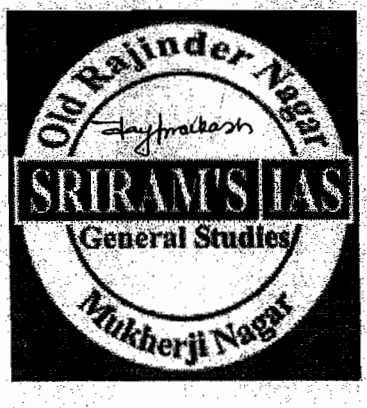
SRIRAM'S IAS



GENERAL STUDIES

Cropping patterns, Irrigation and Environment (Paper-III)

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Agriculture

The cultivating process of plants/crops & domestication of animals is known as Agriculture. It includes fisheries, horticulture, sericulture, silviculture, floriculture etc. India is richest country in terms of land availability for agriculture after USA. Location of India is other factor which ~~fever~~ favour's for better agricultural set up in India. It is a primary activity, despite of it is still most important sector/occupation of India. Because still 55% people of India directly and 10% are indirectly derive their livelihood from this sector. India is itself a big market before the world but almost 55% people purchasing capacity depends on this sector. It is not only a source of economy, it is a culture in India.

Characteristics and Problems of Indian Agriculture

1. Monsoon is still gamble for Indian agriculture.
2. Still Traditional or primitive technology, especially in rain fed areas.
3. Predominance of food grains.
4. Heavy Pressure of Population.
5. Subsistent character.
6. Small Size of holdings and fragmentation of fields.
7. Infrastructure components
8. Limited Intensive agriculture.
9. Less area under leguminous and fodder crops.
10. Rain-fed agriculture.
11. Labour intensive.
12. Low productivity & efficiency.
13. Lack of Marketing and storage facilities.
14. Lack of Knowledge about the new technology.
15. Poverty and Indebtedness of the farmers.

Determining factors of Indian Agricultures

- **Traditional Factors**

1. **Physiography** – Terrain, Soil, Slop and Location.
2. **Climate** – Rain / Precipitation, Temp, humidity, dryness and others.

- **Modern Factors**

1. **Institutional** –Land Reform, Land holding, Tenure, ceiling, consolidation of land.
2. **Infrastructural** – Irrigation, Hybrid seeds (Hy.V), commercial energy, chemical fertiliser, pesticides, technology, capital, storage, marketing etc.
3. **Other** – Policies of government, such as agriculture policy, water policy, Procurement policy, Reaserch and Development, Policy for DPAD, Dry land Agriculture effect of globalization etc.

Cropping Pattern

Cropping Pattern means the proportion of area under different crops at a particular period of time. The choice for growing a particular crop in a particular region is an outcome of Cropping Pattern. It also refers the spatial organisation of various crops at a given part of time.

Determinants of copping pattern

- **Physical Factors** - **Climate** - Climate support few crops to grow fastly even they will easily survive in particular climate or season.
  - **Terrain** - Soil & Slope both determines the nature of crop i.e. tea... hilly areas but rice or jute in ~~plane~~ Plain areas.
- **Infrastructural** - **Irrigation** - Creates condition for unmatched climate, Rice in Punjab.
  - **H.y.v** - Short duration – more crops in cropping pattern.
- **Economic** - Demand based cropping pattern in agricultural regions i.e. cotton cultivation in vidarbh region of Maharashtra. Jute in W.B., Rice in Punjab.
- **Social / cultural**
  - Rice cultivation in eastern India & eastern & western coastal plain.
  - It is concern with food habbit. same things is applied for.
  - Wheat in western Indian states.

Holding of land / size of land

Small holding farmers prefer the cultivation of labour intensive crops, while a large holding farmer goes for the capital intensive agriculture practices.

Strength of Individual crops

Cropping Pattern of a region is / are determined on the basis of area strength / covered area of individual crop. i.e. the 1st, 2nd & 3rd ranking of an areal unit may be called as the dominant crops.

Physical diversity

Where physical diversity is less, the Cropping Pattern are also less diversified & vice versa. exp. rainfall deficient areas of Rajasthan farmers grow Bajra while in fertile Brahmaputra / Hugali Valley of W.B. rice has the status of monoculture. contrary to this soil of Indo-Gangetic plains (Eastern India) are suitable for cultivation of numerous crops.

Seasons of Crops - Kharif – Rabbi – Jayad

Types of Cropping Pattern in India

1) Mono Culture

The Practice of growing a single crop in a large area in particular cropping season. It is typical in commercial farming however it is also popular in Indian where

subsistence farming in practiced. Rice & Wheat in Punjab are grow almost in a manner resembling monoculture –

Rice	Wheat	Bajara
↓	↓	↓
W.B.	Punjab	W.Rajasthan

2) **Double Cropping:** There are two Types of double cropping –
   - **a)** Inter Cropping Pattern
   - **b)** Relay Cropping Pattern

Inter Cropping

Practice of grow more than one crop on the same field in the some growing season. it is achieved planting two or more crops in rows, mustard & Wheat in Punjab and Hariyana traditionally cultivated (20 rows mustered & 30 rows wheat).

Relay Cropping

Grow two crops simultaneously making the crop selection in such a manner that while one crop matures and is harvested the other crop has already to started growing. It is generally practiced in well distributed annual rainfall those areas where assured irrigation facilities.

3) Mixed Cropping

Refers to growing variety of crops in a particular growing season. under this system different crops are grown on different fields. It is typical of the areas of subsistence farming where farmers try to produce everything . Whatever they need they cultivate on their on farmland. It is/practice is just opposite to monoculture.

4) Multiple Cropping

Practice of growing more than one crop in a year on the same land. This practice can be only adopted in areas where the rainfall is well distributed over the year or assured means of irrigation is available. Fertility of land will also be maintained usually by the use of manures and fertizer's, No land kept fallowis this practice. It is also Practiced in the areas of Geen Revolution.

Agricultural Marketing

Regulated Market

To remove the deficits of Present Agricultural marketing the government has introduced regulation markets all over the country. The nominees of government Agriculturist- Trades, Local bodies collectively formed a committee to regulate market Practices....

By the beginning of 4 FYP altogether 13 states had passed legislation for the establishment of regulated markets. At present all states & UT's has passed legislation in this regard, there were regulation markets in India in 2012.

Objectives of Regulated Market

1. Ensure Remunerative Prices to Farmers.
2. Narrow down the Price-spread between the producer and the consumer.
3. Reduce Non functional margins of the Traders and commissions agents.

Eradication of Intermediates

1. The consumer is able to ascertain both the quality and the price of goods be buys.
2. Grading & marketing Act. 1937 was the 1st legislation erected by central government to formulate standards and carry out grading and marketing of Agriculture and allied commodities.
3. Marketing work takes places in better way through following majors-
   - Accumulation of surplus Production.
   - Inspiration for.

Significance of Regulated Market

1. Competitive baying,
2. Eradicate malpractices in mandis,
3. Rationalized Market Prices,
4. Ensures use of standardizes weights,
5. Evolved suitable machinery for the settlement of disputes between buyers & Sellers,
6. Provide reliable and up to date market information.

Storage, Transport & Marketing of Agriculture Production & Issues Related to Constraints

The government of India as well as state governments is making lots of programme for the development of rural areas generally the development of agriculture is main concern but it is not good enough to make sure rural development. Agriculture Marketing is such an Issue. If that is proper the good may be achieved. Still a large Part of Marketable surplus of Agriculture Produce is sold in the village itself to person's who have money powers and credit power even they posses also market powers.

Agriculture marketing has a great importance for the present since their economic position depends upon the prices of the agriculture commodities, but the peasants has little comfort over prices which are determined by the broad factors of demand and supply in the Indian villages at large. After the G.R. in Indian production & Productivity being increased rapidly but the real benefits is not going to peasants. Intermediaries are taking real benefits... between peasant and consumer, then the mechanical means of rural marketing must been improved, still the main handicaps of the Indian farmer are that he has to sell his produce at an unfavourable place, at an unfavourable time ant at an unfavourable price.

