GEOGRAPHY

B.A. SEMESTER - IV

Detailed Syllabus for Geography the Examination to be held in the year 2018

Course No. : GO-401 **Title : Geography of India**

Duration of examination : 3 hrs. **Total Marks : 100**

Credits : 04 **Theory Examination : 80**

Internal Assessment : 20

Section A

Unit-I

1. India in the context of Asia
2. Physiographic Divisions of India
3. The mechanism of Indian Monsoon: Jet streams, western disturbances
4. India major river system

Unit-II :

1. India: Soils (Types characteristics and distribution)
2. India: Vegetation (Types characteristics and distribution)
3. Mineral Resources of India: Iron Ore, Mica and Manganese
4. Power Resources of India : Coal, Petroleum and Water Power

Section B

Unit-III :

1. Indian Agriculture : Characteristics and Problems
2. Green Revolution in India : Feature and Advantages
3. Spatial Distribution Population : Density and Growth
4. Urbanization in India: Trends and Dispartities

Unit- IV

1. Basis of Regionalization- Macro, Meso Regions of India
2. Industrialization Regions of India and Factors of Localization of Iron and Steel and Cotton Textile Industries
3. India : Environmental Problems and Measures of Conservation
4. Major Tourist Destination of Indian States- Himachal Pradesh and Rajasthan

Note for Paper Setting :

The question paper shall comprise of two sections : A & B. Section A shall compulsory and shall comprise of 8 short questions of 2 marks each. Answer should limited to 20 words. Candidate shall be required to attempt all the 8 questions. Section B shall comprise of 8 questions from 4 units. Candidates shall be required to attempt one question from each unit and each question shall be of 16 marks. Answer should be limited to 450 words for each question.

Internal Assessment : (Total Marks : 20)

The marks shall be distributed as under :

I.	Class Test	= 10 Marks
II.	Two Written Assignments (05 marks each)	= 10 Marks

SUGGESTED READING :

1. Deshpande, C. D. : India - A Regional Interpretation, Northern book Centre, ND, 1992.
2. Ginsburg N : The Pattern of Asia, Prentice Hall, Englewood Cliffs.
3. Govt. of India : National Atlas of India, NATMO Publication, Calcutta.
4. Govt. of India : The Gazetteer of India, Vol. I & III Publication Division.
5. Negi, Balbir Singh : Geography of India, Kedarnath Ramnath, Meerut, Delhi 1993.

6. Singh, Gopal : India (Latest Edition), Atma Ram & Sons, Delhi.

7. Singh, Jagdish : India : A Comprehensive Systematic geography, Radha Publication, New Delhi, 2003.

8. Singh, R. L. : A Regional Geography, National Geographical society of India, Varanasi, 1995.

9. Spate, O.H.K. and Learmonth,A.T.A. : India and Pakistan -Land, People and economy, Methuen & Co., London, 1967.

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C. No. : GO-401 **UNIT - I**

BA- IV Semester **LESSON-1**

INDIA IN THE CONTEXT OF ASIA

1.1 Introduction

India is a country of great geographical extent. It sprawls from the snowy ranges of the Himalayas in the north to the shores of the Indian Ocean in the south. It belongs to the Asia which is the largest continent of the world. It forms the part of south Asia and is separated by the Himalayas from rest of the continent. It encompasses vast areas of diverse landmasses. In the north are the lofty Himalayas, parts of which are permanently ice-covered. To the south of the Himalayas is the Great-Indo-Gangetic Plain which is well-known for its fertile soils. The western part of this plain is the peninsular India comprising of the uneven plateau which is surrounded by the Eastern coastal plain in the east and western Coastal Plain in the west. Indian landmass gets an abundance of sunshine from the tropical sun and splashing rains from the monsoons. These are two important climatic factors for the Indian people. Due to its vastness and diversities, India is considered to be a subcontinent as it possesses all the qualities of continent.

India lies in the north-eastern hemisphere between $8^0$4'N and $37^0$6'N latitudes ND $68^0$7'Eand $97^0$25'E longitudes. The tropic of cancer passes through the middle of the country, and $82^0$30'e longitude has been taken as the slandered meridian to determine the Indian standard Time which is 5 hours and 30 minutes ahead of GMT.

In terms of the geographical location, India lies in the northern part of the Indian Ocean. The Indian peninsula penetrates into the Indian Ocean dividing it into two flanking expanses of water, i.e, the Arabian sea and the Bay of Bengal.

India commands a total geographical area of 32, 87,263 sq.km which represents about 2.4% of the earth's total land areas. This is not an ideal compact shape. The peculiar shape of the country causes concern in two regions (1) north

western sector, where Kashmir is separated from rest of the country by high mountain ranges and (2) eastern sector, where only 24 km. wide gap between Bangladesh and Nepal joins the north eastern states with the rest of the country.

1.2 India at a glance

1.2.1 Boundaries

India has a 15,000 km. long frontier. Pakistan and Afganistan lie in the west, China, Nepal and Bhutan in the north, and Myanmar and Bangladesh in the east. In the south, a narrow expanse of Palk Strait separates it from Sri Lanka.

India – Afganistan and Pakistan-Afganistan international boundary , called the 'Durand Line' demarcated the buffer state of Afganistan between the British Empire and Russian Territory. The 'Redcliff Line' demarcated the 8,000 km. long boundary with Pakistan and Bangladesh. The Indo-China boundary 4225 km. is a natural boundary running along the Himalayan ranges. Its eastern part is called McMohan Line. The Indian Myanmar boundary about 1,450 km. long passing through deeply forested hills was demarcated under the treaty of Yandaboo, while the Indo- Nepal boundary was demarcated in 1858. The present boundary was finally demarcated in 1959. The India-Bangladesh boundary is 3,910 km. long, of which nearly 2,450 km has been demarcated to the ground.

The maritime boundary of India is 6100km. which increases to 7516 km. off the coast lines of Andaman-Nicobar and Lakshadweep islands are added to it.

1.2.2 Climate

All these countries are situated in the monsoon region and hence have tropical climate. Pakistan's northern parts, on account of the height, experience temperate climate. Similar is the case of Nepal and Bhutan. In fact the climate varies from Equatorial (Maldives) to harsh temperate in the north. Pakistan receives the lowest rainfall in South Asia.

1.2.3 Natural Vegetation

India's natural vegetation is varied from temperate pine, deodars to stunted trees, bushes and grassland. Pakistan, being on the fringe of monsoon regime, is comparatively arid and dotted with stony waste in the west. Bangladesh is lush green due to heavy monsoon rains. India also has modified type of equatorial forests on the Western Ghats and some in the north-east.

1.2.4 Agriculture

India is a leader so far as agricultural products are concerned. Wheat production is more than 3 times than that of its second, the Pakistan. Rice production of India is 4 times higher than that of Bangladesh. Other countries of South Asia are agriculturally poor. In the production of other cereals like maize, barley, millets, etc. India is ahead of other South Asian countries. In the production of jute, Bangladesh used to lead but presently India is far ahead of Bangladesh. Jute production of India is two times that of Bangladesh. In fact India's raw jute production is the highest and is around 50% of that of the world production. Bangladesh is second and Nepal is third in jute production. Other countries do not matter. So far as natural rubber is concerned India and Sri Lanka are worth mentioning. India's production of rubber is about 11 times more than that of Sri Lanka.

Among oil seed crops, India is the largest producer of groundnuts in the world, averaging around one-third of the world's production. Countries of South Asia do not find any significant place anywhere. In the production of linseed, soybean etc. India is the front-ranking producer in South Asia.

In the production of beverages, tea and coffee India again leaves other countries far behind. India is the largest producer of tea. India is a dominant producer of tobacco in South Asia while other countries stand almost nowhere. India is the leading producer of sugarcane in Asia while Pakistan is a poor second.

1.2.5 Fish Resources

In South Asia, India is the dominant fishing nation. Here fish is caught along the sea coast, high seas, lakes, rivers and ponds. A variety of edible fish are caught. It is an important part of diet of the people of South India. Fishing is an important activity in Bangladesh, Pakistan, Sri Lanka and Myanmar. Live Stock. India has over 200 million heads of cattle. These are oxen, cows, buffaloes, sheep, goats, camels, donkeys, horses, mules, poultry birds etc. Pakistan, Bangladesh, Nepal, Myanmar have also sizeable number of livestock.

1.2.6 Energy Resources

The main resources are coal, petroleum and electricity. The secondary resources are wood, animal waste, tide, wind and solar power countries of South Asia. India has the largest resources of these while others are very poor. In fact all other countries arc fully dependent on imports. India is self-sufficient in coal but has to import about one-third of petroleum in order to meet its requirement.

1.2.7 Industrial Production

The dominant industrial power in South Asia is India. The second one is Pakistan while the remaining five have still to develop and find a position of some significance. The major industries of India are iron and steel, textile, machine tools, sugar, cement, fertilizers, electrical, electronics, automobiles, armament, cargo and naval ships, oil refining, agricultural machines, petrochemicals, chemicals, railway engines, rail coaches etc.

1.2.8 Transportation

India is the largest country of South Asia and has a very elaborate system of rail, road, air and water transportation while other countries lag behind. Many countries do not have railway lines (i.e., Bhutan & Nepal). Nepal and Bhutan are land locked countries.

1.2.9 Trade Routes

The Indian Ocean provides major sea routes connecting the Middle East, Africa, and East Asia with Europe and Americas. It carries particularly heavy traffic of petroleum and petroleum products from the oil fields of the Persian Gulf and Indonesia. The Indian Ocean is far calmer and was thus, opened to trade earlier than the Atlantic Ocean and the Pacific Ocean.

1.3 India in the Context of South Asia

Asia is divided into six physic-cultural realms, namely northern, eastern, western, central, southern and south eastern. The Indian sub- continent comprises the Southern Asian realm, and includes besides India, the countries of Pakistan, Nepal, Bhutan, Bangladesh and Sri Lanka.

India possesses almost all the physical characteristics of South Asia. The Himalayan ranges in the North stand as a protective wall and influence the monsoons which charaterise the climate of the sub-continent. The fertile alluvial soils formed by Himalayan Rivers flowing through the Indo-Gangetic Plains cause a flourishing agriculture and a dense population in the sub- continent. The monsoon climate together with relief causes a variety of natural vegetation.

Culturally also, India, Pakistan and Bangladesh share a common history. India and Pakistan have been the home of the famous Indus valley civilization and the Vedic culture. Racically speaking, the Indian sub-continent possesses all the elements that developed due to in-migration of people over the past many centuries.

SAARC: some of the aspects of India's relations within the subcontinent are conducted through the ***South Asian Association for Regional Cooperation*** (SAARC). Its members are Bangladesh, Bhutan, India, Maidives, Nepal, Pakistan, and Sri Lanka. Established in 1985, SAARC encourage cooperation in agriculture, rural development, science and technology, culture, health, population control, narcotics control, and anti- terrorism.

SAARC has internationally stressed these 'core issues' and avoided more divisive issues, although political dialogue is often conducted on the margins of the SAARC meeting. In 1993, India and its SAARC partners signed an agreement gradually to lower tariffs within the region.

1.4 India in the context of South East Asia

The South Eastern Asiatic realm, encompassing Myanmar, Thailand, Laos, Vietnam, Malaysia and Indonesia exhibits different physical and cultural traits. Climatically, the mainland belongs to the monsoon realm, while the scattered islands have an equatorial type of climate. The culture of the region is a mixture of India, Mongolian, Chinese and Muslim.

The islands of South East Asia, being famous for spices, have long been centres for trade. This region has been the meeting ground of various cultures. India was the first country to influence the culture of the region. Buddhism spread in the region as early as third century B.C. Indian traders spread the religion and culture in these countries. Burma was known as 'Suvarna-Bhumi' in ancient times, while Vietnam is called 'Champa'. Cambodia was earlier known as 'Kamboja', where Kaundinya, a Brahmin of the Indian origion, established the Kamboja Empire. Indonesia in ancient times was known as 'Suvarnadwipe'. The Srivijaya Empire was established here in the third –fourth century. In ancient and medieval times, the Chola, Chera, Pandya and Pallava rulers of South India made several successful expenditure to South East Asian countries and had commercial relations with these countries.

1.5 India and the Geopolities of the Indian Ocean

There are 47 littoral countries, 7 island countries and 13 landlocked countries in the Indian Ocean. All these countries are, historically, economically and culturally, associated with the Indian Ocean. Moreover, there are 13 landlocked countries which are also included this ocean as their trade is carried on through the Indian Ocean. Being located to the south of India, it has a great geo-political, socio-cultural and economic importance. This is the only ocean n the world to be named sfter the name

of a country, i.e Indian Ocean after India. The Indian Ocean has immense strategic importance for India. The landlocked nature of the Indian Ocean has given India a commanding position. The strategic importance of this ocean is further enhanced by the fact that it is accessible from the west and the east through the narrow straits only. The Red sea is the narrow outlet in the west, while the Strait of Malacca and Timor and Arafura seas are the narrow outlets in the east. Through the Suez Canal, the Indian Ocean is connected with the Mediterranean Sea and the Europe.

- The Indian Ocean is named after a country. It is because in the past, during the ancient and medieval periods, India had a dominant position in the region.
- The Indian Culture spresd to South East Asia and African countries through the Indian Ocean.
- Islands like Mauritius, Chagos, Seychelles, etc have a dominance of population of the Indian origin.
- The continental shelf of Mumbai High, Gulf of Khambat, and Godawari-Krishna deltas are rich in petroleum, natural gas, fisheries, and biodiversity.
- The Coral formation along the coast of India has great ecological and economic significance.
- Over 98 percent of the International trade of India is carried through the Indian Ocean.
- About 60 percent of the India's petroleum requirements are imported through the Indian Ocean. Thus Indian Ocean is termed "Oil-line of India." Moreover, the bulk of Indian salt is also obtained from the Indian Ocean.
- The potential tidal energy, especially along the Gulf of Khambat, is enormous.
- India occupies an important geographical position is the central arc of the Indian Ocean.

- India has significant economic and technical co-operation programmes in the littoral states of the Indian Ocean. India has been providing technical training facilities, Indian expertise, and consultancy services to the countries around the Indian Ocean.

1.6 Summary

The geographical location of India provides her manifold advantages which include diversity of climate ensuring a variety of flora and fauna. India is centrally located between Europe and the west coast of North America. The strategic location at the head of the Indian Ocean provides her the advantage of commanding all important oceanic routes connecting the east and the west. It is because of the strategic geographical location that India remained well- linked to the civilized world in the past. Indian traders travelled to distant countries like China, Thailand, Cambodia, Sumatra, Java, Bali, etc. in the east, and Arabia, Persia, Egypt, Greece and Rome in the west.some of the Chola, Pandya and Pallava rulers established their colonial empire in the east where traces of Indian culture are still found.

1.7 Glossary

Mountain: A large natural elevation of the earth's surface rising abruptly from the surrounding level; a large steep hill..

Peak: The pointed top of the mountain.

Sub- continent: A large land mass, smaller than that usually called a continent; often a subdivision of a continent, regarded as a geographic or political entity.

Diversity: the diversity of something is the fact that it contains many very different elements.

Landlocked country: a landlocked state or landlocked country is a sovereign state entirely enclosed by land, or whose only coastlines lie on closed seas.

1.8 Short Answer Questions

1. Name the South East Asian Countries.

2. Give the importance of Indian Ocean.

3. Write a short note on SAARC.

1.9 Examination Oriented Questions

1. Describe the significance of the Indian Ocean.

2. Discuss in detail the role of India in the context of Asia.

3. Discuss in detail the Geo-Political significance of India's location.

4. Discuss in detail India in the context of South East Asia.

1.10 Suggested Readings

Wadia, D.N., 1967, Geology of India, Tata McGraw-Hill Pub. Co. Ltd, New Delhi.

Tirtha, Ranjit., 2011, Geography of India, Rawat Publications, New Delhi.

Bindra, S.S., 1989, India and Her Neighbours, Deep and Deep Publications, New Delhi.

1.11 References

Husain, Majid., 2001, Geography of India, Tata McGraw- Hill Publishing Company Limited, New Delhi.

Tiwari, R.C., 2006, Geography of India, Prayag Pustak Bhawan, Allahabad, India.

Chatterji, Rupali., 2015, Geography of India, Global Academic Publishers, New Delhi.

Gautam, Alka.,2006, Advanced Geography of India, Sharda Pustak Bhawan, Allahabad, India.

Bali, P.K., and Tikka, R.N., 2003, Geography of Asia, New Academic Publishing Company, Jalandhar.

1.12 Model Test Paper

Time allowed- 3 hours **Maximum marks-80**

Note: This paper has two sections.

Section A: Compulsory, contains 8 questions carrying 2 marks each. Answer should be limited in 20 words each.

Section B: Contains 8 questions. Students have to answer 4 questions from each Unit. Each question carries 16 marks. Answer should be limited in 450 words each.

Section A

All questions are compulsory

1. Define Indian islands.
2. Distinguish between Alluvial and Desert soil.
3. Define monsoon winds.
4. Give the human factors of soil erosion.
5. Give the problems of Indian forestry.
6. Define Crop combination.
7. Distinguish between population distribution and density.
8. Give the name of Macro regions of India.

Section B

Attempt one question from each unit.

Unit I

1. Write a note on the Great Plains of northern India.
2. Himalayan river system plays very important role in India. Justify this statement.

Unit II

3. Define Soil. Give the various types and characteristics of soils in India.
4. Give the distribution of Coal in India.

Unit III

5. Discuss in detail the problems which are faced by Indian agriculture.
6. Define Growth rate. Give the various trends of population growth in India.

Unit IV

7. Discuss in detail the tourist destinations of Himachal Pradesh.
8. Discuss in detail about the Industrial regions of India and their factors of localization.

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C. No. GO-401 **Unit-I**

BA- IV Semester **Lesson-2**

PHYSIOGRAPHIC DIVISIONS OF INDIA

Introduction

India has a unique personality with regard to physiography. The great diversity of relief features encompassed in the vast dimensions of the country is simply amazing. The physiograhic diversity of India embraces lofty young fold mountains, flat plains and one of the oldest plateaus of the world. The Indian islands have their own unique personality. A rough estimate made by the Census Commission in 1951, shows that of the total land area, 10.7 per cent 2135m above sea level and is mountainous, 18.6 percent is hilly area (305 to 2135m), 27.7 percent is plateau (305 to 915m) and the remaining 43 percent is plain area.

India is a country of great physical diversity. On basis of the varied physiographic features, India is divided into six physiographic divisions:

1. **The Himalayan mountains**
2. **The Great Plains of North India**
3. **The Peninsular Plateau**
4. **The Coastal Plains**
5. **The Islands**

The physiographic contrasts between these regions are more striking. The Himalaya displays the most youthful and highly differentiated relief on the face of the earth. They are young folded mountains with great magnitude and local relief, highly uneven terrain , very steep slopes, little flat lands and both V-shaped and U-shaped valleys with deep river gorges. The plains present a monotonous aggradational surface of great extent, immense thickness, enormous width and uniform character of alluvium which forms the subsoil of the plains. On the other hand, the peninsula is dominated by an open senile topography which has witnessed vast periods of geological quiescence.

2.1 Physiographic Division of the Himalayas

2.1.1 Vertical division of himalayas

For a systematic study of the physiography and relief, the Himalayas may be divided into the following four divisions from north to south.

1. The Trans- Himalayas
2. The Greater Himalayas
3. The Lesser Himalayas
4. The Shiwaliks or the Outer Himalayas

The Trans Himalayas

The Trans-Himalayas are about 40 km wide. They contain the Tethys sediments. The rocks of this region contain fossils bearing marine sediments which are underlain by "tertiary granite". It has partly metamorphosed sediments and constitutes the core of the Himalayan axis. It has a great accumulation of debris in the valleys of defeated streams which could not maintain their southerly course across the rising barrier of the Himalayas.

The Greater Himalayas

This is also known as Inner Himalayas, central Himalayas or Himadri. This is the northernmost or the innermost of all the Himalayan ranges.The greater Himalayas rise abruptly like a wall north of the Lesser Himalayas. The greater Himalayas are about 25km wide with an average height above 5000 meters. Almost all the lofty peaks of the Himalayas lie in this zone. This range is so formdable that it cannot be easily crossed even through the passes because they are generally higher than 4,570m above sea level and are snowbound for most of the year.

The Lesser Himalayas

In between the Shiwaliks in the south and the great Himalayas in the north is the Middle Himalayas running almost parallel to both the ranges. It is also known as the Himachal or Lower Himalayas. It has an intricate system of ranges which are 60-80km wide having elevations varying from 3,500 to 4,500 m above sea level. The main rocks are slate, limestone and quartzites. This region is subjected to extensive erosion due to heavy rainfall and deforestation.

The Shiwaliks or the Outer Himalayas

The Shiwaliks extend from Jammu division of Jammu and Kashmir to Assam. In width, Shiwaliks vary from 8km in the east to 45km in the west with an average elevation of about 1300 meter above sea level. It is not a countinous range. It is broader in the west and narrows down in the east. The Shiwaliks are mainly composed of sandstones, sand rocks, clays, conglomerates and limestones.

2.1.2. Longitudinal Division of the Himalayas

Kashmir Himalayas: The Kashmir Himalaya mostly lies in Jammu and Kashmir covering an area of 3,50,000sq km. they are about 700 km long anf 500 km wide with an average elevation of 3000 metres. They have the largest share of snow and glaciers. It is breached by the Kishanganga, the Jhelum and the Chinab. Valley of Kashmir lies in this region.

The Punjab Himalayas: The Punjab Himalaya stretches north-westwards from the Satluj about 570 km and covers an area of 45,000sq km. high peaks are rare in this section. The Northernmost part of Himacahl Himalayas is an extension of ladakh cold desert, in Spiti sub-division of Lahul and Spiti. These are noted for their fruit culture and scenic beauty.

The Kumaon Himalaya: The Kumaon Himalayas extends from the river Satluj to the kali to a distance about 320 km. it covers about 38,000 sq km. the highest peak Nanda devi followed by others like Kamet, Badrinath, Kedarnath, Nandakot, gangotri

and others. This section of Himalaya has great significance for Hindus due to the Bhagirathi, the Ganga and the Jamuna, which have their source in this zone.

The Central Himalya: The Central Himalya stretches from river Kali to river Tista for about 800 km covering an area of about 1,16,800 sq km. it has the distinction of carrying the highest peaks in the world, Dhaulagiri, Annapurna, Mansalu, Mt. Everest Kanchanjunga,etc. this range is known as Sikkim Himalaya in Sikkim; Darjeeling Himalaya in Bengal; and Bhutan Himalaya in Bhutan.

The Assam Himalaya: The Assam Himalaya stretches from Tista to the Brahmaputra to a distance of about 720 km. it covers about 67,500 sq km. it rises over 800 m above the Bramhputra valley. The noted peaks are Pauhunri and Kulhakangri.

2.1.3 Importance of the Himalayas on the Economic Life of Indians

- Himalayas intercept the Monsoon winds and cause rainfall over the greater part of the country.
- Major North Indian Rivers owe their origin to the glaciers of the high Himalaya.
- The vast Indo-Gangetic plains have been formed by the deposition of sediments brought down by the Indus, Ganga, Brahmaputra and their innumerable tributaries.
- The Himalayan forests support a number of forest-based economic activities like timber trade.
- Development of tourism industry is a major economic activity in the Himalayas.
- Himalayas provide favorable terrain for development of hydro-electricity.
- Cultivation of orchard crops like apples and oranges and cultivation of crops like tea and saffron are the major economic activities in the Himalayas.
- Many medicinal plants and herbs grow in these mountains.

2.2 North Indian Plains

The great plains of North India, covering an area of 6, 52,000 sq. km, stretches in an east-west direction. They are bordered by the Himalayas in the north and Central Indian Highlands in the south. These plains consist of very rich and fertile alluvium deposited by many perennial rivers, such as Indus, Ganga, Brahmaputra and their numerous tributaries. The plains form one of the largest agricultural belts in the world. The Northern Plains provide suitable conditions for irrigation, inland navigation, constructing roads and railways. These have helped in setting up industries. About 40 per cent of India population resides in the northern plains. They are formed by alluvial deposits brought by rivers – Indus, Ganga, Brahmaputra. The Northern Plains extend 3200 km from east to west in Indian Physiography. The Maximum depth of alluvium deposits from 1000-2000 km. Three zones from North to South – Bhabar(narrow belt parallel to Shiwalik foothills at slope break-up), Tarai(They are situated in south of bhabar, re-emerge without having any properly demarcated channel, this region has luxurious growth of natural vegetation), Alluvial plains(located to the south of Tarai, mature stage of fluvial erosional and depositional landforms like sand bars, meanders. It is divided into Khadar and Bhangar).

The Great Northern plains consist of the following regions :

A) **The Punjab Haryana Plains**: They are drained by the tributaries of river Indus, Ravi, Beas and Satluj. These plains are flat with an average elevation of 200 to 240 metres. These fertile plains include the Bari Doab(between Ravi and Beas river) and Bist Doab(between Beas and Satluj).

B) **The Rajasthan Plains:** They cover an area of 1.75 lakh sq km in Rajasthan and its adjoining states. It includes the Marusthali of Thar desert and Bagar tract west of the Aravallies. The region is one of the dry river beds (Sarswati) and shifting sand dunes. River Luni is an inland drainage river. Sambhar, Kuchaman, Didwana and Pachbhadra are the salt lakes of this region.

C) **The Ganga Plains:** The Ganga plains of Utter Pradesh, Bihar and Bengal occupy an area of 3.57 lakh sq.km. Important rivers of this region are the Ganga, the Yamuna, the Gandak, the Son and the Kosi. The Bengal basin is mainly composed of the delta basin.

D) **The Brahmaputra plains:** it contains alluvial deposits of the Brahmaputra and its tributaries the Subansiri, Dibang and the Lohit. It is a flood prone area because the slope of the valley is too gentle to drain away the large volume of rainfall in monsoon season.

2.3 PENINSULAR PLATEAU

The peninsular plateau, which covers an area of about 16 lakh sq. km., is the largest physiographic division of the country. It has senile topographical features. The Aravallis form its boundary in the north-west, Rajmahal Hills in the north and north-east. South of about 220 N latitude, the Sahyadris and the Eastern Ghats form the western and eastern boundaries respectively.

On the basis of variation in relief, further divisions of the peninsular plateau may be made as follows:

(a) **The Aravalli Range:** It is one of the oldest fold mountains of the world. The highest peak is Gurushikhar in Mount Abu Hills. The Delhi Ridge marks the northern end of the range.

(b) **The Central Plateau**: It consists of Plateau of Rajasthan and Madhya Pradesh. Average height is 250-300M. The Malwa Plateau in Madhya Pradesh lies in the north of Vindhyas. The Plateau is largely broken. The Chambal ravine is an important feature. The area between the Yamuna and Vindhyan Plateau is called Bundelkhand Plateau. It lies in the east if Maikal ranges and south of river, Son. Important rivers of this region are Rihand and Son.

(c) **The Vindhyan Range**: It is an escarpment running in east-west direction. Kaipur Hills form its eastern portion.

(d) **The Satpura Range** : It lies between Narmada and Tapti valleys latitudinally. The plateau is formed of lava. The highest point of Satpura range is Dhupgarh in Panchmarhi. The eastern part of the range is Maikal Plateau.

(e) **The Eastern Plateau and the Chhotonagpur Plateau**: East of the Maikal Hills lies the Baghelkhand Plateau. South of the Baghelkhand is Chattisgarh BasinFurther south is Bastar Plateau or Dandakaranya. The Chhotanagpur Plateau lies in the east of Baghelkhand Plateau. It has an average height of about 700m. It

has a radial drainage. The Damodar River originates near Tori in Palamau. Damodar valley project is located here. The Chotanagpur Plateau ends in Rajmahal Hills.

(f) **The Kathiawar and Kutch Peninsula**: they have an Archaean structure but are surfaced by tertiary rocks. It tapers into the Arabian Sea.

(g) **The Deccan plateau:** it is located within the Satpura-Mahadeo-Malkal ranges in the north, the Eastern Ghats in the east and the Western Ghats in the west. It is slightly titled towards south east. The peninsula is triangular in shape-rising from 500 to 1,000m. Amarkantak and Dhupgarh are important Peaks.

(h) **The Western Ghats or the Sahyadris:** they form the western edge of the Deccan Plateau. Starting from khandesh, south of tapi and running southward parallel along the western coast for 1600 km, it reaches Kanyakumari and joins the Eastern Ghats at Nilgiri Hills. Kalsubai, Mahabaleshwar, and Harishchanderagad are among the highest peaks in this parts of the Ghats. Thaighat and Bhorghat are important passes through which roads and railways run between the Deccan plateau and konkan plains. Kundremukh, Pushpagiri and brahmagiri peak lie south of Coorg.

(i) **Palghat Gap:** It connects Tamil Nadu and Kerala and is located south of Nilgiri, separating the Cardamom Hills from the Nilgiris. Further south of the Palghat Gap, there are the Annamalai Hills and the Palni Hills and the Palni Hills in the north east. The culmination point of these hills is the Anaimudi peak with the distinction of being the highest peak of South India.

(j) **The Eastern Ghats:** They form the eastern boundary of the Deccan Plateau. They are broken as compared to Western Ghats. The highest point Armakonda is in the Visakhapatnam district and Mahendragiri in Odisha.

2.4 Coastal Plains

India coastline extends from the Kutch in Gujarat in the west to the Gangetic delta in the east. The Western coastal plain lies between the Western Ghats and Arabian Sea. It

extends from Gulf of Kutch in the north to Cape Comorin (Kanyakumari) in the south. The length of the western coastal plain is 1500 km. The subdivisions of the Western coastal plain are the Kutch and Kathiawar peninsulas and the Gujarat coastal plain (in Gujarat), Konkan coastal plain (in Maharashtra and Goa), Karnataka coastal plain (in Karnataka) and Malabar coastal plain (in Kerala). The Malabar coastal plain is the widest part of the western coast, made up of extremely fertile alluvial soil and has a number of lagoons and backwaters like Asthamudi and Vembanad. The western coast receives heavy rainfall from the south-west monsoon winds. The Eastern coastal plain extends from the Gangetic delta to Cape Comorin (Kanyakumari) and lies between the Eastern Ghats and Bay of Bengal. The eastern coastal plain consists of the deltas of Mahanadi, Godavari, Krishna and Kaveri. Some salt water lagoons and lakes are present, such as the Chilka Lake in Odisha (largest lagoon in India) and Pulicat Lake in Tamil Nadu. The eastern coast is divided into the Coromandel Coast in the south and Utkal coast in the north. The Northern Circars extend from the mouth of the river Subarnarekha to the Krishna delta.

The West Coastal Plains

These plains are confined to a narrow belt about 10 to 25 km. wide stretching between the Arabian Sea and the Western Ghats and extending from Kanya Kumari to Surat for about 1,500 km. Kutch and Kathiawar peninsula lie at their northern end, as also the plain of Gujarat formed by the Tapi, th Narmada and the Mahi rivers. It further sub-divided regionally into the Konkan coast, Karnataka coast and Kerala coast.

The Kutch peninsula, the Great Rann, the Kathiawar peninsula, the Gujarat plains, the Konkan coast, the Karnataka coast and the Kerala coast are comparatively make the West Coastal plains.

The East Coastal Plains

These extends from Kanya kumari northwards to the Krishna and Godavari deltas for1,100 km. with an average width of 120km. The coastal plains again widen north of Berhampur and extend to the Chilka lake, the Mahanadi delta, and the Balasore coastal plain, where they merge into the deltic plains of Ganga. As the peninsular plateau is tilted

towards east, all rivers, except Narmada and Tapi, flow eastwards towards the way of Bengal, forming vast deltas, which are very fertile, highly irrigated and densely populated. The plain is sub-divided into the Tamil Nadu plain, Andhra plain, and the Orissa plain.

Importance of the Coastal Regions of India

- Economic activities such as agriculture, trade, tourism, industrial development, fishing etc.
- Important hinterland for major parts like Kandla, Mumbai, Nhava-Sheva, Mormugao, Mangalore, Cochin, Tuticorin, Chennai, Visakhapatnam, Paradeep, Haldia, Kolkata.

2.5 The Indian Islands

Apart from the large number of islands in the near proximity of the Indian coast, there are two main groups of Islands in the Indian Ocean far away from the coast. One of these is the Andaman and Nicobar in the Bay of Bengal and the other is a group of tiny islands known as Lakshadweep Islands in the Arabian Sea.

The Andaman and Nicobar: The Andaman and Nicobar group of Islands form a chain of about 590 km with a maximum width of about 58 km. This archipelago is composed of 265 big and small islands covering a cumulative area of about 8249 sq km. the entire chain consists of two distinct groups of Islands. The Great Andaman group of islands and the Nicobar group of islands. The Great Andaman is a closely knit group of about 203 islands. It is about 260 km long and 30 km wide with total area of 6596 sq km. This group of islands is divided into three major groups viz. North Andaman, Middle Andaman and South Andaman.

The Nicobar group of islands consists of 7 big and small islands together with several tiny islands. They are scattered over a length of 262 km with maximum width of 58 km covering an area of 1,653 km. The Great Nicobar, as its name suggests, is the largest island. It is the southernmost island and is only 147 km away from the Sumatra island of Indonesia.

The Lakshadweep Islands: The Lakshadweep Islands in the Arabian Sea, though literally mean one lakh islands is only a group of 25 small islands. They are widely scattered over an area of 108.78 sq km. All are tiny islands of coral origin and are surrounded by fringing reefs. The largest and the most advanced is the Minicoy Island with an area of 4.53 sq km. Most of the islands have low elevation and do not rise more than five metres above mean sea level.

2.6 Summary

The diversity in geological structure of India has produced a variety of relief and physical features in the country, which has nearly 10.6% area occupied by mountains, 18.5% by hills, 27.7% by plateaus and 43.2% by plains. In the north lie the lofty mountain ranges of the Himalayas with snow-capped peaks, large glaciers, deep gorges, and longitudinal valleys. Lying south of the Himalayas there are flat and featureless Great Plains drained by mighty rivers like the Indus, Ganga, Brahmaputra and their tributaries. The western Rajasthan plain is a sandy desert with a treeless expanse of sand dunes and ephemeral streams. The Indian Peninsula, extending south of the Great Plain is a tableland, dominated by a landscape of complex of denuded rocks, series of scraps, and step like topography at places, flat topped summits, residual ranges and broad valleys. The two groups of islands, the Lakshadweep in the Arabian Sea, and the Andaman-Nicobar in the Bay of Bengal are of different origin.

2.7 Glossary

Middle Himalayas: In between the Shiwaliks in the South and the Great Himalayas in the north is the Middle Himalaya.

Peak: The pointed top of the mountain.

Physiographic: A description of the features and phenomena of nature**.**

Plateau: a usually extensive land area having a relatively level surface raised sharply above adjacent land on at least one side.

Glacier: a large mass of ice formed over many years that do not melt during the summer. Glaciers move slowly over an area of land such as a mountain valley.

2.8 Short Answer Questions

1. Define Kashmir Himalaya?
2. Give the importance of Himalayas.
3. Write a short note on Western Ghats.

2.9 Examination Oriented Questions

1. Describe the physiographic divisions of India.

2. Discuss in detail the division of Himalayas and their significance.

3. Discuss in detail the division of Plains and their significance.

4. Discuss the significance of coastal plains in India.

2.10 Suggested Readings

Ahmed, E., 1972, Coastal Geomorphology of India, Orient Longman, New Delhi.

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2.12 Model Test Paper

Time allowed- 3 hours **Maximum marks-80**

Note: This paper has two sections.

Section A: Compulsory, contains 8 questions carrying 2 marks each. Answer should be limited in 20 words each.

Section B: Contains 8 questions. Students have to answer 4 questions from each Unit. Each question carries 16 marks. Answer should be limited in 450 words each.

Section A

All questions are compulsory

1. Define monsoon.
2. Distinguish between Alluvial and Desert soil.
3. Define Jet Stream.
4. What is reserved forest?
5. What are natural resources?

6. Define Density and give its types.

7. Define Urbanization.

8. Give the name of Macro regions of India.

Section B

Attempt one question from each unit.

Unit I

1. Discuss in detail the position of India in the context of Asia.

2. Define Monsoon. Give the role of Jet stream and western disturbances on monsoon.

Unit II

3. Define Soil. Give the various types and distribution of soils in India.

4. Discuss in detail the classification of forests.

Unit III

5. At present Indian agriculture facing number of problems. Justify this statement.

6. Give the various trends of Urbanization in India.

Unit IV

7. Discuss in detail the tourist destinations of Himachal Pradesh.

8. Discuss in detail the meso regions of India.

Dr. Rakesh Jasrotia
Asstt. Professor
GDC for women, Kathua.

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C. No. GO-401 **Unit-I**

BA- IV Semester **Lesson-3**

THE MECHANISM OF INDIAN MONSOON: JET STREAMS, WESTERN DISTURBANCES

3.1 Introduction

The phenomenon of monsoons is certainly very old, but its exact nature and causation discovered only recently. The monsoon has received fervent attention for nearly 350 years. Since then there is consistent effort of meteorologist, to unravel the mysteries of monsoon. As the understanding of monsoon went on increasing, the definitions of monsoon also went on changing. The name southwest monsoon is used for the phenomenon of rains, southwesterly surface winds and the period during which they occur. It connotes the seasonal reversal of wind at lower atmosphere and upper atmosphere over Indian subcontinent. These wind system prevails for 2 to 4 months from June to September.

The word 'monsoon' indicates, the south Asian summer monsoon is part of seasonally reversing wind system characterized by wet summer and dry winters. Thus, in simple words Monsoon is a seasonal reversing wind accompanied by corresponding changes in precipitation.

The meteorologist definition of the monsoons is very simple. ' A complete replacement of the dry hot air by the equatorial maritime air up to an altitude of three to five kilometers over the land and water surface.' The monsoon system considered holistically self-regulating described by renowned meteorologist Webster. The monsoon manifested as land-atmospheric-ocean interaction between continents and oceans in the seasonal cycle. Monsoon is a response of the coupled atmosphere-ocean-land system to annual variation of solar radiation forcing. Physical process governing monsoon climate involve not only atmospheric dynamical process but also extremely complex process of interactions among the atmosphere ocean and land surface. Coupled aspect, land-sea and atmospheric interaction as mentioned above challenged by new theories of Chao and Chen has to do very little with monsoon formation.

3.2 Factors exerting influence on Indian Monsoon

1. Jet streams,
2. Tibetan Plateau,
3. El Nino,
4. Indian Ocean Dipole
5. Cyclonic

3.2.1 Jet Streams

Jet stream Theory is the latest theory regarding the origin of the monsoons and has earned worldwide acceptance from the meteorologist's. Jet stream is a narrow band of fast moving air flowing from west to east (Westerlies). Jet Streams in northern hemisphere flows between 25° to 35° N in the upper troposphere at a height of about 12-14 km. The wind speeds in a westerly jet stream are commonly 150 to 300 km p.h. with extreme values reaching 400 km p.h.

"Jet stream is a swiftly blowing wind at a height of 3 to 5 kms above the subtropical high pressure belt. Himalayas act as a barrier in their path and as such, the jet streams divided into westerly and easterly jet streams. The westerly jet is responsible for bringing western disturbances into north-west India and Pakistan which bring winter rainfall. The easterly jet blowing over northern India is responsible for bringing tropical depressions over India and Bangladesh. These depressions play an important role in the distribution of rainfall." This is short description of jet streams.

Jet Streams in winter

- Westerly jet stream blows at a very high speed during winter over the sub-tropical zone.
- This jet stream is bifurcated by the Himalayan ranges and Tibetan Plateau.
- The two branches reunite off the east coast of China.
- The northern branch of this jet stream blows along the northern edge of the Tibetan Plateau.

- The southern branch blows to the south of the Himalayan ranges along 25° north latitude.
- A strong latitudinal thermal gradient (differences in temperature), along with other factors, is responsible for the development of southerly jet.

Jet Streams in summer

- With the beginning of summer in the month of March, the Jet streams (upper westerlies) start their northward march.
- The southerly branch of Jet streams remains positioned south of Tibet, although weakening in intensity.
- The weather over northern India becomes hot, dry and squally due to larger incoming solar radiation and hot winds like loo.
- Over India, the Equatorial Trough (ITCZ) pushes northwards with the weakening of the Jet streams (upper westerlies) south of Tibet, but the burst of the monsoon does not take place until the upper-air circulation has switched to its summer pattern.
- By the end of May the southern jet breaks and later it is diverted to the north of Tibet Plateau and there is sudden burst of monsoons (the ridge moves northwards into Central Asia high pressure over north-west India moves northwards into Central Asia makes way for south-west monsoon winds). An Easterly jet emerges over peninsular India with the northward migration of Jet streams.
- The upper air circulations are reversed with the emergence of Easterly jet (convergence in upper layers is replaced by divergence. Divergence in lower layers is replaced with convergence high pressure at lower layers is replaced by low pressure system). The easterly winds become very active in the upper troposphere and they are associated with westerly winds in the lower troposphere (south-west monsoon winds).
- Western and eastern jet flow to the north and south of the Himalayas respectively. The eastern jet becomes powerful and is stationed at 15° N latitude.

- This results in more active south-west monsoon and heavy rainfall is caused.

3.2.2 Effect of Tibetan Plateau

First time in year 1958 Flohn propounded theory that Tibetan Plateau might act as elevated heat source during the summer monsoon season has gained some importance. According to this theory due to extra heat at Tibetan Plateau lifts air over Tibetan Plateau this air then tries to descend over Indian Ocean of equatorial side. However, due to earth has movement the air deflects to the right side this air returns to Indian peninsula in the form of moisture-contained air in southwesterly direction. It has even been suggested by some investigators that the thermal effects produced by the plateau might be dominating factor responsible for the northward extension of easterly monsoon current over India. To test the hypothesis all available radiosonde observations from central and southern Asia, including several from Tibet and the neighborhood for the year 1957, were utilized and mean upper air temperature maps were drawn. It is found that there is no observational evidence for the hypothesis (which was originally based on indirect evidence) that a concentrated warm region exists in the upper atmosphere over Tibetan Plateua. On the other hand a diffuse warm ridge has been found to extend east-west along the entire Asiatic continent between the 25th and 30th Parallel at 500mb. level. The existence of such a ten thousand kilometer long ridge suggests that the associated northward extension of the upper easterly current cannot be linked solely with the Tibetan Plateau but with the entire Asiatic landmass itself. At upper troposphere over Tibetan plateau the planetary scale high pressure system and associated anticyclone circulation persists. This system is referred as Tibetan High. This ridge covers entire eastern hemisphere and dominates the global upper troposheric circulation. The clockwise flow (anticyclone) around Tibetan High contains an easterly jet stream in its southern flank called the tropical easterly jet. Tibetan High formed due to diabetic heating process associated with deep convective rainfall in south-east Asia and western Pacific and also to sensible and convective heating over elevated Tibetan Plateau.

3.2.3 Cyclonic Storms

It has been established that cyclones originating over the seas and moving towards the land have special roles in causing widespread rains. Those cyclones are associated

with the tropical cyclones originating in the Western Pacific, near the Atlantic Coast and moving parabolically cause heavy rain in South East Asia. Some vigorous cyclones reach the way of Bengal and head towards the Indian mainland. Sometimes El-Nino-Southern Oscillation (ENSO) disrupts the formation and movement of these tropical cyclones. It is called ENSO effect.

