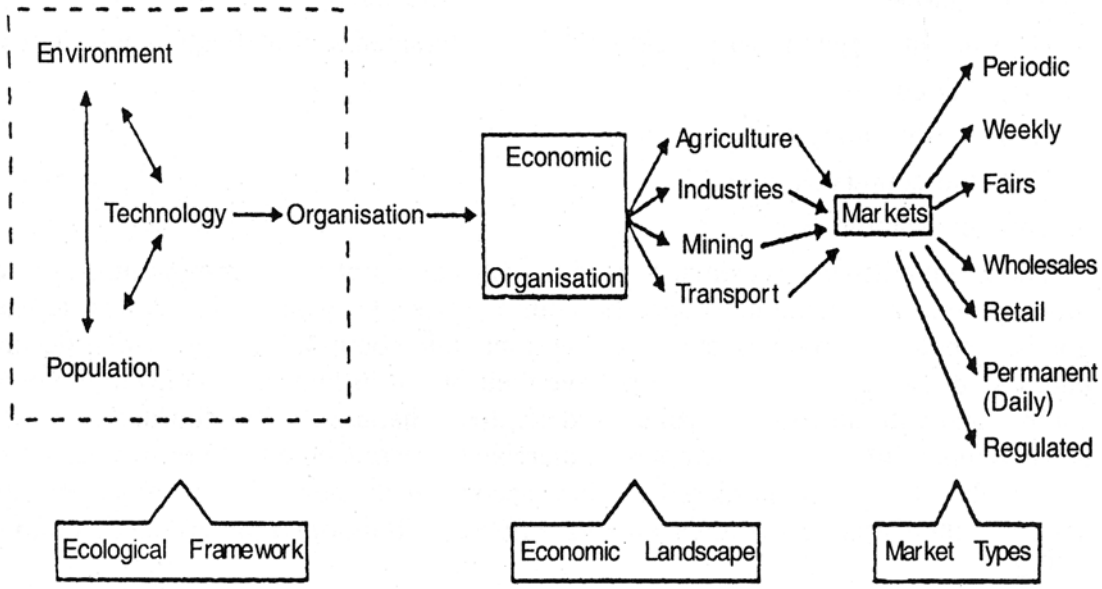
programme. A number of programmes were initiated by the government, such as Jawahar Rozgar Yojana, Employment Assurance Scheme, Pradhan Mantri Gram Sadak Yojana etc. and they did help to provide employment in rural areas and consequently alleviate poverty. The productivity of the informal sector must be raised so that these informal activities may provide decent jobs, incomes and protection and can trade in the international system.

Globalisation has been unfair to underdeveloped and least developed countries. India has been experiencing jobless growth over the last 15 years which means a large number of people have been marginalized even as the economy has grown. Pitching for globalization Prof. John Haris, Director, Development Studies Institute, London School of Economics said, "India has such a huge domestic market that it needn't rely on the overseas market for growth, but to realize that potential, people need to have incomes." India should therefore, endeavor to achieve synergy between employment generation and growth.

4.9 MARKETS, ITS TYPOLOGY AND NETWORK

Marketing Geography is a specialized study of market places and marketing. It is concerned with the channels of distribution through which goods move from producer to consumer. The growth of markets is a result of ecological factors. The model developed by the Dr. H.M. Sexena indicates the relationship between ecology and growth of markets.

Ecology and Growth of Markets



It becomes clear from the model that ecological factors (environment, population and technology) are responsible for the development of organizations. Among organizations economic organization is a prime one consisting of agriculture, industries, mining and transportation, and culminating on a place known as markets either periodic or permanent.

A market centre is a place where buyers and sellers meet daily or periodically for business transaction under certain regulations. As dynamic elements of a cultural environment the market centres are also in a state of change whether growing, developing, maturing or even declining. Geographically, market centres are the physical extent of territory varying from a petty village to a metropolitan city. Therefore, the market centres have to be considered from many angles for their typology or classification.