Types of Farming

Due to variations in the physical environment and culture a variety of farming practices and cultivation systems have evolved in different parts of India. The variety of farm practices ranges from the traditional slash and burn technique of farming to the most modern mechanized commercial farming. A brief outline of various farming methods and systems is provided below.

Sedentary Farming:- This type of farming is the most common practice in most parts of India today. Under the system of sedentary cultivation, the cultivator works on a fixed piece of land time and again. This is called the settled cultivation also. This type of farming is typical of the areas with a relatively higher density of population where virgin land is not available for bringing under the plough.

Shifting Cultivation:- The practice is just opposite of the sedentary cultivation. Under shifting cultivation, the farmer clears the forest from a piece of land for cultivation and raises generally food crops for a few years. Slashing and burning are the chief methods of removing natural vegetation from such land. Hence it is often called the slash and burn cultivation also. Farming under this system employs traditional methods and is of subsistence type. Some grain and vegetable crops are generally grown using largely manual labour. After a few years the fertility of the land start declining and the forest and weeds start taking over land and the farmer abandons it. A new patch is then cleared of the forest and the practice is thus repeated on new land. This type of farming is practiced generally by the tribal people in tropical forest regions and is characteristic of the areas with a low density of population where virgin land is available for bringing under cultivation. As the density of population increases and new land becomes scarce, shifting cultivation tends to be replaced by sedentary cultivation. Different terms are used to refer to this type of farming in different parts of India. It is called jhoom in assam, onam in Kerala, podu in Andhra Predesh and Orissa, and bewar, masha, penda, bera etc. in various regions in Madhya Pradesh and Chattisgar. Shifting cultivation is highly wasteful of land resource. The areas from which the forest cover has been removed and has been abandoned after cultivation for a few years. become highly susceptible to soil erosion. Therefore this practice is discouraged by the government and efforts are made to convince the following of this practice of adopt sedentary farming.

Terrace Farming:- This is a common practice in the hills and mountains where slopes are too steep to allow cultivation. The soil on steep mountain and hills slopes is not stable and if the forest or other natural plant cover is removed for cultivation of land, the soil gets eroded very quickly. To avoid this hill slopes are terraced that provide relatively flat surfaces in the form of terraces on which crops can be raised successfully. Terraces help in curtailing the velocity of surface run off thereby checking soil erosion and allow rainwater to soak into the soil. Terraces with high protective walls allow flooding of fields that can be planted with water intensive crops like rice. Generally terrace farming is also a settled type of farming practice.

Wet or irrigated and Dry Farming:- Farming practices can also be differentiated on the basic of availability and use of water or irrigation facilities. Wet farming is the term applied to cultivation of water intensive crops like paddy rice in areas receiving a large amount of rainfall. Similar types of crops can also be grown in areas of relatively lower and more seasonal rainfall with the help of irrigation. This practice is called irrigated farming. The term dry farming or dry cultivation is used to denote the type of farming areas of seasonal and limited rainfall where irrigation facilities are not available. This time of farming is sometimes called rain-fed agriculture also. However, the term rain-fed dose not indicate the limited availability of moisture that is implied by the term dry farming. Generally coarse grains, pulses and oil seeds are grown under the system of dry farming. In India, most of the area receiving an annual rainfall of less than 80 cm is considered the zone of dry cultivation.

Intensive Agriculture :- This type practiced in areas having a high density of population and hence small per capita cultivated area. Due to high population pressure on land. effort is made to obtain the maximum output from the limited area. Intensive farming also implies large inputs of manpower, animal energy and use of organic manures and chemical fertilizers. Irrigation is a common practice in areas of intensive cultivation. The areas of intensive cultivation are also characterized by a high incidence of multiple cropping. Per hectare yields under intensive cultivation are generally higher and a high input of manpower often leads to a rather low per capita productivity. It is often said about this system that the labour input is carried to the level of zero marginal productivity and hence called a labour intensive form of agriculture. Food grains like rice are typical crops grown under intensive farming system. This system is also characterized by a multiplicity of crops and subsistence nature of farm enterprise. Most of Indian farming in intensive in character.

An important change in the character of intensive farming in India is the increasing crop specialization and character of farm enterprise. Large acreages are today given to single crops like rice and wheat grown primarily for market. Wheat farming and rice farming in Punjab are typical example of the increasing commercialization of intensive agriculture in India.

Extensive Cultivation :- This is a type contrasting with intensive cultivation and it is mostly practiced on large farms with the help of farm machinery. It is also a capital-intensive form of farming. It is characteristic of the areas having a low density of population and a lot of virgin land that can be brought under the plough as the need for additional cultivated area arises. An emphasis is laid on increasing the farm output by extending the cultivated area and per hectare yields may not be comparable to those under intensive farming. Use of irrigation and chemical fertilizers is rare. A typical

character of this form of agriculture is crop specialization. Large acreages are given to a single crop and the farming is done commercially. As additional virgin lands become scarce due to an increased population, extensive cultivation tends to be replaced by intensive cultivation. This form of farming is not practiced in modern India even though use of farm machinery in some areas having large holding is common.

Subsistence and Commercial Farming :- When the entire production of a region is consumed within the region, the farming is said to be subsistence type. It is the common practice in areas of high density of population or low fertility of soils. Although it is erroneously define as the type of farming where the cultivator himself consumes most of the farm produce leaving practically nothing or very little for market, subsistence character of farming is more accurately identified on the basis of regional consumption. Subsistence farming is characterized by a greater emphasis on food crops. It is usually intensive if the density of population is high. However, in areas of low fertility of land, it may not be very intensive.

Commercial farming, on the other hand, is characterized by a large surplus that is available for the market. It may or may not be grain intensive. Generally, the crop selection under this system is made keeping in view the environmental suitability of an area for particular crops and the market demand for various products. Rice cultivation in Punjab and Haryana is a typical example of commercial farming. These two crops are not the staple food of the local people and most of the production finds its way to those parts of the country where the regional production is not sufficient to meet the regional demand. Other examples of crops grown primarily for market in India include cotton, sugarcane, jute and groundnuts. Most of the production of these crops finds its way into the market. Some of them are also called industrial crops because they supply raw material to industries. Another term applied to such crops is cash crops.

Crop Rotation : This practice has been a common feature of traditional farming system in India. It implies growing of different types of crops one after the other in a systematic manner so that the soil fertility is maintained. The crops grown are so selected that in one season the farmer plants a shallow rooted crop while in the other season a deep-rooted crop is grown. In between legume crops are grown to maintain high level of nitrogen in the soil. Occasionally, the land is also left fallow (uncultivated) for the accrual of fertility. Crop rotation is an environment friendly method of maintaining soil fertility . However, with increasing pressure of population, the practice of leaving the land as fallow periodically is disappearing and crop rotation in most instances prevails without fallow.

Pollution

The condition of mixing unwanted and harmful substances in our natural resources so as to alter their natural qualities and to make them unfit for use, is called as pollution. Agents causing pollution are known as pollutants.

Our natural resources are known to have some specific qualities of their own. These qualities are known as natural qualities . It is due to speicific natural qualities that different natural resources have been useful to us and to the whole biosphere. But now, the condition has changed considerably. Most of our natural resources like air, water and soil have gone bad due to pollution of different types. What is pollution?

Types of pollutions

Types of pollutions are - Air Pollution, Water Pollution, Soil Pollution,Radiation Pollution and Noise Pollution. In this chapter, we are going to study about different types of pollutions and their sources.

Air pollution:

The conditions of mixing of undersirable substances in the air so as to alter its natural quality is called as air pollution. According to the World Health Organization (WHO), the air pollution can be defined as - the condition produced due to 'substances put into air by the activity of mankind into concentration sufficient to cause harmful effects to his health, vegetables, property or to interfere with the enjoyment of his property' is called as air pollution.