3.2.4 El Nino-Southern Oscillation (ENSO) effect

Southern Oscillation, a phenomenon first observed by Sir Gilbert Thomas Walker Director-General of Observatories in India, refers to the seesaw relationship of atmospheric pressures between Tahiti near tropical eastern Pacific and Darwin in Australia. He noticed that when it was high pressure in Tahiti, it was low pressure in Darwin and vice versa. Walker noticed that the quantity of rainfall in the Indian subcontinent was often negligible in the years of high pressure at Darwin (and low pressure at Tahiti). Conversely, low pressure at Darwin bode well for the precipitation quantity in India. Thus he established the relationship of Southern Oscillation with quantities of Monsoon rains in India. Ultimately, it was realized that the Southern Oscillation is just the corresponding atmospheric component of the El Nino/La Nina effect (which happens in the Ocean). Therefore in the context of the Monsoon, the two cumulatively came to be known as the ENSO. The ENSO is known to have a pronounced effect on the strength of SW Monsoon over India with the Monsoon being weak (causing droughts in India) during the El Nino years whereas La Nina years had particularly good Monsoon strength over India. Although ENSO was statistically effective in explaining several past droughts in India, in the recent decades the ENSO-Monsoon relationship seemed to weaken in the Indian subcontinent. Although a weak El Nino was known to be developing in 2002, none of the predictions for 2002 suggested a large deficit in the Indian monsoon rainfall. The experience of 1997 and 2002 suggest that we do not as yet understand adequately the response of the monsoon to El Nino. It should be noted that droughts do occur in the absence of El Nino. In fact, of the 24 droughts that occurred during 1871-2004, only 11 were associated with El Nino. Discovery of ENSO thus led to establishing important predictor for forecasting Indian monsoon.

3.2.5 Indian Ocean Dipole effect

This effect depends upon the temperature and pressure of sea surface at western Arabian Sea near African coast and temperature and pressure of sea surface at eastern Indian Ocean near Indonesia. Like ENSO, the temperature difference of sea surface at both sides has seesaw like effect. Discovery of this phenomenon took place in 1999 and named the Indian Ocean Dipole (IOD). In due course of time its index got formulated. IOD develops in the equatorial region of Indian Ocean from April to May peaking in October. At the time of positive IOD index west Arabian Sea is hotter than Indian Ocean at Indonesia. In the negative dipole year, reverse happens making Indonesia much warmer and rainier. It demonstrates that a positive IOD index often negated the effect of ENSO, resulting in increased Monsoon rains in several ENSO years like the 1983, 1994 and 1997. Further, it was shown that the two poles of the IOD - the eastern pole (around Indonesia) and the western pole (off the African coast) were independently and

cumulatively affecting the quantity of rains for the Monsoon in the Indian subcontinent

3.3 The Seasons

The monsoon type of climate is characterised by a distinct seasonal pattern. The weather conditions greatly change from one season to the other. These changes are particularly noticeable in the interior parts of the country.The coastal areas do not experience much variation in temperature though there is variation in rainfall pattern. Four main seasons can be identified in India – the cold weather season, the hot weather season, the advancing monsoon and the retreating monsoon with some regional variations.

3.4 Types of Seasons

3.4.1 The Cold Weather Season (Winter)

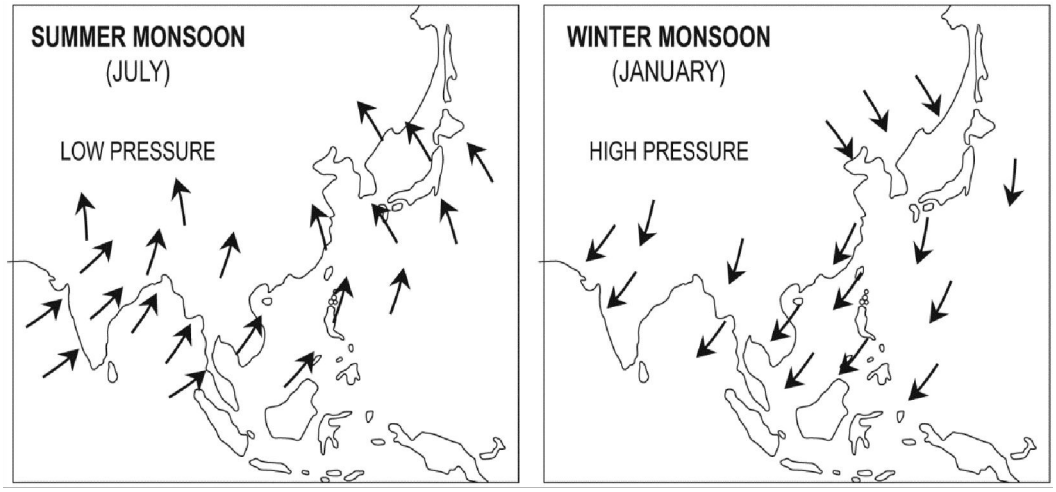
The cold weather season begins from mid- November in northern India and stays till February. December and January are the coldest months in the northern part of India. The temperature decreases from south to the north. The average temperature of Chennai, on the eastern coast, is between 24° - 25° Celsius, while in the northern plains, it ranges between 10° - 15° Celsius. Days are warm and nights are cold. Frost is common in the north and the higher slopes of the Himalayas experience snowfall. During this season, the

northeast trade winds prevail over the country. They blow from land to sea and hence, for most part of the country, it is a dry season. Some amount of rainfall occurs on the Tamil Nadu coast from these winds as, here they blow from sea to land. In the northern part of the country, a feeble high-pressure region develops, with light winds moving outwards from this area. Influenced by the relief, these winds blow through the Ganga valley from the west and the northwest. The weather is normally marked by clear sky, low temperatures and low humidity and feeble, variable winds. A characteristic feature of the cold weather season over the northern plains is the inflow of cyclonic disturbances from the west and the northwest. These low-pressure systems originate over the Mediterranean Sea and western Asia and move into India, along with the westerly flow. They cause the much-needed winter rains over the plains and snowfall in the mountains. Although the total amount of winter rainfall locally known as *'mahawat'* is small, they are of immense importance for the cultivation of *'rabi'* crops. The peninsular region does not have a welldefined cold season. There is hardly any noticeable seasonal change in temperature pattern during winters due to the moderating influence of the sea.

3.4.2 The Hot Weather Season (Summer)

Due to the apparent northward movement of the sun, the global heat belt shifts northward. As such, from March to May, it is hot weather seasonin India. The influence of the shifting of the heat belt can be seen clearly from temperature recordings taken during March-May at different latitudes. In March, the highest temperature is about 38° Celsius, recorded on the Deccan plateau. In April, temperatures in Gujarat and Madhya Pradesh are around 42° Celsius. In May, temperature of 45° Celsius is common in the northwestern parts of the country. In peninsular India, temperatures remain lower due to the moderating influence of the oceans. The summer months experience rising temperature and falling air pressure in the northern part of the country. Towards the end of May, an elongated low-pressure area develops in the region extending from the Thar Desert in the northwest to Patna and Chotanagpur plateau in the east and southeast. Circulation of air begins to set in around this trough. A striking feature of the hot weather season is the *'loo'*. These are strong, gusty, hot, dry winds blowing during the day over the north and northwestern India. Sometimes they even continue until late in the evening. Direct exposure to these winds may even prove to be fatal. Dust storms are very common during the month of May in northern India. These storms bring temporary relief as they lower the temperature and may bring light rain and cool breeze. This is also the season for localised thunderstorms,

associated with violent winds, torrential downpours, often accompanied by hail. In West Bengal, these storms are known as the *'Kaal Baisakhi'*. Towards the close of the summer season, pre-monsoon showers are common especially, in Kerala and Karnataka. They help in the early ripening of mangoes, and are often referred to as *'mango showers'*.



3.4.3 Advancing Monsoon (The Rainy Season)

By early June, the low-pressure condition over the northern plains intensifies. It attracts the trade winds of the southern hemisphere. These south-east trade winds originate over the warm subtropical areas of the southern oceans. They cross the equator and blow in a southwesterly direction entering the Indian peninsula as the south-west monsoon. As these winds blow over warm oceans, they bring abundant moisture to the subcontinent. These winds are strong and blow at an average velocity of 30 km per hour. With the exception of the extreme north-west, the monsoon winds cover the country in about a month. The inflow of the south-west monsoon into India brings about a total change in the weather. Early in the season, the windward side of the Western Ghats receives very heavy rainfall, more than 250 cm. The Deccan Plateau and parts of Madhya Pradesh also receive some amount of rain in spite of lying in the rain shadow area. The maximum rainfall of this season is received in the north-eastern part of the country. Mawsynram in the southern

ranges of the Khasi Hills receives the highest average rainfall in the world. Rainfall in the Ganga valley decreases from the east to the west. Rajasthan and parts of Gujarat get scanty rainfall. Another phenomenon associated with the monsoon is its tendency to have 'breaks' in rainfall. Thus, it has wet and dry spells. In other words, the monsoon rains take place only for a few days at a time. They are interspersed with rainless intervals. These breaks in monsoon are related to the movement of the monsoon trough. For various reasons, the trough and its axis keep on moving northward or southward, which determines the spatial distribution of rainfall. When the axis of the monsoon trough lies over the plains, rainfall is good in these parts. On the other hand, whenever the axis shifts closer to the Himalayas, there are longer dry spells in the plains and widespread rains occur in the mountainous catchment areas of the Himalayan Rivers. These heavy rains bring in their wake, devastating floods causing damage to life and property in the plains. The frequency and intensity of tropical depressions too, determine the amount and duration of monsoon rains. These depressions form at the head of the Bay of Bengal and cross over to the mainland. The depressions follow the axis of the "monsoontrough of low pressure". The monsoon is known for its uncertainties. The alternation of dry and wet spells varies in intensity, frequency and duration. While it causes heavy floods in one part, it may be responsible for droughts in the other. It is often irregular in its arrival and its retreat. Hence, it sometimes disturbs the farming schedule of millions of farmers all over the country.

3.4.4 Retreating/Post Monsoons (The Transition Season)

During October-November, with the apparent movement of the sun towards the south, the monsoon trough or the low-pressure trough over the northern plains becomes weaker. This is gradually replaced by a high-pressure system. The south-west monsoon winds weaken and start withdrawing gradually. By the beginning of October, the monsoon withdraws from the Northern Plains. The months of October-November form a period of transition from hot rainy season to dry winter conditions. The retreat of the monsoon is marked by clear skies and rise in temperature. While day temperatures are high, nights are cool and pleasant. The land is still moist. Owing to the conditions of high temperature and humidity, the weather becomes rather oppressive during the day. This is commonly

known as 'October heat'. In the second half of October, the mercury begins to fall rapidly in northern India. The low-pressure conditions, over northwestern India, get transferred to the Bay of Bengal by early November. This shift is associated with the occurrence of cyclonic depressions, which originate over the Andaman Sea. These cyclones generally cross the eastern coasts of India cause heavy and widespread rain. These tropical cyclones are often very destructive. The thickly populated deltas of the Godavari, the Krishna and the Kaveri are frequently struck by cyclones, which cause great damage to life and property. Sometimes, these cyclones arrive at the coasts of Orissa, West Bengal and Bangladesh. The bulk of the rainfall of the Coromandel Coast is derived from depressions and cyclones.

3.5 Western Cyclonic Disturbances

The western cyclonic disturbances are weather phenomena of the winter months brought in by the westerly flow from the Mediterranean region. They usually influence the weather of the north and north-western regions of India. Tropical cyclones occur during the monsoon as well as in October - November, and are part of the easterly flow. These disturbances affect the coastal regions of the country. Have you read or heard about the disasters caused by them on Orissa and Andhra Pradesh coast.

A western disturbance (WD) is defined as an eastward-moving extra-tropical upper air trough in the subtropical westerlies, often extending down to the lower atmospheric level of the north Indian latitude during the winter months. Sometimes, these are observed as closed cyclonic circulations at the sea-level. This definition was first put forward by Pisharoty and Desai. The study by Mooley revealed that even before the onset of monsoon over east Uttar Pradesh, temporary advancement of monsoon current over Punjab, west Uttar Pradesh, Jammu and Kashmir takes place when a Western Disturbances moves across northwest India. Also, the passage of a Western Disturbances across north India increases monsoon activity over Punjab and Uttar Pradesh. Satellite study of Western Disturbances revealed the secondaries of extra-tropical depressions move northeastward from the eastern Mediterranean and are confined in the latitudinal belt 25°N to 35°N. The frequency of Western Disturbances abruptly decreases from winter to the pre-monsoon season. Even in the hot weather period of April and May, Western Disturbances move across north India. In the Himalayan region of India, monsoon current progresses from

east to west. But the Western Disturbances move across north India from west to east, with consequent rise in pressure and cold pool of air in the rear. Though Western Disturbances activate monsoon in certain areas of NW India, it is not clear whether the visit of pre-monsoon Western Disturbances across north India has any impact on the progress of forthcoming monsoon current towards NW India and its activity. Also, from climate change point of view, trends of the Western Disturbances frequency in pre-monsoon months and onset dates over north India have not been studied so far.

- Winter rain and heat storms in north-western plains and occasional heavy snowfall in hilly regions are caused by these disturbances.
- These are generally followed by cold waves in the whole of northern plains

3.6 Summary

On the basis of analysis of classical concepts and modern concepts of monsoon origin and mechanism it can be concluded that monsoon is complex and dynamic in nature. Indian monsoon climate is affected by factors such as – latitudinal position (latitude), altitudinal variations (relief), the mountain wall of the north i.e. the Himalayas, distribution of land and sea,

Distance from sea, jet streams (westerlies and easterlies), Tibetan plateau, tropical cyclones and western disturbances, El Nino and Southern Oscillation (ENSO). Over the period of time the perspective regarding monsoon has changed from that of local land and sea breezes to tropical planetary winds and from surface winds to circulations involving upper air conditions. Monsoon climate is basically a sub-system within the global climate system. Till the time scholars are not able to identify all the elements involved in this mechanism and intensity and dynamics of their roles, correct prediction will remain a challenge even after using super computers and dynamic models. The global climate change has further increased the intensity of this challenge. A high level of accuracy is required in the forecasting and prediction of monsoon in spatio-temporal dimensions to provide stability and sustainability to Indian.

3.7 Glossary

El Nino: This is a name given to the periodic development of a warm ocean current along the coast of Peru as a temporary replacement of the cold Peruvian current.

Monsoon' refers to the seasonal reversal in the wind direction during a year. Monsoon is characterised by a seasonal reversal of wind direction.

Coriolis force: An apparent force caused by the earth's rotation. The Coriolis force is responsible for deflecting winds towards the right in the northern hemisphere and towards the left in the southern hemisphere.

Jet stream: These are a narrow belt of high altitude (above 12,000 m) westerly winds in the troposphere. Their speed varies from about 110 km/h in summer to about 184 km/h in winter.

3.8 Small Answer Question

Question. Define Jet Streams?

Question. Define Monsoon.

Question. What is Western disturbances?

3.9 Examination Oriented Questions

1. What are the controls affecting the climate of India?
2. Why does India have a monsoon type of climate?
3. What are Jet streams and how do they affect the climate of India?
4. Discuss the mechanism of monsoons.
5. Give the characteristics and effects of the monsoon rainfall in India.

3.10 Suggested Readings

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2.12 Model Test Paper

Time allowed- 3 hours **Maximum marks-80**

Note: This paper has two sections.

Section A: Compulsory, contains 8 questions carrying 2 marks each. Answer should be limited in 20 words each.

Section B: Contains 8 questions. Students have to answer 4 questions from each Unit. Each question carries 16 marks. Answer should be limited in 450 words each.

Section A

All questions are compulsory

1. Define Plateau.
2. Distinguish between Mountain and Coastal soils.
3. Define Jet Stream.
4. What is Soil erosion?
5. Give some measures of forest conservation.
6. Define Arithmetic Density.
7. Define Urbanization.
8. Give the name major industrial regions of India.

Section B

Attempt one question from each unit.

Unit I

1. Discuss in detail the physiographic division of Himalayas.
2. Define Monsoon. Discuss factors exerting influence on Indian Monsoon.

Unit II

3. Define Soil. Give the various types of soils in India.
4. Discuss in detail the conservation of forests rsources.

Unit III

5. What is Green revolution? Give a brief account on impact of green revolution on Indian agriculture.

6. Give the various trends and disparities of Urbanization in India.

Unit IV

7. Discuss in detail the tourist destinations of Rajasthan.

8. Discuss in detail the Macro regions of India.

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C. No. : GO-401 **Unit-I**

BA- IV Semester **Lesson-4**

INDIA MAJOR RIVER SYSTEM

Dr. Shivani Walia

4.1 Introduction

Rivers have played a very significant role in the growth of civilization, culture and economic development of India. The ancient Indus Valley civilisation and thereafter, Aryan civilization owe their development to the fertile valleys of the Indus and the

Ganga respectively. Rivers are of immense importance because they are the bosses of irrigation, industrial and domestic water supply, hydro-electric development, fishing, inland transportation and recreation. On account of availability of river water supply a large number of religious, cultural and commercial centres have flourished on the banks of different rivers in India.

The rivers of the Indian sub-continent can be divided into two broader categories, i.e rivers originating in the Himalayas and the Peninsular rivers.

4.2 Objectives

- to make the students aware of the River system in India.
- to explain the types of river system of India which includes both perennial and seasonal rivers.
- to familiarize the students with the origin and characteristics of major river systems in India.

4.3 Classification of Indian River System: Indian River System is classified into two major River System, i.e Himalayan River System and Peninsular River System.

The Himalayan River System: The rivers originating in the Himalayan are divided into three systems.

(1) The Indus River System.

(2) The Ganga River System.

(3) The Brahmaputra River System.

(1) The Indus River System:- The Indus River System consist of Indus as the main river and a number of tributaries.

i) The Indus River: The Indus is the main and largest river of the Indus River System. The other name of the Indus is Sindh. It rises from the

Bokhar Chu glacier near Mansrover Lake in China, at the height of 5000 mts. It is the confluence of "The Singge Khubah" and "The Gartung Chu" that makes the Indus River. Its total length is 2,897 kms. The Indus river cuts through the Nanga Parbat making a gorge 5,181 mts. deep at Bunji (north) of the Nanga Parbat. It is one of the antecedent rivers of India. The Sindh river passes through China, India and Pakistan. It flows 709 km. in India through Jammu and Kashmir. Its important tributaries in the upper part are the Shyok, Zanskar, Dras, Shigar, Nubra, Gilgit, Astor, Hunza etc. The Sindh enters the plain at Attock, where the Kabul river, with its tributaries, meets it. Ist other tributaries are the Kurram, Tochi and Zhob Gomal. Most of its water is due to its eastern tributaries, i.e the Sutlej, Beas, Ravi, Chenab and Jehlum. Its important tributaries are described below.

ii) The Jhelum River: The Sanskrit name of the Jhelum River is "Vitasta" and "Hydarpes" in Greek. It is called Veth in Kashmir. It originates at Verinag near the northern end of the Kashmir Valley. It is at the base of the Pir Panjal range. After Jammu, passing through Pind Dadankhan, it meets the Chenab river. Its total length is 400 km. in India. It flows both in India and Pakistan. The main tributary of the Jhelum is the Kishangana which meets it at Muzaffarabad. It is a right bank tributary if Jhelum. The river cuts into Pir Panjal making a deep and narrow gorge between Baramula and Muzaffarabad. It passes through Wular lake. Jhelum is navigable between Anantnag and Baramula.

iii) The Chenab River: This river is called "Asikine" in Sanskrit and "Acesines" in Greek. It is formed by the confluence of the Chandra and the Bhaga in H.P it meets the river Indus at Panchnad. Its length is 1,180 km. It flows in India and Pakistan. Its main tributary is the Ravi river.

iv) The Ravi River: The Ravi river is knows as "Iravati" in Sanskrit. Its source is on the northern side of Rohtang pass. It flows between Pir Panjal

and Dhauladhar ranges. It enters the plains of Punjab near Madhopur. It meets Chenab and enters Panchnad. Its total length is 725 km.

v) The Beas River: Its Sanskrit name is "Vipasha" and Greek name is "Hyphasis." It rises from the Beas Kund the southern end of Rohtang pass at the height of 4000 mts and meets the Sutlej at Harike near Kapurthala. It makes the famous Kullu Valley. Its total length is 615 mts.

vi) The Satlej River:

Its Sanskrit name is "Shatdru." It rises in China from the northern slope of "Kailash Range" at a height if 5000 mts. Its enters Himachal Pardesh through Shipki, then it enters Punjab plain at Nangal in Ropar district. The Sutlej, then crosses over to Pakistan at Sulemanki near Ferozepur. Its length in India is 1,050 km. The world famous Bhakhra Dam is constructed on this river.

(2) The Ganga River System: The Ganga river system consists of Ganga River as the master stream, along with a number of its tributaries.

(i) The Ganga River: The River Ganga is formed by the confluence of the Alaknanda and Bhagirathi at Devaprayag. The Alakand a river rises from a height of 7800 mts. in Tibet. Bhagirath is the main Ganga, which rises from the Gangaotri Glacier at a height of 6600 mts. Its total length is 2525 km. The main tributaries of the Ganga are the Yamuna, Son, as the right tributaries. The left tributaries are the Ramganga. Gomti. Ghaghra. Gandak and Kosi.

(ii) The Yamuna River: This river rises from the Yamunotri Glacier at a height of about 6000 mts. It meets the Ganga at Allahabad. It is the most important tributary of the Ganga. Its total length is 1300 km. Its major tributaries are the Chambal, Kali Sindh, Betwa and Ken.

(iii) The Gomti River: This is the only tributary river of the Ganga which rises in the plains and not the hills. It meets the Ganga down Varanasi.

(iv) The Ghaghra River: this river rises parrellel to the Ganga in Uttranchal. Its sources is in the snowclad Himalayas. It joins the Ganga near Chapra. Its total length is 1080 km. Its two important tributaries are the Sarda and the Rapti.

(v) The Gandak River: Its source is in the Central Himalayas. It is called the Narayani river in Nepal. It is 425 km. long. The Gandak meets the Ganga near Bankipur in Bihar.

(vi) The Burhi Gandak River: This river rises in Nepal on the western slopes of Sumesar hills. Its length is 610 km. It joins the Ganga river in Bihar. It creats flooding in Bihar.

(vii) The Kosi River: This river rises in the snow clad mountains of Tibet, Nepal and Sikkim. This river is a combination of seven streams, the three main streams are Kosi, Arun and Tamur. Out of these, the Arun is an antecedent river. The total length of the River Kosi is 730 km. This river is also called "the sorrow of Bihar, because it creates much havoc during monsoons. With the construction of Kosi project, which is an Indo Nepal collaboration, floods have been controlled.

(viii) The Damodar River:-This river in the hills of Chotangpur Plateau in Hazaribag district. Its total length is 541 km. It meets the Hoogly below Kolkata. It is known as a flashy river. It creates sudden floods. This river is known as "sorrow of Bengal". Damodar Valley Project is constructed on this river to control the flood conditions.

(3). The Brahamputra River System: The main river of this system is the Brahamputra river. Its source lies in the Kailash mountains at a height of 5100 mts. above mean sea level. It is known by the name of "Tsangpo in

Tibet, when it enters India, it is known as Diheng, where its two important tributaries meet, which are Dihand and Lohit. After this, the river flows in the western direction and is called Brahmaputra. Its total length is 2580 km. but flows only 885 km. in India. Its important right bank tributaries are the Subansiri, the Kameng, the Tista, the Manas, while the Burhi, the Dihang, the Kapila and the Dhansiri are the left bank tributaries. In Bangladesh, it is called the Jamuna before it meets the Ganga.

4.4 The Peninsular River System:

There are number of river that collectively make the Peninsular River System.

(i) The Mahanadi River: This river originates from the Bastar hills in the Chattisgarh state. Its total length is 857 km. it flows in Madhya Pradesh and Orissa, It left tributaries are Seonath, Hasdeo, Mand and Ile, where as right hand tirbutaries are the Jonk, Ung and Tel. It makes a delta in Orissa and meets the Bay of Bengal Hirakud dam is constructed on Mahanadi river. However, some canals also have been constructed which provide irrigational facilities.

(ii) The Godavari River: It originates in the Nasik district of Maharashtra State. It passes through Maharastra and Andhra Pradesh and forms a delta in the Bay of Bengal. Its total length is 1500 km. it is also called as old Ganga. It is the longest river of the peninsular India. Its important tributaries are the Prawara, Purnam Pen Ganga, Wain Ganga, Wardha, Pravhita, Indravati, Manar and Sabri Dam Anicut is constructed on it near Rajamundari.

(ii) The Krishna River: This river originates from near Mahabaleshwar in Maharashtra state. This river makes a delta close to that of the Godavari and meets the Bay of Bengal. Its length is 1400 km. It passes through Maharashtra, Karnataka and Andra Pradesh. Its tributaries are Koyna, Varna, Panch Ganga, Dudh Ganga, Ghat Prabha, Mal Prabha, Bhima, Tungbhadra, Musi etc.

(iii) The Cauvery River: This river rises from the Brahamagiri hills in Coorg district of Karnataka state. This river makes a delta in the Bay of Bengal. The total length of this river is 800 km. It passes through Karnataka and Tamil nadu states. Its right bank tributaries are Lakshmantirtha, Kabini, Suvaramati and Bhawani, Where as left side tributaries are Herangi, Hemawati, Shumsha and Ankavati.

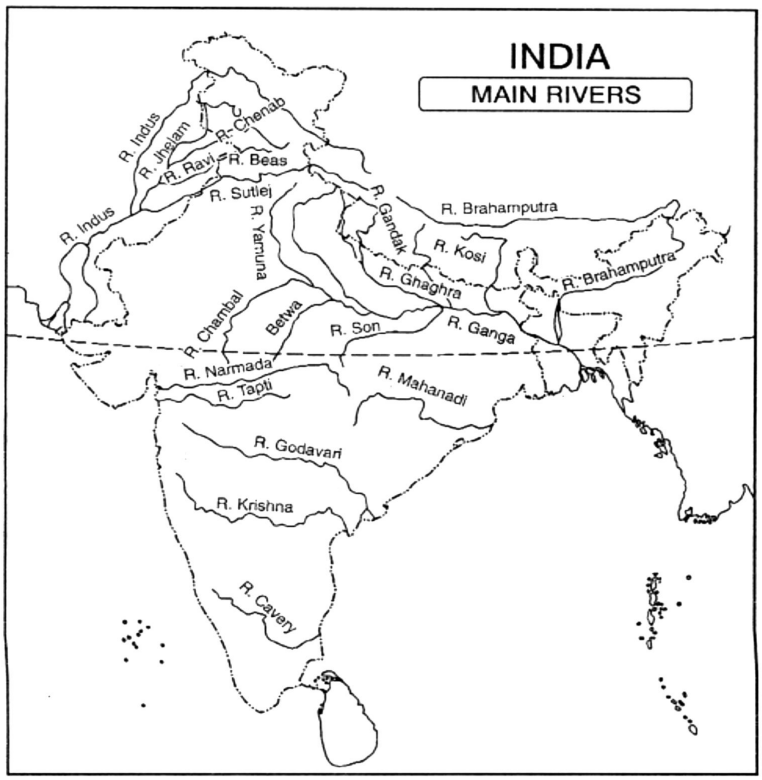
(iv) The Narmada River: The river rises from the Amrkantaka Plateau of the Maikal range in Madhya Pradesh. It makes an estuary with Gulf of Khambat near Bharavch. Its length is 1312 km. it flows from east to west. This river flows in a rift valley which is situated between the Vindhya and Satpura Ranges. It flows through Madhya Pradesh, Maharashtra and Gujarat. Its tributaries are small which includes Hiran, Orsang, barna and Kolar This river makes a fabulous Kapilethara fall which is 23 mts. high.

(v) The Tapti River: It Originates from the Multapti of the Satpura range and debouches in the Gulf of Khambat. It is 721 km. long. It flows parallel to the Narmada river. It passes through Madhya Pradesh, Maharashtra and Gujarat. It flows from the east to the west direction. The Purna is its main tributary. Other tributaries are the Betul, Pakti, Ganjal, Bokad, Mor, Guli, Arunavati, Gomai, Ambhora, Kapra, Garja etc.

(vi) The Mahi River: It orginates in the Mehd lake situated in the western part of the Vindhyan range. It also debouches in the Gulf of Khambat. Its length is 560 km. This river passes though Madhya Pradesh, Rajasthan and Gujarat. This river does not have any tributary worth the name.

(vii) The Sabarmati River: It rises in the Aravalli Mountian and falls into the Gulf of Khambat. It is a small river and its length is 300 km. it passes though Rajasthan and Gujarat.

(viii) The Luni River: It rises in the Aravallis, south west of Ajmer. It flows for 320 km parallel the Aravallis and drains into Rann of Kutch.



4.5 Lakes of India:-

Following are the different types of lakes found in India:-

(i) **Tectonic lakes:** Old Pleistocene lakes of Kashmir and Kumaon Himalayas are of this kind. Their formation is due to differential earth movements.

(ii) **Volcanic Lakes:** They are due to volcanicity. They are called crator lakes also. The Lonar lake in Budhana district in Maharashtra state.

(iii) **Glacier lakes:** These are found in high mountains. The Tarn lakes on the north eastern slopes of the Pir Panjal range in J&K State.

(iv) **Alluvial lakes:** Oxbow lakes in the Ganga Plain.

(v) **Aeolian Lakes:** These are caused due to small depression. There are several such lakes in Rajasthan.

(vi) **Lagoon:** These are formed due to deposition of sand bars along sea coast. e.g Chilka lake (Orissa) Pulicat lake (A.P)

4.6 Summary: In the concluding lines, it is important to mention here that there are a number of important rivers of India and they are the Ganga, Yamuna, Brahmaputra, Mahanadi, Narmada, Godavar, Tapti, Krishna and Cauvery. Parts of the Indus river also flow over Indian surface. All the river collectively leads to the formation of four major river systems. These rivers have great importance as they are a big source of fresh and other aquatic life and also a major source of kesh water. The waters of these rivers are used not only for drinking purposes,but also for generating electricity and irrigational purposes. Many industries, which require ample supply of water, are lying on the banks of rivers. So we can say that Indian river are important because they help in the economic development of the country in one or the other way. They also help to maintain the fertility of the soils by depositing sediments especially in the Great Plains and coastal plains of India.

4.7 Glossary:

1) **Delta:** A low flat land, sometimes shaped like a triangle where a river divides into several smaller rivers before flowing into the sea.

2) **Gorge:-** a narrow valley between hills or mountains typically with steep rocky walls and a stream running through it.

3) **Inland River:-** Rivers which do not reach an ocean or sea but empty their water in a lake or inland.

4) **River:-** A large natural stream of water flowing in a channel to the sea, a lake or another river.

4.8 Short Answer Type Questions:-

Q1. What are perennial Rivers.

Q2. Name the sources of the Ganga river. Narmada River, Kaveri River and Satlej River.

Q3. Why the rivers are considered as the most important resource of any nation?

Q4. How the Himalayan rivers are different from the peninsular rivers?

4.9 Examination Oriented Questions :

Q1. Name the important drainage system of India. Explain Brahamaputra Drainage System in detail.

Q2. Explain the Himalayan river system in detail. Support your answer with a map.

Q3. Explain with map the Penninsular River system of India.

4.10 Suggested Reading:

1. Indian Geography, by Ravi S. Singh
2. India The Physical Aspects, by K .Siddartha
3. Geography of India, by Goutam Rastogi

4.11 References

1. Geography of India, by Ranjit Tirtha
2. Geography of India, by Majid Hussain
3. Geography of India and world Regional Geography,

   by Dr. Mohammad Bashir Magray
4. Geography of India, by Tikkha Bali Sekhon

4.12 Model Test Paper

Section-A

Answer the following in not more then 50 words (2x8=16)

Q1. What are regur soils?

Q2. Name the meso regions of India.

Q3. What do you mean by western disturbances?

Q4. What are "Sholas"

Q5. What are Kharif and rabi crops?

Q6. What do you mean by soil conservation.

Q7. Name the major tourist desitation of Himachal Pradesh.

Q8. What are the characteristics of Indian Agriculture.

Section-B

Unit-I

Answer the following question upto 300 words each questions carrier 16 mark (16x4=64)

Q9. Name the physiographic divisions of India. Explain them in detail.

Q10. Explain in detail the Peninsular river system of India.

Unit-II

Q11. What are soils? Give the classification of Indian soils. Also give their characteristics and distribution

Or

Q12. Discuss the production and distribution of Mica in India.

Unit-III

Q13. What is the impact of Green Revolution on Indian agriculture. Also discuss the characteristics and problems of Green Revolution

Or

Q14. Explain in detail the disparities in Urbanization of India

Unit-IV

Q15. Name the industrial regions of India. Also discuss the factors of localization of iron and steel industry.

Or

Q16. Divide India into Meso regions. Discuss any one of these in detail.

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C. No. : GO-401 (Theory) **Unit-II**

BA - Semester-IV **Lesson-5**

INDIA: SOILS (TYPES CHARACTERISTICS AND DISTRIBUTION)

Dr. Shivani Walia

5.1 Introduction:

Soil is not only a mixture of rocks, but it contains living organic substances also. These organic substances continues to operate in plant and animal organisms of the rock mixture. This mixture, through chemical, physical and biological actions convert carbohydrates, proteins etc into many types of substances, which supply the vegetation with food. The biological portion of the soils consists of a mixture of leaves, fruits, branches, the residue as well as part of animals etc. in various stages of decay. The microorganisms with are usually present are fungi, bacteria, protozoa, insects etc. Soil is, therefore, not a static thing, but is a dynamic and developing part of the surface of the earth, which adjust itself, according to water, air and structuring of the surfaces. The science related to the study of soils is called pedology.

5.2 Objectives:

- to make the students aware of the factors responsible for the formation of soils in India.
- to explain the various types of soils, their characteristics and distribution in India.
- to familiarize the students with the various problems of Indian soils and the various methods to conserve the soils.

5.3 Factors affecting Soil formation:

The important factors that affecting the soil formation are:

I) Climate: Climatic factors include:-

i) Weathering: Extremes of temperature in the desert areas, freezing and thawing of ice results in breaking up of rocks and result in soil formation.

ii) Vegetation: Decayed or decomposed of vegetation determine humus present in the soil.

iii) Bio-chemical Processes:- Bacteria and fungi cause decay of plants and animal remains. Some transform atmospheric nitrogen into soil nitrogen.

2) Parent rock: The physical and chemical composition of the parent rock determines the relative proportions of different minerals in the soil layers.

3) Topography: The slope of the land and the hardness and softness of the rocks are also important in soil formation.

5.4 Types of soils in India:

The following are the important categories of soils found in India.

(1) Alluvial Soils

(2) Black Soils

(3) Red Soils

(4) Laterite soils

(5) Forest soils

(6) Desert Soils

(7) Saline Soils

(8) Peaty Soils

These types are discussed below one by one:-

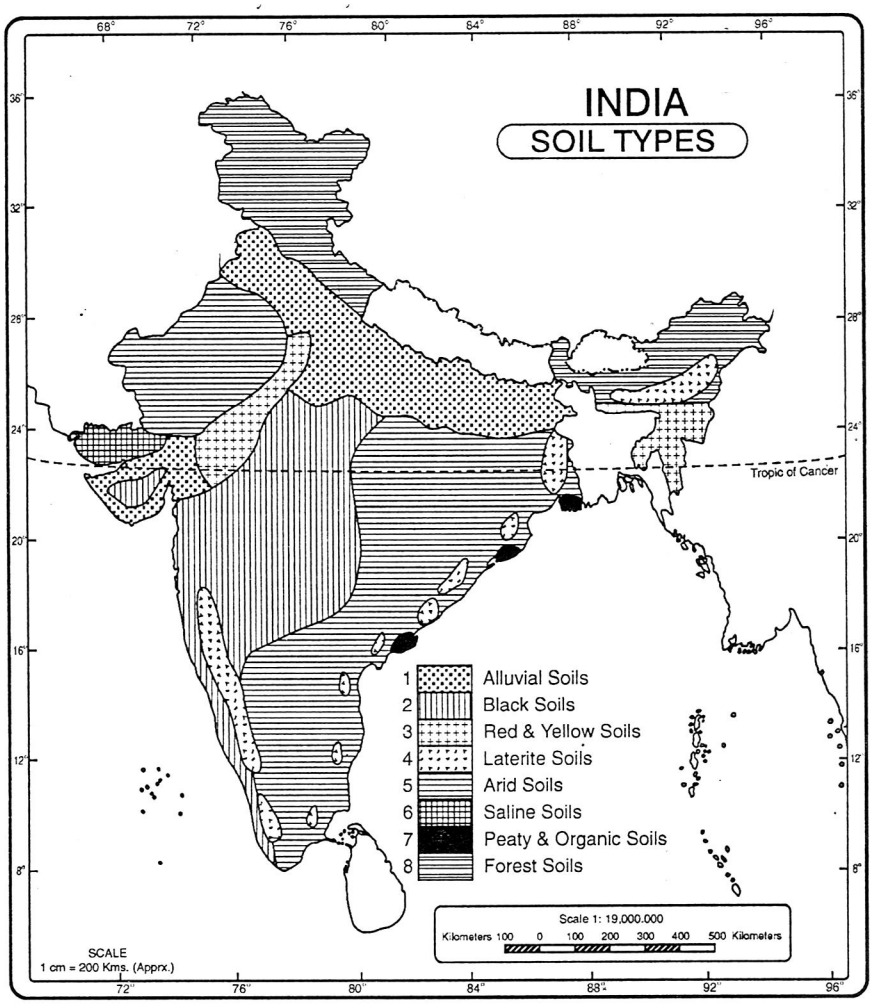
1) Alluvial Soils: The alluvial soils are the most important soils of India. They cover about 24% of the total area of the country. These soils are formed by the sediments deposited by the rivers in the Great

Plains stretching from Punjab to Assam and the coastal plains formed by the Mahanadi, Godavari, Krishna and Kaveri and in the interior parts of the valleys of the Narmada and Tapti. These soils are divided into Bangar and Khadar. The Bangar is older alluvium, clayey in texture and dark coloured, while the Khadar is hewer alluvium, generally sandy in texture and light coloured. The Banger occurs in higher interfluve zones. It is full of lime nodules known as 'kankar'. The Khader occurs near river beds where sediments are deposited regularly during the floods. Alluvial soils are generally deficient in nitrogen and humus, and therefore, need a heavy dose of fertilizers. These soils are suitable for growing cerals, pulses, oil seeds, cotton, sugarcane. Jute grows in the humid eastern region, and the deltas. Sometimes these soils also need irrigation, especially in the dry and low rainfall areas. These soils are most commonly found in Eastern Rajashtan, Punjab, Haryana, Uttar Pradesh, West Bengal, Assam and in the eastern coastal areas of peninsular.

2) **Black Soils**: These soils are also known as "regur soils" or "cotton soils". These soils vary in colour from deep black to light brown. The black colour is because of the presence of iron, magnetite and aluminium. They are generally deficient in nitrogen, phosphorous and humus, but rich in potash and lime. They are finely grained and so they become sticky when wet and develop cracks when dry. They retain moisture for a long time. These soils are bit sandy and less fertile in uplands, but rich in fertility in lowlands. They are good for the cultivation of cotton, cereals, oilseeds, sugarcane, vegetables and citrus fruit. Such soils are fertile and usually not required adequate manuring. They are suitable for dry farming and unsuitable for heavy irrigation Black soils are found in the Deccan trap, occupying Maharashtra, Gujurat, Madhya Pradesh, Andhra Pradesh, Karnataka, Tamilnadu, Uttar Pradesh and Rajasthan.

3) **Red Soils:** These soils are derived from crystalline and metamorphic rocks. Morphologically, the red soils are of two types, i.e red loams and yellow earths. Such soils have light texture, porous and friable structure and certain amount of soluable salts. They are generally deficient in nitrogen, humus phosphorous and lime. These soils differ greatly in colour, depth and fertility. On the uplands, they are thin, poor, gravely, stony, porous and light coloured which support cultivation of inferior food crops like bajra. In the lowlands, they are rich deep dark coloured, fertile which under irrigation produce crops like cotton, rice, wheat, pulses, tobacco, linseed, groundnut, millets, potatoes and fruits.

4) **Laterite Soils:** Laterite soils are found in the regions of heavy rainfall which promotes leaching of soils, a process whereby lime and silica are leached away and oxides of iron and aluminum compounds are left behind. The iron oxides give them a red colour. These soils are not very fertile soils. And with manuring they are suitable for growing a variety of crops like rice, sugarcane, tapioca and cashewnuts. These soils are mostly found on the summits of the basaltic hills and plateaus of Vindhyas, Satpura and other ranges in Madhya Pradesh Rajmahal Hills, West Bengal, Orissa, Maharshtra, Karnataka and Kerala, parts of Assam and Garo hills in Megahalaya.



5) **Forest Soils:** These soils are also known as mountain soils, and are mostly found on the mountaneous and hilly tracts of India. They have a high organic content. These soils have great variations due to sharp difference in climatic conditions. Podzola are develop under highly acidic conditions, while brown soils are found under less acidic and neutral

conditions. These soils are deficit in potash, phosphorous and lime and need fertilization for raising the crops. Tea, coffee, spices, fruits, maize, wheat and barely are grown on these soils.

6) **Desert Soil:** These soils are mostly developed in arid conditions, that's why also known as desert soils. These soils occupy the areas of Rajasthan, Haryana and South Punjab. These soils are Sandy, have high soluable salt content and a very low humus content. They are rich in phosphate but poor in nitrogen, and have low moisture content. With the help of irrigation cotton, cereals, millets are grown on these soils.

7) **Saline Soils:** These soils are also known as alkaline soils. These soils are mostly developed in arid and semi arid parts of Rajasthan, Punjab, Haryana, Uttar Pradesh and Bihar. These soils are, however, alluvial soils, which have been rendered infertile and uncultivable due to deposition of salts, mainly of sodium, calcium and magnesium. Excessive canal irrigation causes deposition of these salts during dry season. These soils are known by different names such as "thur", "Kallar", "rakar", "usar", chopan" etc. these soils are sandy to loamy sand in texture crops like barseem, rice, sugarcane, wheat, cotton and tobacco are raised on these soils with the help of irrigation.

8) **Peaty Soils:** These soils are also known as organic soils, because they formed due to the accumulation of large amounts of organic matter. Such soils develop under humid conditions and contain considerable amount of soluable salts, these soils are black in colour, highy acidic, and deficit in potash and phosphate. Marshy soils occur in the coastal areas of Orissa, West Bengal, Andhara Pradesh, Tamilnadu, North and Central Bihar and in Almora district of Uttar Pradesh.

5.5 Characteristics of Indian Soils:

Following are the few characteristics of the Indian Soils:-

1) Indian soils are quite old and mature.

2) Older Alluvial soils are dominant soils in India.

3) Parental rocks and climatic conditions are largely responsible for the formation of older Alluvial soils.

4) During dry season, the soils requires irrigation.

5) Soils become infertile due to continued cultivation.

6) Soil erosion is the major problem of Indian soils.

7) Indian soils are mostly deficient in nitrogen, humus and mineral salts.

8) The plateau and mountain soils have shallow layers where as the plains have deep soils.

Problem of Soils:

Indian soils suffer from a number of problems. These problems are given below:

1) Soil erosion

2) Deficiently in fertility

3) Expansion of desert

4) Water logging

5) Alkali Soils

6) Wasteland

7) Exploitation of land by man

8) Encroachment on cultivable land due to urban and transport development.

9) Continued cultivation.

10) Overgrazing.

Soil Conservation:- Soil conversation is one of our major concerns, because uncontrolled loss of soil would amount a great loss for mankind. Ecologists have devised several biological, mechanical and other methods for the conservation of soils during its erosion. These biological and mechanical methods are discussed as under:

Biological Methods: These methods involve the use of plant or vegetation cover and include the following:

i) **Contour Farming:** It is the oldest method involving preparation of the field with alternate furrous and ridges in the plains. On slopes, however, it is coupled with terracing.

ii) **Mulching:** It is effective against wind and water erosion. It provides a protective layer formed by the stubble. Mulches reduce soil moisture, evaporation and increase the amount of soil moisture by adding organic matter to soil.

iii) **Crop Rotation:** It preserves the productivity of land. Depletion of soil minerals by raising the same crop after year is overcome by cultivating legumes.

iv) **Strip Cropping:** It involves the planting of crops in rows or strip to check flow of water.

v) **Dry farming:** This practice is useful for croplands in low and moderate rainfall areas.

vi) **Agrostological Methods:** Erosion resistant grasses such as *cynodon dactylon* are grown in strips between the crops. These act as stabilizers when grown in gully and sodding.