Classification based on periodicity :

Periodicity is one of the essential elements of market centres and classification based on periodicity is as follows :

i) regular or daily or permanent market centres; and

ii) periodic or temporary market centres

The regular or daily markets are those in which the marketing or buying and selling activity is a regular feature. Although it is a characteristic of urban centres, it is also seen in some rural centres and are called urban daily or rural dailv markets. On the other hand, periodic market is a temporary feature; held either on a specific day or days of the week, fortnight or a month or once, twice or thrice in a year. The former is popularly known as a weekly market or "hut" in which mostly a weekly cycle is followed. The latter is known as a fair or "mela".

Fairs are multifunctional and Allex (1922) attempted a classification as follows -

(i) the commodity fair,

(ii) the livestock fair,

(iii) the country fair; and

(iv) the sample fair

The commodity fair is primarily held for sale and purchase of commodities, sometimes general and sometimes specific commodities like wool, silk, textiles, leather goods, handloom products etc. The livestock fair commonly deals with sale and purchase of cattle. The country fairs have their origin in rural gatherings in the open country and with time they became fixed centres of habitation. The fourth type of fair is the sample fair in which samples of merchandise are offered and orders are taken for supply. Other experts classified fairs according to their primary functions, the nature of their products or their area of influence. Religious fairs are also common in India.

Classification based on Census Status :

According to census classification, settlements are classified into two well-known categories - urban and rural and markets are also classified as rural or village markets and urban markets or market towns. In developed countries, every urban centre is a market town with varying size and functions. But in developing countries, every urban centres is not a developed market town. One of the basic problems in marketing geography is the identification of market towns. Dr. H.M. Saxena on the basis of the study he carried on in Rajasthan has devised the following norms for the identification of market towns -

(i) It should be a census town.

(ii) Its percentage of the population engaged in trade and commerce should be higher than the percentage of population engaged in trade and commerce of the region, or the percentage of population engaged in trade and commerce of a particular centre must be higher than the percentage of other functional categories of the workers group.

(iii) It should possess the following infrastructures : (a) a definite place of exchange of commodities or a regular "mandi", (b) banking facilities, and (c) storage facilities. In other words, it must have a market morphology comprising of retail and/or wholesale establishments etc.

(iv) It must be well-served by rail and/or by metalled roads. These criteria may be used at least for developing countries. On the other hand, rural markets are those settlements having at least 10 retail shops and/or a periodic market.

Classification based on Hierarchy :

The hierarchy of market centres too follows identification of market centres in a region. Hierarchy can be determined on the basis of several variables like -

(a) Number of retail shops

(b) Threshold population

(c) Arrival of commodities

(d) Size of trading areas

W. Christaller (1933) proposed six towns in Southern Germany with different levels of specialization arranged in a hexagonally shaped hinterland. For every six towns, there would be a larger, more specialized city which, in turn, would be situated an equal distance from other cities with the same level of specialization as itself. They are (a) Market hamlet, (b) Township centre, (c) County seat, (d) District city, (e) Small state capital, (f) Provincial head capital and (g) Regional capital city.

August Lasch (1954) determined the number of threshold farms with a minimum of three and thereafter continued through four and seven. Thrope (1968) has developed hierarchy of service and trade centres in U.K. and identified seven types of centres -regional centres, sub-regional centres, area centres, major centres, district centres, local centres and village or small suburban centres.

Berry's (1967) identification of the hierarchy of Central places in Iowa, Dakota and Chicago is the most notable work in U.S.A. Based on different variables and their correlation, he has identified seven levels of hierarchy namely - hamlet, village, large village, small town, regional centre, regional metropolis and national metropolis.

Classification based on location :

Cleef (1937) has categorized the markets on the basis of its location as follows -

(i) Junction of routes.

(ii) Head of navigation : (a) along rivers, (b) coasts

(iii) Change in direction of traffic routes : (a) river bends, (b) water bodies, (c) highlands or other natural features impending transportation,

(iv) Change in mode of transportation

(v) Arbitrary or accidental selection of location

Classification based on function in the distribution chain :

Hodder (1965) has described the following categories of market centres according to their function in the distribution chain :

(i) The feeder markets, which handle small amounts of trade.