Sources of Air Pollution :

The air pollution is caused either through natural processes or through human activities. On this basis sources of air pollution have been divided into two broad catergories. A - Natural sources and, B- Anthropogenic sources.

A.Natural Sources: The natural phenomena like volcanic activities, dust storms, forest fires, scattering of pollen grains and release of hydrocarbons from plants are natural sources of air pollution.

B.Anthropogenic Sources: These sources comprise sources of air pollution connected to human activities. Different types of anthropogenic sources of air pollution are being discussed below.

1. Domestic Sources: Heating and cooking activities in homes produce different types of pollutants like - Carbon dioxide, Carbon monoxide, Sulphur dioxide, Nitrogen dioxide, Carbon particles, and dusts etc. These pollutants cause indoor air pollution in unscientifically built houses. Heating plants employed in homes and apartments are considered to be fourth largest source of air pollution.

2. Automobile Sources: Automobiles are regarded as greatest sources of air pollution. Cars, scooters, motor cycles etc. are some of the automobile sources of air pollution. About one-fifth of the air pollution in cities is caused through these sources.

3. Industrial Processsors: Metallurgical plants and smelters, chemical plants, petroleum refineries, pulp and paper mills, sugar mills, cotton mills, synthentic rubber manufacturing plants etc. come under this category of industrial sources of air pollution.

4. Transport Industry: Public Transport System, ships, aeroplanes, trucks, diesel rail engines, etc. come under this category.

5. Agricultural Sources: These sources include many chemicals like insecticides, herbicides, fungicides, rodenticides, pollen grains, crop residues etc.

6. Construction and demolition sources: Construction and demolition activities generate lots of wastes. Different types of paints and other chemicals used in furnishing of houses and furniture cause serious pollutions.

7. Industrial Accidents: Accidents use to occur in different industries from time to time due to carelessness of workers and old machines. These accidents cause serious pollutions that produce long lasting impacts on life and property.

8. Dumps of Wastes: Large amounts of wastes are routinely generated through human actvities. These wastes are dumped carelessly here and there to create ugly scenes. The biodegradable wastes gradually decompose to produce methane (CH_4) which is a serious pollutant if generated in big volumes. A number of germs of diseases develop at dumping sites and get disseminated through the agency of wind and water.

MAJOR AIR POLLUTANTS:

Substances that cause pollution of air are called as air-pollutants. These pollutants can be put into two broad categories A. Gaseous Pollutants, and B. Particlates.

GASEOUS POLLUTANTS: The gaseous pollutants causing air pollution are numerous. Some remarkable gaseous pollutants in the present context are being mentioned below.

1. Sulphur dioxide: Sulphur dioxide (SO_2) and sulphur tri- oxide (SO_3) are produced largely by the combustion of coal and petroleum. These are also poroduced through smelting of ores of sulphide, copper, zinc, and lead; and decomposition of bio-mass. Some industries that emit sulphur dioxide are industries manufacturing sulphuric acid (H_2SO_4), oil refineries, fertilizer industries and paper industries.

2. Hydrogen sulphide: It is a colorless toxic gas which is produced from decaying vegetation and animal materials particularly in shallow fresh water and marine environment. It also comes out from sulphur springs, volcanoes, coal pits and sewers.

3. Carbon monoxide: It is a poisonous gas which originates from incomplete combustion of carbonaceous materials. It can also be oxidized to carbon dioxide which too is a poisonous gas.

4. Hydrogen fluoride: It naturally comes out from volcanoes, However it is produced from blast furnaces and industries concerned with the production of brick, tiles and super phosphates. It also comes out during combustion of coal.

5. Hydrogen chloride: It comes out during the combustion of coal, paper, plastics and chlorinated hydrocarbons.

6. Hydrocarbons: Chemical compounds made of hydrogen and carbon, are called as hydrocarbons. Methane, ethylene and aniline are three examples of hydrocarbons. Methane is the principal constituent of the natural gas. Major sources of release of hydrocarbons are organic matter, seepage from natural gas and oil fields and emission of Volatile Organic Chemicals (VOCs). Hydrocarbons are also produced due to imcomplete combustion of fuels, to incomplete exhausts, petroleum refineries, bruning of crop residues, cracking of natural gas in petrochemical plants etc.

7. Ammonia: This gas is principally generated through refrigerator pre-cooler system of cold storage, manufacture of anhydrous ammonium fertilezers, nitricf acid and domestic incineration etc. The emission of ammonia causes bleaching of plant-leaves reduction of root and shoots growth, browning and softening of fruits, reduction in the rate of germination etc.

8. Nitrogen Oxides: Nitrogen oxide and Nitric Oxide are principal gaseous pollutants emitted through human activities. Nitrogen oxides have been reported to cause fading of colours of clothes, deterioration of nylon and cotton and corrosion of metals.

9. Tobacco Smoke: Smoking of cigarettes and allied things generate tobacco smoke. It is a potent pollutant in closed atmosphere like buses; trains e.t.c. It causes lung cancer, pulmonary and coronary heart diseases. Even passive smokers may be caught by a pulmonary or a coronary disease.

WATER POLLUTION:

Mixing of different solid, liquid or gaseous substances and microorganisms into water, so as to alter its natural is called as water pollution. According to the National Water Commission (1973), water gets polluted if it has not been of sufficiently high quality to be suitable for the highest uses people wish to make of it at present or in future.

SOURCES OF WATER POLLUTION:

The sources of water pollution can be grouped into different heads, llike municipal sources, Industrial sources, Agricultural sources, Shipping sources and underground sources.

1. Municipal Sources: These sources of water pollution comprise residential colonies, mohallahs, hospitals, small industries, offices, institutions etc. The pollutants released from these sources reach to drains from where they are carried to ponds, lakes and rivers.

2. Industrial Sources: Petrochemical workshops, synthetic fertilizer industries, oil refineries, paper mills, textile industries, sugar mills iron and steel industries, leather industries, wine industries, rubber industries, fiber industries, plastic industries, and many others are sources of water pollution. These industries produce industries, and many others are sources of water pollution. These industries produce different types of poisonous by- products that are released into streams which join rivers.

3. Agricultural Sources: Different types of agrochemicals like synthetic fertilizers, pesticides, hormones, soils of crop fields, dung of cattle, wastes of dairies etc. are remarkable agricultural sources of water pollution.

4. Shipping Sources: Ships moving in seas and ocean release lots of wastes into water. Besides human wastes, lots of oil and other products from ships contaminate marine water, day and night.

5. Sources of Underground Pollution: The under ground water is polluted by mixing of wastes seeped into the earth from the heaps of wastes and industrial dumps. Different types of germs of diseases that are produced in the accumulated wastes on ground, also seep into the earth and contamination the ground water.

MAJOR WATER POLLUTANTS:

There are different types of pollutants that mix into water and make it unfit for use by humans, animals and even by plants. These pollutants can be kept under different groups like sewerage, infectious microorganisms, plant nutrients, organic chemicals, inorganic chemicals, and sediments etc.

1. Sewage: Some materials get mixed into water where microorganisms start their degradation to produce carbon dioxide, methane and other gases. The oxygen found

dissolved in water is consumed in this process of degradation. Due to this an artificial crisis of oxygen into water is created which kills many aquatic organisms.

The oxygen needed for complete degradation of sewage found in the polluted laboratory process. BOD is measured in mg/L.

2. Infectious Microorganisms: The effluent released from leather industries, slaughter houses and toilets contain numerous types of bacteria and microorganisms. Dumps of wastes near water bodies produce vast varieties of germs that go into the water during rains through the surface runoffs. These germs may be the germs of cholera, typhoid, diarrhea, dysentery and skin diseases.