Mechanical Method: These methods are used as supplements to biological methods and include the following:-

i) **Afforestation:** Trees as wind breaks are planted in desert which check the velocity of wind. They check the spread of sand dunes or blowing away of the fertile top soils. Wind breaks may by planted in several rows.

ii) **Gully Controls:** Bunds, dams, drain and diversions should be constructed to check the formation or widening of gullies.

iii) **Basin Listing:** It involves construction of small basins along the contours to retain water, which also reduces its velocity.

iv) **Contour terracing:** It involves construction of a channel along the slope to intercept and divert the run off water.

v) Stream Bank Protection:- It involves plantation alongside, the riverbank, construction of drains, concrete or stone pitching etc. for checking the cutting and caving of river banks.

5.6 Summary:

In the concluding lines, it is important to mention here that Indian is endowed with various types of soils. These soils are considered to be an important natural resource. As we known that India is an agrarian country, and so soils play a vital role in the economy of India. About 65 to 70% of the total population of the country is depended on agriculture. A number of crops are grown in India, and that is possible only because of fertile soils.

5.7 Glossary:

Alkali Soils: Alkali soils, or say, Alkaline soils, are clay soils with high pH (>8.5), a poor soil structure and a low infiltration capacity.

Humus: The organic component of soils, formed by the decomposition of leaves and other plant material by soil micro organisms.

Regur Soils: These are also known as black cotton soils. They are derivatives of trap lava.

Soil: Soil is a mixture of organic matter, minerals, gases, liquids and organisms that together support life.

Water logging: Water logging is the saturation of soils and water. Soil may be regarded as water logged when it is nearly saturated with water much of the time such that its air phase is restricted and anaerobic conditions prevail.

5.8 Short answer type questions:-

Q1. What do you mean by soil depletion?

Q2. Name the factors responsible for the formation of soils.

Q3. Name the important soils of India.

Q4. What do you mean by soil conservation?

Q5. Why the soils are considered to be an important resource for any nation?

5.9 Examination Oriented Question

Q1. What are soils? Give the classification of soils of India

Q2. What are the main problems of soils in India. Also mention the methods to conserve the soils.

5.10 Suggested Reading

1.Indian Geography, by Ravi S. Singh

2. Indian: The Physical Aspects, by K. Siddhartha

3. Geography of India, by Goutam Rastogi

5.11 References

1. Geography of India, by Ranjit Tirtha

2. Geography of India, by Majid Hussain

3. Geography of India and world Regional Geography, by Dr. Mohammad Bashir

4. Geography of India, by Tikkha, Bali, Sekhon

5.12 Model Test paper

Section-A

Answer the following in not more then 50 words (2x8=16)

Q1. What are regur soils?

Q2. Name the meso regions of India.

Q3. What do you mean by western disturbances?

Q4. What are “Sholas”

Q5. What are Kharif and rabi crops?

Q6. What do you mean by soil conservation.

Q7. Name the major tourist desitation of Himachal Pradesh.

Q8. What are the characteristics of Indian Agriculture.

Section-B

Unit-I

Answer the following question upto 300 words each questions carrier 16 mark (16x4=64)

Q9. Name the physiographic divisions of India. Explain them in detail.

Q10. Explain in detail the Peninsular river system of India.

Unit-II

Q11. What are soils? Give the classification of Indian soils. Also give their characteristics and distribution

Or

Q12. Discuss the production and distribution of Mica in India.

Unit-III

Q13. What is the impact of Green Revolution on Indian agriculture. Also discuss the characteristics and problems of Green Revolution

Or

Q14. Explain in detail the disparities in Urbanization of India

Unit-IV

Q15. Name the industrial regions of India. Also discuss the factors of localization of iron and steel industry.

Or

Q16. Divide India into Meso regions. Discuss any one of these in detail.

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C. No. : GO-401 **Unit-I**

BA- IV Semester **Lesson-6**

INDIA: VEGETATION
(TYPES CHARACTERISTICS AND DISTRIBUTION)

Dr. Shivani Walia

6.1 Introduction:

Natural vegetation includes plants, trees, bushes and grasses that grow naturally under various physical conditions. Before assessing the natural vegetation of India, it would be worthwhile to distinguish between “Flora” and “Natural vegetation”.

Flora denotes all groups of plants, trees, bushes and grasses in a region, where as natural vegetation means a typical group of plants, trees, grasses, bushes etc. Floristically speaking, India falls in the Palaco-tropical region. Natural vegetation of India is the combined result of a number of factors including climate, soil and biotic. Of these, the climate factor is the most potent. The climate comprises temperature and moisture and their combination and seasonal variation. Altitude too is a dominant factor in determining the type of natural vegetation.

6.2 Objectives:

- to make the students aware of the meaning and classification of natural vegetation.
- to explain the various types of trees and their distribution in the country.
- to make them familiarize with the importance of forest conservation and various measures taken for the conservation of forests.

6.3 Types and Characteristics of Natural Vegetation:

Due to unequal distribution of rainfall, soil and other biotic conditions, there is a great variety of natural vegetation found in India. **Champion** classified India's vegetation in 116 types. **Legiris** and **Puri** merged various types and suggested a classification of forests into fewer types and sub types. Keeping in view the various schemes, natural vegetation of India may be classified as under.

1. Tropical Evergreen Forest (Rain Forests)

(a) Tropical wet evergreen forests

(b) Tropical Semi-evergreen forests

(c) Tropical moist deciduous forests

(d) Littoral Forests

2. Dry Tropical Forests

(a) Tropical Dry deciduous forest

(b) Tropical dry evergreen forests

(c) Tropical Thorn forests

3. **Sub- Tropical Broad leaved hill forests**

4. **Montane wet temperate forests**

5. **Alpine forests**

6. **Grasslands**

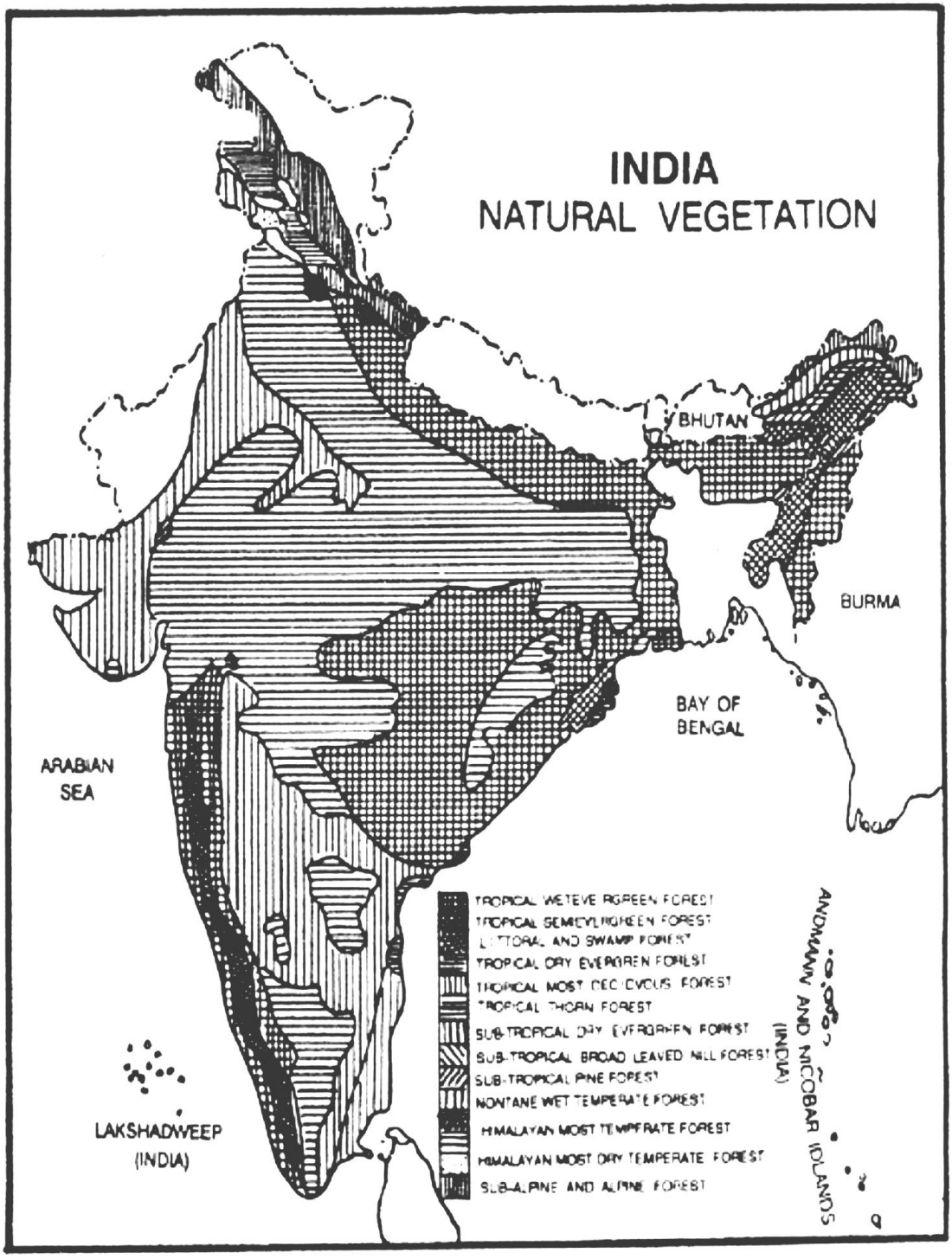
It is important to mention here that the above said categories have some amount of mixture and over-lapping. The description of the different categories of natural vegetation of India is given under one by one.

1. Tropical Evergreen forests

These forests are also known as "Rain Forests". They grow in the areas where annual rainfall exceeding 200 cms, average annual temperature between 25° C and 27°C and the average annual humidity exceeding 80%. These forests are very dense and composed of tall and medium-sized trees and shrubs. There is also a luxuriant growth of climbers and epiphytes. The main characteristic of the trees is that they donot shed their leaves in one season, and that's why they appear green throughout the year. These forests are found in the (i) Western slopes of the Western Ghats, (ii) Eastern parts of the sub tropical Himalayas (iii) North Eastern Hills and (iv) Anadman and Nicobar Islands

These forests may be divided into four major types:-

(a) Tropical Wet Evergreen Forests: These forests are found in the areas where annual rainfall exceeding 300cm. These forests are very dense with thick canopy and multistoried. They have thick undergrowth of cones, bamboos, ferns and climbers. These forests are hardwood forests and have high economic value. However, they remain unexploited due to dense growth and lack of means of transport. They are found along the western side of the Western Ghats, in a narrow belt stretching from Arunchal Pradesh, Nagaland, Manipur, Tripura, Meghalaya, Upper Assam and in Andaman and Nicobar Islands. The important spices of these forests are chaplas, rosewood, tun, ebony, ironwood gurjan, telsue etc.


INDIA
NATURAL VEGETATION
BHUTAN
BURMA
BAY OF
BENGAL
ARABIAN
SEA
LAKSHADWEEP
(INDIA)
ANDAMAN AND NICOBAR ISLANDS
(INDIA)
TROPICAL WETEVE RGREEN FOREST
TROPICAL SEMIEVLRGREEN FOREST
LITTORAL AND SWAMP FOREST
TROPICAL DRY EVERGREEN FORLST
TROPICAL MOST DECIDUOUS FOREST
TROPICAL THORN FOREST
SUB-TROPICAL DRY EVERGREEN FOREST
SUB-TROPICAL BROAD LEAVED HILL FOREST
SUB-TROPICAL PINE FOREST
MONTANE WET TEMPERATE FOREST
HIMALAYAN MOIST TEMPERATE FOREST
HIMALAYAN MOIST DRY TEMPERATE FOREST
SUB-ALPINE AND ALPINE FOREST

(b) Tropical Semi-Evergreen Forests:- These forests are found in the areas having rainfall between 200-300 cm, temperature between 24°C to 27° and humidity 80%. These forests are having a mixture of evergreen trees and deciduous trees, which have a less dense canopy and heavy climbers. These forest are found on the western coast, upper Assam, lower slopes of Eastern Himalayas, Orissa and in Andaman and Nicobar Islands. Important species of these forests are semul, kadam laurel, rosewood, kusum, champa, mango with canes, ferms orchids and thorny bushes also.

(c) Tropical Moist Deciduous Forests: These forests are found in the areas, where rainfall is moderate, i.e between 100 cm to 150cm, and the mean annual temperature is 27°C with 60-80% humidity. These forests are not evergreen, because the trees shed their leaves during spring and summer., The sal and teak are the two important species, which yield great commercial value, as largely used for timber. Other species are arjun, ebony, kusum, mulberry, ber, daldu, palas, mehka, andalwood, amla, Jamun etc. These forests have been exploited and cleared for cultivation.

(d) Littoral Forests: These forests are also called "Tidal Forests," as they are found in the tidal areas and in the river deltas, where mud and silt accumulate. The most important species is "Sundari. Other species are amur, canes, palms, koera etc. The delta of Ganga, Mahandadi, Godavari, Krishna and Kaveri have these forests.

2. Dry Tropical Forests:

These forests are found in areas having annual rainfall ranging between 75 cm to 125 cm, 23°Cto 27°C mean annual temperature and 50 to 58% humidity. These forests are classified into following three types:

(a) Tropical Dry Deciduous Forests: These forests are spread over a large area, extending from the foot hills of the Himalayas in the north to Kankya kumari in the south. These forests are of great economic value, however large tracts of the forests have been cleared for cultivation. Important species are teak, tendu, sal, bijasal, rosewood, palas, khail, etc.

(b) Tropical Thorn Forests: These forests are found in the areas of low annual rainfall, i.e between 50cm to 75cm, having mean annual temperature of 26°C and very low humidity, i.e below 47%. The vegetation, primarily, consists of thorny trees and shrubs due to low rainfall. But during the rainy season, small grasses are also grown. The important species are tamarind, babul, khair, neem , palas, aak, khejra, kanju, thor etc. The tress found in these forests are mostly dwarf. The important areas of are Kutch and neighbouring parts of Saurashtra, south-western Punjab, Western, Haryana, Western and northern Rajsthan, Upper Ganga plains, Deccan Plateau and the lower Peninsular India.

(c) Tropical Dry Evergreen Forests: These forests are found in the areas where the annual rainfall is 100 cms, mean annual temperature is 28°C and the mean annual humidity is 74%. The trees are mostly of short height but mostly evergreen. The rainfall is mostly received from the north eastern monsoon. The important area of these forest is the east coast. Species of these forests are like khirni, jamun, kakko, ritha, neem, tamarind, palm cane etc.

3. Sup- Tropical Broad leaved hill forests: These forests are found in the hilly regions, at an altitude ranging between 915 mts. to 1830 mts. above mean sea level. Here, the annual rainfall is between 75cm to 125cm annual, temperature is between 18°C to 21°C and the annual humidity is 80%. These forest are known as "Sholas" in south India, having luxuriant growth of evergreen species. These forests are most common in the highlands of Bastar, Panch marhi, Mahabaleshwar, Nilgiri and Palni hills in the peninsular in the Khasi hills and on the lower slopes of the Eastern Himalayas.

4. Montane wet Temperature Forests: These forests occur at an altitude between 1600 mts. to 3000 mts above mean sea level, with annual temperature between 11°C to 14°C, mean annual rainfall is between 150cm. to 300 cm. and the mean annual humidity is 830%. The trees found in these forests are coniferopus evergreen. The important species are pine, deodar, magnolia, birch, spruck, silverfer oak, hemlock, blue pine, beach etc. the principals areas of these forests are the higher hills of Tamilnadu and Kerala. Eastern Himalayas, the higher hills of Assam and Arunchal Pradesh, and in the areas of western Himalayas stretching from Jammu and Kashmir,

Himchal Pradesh, Uttar Pradesh, west Bengal and Sikkim. All the trees are of great economic value.

5. Alpine forests: These forests are found in the Alpine areas of the Himalayas between 2900 mts. to 3500 mts. above mean sea level. These consists of dwarf shrubs and pastures. Trans humance is prevalent in these grasslands. The important species are juniper, fir, betula, honey-sucker, birth, rhododendrons.

6. rasslands: In India natural grasslands are hardly present however the existing grassland have developed secondarily by the destruction of forests **Whyte** has classified Indian grasslands into eight major types. However these types are regrouped into the following three types:-

(a) Xerophilous: These grasslands occur in dry regions of north west India under semi-desert-conditions.

(b) Mesophilous: These are also called as "Savannah". These are most found in the northern plains.

(c) Hygrophilous: These are called as "wet Savannah".

6.4 Distribution of Important Trees.

1.	Rosewood	:	Western Ghats, T.N, MP. Orissa
2.	Shisham	:	North India
3.	Toona	:	Foothills of the Himalayas
4.	Chaplas	:	Western Ghats and NE States
5.	Gurjan	:	West Bengal, Assam, Andaman and Nicobar Island
6.	Sal	:	In Sub-Himalayas zone
7.	Teak	:	Karnataka, T.N, M.P, Assam, Bihar, Chattisgarh, Orissa, Gujarat.
8.	Ebony	:	All over India in the decidous forests.

9.	Sandal	:	Karnatka, T.N A.P
10.	Chir	:	J&K, H.P, Uttaranchal
11.	Deodar	:	J&K, H.P, Uttaranchal
12.	Sundri	:	Sunderbans
13.	Birch	:	High Himalayan Slopes
14.	Cypress	:	Uttranchal Himalayas
15.	Tendu leaves	:	M.P Chattisgarh Orissa
16.	Rasin	:	Punjab, Himachal Pradesh, Uttaanchal
17.	Mulberry Trees	:	J&K Assam, Karnataka, Orissa, W.B
18.	Bamboo	:	Lower Himalayan slopes
19.	Lac	:	Chattanagpur Plateau, Eastern Maharashtra, South West Bihar, South East U.P , Norhtern Orissa.

6.5 Forest Conservation : The uncontrolled and reckless felling of trees particularly in the Himalayas and other hilly areas has resulted in erosion of the top layer of the soil, irregular rainfall and frequent floods. Fuel caused immense loss of forest productivity. To combat this situation, the Forest Conservation Act (1980) was revised in 1988, which provided severe punishment for violation of laws related to forest lands. The following measures have been proposed for an effective conservation of forest:

i) afforestration and development of fallows and degraded lands.

ii) replantation and re-forestation in the existing forest areas.

iii) forest survey to be made effective.

iv) identification and delimitation of forest areas.

v) solidification of forest security.

vi) systematic surveying and investigation by forest officers.

vii) systematic ban on grazing

viii) to make depot for the supply of fuel wood and timber.

xi) improved 'Chulhas'

x) supply of alternative means of fuel

xi) controlling timber saw milling

xii) check on mono culture

xiii) determining concessions and greats for tribal people and fulfilling their needs.

xiv) controlling natural and man made forest fires.

xv) ban on poaching

Fire is one of the major factors responsible for the destruction of forests in the country. Most of the fires in forests are man made and deliberates. Grazing collection of flowers, 'Mahua' seeds and 'tendu' leaf, poaching and shifting cultivation are some of the causes of national fires. Several appropriate measures have been undertaken to reduce the incidents of fire in forests. The UNDP assisted modern forest fire control projects initiated in 1984 in Chandrapur (Maharashtra), Halwani and Nainital (U.P) is in operation in 11 states of the country.

6.6 Summary

In the concluding lines, it is important to mention here that forests constitute one of the most important renewable natural resources and play a vital role in the economy and welfare of the nation. Forests not only give the valuable products like timber, paper lac, gum, resin, wood-oil, natural varkish, but also provide the fresh air to breathe, habibats for animals and livelihoods for humans, watershed protection. It also helps to prevent soil erosion and mitigate climate change.

6.7 Glossary

Climbers: These are plants which climb up trees and other tall objects. Many of them are vines whose stems twine round trees and branches

Coniferous Trees: Coniferous trees are mostly evergreen trees and shrubs having usually needle shaped or scale like leaves with true cones.

Deciduous Trees: Deciduous trees are broad leaf trees which lose their leaves each year. They are found in areas with warm and moist summers and cool winters.

Epiphytes: a plant that grows on another plant

Savannah: A Savanna is a rolling grassland scattered with shrubs and isolated trees, which can be found between a tropical rain forest and desert biome.

Sundari Tree: These trees are the species of mangrove trees which are mostly found in coastal areas.

Timber: It is a types of wood prepared far use in building and carpentry.

Transhumance: A practice of moving livestock from one grazing ground to another in a seasonal cycle, typically to lowlands in winters and highlands in summers.

6.8 Short Answer Type Questions:

Q1. What do you mean by natural vegetation?

Q2. What is the difference between deciduous and coniferous forests?

Q3. Why forests are considered to be an important resource of any nation?

Q4. What do you mean by Montane Wet Temperate Forests?

Q5. What are Sholas?

6.9 Examination oriented Questions

Q1. Give the classification of natural vegetation in India.

Q2. What are the problems of Indian forestry? What are the important policies to conserve them?

6.10 Suggested reading

1. Indian Geography, by Ravi S. Singh

2. India The Physical Aspects, by K .Siddartha

3. Geography of India, by Goutam Rastogi

6.11 Reference

1. Geography of India, by Ranjit Tirtha

2. Geography of India, by Majid Hussain

3. Geography of India and world Regional Geography, by Dr. Mohammad Bashir Magray

4. Geography of India, by Tikkha Bali Sekhon

6.12 Model Test Paper

Section-A

Answer the following in not more then 50 words (2x8=16)

Q1. What are regur soils?

Q2. Name the meso regions of India.

Q3. What do you mean by western disturbances?

Q4. What are “Sholas”

Q5. What are Kharif and rabi crops?

Q6. What do you mean by soil conservation.

Q7. Name the major tourist desitation of Himachal Pradesh.

Q8. What are the characteristics of Indian Agriculture.

Section-B

Unit-I

Answer the following question upto 300 words each questions carrier 16 mark

(16x4=64)

Q9. Name the physiographic divisions of India. Explain them in detail.

Q10. Explain in detail the Peninsular river system of India.

Unit-II

Q11. What are soils? Give the classification of Indian soils. Also give their characteristics and distribution

Or

Q12. Discuss the production and distribution of Mica in India.

Unit-III

Q13. What is the impact of Green Revolution on Indian agriculture. Also discuss the characteristics and problems of Green Revolution

Or

Q14. Explain in detail the disparities in Urbanization of India

Unit-IV

Q15. Name the industrial regions of India. Also discuss the factors of localization of iron and steel industry.

Or

Q16. Divide India into Meso regions. Discuss any one of these in detail.

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C. No. : GO-401 **Unit-I**

BA- IV Semester **Lesson-7**

MINERAL RESOURCES OF INDIA: IRON ORE, MICA AND MANGANESE

Ms. Sarita Nagari

7.1 INTRODUCTION:

A mineral is a naturally occuring inorganic homogeneous substance usually crystalline with a definate chemical composition.Minerals are closely associated with mining. Mining and quarrying covers underground and surface mines, quarries and wells and includes extraction of minerals and also all supplemental activities such as dressing and benefication of ores and other crude materials, like crushing, screening, washing, cleaning, grading and several other preparations carried out at the mine site, which are needed to render the material marketable. *Open cast mining and underground mining*are two chief methods of mining practiced in India. Open cast mining is more useful for minerals found just below the surface while underground mining is done to extract minerals found at greater depths. Drilling and pumping is practiced for extracting oil and natural gas. Minerals are natural means of production which are used in many industries as raw materials.

7.2 OBJECTIVES:

The present topics lead the studies of minerals resources of India. The minerals wealth of India is uneven distribution due to various factors. The present chapter studies the some selected minerals of India such as Iron ore, Mica and Manganese.

7.3 MINERAL WEALTH OF INDIA

India is endowed with a rich variety of minerals. Large size and diverse geological formations have favoured India in providing a wide variety of minerals. According to Meher D.N, Wadia, "The mineral wealth of India, though by no means inexhaustible, is varied enough to provide for sound economic and industrial development of the country but has at the same time, certain important deficiencies. It has been estimated that nearly 100 minerals are known to be produced or worked in India, of which nearly 30 may be considered more important including several which although comparatively unimportant in quantity today are capable of material development in future with expansion of industries. The country has fairly abundant reserves of coal, iron and mica, adequate supplies of manganese ore, titanium and aluminum, raw materials for refractories and limestone; but there is a deficiency in ores of copper, lead and zinc. There are workable deposits of tin and nickel." India

earns a lot of foreign exchange by exporting a large variety of minerals such as iron ore, titanium, manganese, bauxite, granite and a host of other minerals. At the same time India has to depend upon imports to meet her requirements of some other minerals such as copper, silver, nickel, cobalt, zinc, lead, tin, mercury, limestone, platinum, graphite and so many other minerals. Industrial revolution during 18^{th} century to 20^{th} century increase demand for minerals. The distribution of mineral is uneven in the country. It is become occurrence of minerals are associated with certain geographical foundation and they are found in certain region only.

Normally two types of minerals are recognized:

(i) **Metallic Minerals :**These minerals contain metal. Iron ore, copper, manganese, nickel, etc. are important examples of metallic minerals.

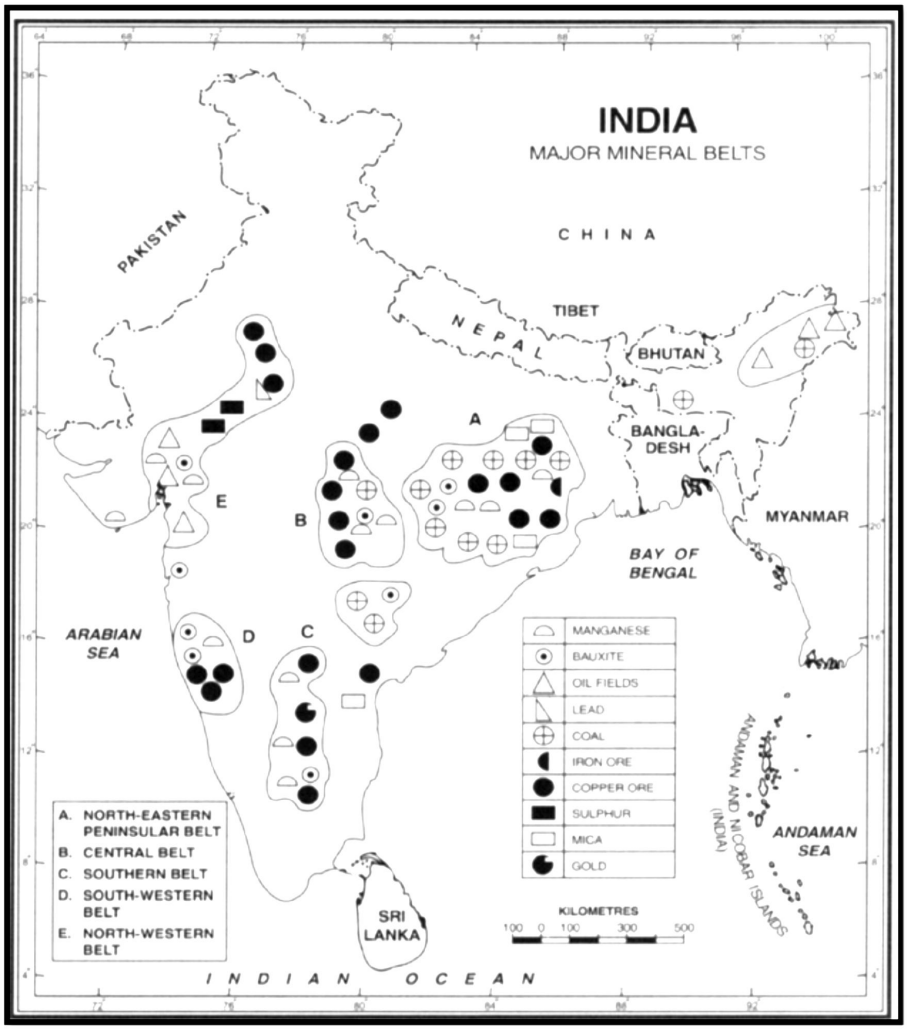
Metallic minerals are further sub-divided into ferrous and non-ferrous minerals.

(a) Ferrous Minerals: These minerals have iron content. Iron-ore, manganese, chromite, pyrites, tungsten, nickel, cobalt, etc. are important examples of ferrous minerals.

(b) Non-ferrous Minerals : These minerals do not have iron content. Gold, silver, copper, lead, bauxite, tin, magnesium, etc. are important examples of non-ferrous minerals.

(ii) **Non-metallic Minerals :** These minerals do not contain metal. Limestone, nitrate, potash, dolomite, mica, gypsum, etc. are important examples of non-metallic minerals. Coal and petroleum are also non-metallic minerals. They are used as fuel and are also known as *mineral fuels*.

MAJOR MINERALS BELTS OF INDIA



7.4 METALLIC MINERALS

Metallic minerals form an important section of mining activity in India and provide solid base to metallurgical industries in the country. Iron ore is *a* metal of universal use. It is the backbone of modern civilization. It is the foundation of our basic industry and is used all over the world. The standard of living of the people of a country is judged by the consumption of iron. Iron is taken out from mines in the form of iron ore. Different types of iron ore contain varying percentage of pure iron. A rapid increasing demand of iron and steel for innumerable uses has given impetus to iron ore mining.

Iron ore in India. Following four varieties of iron ore are generally recognized.

1. Hematite : This is the best quality of iron ore with about 70 per cent metallic content and occurs as massive, hard compact and bumpy ore having reddish or coral red colour. Most of the hematite ores are found in Dharwad and Cuddapah rock systems of the peninsular India. Over 80 per cent of the hematite of magnetite ore resources are located in just four states namely, Karnataka 7,802 million tonnes (73%), Andhra Pradesh 464 million tonnes (14%), Rajasthan 527 million tonnes (5%) and Tamil Nadu (4.9%). The remaining about 3.1 per cent is found in Assam, Bihar, Goa, Jharkhand, Kerala, Maharashtra, Meghalaya and Nagaland.Production and Distribution.The India has progressed a lot with respect to production of iron ore and the production has consistently increased over the years. However, declining trends in production have been observed after 2009-10 which not a good sign is keeping in view the growth requirements of India.Patternit during the last few years. Goa occupied the first position among the major iron ore producing states for over a decade, but has been overtaken by Karnataka, Odisha and Chhattisgarh in due course of time. At present, over 96 per cent of India's iron ore is produced by just five states of Odisha. This fact speaks volumes of high concentration of iron ore reserves and their lopsided distribution in the country.

1. **Odisha :** Odisha produces over 40 per cent iron ore of India." The most important deposits occur in Sundargarh, Mayurbhanj, Cuttack, Sambalpur, Keonjhar and Koraput districts. India's richest haematite deposits are located in Barabil-Koira valley where 100 deposits are

spread over 53 sq km. The ores are rich in haematites with 60 per cent iron content. Sizeable deposits occur near Gorumahisani, Sulaipat and Badampahar in Mayurbhanj district; Banspani, Tahkurani, Toda, Kodekola, Kurband, Phillora and Kiriburuin.Keonjhar district; near Malangtoli, KandadharPahar, Koira and Barsua in Sundargarh district, Tomka range between Patwali and Kassa in Sukind area of Cuttack district, Daitnri hill along the boundary between Keonjhar and Cuttack districts, Hirapur hills in Koraput district and Nalibassa hill in Sambalpur district.

2. **Goa :** Production of iron ore in Goa started quite late and it is a recent development. Starting from a non-entity, Goa is now the second largest producer of iron ore in India. Though its reserves, amounting to only 11 per cent of India, are not very impressive as compared to other major producing states, it occupied the first position among the iron ore producers for several years and yielded this place to M.P. in 1990s. At present, Odisha produces more iron ore, relegating Goa to second place, Goa now produces about 20 per cent of the total production of India. In 1975, the Geological Survey of India located 34 iron bearing reserves which estimated the total ore deposits of 390 million tonnes. There are nearly 315 mines in North Goa, Central Goa and South Goa. Important deposits occur in Pirna-Adolpale-Asnora, Sirigao-Bicholim-Daldal, Sanquelim-Onda, Kudnem-Pisurlem and Kudnem-Surla areas in North Goa; Tolsia-Dongarvado-Sanvordem and Quirapale-Santone-Costi in Central Goa; and Borgadongar, Netarlim, Rivona-Solomba and Barazan in South Goa. The richest ore deposits are located in North Goa. These areas have the advantage of river transport or ropeways for local transport and that of Marmagao port for exporting the ore. Most of Goa's iron ore is exported to Japan. Most of the ore is of low grade limonite and siderite. Most of the mines are open-cast and mechanised which result in efficient exploitation of iron ore in spite of its inferior quality.

About 34,000 people earn their livelihood from iron ore mining and allied activities in Goa.

3. **Chhattisgarh :** Chhattisgarh has about 18 per cent of the total iron ore reserves of India. This state produced about 18 per cent of the total iron ore production of the country in 2011-12. The iron ores are widely distributed, the prominent deposits being those of Bastar and Durg districts. The reserves in these districts are estimated to be of the order of 4,064 million tonnes. These reserves are of high grade ore, containing over 65 percent iron, Bailadila in DakshinBastar, Danlewada and Bijapur district, and Dalit Rajhara in Durg district are important producers. In Bailadila, 14 deposits are located in 48 km long range running in north-south direction. With estimated reserves of about 1,422 million tonnes, the Bailadila mine is the largest mechanised mine in Asia. An additional ore benefication plant with a capacity of 7.8 million tonnes has been set up in Bailadila. A 270 km long slurry pipeline carries the ore from the Bailadila pithead to the Vizag plant. This has reduced the pressure on road route to a great extent. Bailadila produces high grade ore which is exported through Vishakhapatnam to Japan and other countries where it is in great demand. The Dalli-Rajhara range is 32 km long with iron ore reserves of about 120 million tonnes. The ferrous content in this ore is estimated to be 68-69 per cent. The deposits of this range are being worked by the Hindustan Steels Plant at Bhilai. Raigarh, Bilaspur, and Surguja are other iron ore producing districts.

4. **Jharkhand :** Jharkhand accounts for 25 per cent of reserves and over 11 per cent of the total iron ore production of the country. Iron ore mining first of all started in the Singhbhum district in 1904 (then a part of Bihar). Iron ore of Singhbhum district is of highest quality and will last for hundreds of years. The main iron bearing belt forms a range about 50 km long extending from near Gua to near Pantha in Bonai (Odisha). The other deposits in Singhbhum include those of

Budhu Buru, Kotamati Buru and Rajori Buru. The well-knownNoamandi mines are situated at Kotamati Buru. Magnetite ores occur near Daltenganj in Palamudistrict. Less important magnetite deposits have been found in SanthalParganas. Hazaribagh, Dhanbad and Ranchi districts

5. **Karnataka :** Karnataka is the fifth largest producer and accounts for nearly 8 per cent of the total iron ore produced in India. In Karnataka production of iron ore has increased byabout three times since 1980. Iron ores are widely distributed in the state, but high grade ore deposits are those of Kemmangundi in Bababudanhills of Chikmagalur district and Sandur and Hospet in Bellary district. Most of the ores are high grade haematite and magnetite. The other important producing districts areChitradurga, Uttar Kannad. Shimoga.Dharwar and Tumkur. Others. Apart from the major producing states described above, iron ore in small quantities is produced in some other states also. They include Andhra Pradesh (1.02%) ,Kurnool,Guntur, Cuddapah,Ananthapur,Nellore, Maharastra (0.88%): Chandrapur, Ratnagari and Sindhudurg,*Madhya Pradesh* (0.66%),*Tamilnadu*: Salem, Tiruchirapalli, Coimbatore, Madurai, NellaiKattabomman (Tirunelveli),*Rajasthan :* Jaipur, Udaipur, Alwar, Sikar, Bundi, Bhilwara; *Uttar Pradesh :* Mirzapur, *Vttaranchal*: Garhwal, Almora, Nainital; *Himachal Pradesh* : Kangra and Mandi; *Haryana :* Mahendragarh; *West Bengal*: Burdwan, Birbhum, Darjeeling; *Jammu and Kashmir :* Udhampur and Jammu; *Gujarat :* Bhavnagar, Junagadh, Vadodara; and *Kerala* : Kozhikode.

Exports: India is the fifth largest exporter of iron ore in the world. We export about 25 per cent of our total iron ore production to countries like Japan, Korea, European countries and lately to Gulf countries. Japan is the biggest buyer of Indian iron ore accounting for about three-fourths of our total exports. Major ports handling iron ore export are Vishakhapatnam, Paradip, Marmagaoand Mangalore.Increasing demand for iron ore in the domestic market due to expansion of iron and steei industry

in India has adversely affected our export performance as is clear from Table 23.3. The exports have declined from 47.2 million tonnes in 2011-12 to 16.5 million tonnes in 2013-14.Efforts are being made to increase the production so that sufficient quantity of iron ore is available for export after meeting the requirements of the expanding home market. Export of iron ore is necessary for earning the much needed foreign exchange.

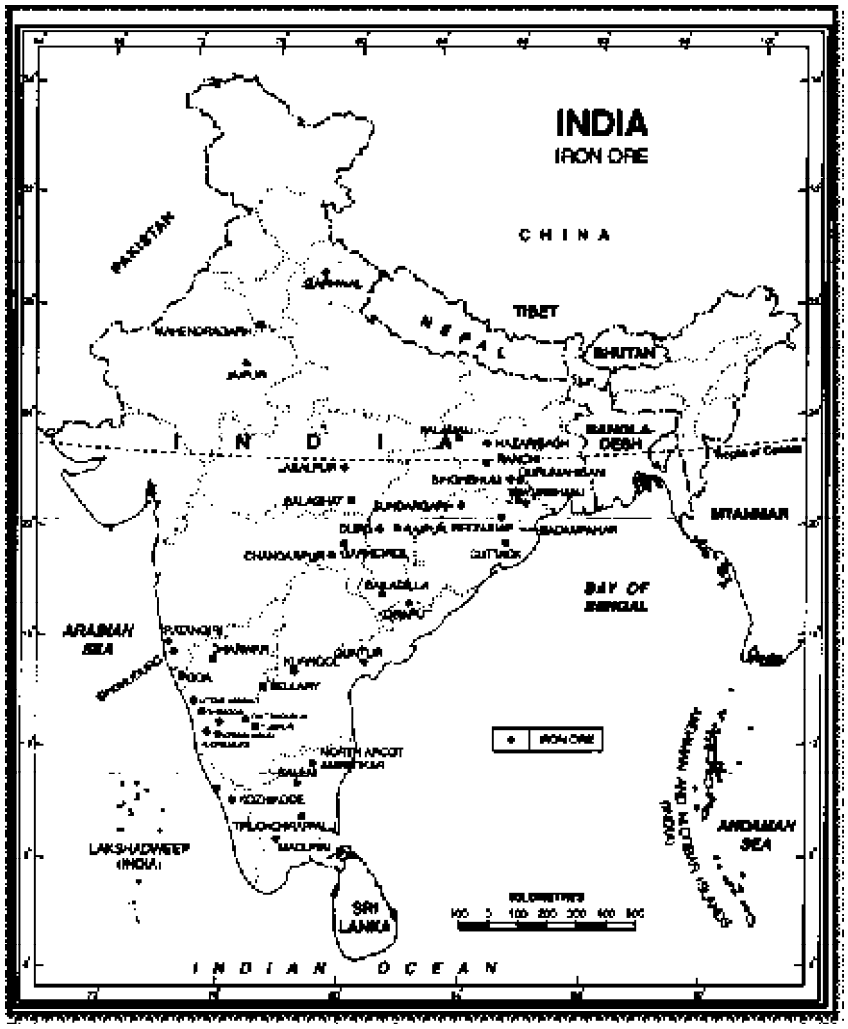
Year Wise Production of Iron Ore in India (Million Tonnes)

Year	Production	Year	
1950-51	3.90	2006-07	187.7
1960-61	10.9	2007-08	213.2
1970-71	32.5	2008-09	213.0
1980-81	42.2	2009-10	218.6
1990-91	53.7	2010-11	208.0
2000-01	80.6	2011-12	167.3
2005-06	154.4		

State wise Production of Iron Ore in

S. No	Name of State	Production (Thousand Tonnes)	Percentage of All India
1	Odisha	67013	40.06
2	Goa	33372	1995
3	Chhattisgarh	30455	18.21
4	Jharkhand	18942	11.32
5	Karnataka	13189	7.88
6	Andhra Pradesh	1714	1.02
7	Maharastra	1470	0.88
8	Madhya Pradesh	1102	0.66
9	Rajasthan	32	0.02
10	Total	167289	100.00

IRON ORE PRODUCING REGION OF INDIA



7.5 NON-METALLIC MINERALS

India also produces a large number of non-metallic minerals although only a few of them have assumed as much industrial and economic importance as is done by the metallic minerals. However, they are used in a large variety of industries; the major industries being cement, fertilizers, electrical, etc.

Mica: Mica is a bad conductor of electricity and is therefore used in electrical instruments.Mica has been used in India since ancient times as a medicinal item in Ayurveda and is known as *abhrak.*With the development of electrical industry, mica found new vistas of use. Its insulating properties have made it a valuable mineral in electrical and electronics industry. It can withstand high voltage and has low power loss factor. The three major types of mica found in India are *Muscovite, phlogopiteand biotite. India is the Leading producer of sheet mica and account for 60% of the global mica trade.*

RESERVES: Most important mica-bearing pegmentities occur in Andhra Pradesh, Bihar, Jharkhand, Maharashtra and Rajasthan. Occurrences of mica pegmatites are also reported from Gujarat, Haryana, Karnataka, Kerala, Odisha, Tamil Nadu and West Bengal. The total resources of mica in the country are estimated at 5,32,237 tonnes out of which 1,90,741 tonnesa replaced under reserves category and 3,41,496 tonnes under remaining resources category. Andhra Pradesh leads with 41 per cent share in country's total resources followed by Rajasthan (21 per cent), Odisha (20 per cent), Maharashtra (15 per cent), Bihar (2 per cent) and balance (less than 1 percent) in Jharkhand.

7.5.1 PRODUCTION AND DISTRIBUTION:

India has a near monopoly in the production of mica, producing about 60 per cent of world's total production. Production was just 772 tonnes in 1947-48 which increased to about ten thousand tonnes within three years. The production increased at a rapid pace up to 1960-61 and there was a record production of 28,347 tonnes in that year. But afterwards it showed a declining trend and the production came down to 1,807 tonnes in 2011-12.

This decrease is the result of the fall in its demand in the international Market. Earlier there was no substitute for mica. Now materials like plastics and synthetics have been developed which can be used as substitutes for mica.

About 95 per cent of India's mica is found in just three stales of Andhra Pradesh, Rajasthan and Jharkhand. Some mica is produced in Bihar also.

1. **Andhra Pradesh :** Andhra Pradesh is the largest mica producing state of India. In 2011-12,this state produced 1,694 tonnes of mica which was more than 93 per cent of all India production. In the recent years, share of Andhra Pradesh has progressed in respect to mica production. The mica belt lies in Nellore district and is 100 km long and 25 km wide. Nellore mica is generally light green in colour; it is generally stained and spotted. The other districts with ' workable mica deposits are Vishakhapatnam, West Godavari and Krishna (Tiruvur). Shah mine in Gudurtaluka is the deepest with mining being done at 300 m depth.

2. **Rajasthan :** Although occupying the second position among the mica producing states of India, Rajasthan is not as important a producer as Andhra Pradesh is. This state produced 113 tonnes or 6.3 per cent of India in 2011-12. The main mica belt extends from Jaipur to Udaipur. This is 322 km long with an average width of 96 km. This belt broadens around Kumbhalgarh and Bhilwara. The main producing districts are Bhilwara, Jaipur, Tonk, Sikar, Dungarpur and Ajmer.

3. **Jharkhand :** Jharkhand is the third largest producer of mica in India. Mica in Jharkhand is found in a belt extending for about 150 km in length and 32 km in width from eastern part of Gaya district of Bihar across Hazaribagh, Girdih and Munger to Bhagalpur district. This belt contains the richest deposits of high quality ruby mica. The main centres of mica production in this belt are Kodarma, Dhorhakola, Domchanch, Dhab, Gawan, Tisri, Chakai and Chakapathal. Outside the main mica belt, mica occurs in Dhanbad, Palamu, Ranchi and Singhbum districts.