(ii) The bulking centres, which receive goods from feeder market and also directly from the producers, thus dealing in a large volume of goods,

(iii) The major markets are those in which large scale trading activities are carried out by several trade agencies,

(iv) The large trade centres. These are larger than major markets, although having similar characteristics.

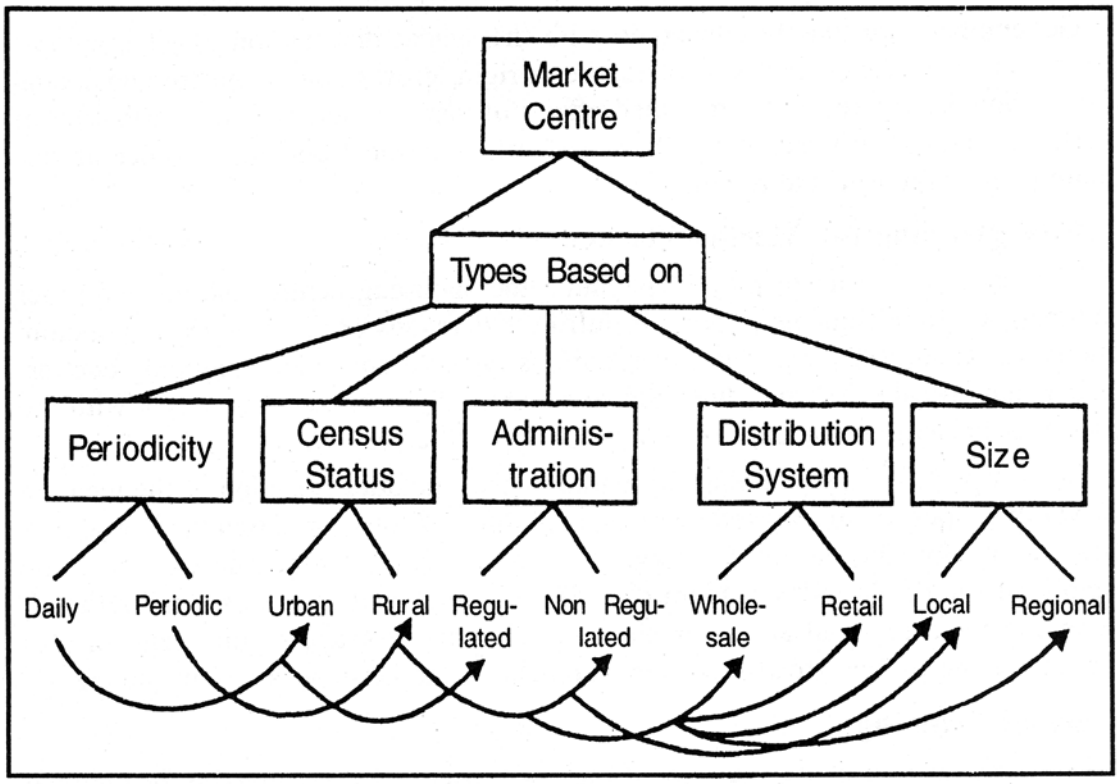
Specialized Markets :

Some market centres specialize, in one particular commodity, available in sizeable quantity. The commodities vary from livestock (Sonpur in Bihar) forest produce (Damoh in M.P.), rice (Nohta in Malwa plateau), handloom clothes (Erode in Tamilnadu) to leather goods, fruits and other items, used in different parts of the world. This is because, these are available there on a large scale, engaging larger number of people.

Grain market centres need special mention, usually classified in three categories

: (i) Bazars or Hats - they are primary market centres dealing in commodities required by rural persons and are usually regulated and controlled by village Panchayats. (ii) Mandis - at taluq or Tahsil level these secondary markets deal with wholesale transactions and are regulated by local bodies, (iii) Ganjs - the wholesale markets at rail heads work as terminal centres and are controlled by local bodies.