3. Plant Nutrients: Plant nutrients like nitrogen and phosphorous reach to water bodies and stimulate the growth of aquatic plants in them. Thus the water gets enriched by nutrients causing eutrophication. It is the eutrophication which gradually converts lakes and ponds into marshes and swamps.

4. Exotic Organic Chemicals: Surfactants and detergents, pesticides etc., are called as exotic organic chemicals. Many of these substances are non-biodegradable.

5. Inorganic chemicals and inorganic compounds: These pollutants enter into water from municipal and industrial wastes and urban runoffs.

6. Sediments: Considerable amounts of soil and silt and silt are washed away from logged hillsides, ploughed fields and construction sites. These fine particles carried away by water are called as sediments. The sediments that join streams reach to rivers and estuaries where they cover gravel beds and deprive fishes like Trout and Salmon against spawning. Sediments block gills of fishes also.

SOIL POLLUTION:

Mixing of different types of substances in soil which affects its natural qualities and causes reduction in its fertility, is called as soil pollution. Some environmentalists define soil pollution as - build up of toxic chemical compounds, salts, pathogens or radio active materials in soil that can affect plant and animal life adversely, is called as soil pollution.

A polluted soil often contains varieties of germs of diseases. Some of those diseases are - anthrax , typhoid, leptospirosis baciallary dysentery, cholera etc. A big amount of soil is lost due to soil erosion, storms, overgrazing and deforestation activities. This loss of soil is often called as negative soil pollution.

SOURCES OF SOIL POLLUTION:

There are many different sources of soil pollution. These are being introduced on the following page.

A. Domestic Sources of Soil Pollution: Wastes produced due to domestic activities are called as domestic wastes. Food leftovers, peeling of fruits and vegetables, ash, paper bits, packets, polythene bags, glass bottles, tin cans, used tyres, expired medicines etc. are some examples of domestic wasted that are often dumped on the ground. These wastes alter the soil composition and make it bad for the growth and development of plants.

B. Municipal Sources: Different types of municipal wastes dumped on the ground cause bad effects on soil. These wastes act as shelter homes of various types of insects and germs of diseases.

C. Industrial Sources: Industries dump lots of wastes on land. These wastes create ugly scenes on ground and contaminate soil making it unfit for productive utilization. A number of toxic wastes seep into the ground and cause underground water pollution.

D. Agricultural Sources: Agro- chemicals used in agricultural produce adverse effects on soil. Synthetic fertilizers, if used continuously for a long time alter the composition of soil, making it unfit for the growth and development of plants.

Faulty irrigation practices cause water logging. The water is evaporated in the sun leaving behind salts in the soil. Thus soil gradually becomes saline and unfit for plant growth.

E. Mining Sources: Mining activities cause long lasting damages to the soil, Tailings, slags, stones etc. that come out of mines are dumped near them. Besides these, different types of toxic chemicals are exposed due to mining which further cause serious soil and water pollution during rains.

F. Wastes: The electronic wastes generated through the disposal of electronic goods, like, computers, televisions, wires, and plastic cabinets etc. Which are often dumped on the ground, create serious pollution on land.

MAJOR SOIL POLLUTANTS:

(i) Toxic Chemicals from industries,
(ii) Pesticies, herbicides and synthetic fertilizers,
(iii) Fly ash from thermal power stations,
(iv) Chemicals from sugar mills, pulp and paper mills, refineries, distilleries etc.
(v) Wastes from leather and rubber industries,
(vi) The domestic garbage dumped on land,
(vii) E- Wastes Or Wastes generated from electronic industries like computers CDs, Floppies, Wires on Mother boards etc.

RADIATION POLLUTION:

Nuclear Power Plants, transport and disposal of nuclear wastes, mining of radioactive substances, fall out of bomb explosions, nuclear weapons, testing of nuclear devices and nuclear accidents etc. are major sources of radiation pollution. These sources cause permanent damages to life and property. A nuclear reactor accident took place in 1986 in Chernobyl, Ukraine which killed at least 31 people and forced more than 200, 000 people to vacate and relocate.

Radiation pollution may be both - Natural and Man - made. Cosmic radiations, ultra violet radiations etc. are example of Natural Radiations. The application of explosive devices. Testing of bombs, leakages from nuclear reactors etc. are man made sources of radiation pollution.

Radio active substances emit rays like alpha (α) rays, gamma (γ) rays and beta (β) rays. These rays are emitted from unstable radioactive substances so as to become stable. In this way these are gradually reduced in their value. The time taken by a radioactive substance to get reduced up to the half of its initial value is called as half life period. The unit applied to express the decay of a radio active substance is called as Becquerel.

NOISE POLLUTION:

Sound without value is called as noise. It is the sound which is undesired by the recipient. Noise interferes with communication, relaxation, leisure, heartbeat, eardrum and mental conditions. It is very harmful to sick persons and students on their studies. Hence, noise is considered as serious pollutant which spreads through air.

Pressure horns of cars and other vehicles, noise produced through loud speakers during social and religious functions, noise produced by heavy machines, irresponsible practice of hearing high pitched sound of music systems, televisions etc. are some remarkable sources of noise pollution.

The popular unit of sound measurement is decibel (db). This unit has been named after Sir Alfred Bell. The human ear is sensitive to sound from 0 to 180 db. However, the sound beyond 140 db is harmful.

MARINE POLLUTION: OIL SPILLS:

The Marine Pollution, as defined by the International Oceanographic Commission (IOC) for United Nations Educational and Scientific Commission, the introduction by man, directly or indirectly, or substances into the marine environment, resulting health, or hindrance to marine activities and reduction of amenities is called as marine pollution.

SOURCES OF MARINE POLLUTION:

Sources of Marine Pollution are -

1. Marine Commerce,
2. Industrial Effluents joining seas and oceans,
3. Dumping of radio active substances into sea water,
4. Sewage brought to the sea by rivers,
5. Offshore oil rigs,
6. Recreational activities,
7. Agricultural pollutants brought to the sea by rivers.

Global Issues of Environment

Our environment today is facing a number of problems. All those problems are causing dangers to take shape against the existence of the whole biosphere of this planet. But, who is behind all those problems? The answer is - man. All those problems have become great topics for discussion, planning and implementation at all levels. An important topic that people discuss or argue about is called as an issue. We have different types of environmental issues at local, regional, national and global levels. Here in this chapter, we are going to discuss about some global issues like Green House Effect and Global Warming, Climate Change , Acid Rain and Depletion of Ozone Layer. These are global issues caused due to human activities in their own countries but these issues relate to the fate of the whole planet.

GREEN HOUSE EFFECT:

The warming effect produced inside a green house by its glass panels, is called as Green House Effect. A green house is a specialized house constructed at horticulture stations for keeping plants that survive better in warm surrounding.

GREEN HOUSE EFFECT: HOW DOES IT OCCUR?

The walls or panels of a green house are made of specialized glass that allows short wave solar radiations to go inside but does not allow long wave infrared heat energy of

the glass houses to pass out. In fact, some of the solar radiations that are absorbed inside the green house get transformed into heat energy in the form of long wave infrared radiations that can not go out of the glass panels of the green house. Thus, temperature inside the green house rises as compared to the temperature outside. The term - Green Houses Effect was coined by J. Fourier in 1827

GREEN HOUSE GASES:

1. Water Vapour: It accounts for about 60 to 70 percent of the natural green house effect. Its level in the atmosphere rises with the increasing global warming adding up further to the green house effect.

2. Carbon- dioxide: It is released into atmosphere through decay or burning of organic substances and through volcanic eruptions. It circulates in the atmosphere through carbon cycle. A good part of carbon dioxide is utilised through photosynthesis and major part of it is absorbed by oceans, rivers and lakes. But, in the modern age of industrialization and increasing automobile exhausts the concentration of carbon dioxide is increasing faster than the earth's natural capacity of assimilation. It has been assessed that the level of CO_2 in the atmosphere has risen by more than 30 per cent since 1750. Currently, the CO_2 concentration in the atmosphere is about 370 parts per million. It accounts for more than 60 percent of the additional green house effect.