Other producers : The other areas with small deposits of mica are *Gujarat* (Banaskantha, Vadodara, Sabarkantha), *Kerala*(Alleppey and Kollam), *Tamil Nadu*(Nilgiri, Coimbatore, Salem and Tiruchirapalli), *Madhya Pradesh*(Balaghat and Chhindwara), *Chhattisgarh* (Bilaspur, Bastar andSurguja) and *Uttar Pradesh*(Mirzapur). Some deposits have also been reported from Odisha, Haryana, Himachal Pradesh and West Bengal.

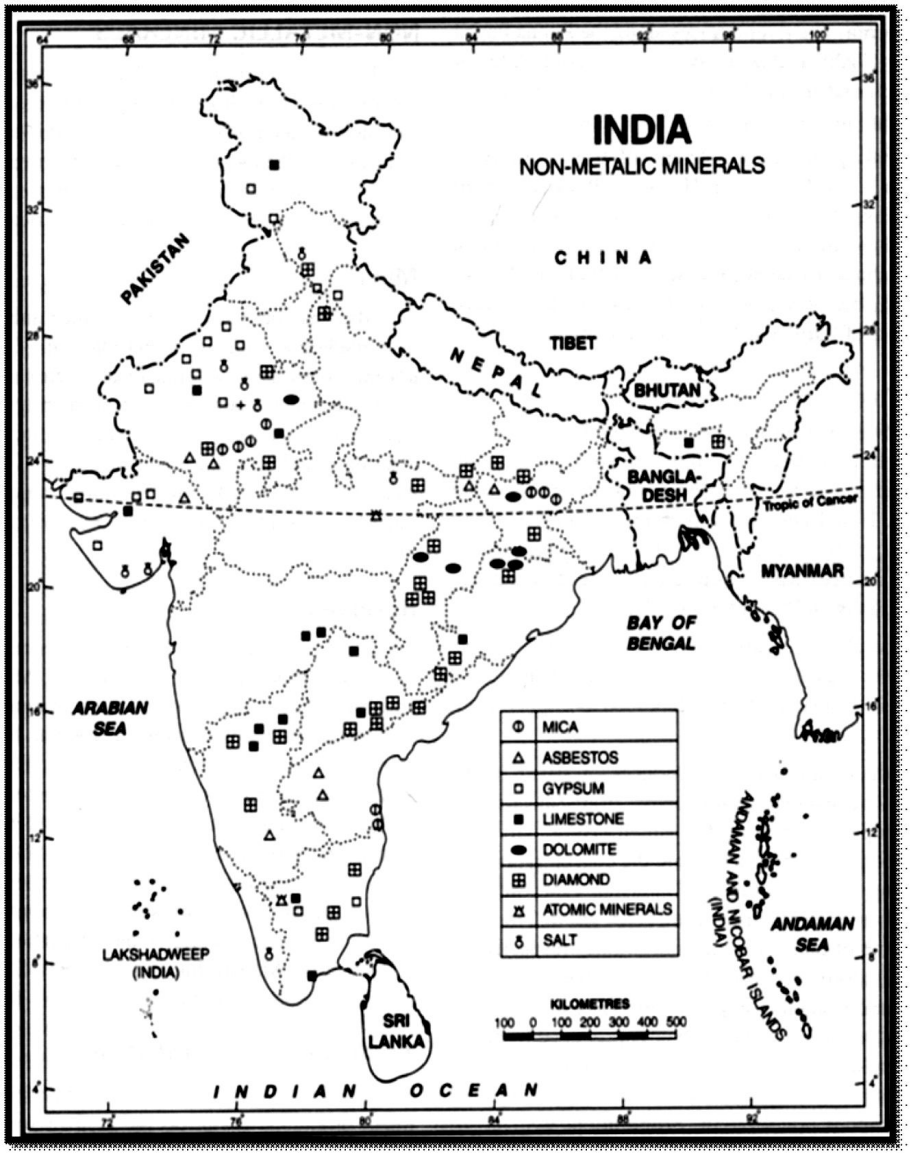
Exports: India is not only the largest producer but also the largest exporter of mica in the world. In spite of the threat from synthetic mica, certain grades of Indian mica will remain vital to the world's electrical industries.

Most of the exports are routed through the ports of Kolkata and Vishakhapatnam. Japan (19%), the USA (17%), U.K. (7%), Norway (7%), Russia, Poland, Germany, Czech Republic, Slovakia, Hungary, France, the Netherlands, etc. are the main buyers purchasing about 80 per cent the total mica exported by India. However, trends in exports of mica from India are quite fluctuating *(see* Table 23.11).

Year wise Mica Production in India

Year	1960-61	1970-71	1980-81	1990-91	2000-01	2010-11	2011-12	2012-13	2013-14
Production (Thousand Tonnes)	28.4	26.7	16.7	42.0	63.2	125.8	131.1	126.8	126.4

NON METALIC MINERALS OF INDIA



7.6 MANGANESE

Introduction: It is an important mineral which is used for making iron and steel and it acts as a basic raw material for manufacturing its alloy. Nearly 6 kilograms of manganese is required for manufacturing one tonne of steel. It is also used for the manufacture of bleaching powder, insecticides, paints, and batteries.

7.6.1 PRODUCTION AND DISTRIBUTION:

India has the second largest manganese ore reserves in the world after Zimbabwe. The total reserves of manganese ore are 430 million tonnes (2010). Odisha (44%), Karnataka (22%), Madhya Pradesh (13%), Maharashtra (8%), Andhra Pradesh (4%) and Jharkhand and Goa (3% each). Rajasthan, Gujarat and West Bengal together share the remaining 3 per cent resources,

India is the world's fifth largest producer of manganese ore after Brazil, Gabon, South Africa and Australia. Production of manganese ore in India remains more or less static with slight variations from year to year.It was 1,632 lakh tonnesin 1994-95 and stood at 2,349 lakh tonnes in 2011-12.

Maharashtra, Madhya Pradesh, Odisha, Andhra Pradesh and Karnataka are the major manganese producing states which account for more than 98 per cent of the total production of India. Maharashtra and Madhya Pradesh together produce more than half of India's manganese.

1. **Maharashtra :** It produces about 27.66 per cent of India's manganese ore. The main belt is in Nagpur and Bhandara districts. High grade ore is found in Ratnagiri district also.

2. **Madhya Pradesh :** Maharashtra is closely followed by Madhya Pradesh. About 27.59 per cent of India's manganese ore is obtained from Madhya Pradesh, The state produced only 11 per cent ofIndia's manganese ore just two decades ago. The main belt extends in

Balaghat and Chhindwara districts. It is just an extension of the Nagpur-Bhandara belt of Maharashtra.

3. **Odisha :** Odisha is the third largest producer and produces over 24 per cent manganese ore of India. It is obtained from Gondite deposits in Sundargarh district and Kodurite and Khondolite deposits in Kalahandi and Kortput Districts. Manganese is also mined from the lateritic deposits in Bolangir and Sambalpur districts.

4. **Andhra Pradesh :** Andhra Pradesh produced more than 13% of India's manganese n 2011-12. The main belt is found between Srikakulam and Vishakhapatnam districts. Srikakulam district has the distinction of being the earliest producer (1892) of manganese ore in India. Cuddapah, Vijayanagaram and Guntur are other producing districts.

5. **Karnataka :** About 6 per cent of India's manganese ore is produced by Karnataka. The main deposits occur in Uttara Kannada, Shimoga, Bellary, Chitradurg and Tumkur districts.

Other producers : Jharkhand. Rajasthan, Goa, Panchmahals and Vadodara in *Gtijant,*Udaipur and Banswara in *Rajasthan*and Singhbhum and Dhanbad districts in *Jharkhand* are other producers of manganese.

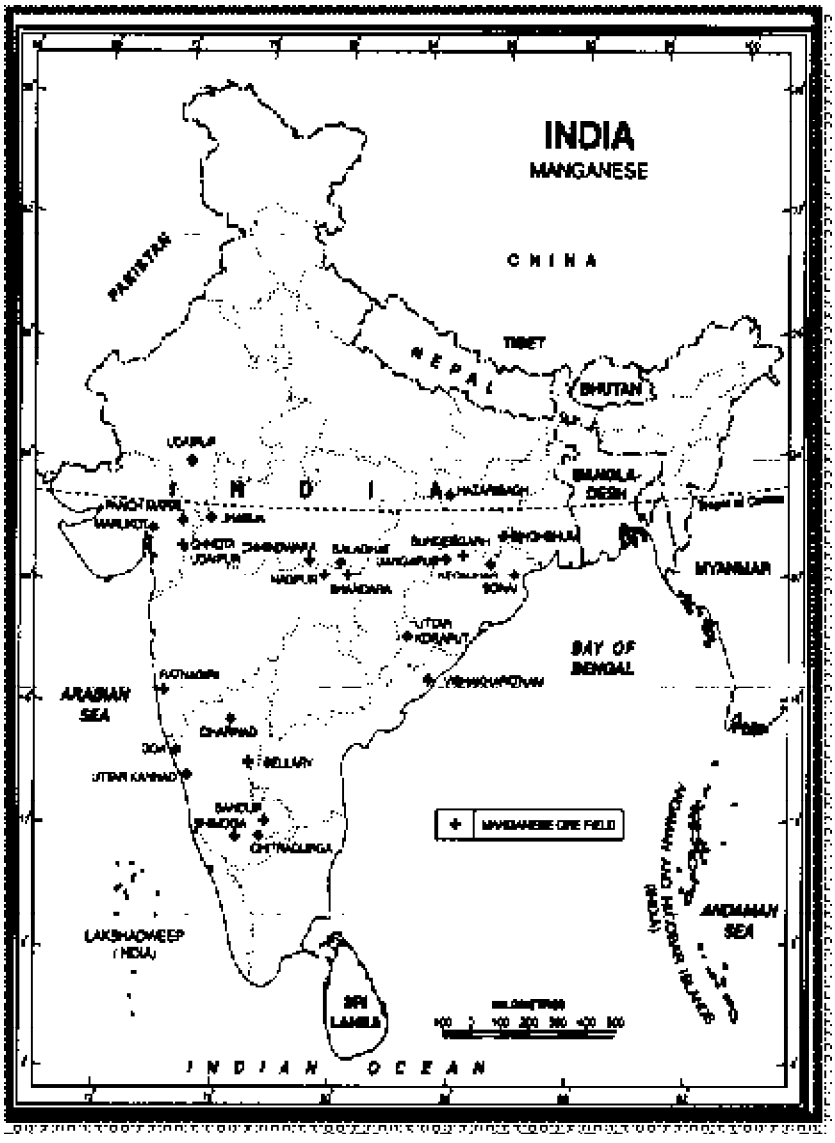
Exports : Over four-fifths of the total production is consumed within the country and less than one-fifth is exported. Exports of manganese had been constantly decreasing because of rapidly increasing demand in domestic market. This is due to expansion of some of those industries, which use manganese as one of the basic raw materials. Such industries include iron and steel industry, manufacturing of dry batteries, chemicals used in photography and some other industries. So far India had to impose ban on the export of high and medium grade ores with 35 per cent manganese content in 1971 to feed our industries. India is now exporting low grade ores with less than 35 per cent manganese content for which there is not much demand in the international market. It is worth mentioning here that the share of manganese ore exported to total

production of the ore had fallen from 88.86 per cent in 1970-71 to less than 15 per cent in 2013-14. Japan is the largest buyer of Indian manganese accounting for about two-thirds of our total exports. The other buyers are the USA, UK, Germany, France, Norway, Sweden, Belgium, Czech Republic, Slovakia, Ukraineetc.

State wise Production of Manganese in India

S.No	Name of State	Production (Thousand Tonnes)	Percentage of All India
1	Maharashtra	649898	27.66
2	Madhya Pradesh	648283	27.59
3	Odisha	565662	24.08
4	Andhra Pradesh	322027	13.71
5	Karnataka	136072	5.79
6	Jharkhand	18265	0.78
7	Rajasthan	7483	0.32
8	Others	1550	0.07
9	Total	2349300	100.00

MANGANESE IN INDIA



7.7 Sample Paper Chapter 7th. Short Answer Type Questions

Q.1 Define term Minerals.

Q.2 Name the major type of Iron ore.

Q.2 Define Mica.

Q.2 Define Manganese.

Q.5 Name the Mica producing area of India.

7.8 Chapter 7th long Answer Type Questions

Q.1 Discuss the type, production and distribution of Iron ore in India.

Q.2 Define Mica and discuss the production and distribution of Mica in India.

Q.3 Define Manganese, discuss the production and distribution of Manganese in India.

7.8 Glossary:

1. **Metallic Minerals:**These minerals contain metal. Iron ore, copper, manganese, nickel, etc.
2. **Ferrous Minerals:**These minerals have iron content. Iron-ore, manganese, chromite etc.
3. **Non-ferrous Minerals:**These minerals do not have iron content. Gold, silver, copper, etc.
4. **Mica:** Mica is a bad conductor of electricity and is therefore used in electrical instruments
5. **Manganese:** It is an important mineral which is used for making iron and steel.

7.9 Suggested Reading

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C. No. : GO-401 **Unit-II**

BA- IV Semester **Lesson-8**

POWER RESOURCES OF INDIA- COAL, PETROLEUM AND WATER POWER

Ms. Sarita Nagari

8.1 INTRODUCTION:

Energy is the primary input in the production of goods and services. *The wheels of progress move with the flow of energy.* One of the critical elements in raising the standard of living of a country's population is the provision of affordable and reliable energy services in sufficient quantities. More regular and ample is the availability of energy, more even will be the path to economic prosperity. The role of energy has significantly increased with the increase in industrialization and urbanization in the present day society. From its early role, which was confined to kitchen as a fuel for household cooking, energy is now a major input in sectors such as industry, commerce, transport and telecommunications, besides the wide range of services required in the household sector.Depending upon its source and utilization, energy can be divided into two broad classes *viz. (i) traditional or non-commercial,* and *(ii) commercial energy.* The non-commercial energy includes fire-wood, charcoal, cow dung, agricultural wastes and also animal power. The commercial sources of energy comprise coal, oil. natural gas. hydro-electricity, nuclear power, as well as wind and solar power.Energy may also be classified as *conventional* and *non-conventional* depending upon its nature. Coal, petroleum, natural gas and electricity are the main sources *of conventional energy* while solar, wind, tidal, geothermal energy and biogas, etc. are some of the outstanding examples of *non-conventional energy.*

8.2 OBJECTIVES:

The present chapter leads the study of various minerals resources in India, each mineral having their own nature and significance for the country economic development. Some selected minerals resources their distribution and production in India.

8.3 COAL

Coal is an inflammable organic substance, composed mainly of hydrocarbons, found in the form of sedimentary rocks and capable of being used as fuel to supply heat or light or both. It also contains volatile matter, moisture and ash in varying proportions. Combustible matter in coal consists of carbon and hydrogen.Coal was, is and will continue to be the main-stay of power generation in India for a longtime. It constitutes about 70 per cent of total commercial energy consumed in the country. The power sector and industries account for 94 per cent of total consumption. Manufacturing of iron and steel and a variety of chemicals largely depend upon the availability of coal. Due to its high utility as a source of energy and as a raw material for a large number of industries, it is often called *Mack gold.* A recent study conducted by energy experts show that the world coal reserves are six times the known reserves of oil and coal has been described as the *bridge into the future*.

8.3.1 ORIGIN OF COAL

Coal has originated from the organic matter wood. Large tracts of forest lands were buried under sediments in the geological past *i.e.* in the Carboniferous age. Wood was burnt and decomposed due to heat from below and pressure from above. During the process of decomposition of wood, hydrogen originates in the form of methane and water, oxygen in the form of carbon dioxide and water. During the process of change from wood to coal, the amount of oxygen and nitrogen decreases and the proportion of carbon increases. The capacity of coal to give energy depends upon the percentage of carbon contained in it. The percentage of carbon in coal depends upon the duration and intensity of heat and pressure on wood.

8.3.2 TYPES OR (VARIETIES OF COAL)

Depending upon its grade from highest to lowest, following four varieties of coal are generally recognized.

1. **Anthracite Coal:** This is the best quality of coal and contains 80 to 95 per cent carbon. It has very little volatile matter and negligibly

small proportion of moisture. It is very hard, compact, jet black coal having semi-metallic luster. It ignites slowly and burns with a nice short blue flame. It has the highest heating value and is the most prized among all the varieties of coal. In India, it is found only in Jammu and Kashmir and that too in small quantity.

2. **Bituminous Coal:**This is the most widely used coal. It derives its name after liquid called bitumen released after heating. It varies greatly in composition-in-carbon content (from 40 to 80 per cent)-and moisture and volatile content (15 to 40 per cent)-so that it is often sub-divided into several minor divisions such as sub-bituminous and bituminous coals. It is dense, compact, and is usually of black colour. A good bituminous coal is composed of alternate dull and bright bands. It does not have traces of original vegetable material from which it has been formed. Its calorific value is very high due to high proportion of carbon and low moisture content. By virtue of this quality, bituminous coal is used not only for steam raising and heating purposes but also for production of coke and gas. Most of the bituminous coal is found in Jharkhand, Odisha, West Bengal, Chhattisgarh and Madhya Pradesh.

3. **Lignite:** Also known *asbrown coal*, lignite is a lower grade coal and contains about 40 to 55 per cent carbon. It represents the intermediate stage in the alteration of woody matter into coal, its colour varies from dark to black brown. It is friable and pyritious. Its moisture content is high (over 35 per cent) so thatit gives out much smoke but little heat. Its typical qualities make it liable to disintegrate on exposure and even to spontaneous combustion. It is found in Palna of Rajasthan, Neyveli of Tamil Nadu, Lakhimpur of Assam and Karewa of Jammu and Kashmir.

4. **Peat:** This is the first stage of transformation of wood into coal and contains less than 40 to 55 per cent carbon, sufficient volatile matter and lot of moisture. It is seldom sufficiently compact to make a good

fuel without compressing into bricks, Left to itself, it burns like wood, gives less heat, emits more smoke and leaves a lot of ash after burning.

8.3.3 OCCURRENCE OF COAL IN INDIA

The coal bearing strata of India are geologically classified into two main categories, *viz.*, the Gondwana coal fields and the Tertiary coal fields.

(a) Gondwana Coal: Gondwana coal contri-butes overwhelmingly large proportion of both the reserves and production of coal, accounting for 98 per cent of the total reserves and 99 per cent of the production of coal in India. It is the store house of India's metallurgical as well as superior quality coal. Of the 113 major coal fields found all over India, 80 are located in the rock systems of thelower Gondwana Age. There are about 75 separate basins covering an area of 77,700 sq km mainly confined to the Peninsular India. The size of these basins varies from 1 sq. km to 1,550 sq. kms. These basins occur down in the valleys of certain rivers *viz.*, the Damodar (Jharkhand-West Bengal); the Mahanadi (Chhattisgarh-Odisha); the Son (Madhya Pradesh-Jharkhand); the Godavari and the Wardha (Maharashtra-Andhra Pradesh); the lndravati, the Narmada, the Koei, the Panch, the Kanhan and many more.Gondwana coal is said to be about 250 million years old. It includes coking as well as non-coking and bituminous as well as sub-bituminous coal. Anthracite is generally not found in the Gondwana fields. The volatile compounds and ash (usually 13 to 20, rising to as much as 25 to 30 percent) are present in too large a proportion to allow the carbon percentage to rise above 55 to 60; generally much less than that. The Gondwana coal is almost free from moisture, but it contains sulphur and phosphorus in small variable quantities.It is possible that some coal bearing Gondwana rocks are hidden beneath the great pile of lava of the Deccan trap. At several places, chiefly in the Satpuras, denudation has exposed coal bearing Gondwana strata, from which it can be inferred that considerable

quantities of valuable coal can be obtained from these areas. The Damuda series *(i.e.* Lower Gondwana) possesses the most valuable and best worked coalfields and accounts for about 80 per cent of the total coal production in India.

(b) **Tertiary Coal:** The tertiary rock system bears coals of younger age; from 15 to 60 million years and is mainly confined to the extra-Peninsula. This coal generally has low carbon and high percentage of moisture and sulphur. Important areas of Tertiary coal include parts of Assam, Meghalaya, Arunachal Pradesh, Nagaland, Himalayan foothills of Darjeeling in West Bengal, Jammu and Kashmir, Uttar Pradesh, Rajasthan, Kerala, Tamil Nadu and the union territory of Puducherry. Reserves According to the Geological Survey of India, the coal reserves of India as on 1 April, 2008 (down to a depth of 1,200 meters) have been estimated at 293.497 billion tonnes.

8. 3.4 PRODUCTIONAND DISTRIBUTION OF COAL IN INDIA:

Majority of the coal-fields are found in the eastern part of India particularly to the east of 78" E longitude. Maximum concentration of coal fields is in the north-eastern part of the peninsular plateau of India comprising parts of Jharkhand, Chhattisgarh, Odisha and eastern Madhya Pradesh and western part of West Bengal adjoining Jharkhand. Southern part of Madhya Pradesh, eastern part of Andhra Pradesh and eastern part of Maharashtra also have large deposits of coal. There are about three-fourth of India's coal is produced by four states of Chhattisgarh, Jharkhand, Odisha and Madhya Pradesh. More than 40 per cent of India's total coal production comes from just two states of Chhattisgarh and Jharkhand. About one-third of the total coal of the country is obtained from Andhra Pradesh, Maharashtra, West Bengal, Uttar Pradesh and Meghalaya.

Gondwana Coalfields: As mentioned earlier, the Gondwana Coal fields are exclusively found in the peninsular plateau of India. State-wise major Gondwana coal producing areas are described as under:

1. **Chhattisgarh :** Chhattisgarh holds the third position with respect to coal reserves but occupies the first position, so far as production is concerned. This state has 16.09 per cent of the coal reserves and produces over 21 per cent coal of India. Most of the coal fields of Chhattisgarh are located in the northern part of the state. The *Korba*coalfield stretches over an area of 515 sq km in the valleys of Hasdo (a tributary of the Mahanadi) and its tributaries (Ahram and Kurang) in Korba district. Coal occurs in the Barakar measures with total thickness of 700 m. Most of the coal from the field is sent to thermal power plant at Korba. The *Birampur*coalfield lies in Surguja district. With total reserves of 542 million tones this field has coal seams of thickness varying from 30 cm to 1.8 m. The *Hasdo-Arand*coalfield extends from Rampur in Surguja district to Arand valley in Bilaspur district and covers an area of about 1004 sq km. The coal reserves in this field are estimated at 4,321 million tonnes. The coal seams have average thickness of 2.5 m to 7.0 m. *Chirmiri*coalfield in Surguja district spreads over an area of 128 sq km.The total reserves of this field are estimated at 362 million tonnes, Thereare four coal seams in this field out of which three seams contain good quality coai. *Uikhwipur*coalfield lies south of Bisrampur coalfield and spreads over Surguja, Koriya, Korba and Bilaspur districts. Here the coal seams are I to 3 m thick, *Jhilmili*coalfield occupies a total area of 106 sq km. being an extension of Sahagpur coalfield of Shahdol district (in Madhya Pradesh), and most of it lies in Koriya district of Chhattisgarh. It has five coal seams which belong to Talcher and Barakar measures. The coal is non-cocking type and has high proportion of ash. *Johilla*coalfield, lying in the Johilla valley, covers an area of about 38 sq km. The reserves are estimated at 311 million tonnes, *Sonluit*coalfield in Surguja district has superior quality coal. Kutkona, Charch and Sardih coal bearing strata have high grade coal. *Tatapani-Ramkota*coalfields lie between Kanhar and Rehar rivers in the north-eastern part of Surguja district. Coal of Tatapani coalfields belongs to the Damuda series.

2. **Jharkhand :** Jharkhand is the richest state with respect to reserves but has conceded the first place to Chhattisgarh. This state was the largest producer of coal in India till recent past. Jharkhand has over 28 per cent of the coal reserves and produces more than 20 per cent coal of India, In the year 2011-12, Jharkhand produced 1097, 02 lakh tonnes of coal.Most of the coal fields are located in a narrow belt running in east-west direction almost along the 24°N latitude. There are 21 prominent coal fields in Jharkhand of which 8 are in Dumka (SanthalParganas), 7 in Hazaribagh and 3 each in Dhanbad and Palamu. Amongst these, Jharia, Bokaro, Girdih and Karanpura are outstanding. The *Jhariacoal-field* lies to the south-west of Dhanbad city and covers an area of 453 sq. kms. It is one of the oldest and the richest coal fields of India and has been recognised as the *store house* of the best metallurgical coal in the country. The total estimates of all grades of coal upto a depth of 900 meters are estimated to be 16,985.69 million tonnes, The *Bokarocoat-field*in Hazaribagh district lies within 32 km of western end of the Jharia coal field. It is a long but narrow strip in the catchment area of the Bokaroriver spreading over an area of 674 sq. km. The entire Bokaro coalfield is divided into two parts *viz.*West Bokaro and East Bokaro. The reserves in West Bokaro upto a depth of900 meters have been estimated at 4,473.73 million tonnes with seams ranging from 3.5 to 11 metre thick. East Bokaro has 4,246.32 million tonnes of reserves upto a depth of 600 metre. The *Girdih*(also known as *Karharbari)* coalfield lies to the south-west of Girdih in Hazaribagh district. Spreading over an area of 28.5 sq km this field has three main seams of varying thicknesses: (i) the Lower Karharbari*(ii)* the Upper Karharbari and *(iii)* the Badhua seams. The Lower Karharbari seam is 3 to 7.5 metre thick and gives out of the finest coking coal in India for metallurgical purposes. The *Karanpura and Ramgarh* coalfields lie to the west of Bokaro and cover an area of about ,522sq. kms. The *North Karanpura*covers an area of 1,230 sq km having estimated reserves

of 13,110.84 million tonnes upto a depth of 900 meters. The *South Karanpura*field covers an area of 194 sq. km and possesses estimated reserves of 5,757.85 million tonnes down to 900 meters in depth. *Ramgarh coal field* situated about 9 km away from the Bokaro field covers an area of 98 sq km having 22 seams. The total coal reserves of this field are estimated to be at 1,059.20 m tonnes down to a depth of 900 m.

3. **Madhya Pradesh :** Madhya Pradesh has about 7.77 per cent of the coal reserves but contributes about 13.27 per cent of the total coal production of India. Currently Madhya Pradesh is the fourth largest coal producing state of India, *Singrauli*(Waidhian) coalfield in Sidhi and Shahdol districts is the largest coalfield of Madhya Pradesh. Spreading over an area of 2,337 sq. km. this coalfield has 9,207 million tonnes of coal reserves. Jhingurda, Panipahari, Khadia, Purewa and Turra are important coal seams. Jhingurda with a total thickness of 131 m is the richest coal seam of the country. This field supplies coal to thermal power plants at *Singrauti*and *Obi a. Pench-Kanhan-Tawa*in Chhindwara district is another important coalfield of Madhya Pradesh. It contains 1956 million tonnes of semi-coking and non-coking coal. Ghoravari seam in Kantian field is 4.6 m thick and contains coking coal. *Sohagpitr*coalfield in Shahdol district has 2,284 million tonnes reserves of coal. Here coal seams attain a thickness of 3-5 m and even more. *Umaria*coalfield is situated at a distance of 58 km to the south of Katni. It contains 6 coal seamsof which 4 are important (thickness 2 to 4 m). The total reserves are estimated at about 58 million tonnes. However, the coal is of inferior quality with high percentage of moisture and ash,

4. **Andhra Pradesh and Telangana :** With only 7.07 per cent of the reserves Andhra Pradesh andTelangana produce about 9,69 per cent of India's coal, Most of the coal reserves are in the Godavari valley spread over an area of 10,350 sq. kms in the districts of Adilabad,

Karimnagar, Warangal, Khammam, East Godavari, and West Godavari. The actual workable collieries are situated at Tandur, Singareni and Kothagudam. Almost the entire coal is of non-coking variety. The reserves of all types of coal in the Godavari valley upto a depth of 1210 metre have been estimated at 10,435.50 million tonnes. These are the southernmost coalfields of India and a source of coal supply to most of south India.

5. **Maharashtra. :** Though Maharashtra has only 3 per cent reserves, the state accounts for over 7 per cent of the production of coal in India. Most of the coal deposits are found in the Kamptee coalfields in Nagpur District; Wardha valley, Ghughus, Ballarpur and Warora in Chandrapur district and the Wun field in Yavatmal district, Coal has also been located in Umrer, Nand, Makardhokra and Bokhara areas.

6. **West Bengal :** Although West Bengal produces just over four per cent of India's coal, the state has over 11 per cent of the coal reserves of the country. Barddhaman, Bankura, Purulia, Birbhum, Darjeeling and Jalpaiguri are the chief producing districts. Raniganj is the largest coalfield of West Bengal. In fact, it is at Raniganj that coal-mining started in India in 1,774. It covers an area of 1,500 sq. kms mainly in Barddhaman, Bankura and Purulia districts. Small part of this field is in Jharkhand state. This field produces mainly non-coking steam coal, which is mainly used by thermal power plants.

   In Darjeeling district, coal reserves are found in Dalingkot coalfield; several seams occur near Tindharia where the best seam is about 3.3 meters thick. In Jalpaiguri district, a few seams are located near the Duars area.

7. **Uttar Pradesh :** Most parts of Uttar Pradesh are covered with sediment brought by rivers and do not possess coal reserves. But some of the coal seams of Madhya Pradesh project into the territory of this state. A small portion of the Singrauli field of Madhya Pradesh

falls within Mirzapur district of Uttar Pradesh. A high grade coal seam, about 1 to 1.5 m thick occurs near Kotah.

Tertiary Coal-fields

Tertiary coal-fields mainly occur in association with limestone and slates of either Eocene or Oligocene-Miocene age. The statewise distribution of tertiary coal is as follows:

1. **Assam :** The major coalfields in Assam are the Makum, Nazira, Mikir Hills, Dilli-Jeypore and Lakhuni. Of these, the Makum coalfield in Sibsagar district is the most developed field. It is 28 km long and about 5 km wide. The total reserves of all types of coal in this field are estimated to be 235.6 million tonnes, down to a depth of 600 m. In the Mikir Hills coalfield, Koilajan, Langlor, Diogarang river areas are worth mentioning. Assam coals contain very low ash and high coking qualities but the sulphur content is high, as a result of which this coal is not suitable for metallurgical purposes. But these coals are best suited for hydrogenation process and are used for making liquid fuels.

2. Meghalaya, Garo, Khasi and Jaintia hills are believed to have deposits of tertiary coal belonging to lower Eocene. The total reserves of all types of coal in Meghalaya are estimated to be459 million tonnes. The Garo hills have important coalfields near Darrangiri. In the Khasi and Jaintia hills, Siju. Cherrapunji, Liotryngew, Maolong and Langrin coalfields are important.

3. Arunachal Pradesh : The Upper Assam Coal belt extends eastwards as Namchick-Namrup coalfield in the Tirap district of Arunachal Pradesh. The seams of this coalfield are 4 to 19 meters thick,the coal is generally high in volaliles and in sulphur. The total reserves of all kinds of coal upto a depth of 330 m are estimated to be about 90 million tonnes.

The other tertiary coalfields include the Kalakot, Jangali, Chinkah, Metka, Maholgala and Ladde areas of Jammu and Kashmir and the Chamba district of Himachal Pradesh.

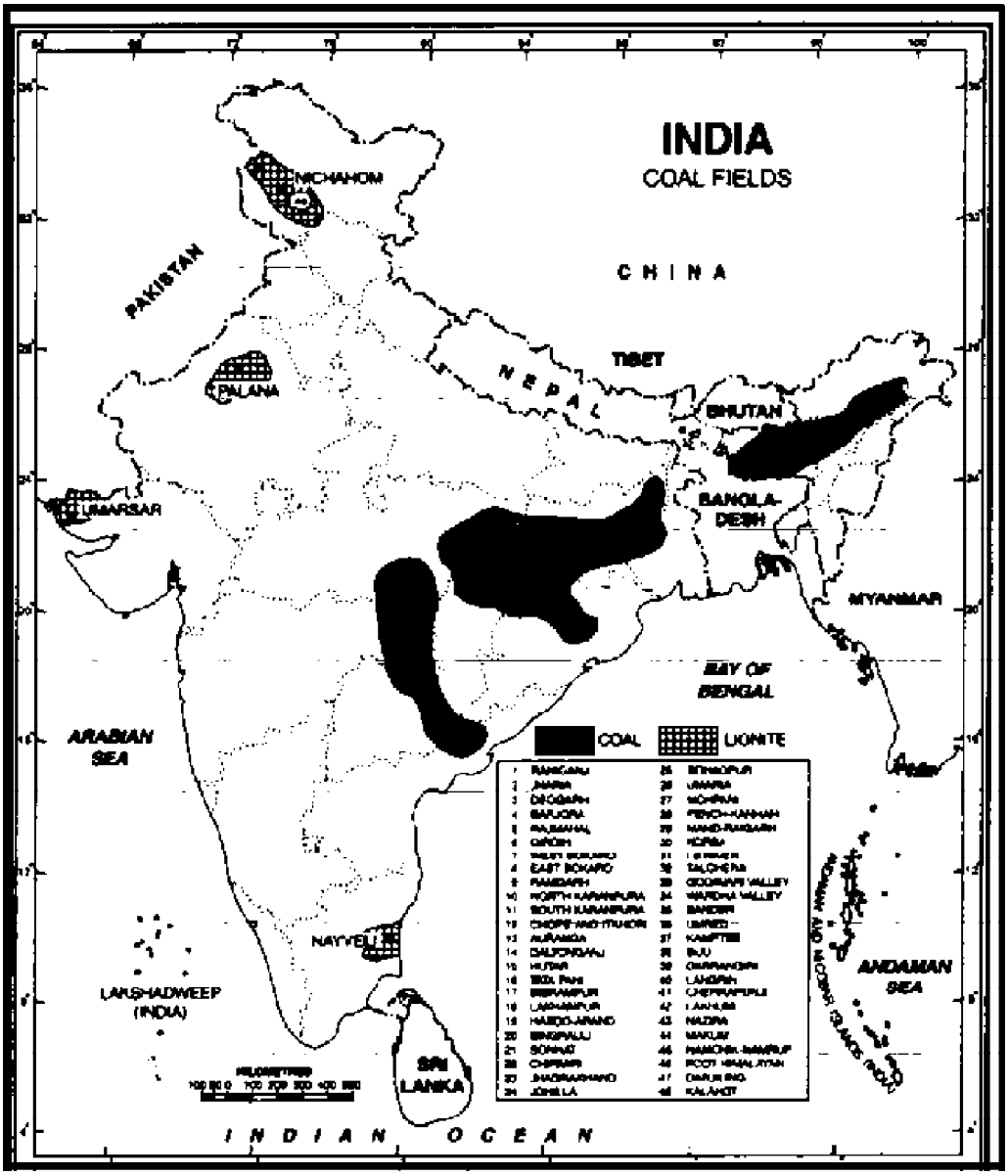
Distribution of Coal Reserves in India 2008

S.No	Name of State	Total Reserves (Million Tonnes)	Percentage of All India Reserves
1	Jharkhand	75460.14	28.53
2	Odisha	65263.34	24.67
3	Chhattisgarh	44134.04	16.68
4	West Bengal	28334.84	10.71
5	Madhya Pradesh	20559.96	7.77
6	Andhra Pradesh	18696.59	7.07
7	Maharashtra	9818.09	3.71
8	Others	226.06	0.86
	Total	**264535,06**	**100.00**

Distribution of Coal Production in India 2008

S.No	Name of State	Total Production (Thousand Tunes)	Percentage of All India Production
1	Chhattisgarh	113918	21.10
2	Jharkhand	109702	20.32
3	Odisha	105476	19.54
4	Madhya Pradesh	71658	13.27
5	Andhra Pradesh and Telangana	52210	9.69
6	Maharashtra	39178	7.26
7	West Bengal	24287	4.49
8	Uttar Pradesh	15650	2.89

COAL FIELDS IN INDIA



8.4 PETROLEUM OR MINERAL OIL

INTRODUCTION:

The word 'petroleum' has been derived from two Latin words Petra (meaning rock) and Petroleum (meaning oil)..Thus petroleum is oil obtained from rocks; particularly sedimentary rocks of the earth. Therefore, it is also called mineral oil. Technically speaking, petroleum is an inflammable liquid that is composed of hydrocarbons which constitute 90 to 95 per cent of petroleum and the remaining is chiefly organic compounds containing oxygen, nitrogen, sulphur and traces of organ-metallic compounds. Crude petroleum consists of a mixture of hydrocarbons—solid, liquid and gaseous. These include compounds belonging to the paraffin series and also some unsaturated hydrocarbons and small proportion belonging to the benzene groupUtilisation of Petroleum. Petroleum and petroleum products are mainly used as motive power. It is a compact and convenient liquid fuel which has revolutionizedtransportation on land, in the air and on water. It can be easily transported from the producing areas to the consuming areas with the help of tankers and more conveniently, efficiently and economically by pipelines. It emits very little smoke and leaves no ash. (As is the case in coal utilisation) and can be used upto the last drop. It provides the most important lubricating agents and is used as an important raw material for various petro-chemical products.

8.4.1 ORIGIN AND OCCURRENCE OF PETROLEUM:

Petroleum has an organic origin and is found in sedimentary basins, shallow depressions and in the seas (past and present). Most of the oil reserves in India are associated with anticlines and fault traps in the sedimentary rock formations of tertiary times, about 3 million years ago. Some recent sediment, less than one million years old also show evidence of incipient oil. Oil and natural gas originated from animal or vegetable matter contained in shallow marine sediments, such as sands, sills and clays deposited during the periods when land and aquatic life was abundant in various forms, especially the minor microscopic forms of flora and fauna. Conditions for oil formation were favorable especially in the lower and middle Tertiary period. Dense forests and sea

organisms flourished in the gulfs, estuaries, deltas and the land surrounding them during this period. The decomposition of organic matter in the sedimentary rocks has led to the formation of oil. Though oil is mainly found in sedimentary rocks, all sedimentary rocks do not contain oil. An oil reservoir must have three pre-requisite conditions: (/) porosity so as to accommodate sufficiently large amounts of oil; *(H)* permeability to discharge oil and/or gas when well has been drilled; *(Hi)*the porous sand beds sandstone, conglomerates of fissured limestone containing oil should be capped by impervious beds so that oil does not gel dissipated by percolation in the surrounding rocks. Oil on a commercial scale is usually found where the sedimentary rock strata are inclined and folded; in a sort of chamber or reservoir, in the highest possible situation *e.g.*crests of anticlines. Normally, oil is associated with water. Being lighter than water (specific gravity of 0.8 to 0.98), it collects in the anticlines or fault traps above the surface of water. Gas is still lighter and occurs above oil. Thus on drilling an oil well, one finds gas followed by oil. As already mentioned, oil as well as natural gas in India occur in sedimentary rocks. About 14.1 lakh sq km or about 42 per cent of the total area of the country is covered with sedimentary rocks out of which about 10 lakh sq km form marine basins of Mesozoic and Tertiary times. Besides, the country has offshore areas having Mesozoic and Tertiary rocks of marine origin covering an area of 2.5 lakh sq km upto a depth of 100 metre and another area of 0.7 lakh sq km upto a depth between 100 and 200 metre. Thus the total continental shelf of probable oil bearing rocks amounts to 3.2 lakh sq km *{see*Fig. 24.4) the total sedimentary area including both on shore and offshore comprises 27 basins. The geological and geophysical studies have been conducted in 14 basins while exploratory drilling has been done in 9 basins. Mumbai High, the Khambhat Gulf and the Assam are the most productive areas.

7. 4. 2 PRODUCTIONS

India was a very insignificant producer of petroleum at the time of Independence and remained so till Mumbai High started production on a large scale. In fact, off-shore production did not start till the mid-1970s and the entire production was received from on-shore oil fields.In I980-8S about half of the production of crude oil came from on-shore fields while the remaining half was received from the off-shore resources. After that juncture, the off-shore production increased at a much faster rate than the on-shore production. From 1990-91 to 2009-10, about two-thirds of the production had been received from off-shore sources but after that on-shore production has picked up very fast. The total production recorded more than three times increase after 1980-81

On-shore Oil Production : On-shore oil fields are located in the Brahmaputra valley of north-east India, Banner area of Rajasthan, Gujarat coast in western India and Cauvery on-shore basin in Tamil Nadu. Besides Andhra Pradesh has both on-shore and off-shore oil reserves.

8.4.3 OILFIELDS IN NORTH-EAST INDIA

The major oilfields in north-east India are those of the Brahmaputra valley in Assam and its neighboring areas including Arunachal Pradesh, Nagaland, Meghalaya, Tripura, Manipur and Mizoram.Assam. Assam is the oldest oil producing state in India. The main oil bearing strata extend for a distance of 320.km in upper Assam along the Brahmaputra valley. Following are some of the important oilfields of Assam:

The Digboi field : Located in the north-east of Tipam hills in Dibrugarh district of Upper Assam, Digboi is the oldest oil field of India. The oil bearing strata cover an area of about 13 sq km where oil is available at 400 to 2,000 meters depth. Over 800 oil wells have been drilled so far. Before the opening of the oil fields of west India, Digboi used to

account for three-fourths of the total oil production of India. The most important centres- are Digboi, Bappapang, Hassapang and Paintola, Most oil is sent to oil refinery at Digboi.

The Naharkatiya field : It is located at a distance of 32 km southwest of Digboi at the left bank of BurhiDihing river. Here oil was discovered in 1953 and production started in 1954. Oil is available at depths varying from 4,000 to 5,000 meters. Out of the 60 successful wells drilled so far, 56 are producing oil while the remaining 4 are producing natural gas. The annual production is 2.5 million tonnes of oil and one million cubic meters natural gas.Oil from this area is sent to oil refineries at Noonamati in Assam (443 km) and Barauni in Bihar (724 km) through pipeline.3. *The Momn-Hugrijan field*. It is located about 40 km south-west of Naharkatiya. Oil at Moran-Hugrijan field was discovered in 1953 and production started in 1956. Drilling has proved an oil bearing Barail horizon at a depth of 3,355 metre. Moran's potential may be estimated at one million tonnes per annum. As many as 20 welis have been drilled which yield oil as well as gas.

Other fields have been discovered at Rudrasagar, Sibsagar, Lakwa. Galeki, Badarpur, Barholla and Anguri.Oilfields of Assam are relatively inaccessible and are distantly located from the main consuming areas. Oil from Assam is, therefore, refined mostly in the refineries located at Digboi, Guwahati, Bongaigaon, Barauni and Numaligarh.*Arunachal Pradesh* has oil reserves at Manabhum, Kharsang and Charali. In *Tripura,* promising oilfields have been discovered at Mamunbhanga, Baramnra-DeotamuraSubhang, Manu, Ampi Bazar, Amarpur-Dambura areas. *Nagaland* also has some oil bearing rock strata

On-shore oil Fields of Western India

Gujarat : Explorations by Oil and Natural Gas Commission (ONGO have yielded valuable findings of oil bearing rock strata over an area of about 15,360 sq km around the Gulf of Khambhat. The main oil belt extends from Surat to Amreli, Kachchh, Vadodara, Bharuch, Sural,

Ahmedabad, Kheda, Mahesana, etc. are the main producing districts. In 2011-12, Gujarat produced over 5774 thousand tonnes of crude oil which accounted for over 15 per cent of the total oil! Production of India. Ankleshwar, Lunej, Kalol, Nawgam, Kosamba, Kathana, Barkol, Mahesana and Sanand are the important oilfields of this region.