The above mentioned classifications of market centres are based on either their primary function or their status. In fact, types of market based on periodicity, nature, size, junction, hierarchy etc. are interrelated with each other and sometimes overlapping. The typology of market centres and their interrelationship has been depicted in the following diagram.



4.10 ROLE OF MARKET IN THE DEVELOPMENT OF TRADE AND COMMERCE.

There are several ways to deal with development. Every process or system has its own merits and demerits. The development strategy of market centres is one of the several ways to deal with rural development. Markets are indispensable features of modern life and they are the indicators of regional economic development. They are concerned with channels of distribution through which goods move from producer to

consumer. In other words, the trade and commerce of any area is fully controlled by the markets.

Market centres are not only the centres of marketing activity but they are also the nerve centres and nucleus of developments. They have economical, social and cultural importance and they help in increasing social contacts, serve as centres of diffusion and become focus for political and other activities. They are the controlling centers of marketing system and have an important role in stimulating production and consumption and also help to accelerate the rate of economic development. Thus development of market centres implies the economic development as a whole and their growth always follows the development of agriculture, transportation, industries, trade, etc. which ultimately lead to overall regional development.

Geographers are mainly concerned with the spatial distribution of geographical phenomena. In case of market centres, their origin, growth, development and spatial distribution are the result of combined efforts of various factors. The distribution of market centres is influenced by physio-cultural, historical and many other unique qualities prevailing in the region.

City Planning for Market Places :

Markets have a role to play in planning the shopping centres, stores and other commercial establishments in order to fulfil the demands of the growing population. There is a direct relationship between various types of shops and shopping centres, their potential sales and the threshold population. This relationship varies with the consumer behaviour, standard of living and type of economy.

Other aspects of city planning for market places includes selection of the location for various types, of specialized markets, including markets for agricultural products, location of store house, cold storages and other market infrastructures etc. The establishment of three-level hierarchy of shopping centres, i.e. neighbourhood, community and regional and their planning in terms of space requirements is also needed for the proper growth and development of market-places within the city.

Regional Planning :

It is necessary to study the role of market towns and rural markets in regional development and planning. Market towns are economically most viable and represent the regional pattern of development because market towns (i) provide trade and commerce to the region, (ii) act as nodal centres for transportation and (iii) serve as growth centres by providing various services to the region. Economic progress and market development are interdependent and their growth is mutual and symbolic in association.

The variation in the spatial distribution of market town is an indicator of development and/or backwardness of a micro unit within a region. The existence of

more market towns or their clustered pattern shows the availability of larger quantity of marketable surplus and vice versa.

There is a need to correlate economic development and existence of market towns. The pattern of economic development can be measured in terms of (i) percentage of total workers to total population, (i) per capita income of the unit, (iii) percentage of net sown area to total population, (iv) percentage of villages electrified to total number of villages, etc.

The hierarchy of the market towns in a region can be taken as base for development planning. Berry (1967) has rightly pointed out "A system of Centres arranged in a hierarchy and efficient way of articulating distribution too, and administration of regions. A proper system can avoid duplication and waste, and make possible the realization of social benefits from economies of scale". The pattern of hierarchy can help the planners in diversifying the resource allocation in a better way. The developed first-order market towns have self development potentialities, while the lower order centres require incentive for further development.

Rural Development :

Rural markets play an important role in the socio-economic life of the people, specially in the peasant society of the developing countries. Here, marketing activities are primarily periodic rather than occurring on a daily basis. There evolves some selected places which provide the services and to which people from surrounding areas assemble to avail the specific services of periodic markets. The consumers and traders establish a person to person contact and bargain before exchanging goods and services at market centres periodically. The whole economic system is based on consumption, production, distribution, exchange and in the absence of any one, the economic system cannot run. The periodic marketing system is dealt with the rural economy which is found mainly in the countries affected by agricultural system. Hence, rural markets are likely to help promote the local production, effectively utilize the local resources, extend employment opportunity and promote a rural area from its depressed economic situation to progressive situation. These centres socially and spatially close to villages are organizationally and functionally more close to towns and urban centres.

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