3. Methane: This gas is produced through various sources like decomposing organic substances, coal mining, production and transport of other fossil fuels etc. Its concentration in the atmosphere has become more than double since 1750. Scientists are of the opinion that it is an extremely effective heat trapping gas. One molecule of methane is 20 carbon dioxide.

4. Nitrous Oxide: This gas is released into the atmosphere by burning of fossil fuels, automobile exhaust, decomposition of nitrogenous fertilizers in the soil etc. Its level in the atmosphere has risen by 17 percent since 1750. This gas has a capacity of trapping heat 300 times more effectively than carbon dioxide. It can stay in the atmosphere for about 100 years.

5. Fluorinated Compounds: Compounds comprising CFCs (chlorofluoro carbons), HCFCs (hydrochloroflurocarbon) and HFCs (hydrofluorocarbons) are man- made compounds called as fluorinated compounds. These compounds are used in a variety of manufacturing processes. CFCs were first synthesized in 1928. Since then these were widely used in the manufacture of aerosol sprays, blowing agents for foams, packing materials, as solvents and as refrigerants. By 1992 an amendment in the Montreal protocol was made to ban these compounds worldwide. However, the HFCs compounds do not contain chlorine and stay in the atmosphere only for a short time. Hence, these are regarded as sace for various applications.

6.Trifluoromethyl sulphur pentafluoride: This compound was not reported before 2000. Each molecule of this industrially produced compound can trap heat more effectively than all the other gases know to cause green house effect.

IMPORTANCE OF GREEN HOUSE EFFECT:

Our Earth is subjected to green house effect which is very important for creating a climate favourable to the sustenance of most forms of life on it. In this context, the green house effect can be defined as -

The effect of warming and insulation of the earth caused due to some heat trapping gases accumulated in the atmoshphere after their emission from the earth surface, is called as green house effect.

The natural green house effect is in fact, a process of thermal blanketing of the earth which maintains its temperature around 33 Celsius degrees which helps in the sustenance of life on it. Without the green house effect, the climate of the earth is reported to become too cold for most of the life to survive. Then. the temperature may fall much below the required level essential for the existence of life. Hence green house effect is an important natural process which is essential for the survival of life on this planet.

GREEN HOUSE EFFECT AND GLOBAL WARMING:

Human activities of pollution are modifying the natural process of green house effect. The advent of the Industrial Revolution in the 1700s boosted up the activities of burning of fossil fuels like coal, oil and natural gas which released lots of heat absorbing gases in to the atmosphere. Clearing of land for agriculture or for urban settlements wiped out the vegetation that acted as ecological sink for some of those gases like carbon dioxide. These heat absorbing gases accumulate in high concentrations in the upper atmosphere around the earth extending up to 100 km above its surface and act as glass panels of a green house. They allow much of the short wave solar radiation to reach to the earth surface but stop much of the long wave infrared rays against escaping out as heat. They absorb these infrared radiation and then re-radiate most of them back to the earth surface. Thus, the temperature of the atmosphere rises gradually causing an unnatural heating effect which is called as the Global Warming. The Global Warming is the enhanced green house effect due to greater accumulation of GHGs in the upper atmosphere.

The warming of the earth's atmosphere attributed to a build up of green house gases in high concentration in the atmosphere is called as the Global Warming. It is a term which is used to refer to the observed increase in the average temperature of the earth's atmosphere and oceans in recent decades. Scientific discoveries reveal that the world experienced warmest atmosphere during last 50 years out of the period of 100 years. the global mean temperature increased by about 0.5 to 1 degree Celsius, within a period of last 100 years.

IMPACT OF GLOBAL WARMING:

The Global Warming has various types of impacts on the whole earth and its systems. Some of the major impacts of Global Warming are mentioned below.

1. Global Warming may cause frequent natural disasters like cyclones, storms and hurricanes, floods and droughts. It may also cause cloud bursts, avalanches, landslides, mud- flows and earthquakes.

2. Global Warming is causing melting of ice and glaciers which is leadings to a rise in sea- level. As are result, the creeping up of oceans swallow low lying islands and coastal areas.

The rising sea level is causing loss of land, loss of property and loss of lives. It may also cause large scale displacement of people which may further create a problem of rehabilitation.

3. It is damaging forests, agriculture and water supplies.

4. It is damaging various ecosystems like mangrove- swamps, coral reefs and coastal lagoons etc. due to various reason like reduction in Ph of oceanic water and in increasing deposits of acids.

5. Some populations of migratory birds have been declining because of unfavorable variations in climatic conditions. On the other hand the migration time of spring butterflies in Britain has become earlier than it was 30 years ago. It has been observed that the behaviors of some bird species have changed due to climatic variations in the Indian state of Orissa. Some birds like Black Headed Oriole and Open Billed Stork have changed their times of migration whereas some birds like Bronze Winged Jacuana and Indian small Skylark have changed their nesting behaviors.

PREVENTION AND CONTROL OF GLOBAL WARMING :

The Global Warming can be prevented and controlled by following important measures-

1. Reduction on the consumption of fossil fuels by depending on non-conventional renewable sources of energy like wind, sunlight, nuclear and bio- energy.
2. Checking the GHGs at the source of their production and disposing them elsewhere.
3. Collection or recovery of GHGs already present in the atmosphere and their disposal.
4. Learning to adopt and accept the changes in the climate.
5. International co-operation for reduction of GHGs emission with full majority.

GLOBAL EFFORTS:

Periodic Survey's researches and assessments have proved that the global warming causing changes in the world climates is increasing day by day. It is currently recognized as an important global issue. Representatives from over 160 countries have met regularly to discuss ways to reduce GHG emission. In 1997 a conference was organized in Kyoto, Japan, in which world nations signed an agreement called as Kyoto Protocol. According to the Protocol, the percent below 1990 levels, by 2012. Russia's cabinet approved the treaty in 2004 and paved the way to start it with effect from 2005. The protocol has been ratified by more than 126 countries. But Australia and U.S did not support the protocol.

In early December 2005, representatives from 90 countries met in Montreal; Canada, to discuss ways on cutting down the use of fossil fuels so as to ensure less emission of carbon dioxide. According to the Montreal Bulletins, the CO_2 level in the atmosphere is now higher within past 650, 000 years. Unfortunately the two biggest CO_2 emitters of the world - Australia and United States refused to cut down their emissions.

ACID RAN

Falling down of acids from atmosphere to the earth in different forms is called as acid rain. In other words, we can say that- The process by which acids, with PH normally below 5.6 are removed from the atmosphere in rain, snow, hail or sleet is called as acid rain. The quantity of acid in a liquid, like water is measured by a scale called as ph scale. In fact, the acid content of a solution is based on the concentration of Hydrogen ions and it is expressed as ph. The acidity of rain samples is usually measured by ph- scale. As the number on a ph- scale goes down, it indicates more and more acidic nature of the sample

of the rain water. Zero number indicates maximum acidity, seven number indicates neutrality where as fourteen number indicates maximum alkalinity, You might have studied about ph in your Chemistry classes.

HOW IS THE ACID RAIN CAUSED?

Acid is a substance chemically characterized by the ability to form a salt on reacting with a base. It turns blue colour of litmus into red and can burn or cause injury to animal skin and plant leaves that come into its contact. In the modern industrialized world furnaces, engines and machines burn lots of fossil fuels regularly. Burning of fossil fuels emits gaseous pollutants like oxides of sulphur and nitrogen etc. Forest fires also cause the release of acidic fumes and vapours that go up into the atmosphere. These substances are regarded as serious air pollutants. These pollutants are transported in the atmosphere over distances of hundreds and thousands of kilometers. In their journey through sky, these pollutants eventually combine with water vapour to form acids like sulphuric Acid (H_4SO_4) and Nitric Acid (HNO_3). These acids are washed down during rains to reach to the earth surface. such a rain is called as acid rian.