Ankleshwar : The first major oil-find came in 1958 with the discovery of Ankleshwar field located about 80 km south of Vadodara and nearly 160 km south of Khambhat. Ankleshwar anticline is nboul 20 km long and 4 km wide. Oil is available at depths varying from 1,000 to 1,200 metres. It has a capacity of 2,8 million tonnes per annum. It is such a prolific oilfield that Pt. Jawahar Lai Nehru called it the *fountainofprosperity.*As many as 170 oil wells have been bored so far. It is estimated that 25 lakh tonnes per year of oil can be obtained from this field. Oil from this field is sent to refineries at Trombay and Koyalt.*Khambhat or Lunej field.*The oil and Natural Gas Commission drilled test wells in 1958 at Lunej near Ahmadabad and confirmed the occurrence of a commercially exploitable oil field. Oil was obtained on 4th Sept. 1959. Till 1969, a total of 62 wells were drilled out of which 19 yielded gas while. 3 yielded oil. The annual production is 15 lakh tonnes of oil and 8-10 lakh cubic meters of gas. The total reserves are estimated at 3 crore tonnes.

Ahmedabad and Kalol field : It lies about 25 km north-west of Ahmedabad. This field and a part of Khambhat basin contain 'pools' of heavy crude trapped in chunks of coal. Nawgam, Kosamba, Mahesana, Sanand, Kathana, etc. are important producers.Oil has also been struck in Olkad, Dholka, Kadi, Asjol, Sandkhurd, Siswas, Nandesan, Bandrat, Sobhasan and Vadesar areas.Rajasthan. One of the largest inland oil discoveries was made in Barmer district of Rajasthan in 2004. The oil block covers an area of approximately 5,000 sq. kms. State-of-the-art technology with innovative geological modeling was used in discovering this oil field. Initial estimates of the oil in place of this discovery range from 63 to 153 million tonnes. Two important discoveries, *viz.*, Sarswati and

Rajeshwari, with a total 35 million tonnes of inptace oil reserves were made earlier in 2002. The Sarswati discovery had found 14 million tonnes of in place oil reserves for which drilling upto 3,476 *m* was done. Mangala oil field discovered in 2004 is the largest oil discovery since 1985. It has nearly one billion barrels of recoverable oil. In the year 2011-12, Rajasthan produced 6,553 thousand tonnes of oil which accounted for over 17 per cent of the total production. Thus Rajasthan became the largest off shore oil producing state of India surpassing Assam and Gujarat in quick succession.

Western Costal ShoreOil fields

Extensive surveys have been conducted by ONGC in the offshore areas of Kachchh, Khambhat, Konkan,Malabar and Coromandal coasts, Krishna-Godavari delta and Sunderbans. Success on commercial scale has been achieved at Mumbai High, Bassein and Aliabet.

Mumbai High : The greatest success achieved by the ONGC with respect to offshore surveys for oil was that of Mumbai High in 1974. It is located on the continental shelf off the coast of Maharashtra about 176 km north-west of Mumbai. Here the rock strata of Miocene age cover an area of 2,500 sq. kms. with estimated reserves of about 330 million tonnes of oil and 37,000 million cubic meters of natural gas. Production on commercial scale began in 1976. Oil is taken from a depth of over 1,400 meters with the help of a specially designed platform known as *Sagar Samrat.* The discovery of Mumbai High has revolutionized the oil production in India. The share of Mumbai High in the total oil production of India has shot up considerably. This area produced 85 lakh tonnes of oil in 1982 which rose to over 189 lakh tonnes or over 62 per cent of all India in 1991-92. Production from this field declined between 1989-90 and 1993-94 due to over exploitation. Remedial measures have been taken to enhance the production and the declining trend has been reversed since 1994-95.

Bassein : Located lo the south of Mumbai High, this is a recent discovery endowed with reserves which may prove to be higher than those of the

Mumbai High. Huge reserves have been found at a depth of 1,900 metre. Production has started and has picked up fast.

Aliabet : It is located at AliabetIsland in the Gulf of Khambhat about 45 km off Bhavnagar. Huge reserves have been found in this field. Commercial production is expected to start soon.East Coast. The basin and delta regions of the Godawnri, the Krishna and the Cauvery rivers hold great potential for oil and gas production. As such these are both on-shore and off-shore areas where extensive exploration has been conducted during the last few years. The Rawa field in Krishna-Godawari off-shore basin is expected to produce I to 3 million tonnes of crude oil annually.*Tamil Nadu* produces less than the one per cent of the total oil production of India. The Narimanam and Kovilappal oilfields in the Cauvery on-shore basin are expected to produce about 4 lakh tonnes of crude oil annually. *Andhra Pradesh* also produces less than one per cent of the total crude oil of India. Oilfields have recently been discovered in the Krishna-Godavari basin. The oilfield near Amolpur is expected to yield 3,600 barrels of crude oil per day.*Probable Areas.* There are vast possibilities of finding oil from about one lakh sq km area of sedimentary rocks in different parts of the country (see Fig. 24.4). Some of the outstanding areas which hold possibilities of oil are:

(i) Jawalamukhi, Nurpur, Dharamsala and Bilaspur in Himachal Pradesh.

(ii) Ludhiana, Hoshiarpur and Dasua in Punjab.

(iii) The Gulf of Mannar off the Tirunelveli coast,

(iv) The off-shore area between Point Catimereand Jaffna peninsula.

(v) Off-shore deep water area in Bay of Bengal between 12°N-16°N latitudes and 84°E - 86° E longitudes.

(vi) The marine delta region of the Mahanadi, Godavari, Krishna and Cauvery rivers.

(vii) Stretch of sea between South Bengal and Baleshwar coast.

(viii) Off-shore area of the Anadaman and Nicobar Islands.

8.4.4 PETROLEUM REFINING

Oil extracted from the oil wells is in its crude form and contains many impurities. It is refined in oil refineries before use. After refining, various products such as kerosene, diesel, petrol, lubricants, bitumen, etc. are obtained. Although India's first oil refinery started working way back in 190! at Digboi in Assam, it remained the only refinery in the whole of India for more than half a century. It was only in 1954 that another refinery at Tarapur (Mumbai) joined the lone refinery of Digboi. Since then oil refining in India has progressed at a rapid pace. In the recentpast, seen a tremendous growth in the refining sector. The comprising 22 refineries 17 under public sector, 3country's refining capacity has increased from a under private sector and 2 in joint venture.

Petroleum Production in India 2008

S.No	State/ Region	Production (Thousand Tunes)	Percentage of All India Production
1	Off Shore	20664	52.68
2	Rajasthan	6553	17.20
3	Gujarat	5774	15.16
4	Assam	5023	13.19
5	Andhra Pradesh	305	0.81
6	Tamil Nadu	249	0.65
7	Arunachal Pradesh	120	0.31
8	All India	38088	100.00

MINERAL OIL OCCURRENCE IN INDIA

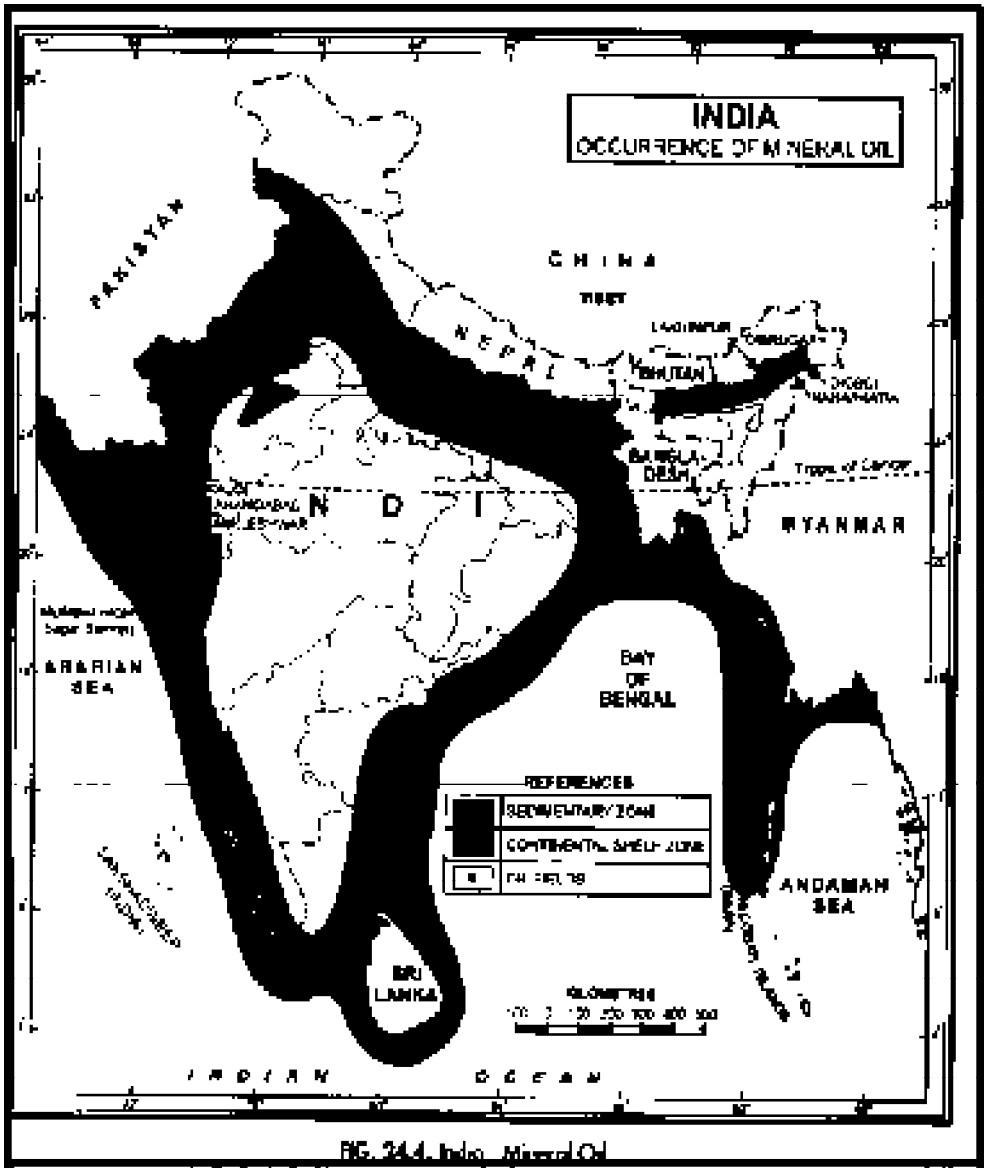


FIG. 24.4. India : Mineral Oil

8.5 HYDROELECTRICITY

INTRODUCTION:

The future prosperity of India depends to a great extent on our ability to produce and use hydroelectricity. The other two sources of energy, coal and petroleum, are exhaustible and will not be available to us forever. Therefore, we should reduce our dependence on coal and petroleum and develop hydroelectricity as far as possible. Currently, hydroelectricity accounts for about 16 per cent of the total installed capacity. This has to be increased so that increasing demand for energy is met and at the same time, precious and scarce coal and petroleum resources are saved from over exploitation. Hydroelectricity is a renewable, cheap, clean and environmentally benign source of energy and will be available to us for all times to come. River water, if not properly used, will wastefully drain into the sea.India is blessed with huge water resources and there are vast possibilities of producing hydroelectricity. However, India has developed only a small percentage of the total potential available. India's exploitable hydro-electric potential in terms of installed capacity is estimated to be about 1,48,700 MW out of which a capacity of 39.0 thousand MW (26.2%) has been developed so far. This is due to certain geographical factors as well as because of developing stage of economy. Most of the river regimes in India are extremely erratic because they are fed by monsoon rains which are highly seasonal and whimsical. Further, many rivers do not have natural waterfalls and huge capital has to be invested for constructing dams. Most of the sites suitable for generating hydroelectricity are located away from the consuming centres as a result of which a lot of energy is wasted in transmission. Under normal circumstances, there is loss of 8 per cent energy for transmitting it through a distance of 160 km and 21 per cent loss for 800 km. Thus if hydroelectricity generated at BhakhraNangal dam is to be consumed at Delhi, the average loss is about 15 percent.The hydroelectric power generation in India made a humble start at the end of the 19th century with the commissioning of a hydroelectric power plant in 1897 to supply electricity to Darjeeling. Another hydroelectric power plant was set up at Shivasamundram waterfall on the Cauvery river in Karnataka in the year 1902. At a later stage some hydroelectric power plants were erected in the Western Ghats. These were designed to meet the growing demands of Mumbai. In

1930s, a number of hydropower plants were commissioned in Himachal Pradesh, Uttar Pradesh, Tamil Nadu and Karnataka. The total generation capacity was 508 MW at the time of independence in 1947. Planned period started immediately after independence and several multipurpose projects were undertaken during the Five Year Plans. The National Hydroelectric Power Corporation (NHPC) was set up in 1975. Till now, it has completed the construction of eight hydroelectric projects with the total installed capacity of 2,193 MW) installed capacity of hydroelectricity increased from 0.6 thousand MW in 1950-51 to 40.5 thousand MW in 2013-14). This was nearly one-fourth of the total installed capacity of electricity.Hydroelectric power can play a significant role in view of the energy crisis which India is currently facing. Indian rivers drain 1,677 billion cubic meters of water to the sea every year. The Central Water and Power Commission estimated the potential of hydroelectric power at about 40 million kW at 60% load factor from these rivers. Central Electricity Authority re-estimated this potential at 84,000 MW at 60% load factor. It is equivalent to about 450 billion units of annual energy generation. Following influence the development of Hydroelectric Power (HEP) in India: (There should be perennial flow of large volume of water which depends upon the amount of rainfall.

(i) The water should fall from a sufficient height. This height may be in the form of a natural waterfall or a fall obtained by constructing a dam across the river. It may also be obtained by diverting the water from one river basin to another.

(ii) A readily available market is an essential requirement for generating HEP as electricity cannot be stored.

(iii) The generation of HEP requires huge capital investment as it is capital intensive activity.

(iv) It also requires technological advancement because production, distribution and utilization are closely related to the technological level of the concerned area.

The rivers originating from the northern mountainous region and the peninsular rivers differ markedly with respect to their suitability for hydroelectric production;some outstanding facts are explained as under:

Northern Rivers : These rivers are very useful for hydroelectric generation due to a large number of factors. Major factors are:Himalayan rivers originate from the mountainous region and have their sources in glaciers and snowfields. Therefore, they receive water both from rain in rainy season and snowmelt in hot season and have enough flow of water throughout the year. As such they are known as perennial rivers and supply water for hydroelectric production all the year round.

(v) Velocity of water flow is high because of dissected terrain and steep slope. This helps in generation of hydroelectric power,

(vi) Low competition for use of water for other purposes makes water available for HEP production. Water used in hydroelectric generation can be gainfully used for irrigation.

(vii) About three-fourth of the total potential is confined to the river basins originating from the northern mountainous region. The major rivers are the Indus, the Ganga and the Brahmaputra.

Peninsular Rivers : The peninsular rivers are comparatively poor with respect to hydroelectric power potential and production due to following reasons: The peninsular rivers are purely dependent on rainfall as a result of which flow of water in these rivers is very erratic. They have exceptionally high flow during the rainy season which is followed by a prolonged dry season of lean flow.They are thus not perennial rivers and are not much suited to hydroelectric production.

(ii) Storage of water is essential to regulate the flow.

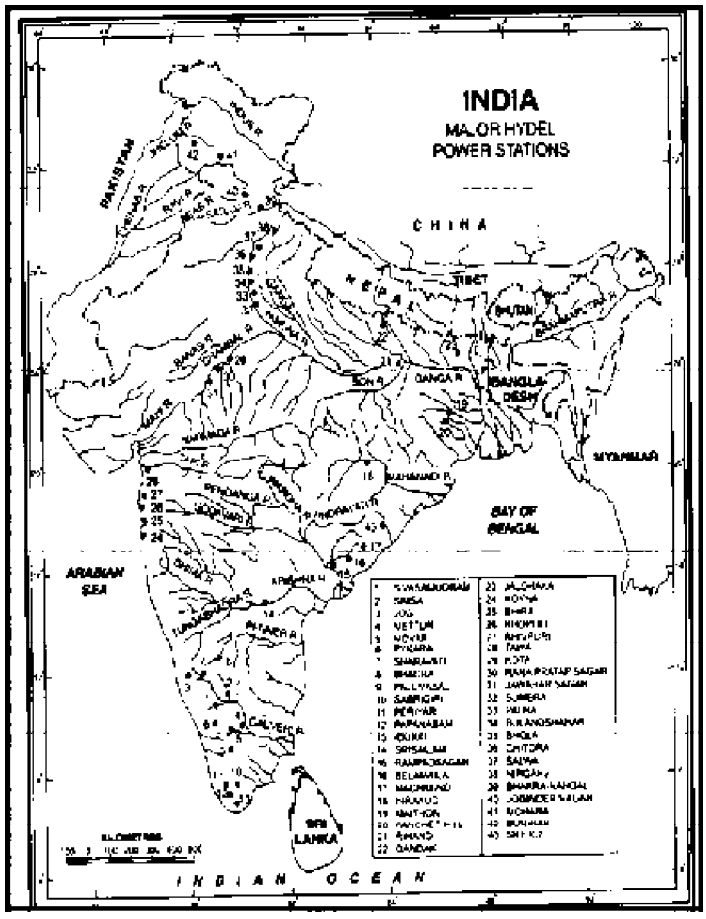
(iii) The bulk of potential is confined to hilly regions.

However there are some factors which favour the development of hydroelectric power in the peninsular India.

(iii) The topographical features in upper reaches of the major rivers are seldom favourable for development of irrigation. Consequently, development of hydroelectric sites would not clash with other priority uses of water.Nilgiri

and Anamalai hills and upper Narmada basin are major areas of concentra-tion of potential in peninsular India.Most of the areas in the southern states, especially the western part of the peninsula, are far away from the coal deposits of north-eastern part of the peninsular plateau. As such they have to depend upon the hydroelectric power to meet their energy requirements.Generation of hydroelectricity registered a gradual increase from 2.5 billion kwh in 1950-51 to 82.9 billion kwh in 1998-99, after that juncture

MAJOR HYDEL POWER STATION OF INDIA



8.6 Sample Paper Chapter 8th.

Short Answer Type Questions

Q.1 Define Coal.

Q.2 Define term Petroleum.

Q.2 Name the Hydel power station in India.

Long Answer Type Questions

Q.1 Discuss distribution and Production of Coal in India.

Q.2 Define Petroleum and discuss the production and distribution of petroleum in India.

Q.2 Discuss the potential and significance of hydel power in India.

8.7 Glossary:

1. **Coal:** Coal is an inflammable organic substance, composed mainly of hydrocarbons, found in the form of sedimentary rocks
2. **Petroleum:** The term petroleum is combination of two words pet means rock and oleum means oil. It is related with mineral oil.
3. **Peat:** This is the first stage of transformation of wood into coal it is also called low quality type of coal.
4. **Gondwana:** Southern land Mass.

8.8 Suggested Readings

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C. No. : GO-401 **Unit-III**

BA- IV Semester **Lesson-9**

INDIAN AGRICULTURE : CHARACTERISTICSAND PROBLEMS

Ms. Sarita Nagari

9.1 INTRODUCTION:

Agriculture includes raising of crops from the land, animal husbandry, agroforestry and pisciculture. India is pre-eminently an agricultural country. Agriculture has been practiced in India since time immemorial. It plays a vital role in the economy of India.Till 1971, about 80 per cent of India's population lived in rural areas and depended directly or indirectly on agriculture. It contributed about 45 per cent of Gross Domestic Production (GDP) at that time. The relative importance of agriculture has reduced considerably since then due to rapid development of other occupations such as mining, manufacturing, transport, trade and services. Today, agriculture and allied sectors contribute nearly 14.4 per cent of GDP, while about 55 per cent of the population is dependent on agriculture for their livelihood, and it still forms the hub of

India's economy. In addition to providing food and fodder to large population of human beings and livestock respectively, agriculture is the main source of raw materials for several key industries Sugarcane, cotton, jute and oil seeds are some of the outstanding agricultural raw materials used in industries.

9.2 OBJECTIVES:

Agriculture is the primary or basic occupation of man on earth surface. The present topic deals with the Indian Agriculture characteristics and problems. Indian agriculture is having their own nature and characteristics. There are various characteristics of Indian agriculture and lot of problems too.

9.3 CHARACTERISTICS OF INDIAN AGRICULTURE :

India is a unique country from agricultural point of view. Its enormous expanse of level plains, rich soils, high percentage of culturable land, wide climatic variety with adequate aggregate rainfall combined with sufficient temperature, ample sunshine and long growing season provide solid base to agriculture.A healthy and advanced agriculture creates demand for several industrial products like tractors, harvesters, threshers, chemical fertilizers, pesticides, etc. Moreover, income generated in the agricultural sector creates ready market for various manufactured goods.Thus agriculture has double relation with industry. It acts as a supplier of raw materials to the industries and as consumer of industrial products, it goes without saying that the prosperity of industrial sector largely depends upon the agricultural prosperity. In fact, prosperity of the entire nation depends upon the prosperity of agriculture.Agricultural sector also contributes a lot to the export trade of India. Bulk of India's export trade consists of agricultural products and agro-processed products. The major agricultural commodities of export are tea, coffee, cashew kernels, raw cotton, oil cakes, tobacco, spices, fruits and vegetables. There is great need to increase agricultural production so that sufficient exportable surplus commodities are available after meeting our domestic requirements.' From the above discussion, it can be concluded that agriculture furnishes the central sinew of Indian economy. A prosperous farmer means a prosperous nation.Indian agriculture has its own peculiarities. Some of the outstanding features of Indian agriculture are mentioned as follows.

1. Subsistence agriculture: Most parts of India have subsistence agriculture. The farmer owns a small piece of land, grows crops with the help of his family members and consumes almost the entire farm produce with little surplus to sell in the market. This type of agriculture has been practiced in India for the last several hundreds of years and still prevails in spite of the large scale changes in agricultural practices after Independence.

2. Pressure of population on agriculture: Thepopulation in India is increasing at a rapid pace and exerts heavy pressure on agriculture. Agriculture has to provide employment to a large section of work force and has to feed the teeming millions. While looking into the present need of food grains, we require an additional 12-15 million hectares of land to cope with the increasing demands. Moreover, there is rising trend in urbanization. As much as 31.16 per cent of the Indian population lived in urban areas in 2011 and it is estimated that over half of the total population of India would be living in urban areas by 2025 A.D. This requires more land for urban settlements which will ultimately encroach upon agricultural land. It is now estimated that about 4 lakh hectares of farm land is now being diverted to non-agricultural uses each year.

3. Importance of animals: Animal force has always played a significant role in agricultural operations such as plugging, irrigation, threshing and transporting the agricultural produces. Complete Mechanisation of Indian agriculture is still a distant goal and animals will continue to dominate the agricultural scene in India for several years to come.

4. Dependent upon monsoon: Indian agriculture is mainly dependent upon monsoon which is uncertain, unreliable and irregular. In spite of the large scale expansion of irrigation facilities sinceIndependence, less than one-third of the total cropped area is provided by perennialirrigation and the remaining two-third of the cropped area has to bear the brunt of the vagaries of the monsoons.

5. Variety of crops : India is a vast country with varied types of relief, climate and soil conditions. Therefore, there is a large variety of crops grown in India. Both the tropical and temperate crops are successfully grown in India. Very few countries in the world have a variety of crops comparable to that produced in India.

6. Predominance of food crops: Since Indian agriculture has to feed a large population, production of food crops is the first priority of the farmers almost everywhere in the country. More than two-thirds of the total cropped area is devoted to the cultivation of food crops. Area under food grains increased from 121.05 million hectare in 2000-01 to 126.77 million hectares in 2010-11 and there is not much scope for further increase in area under food grains because more than 85 per cent of the net sown area is already under food grains.

7. Insignificant place to given fodder crops: Although India has the largest population of livestock in the world, fodder crops are given a very insignificant place in our cropping pattern. Only four per cent of the reporting area is devoted to permanent pastures and other grazing lands. This is due to pressing demand of land for food crops. The result is that the domestic animals are not properly fed and their productivity is very low compared to international standards.

8. Seasonal pattern. India has three major crop seasons. :

(i) Kharif season starts with the onset of monsoons and continues till the beginning of winter. Major crops of this season are rice, maize, jowar, bajra, cotton, sesamum, groundnut and pulses such as moong, urad. etc.

(ii) Rabi season starts at (he beginning of winter and continues till the end of winter or beginning of summer. Major crops of this season are wheat, barley, jowar, gram and oil seeds such as linseed, rape and mustard.

(iii) Zaidis summer cropping season in which crops like rice, maize, groundnut, vegetables and fruits are grown. Now some varieties of pulses have been evolved which can be successfully grown in summer.

9. Mixed Cropping : Mixed cropping is one of the chief characteristics of Indian agriculture particularly in the rain-fed areas. Sometimes four to five crops are grown simultaneously in thesame field and in areas Jhuming (shifting agriculture) ten to fifteen area mixed in one field. The popular crops are millets, maize and pulses in the kharif season and wheat, gram and barley in the Rabiseason. This is done to

ensure good agricultural production keeping in view the vagaries of the monsoon rainfall anduncertain weather conditions. If the amount of rainfallis good, rice crop will give better output and if there is failure of the monsoon rains, then less water requiring crops such as maize, millets and pulses will give better yields. Mixed cropping is a characteristic of subsistent agriculture and this practice reduces the overall agricultural output and per hectare yield.

10. High percentage of reporting area under cultivation : In the year 2010-11, 141.58 million hectares was the net sown area out of total reporting area of 305.57 million hectares. Thus nearly 46 per cent of the total reporting area is under cultivation. This is a very high percentage when compared to some of the advanced countries like 16.3% in U.S.A., 14.9% in Japan, 11.8% in China, and only 4.3% in Canada.

11. Labour intensive : In large parts of India, agriculture is labour intensive as most of agricultural operations like ploughing, leveling, sowing, weeding, pruning, sprinkling, spraying, harvesting, thrashing, etc. are done by the fanners and their animals. Mechanisation of farming is prevalent in Punjab, Haryana, and western part of Uttar Pradesh and in these area too, it is the privilege of the rich farmers only. Farm mechanism in packing up in Uttrakhand, Gujarat and Maharashtra also where limited areas use farm machinery.

9.4 PROBLEMS OF INDIAN AGRICULTURE AND THEIR SOLUTIONS

Indian agriculture is plagued by several problems; some of them are natural and some others are man-made. Some of the major problems and their possible solutions have been discussed as follows.

1. Small and fragmented land-holdings: Theseemingly abundance of net sown area of 141.58 million hectares and total cropped area of 198.97 million hectares (2010-t 1) pales into insignificance when we see that it is divided into economically unviable small and scattered holdings, The average size of holdings was 2.28 hectares in 1970-71 which was reduced 1.16 hectares in 2010-11. The size of the holdings will further decrease with the infinite sub-division of the land holdings. The problem

of small and fragmented holdings is more serious in densely populated and intensively cultivated states like Kerala, West Bengal, Bihar and eastern part of Uttar Pradesh where the average size of land holdings is less than one hectare and in certain pansit is less than even 0.5 hectare. It has been estimated that over two-thirds of the landholdings are less than one hectare and only 0.7 percent are over 10.0 hectares in size.The main reason for this sad state of affairs is our inheritance laws. The land belonging to the father is equally distributed among his sons. According to new inheritance law, even daughters are entitled to share the father's property. This distribution of land does not entail a collection or consolidated one, but its nature is fragmented. Different tracts have different levels of fertility and are to be distributed accordingly. If there are four tracts which are to be distributed between two sons, both the sons will get smaller plots of each land tract. In this way the holdings become smaller and more fragmented with each passing generation.Sub-division and fragmentation of the holdings is one of the main causes of our low agricultural productivity and backward state of our agriculture. A lot of time and labour is wasted in moving seeds, manure, implements and cattle from one piece of land lo another. Irrigation becomes difficult on such small and fragmented fields. Further, a lot of fertile agricultural land is wasted in providing boundaries. Under such circumstances, the farmer cannot concentrate on improvement.The only answer to this ticklish problem is the consolidation of holdingswhich means the reallocation of holdings which are fragmented, the creation of farms which comprise only one or a few parcels in place of multitude of patches formerly in the possession of each peasant. But unfortunately, this plan has not succeeded much. Although legislation for consolidation of holdings lias been enacted by almost all the states, it has been implemented only in Punjab, Haryana and in some parts of Uttar Pradesh.

2. Seeds: Seed is a critical and basic input for attaining higher crop yields and sustained growth in agricultural production. Distribution of assured quality seed is as critical as the production of such seeds. Unfortunately, good quality seeds are out of reach of the majority of farmers, especially small and marginal farmers mainly because of exorbitant prices of better seeds. In order to solve this problem, the Government of India has taken several steps so that quality seeds are made available to farmers in

sufficient quantity at reasonable prices. But the benefit of schemes launched by the government still remains out of reach of the small and marginal farmers.

3. Manures, Fertilizers and Biocides: Indian soils have been used for growing crops over thousands of years without caring much for replenishing. This has led to depletion and exhaustion of soils resulting in their low productivity. The average yields of almost all the crops are among thelowest in the world. This is a serious problem whichcan be solved by using more manures and fertilizers. Manures and fertilizers play the same role in relation to soils as good food in relation to body. It has been estimated that about 70 per cent of growth in agricultural production can be attributed to increased fertilizer application. Thus increase in the consumption of fertilizers is barometer of agricultural prosperity. However, there are practical difficulties in providing sufficient manures and fertilizers in all parts of a country of India's dimensions inhabited by poor peasants. Cow dung provides the best manure to the soils. But its use as such is limited because much of cow dung is used as kitchen fuel in the shape of dung cakes. Reduction in the supply of fire wood and increasing demand for fuel in the rural areas due to increase in population has further complicated the problem. Chemical fertilizers are costly and lire often beyond the reach of the poor farmers. The fertilizer problem is, therefore, both acute and complex.

It has been felt that organic manures are essential for keeping the soil in good health. The country has a potential of 650 million tonnes of rural and 160 lakh tonnes of urban compost which is not fully utilized at present. The utilization of this potential will solve the twin problem of disposal of waste and providing manure to the soil.

The government has given high incentive especially in the form of heavy subsidy for using chemical fertilizers. There was practically no use of chemical fertilizers at the time of Independence. As a result of initiative by the government and due to change in the attitude of some progressive farmers, the consumption of fertilizers increased tremendously.

Pests, germs and weeds cause heavy loss to crops which amounted to about one-third of the total field produce at the time of Independence. Biocides (pesticides, herbicides and weedicides) are used to save the crops and to avoid losses. The increased use of these inputs lies saved a lot of crops, especially the food crops from

unnecessary wastage. But indiscriminate use of biocides has resulted in wide spread environmental pollution which takes its own toll.

4. I rrigation: Although India is the second largest irrigated country of the world after China, only one-third of the total cropped area is under irrigation. Irrigation is the most important agricultural input in a tropical monsoon country like India where rainfall is uncertain, unreliable and erratic. India cannot achieve sustained progress in agriculture unless and until more than half of the cropped area is brought under assured irrigation. This is testified by the success story of agricultural progress in Punjab, Haryana andwestern part of Uttar Pradesh where over half of the cropped area is under irrigation. Large tracts still await irrigation to boost the agricultural output. However, care must be taken to safeguard against ill effects of over irrigation especially in areas irrigated by canals. Large tracts in Punjab and Haryana have been rendered useless (areas affected by salinity, alkalinity and waterlogging), due to faulty irrigation. In the Indira Gandhi Canal command area also intensive irrigation has led to sharp rise in sub- soil water level, leading to waterlogging, soil salinity and alkalinity.

5. Lack of mechanization: In spite of the large scale mechanizationof agriculture in some parts of the country, most of the agricultural operations in larger parts are carried on by human hand using simple and conventional tools and implements like wooden plough, sickle, etc. Little or no use of machines is made in plugging, sowing, irrigating, thinning and pruning, weeding, harvesting, threshing and transporting the crops. This is specially the case with small and marginal farmers. It results in huge wastage of human labour and in low yields per capita labour force.

There is urgent need to mechanize the agricultural operations so that wastage of labour force is avoided and farming is made convenient and efficient. Agricultural implements and machinery are a crucial input for efficient and timely agricultural operations, facilitating multiple cropping and thereby increasing production.

Some progress has been made for mechanizing agriculture in India after Independence. Need for Mechanisation was specially felt with the advent of Green Revolution in 1960s. Strategies and programmes have been directed towards replacement of traditional and inefficient implements by improved ones, enabling the farmer to own tractors, power tillers, harvesters and other machines. A large industrial

base for manufacturing of the agricultural machines has also been developed. Power availability for carrying out various agricultural operations has been increased. This increase was the result of increasing use of tractors, power tillers and combine harvesters, irrigation pumps and other power operated machines. Strenuous efforts are being made to encourage the farmers to adopt technically advanced agricultural equipment's in order to carry farm operations timely and precisely, and to economies the agricultural production process.

6. Agricultural Marketing : Agricultural marketing still continues to be in a bad shape in rural India. In the absence of sound marketing facilities, the farmers have to depend upon local traders and middlemen for the disposal of their farm produce which is sold at throw-away price. In most cases, these farmers are forced, under socio-economic conditions, to carry on distress sale of their produce. In most of small villages, the farmers sell their produce to the money lender from whom they usually borrow money. According to an estimate 85 per cent of wheat and 75 per cent of oil seeds in Uttar Pradesh, 90 per cent itself. Such a situation arises due to the inability of the poor farmers to wait for long after harvesting their crops. In order to meet his commitments and pay his debt, the poor farmer is forced to sell the produce at whatever price is offered to him. The Rural Credit Survey Report rightly remarked that the producers in general sell their produce at an unfavorable place and at an unfavorable time and usually they get unfavorable terms. In the absence of an organized marketing structure, private traders and middlemen dominate the marketing and trading of agricultural produce. The remuneration of the services provided by the middlemen increases the load on the consumer, although the producer does not derive similar benefit. Many market surveys have revealed that middlemen take away about 48 per cent of the price of rice, 52 per cent of the price of groundnuts and 60 per cent of the price of potatoes offered by consumers.

In order to save the farmer from the clutches of the money lenders and the middle men, the government has come out with regulated markets. These markets generally introduce a system of competitive buying, help in eradicating malpractices, ensure the use of standardized weights and measures and evolve suitable machinery

for settlement of disputes thereby ensuring that the producers are not subjected to exploitation and receive remunerative prices.

7. Inadequate storage facilities: Storage facilities in the rural areas are either totally absent or grossly inadequate. Under such conditions the farmers are compelled to sell their produce immediately after the harvest at the prevailing market prices which are bound to be low. Such distress sale deprives the farmers of their legitimate income.

The Parse Committee estimated the post-harvest losses at 9.3 per cent of which nearly 6.6 per cent occurred due to poor storage conditions alone. Scientific storage is, therefore, very essential to avoid losses and to benefit the farmers and the consumers alike. At present there are number of agencies engaged in warehousing and storage activities i.e.Food Corporation of India(F.C.I.), the Central Warehousing Corporation(C.W.C.) and State Warehousing Corporationare among the principal agencies engaged in this task. These agencies help in building up buffer stock, which can be used in the hour of need. The Central Government is also implementing the scheme for establishment of national GridofRuralGodownssince 1979-80. This scheme provides storage facilities to the farmers near their fields and in particular to the small and marginal farmers. The Working Group on additional storage facilities in rural areas has recommended a scheme of establishing a network of RuralStorageCentresto serve the economic interests of the farming community.

8. Inadequate transport: One of the main handicaps with Indian agriculture is the lack of cheap and efficient means of transportation. Even at present there are lakhs of villages which are not well connected with main roads or with market centres. Most roads in the rural areas are Kutcha(bullock-cart roads) and become useless in the rainy season. Under these circumstances the farmers cannot carry their produce to the main market and are forced to sell it in the local market at low price. Linking each village by metalled road is a gigantic task and it needs huge sums of money to complete this task.

9. Scarcity of capital: Agriculture is an important industry and like all other industries it also requires capital. The role of capital input is becoming more and more

important with the advancement of farm technology. Sincetheagriculturists'capitalis lockedupinhislandsandstocks,he is obliged to borrow money for stimulating the tempo of agricultural production. The main suppliers of money to the farmer are the money-lenders, traders and commission agents who charge high rate of interest and purchase the agricultural produce at very low price. AllIndiaRuralCreditSurveyCommitteeshowed that in 1950-51 the share of money lenders stood at as high as 68.6 per cent of the total rural credit and in 1975-76 their share declined to 43 per cent of the credit needs of the farmers. This shows that the money lender is losing ground but is still the single largest contributor of agricultural credit. Rural credit scenario has undergone a significant change and institutional agencies such as Central CooperativeBunks,StaleCooperativeBanks, CommercialBanks,CooperativeCreditAgencies and someGovernmentAgenciesare extending loans to farmers on easy terms.

10. Tradition Bound: In spite of some breakthroughs, Indian agriculture remains tradition bound even at the dawn of 21st century. Established centuries ago, the structures of a self-contained rural economy, founded in caste-drain occupational land tenure, made complex by absentee and parasitic landlords still continues. The tradition bound institutions have been the greatest hindrance in the way of modernisation and Indian agriculture has been rather slow in responding to new innovative ideas.

11. Primitive Technology: A large proportion of Indian farmers use primitive technology which hinders the requisite progress in agricultural production. They are hand tools like sickle, hoe, etc. and drought animals like bullocks, male buffaloes, camels, etc. as source of motive power in agricultural operations. Although agricultural machinery is replacing the animal and human power, yet the pace of progress is very slow and use of agricultural machinery is the privilege of a few rich farmers in selected states like Punjab, Haryana and Uttar Pradesh only.

12. Dependent on Monsoon Rainfall: In large parts of India irrigation facilities are either totally absent or are partially available and agriculture depends on monsoon rainfall. Unfortunately Indian monsoon rainfall is highly erratic and least dependable. It varies in time and space and variability of rainfall is the highest in areas of least rainfall. Whenever rain fails or there is deficiency of rainfall, the agricultural production

drops to a miserably low level. There is overall scarcity of agricultural products in the market and the prices of agricultural products reach sky high. In extreme cases famine conditions prevail and humans and livestock die of hunger and starvation,

13. Lack of Crop Diversification: Crop diversification means growing a large number of crops and reducing dependency on a single crop. Unfortunately in India more emphasis is laid on food crops and other crops are given a secondary status. Although top priority to food crops is necessary in the back drop of fast growing population, neglecting other crops is detrimental to balanced growth of agriculture. Only 3.3 per cent of the reported area is under fodder crops which is very insignificant in view of the fact that India has the largest number of livestock in the world. Further, nitrogen fixing leguminous crops are ignored which leads to imbalance in the composition of soil and reduction in the soil fertility.

14. Low Productivity: In spite of the rapid strides made by India in agricultural field, particularly after the advent of the Green Revolution in 1960s, agricultural productivity in India still remains at a low level. Yield per hectare of almost all the crops is much lower as compared to international standards. This is due to low fertility of soil and little care to replenish is through fertilizers, green manure, fallowing, crop rotation etc. Other inputs like machinery, irrigation, better seeds etc. are also limited to a few selected areas and to a few rich farmers.

15. Government Apathy: Indian agriculture has been the victim of negligence and step motherly treatment by the government. Although agriculture got highest priority in the First Five Year Plan in view of the acute shortage of food grains immediately after partition of the country in 1947, agriculture has not been given its due important and more emphasis was laid on industrial growth in the subsequent plans. Farmers do not get remunerative price of their products and most of them permanently remain under debt. Even in some of the so-called rich areas from agriculture point of view like Punjab and Maharashtra, a large number of farmers have committed suicide out of distress and depression. However, the government has become slightly more sensitive to the problems of the farmers and some recognition has been given to agriculture in Tenth and Eleventh Five Year Plans.

16. Lack of Definite Agricultural Land use Policy: There is no definite policy concerning agriculture and land use at the national or regional level and the farmers grow one or the other crop at their own sweet will. It often leads to excess or scarcity of particular crops. In the event of excess crop the farmers are forced to sell their produce at throw away prices. On the contrary consumers are the main suffers when there is shortage of a particular crop.

17. Low fertility of soils: Indian soils have been used for cultivation for the last hundreds of years without much care to restore their fertility. Most of the Indian soils are exhausted and are not capable of giving high yields. They lack in various chemicals and humus which are necessary for high rate of productivity in the agricultural field.

18. Soil Erosion and Soil Degradation: Wrong agricultural practices coupled with reckless felling of trees has led to large scale soil erosion and soil degradation both by water and by wind. Rain water washes away huge amounts of fertile top soil in areas of heavy rainfall during the rainy season of jute in West Bengal, 70 per cent of oilseeds and 35 per cent of cotton in Punjab is sold by farmers in the village

19. Low Status of Agriculture in Society: In large parts of India agriculture is not given its due place of honour and is considered to be a profession of low status. This leads to disappointment and lack of enthusiasm amongst farmers. Younger generation belonging to families of farmers is no more interested in agricultural profession and tends to opt for petty jobs in government offices. Besides, rich farmers invest their agricultural profits in more Ulcerative non-agricultural sectors. Rural youth migrate to urban areas in search of non-agricultural or white colored jobs and many of them end up in slums, ghettoes and shanty colonies.

20. Land Tenancy: In many parts of India the actual tillers are not the owners of land and they are forced to till the land of absentee landlords. There are big landlords who own vast stretches of land but do not till the land themselves. The poor landless tanent cultivators do not take much interest in the development of agriculture as a result of which the yields of almost all the crops are at a miserably low level.

21. Lack of Agricultural Research, Education, Training and Extension Services: Although a number of research institutions were established immediately

after Independence and much advancement in agricultural research have been made since then, yet agricultural research hardly matches international standards, Further there is lack of coordination between research laboratories and farms and there is a big vacuum between the two. Farmers, especially small and marginal farmers are deprived of the benefit of the new findings of research laboratories. In a similar way hardly any attention is paid to educate the farmers about the new techniques of agriculture for increasing the farm production.

9.5 Sample Paper Chapter :

Short Answer Type Questions

Q. 1 Define term Agriculture.

Q.2 Name the five major problems of Indian agriculture.

long Answer Type Questions

Q.1 Discuss in detail, the characteristics of Indian agriculture

Q.2 What are the major problems of Indian Agriculture?

Q.3 What are the characteristics and problems of Indian Agriculture?

9.6 Glossary:

1. **Agriculture:** The term agriculture is combination of two words ager means field and Culture means cultivate.
2. **HYV:** High Yielding Verities
3. **Insecticide and Pesticide:** Fertilizers.
4. **Self-Sufficient:** Self-supporting.
5. **Mechanization:** Use of Modern technology.

9.7 Suggested Reading :

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C. No. : GO-401 **Unit-III**

BA- IV Semester **Lesson-10**

GREEN REVOLUTION IN INDIA : FEATUREAND ADVANTAGES

Khalid Hussain

10.1 INTRODUCTION:

Green Revolution owes its origin in the finding of new dwarf variety of wheat seed by Dr. Norman Earnest Borlaug. He was incharge of Wheat Development Programme in Mexico in the 1950s and was the genetic architect of the dwarf wheat. Dr. Hassar efforts at breeding a suitable dwarf variety were crowned with success by 1951 in Mexico and that country became self-sufficient in food by 1956. Later

on, the Japanese wheat variety NORIN-I0 was crossed with the Mexican improved varieties and the first breakthrough came in 1961. Green Revolution in rice was triggered off by intense upsurge in rice research resulting from the establishment of

International Rice Research Institute (IRRI) at Manila. Some work on rice had been done in Taiwan also. Although seeds of the Green Revolution were sown in early 1950s in Mexico, the term Green Revolution was first used by the then Administrator of the *U.S.* AID, William S. Gadd on March, 1968 in Washington D.C, when he addressed the Society for International Development on the subject Green Revolution.

10.2 OBJECTIVES:

Agriculture is the man primary or basic occupation. The present topic deals with the influence of Green Revolution in Indian Agriculture. Green revolution has great importance in Indian agriculture to drastic change in agriculture sector for surplus food grains production.