There are other pollutants as well that help in the process of acid rain. These pollutants are Hydrocarbons, soot and metallic ions of manganese, iron, nickel and copper etc. that may often remain inside water vapour. These particles have been reported to catalyze the process of acid formation.

Sulphur dioxide and Hydrogen Sulphide may form Sulphuric acid where as Nitrogen oxide may form Nitric acid when combined with water. Similarly, other acids like Hydrochloric acid, Carbonic acid Phosphoric acid may also be formed in the atmosphere as secondary pollutants and may be washed down to earth along with rain water, snow, hail or sleet.

Chemical Reactions, pertaining to the formation of acid during the process of acid deposition/acid rain are given as follows.

IMPACT OF ACID RAIN:

The acid rain affects living and non-living components of environment. In July 1982, Stockholm - the venue of U N - conference on acid rain, suffered heavy acid showers for about a week. In India too, acid rains have been reported since last Delhi, the capital of India. Some of the remarkable impacts of acid rain are mentioned below-

A. Impacts on Human Health: Acids of rain water join food-chains and water cycles and reach to human body systems. There they cause various types of health problems like neurological and digestive disorders, problems of eyes, throat and respiratory tract. Acid rain causes varieties of safety hazards like reduced visibility due to smog etc.

B. Impact on Flora and Fauna: Acid rain has seriously adverse impacts on aquatic as well as terrestrial flora and fauna. It kills fishes in lakes and ponds. Sweden and U.S.A. have 15000 and 100 fishes lakes respectively due to acid rains. About 237 lakes in Adirondack have highly acidic water with ph below 5. Numerous species of microorganisms are also killed due to acid rains. About 10 percent of forests have been destroyed and 18 million acres of vegetation are under serious threat due to acid rains in West Germany.

C. Impact of Acid Rain on Monuments: Acid is corrosive by nature. Hence, water containing acids will also be naturally corrosive. Even dry acids deposited in air causes

damage to limestone, marble and metals. Acid rain causes heavy damage to monuments and other buildings containing limestone, marble and metals as acids quickly react with these substances. some chemical reaction a of sulphuric acid with different substances are given below:

PREVENTION AND CONTROL OF ACID RAIN:

Acid rain can be prevented by controlling air pollution especially from industrial sources. For this, industrial units should install such technological equipments or devices that may control emissions at the source of their origin. Scrubbers, filters and electrostatic precipitators are some devices that help in controlling as well as removing air pollutants. Acidic water should be neutralized chemically so as to reduce its toxicity. The existing level of air pollutants especially CO_2, SO_2, NO, NO_2, N_2O etc. should gradually be removed out of atmosphere trough specific technology. Vehicles should also be fitted with pollution control devices. They must be checked regularly for their exhausts.

DEPLETION OF OZONE LAYER:

The depletion of ozone layer is one of the Global Issues of environment related to atmosphere and air pollution. But, what is ozone? How is it formed? What are its functions? .... etc., are many questions that we need be answer here. Let us take up these questions one by one.

WHAT IS OZONE? HOW IS IT FORMED?

Ozone is one of the three allotropes of oxygen, an element in gaseous form. It is triatomic and less stable than oxygen. Its chemical formula is O_3. Ozone in the stratosphere is very important to life. It is formed by the action of the ultraviolet light from the sun on molecules of oxygen. However, it is mainly produced from oxygen containing molecules such as SO_2, NO_2, aldehyde etc. also when these molecules are exposed to ultraviolet radiations. Here is an example of the chemical reaction that takes place during the formation of ozone from NO_2.

Reaction;

A large number of ozone molecules assemble around the earth to form the Ozone Layer which extends from 12 to 45 km above the earth surface. On an average it is about 230 Dobson units (DU) in thickness. DU is the unit which measure thickness of the ozone layer. It equals to 0.01 mm. One Dobson unit is the number of molecules of ozone that would be needed to create a layer of pure ozone 0.01 mm thick at a temperature of zero degrees Celsius at pressure of 1 Atmosphere. $1DU = 2.69 \times 10^{16}$ ozone molecules.

ULTRAVIOLET RADIATIONS AND THEIR HARMFUL IMPACTS:

There are three types of ultraviolet radiations in the sunlight- ultraviolet-A, ultraviolet-B and ultraviolet-C radiations. The UV-A is a low energy radiation with wavelengths 400 to 315 nm. It is not harmful to life. UV-B radiations that comprise 1-5 percent of the total radiation, is a short wave radiation (315 to 280 nm) with high energy. It is harmful to life. The UV-C radiations is a radiation of power to damage life but the ozone layer does not allow it at all to pass through and to reach to the earth.

HOW IS THE OZONE LAYER DEPLETED?

Chlorofluorocarbon or Freons get accumulated in greater amounts at high altitudes and gradually reach to the stratoshpere. Under the influence of intense short wave ultraviolet radiations they release chlorine atoms. A single chlorine atom can react with more than, 100,000 molecules of ozone and can convert them into oxygen. Other ozone depleting substances like methane, nitrous oxide, methyl radiations of sunlight and catalysts found in the air and help in the depletion of ozone layer.

Ozone Hole: The hole in the context of ozone depletion relates to thinning of the ozone layer in a certain area. The satellite measurements done in September 2000 revealed that the thinning of ozone layer in Antarctic had reached a record 28.3 million sq km which was about one million sq km greater than the record of 1998. As per the latest record of October 21, 2006 the area of ozone hole was 29 million square kilometers. The blue and purple colours are where there is the least ozone and the greens, yellows and reds are where there is more ozone (NASA, Paul Newman, Image and Records; Satellite Aura). Thinning of ozone in such a big area is rightly termed as ozone hole. The ozone hole in the Northern Latitudes has also been recorded. The ozone hole over Antarctica may expose not only the Antarctica but also a large area of the pacific and Atlantic oceans and South America as well.

PREVENTION AND CONTROL OF OZONE DEPLETION:

Banning the production and use of ozone depleting substances is one important way of preventing further depletion of the ozone layer in the stratosphere. On the other hand, alternatives to these chemicals. compounds should also be searched out so as to replace these chemicals. Scientists of the University of California, U.S.A. devised a possible way of plugging the ozone hole by injecting alkanes or propanes into the atmosphere of Antarctica.The alkanes have the affinity of reaching with of alkane or propane would have to be blown to check the ozone loss. These chemicals could be released from an altitude of about 15 km by a group of hundreds of large aircrafts.

GLOBAL EFFORTS:

Since ozone depletion is a Global Environmental Problem, it requires strong global efforts and co-operations for its solution. The International Community is taking up strong efforts as a result of which global consumption of ozone depleting substances has decreased markedly

Following the UNEP's Governing Council's meeting to co-ordinate acitivities on protecting ozone layer in 1975, United States, Canada, Norway and Sweden banned the use of CFCs. The production capacity of the European Union was frozen allowing limited uses of aerosols. In March 1985, 28 countries of the world agreed on Vienna Convention for the protection of the ozone layer. In September 1987, different countries of the world adopted Montreal Protocol on substances that deplete ozone layer. By December 2001, 182 countries ratified the Vienna Convention and 181 the Montreal Protocol. By 2000, 96 chemicals were subject to control under the Montreal Protocol.

Environmental Impact Assessment

Refer to the studies and statement which firstly attempt to produce estimates of future environmental changes, attributable to a proposed action, and secondly attempt to suggest the likely impact of these changes (environmental changes to be brought in by human.

Environmental changes which are likely to be caused by the proposed human activities related to land use changes, construction of dams, reservoirs, roads, rails, bridges etc.; industrial location, urban expansion etc.