10.3 GREEN REVOLUTION IN INDIA:

In India, the seeds of Green Revolution were first field tested in the drought year of 1964-65. They were introduced to the Indian scientists by Dr. Borlaug in 1963. He had predicted in 1961 that India could double her wheat production in one decade. India received 100 kg seeds each of four dwarf and semi-dwarf varieties. These seeds were planted in different soils in Delhi, Ludhiana, Pusa and Kanpur. The yield was over 4,000 kg per hectare which was about four times the yield of local varieties. These varieties were released for general cultivation after experimentation, multiplication and demonstrations by Indian scientists in about 100 different farmers' fields. In 1966, about 16,000 tonnes of seeds were imported for cultivating about 4 lakh hectares of land. High Yielding Varieties Programme (HYVP) was introduced in the kharif season of 1966. The production of food grains in 1967-68 was 25 per cent higher than that of 1966-67. This increase was more than the increase recorded in the preceding 16 years of plan period. This unprecedented increase in production was nothing less than a revolution and it was termed as *Green Revolution.* In the words of Dr. Hassar, The Green Revolution is the phrase generally used to describe

the spectacular increase that took place during 1968 and is continuing in the production of foodgrains in India. Unfortunately, Green Revolution left its impact only in Punjab, Haryana and Western U.P. in respect of wheat production and Andhra Pradesh and Tamil Nadu in respect of rice production. There seems to be no valid reason, why other stales cannot follow suit and get the benefit of Green Revolution.

10.4 COMPONENTS OF THE GREEN REVOLUTION :

Following are the 12 components of the Green Revolution:

1. High Yielding Varieties (HYV) of seeds.
2. Irrigation *(*surface and ground).
3. Use of fertilizers (chemical).
4. Use of insecticides and pesticides.
5. Command Area Development (CAD).
6. Consolidation of holdings.
7. Land reforms.
8. Supply of agricultural credit.
9. Rural electrification.
10. Rural roads and marketing.
11. Farm mechanization.
12. Agricultural universities.

Each components of Green Revolution has their own nature and Characteristics. In India green revolution lefts its impact on some selected crops as well as in some selected region. Each component discuss separately below.

1. High Yielding Varieties (HYV) of seeds: The high yielding variety seeds are major input of agricultureproduction under the Green Revolution technology. Their main characteristic is increased responsiveness to chemical fertilizers, their period of maturing is short, it helps double cropping; their short stems can easily carry fertilizer load, resist wind damage, their large leaf surface helps the process of photosynthesis.

M.S. Swaminathan has remarked that apart from erasing the 'begging bowl' image of our country, the most important gain has been the saving of forests and land, thanks to the productivity improvement associated with high yielding varieties. The development of HYV seeds of wheat in 1960s and those of rice in 1969-70 laid the foundation for Revolution in India. Bandhu Das Sen has rightly remarked that they play the role of modernises of agriculture like engines of change, capableof transforming a traditional farmer into a commercial producer. They act as part of steam engine (for industrial revolution) to ignite an agrarian revolution in poor countries. Thus the HYV programme brought about a major changea transformation affecting almost every aspect of Indian agriculture. In words of Dantwala, "widespread adoption of HYVs has helped to step up cereal production, stimulated investment and substantially increased the use of modern inputs".

2. Irrigation: Irrigation is the second most important component of Green Revolution technology after HYV seeds. Assured and regular supply of sufficient water to crops not only adds to production, it also assures stability in production. Indian rainfall being unreliable, irregular and seasonal, there is urgent need to expand irrigation potential to meet the requirements of the Green Revolution strategy. Irrigation is a pre-condition for successful introduction of HYV seeds even in areas of heavy rainfall.The success in use of HYV seeds lies in availability of water at the right time and in the right quantity for which B.B. Vohra had laid more emphasis on ground water rather than on surface water. The ground water gives the advantage of *push-button* irrigation, made possible by a pumpset or a tube well and is completely under farmer's own control.

3. Use of Fertilizers (Chemical): The use ofchemical fertilizers has been the third most important input of Green Revolution after HYV seeds and irrigation, *rather the three are tied together.* In fact use of HYV seeds needs heavy dose of irrigation and fertilizers to give high yields. Since the entire cultivable land has already been brought under plough and there is practically no scope for bringing any new areas under cultivation, further increase in food grains production can be achieved only by multiple-cropping which heavily leans on the *trio* of the basic inputs, *viz.* HYV seeds, irrigation and chemical fertilizers.

4. Use of Insecticides and Pesticides: Though intensive use of irrigation and fertilizers under the Green Revolution technology has increased the farm production, it has also given birth to the problem of pests, insects, weeds, rodents, etc. The monoculture promoted by the Green Revolution technology is more vulnerable to the insects and pests. These pests, weeds and diseases are to be checked by proper doses of insecticides, pesticides and weedicides. The regional distribution makes it clear that areas with Green Revolution technology are the main consumers of pesticides. For example, Punjab, Haryana, Andhra Pradesh and Tamil Nadu consumed over 60 per cent of the country's pesticides in 2013-14.

5. Command Area Development (CAD) : Command Area Development Programme is a centrally sponsored scheme which was launched in January 1975. Its aim was to bridge the gap between potential created and utilized in selected major/ medium irrigation projects of the country for optimizing agricultural production from the irrigated land.

The programme covers the following components.

(i) *On-farm development (OFD)* works which include soil surveys, land shaping, construction of field channels, field drains, farm roads, re-alignment of field boundaries (where possible consolidation of holdings should also be combined), introduction of *warabandi* to ensure equitable and assured supply of water to each and every farm holding, supply of all inputs and services including credit and strengthening of extension services.

(ii) Selection and introduction of suitable cropping pattern.

(iii) Development of groundwater to supplement surface water.

(iv) Development and maintenance of the main and intermediate drainage system.

(v) Modernisation, maintenance and efficient operation of the irrigation system upon the outlet of one cusec capacity.

Initially, 60 major and medium irrigation projects were taken up under CAD programme, covering a Culturable Command Area (CCA) of about 15 million hectares.

6. Consolidation of Holdings: Small and fragmented land holdings have been one of the main obstacles in the progress of agriculture in India. Consolidation of holdings has been introduced to solve this problem. Today we can find that the landholding in India is decreasing day by day. Green Revolution needs land consolidated which leads the foods grains production but increasing trend of population India landholding also decrease.

7. Land Reforms: Immediately after Independence, it was felt that land reforms must be brought in to improve the agricultural situation in the country. Absentee landlordism, tenancy-at-will and share cropping could not help in inculcating interest among the farmers to make investments in farm inputs and adopt new farm technology. In 1947 half of India was under *Zamindari System* in which 80 per cent of the land was in the hands of the absentee landlords. The *Zamindar* used to exploit the farmers who used to till the land. Soon after Independence, the slogan of *land to the tiller* was raised and steps were taken for the abolition of the Zamindari. Consequently, tenants became owners of land. They started taking interest and pains to increase the farm production. *Raitwari* system prevailed in Madras, Bombay, Assam and Punjab. Under this system the peasant was the owner of land and paid rent directly to the Government.

These systems were to be abolished in the interest of better agricultural performance. Another measure taken by the government was the enforcement of land ceiling act. Under this act a farmer cannot own more land than the ceiling limits. This resulted in the re-distribution of surplus land which proved beneficial to lakhs of landless farmers. After obtaining the ownership rights, farmers worked whole-heartedly on their farms and this led to a tremendous increase in agricultural production.

8. Supply of Agricultural Credit: In the words of R.N. Chopra "Credit is the most crucial input in all agricultural developmental programmes. The other inputs *viz.*, technology, HYV seeds, fertilizers, pesticides, irrigation water and machinery all depend on the availability of credit". A large percentage of Indian farming community consists of small and marginal farmers who do not have their own resources to invest in agriculture. They depend upon agricultural credit to carry on most of their agricultural operations. Earlier they used to get loan from the moneylender who used to charge

very high rate of interest. Now Cooperatives, Commercial Banks and Regional Rural Banks extend loans to farmers on easy terms.

9. Rural Electrification: Rural electrification is one of the essential inputs in modern agricultural system. Electricity makes a significant contribution to development of agriculture. It is a cheap source of energy which can be used for lifting water by tube wells/pump sets, processing and preserving agricultural produce, sprinkler irrigation and so many water, so vitalfor Green Revolution, requires uninterrupted supply of electricity at cheaper rates. At the time of Independence only 1,300 villages had been electrified and only 6,400 energised pump sets were working in the entire country. Currently more than 95 per cent of the villages are electrified.

Haryana was the first state to electrify all its 6,759 villages in 1970. Punjab, Kerala, Andhra Pradesh, Karnataka, Gujarat, Himachal Pradesh, Tamil Nadu, J&K Maharashtra and Nagaland have 97 to 100 per cent villages electrified.

10. Rural Roads and Marketing: Rural roads are very essential for connecting the villages to the neighboring markets and villages. Unfortunately, there is stilt a big gap between the requirement and availability of village roads. Road network upto town level is fairly satisfactory. The weakest point is that of rural roads. Marketing is essential for progressive agriculture. Regulated markets enable the farmer to sell his agricultural produce and to purchase farm implements and tools, fertilizers, pesticides and other agricultural inputs as well as goods of everyday use. The farmer can go to the market with his produce, sell it and on his return journey he can bring the goods required for agriculture or in everyday life.

11. Farm Mechanisation: Much success of the Green Revolution depends upon farm mechanisation. Mechanisation saves a lot of human labour and quickens the farm operations, thereby adding to the farm efficiency and productivity. Mechanisation played a significance role for Green Revolution development in India without Mechanisation green revolution is not successful in any part of the world.

12. Agricultural Universities: Agricultural universities and other agricultural institutes are primarily engaged in agricultural research and passing on the research findings to the farmers. A good deal of research and extension work done by these

universities has paid rich dividends in the agricultural field. Success of Green Revolution largely depends upon the work done by these universities. Punjab, Haryana and Uttar Pradesh, are the best examples of such a progress.

10.5 IMPACT OR ADVANTAGES OF GREEN REVOLUTION:

Like other developing countries, Green Revolution has influenced the economy and way of life in India to a great extent as is evident from the following points:

(1) Increase in Agricultural Production: Theintroduction of Green Revolution in 1967-68 has resulted in phenomenal increase in the production of agricultural crops especially in food grains. From 1967 onwards, the *Green Revolution* aimed at bringing about a *Grain Revolution.* Among the food grains too, it is the wheat crop which drew maximum benefit from Green Revolution. The production of wheat increased 23.S million tonne in 1970-71 to 95.8 million tonnes in 2013-14 thereby recording over four time increase, while the overall increase in the production of food grains was about 2.5 times in the corresponding period.

(2) Diffusion of Rice and Wheat Cultivation to non-traditional areas: Since the success of the Green Revolution depends on the basic inputs like better seeds, fertilizers and irrigation, it has led to diffusion of crops, particularly two major food-crops viz. rice and wheat, to the areas hitherto unknown for their cultivation. For instance, West Bengal and Bihar had been traditional producers of rice and had the distinction of being called as 'rice heartland'. But the virtues of the Green Revolution have helped in spreading rice cultivation to semi-arid areas of Punjab, Haryana and western part of Uttar Pradesh, thereby changing the cropping pattern of these areas. This feat has been achieved primarily due to increase in irrigation facilities supplemented by availability of better seeds and fertilizers.The area production and yield of rice were 35.47 million hectares, 30.59 million tonnes and 862 kg/ha in 1965-66 and the corresponding figures increases to 43.9 million hectares, 106.3 million tonnes and 2419 kg/ha in 2013-14.Similarly wheat cultivation has spread to vast areas in eastern Uttar Pradesh, Madhya Pradesh, Rajasthan, and some parts of Maharashtra, Gujarat and West Bengal.Although diffusion of wheat cultivation started from its heartland right with the beginning of the Green Revolution in the mid-1960s, yet the major part of diffusion in Uttar Pradesh, Madhya Pradesh, Rajasthan, Gujarat, Bihar and West Bengal was observed in 1970s.

(3) Prosperity of Farmers: With the increase in reduction in import of food grains.The main farm production the earnings of the farmers also benefit of Green Revolution was the increase in the increased and they became prosperous. This has, especially, been the case with big farmers having more than 10 hectares of land.

(4) Reduction in Import of food grains: The main benefit of green revolution was the increase in production of food grains as a result of which there was a drastic reduction in their imports. We are now self-sufficient in foods grains and we have sufficient stock in the central pool.

(5) Capitalistic Farming: Big farmers having more than 10 hectares of land have tended to get the maximum benefit from Green Revolution technology by investing large amount of money in various inputs like HYV seeds, fertilizers, machines, etc. This has encouraged capitalistic farming.

(6) Plugging back of profit: The introduction of Green Revolution helped the fanners in raising their level of income. Wiser farmers ploughed back their surplus income for improving agricultural producti-vity. This led to further improvement in agriculture. According to a study conducted by Punjab Agriculture University, Ludhiana farmers plough back about 55 per cent of their income for agricultural progress.

(7) Industrial Growths: Green Revolution brought about large scale farm Mechanisation which created demand for different types of machines like tractors, harvesters, threshers, combines, diesel engines, electric motors, pumping sets, etc. Besides, demand for chemical fertilizers, pesticides, insecticides, weedicides, etc. also increased considerably. Consequently, industries producing these items progressed by leaps and bounds. Moreover, several agricultural products are used as raw materials in various industries. These industries are known as *agro based industries.* Textile, sugar, vanaspati, etc. are some outstanding examples of agro based industries.

(8) Rural Employments: While on one hand, large scale unemployment was feared due to mechanization of farming with the introduction of Green Revolution technology in India, there was an appreciable increase in the demand for labour force due to multiple cropping and use of fertilizers. According to Gobind Thukral, Green Revolution has generated lakhs of new jobs in Punjab. Almost 15 lakh poor people

from the impoverished regions of Bihar, eastern Uttar Pradesh and Odisha work here. They not only earn their bread and butter, but take back home new ideas and technology. During the early years of the Green Revolution, a large number of farm labourers had migrated from Bihar and eastern Uttar Pradesh to Punjab where they found better opportunities of earning a livelihood. However, reverse trend has been observed during 2010s as a large number of labourers from these areas are going back to their home state because they are now finding employment opportunities there caused by overall development including impact of Green Revolution.

(9) Change in the Attitude of Farmers: TheIndian farmer had remained illiterate, backward and traditional and bad been using conventional methods of cultivation since the earliest times. But Green Revolution has brought about a basic change in his attitude towards farming. The way he has readily adopted the Green Revolution technology has exploded the myth that the Indian farmer is basically tradition bound and does not use new methods and techniques. The desire for better farming methods and a better standard of living is growing not only among the relatively small number of affluent farmers using the new technology, but also among countless farmers still from outside looking in.

10.6 DEMERITS OR PROBLEM OF GREEN REVOLUTION:

Green Revolution is a unique event in the agricultural history of Independent India. This has saved us from the disasters of hunger and starvation and made our peasants more confident than ever before. But it has its own inherent deficiency segments. Ever since its inception, the income gap between large, marginal and small farmers has increased, gap between irrigated and rain fed areas has widened and some crops have benefited more than the others, sometimes even at the cost of other crops. It is neither product-neutral nor region-neutral and leaves uneven effects of growth on products, regions and classes of people.Some of the demerits or problems of Green Revolution are briefly discussed as under.

(1) Inter-Crop Imbalances: The effect of Green Revolution is primarily felt on foodgrains. Although all foodgrains including wheat, rice, jowar, bajra and maize have gained from the Green Revolution, it is wheat which has benefited the most. It has wrested areas from coarse cereals, pulses and oilseeds. The HYV seeds in latter

crops have either not been developed so far at all, or they are not good enough for farmers to risk their adoption. The result is that an excess of production in two main foodgrains (wheat and rice) and shortages in most others today prevail side by side. Major commercial crops like cotton, jute, tea and sugarcane are also almost untouched by the Green Revolution. This is not good for a balanced growth of Indian agriculture. Central Government has taken some steps to remove these imbalances.

(2) Regional Disparities: Green Revolution technology has given birth to growing disparities in economic development at inter and intra-regional levels. It has so far benefited only 40 per cent of the total cropped area and 60 per cent is still untouched by it. The most affected areas are Punjab, Haryana and western Uttar Pradesh in the north and Andhra Pradesh and Tamil Nadu in the south. The major benefit in these two regions has been with respect to increase in wheat and rice cultivation respectively. It has hardly touched the Eastern region, including Assam, Bihar, West Bengal and Odisha and arid and semi-arid areas of Western and Southern India. In short, it failed to take care of areas like rain fed, hilly, coastal, dry and arid zones of the country which could be developed for production of exportable items like fruits, honey, mushroom, milk, meat, etc. In short, Green Revolution affected only those areas which were already better placed from agricultural point of view. Thus the problem of regional disparities has further aggravated as a result of Green Revolution. Regional disparities in crop yields can be reduced by evolving suitable disease resistant high-yield strains of paddy for most eastern parts and by developing irrigation facilities and a suitable dry farming technology for the arid and semi-arid western and southern regions.

(3) Increase in Inter-Personal Inequalities: Ithas been observed that it is the big farmer having 10 hectares or more land, which is benefited the most from Green Revolution because he has the financial resources to purchase farm implements, better seeds, fertilizers and can arrange for regular supply of irrigation water to the crops. As against this, the small and marginal farmers do not have the financial resources to purchase these farm inputs and are deprived of the benefits' of Green Revolution Technology. There were about 1,37,757 thousand holdings in India in 2010-11 out

of which only 0.7 per cent exceeded 10 hectares in size. Francine R. Rankel has concluded from his study of Ludhiana (Punjab), West Godavari (Andhra Pradesh), Thanjavur (Tamil Nadu), Palghat (Kerala) and Bardhaman (West Bengal) that the greater beneficiaries are those farmers who own 10 to 12 hectares of land. Similar conclusion was drawn by G.R. Saini from his study of Ferozepur (Punjab) and Muzaffarnagar (U.P.). G.S. Bhalla and G.K. Chadha have found out that Green Revolution has benefited the farmers in general but one-third of them are small farmers with 2.5 acres (about one hectare) of land and are living below poverty line. Another 24.0 per cent of the farmers own 2.5 to 5.0 acres (1-2 hectares) of land and they are also living below poverty line.

(4) Unemployment: Except in Punjab to some extent in Haryana, farmer mechanization under Green Revolution has created widespread unemployment among agricultural labourers in the rural areas. The worst hits are the poor and the landless people.

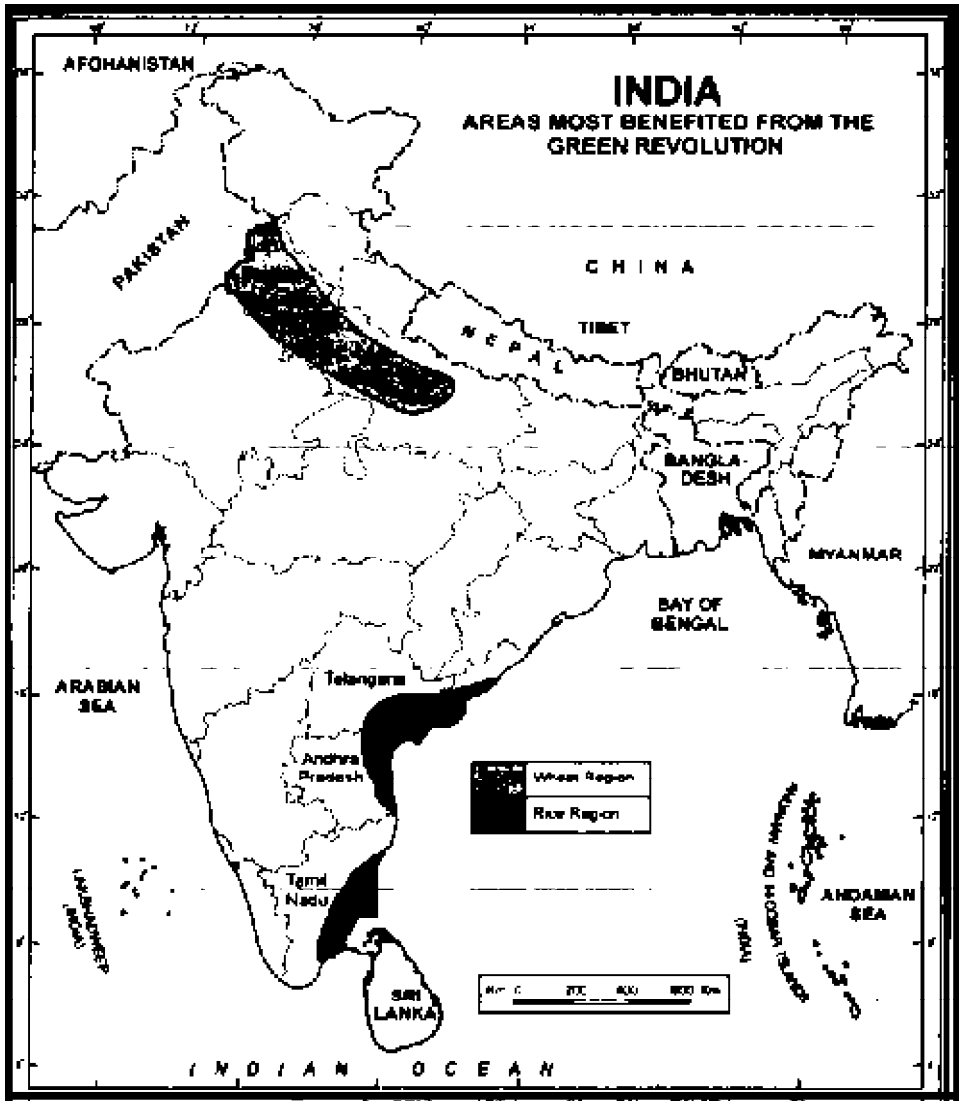
Other Problems: Agriculture under Green Revolution has not grown at a rate which was expected in the beginning. The differential rates of growth of different crops and their regional variations have already been discussed. Some scholars have expressed serious doubts about the capability of HYV seeds itself. In actuality, these seeds are highly responsive to certain key inputs such as fertilizer and irrigation and as such they should have been called highly *responsive* varieties. According to Shiva, "the inevitability of the Green Revolution option was built on neglecting the other avenues for increasing production that is more ecological such as improving mixed cropping systems, improving indigenous seeds and improving the efficiency of use of local resources." Vandana Shiva further comments that "having destroyed nature's mechanisms for controlling pests through the destruction of diversity, the 'miracle seeds' of the Green Revolution became mechanisms for breeding new pests and creating new diseases". In a case study of Punjab, M.K. Sekhon and Manjeet Kaur of P.A.U. Ludhiana have warned against the excessive use of groundwater, chemical fertilizers and pesticides. This will lead to large scale depletion of groundwater and will adversely affect the health of soil.

10.7 SECOND GREEN REVOLUTION

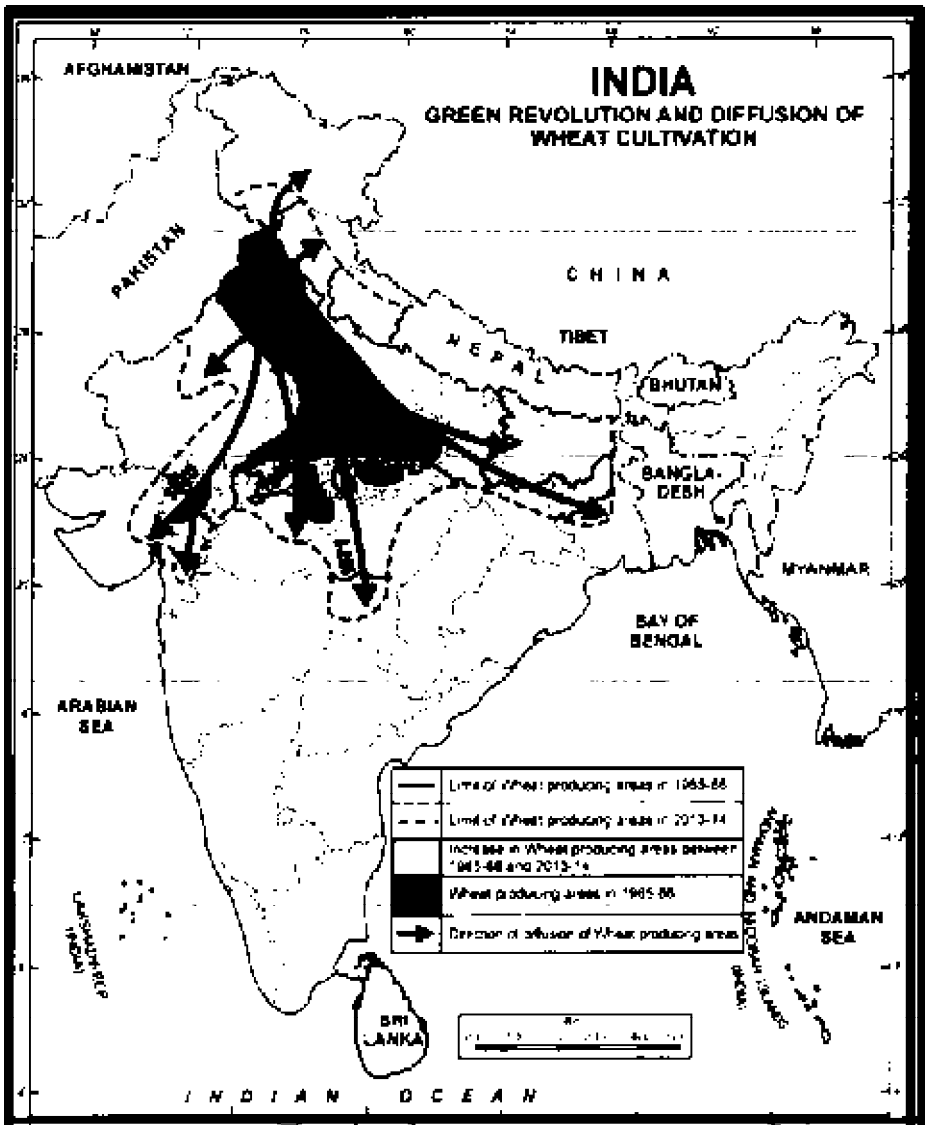
As mentioned earlier, the fatigue of the First Green Revolution has become conspicuous and the production as well yields of almost all the crops has reached the plateau stage. Declining productivity of a number of crops due to unsustainable agricultural practices over the years and a galloping rate of population growth have put a severe strain on the food supply situation in the country. The food safety net for our rapidlygrowing population requires enhanced production and productivity in the form of a Second Green Revolution. In fact, a Second Green Revolution has become imperative keeping in view the tardy growth of food grains in proportion to the population growth. Further, special attention is required for achieving higher production and productivity levels in pulses, oilseeds, fruits and vegetables which remained untouched in the First Green Revolution but are essential for our nutritional security. In this regard, achieving high production of poultry, meat and fisheries is also essential. The First Green Revolution also ignored certain areas like rainfed, hilly, coastal and arid zones which could be developed for producing fruits, milk and meat. Thus, a number of shortcomings have been noticed in the First Green Revolution and it is right time to strive for the Second Green Revolution. Even Norman Borlaug, the chief architect of the First Green Revolution noted upon receiving the 1970 Nobel Peace Prize, that the Green Revolution represented only a "temporary success." The Second Green Revolution differs from the First Green Revolution because in the First Green Revolution the main emphasis was on increasing the production of food grains, often without much caring about environment and ecology. The Second Green Revolution on the other hand, refers to practising sustained agriculture. In order for development to be sustainable it must meet the needs of the present without compromising the ability of future generations to meet their own needs." (Brundtland Commission on Environment and Development, 1987). Thus sustainable agriculture involves protecting natural resources from becoming increasingly degraded and polluted, and using production technologies that conserve and enhance the natural resource base of crops, forests, in land and marine fisheries. As of now, the outlook for a Second Green Revolution seems uncertain because most of the increase in food supplies has to come from currently cultivated land as all the land fit for cultivation has already been

brought under plough using the current level of technology. Therefore raising the level of productivity will require new technologies and better farming practices. Besides green technologies will have to be specially focussed on dry land agriculture and to benefit small and marginal farmers. Improving soil health by taking care of physical, chemical and biological characteristics of soil is equally important. Also of vital concern are water harvesting, water conservation and sustainable and equitable use of water. Besides, there is need to pay more attention to issues such as access to affordable credit and to life and crop insurances reform. Equally important are development and dissemination of appropriate technologies and improved opportunities, infrastructure and regulations for marketing of agricultural products. Thus India is at a juncture where further reforms are urgently required to achieve greater efficiency and productivity in agriculture for sustaining growth.

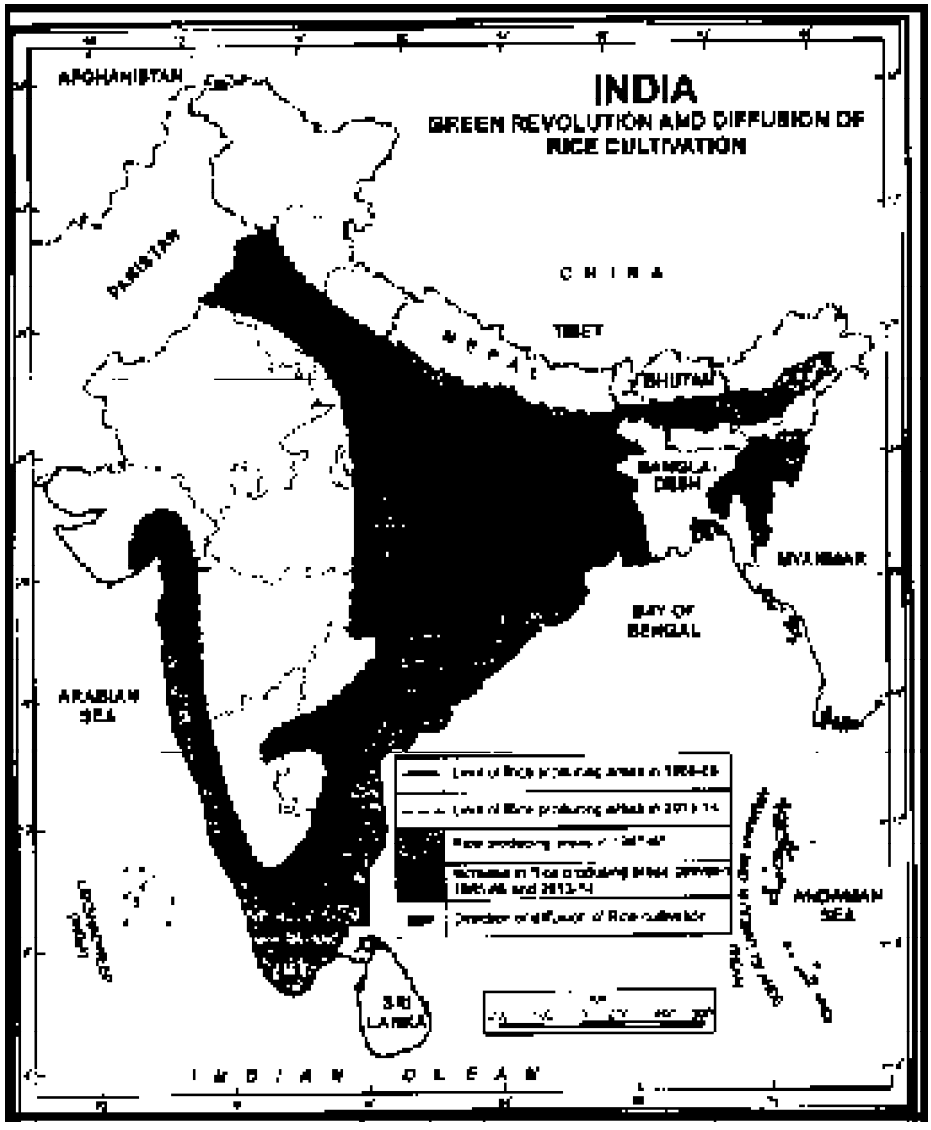
AREA OF INDIA MOST BENEFITED FROM THE GREEN REVOLUTION



MOST BENEFITED FROM THE GREEN REVOLUTION IN TERM OF WHEAT CULTIVATION



MOST BENEFITED FROM THE GREEN REVOLUTION IN TERM OF RICE CULTIVATION



10.8 Sample Paper Chapter :

Short Answer Type Questions

Q.1 Define Green Revolution.

Q.2 Name the Major Component of Green Revolution.

Long Answer Type Questions

Q.1 Define Green Revolution and discuss the major component of Green Revolution.

Q.2 Define Green Revolution and discuss it impact on Indian griculture.

10.9 Glossary:

1. **Agriculture:** The term agriculture is combination of two words ager means field and Culture means cultivate.
2. **HYV:** High Yielding Verities
3. **Insecticide and Pesticide:** Fertilizers.
4. **Self-Sufficient:** Self-supporting.
5. **Mechanization:** Use of Modern technology.

10.10 Suggested Reading :

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C. No. : GO-401 **Unit-III**

BA- IV Semester **Lesson-11**

SPATIAL DISTRIBUTION POPULATION : DENSITY AND GROWTH

Khalid Hussain

11.1 INTRODUCTION:

With a total population of 1210.2 million according to 2011 census figures, India is the second most populous country of the world, next only to China, a country with a population of 1,341.0 million in 2010. India covers only 2,4 per cent of the

land area of the world, but is the home of about 17.5 per cent of the world's population as compared to 19.4 per cent of the world's population living in China. Thus a little more than one out of every six persons in the world is from India. With about 308.7 million populations, the USA is the third largest country of the world with respect to population size. Further it is worth noting that gap between population of India and China is only 130.8 million *(i.e.* 1.9%) while between population of India and the USA is 901.5 million (i.e. 13%). Our population is almost equal to the combined population of the USA, Indonesia, Brazil, Pakistan, Bangladesh and Japan put together, the population of these six countries totals 1214.3 million. If we look at the area of the major countries of the world, Russian Federation is more than five times, Canada is over three times, the USA is 2.8 times, Brazil is 2.6 times and Australia is 2.3 limes as large as India. But their combined population is only 63 per cent of the total population of India. India's population is a little over twice the population of Latin America and 1.2 times the population of whole of Africa.

11.2 OBJECTIVES:

Population is the major human resource of a nation which leads the country. The uneven distribution of the world population is due to various factors. The present topic deals with the spatial distribution of population in India. India is the second most populouscountry of the world after China.

Spatial distribution of population in India: One of the most important aspects of India's population is its uneven distribution. On one hand the population of India is highly concentrated in some pockets such as highly urbanized and industrialised areas and areas of high agricultural productivity, while on the other hand there are virtually demographic deserts in high mountains, arid lands, thickly forested areas and some remote comers of the country. Such u situation needs some explanation and the explanation is found, to a great extent, by the study of some geographical factors which affect the distribution and density of population in a given area. Besides some social, demographic, political and historical factors play their own role in influencing the distribution and density of population. It may further be emphasised that these factors act in totality and not individually. While some scholars attach more importance to natural factors, Clarke and Zelinsky are of the view that cultural factors are more

prominent in determining the concentration of population in an area. According to Clarke, economic conditions, technological development, social organisation, government policy, etc. play a vital role in the distribution of population.

11.3 MAJOR FACTORS INFLUENCING THE DISTRIBUTION AND DENSITY OF POPULATION IN INDIA :

1. Terrain : Terrain of land is a potent factor which influences the concentration and growth of population. Normally speaking, plain areas encourage higher density of population as compared to mountain regions. The steep slopes in mountain areas restrict the availability of land for agriculture, development of transport, industries and other economic activities which may tend to discourage concentration of population arid its proper growth. It is because of these adverse circumstances that the Himalayan region, though occupies about 13 per cent of India's land area, supports only 1-2 per cent of the country's population. In contrast to this, the Great Plain of North India is a land of extremely gentle slope and offers great opportunities for the growth of agriculture, transport and industries.

2. Climate : Climate is as important as terrain in influencing population. Of all the climatic factors, twin elements of rainfall and temperature play the most important role in determining the population of an area. Extremes of climate discourage the concentration of population. Such climates include the too cold climate of Himalayas, and the too hot and dry climate of the Thar Desert. A moderate climate, on the other hand, is favourable for population.As we move from the Ganga-Brahmaputra Delta in the east towards the Thar Desert in the west, the amount of rainfall and consequently the density of population decrease. The Assam valley in the north-east and the Circars coast on the Bay of Bengal have moderate density of population although these areas receive heavy rainfall, similarly.southern face of the Himalayas is scarcely populated though this area receives sufficiently high rainfall. Some of the adverse factors such as steep slope, frequent floods, infertile soils and dense forests counterbalance the positive effect of rainfall. Increased use of irrigation facilities in north-west India comprising Punjab, Haryana and western Uttar Pradesh has resulted in higher concentration of population than normally expected considering the amount of rainfall received by this region.

3. Soil : Soil is an important factor in determining the density of population in an overwhelmingly agricultural country like India. Fertile soil supports higher population density while infertile soil leads to low density. In the northern plain of India, the soil is regularly enriched by annual floods of the great rivers like the Indus, the Ganga and the Brahmaputra and their tributaries. Therefore, this is an area of high population density. The coastal plains also have fertile soils and are areas of high population density. The Black soil of the Deccan Plateau also supports high population density. On the other hand, desert soils, mountain soils, laterite soils are infertile soils and are not capable of supporting high population densities. However, new technology in the agricultural field may change the future population scenario to some extent.

4. Water Bodies : Availability of water plays a significant role in determining the population of a given area. Water is the basic necessity for several purposes including irrigation, industries, transport and domestic use. Rivers are the greatest source of fresh potable water. Therefore, most of the population is concentrated in the river valleys.

5. Mineral Resources : Minerals act as great source of attraction for people from different areas, which results in higher density of population. The higher population densities in the Chhota Nagpur Plateau of Jharkhand and in the adjoining areas of Odisha are largely due to the availability of minerals.

6. Industries : Industrial growth offers massive employment opportunities and acts as a great magnet to attract people, particularly from the neighboring areas. This results in higher population density. Industrial areas are almost invariably associated with areas of high population densities. One hectare of industrial land is capable of supporting several thousand persons, while the most fertile area devoted to agriculture may not support more than a few hundred persons per hectare. One of the major causes of high population density in West Bengal, Bihar, Jharkhand, Odisha, Maharashtra and Gujarat is the phenomenal growth of industries in these states.

7. Transport : Growth of population is directly proportional to the development of transport facilities. The northern plain of India has a dense network of transport routes and is a densely populated region.The peninsular plateau has moderate network of

transport routes and is moderately populated area.The Himalayan region badly lacks transport facilities and is sparsely populated.

8. Urbanization : Urbanization and population concentration go hand-in-hand and are closely related to each other. All the urban centres are marked by high density of population. The minimum density, that an area should have to be designated as urban, is 400 persons per sq. kms. The highly urbanized districts of Kolkata, Chennai, Greater Mumbai, Hyderabad, Delhi and Chandigarh have population densities of over 6,000 persons per sq. kms. Delhi has the highest population density of 11,297 persons per sq. kms. as per 2011 census Figures.

11.3.1 DISTRIBUTION OF POPULATION IN INDIA:

The total population of India according to the 2011 census is 1210.2 millions. A casual look at Table 10.10 will reveal that the distribution, of India's population is very uneven. The contrasts in population distribution are quite clear at the level of the states, and are further sharpened at the level of districts. These contrasts are due to varying size of the states and wide variations in their resource base. Uttar Pradesh has the largest population, of 199.5 millions. This is followed by Maharashtra (112.3 millions), Bihar (103.8 millions). West Bengal (91.3 millions) and Andhra Pradesh including Telangana (84.6 millions). These five states account for about half of the country's population. More than one-fourth of our people live in two-states of U.P. and Maharashtra alone. This, however, does not imply that states with large areas have large population also. For example. Rajasthan is the largest state of India accounting for over 10.4 per cent area of the country. But this state supports only 5.67 per cent population of India. Similarly, Madhya Pradesh, the second largest state in terms of area, has 6.0 per cent of population on 9.38 per cent of area of the country. Contrary to this, Uttar Pradesh supports 16.49 per cent of population on only 7.33 percent of area of the country. In fact, LT.P has more people than the two largest states of Rajasthan and Madhya Pradesh. The three southern states of Kerala, Karnataka and Tamil Nadu

together have less population than Uttar Pradesh. Bihar has 9.29 per cent of population on 9.S6 per cent of area. In all, in eleven states and six union territories population size is much larger in comparison to the areas. This means that these states have higher pressure of population than the national average. On the other hand, Jammu and Kashmir covers 6.76 per cent area but supports -only 1 per cent population of India. Arunachal Pradesh has 0.11 per cent of population on 2.55 per cent of area. Sikkim, a Himalayan mini-state has only 6 lakh population which is only 0.05 per cent of the total population of India. In fact, Sikkim has the smallest population among all the states of India. Delhi with 16.75 million has the largest population among all the union territories. It is a matter of fact that more people live in Delhi than in the state of Jammu and Kashmir or in all the Union Territories put together.