Methods of Environmental impact Assessment

National environmental policy act (NEPA) in the year 1969 with the following major aims and objectives in the USA:

- to declare a national policy to encourage productive and enjoyable harmony between man and environment.
- to promote efforts to prevent or eliminate damage to the environment and the biosphere and stimulate the health and welfare of man.
- to increase understanding of ecological system and nature resources important to the nation.
- to establish a council on environmental quality (CEQ).

Major Steps (1969)

1. Describe the present environment (the base line conditions).
2. Describe the projeet, including purpose and needs.
3. Describe the effects of the project.
4. Describe the effects, both sort-term and long-term.
5. Suggest and compare alternatives (projects).
6. Provide a projection of the future of the site with and without the project.
7. Suggest mitigating (remedial measures) activities.

Environment impact assessment and statement, thus, includes the following considerations,

- Presentation of the existing environmental conditions in terms of physical, biological, social and economic conditions of the side of the proposed project or plan before the implementation of proposed plan.
- Statements on the possible expected effects of proposed project, if implemented, on the existing environmental conditions.
- Statements about those unavoidable adverse effects which may come after the implementation of the project.
- Presentation of viable alternative projects to the proposed projects.
- Statements on the relationship between local short-term uses of the environment and the maintenance of long- term productivity and stability of the environment.
- Evaluation of cost of the project and its probable benefits to the society.

- Statement on suitable remedial measures of adverse effects arising out of the project after its implementation.

Procedures for environmental impact assessment

1. Statement of Objectives : definition of the objectives sought by the proposed development (plan),
2. Technical possibilities of achieving the objective,
3. Proposed actions and alternatives (plans): for achieving the stated objectives,
4. Report on the character of the environment before action begins,
5. Principle of alternative engineering proposals submitted as reports; with analysis of monetary costs and benefits of each engineering alternative,
6. Proposed plan (engineering report) and the report on the present environment are considered; this allows evaluation of the likely environmental impact of the proposal. Impacts are evaluated for each major alternative plan. Attention centres on

a. magnitude of the impact (scale), and
b. importance of the impact (significance)

7. Assessment of environmental impacts of each alternative plan of action, and
8. Environmental Impact Statement is produced; this summarizes the whole analysis, and lists final recommendations and the relative merits of each of the main alternatives.

Categorization of Projects

At the first stage all project undergo an initial Environmental Evaluation Report (IEE). Then the projects are assigned to one of three categories. the categorization is made according to the physical and ecological features of the site and its surroundings, land use, current pollution level, cultural factors and socio-economic conditions of the area.

The three categories are:

i) **Category A** : This category covers the projects with significantly adverse environmental impacts therefore, these projects require complete Environmental Impact Assessment (EIA).

ii) **Category B :** This category includes the projects with adverse environmental impact but comparatively of lesser degree as compared to category A. In this case the Initial Environmental Evaluation Report (IEE) determines the issues and the project may be upgraded to category A.

iii) **Category C :** This category covers projects with negligible adverse environmental impacts or without any adverse impacts or those projects that will improve the environmental conditions.

Luna Leopold had developed a matrix for EIA

Leopold Matrix involves 100 project actions along the horizontal axis and 88 environmental characteristics and conditions, which are liable to be affected by project actions listed in the horizontal axis, in the vertical axis of the matrix. The following are

the variables of project actions and the environmental conditions to be affected by the project actions

Evaluation of Leopold Matrix

The procedure of Environmental Impact Assessment of Leopold et al. suffers from the following shortcomings:

- It requires a tremendous volume of paper work by requiring detailed reports which obscure the central and important issues.
- Insertion of numerous information and reports makes the scheme confusing and it becomes difficult for the concerned authorities to pick up important but most relevant information.
- It has bias towards physical-biological environment.

Despite of all shortcomings it is a scientific model which aware the planners and policy formulaters.

Case Study - 1

(1) Aswan Dam on Nile river

Aswan high dam with lake Nasser is one of the highest dams in the world. It lies in Egypt and its construction was started in 1964. Its construction caused several environmental problems of serious consequences. The environmental impact of dam and lake were not properly evaluated. Initially a small dam was constructed in 1902 but it could not cater to the needs of controlling floods and providing water for irrigation. Then Aswan High Dam was constructed in 1964 for various purposes like: controlling floods, irrigation, hydroelectric power generation, reclaim additional land from the desert and to protect people from drought and famine.

Errors committed while implementing the project:

(a) Evaporation loss was no assessed because high velocity winds were ignored. The high velocity winds passing over a lake cause very high evaporation than low velocity winds. Therefore, it resulted into a loss of 5 billion cubic metres of water every year.

(b) Loss of water through seepage and percolation was also ignored.

Environmental problems arising out of dam construction :

1. 134 million tons of sediments brought by river Nile were deposited each year because of absence of sluices or floodgates.
2. Sedimentation in the lake resulted in the reduction of nutrients near the mouth of Nile. This led to one-third reduction in the plankton which further led to the falling population of fish like sardine, mackerel, lobster etc.
3. The reservoir or lake water became contaminated by disease carrier snails.
4. Considerable increase in the incidence of malaria.
5. Very high rate of soil salinity reduces the agricultural production.

Case study-2

Sethu Samudram Canal Project of India

Existing Environmental and Ecological Conditions

The environmental and ecological set up of the Gulf of Mannar and the palk Bay, forming important closed marine ecosystems are characterized by the following significant features:

- The marine ecosystems of the Gulf of Mannar and the Palk Bay covering an area of 10,500 Km2 are characterized by large biological communities having several species.
- There are 3,268 species of flora and fauna in the Gulf of Mannar of which 377 species are rare and endemic to this marine ecosystem.
- The rich cords of the region provide ideal base for biological diversity in this marine ecosystem.
- The Gulf of Mannar is a Marine Biosphere Reserve and its 21 islands have been declared as marine national parks.
- The sea grass meadows and sea weeds ecosystems form ideal marine ecosystems which provide rich feeding places for fish communities, mainly those varieties which are commercially very important.
- The region is endowed with 127 located fish landing stations of which 87 are located between point Calimore and Pamban in the Palk Bay and 40 in the Gulf of Mannar.

Oppositions to the SSCP

The ecologists, academicians, politicians, non-govt. voluntary organizations (NGCs) and local fishermen communities raised strong voices of protests including petition in the court of laws against the execution of the Sethusamudram Ship Canal Project on several grounds as given below. It may be mentioned that the operation (dredging) of the project was formally inaugurated by the Prime Minister of India in the first week of July 2006.

The environmentalists and ecologists have objected the project on the following grounds:

- There would be catastrophic effects on fisheries, and the large fishing communities of the east coasts of Tamil Nadu would be adversely affected and they would lose their livelihood.
- The dredged canal would disturb the existing sea dynamics and will generate powerful currents between the Palk Boy and the Gulf of Mannar. The thermal condition of sea water in Mandapam region will be disturbed and consequently undersea marine forests will be destroyed.
- The Gulf of Mannar and the Palk Bay are separate closed marine ecosystems with their different ecological characteristics and sea dynamics. The construction of ship canal will amalgamate both the ecosystems which may damage marine life. The ship traffic may destroy marine ecosystem. It may be mentioned that hitherto these two marine ecosystems are lagoons due to shallow depth of water housing rich biological communities.

- The marine ecosystems of coastal shallow water provide livelihood to lakhs of fishermen of 140 costal villages of Ramnathpuram and Tuticorin districts.
- Since coral reefs are seat of biological diversity and provide ideal habitats to many species of sea plants and animals, but if corals are destroyed hundreds of species of marine animals will be killed due to starvation. This will upset the marine food chains and food webs.
- Marine sanctuaries, which are hitherto well protected, well be lost for ever.
- The sea grass meadows and weeds form rich marine ecosystems which support dugongs, which is an endangered species. Sea grasses and sea weeds also act as natural protective walls against marine erosion. The dredging of ship canal would damage the marine ecosystem. The dugongs would become extinct and marine erosion would be accelerated.
- The basic characteristics of the Gulf of Mannar Biosphere Reserve and 21 islands designated as 'marine national parks' will be lost for ever.
- The NEERI has already cautioned in its EIA report that if hard bedrocks of Adam's Bridge are encountered during dredging operation, blasting of rocks would be required. Ecologists say that if powerful blastings are affected, the resultant shock waves would drive away and kill fish communities (due to sound effects).
- The NEERI's EIA report does not throw light on detailed aspects of damage/destruction to ecological set-up of the Gulf of Mannar Biosphere Reserve.
- No major studies of adverse effects on flora and fauna have been carried out in long-term perspective.
- Excavation/dredging of canal would generate 62 million tonnes of silts and sands, the dumping of which would disturb the sediment budget of the region.
- The fishermen alleged that 'heir access to the sea would be regulated and restricted due to frequent plying of ships.

PRIMARY INDUSTRY AND SECONDARY INDUSTRY

When the Product of Primary sector of the economy is used in manufacturing activities as raw material then it is called Primary Industry such as crude Iron are used in Iron and Steel factory but the product of Primary Industry is used as raw Material in Industry such as steel is used for automobile Industry then it is known as secondary Industry.

FACTORS INFLUENCING THE LOCATION OF INDUSTRIES

Many factors come into play in determining the best location for an industry. Industries are developed in response to human needs, converting certain raw materials into manufactured goods of greater utility. The industrial concern may be a simple village workshop owned by a single man or a highly-complex corporation with huge factories and workshops, but it must conform to certain standards of Profitability to justify its existence. Industrial activities prosper not only in regions of dense population, for there are instances where industrial establishment are found in the deserts or mountains, e.g. the mining and concentration of nickel at Kalgoorlie and of tin in the Andean Highlands. Water, daily provisions, mining equipment, workers and overseers may have to be brought hundreds of kilometers to the site. As long as the monetary returns are high, human ingenuity will devise ways and means of overcoming geographical barriers. But as soon as the profit falls short of the investors' expectation, the industrial activity will in theory be discontinued. In practice, some uneconomic industries are subsidized and assisted by governments for a variety of reasons-strategic, political or social so that government intervention is an increasingly important economic factor and is often a locational factor as well.

Raw materials

It is indisputable that raw materials in all their varied forms are fundamental to the initiation and sustenance of any industry. Many industrialists must look to the farms, mines, forests and seas for the supply of many raw materials. On the other hand the

products for others, e.g.testiles are the raw materials for garment manufacture and pre-manufactured components are the raw materials of assembly industries like automobiles or electrical equipment. If the appropriate raw materials can be secured close at hand, it will definitely be an advantage as much transport cost can be saved. However, if raw materials are small in quantity, light in weight or of high value, transport costs may be low and raw materials location will be unnecessary. Thus some industries are tied closer to raw materials than others. The following types of industries are usually located close to their raw materials.

Fuel and power

Before the Industrial Revolution the main source of fuel was wood or charcoal, and the main sources of power were human labour and water-mills. Small industries could be operated anywhere with swift streams or wood supplies. With the introduction of steam power and the development of large-scale industries, large quantities of coal were required for almost every industrial activity. In the early days the fuel efficiency of coal was poor, so that, for example, as much as 12 tonnes of coal were required to smelt one tonne of iron. Under these circumstances it was hardly surprising that industrial districts should grow up on or near the coalfields (see Special Topic 11). Not only were large amounts of coal required for steam power but coal was used to make coke for the blast furnaces. Given the poor transportation conditions of the time, it was also clear that other industries would gravitate towards supplies of steel and coal. The present world pattern of industrial regions, especially those with many heavy industries, is very closely related to the coalfield. Examples are the Ruhr-Westphalia, Silesia and Saxony regions of Germany and Poland; north eastern .France and the Sambre-meuse basin of Belgium; the Midland, Lancashire, Yorkshire, South Wales and Central Valley of Scotland, in Britain; the Pennsylvania-Appalachian-Great lakes industrial region of the U.S.A., the Donbas, Kuzbas, Moscow-Tula regions of the U.S.S.R.; New South Wales in Australia; Damodar Valley in India; Anshan, Wuhan and Chongqing (Chungking) in China.

Markets

There is a very strong justification for industries to be located near the markets which consume their finished products. Large urban areas, which often coincide with large industrial conurbations as in Western Europe, North America and Japan, constitute markets for the consumption of manufactured goods and at the same time form a ready source of labour. But a dense population need not necessarily constitute a large market. For instance, in many parts of Monsoon Asia the population does not have a high **Purchasing Power** and cannot afford to buy the goods that the industrialists turn out. only industries which produce cheap or highly-essential goods can find an adequate market in such areas. This party explains why some underdeveloped countries, though densely populated, have very few industries. Other underdeveloped countries may be under populated, thus not constituting a large enough market. Economic production is based on demand and the ability to pay for the goods produced. Unless both these conditions are fulfilled, the promise of monetary reward is absent and industries will not be established. Markets are thus not merely a question of numbers, but also of the earning capacity of the people and of their willingness to spend.

Facilities

economic geography → i) primary → Agriculture → Resource Mobilisation

secondary → industry → primary 2nd tertiary

Retreating Monsoon → winter season

Agriculture → domestication of plants (Natural)

i) determining components of Agriculture → environmental / physical / Traditional

ii) Revolution in agriculture → Modern (Non-natural / Anthropogenic)

	70s	80s	90s
	Dry	Dry	Bundel/Band
K	Rice	Maize	Jwar
	Rice	Rice	Jawar

After green revolution

- CR
- WR – MILK
- BR – For fish
- PR –
- YR
- RAINBOW R.

Soil
- Desert (Big or coarse)
- Alluvial
- Black (Fine)

Modern component
- Institutional
- infrastructural
- govt. policy & others.

→ Climate
- Amount of Rain
- Temperature

→ ~~Rainfall~~ physiographic
- i) Terrain (Slopes)
- ii) Soil
- iii) Location.

Resource Mobilisation
i) Capital (currency)
ii) Technology.

Changamagai dist of Rajasthan ↓ producing sugarcane.

Slope → (Hilly areas. { Tea :- More water, but Not water logging required } → Assam (Slopes)

{ Rice } → Assam (plain Region)

Q. i) Discuss about traditional determining component of Agriculture?

ii) Discuss the cropping pattern in India based on Rainfall?

iii) Discuss the Agricultural productivity & production in Indian on the basis of rain pattern?

iv) ICAR Role in the development in Agriculture in India?

Report of ICER, ICAR

infrastructure :- Technology & Capital based.

institutional :- policy Based.
- old (Before 80s (All land reform
- New / After 80s. (Agricultural Marketing

political economic sector-culture

i) Abolition of zamindari
ii) Land consolidation
iii) economic land
iv) Co-operating farming

i) Minimisation of disputes

ii) Land ceiling
iii) govt. gives farmer ownership of land.
iv) Co-operating farming Started to compensate the lack of (Tools & Means)

ICAR do research for which Soil, what types of Fertilisers required

v) Indian Agriculture is gamble with Monsoon because Monsoon is unpredictable??

vi) Mr. Monsoon is the real finance Minister of India? comment.

55% directly dependent, 15% — indirectly dependent

vii) India itself a big market but market depends on Monsoons?

viii) India is rich but Indians are Not?? UNDP } India : is rich in resource

ix) Discuss the cropping pattern & what new trend develop or change took place?

"4th"

green Revolution.

Mexico – Wheat Revolution
Philippines – Rice } → about 1965

(ICAR)

x) Discuss the green revolution in India?? Causes & Consequ

infrastructure :- (Hy.V) → must ensure ii) irrigation facility.
+ Chemical Fertilisers (for better productivity)

Slight subsidy given by government