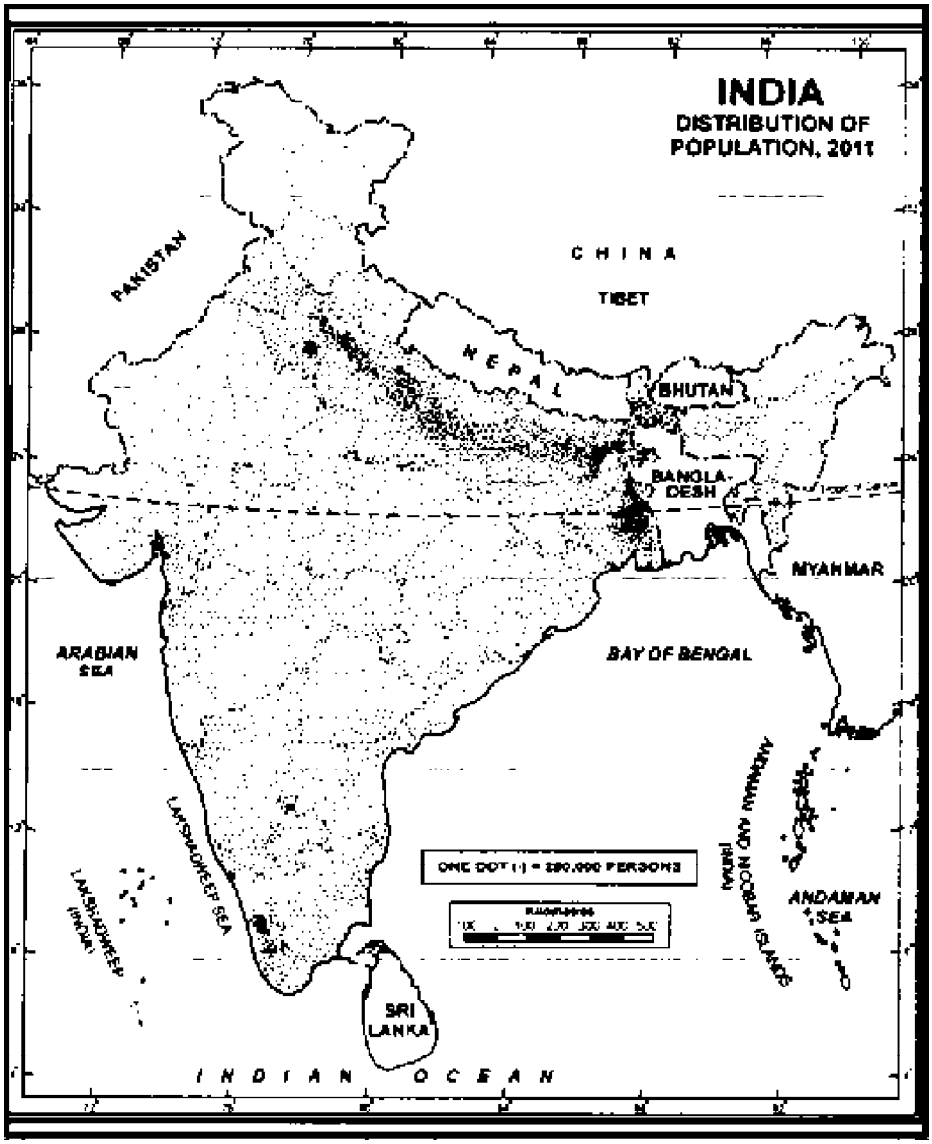
State wise Distribution of Population in India 2011

Rank	State /Union Territory	Total Population 2011	Population in %
1	Uttar Pradesh	199581477	16.49
2	Maharashtra	112372972	9.29
3	Bihar	103804637	8.58
4	West Bengal	91347736	7.55
5	Andhra Pradesh and Telangana	846655533	7.00
6	Madhya Pradesh	72597565	6.00
7	Tamil Nadu	72138958	5.96
8	Rajasthan	68621012	5.67
9	Karnataka	61130704	5.05
10	Gujarat	60383628	4.99
11	Odisha	41947358	3.47

12	Kerala	33387677	2.76
13	Jharkhand	32966238	2.72
14	Assam	31169272	2.58
15	Punjab	27704236	2.29
16	Chhattisgarh	25540196	2.11
17	Haryana	25353081	2.09
18	NCT of Delhi	16753235	1.38
19	Jammu and Kashmir	12548926	1.04
20	Uttrakhand	10116752	0.84
21	Himachal Pradesh	6856509	0.57
22	Tripura	3671032	0.30
23	Meghalaya	2964007	0.24
24	Manipur	2721756	0.22
25	Nagaland	1980602	0.16
26	Goa	1457723	0.12
27	Arunachal Pradesh	1382611	0.11
28	Puducherry	1244464	0.10
29	Mizoram	1091014	0.09
30	Chandigarh	1054686	0.09
31	Sikkim	607688	0.05
32	Andaman &Nicobar Island	379944	0.03
33	Dadra &Nagar Havali	342853	0.03
34	Daman and Diu	242911	0.02
35	Lakshadweep	64429	0.01
	India	1210193422	100.00

Source: Census of India 2011

SPATIAL DISTRIBUTION OF POPULATION IN INDIA



11.3.2 CAUSES OF UNEVEN DISTRIBUTION OF POPULATION IN INDIA:

The uneven distribution of population described above is the result of several factors of which physical, socio-economic and historical factors are more important. Physical Factors.Among the physical factors, relief, climate and availability of water are the chief factors which determine the population of an area. It is because of these factors that the North Indian Plains, deltas and coastal plains have higher proportion of population than the interior districts of southern and central Indian states, the Himalayas, some of the north eastern and the western states. However, development of irrigation facilities by Indira Gandhi Canal in Rajasthan, rich deposits of mineral and energy resources in Chotanagpur plateau of Jharkhand have resulted in moderate to high proportion of population in these areas which were previously very thinly populated, Socio-economic andHistorical Factors.Evolution of settled agriculture and agricultural development; pattern of human settlement; development of transport network, industrialisation and urbanisation are some of the important socio-economic and historical factors which influence the distribution of population. Generally speaking river plain and coastal areas have larger concentration of areas like Delhi, Mumbai, Kolkata, Bengaluru population due to early history of human settlement and development of transport network. Urban areas like Delhi, Mumbai,Kolkata,Bengaluru, Pune, Ahmedabad, Chennai and Jaipur have high concentration of population due to high level of industrilisation and urbanization. People in large number migrate from rural to urban areas.

11.4 DENSITY OF POPULATION IN INDIA :

Introduction: Density of population is a better measure of understanding the variation in the distribution of population. It is expressed as number of persons per unit area. In other words, it is the ratio of total population to the total area of the country or a part thereof. For example the total population of India accordingto 2011

census is 1210.1 million living on a total area of 3.17 million square kilometres (excluding the area of lammu and Kashmir illegally occupied by Pakistan and China). Therefore, the density of population of India in 2011 is382 persons per; sq. kms. India's population density of 382 persons per sq. km is much higher than China's 141 persons per sq. km. Among the most populous ten countries of the world, India stands second in density; the first being Bangladesh (1141 persons per sq.km). Thus heavy pressure of population oh land is one of the serious problems of the country. The main cause of worry is that the population density in India has been consistently increasing since. There has been almost fivefold increase in the density of population between 192] and 2011. The density of population increased rapidly between 1951 and 2011. The density of population in India is very high and is increasing at a very fast rate. During the decade 2001-11alone, India's population density increased by 57 persons per sq. km which means each sq. km of land has to feed 57 new mouths. This is a matter of great concern as it puts immense pressure on our natural resources. This increase is nearly double the existing density of the USA (30 persons/sq. km), seven times the existing density of Russia (8 persons/sq. km) and a more than one-third the existing density of China (141 persons/sq. km). Hence among the large sized countries of the world, India is not only the most densely populated but is also adding to its density at an alarming rate.

1. Areas of Extremely Low Density: Areas having 100 persons persq. km and less than that are included in this class. They include Arunachal Pradesh (17), Mizoram (52), Andaman and Nicobar Islands (46) and Sikkim (86). Arunachal Pradesh and Mizoram are located in a remote and inaccessible part of north-east India. Sikkim is also a mountainous area with low density of population. Andaman and Nicobar Islands are situated far away from the Indian mainland. Hot and humid climate of these islands is injurious to health and very little economic development has taken place here from almost the same problems as those of Arunachal Pradesh and Mizoram, although to a lesser extent. Himachal Pradesh and Uttrakhand are parts of

the north-western Himalayan region and have very little level land to support high population density. Jammu and Kashmir has vast areas devoid of population. Only some parts of Jammu region and Kashmir valley are thickly populated. Large stretches of Leh (Ladakh) and Kargil have population density less than ten persons per sq km. On the whole Kargil has population density of 10 persons/sq. km while Leh (Ladakh) has only 3 persons per sq. kms. These are dry and cold areas and badly lack the basic amenities of life. Rajasthan is the largest state of India. There are obviously large variations in the density of population in different parts of the state depending upon the local conditions. Most of Rajasthan is a sandy desert lacking in water resources and does not support high population density. Western part of the state is having even less than 50 persons per sq. kms whereas eastern and north-eastern parts of this state have sufficient resources and have comparatively high density of population. Madhya Pradesh is a part of the Deccan Plateau and is having rugged topography of hard rocks. Like Madhya Pradesh, Chhattisgarh has rugged topography, is thickly forested and is largely inhabited by the tribal people. As such, the population density in this state also is low.

2. Areas of Moderate Density : This class includes those areas which are having 251 to 500 persons per sq. km. The average for whole of India (382 persons per sq. km) also falls in this class. Odisha (269), Gujarat (308), Andhra Pradesh including Telangana (308), Karnataka (319), Tripura (350), Maharashtra (365), Goa (394), Assam (397) and Jharkhand (414) are included in this category. These areas are wide apart from one another and there are different reasons for moderate density of population in different areas. For example, Assam has tea estates whereas Andhra Pradesh, Telangana, Odisha, Karnataka and Jharkhand have agricultural and mineral resources. Maharashtra is highly urbanised and industrialised state. The neighboring state of Gujarat also has urban and industrial growth, although at a scale smaller than that of Maharashtra. Among the north-eastern states, Tripura has sufficient level land which supports moderate population density.

3. Areas of High Density : These are areas having population density of 501 to 1000 per square kilometers states and union territories included in this category are Punjab (550), Haryana(573) Dadra& Nagar Haveli (698), Uttar Pradesh (828) and having population density of 501 to 1000 per sqkm.Kerala (859). Punjab' and Haryana have highly States and union territories included in this category developed agriculture based on heavy inputs in the form of high yielding varieties varies of seeds,chemical fertilizers and canal and tube-well irrigation. Similarly,Tamil Nadu's population is based on agriculture and industries. The coastal plain of Kerala is also very fertile. However, Kerala has started showing decline in the growth rate of population, Uttar Pradesh is located in the fertile Ganga Plain and supports high population density.

4. AreasofVery High Density : Areas having more than 1000 persons per sq. km are termed as areas of very high population density. West Bengal (1029), Bihar (1102), Lakshadweep (2013), Daman & Diu (2169) Puducherry (2548), Chandigarh (9252) and Delhi (11,297) have very high density of population due to different factors operating in different areas. Like Uttar Pradesh, Bihar is located in the fertile plain of Ganga and supports very high population density. It seems that measures to control for population growth have not given the desired results and Bihar has now surpassed West Bengal as the state with highest density of population among the major states. West Bengal is located in the Ganga delta which is one of the most fertile areas of the world, producing 3-4 crops of rice in a year. In addition, India's biggest industrial cluster is located in the Hugli basin. These factors combine together to make West Bengal the second most densely populated state of India. Among the union territories, Delhi has experienced one of thefastest population growths as a result of which its population density has increased considerably. This growth is primarily due to large scale migration of people from the surrounding areas. People migrate to Delhi in large numbers in search of livelihood, and better amenities of life.

Density of Population in India 1901-2011

Census Year	Density (Per Sq. Kms.)	Absolute Increase	Percentage Increase
1901	77	-	-
1911	82	5	6.5
1921	81	-1	-1.2
1931	90	9	11.1
1941	103	13	14.4
1951	117	14	13.6
1961	142	25	21.4
1971	177	35	24.6
1981	216	39	22
1991	267	51	23.6
2001	325	58	21.7
2011	382	57	17.5

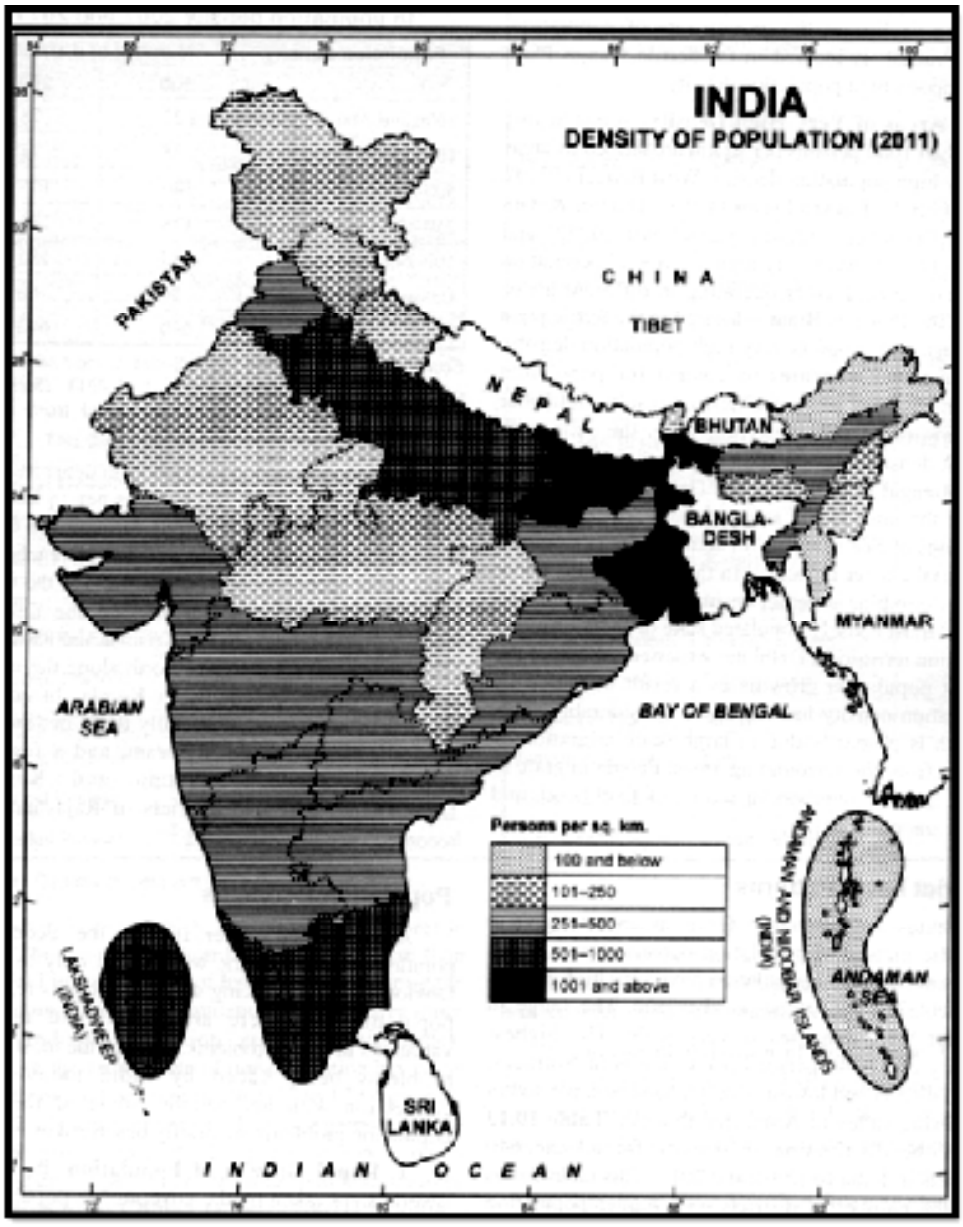
Source: Census of India 2011

State Wise Population Density in India 2011

Rank	Name of State & Union Territories	Population Density	Rank & Union Territories	Name of State Density	Population
1	NCT of Delhi	11297	19	Karnataka	319
2	Chandigarh	9252	20	Andhra Pradesh and Telagana	308
3	Puducherry	2598	21	Gujarat	308
4	Daman &Diu	2169	22	Odisha	269
5	Lakshadweep	2013	23	Madhya Pradesh	236
6	Bihar	1102	24	Rajasthan	201
7	West Bengal	1029	25	Uttrakhand	189
8	Kerala	859	26	Chhattisgarh	189
9	Uttar Pradesh	828	27	Meghalaya	132
10	Dara & Nagar Havali	698	28	Jammu & Kashmir	124
11	Haryana	573	29	Himachal Pradesh	123
12	Tamil Nadu	555	30	Manipur	122
13	Punjab	550	31	Nagaland	119
14	Jharkhand	414	32	Sikkim	86
15	Assam	397	33	Mizoram	52
16	Goa	394	34	Andaman & Nicobar	46
17	Maharashtra	365	35	Arunachal Pradesh	17
18	Tripura	350		India	382

Source: Census of India 2011

DENSITY OF POPULATION IN INDIA 2011



11.5 POPULATION PROBLEMS:

As mentioned earlier, India is the second most populous country of the world, next only to China. Obviously India is facing serious problems regarding population and there are spatial and temporal variations in these problems. Perhaps the most serious problems being faced by India today are in connection with her people. Some of the major population problems are briefly described as under:

1. Rapid Growth of Population: In spite of several steps taken by (he government, population of India is growing at a rapid pace. India's population was just 36.1 crores at the time of first census (1951)after Independence which rose to over 121 crores in 2011. Thus our population has increased more than three fold in a short span of half a century. During the last century, the world population grew by three times while India's population grew by four times. Although the growth rate of our population has come down from 24.8 per cent in 1961-71 to 17.64 per cent in 2001-11, it is still vary high as compared to world average, growth rate of 12.3 per cent and is much higher than 5.3 per cent of the most populous country of the world—China. During 2001-11 India's population increased by 181.4 millions against China's 79.7 millions. At this rate our population is likely to exceed the population of China in 2028. The population growth was so high during 1951-81 that it is often referred to as population explosion.

2. Uneven distribution of Population : One ofthe most striking features of India's population is its uneven distribution. On one hand, there are almost empty lands like Arunachal Pradesh where population density is only 17 persons per sq. kms and large tracts of the Himalayas have less than five persons per sq. kms. On the other hand Bihar's one sq. kms has to support as many as 1102 persons per square kms. on an economy which is heavily dependent on agriculture. Urbanization union territories like Chandigarh and Delhi have unmanageable densities of 9225and 11297 person sq.km.Rapid growth and uneven distribution of population have put enormous pressure on our scarce natural resources to varying degrees in different parts of the country. Main problems arising out of such a situation are unemployment, poverty, hunger, malnutrition, environmental degradation and lower standard of living. These problems will be discussed in the following paragraphs.

3. Unemployment : In view of rapidly growing population and limited resources, the employment seekers far outnumber and outpack the growth of employment opportunities. Indian economy is heavily dependent on agriculture which the largest employment provider in the country. At present 68.84 per cent of India's population is living in rural areas which solely depend on agriculture for its livelihood. More than 58% of the population of the country earns its livelihood from agriculture. But in spite of heavy inputs in agriculture in the form of high yielding variety of seeds, chemical fertilizers and machines, agricultural progress has failed to keep pace with the growing demand for employment due to fast increasing population. Moreover; agriculture is a seasonal activity in which labour is required only during the sowing and harvesting seasons and the agricultural labourers are without employment for about six months in a year. The secondary and tertiary sectors have also not grown in proportion to demand for employment. As such, the employment opportunities for unskilled, semi-skilled, and skilled people are very limited. Even the educated and professional technocrats are finding it difficult to get suitable jobs and they have a tendency to migrate to developed countries resulting in a serious crisis of brain drain. According to official figures there are more than forty million unemployed youths in India and their number is fast growing. This situation of unemployed youth is very dangerous because the younger people are more liable to be involved in anti-social activities like theft, cheating, drugs, murder, rape, etc.

4. Hunger and Malnutrition : Situation of hunger and malnutrition arises when the population growth outpaces the growth of food grains and food items become so costly to be out of reach of the common man. The Global Hunger Index (GHI) released in 2012 showed that India's ranking was a miserable 65 out of 79 countries and this is termed as alarming situation. Table 10.15 shows that many of India's neighbors have done better in tackling issues of hunger and malnutrition.

5.Poverty: Poverty is another serious Populationproblem but million dollar questions is who is a poor India. Different criteria have been followed by different committees and the number of families living below poverty line have varied widely from each other .For Example in 2010 Wadhwa Committee.

6. Low Agricultural Productivity : In most parts of India, agriculture is tradition bound and is of subsistence type in which the entire agriculture produce is consumed by the family members of the farmer. A large percentage of farmers are poor and cannot afford costly inputs like agricultural machines, high yielding seeds, and chemical fertilizers etc. Moreover land tenancy, small and fragmented fields also create hindrances in agricultural growth. For the last so many years the annual rate of agricultural growth has been very slow and is not able to meet the growing demand of teeming millions. Further agricultural sector has failed to provide suitable employment opportunities to growing number of rural youth.

7. Slow Growth of Industries : Although industrial sector has grown faster than agricultural sector, yet this sector is unable to provide sufficient employment to our young population, particularly to those who migrate from rural to urban areas. The basic problem is that the labour which migrates from rural to urban areas largely consists of unskilled workers for whom there is little scope in the industrial sector. Financial constraints and lack of proper infrastructure are also great hindrances in industrial growth. A high percentage of Indian population consists of poor people and there is lack of proper market for industrial products.

8. Frequent Strikes and Bandhs : The fast growing population has resulted in underemployment, unemployment, hunger, malnutrition, poverty, deprivation and lack of basic necessities of life and has led to overall frustration, particularly among the youngsters and they become indisciplined. Consequently, there are frequent strikes in different spheres of life and industrial sector is the worst sufferer. This reduces the overall productivity of the people.

9. Religion : Tradition and Orthodoxy. Indian population is primarily religious minded society and followers of almost all religious can be found in this country. Some of the religions do not believe in family planning practice. This leads to unchecked growth of population which has its own implications. Further, Indian society is tradition-bound and this is more true of rural society. Orthodoxy and ignorance are their major social aspects of Indian population. All these traits are major obstacles in the way to adopt new technology and innovative ideas. Hence masses are still in a backward state and lead miserable life. In order to overcome these obstacles, large scale literacy and education campaign is necessary.

10. Terrorism and insurgency : India's socio- economic system has undergone drastic changes during the last few decades and economic disparities have increased tremendously. In the existing socio- economic scenario, a few people have become very rich while a large proportion of population is living a life of misery and deprivation. The youthful section of society becomes frustration in the absence of opportunities to earn a livelihood and the youngsters resort to anti-social activities like thefts, robberies, kidnapping, extortion, murder, etc. Some of them go to the extent of resorting to terrorism and insurgency. There are many terrorist groups operating in different parts of the country and the frequency as well intensity of terrorist attacks is increasing with the passage of time. A lot of insurgency is taking place in the peripheral states, particularly in the north-eastern states.

11. Environmental Degradation : Growing pressure of population on natural resources is leading to depletion of these resources and at the same time it has several problems regarding environment and ecology. Large scale destruction of forests for forest products and for making land available for other uses has resulted in drastic ecological imbalance. Shifting agriculture, known as Jhum culture, in the north-eastern stages is the main cause of forest destruction there, because the duration of completing the jhum cycle has been reduced due to increase in demand for agricultural crops caused by growth in population. Over irrigation in Punjab, Haryana and western parts of Uttar Pradesh has caused large scale depletion of ground water and increase in salinity and alkalinity in soil over vast areas. Air and water in (both surface and ground) have been polluted over large tracts in different parts of the country. Noise pollution has become a serious problem in large cities of India. Environmental pollution leads to ill health and cause several diseases which put undue pressure on health services.

12. Pressure on infrastructure and low standard of living : Rapidly growing population puts undue pressure' an infrastructure,. Educational institutes, hospitals, transport system always remain overcrowded and there is acute shortage of housing amenities. Supply of drinking water and electricity is almost invariably erratic and condition of roads and streets is pathetic. Overall deprivation leads to social tensions, and the number of people involved in anti-social activities is increasing with each passing day. Thus the overall standard of living of the masses is very low and people are deprived of even the basic amenities.

11.6 GROWTH OF POPULATION: BASIC CONCEPTS:

Introduction :

1. Growth Rate : Growth of population is the change in the number of people living in a particular area between two given points of time. The net change between two points of time is expressed in percentage and is described as the growth rate of population.

2. Natural Growth : The difference between the natural birth-rate and death-rate is called the natural growthof population.

3. Migratory Growth : This growth of population is caused by migration of people.

4. Positive Growth : When the population increases between two given points of time, it is called *positive growth.* It takes place when the birth rate is higher than the death-rate or people migrate from other countries.

5. Negative Growth : The growth of population is called *negative i*f the population decreases between two given points of time. It takes place if the birth-rate is lower than the death-rate or people migrate to other places.There has always been positive growth rate of population in India ever since first census of India was conducted. However, 1921 is an exception when the growth was negative.Several attempts have been made to estimate the population of India before first census was conducted in 1872. According to an estimate, India's population was just 100 million in 1600 A.D. It rose to 120 million in 1800,130 million in 1841, and 255 million in 1871. This can be termed as a negligible growth compared to the present trends.

11.6.1 POPULATION GROWTH SINCE 1901:

Trends in population growth since 1901 have been given in Table 10.2. A close look at this table shows that there have been significant demographic divides as far as trends in population growth are concerned. These significant turning points are the census years 1921, 1951 and 1981. Thus the demographic history of India can be charted and classified into the following four distinct phases.

1. Period of Stagnant Population (1901-1921)
2. Period of Steady Growth (1921-1951)
3. Period of Rapid High Growth (1951-1981)
4. Period of High Growth with Definite Signs of Slowing Down (1981-2011)

1. Period of Stagnant Population (1901-1921)

During most of the 19th century India witnessed sporadic, irregular and slow growth of population which drifted into twentieth century until 1921. Thus the population growth during this period can be termed more or less stagnant when compared to the growth rates observed during the consequent periods. The high birth rate was counterbalanced by high death rate. The progressive growth rate in 1921 over 1901 was only 5.42 per cent. In fact, the census year 1921 registered a negative growth rate of -0.31 per cent which happened only once throughout the demographic history of India. It is because of this decline in place of rise in population that the year 1921 is called the *'demographic divide'* in the demographic history of India. The high mortality during this period was the product of large scale abnormal deaths due to epidemics of influenza, plague, small pox, cholera, etc. Influenza alone claimed 12 million lives in 1918. Food shortages caused by severe droughts in 1911,1913,1915,1918 and 1920 claimed their own toll. In addition,, thousands of Indian soldiers lost their lives during the World War I (1914-18). Lakhs of people emigrated to a number of countries in Africa.From the view point of population studies, India has been divided into six zones. They are (1) northern zone (Haryana, Himachal Pradesh, Jammu and Kashmir, Punjab, Rajasthan, Chandigarh and Delhi), (2) eastern zone (Bihar, Jharkhand, Sikkim,West Bengal, Odisha and Andaman and Nicobar Islands),(3) north-east zone (Assam, Arunachal Pradesh, Manipur, Meghalaya, Mizoram, Nagaland and Tripura) (4) central zone (Chhattisgarh,

Madhya Pradesh, Uttar Pradesh, Uttrakhand), (5) western zone (Gujarat, Maharashtra, D & N Haveli,Daman and Diu) and, (6) southern zone (Andhra Pradesh, Telangana, Karnataka, Kerala, Tamil Nadu, Lakshadweep, Telangana, Puducherry and Goa.)

During the period 1901-1921, the northern zone suffered a net loss of 1.4 per cent of its population due to various famines and epidemics. In contrast the north-eastern zone registered a very high growth rate mainly due to large scale inmigration/immigration and to some extent lesser sufferings from famines and epidemics. Assam, Manipur, Tripura and Nagaland experienced very high population growth. Assam attracted large number ‘of immigrants in its tea gardens. The southern zone experienced normal growth rate of 11.1 per cent because it did not suffer from famines and epidemics. However, Kerala was an exception, which registered a sharp growth of 22 percent.

2. Period of Steady Growth (1921-51)

During 1921-51, the population of India increased from 251 million to 361 million (Table 10.2). This duration of 30 years has thus registered a growth of 47.3 per cent. Therefore, this period is called the period of steady growth rate. The mortality rate started showing downward trend as a result of improvement in general health and sanitation conditions after 1921. These developments helped in controlling epidemics like plague, cholera and malaria. The crude death rate which stood at a high of 47 per thousand in 1921 declined to 27 per thousand in 1951. On the contrary, the crude birth rate continued to stay at an abnormally high level and decline only to 40 per thousand in 1951 as against 48 per thousand in 1921. Decline in death rate was also

achieved partly through the improvement in the distribution system as a result of improved transportation so that timely supplies of food could be made available to drought and famine stricken areas. The combined effect of these factors was that the population started increasing steadily. Since crude death rate declined considerably and crude birth rate remained very high, the population growth during this period is called *mortality induced*growth. During this period, the northern, eastern and southern zones registered growth rates close to the national average. The central zone registered comparatively low growth rate of 35.6 mostly due to higher rate of mortality and substantial out migration. The western zone experienced high growth rate of 56 per cent partly due to national growth and mainly due to immigration caused by industrial growth in Mumbai, Ahmedabad, Vadodara and Surat.

3. Period of Rapid High Growth (1951-81)

After 1951, there was a steep fall in the mortality rate but the fertility remained stubbornly high. Therefore, this period experienced very high rate of population growth and is often referred to as the *period of population explosion.* As a matter of fact, the birth rate increased from 40 per thousand in 1951 to 42 per thousand in 1961 and stayed at 36 per thousand in 1981. In contrast, death rate fell rapidly from 27 per thousand in 1951 to 12 per thousand in 1981. Consequently the natural rate of growth, which fell slightly from 14.0 per thousand in 1941 to 13 per thousand in 1951 rose steeply to 4 per thousand in 1971 and remained at the same level in 1981 also. The total population of the country increased from 361,09 million in 1951 to 683.3 million

in 1981 recording an increase of 89.36 per cent in a short span of thirty years. This unprecedented growth rate was due to the accelerated developmental activities and further improvement in health facilities. The living conditions of the people improved enormously. Death rates declined much faster than the birth rates.

4. Period of High Growth Rate with Definite Signs of Slowing Down (1981-2011)

The last phase of 20th century and the early phase of 21st century *i.e.,* the period between census years 1981 and 2011 is known as the period of high growth with definite signs of slowing down. Although the rate of growth was still very high, it started declining after 1981. The highest ever growth rate of 2.48 per cent was recorded in 1971 which remained at a high of 2.46 in 1981 also. It declined to 2.38 per cent in 1991,2.15 per cent in 2001 and further to 1.76 in 2011. Thus the growth rate registered the sharpest declines of 2.46 per cent per annum during the decade 2001-2011. During the period 1981-2011, the northern zone and the southern zone had the highest and lowest growth rates respectively. This declining trend marks the beginning of the new era in the country's demographic history. During this period, birth rate declined rapidly, from 36 per thousand in 1981 to 22.5 per thousand in 2009. Declining trend of death rate continued but at a slower rate. The difference between birth and death rates narrowed to 15.2 per thousand. This declining trend is a positive indicator of the official efforts of birth control and people own inclination to opt for smaller families. Although population growth rate in India continues to decline since the 1971 census year yet India's population growth rate is much higher as compared to that of China,. U.S.A., Japan, Brazil, Indonesia, Bangladesh, etc. During 2001 and 2011, India's population

increased by 181.45 million which is slightly less than the total population of Brazil and much more than that of Bangladesh, Nigeria, Russian Federation or Japan. These countries are amongst the ten most populated countries of the world. In fact we, each year we are adding to our population which is almost equal to the population of Australia.According to the United Nations population report released on June 13, 2013, India would pip China as the most populated country in the world by 2028 when India's population will be about 1448 million as compared to China's 1443 million. The report based on new fertility data says that India's population would increase to 1620 million till 2050 and then decline to around 1540 million by the end of the 21st century. China would enter the downturn era in population from 2025 onwards and lose its top spot to India in 2028.Growing longevity will be another major factor responsible for population growth as the life expectancy would increase from 64.9 years in 2013 to 80.6 years in 2100 and would just be one per cent point below the global average. Now it is 2.2 per centpoints below the world average of 67.1 years. However, the fertility rate per woman will fall below 2 in 2050 to 1.84 in 2100. It would result in proportion of the children below the age of 14 years to fall by ten percentage points between 20$_y$13 and 2050. Even this fail will not help India much in controlling the population growth because the base population would be too large for any desired results.The report also says that India will have one of the worst sex ratios in the world. India's sex ratio could be behind only the Middle East. Presently, India has 107 men for every 100 women, a ratio worse than Pakistan, Bangladesh and Sri Lanka. The world population will increase from 7162 million in 2013 to 8193 million in 2028 and 9580 million in 2050.

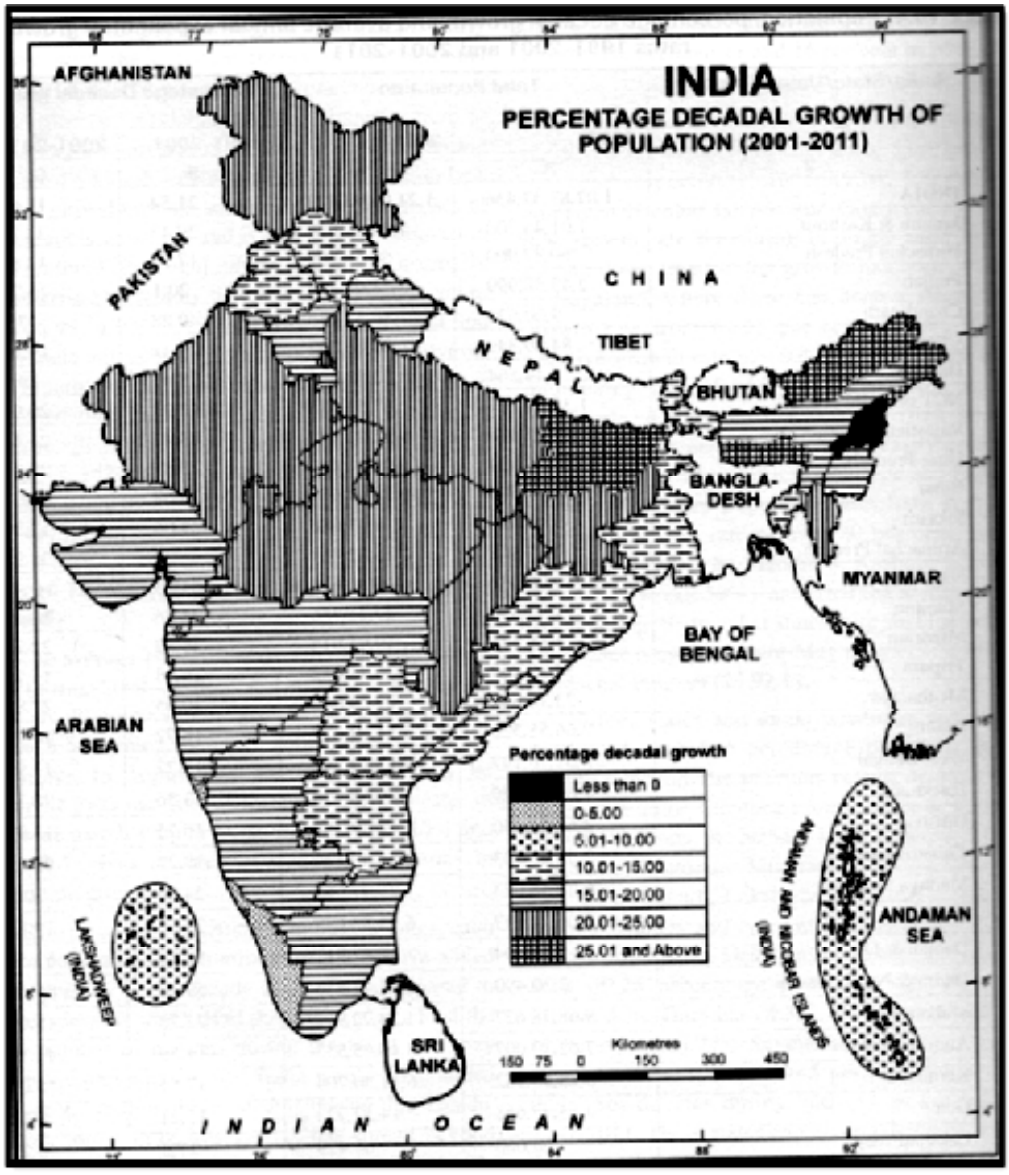
State wise total Population and decadal Growth rate

S. No.	State / Union Territory	Total Population		% Decadal Growth	
		2001	2011	1991-2001	2001- 2011
	India	**1028737436**	**1210193422**	**21.54**	**17.64**
1	Jammu & Kashmir	10143700	12548926	29.43	23.71
2	Himachal Pradesh	6077900	6856509	17.54	12.81
3	Punjab	24358999	27704236	20.1	13.73
4	Chandigarh	900635	1054686	40.28	17.1
5	Uttrakhand	8489349	10116752	20.41	19.17
6	Haryana	21144564	25353081	28.43	19.9
7	NCT of Delhi	13850507	16753235	47.02	20.96
8	Rajasthan	56507188	68621012	28.41	21.44
9	Uttar Pradesh	166197921	199581477	25.85	20.09
10	Bihar	82998509	103804637	28.62	25.07
11	Sikkim	540851	607688	33.06	12.36
12	Arunchal Pradesh	1097968	1382611	27	25.92
13	Nagaland	19,90,036	1980602	64.53	-0.47
14	Manipur	122,93,896	2721756	24.86	18.65
15	Mizoram	8,88,573	1091014	28.82	22.78
16	Tripura	31.99,203	3671032	16.03	14.75
17	Meghalya	23,18,822	2964007	30.65	27.82
18	Assam	2,6655528	31169272	18.92	16.93
19	West Bengal	8,01,76,197	91347736	17.77	13.93

20	Jharkhand	2,69.45,829	32966238	23.36	22.34
21	Odisha	368,04,660	41947358	16.25	13.97
22	Chhattisgarh	2,0833,803	25540196	18.27	22.59
23	Madhya Pradesh	6,03,48,023	72597565	24.26	20.3
24	Gujarat	5,06.71,017	60383628	22.66	19.17
25	Daman and Diu	158204	242911	55.73	53.54
26	Dadra and Nagar Haveli	2,20.490	342853	59.22	55.50
27	Maharastra	9,68,78,627	112372972	22.73	15.99
28	Andhra Pradesh	7,62,10,007	84665533	14.59	11.10
29	Karanatka	52830-562	61130704	17.51	15.67
30	Goa	13,47,668	1457723	15.21	8.17
31	Lakhsdweep	60,650	64429	17.3	6.23
32	Kerala	3, 18, 4074’	33387677	9.43	4.86
33	Tamil Nadu	62405,679	72138958	11.72	15.6
34	Pudocherry	9,74345	1244464	20.62	27.72
35	Andaman & Nicobar Island	336,152	379944	26.9	6.68

Source: Census of India 2011

PERCENTAGE OF DECADAL GROWTH OF POPULATION IN INDIA 2011



11.7 Sample Paper Chapter

Short Answer Type Questions

Q.1 What is difference between Population distribution and Population Density.

Q.2 Define Population Growth.

Q.3 Define Population Density

Long Answer Type Questions

Q.1 Discuss the Spatial distribution of Population in India.

Q.2 Discuss the major factors affecting uneven population distribution in India.

Q.3 Define Population Density. Discuss in detail population density in India.

Q.4 What are the major Population problems in India.

11.8 Glossary:

1. **Population Explosion:** Huge Population
2. **Population Density:** Person living per square kilometers or the ratio between land and man is called population density.
3. **Malnutrition:** Undernourishment or Starvation.
4 **Growth of population:** Development of population between two time periods.

11.9 Suggested Reading :

1 Negi, Balbir Singh: Geography of India, edarnath,Ramnath,Meerrut, New Delhi.,1993

2 Singh Gopal: India (Latest addition) Atma Ram and sons Delhi.

3 Singh,Jagdish:India: A Comprehensive Systematic Geography, Radha Publications, New Delhi, 2003

4 Spate ,O.H.K. and Learmonth, A.T.A: India and Pakistan- Land , People and Economy , Methuen& Co. , London, 1967

5 Hussain Majid"Geography of India" Tata McGraw –Hill Publishing Company Limited New Delhi

6 KhullarD.R ," India A Comprehensive Geography, Kalyani Publishers New Delhi.

7 Deshpande,C.D: India- A Regional Interpretation, Northern Book Centre, New Delhi, 1992

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C. No. : GO-401 **Unit-III**

BA- IV Semester **Lesson-12**

URBANIZATION IN INDIA : TRENDS AND DISPARTITIES

Khalid Hussain

12.1 INTRODUCTION:

Urbanisation is the process of becoming Urban. It is a demographic process where by an increasing proportion of the population of a country or a region.

Urbanisation is a whole process change and consequences where a society gets transformed from agrian economy to industrial economy and a small homogeneous to large homogeneous society. In the study of Urbanisation it is very difficult to define of determine a settlement as an urban settlement or urban centre. Because different countries of the world classify their urban and rural population conditions. Generally urbanisation is associated with the concentration of population in towns and cities.

12.2 OBJECTIVE:

The present topic deals with the study of urban settlement in India.The main objective of the topic to assess the rural urban settlement in India. Factors affecting for urban development in India.

12.3 URBANIZATION IN INDIA:

Everybody seems to know what a city is but no one has given a satisfactory definition although several scholars, both in India and abroad, have tried to define an urban place in their own way. There seems to be rural-urban continuum and the boundary separating urban from rural is often vague and ill defined. It is practically not possible to point out the disappearance of urbanity or the beginning of rurality. Despite widespread use of the terms 'urban' and 'rural' for centuries, they continue to remain vague and elusive, lacking precise definition. Even if we accept the rural-urban dichotomy, it does not in itself, provide us with an adequate frame of reference for defining and identifying urban places. It is almost universally accepted that a single criterion is not enough to define an urban place and the issue has to be settled on the basis of a set of suitable criteria. The multi-dimensional character of urban areas creates hindrance in giving a precise definition for them. The criteria for defining urban areas, in general, fall into five categories:*(1)*demographic, *(2)*economic, (3) social, *(4)*morphological, and *(5)*functional. The census of India has used the above mentioned criteria for defining an urban area. However, there have been changes in the definition given by the Census of India from one census year to another, particularly in the first half of the 20th century. According to the 1901 census, towns included *(a)*every municipality, *(b)*all civil lines not included within the municipal limits, (c) every cantonment and *(d)*every other collection of houses inhabited by not less than 5,000 persons that the census superintendent may decide to treat as a town for census purposes. At the 1911 census, the capitals of the princely states of India, irrespective of being urban or not, were adopted as urban. The census operalions upto 1951 continued with the same definition of a town. After Independence, the former princely

states were mostly merged to form large unions and their erstwhile capitals were not treated as towns in 1951 if they did not possess the requisite urban characteristics. The 1961 census adopted a strict definition which has been applied more rigorously and uniformly and has been followed in the consequent census years of 1971, 1981 and 1991.The only exception related to the exclusion of certain economic activities like fishing, livestock, logging, plantations, orchards, etc. in 1981 from the category of non-agricultural activities for computing the percentage of male workers engaged in such activities.

In 2001 census of India the definition of urban area adopted is as follows:

(a) All places with a municipality, corporation, cantonment board or notified town area committee, etc.

(b) All other places which satisfy the following criteria:

(i) A minimum population of 5,000;

(ii) At least 75 per cent of male working population engaged in non-agricultural pursuits; and

(iii) A density of population of at least 400 persons per sq. km (1000 per sq. mile).Besides, the Directors of Census. Operation in ' States/Union territories were allowed to include, in consultation with the State Governments/Union Territory Administrations and the Census Commissioner of India, some places having distinct urban characteristics as urban, even if such places did not strictly satisfy all the criteria mentioned under category *(b)*above. Such marginal cases include major project colonies, areas of intensive industrial development, railway colonies, important tourist centres, etc.The definition of urban areas has been refined in 2011 according to which urban areas are comprised of two types of administrative units—Statutory Towns and Census Towns.

(a) **Statutory Towns :** All administrative units that have been defined by statute as urban like Municipal Corporation, Municipality, Cantonment Board, Notified Town Area Committee Town Panchayat, Nagar Palika etc., are known as Statutory Towns.

(b) **Census Towns :** Administrative units satisfying the following three criteria simultaneously are treated as Census Towns:

(i) It should have a minimum population of 5,000 persons

(ii) At least 75 per cent of the male main working population should have been engaged in non-agricultural pursuits; and

(iii) It should have a density of population of at least 400 persons per sq km (1,000 per sq. mile).

(c) **City :** Towns with population of 1,00,000 and above are categorised as cities.Out Growth. An Out Growth (OG) is a viable unit such as a village or a hamlet or an enumeration block made up of such village or hamlet and clearly identifiable in terms of its boundaries and location. Some of the examples are railway colony, university campus, port area, military camp, etc., which have come up near a statutory town outside its statutory limits but within the revenue limits of a village or villages contiguous to the town. While determining the outgrowth of a town, it has been ensured that it possesses the urban features in terms of infrastructure and amenities such as pucca roads, electricity, taps, drainage system for disposal of waste water etc.

12.4 TRENDS IN URBANISATION IN INDIA:

The process of society's transformation from a pre-dominantly rural to a predominantly urban population is known as *'urbanisation'*. It includes two things an increase in the number of people living in urban settlements, and an increase in the percentage of the population engaged in non-agricultural activities, living in such places.Trends in urbanization in India from 1901 to 2011 are shown in below table. The total population living in urban areas as well as the percentage of urban population

to total population of India had been gradually increasing since 1901. For example, only 25.94 million people lived in towns till 1911 and by2011 the urban population of India increased by more than fourteen times to 377.11 million. At the time of the first census after Independence *i.e.* 1951, the population living in towns was 62.44 million. Since the 1961 census, however, the urban population and number of towns/urban agglomerations had increased steadily. There has been more than three times growth in urban population in four decades which increased from 109.11 million in 1971 to 377.11 million in 2011.The percentage of urban population to total population has also recorded a gradual increase from one decade to another with the only exception of a decline from 10.84 per cent in 1901 to 10.29 per cent in 1911. This declineis largely attributed to the devastating plague epidemic of 1911 which spread mainly in urban areas and brought an exodus of urban population to rural areas.

On the other hand, the World War II (1939-45) and partition of the country in 1947 were mainly responsible for a sudden spurt in urban growth during 1931-41'and 1941-51. Partition of the country resulted in a massive influx of refugees into India from West Pakistan (now Pakistan) and East Pakistan (now Bangladesh). Refugees from West Pakistan settled down mainly in Delhi and Punjab (including present Haryana) and to a lesser extent in western Uttar Pradesh, while those from East Pakistan found their way in Kolkata and its suburbs as well as in Assam and Tripura. In all, 14 new towns were built to accommodate refugees migrating from Pakistan. In addition, refugee colonies (new townships) were established near existing cities. As many as 19 places in Punjab, Haryana and Delhi were selected for locating these townships (generally called-Model Towns), However, the pace of urbanization slowed down during 1951-61 as a result of declassification of large number of towns.

The percentage of urban population to total population increased only by 0,68 per cent from 17.29 percent in 1951 to 17.97 per cent in 1961. As mentioned earlier,, the number of towns/urban agglomerations actually declined during this period. Further, it is worth mentioning that the pace of urbanizationlowed **down during 1981-**

91. The decennial growth rate had declined from 46.14 per cent in 1971-81 to 37.52 per cent in 1991. According to 2011 census, 377.1 1 million persons or 31.16 per cent of the total population of India is termed as *urban.*In spite of the above mentioned developments, India is still one of the least urbanised countries of the world. Only 31.16% of India's population (census 2011) is urban whereas world's 48% population (according to 2004 figures) lives in urban areas.

India was previously more urbanised than China where 21% population was urban. But that country has left India far behind with 41 % of its population as urban. Even Pakistan has 34% of its total population living in urban areas and is more urbanised than India. India's less than one-third of urban population is no comparison with 79% of the USA, 78% of Japan, 74% of European countries, 73% of Russia, 78% of New Zealand and 91% of Australia.India is' still considered to be a country of villages. But R. Ramachandran (1995) holds alto-gether a different view. According to him, "India is often portrayed as a land of villages and hamlets, nevertheless, in reality, it is equally a land of towns and cities. With over 12,000 settlements with populations of 5,000 persons or more, India has an urban infrastructure of gigantic magnitude". In terms of absolute numbers, India's urban population far exceeds the total population of the U.S.A. which is the third most populous country of the world. Further, it may be mentioned that India's urban population is the world's second largest after that of China.Table 13.5 shows that there had been gradual growth of urban population before independence. The decennial growth rate was at a very low level of 0.35 per cent in 1901 which shot up to 41.42 per cent in 1951. Thereafter, varying trends have been observed with respect to growth rates. The maximum 46.14 per cent in 1981 which declined to 31.80 per cent in 2011. However, such percentages can be misleading because the total urban population was much less in the pre-independence period as compared to the post-independent period.The number of cities/towns increased rapidly from 1,864 In 1911 to 3,035 in 1951. But this number fell sharply to 2,651 in 1961 due to declassification of several towns. Thereafter,

there has been steep rise in the number of cities/towns and the time of 2011 census, there were as many as 7,935 cities/towns in India.The forgoing discussion brings us is the conclusion that where have been three distinct phases of urban growth in India.

12.5 TREND OF URBAN GROWTH IN INDIA:

1. Period of Slow Urban Growth (before 1931): The period of 50 years extending from the first complete census in 1881 to 1931 is considered as the period tow urban growth in India. In 1881, only 9.3 per cent of India's population was living in urban areas which slowly increased to 11.99 per cent in 1931. Thus the growth rate during the first fifty years of census increased only by 2.69 per cent which is negligibly small as compared to the later increase in growth rates. This slow rate of urban growth is attributed to a large number of factors, but natural disasters like drought, floods, famines, epidemics had been the major causes. These factors led to high mortality rate and retardation of urban growth.

2. Period of Medium Growth Rate (1931-61): Period of thirty years from 1931 to 1961 is termed as period of medium growth. There was more than two-fold increase in urban population from 33.46 million in 1931 to 7854 million in 1961 and the percentage of urban population to total population also increased from 11.99 to 17.97 during the same period. This was because of major thrust given by the Government of India and many industrial towns and state capital towns came up immediately after Independence. World War II (1939-45) and partition of the Indian subcontinent in 1947 gave a major thrust to urbanisation in India. Several new towns were set-up to accommodate displaced persons from Pakistan. As a result of declassification of several towns in 1961, the number of towns fell from 3035 in 1951 to 2657 in 1961. Therefore *1951-61 is termed as inactive decade from urbanisation point of view.*

3. Period of Rapid Growth (1961-2011) : During the period of 50 years from 1961 to 2011, India witnessed rapid growth in urbanisation and urban centres. The

urban population saw more than four-fold increase from 78.94 million in 1961 to 377.11 million in 2011 and the percentage of urban population also shot up from 17,67 in 1961 to 31.16 in 2011. The number of towns which fell from 3,035 in 1951 to 2,657 in 1961 sharply increased in to 7,933 in 2011. This is a reflection of India's economic growth history and a major change in the demographic set up of the country as a large number of people are migrating from rural to urban areas in search of livelihood and better quality of life.

12. 4 Spatial Patterns of Level of Urbanisation: The level of urbanisation varies widely among the states. Goa is the most urbanised state where 62.17 per cent of the population lives in urban areas. This is followed by Mizoram where 51.51% of total population of the state lives in towns/cities. Among the larger states Tamil Nadu with 48.45 of its urban population is the most urbanised state. This state is followed by Kerala (47.7%), Maharashtra (45.23%), Gujarat (42.58%), Karnataka (38.57%) and Punjab (37.49%). The other stales with percentage of urban population more than the national average of 31.16 are Haryana, West Bengal and Andhra Pradesh. On the other end of the scale, Himachal is the least urbanised state where 10.04 per cent of the population lives in urban areas. The other states where level of urbanisation is below 20 per cent are Bihar (11.30%), Assam (14.08%), and Odisha (16.68%). The other states with level of urbanisation below the national average are Jammu and Kashmir, Uttar Pradesh, Sikkim, Arunachal Pradesh, Nagaland, Tripura, Meghalaya, Chhattisgarh and Madhya Pradesh. Among the Union Territories, Delhi is the most urbanized where 97.50 per cent of the population is classified as urbanised. Next in order of level of urbanisation are Chandigarh (97.25%), Lakshadweep (78.08%), Daman and Diu (75.16%), Pondicherry (68.31 %) and Dadra and Nagar Haveli (46.62%). The Union Territories of Andaman and Nicobar Islands is the least urbanised where only 35.67% of the population lives in urban areas. Of the total urban population of India, more than one-half lives in just five states. These states are Maharashtra (50.8 million), Uttar Pradesh (44.5 million), Tamil Nadu (34.9 million), West Bengal

(29.1 million) and Andhra Pradesh (28.4 million). The other five states of Madhya Pradesh, Gujarat, Karnataka, Bihar and Rajasthan, account for one fourth of India's total urban population. Thus, the total for these two sets of states comes very high over three-fourths of the total urban population of India. It is interesting to note that U.P. figures in this list, although it is one of the least urbanised states of India with only 22.28 per cent of its population living in urban areas. This happens because its size of urban population is very large (44.5 million) even though its urban percentage is low. One may compare Uttar Pradesh with Maharashtra where the degree of urbanisation is one of the highest in the country but its absolute urban population (50.8 million) is slightly more than that of Uttar Pradesh.

Urban Population in India, 1901-2011

Census Year	Population in Million		Urbanisation Rate %	No of Cities & Towns	Decadal Growth
	Total	Urban			
1901	238.40	25.85	10.84	1915	-
1911	252.09	25.94	10.29	1864	0.35
1921	251.32	2$:09	11.18	2018	8.27
1931	278,98	33.46	11.99	2188	19.12
1941	318.66	44.15	13.86	.2392	31.97
1951	361.10	62.44	17.29	3035	41.42
1961	439.09	78.94	17.97	2657	26.41
1971	548.23	109.11	19.91	3081	28.23
1981	683.33	159.46	23.34	3981	46.14
1991	846.39	217.55	25,70	4615	37.52
2001	1028.61'	286.12	27.82	5161	31.52-
2011	1210.19	377.11	31.16	7935	31.80

Source: Census of India 2011

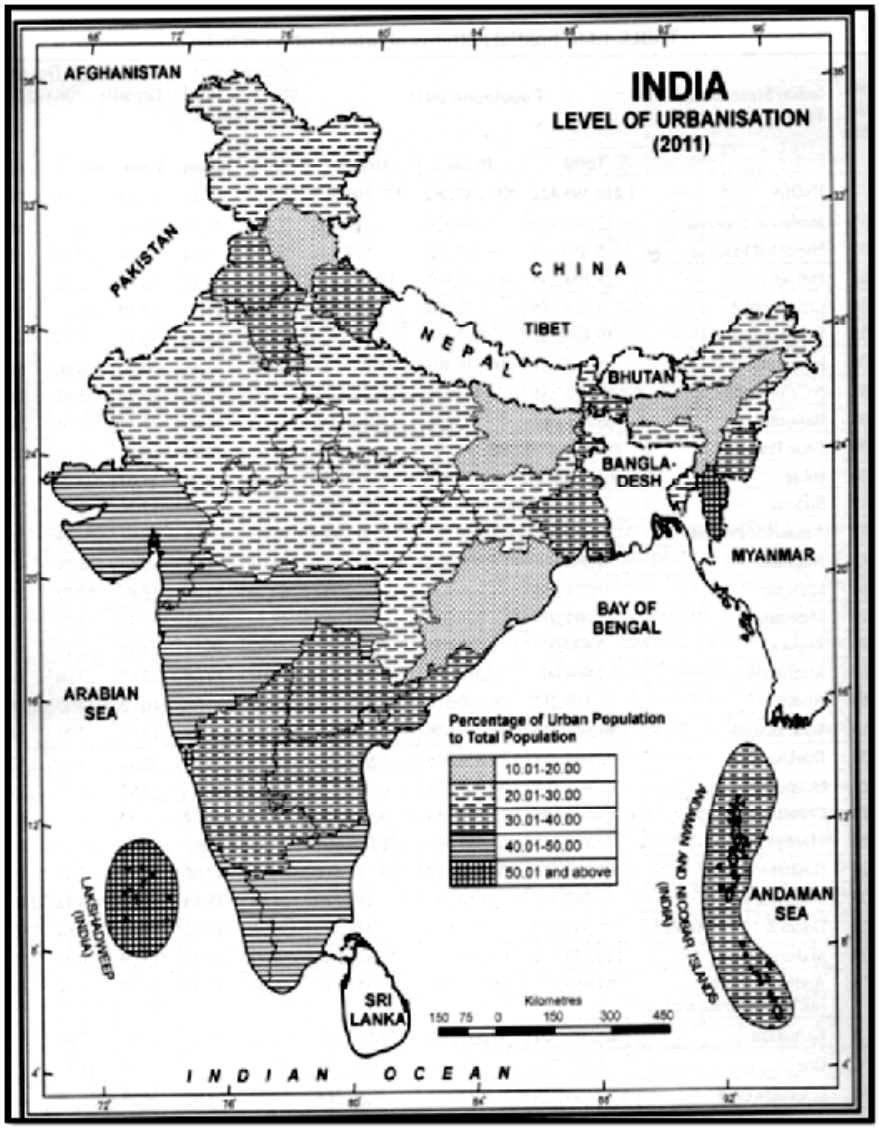
State wise Distribution of Urban and Rural Population 2011

S. No.	State / Union Territory	Total Population 2011			Percentage 2011	
		Total	Rural	Urban	Rural	Urban
	India	1,210,193,422	833,087,662	377,105,760	68.84	31.16
1	Jammu & Kashmir	12,548,926	9,134,820	3,414,106	72.79	27.21
2	Himachal Pradesh	6,856,509	6,167,805	688,704	89.96	10.04
3	Punjab	27,704,236	17,316,800	10387,436	62.51	37.49
4	Chandigarh	1,054,686	29,004	1,025,682	2.75	97.25
5	Uttrakhand	10,116,752	7,025,583	3,091,169	69.45	30.55
6	Haryana	25,353,081	16,531,493	8,821588	65.21	34.79
7	NCT of Delhi	16,753,235	419,319	16,333,916	2.50	97.50
8	Rajasthan	68,621,012	51,540,236	17,080,776	75.11	24.89
9	Uttar Pradesh	199,581,477	155,111,022	44,470,455	77.72	22.28
10	Bihar	103,804,637	92,075,028	. 11,729,609	88.70	11.30
11	Sikkim	607,688	455,962	151,726	75.03	24.97
12	Arunchal Pradesh	1,382,611	1,069,165	313,446	77.33	22,67
13	Nagaland	1,980,602	1,406,861.	573,741	71.03	28.97
14	Manipur	2,721,756	1.899,024	822,132	69.79	30.21
15	Mizoram	. 1,091,014	529,037	561,977	48.49	51.51
16	Tripura	3,671,032	2,710,051	960,981	73.82	26.18
17	Meghalya	2,964,007	2,368,971	595,036	79.92	20.08
18	Assam	31,169,272	26,780,516	4388,756	85.92	14.08

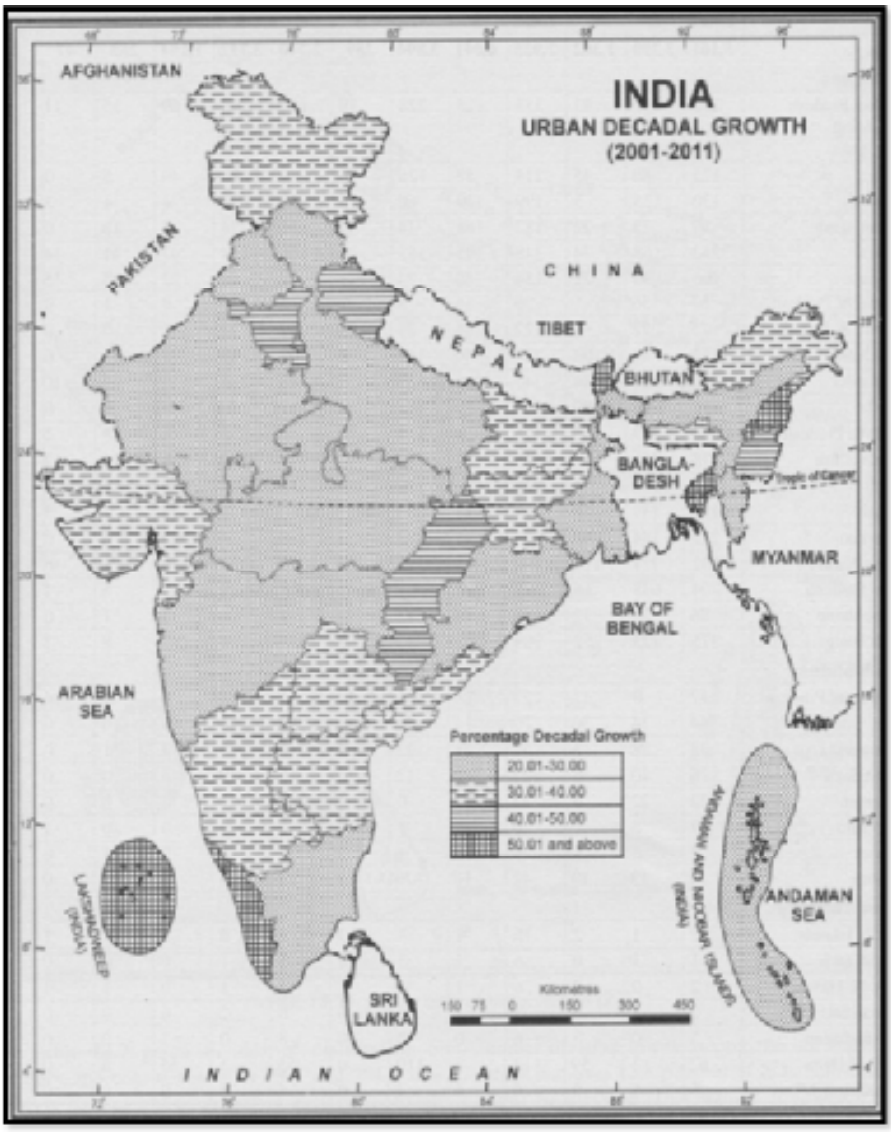
19	West Bengal	91,347,736	62213,676	29,134,060	68.11	31.89
20	Jharkhand	32,966,238	25,036,946	7,929,292	75.95	24,05
21	Odisha	41,947,358	34,951,234	6,996,124	8332	16.68
22	Chhattisgarh	25,540,196	19,603,658	5,936,538	76.76	23.24
23	Madhya Pradesh	72,597,565	52,537,899	20,059,666	72.37	27.63
24	Gujarat	60,383,628	34;670,817	25,712,811	57.42	42.58
25	Daman and Diu	242,911	60331	182,580	24.84	75.16
26	Dadra & Nagar Haveli	342,853	183,024	‘ 159,829	53.38	46.62
27	Maharastra	112,372,972	61,545,441	50,827,531	54.77	45.23
28	Andhra Pradesh	84,665,533	56,311,788	28,353,745	66.51	33.49
29	Karanatka	61,130,704	37,552,529	23,578,175	61.43	38.57
30	Goa	1,457,723	551,414	906,309	37.83	62.17
31	Lakhsdweep	64,429	14,121	50308	21.92	78.08
32	Kerala	33387,677	17.455506	15,932,171	52.28	47.72
33	Tamil Nadu	72,138,958	37,189229	34,949,729	51.55	48.45
34	Pudocherry	1,244,464	394,341	850,123	31.69	6831
35	Andaman & Nicobar Island	379.944	244,411	135,533	64.33	35.67

Source: Census of India 2011

LEVEL OF URBANISATION IN INDIA 2011



URBAN DECAAL GROWTH 2001- 2011



12.6 REGIONAL DISPARITIES IN INDIA :

INTRODUCTION:

Nature has created difference among people, among regions and among situations. These differences are known as natural differences and are taken generally as granted. Rural-urban disparities, particularly in post-colonial countries, have for long been one of the causes of concern for the policymakers. The disparities are seen in all spheres of human life-economic and non-economic. The extent of disparities, however, differs from country to country. India is the largest democracy with consistent economic growth rate since independence. India is also third largest scientific and technological workforce. In agriculture India produces sugar, groundnut, tea, fruits, rice, wheat, vegetables and milk in a large scale. With regard to demographic profile more than 720 billion i.e. one third of its population live in rural areas. Despite these developments, there is a wide gap between rural and urban India with respect to technology, living condition, economic empowerment etc. Many in rural India lack access to education, nutrition, health care, sanitation, land and other assets and they are trapped into poverty. In rural India there is high number of Infant Mortality with low Life Expectancy at Birth Rate.

Rural India mostly depends on agricultural sector. The growth rate in agricultural sector (primary sector) is 2-3% when compared to secondary and tertiary sector which are growing at the rate of 8-12%. Due to this there is a large scale migration of labour forces from rural to urban in search of employment. 8-12% growth rate in the secondary and tertiary sector help Urban India as an emerging global information based economy still urbanization of poverty is a major concern. In this paper an attempt is made to study the rural-urban disparity with the help of selected socioeconomic indicators. Apart from this, condition of women in rural-urban area is also discussed in this paper. On the other hand the differences created by man on account of social, economic, political, religious and cultural aspects are called not as differences but inequalities or disparities. These disparities are called respectively as social, economic, political, religious and cultural disparities. Among all the economic disparities are critical in nature and are the issues of great concern in the modern world. Economic disparities help other disparities be widened.

Therefore, if economic disparities are mitigated, other disparities are automatically narrowed. An economic disparity can be defined as a condition in which a person or persons though legally having equal rights is or are but for economic reasons deprived to some extent from available opportunities of fulfilling economic, social, political, cultural and/or religious needs. In many countries, especially the developing ones, the economic disparities have become widened on account of improper development plans and attained such a high level that not only the economic growth is being badly hit but social and cultural fabric also has become under tremendous pressure. In every economy the people have become divided into two separate groups the poor group and the prosperous group. The poor mass comprises the substantial majority of the world population and there has become a big gulf between poor and prosperous or rich people regarding wealth, wage, education and income. Therefore, at present the economic disparities mean deprivation or privation of a large mass and are thence taken as great evil and a challenge to the public welfare through economic development or growth.

The following issues, which are very relevant in the context of greater balanced regional development of the districts of Tamil Nadu state. The first and foremost issue pertains to some fundamental questions such as what is disparity. The term, development or disparity, is highly subjective. There are numerous definitions giving interpretations of these two terms. Development or disparity may relate any field social, political, physical, psychological and moral. In economics, these two terms used with reference to availability of per capita real income, employment opportunities, infrastructure facilities, amenities and services. These two terms interpreted as an increase or decrease in the material well-being of the population inhabiting a particular area. Development has been appropriately conceptualized as a process, which improves quality of life. Economic Planning has been used in the country as an instrument for bringing about uniform regional development because one of the major objective of the developmental programs has been a progressive reduction in regional disparities in pace of development. The process of development involves a significant change in the economic activities over different regions along with a change in the structure of the economy.

Economic disparities: As regards to India, the history of economic disparities goes back to the British rule. The British government in India developed those regions which were important for them on economic and administrative grounds while rest of the regions were left neglected. At the time of independence India was characterized by different types of disparities. Through the planned economic development since 1951 India has though succeeded in mitigating a few types of socio-cultural disparities to some extent but the economic disparities became more widened instead of being mitigated during the plan period. India Despite various remedial measures taken by the government through its fiscal policy and by the central bank (the Reserve Bank of India) through its monetary policy Indian economy is still fascinated in different inextricable and interwoven types of economic disparities as given below.Income and Wealth Disparity: Income distribution sufficiently unequal even in the pre-independence period but it became more unequal during the plan period after independence. 50% of the total national income goes to the hands of only 20% of the total population and rest 80% of the total population has to depend on the remaining 50% part of total national income. As regards to the distribution of wealth upper 10% of the households own 57% of the total built-up property whence only 43% of the total build-up property is distributed among 90% of the households. Similarly, 72% of the total farming families are marginal farmers and own only 10% of the total agricultural land while 28% of the farming families possess 73% of the total land. The lower strata poor majority is trapped in the problem of arranging bellyful bread while the upper strata rich minority is lacking the heads of expenditure to cover their large incomes. 2. Education Disparity: In remote rural areas there is widespread poverty and approximately 80% of the families are living in acute privation.

12.7 Sample Paper Chapter :

Short Answer Type Questions

Q. 1 Define Urbanisation

Q.2 What is disparity?

Long Answer Type Questions

Q.1 What is Urbanisation. Discuss in detail urban population in India?

Q.2 Discuss the major factors affecting the Urbanisation in in India.

Q.2 Discuss the Spatial Trend of Urbanisation in India.

12.8 Glossary:

1. **Urban:** Development of City or Town.
2. **Demographic:** To study component of population.
3. **Agglomeration:** Cluster of Accumulation.
4. **Drought:** Famine or scarcity.

12.9 Books Recommended

1 Negi, Balbir Singh: Geograpphy of India, Kedarnath , Ramnath,Meerrut, New Delhi.,1993

2 Singh Gopal: India (Latest adition) Atma Ram and sons Delhi.

3 Singh,Jagdish:India: A Comperhensive Systematic Geography, Radha Publications, New Delhi, 2003

4 Spate ,O.H.K. and Learmonth, A.T.A: India and Pakistan- Land , People and Economy , Methuen& Co. , London, 1967

5 Hussain Majid"Geography of India" Tata McGraw –Hill Publishing Company Limited New Delhi

6 KhullarD.R ," India A Comprehensive Geography, Kalyani Publishers New Delhi.

7 Deshpande,C.D: India- A Regional Interpretation, Northern Book Centre, New Delhi, 1992

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C. No. : GO-401 **Unit-IV**

BA- IV Semester **Lesson-13**

BASIS OF REGIONALIZATION- MACRO, MESO REGIONS OF INDIA

Kamlesh Salathia

13.1 Introduction

India is a vast country covering an area of about 32.87 lakh sq. Kilometeres. It is very difficult to study such a vast and varied country physically and culturally. Some criterion is required to divide it into smaller units and then understand that part in much more detail. The northern part of the country is totally mountaneous, central portion is a plain area, in the south, plateaus are there, coastal areas have their unique characteristics. All the areas of India cannot be understood thoroughly unless and until we divide country

into various sub-divisions. Various scholars from India and also from other parts of the world have their own point of view and have divided country into various major and minor regions.

13.2 Objectives

The objectives of this topic are:

(i) To understand the meaning of region

(ii) To make students aware of various types of regions like, natural, agricultural, industrial, geographical, population-resource etc.

(iii) To understand the concept of regional approach and systematic approach in Geography.

(iv) To compare and contrast the physical and cultural features operating in different parts of the country.

(v) To give the concept of uniqueness of a geographical area, why and how?

13.3 Concept of Region and Regional Approach

REGION: Region is area having similarity or homogeneity in its characteristics. The homogeneous character of a region is the result of various physical, cultural and economic factors. The term region is vague in character: the very concept, purpose and method of study, the size and shape of region etc vary. The delimitation of the region is always based on certain criteria. Region may be natural, economic, population resource, agricultural, industrial etc depending upon the purpose of study.

REGIONAL APPROACH: Regional approach focuses on a particular area of the earth and studies it through the whole gamut of geographical factors- physical, biotic and human. All the factors work unison and intersecting among themselves and with other areas over a longer period of period of time and give rise to homogeneous region. Its main concern is with the systematic study of the synthetic results and expressions of the various phenomena spatially related and interconnected in a particular region. For wooldridge and east," The purpose of regional geography is simply the better understanding for a complex whole by the study of its constituent parts."

13.4 Basis of Regionalization in India :

Various attempts have been made for the regionalization of India by different organizations but these regions were formed for specific purposes & they gave less significance to geographical factors. Well known work was produced by LD stamp in 1922-24. He delineated regions in India on the basis of physiography, structure and climate. Stamp divided India into three macro level and twenty two sub regions and designated these as " NATURAL REGIONS".

Three macro level groups of natural regions of the country are:

(a) The natural regions of mountain wall.

(b) The natural region of the northern plains.

(c) The natural region of Indian plateau.

`On the basis of climate and elevation, Himalayan region was divided into 4 sub regions. On the basis climate great alluvial plain region is divided into 5 sub regions. Further, on the basis of physiography and climate, Indian Plateau regions was broadly divided into 3 parts and sub-divided into 10 regions.

Stamp's work held importance for a long time and is still regarded valuable for broad divisions of India. In 1930, Pithawala adopted a factor of physiographic uniformity and gave regional divisions of India. Spate criticized Pithawala's scheme on the ground that single factor is not sufficient for regionalization of a large country like India especially for meso and micro level divisions.

Kazi S Ahmad brought fourth four macro-level divisions of India, separating the coastal plains from Indian Plateau. Spate divided India into three 'paramount' macro-level regions, based primarily on structure. His scheme of division is empirical and gives description of regions. He has brought fourth 35 regions sub-divisions. His view regarding regionalization is highly flexible and dynamic.

India is a vast and varied country physically and culturally. It is very difficult to understand it entirely. For regionalizing such a complex country like India, the criteria have to be multifactoral. Moreover, all the factors may not be of equal importance over

various parts of the country. Physical like geology, soil, natural vegetation, etc do offer some broad regions e.g. macro and meso but for further smaller regions cultural or human factors like population distribution, settlement, industrial development, agricultural practices, trade and commerce etc are very significant and provide base to regionalization in India

13.5 Macro and Meso Regions of India

The most accepted scheme of regionalization in India is as follows:-

Macro Regions

(a) Great plains

(b) Himalayan mountain region

(c) Penninsular uplands.

(d) The Indian coasts and Islands

Meso Regions

(i) Rajasthan plains

(ii) Punjab plain

(iii) Upper ganga plain

(iv) Middle ganga plain

(v) Lower ganga plain

(vi) Assam valley

(vii) Kashmir region

(viii) Himachal region

(ix) U.P Himalayas

(x) Eastern Himalayas

(xi) Purvanchal region

(xii) Udaipur-Gwalior region

(xiii) Malwa region

(xiv) Bundelkhand region

(xv) Chotanagpur region

(xvi) Meghalaya-mikir region

(xvii) Maharashtra region

(xviii) Chattisgarh region

(xix) Orissa highland region

(xx) Dandakranya

(xxi) Karnataka plateau

(xxii) Andhra plateau

(xxiii) Taminadu uplands and south Sahyadri

(xxiv) Gujrat region

(xxv) West coastal region

(xxvi) East coastal region

(xxvii) The Indian Island

13.6 Summary

For Regionalizing a complex country like India, no single master principle can be adopted and the criterion has to be multifactoral. Moreover, factors for regionalization may vary for different levels of hierarchy of regions like macro, meso and micro. For macro divisions, physical factors are important and for further lower level categories cultural, social and economic factors are of due importance. The Geography of the country is better understood if we divide it into smaller units and then study them in much more details. The Reginalization as done by R.L Singh is most accepted all over India.

13.7 Glossary

(i) **Delimitation-** To limit the boundary.

(ii) **Empirical-** Findings on direct observation.

(iii) **Gamut-** Complete range.

(iv) **Homogeneous-** Area with similar character.

(v) **Physiographic uniformity-** Physical similarity.

(vi) **Paramount-** Utmost or highest.

(vii) **Region-** A defined area.

(viii) **Synthetic-** combined.

(ix) **Vague-** Not clearly defined.

13.8 Short Answer-type questions

(i) Define a region?

(ii) Differentiate between regional and systematic geography.

(iii) Name the scholar and year when first Geographical REginalization was done in India.

(iv) Name macro divisions of India.

(v) What do you mean by empirical observation.

13.9 Examination oriented questions

(i) What do you understand by Regionalization?

(ii) Give the basis of dividing India into various geographic regions. Discuss how geographers have given their point of view from time to time.

(iii) Divide India into macro regions and evaluate the northern plains of India.

(iv) Name the meso regions of India and also throw light on the various factors taken into consideration.

13.10 Suggested readings

1. Hussain, Majid (2017). Geography of India, Mc Graw Hill Education.
2. Singh, R.L (2007). India: A Region Geography, National Geographical society of India.
3. Khullar, D.R (2011) India a Comprehensive Geography, Kalyani Publishers, New Delhi.
4. Singh, Gopal (2010) A Geography of India, Atma Ram& sons, New Delhi.
5. Spate O.H.K (1967) India and Pakistan: A general and regional geography

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C. No. : GO-401 **Unit-IV**

BA- IV Semester **Lesson-14**

INDUSTRIALIZATION REGIONS OF INDIA AND FACTORS OF LOCALIZATION OF IRON AND STEEL AND COTTON TEXTILE INDUSTRIES

Kamlesh Salathia

14.1 Introduction

Industries are not located everywhere in India. There are certain areas where industries find their suitable location. Moreover, every type of industry cannot be established in every area. Numerous factors physical, economic, social, cultural and administrative are responsible for setting up of any industry. Cotton textile centres are found mostly in coastal areas and areas of raw materials, iron, and steel industries are located near mining areas of India, certain industries like electrical goods, pharmaceuticals, consumer goods are located in densely populated area where great market is there. The location of public sector industries is controlled by government in order to achieve equal growth and development of various parts of the country. In India,there are eight major industrial clusters, fourteen minor regions and twelve industrial districts and many more are coming up at a very fast rate in order to meet the demands of people .

14.2 Objectives

i) To give students the concept of an industrial region.

ii) To find out reasons,why certain regions of the country are lagging behind in industrialization.

iii) To understand the various industrial clusters and find out the future prospects for further growth.

iv) To discuss each and every factor for setting up of an industry and its consequences both positive and negative.

14.3 Concept of industrialization

14.3.1 Definition of industrial Region

Industrial region may be defined as the region having a huge concentration of factories of same types or of various types. Development of industries in the region depends upon a number of factors, geographical ,economic ,social and administrative, This region is unique one in its characteristics and meets greatly to the demand of consumers.

14.3.2 Factors for establishment of industries

The localization of Industries depends upon a number of geographical and economic factors. These factors are known as factors of localization of industries or agglomeration of industries. The most important such factors are:

(i) Raw material

(ii) Source of power

(iii) Labour

(iv) Means of Transportation

(v) Market

(vi) Other factors like climate, Government policies, capital, water, land, etc.

(vii) New factors in changing situation with the advancement of Scientific and Technological development.

14.4 Major Industrial Regions of India

14.4.1 General classification

Industrial Regions of India are classified into three categories

(i) Major industrial clusters: Those employing a minimum daily number of 15 lakh workers.

(ii) Minor Industrial regions: Those employing minimum daily 2.5 lakh workers.

(iii) Industrial Districts: Those employing a daily minimum of 25,000 workers.

14.4.2 Major Industrial clusters of India

1 Mumbai –Pune Industrial Region

2 Hugli Industrial Regions

3 Banglore –Tamil Nadu Industrial Region

4 Gujrat Industrial Regions

5 Chotnagpur Industrial Region

6 Vishakhapatanan –Guntur Industrail Regions

7 Gurgaon-Delhi –Meerut Industrial Region

8 Kollam- Thirvananthapuram Industrial regions

1. Mumbai –Pune Industrial Region

Industrialization in Mumbai started in the year 1774 when British acquired the Island of Mumbai as site to develop a port . Industrialization further got boost with the opening of 34 KM Mumbai –Thane Railway Track in 1853. Opening of routes therough Bhorghat to Pune and Thalghat to Nasik extended regions influence to the hinterland .

The opening of the Suez Canal in 1869 established closer link with Europe . Mumbai Region had favourable conditions for raw cotton and thus for cotton textile industry . These factors are:-

i) Availability of black soil for cultivation of cotton in Naarmada and Tapti basin .

ii) Coastal humid climate ideal for weaving and spinning.

iii) Easy availability of hydel power from Western Ghats.

iv) Mumbai Port facility for import and export .

v) Cheap Labour from the hinter land.

vi) Thus, this region developed as the 'cottonopolis 'of India with cotton textiles, chemical industry also developed with the exploration of oil from Mumbai High, petro chemical industry developed.

Now industrial centres have been developed from Mumbai to Kurla, Jogeshwari, Ghatkoper, Villeparlo, Andheri, Kalyan,Pimpri, Pune, Bhandup and thane. The various products of this region are textiles , chemical, engineering goods, electrical goods, drugs , transport equipment, plastic goods, synthentic & leather goods , food products and ship-building.

Major Problems faced by this industrial belt are:-

i) Most of the cotton growing area went with Pakistan in 1947 and various industries were shut down because of shortage of Raw cotton .

ii) Problem of congestion is there because of limited space. To overcome this problem disposal of industries is required. Development of Navi Mumbai- a planned urban are can further solve the [problem of congestion of this region.

2) The Hugli Industrial Region

This region is located along river hugli for a distance of 100 KMs from Bansbaria and Naihati in the north to Birlanagar in the South.

Favorable factors for the growth of this industrial hub aew :-

i) River Hugli serves as inland river fort .

ii) It is well connected by Ganga and its tributaries with the rich hinterland, supplying raw material.

iii) Good road and rail transpost network connecting region to Kolkata port.

iv) Discovery of coal and iron ore in chotanagpur plateam, tea plantation in Assam and Northern parts of West Bengal and availability of raw jute in detalic region led to industrial development of this region.

v) Cheap labour is available from thickly populated states of odisha, Bihar Jharkhand and Utter pradesh (U.P).

vi) Britishers invested capital at a large scale for industrial establishments in the past when it was capital of British India.

vii) The modern industrial developed began with the establishment of first jute mill at Rishra in 1855, later on chain of jute mills and other factories were established on both the banks of river Hugli.

viii) At present Kolkata Hugli industrial region is the hub of jute textile , cotton textile , paper ,engineering , textile machinery, electrical , chemical, pharmaceutical , fertilizers, petrochemical industries etc. Factory of Hindustan Motores at Vananagar and diesel engine factory at Chittarnjan are landmarks of this region. Oil refinery at Haldia has faciliated the development of variety of industries. The major centre sod this industrial region are at Kolkata, Haora, Haldia, Serampur, Rishere, Shibra, Budge Budge, Birlanagar , bansbaria, Belgurriah, Triveni, Hugli, Belur etc.

This region faced problem of shortage of raw jute in 1947 when most of jute growing area went to east Pakistan (now Bangladesh) . Later on , this problem was solved growing more jute at home.

Silting of hugli river is another problem.Construction of Farakha Dam barrage about 300 KMs Upstream on Ganga and flushing of channel are the possible answers.

Kolkata Port had a great pressure of cargo ships which has been relieved by construction of Haldia port.

Jute industry of this region is facing tough competition with sythentic paching materials. Thus, region as whole has sluggish growth.

3 Banglore –Tamil Nadu Industrial region

This Fast growing industrial region is spread over all the district of Tanmil Nadu and Banglore, Mysore and Mandhya districts of Karanataka. First of all cotton textile industry was established here and at present it has

large numbers of silk industries, sugar mills, leather industry, chemical, railwagons,diesel engines,radia, light engineering goods, medicines, aluminuim, cement, glass , paper ,Cigarette ,match box,machine tools etc.

Favourable factors for growth and development of the industrial region are:

i) Availability of raw cotton in Tamil Nadu.

ii) Cheap hydropower from Mettur, Sivaramundram, papnaram, pykara and sharvati dams

iii) Cheap skilled labour and nearness of vast market for finished goods

iv) Moderate climate for concentration of textile industries

Coimbatore is known as "Manchester of Tamilnadu "because of its large scale cotton textile industr . Banglore is famous for Hindustan Aeronautics, Hindustan macnine tools, Indian Telephone industry and Bharat Electronics, Madurai is known for cotton textile , Visvesvaraya iron and stell plant is located at Bhadravati. Salem is famous for iron and steel plant. Other important industrial centres are Sivahasi , Tiruchirapalli, Madulottai,Mettur ,Mysore , Mandya, Manali, Nsrimanam, Nagapattiinam etc.

4 Gujrat Industrial Region

Region extends from Ahmedabad to Vadodara, upto Valsad and Surat in south in South and Jamnagar in the west cotton textile industry was esn mid 19th century because of various favourable factors. Decline of cotton textile industry in Mumbai gave further boost to this industry in Gujrat . Various other industries of this regionare silk , sythentic fibre , petro chemical , chemical industry, engineering goods, pharamautical , diesel engine, textile machinery, dairy products, food processing etc.

Factors which favour the growth of Ahmedabad vadodara industrial region are:-

i) Raw cotton from nearby area

ii) Cheap and skilled labour from region itself

iii) Vailability of market in northern planes of india

iv) Kandla port Facility for trade with outside world

v) Discovery of oil in Gulf of Khambhat led to the development of Petrochemicals.

vi) Efficient transport and communication network

The main industrial centres are Ahmedabad , vadodara, Bharuch, Koyali, Surat, Sundernagar, khera, Anand, Jamnagar, Rajkot and **valshad.**

5) Chota Nagpur Plateau Industrial Region

This region is located on Chotanagpur plateau and extends over Tharkhand , Northern Odisha and Western parts of West Bengal. ThisDiscovery of coal in Damodar Valley and iron ore in Tharkan- Odisha mineral belt led to the birth and growth of industrial region. As both iron ore and coal are found in close proximity, the region is known as the 'Ruler of India'.

Power is availed from the dam sites in the Damodar Valley Project and thermal power stations, cheap labour from Bihar, Odisha, Eastern U.P has met the demand of industry, water resources are easily available in nearby area which are required for heavy and basic industries. Market is available in Kolkata region for good produced in Chota Nagpur. Kolkata also serves as a port for import and export of goods. Means of transportation, rail and road are well developed which helps in the transportation of products in the market. The important industries of the region include iron and steel, heavy engineering , machine tools, fertilizers , cement, paper, locomotives and electrical. The important nodal centres are Ranchi, Dhanbad, Chiabasa, Sindri, Hazuribagh, Jamshedpur, Daltaganj Garwa and Japla. Tata Iron and steel company at Jamshedpur

Indian iron and steel Company , Hindustan steek Ltd at Durgapur and Rourkela and Bokaro are the important steel plants located in this region.

6) Gurgaon – Delhi –Meerut Industrial Region:-

Region consists of two industrial belts, one extends over Agra –Mathura –Meerut and Saharanpur in U.P and other belt extends Between Faridabad-Gurgaon–Ambala in Haryana. it developed after independence being a capital region. Favourable reasons for the growth and development of industries here are:-

1) Hydro –power supplied by Bhakr –Nangal Dam. Thermal power is supplied by stations located at Harduaganj, Faridabad and Panipat.

2) Availability of market for variety of finished goods.

3) Cheap labour from surrounding states which are densely populated.

4) The region is located away from the mineral and power resources, and therefore the industries are light and market oriented.

5) It is one of the fastest growing region because of being Nation Capital Region.

Sugar, agricultural implements, Vanaspati ,textile, glass, chemical, engineering goods, paper, electronics, cycle, software etc are some of the important industries of this region.

Agra is famous for its glass industry, Mathura has oil reginery has also been set up. Gurgoan has Maruti car factory, a number of engineering and electronics industries have been set up at Faridabad and Gaziabad and Gaziabad is a centre of large number of agro-based industries. Saharanpur and Yamunanagar have peper mills and Sugar Mills . Other industrial nodes are Modinagar, Sonipat , Panipat, Ballabhgarh etc.

7) Vishakhapatnam-Guntur Industrial region:-

This industrial region extends from Vishakapatnam district in the north – eastern part of Andrapradesh to Kurnool and Prakasham district in the south-east Vishakapatnam and Machilipatnam ports are main factor for industrial development odf the region. Developed agriculture, rich mineral in hinterland provide solid base for growth. Coal fields of Godawari basin are the main source of energy. The major industries are ship building at Vishakapatnam, oil refinery at Vishakapatnam and associated Petro-chemical industries have developed the only iron and steel plant having coastral location is also located here.This steel plant uses coal from Bailadila in Chattisgarh. Lead-Zink smelter plant is at Guntur district. Other industries are suger, textile, paper, , fertilizers, cement, aluminium and light engineering goods. Dscovery of natural gads in Krishana – Godwari basin is likely to provide much needed energy and faster the industrial growth of region. The main industrial centres are Vishakapatnam, Vijawada, Vijay nagar , Rajahmundry, Kurnool, Elum and Guntur.

8) Kollam – Thiruvananthpuram industrial region:-

Comparatively small industrial region extends over Thiruvananthpuram, Kollam , Alwaye, Ernakulam and Allafuzha districts of south Kerala. The region is located for away from mineral belt of the country so most of the industries are agriculture based, market oriented and light industries. Plantation agriculture and availability of hydropower in kerala provides a base to the industrial development. The main industries are textiles , sugar, rubber , match box, glass, chemical fertilizer, food and fish processing , paper, coconet coir products, aluminium and cement . Petro-chemical industry developed with the setting of oil Refinery at Kochi in 1966, main industrial centres are at lollam, Thiruvananthpuram , Alluva, Kochi , Alappuzha and Punalur.

Besides major industrial regions, country has 13 minor industrial Regions.

Minor Industrial Regions are :

1. Ambala – Amritsar in Haryana and Punjab.
2. Ssharanpur –Muzaffarnagar-Bijnour in U.P.
3. Indore –Dewas –Ujjan in M.P
4. Jaipur –Ajmer in Rajasthan
5. Kolhapur –SouthKannada in Maharastra- Karnataka
6. Northern Malabar in Kerala
7. Middle Malabar in Kerala
8. Adilabad – Nizambad in Andra Pradesh(A.P)
9. Allahabad – Varanasi –Mirzapur in U.P
10. Bhojpur –Munger in Bihar
11. Durg- Raipur in Chattisgarh
12. Bilaspur – Korba in Chattisgarh
13. Brahamputra valley in Assam.

14.5 Locational factors for Iron and Steel Industry

Iron and steel is the basic or key industry and lays the foundation of industrial economy . Most of the subsidiary industries such as automobiles, locomotives, rail tracks , ship-building, machine building, bridge, dams and lot of other industrial and commercial activities depends upon iron and steel industry .

The beginning of modern iron and steel industry was made in 1907when Tata Iron and Steel company (TISCO) was set up at Jamshedpur. The Indian Iron &steel company was setup in 1919 at Burnpur, Mysore steel works at Bhadravati in 1923, and in 1950 three steel projects were started at Bhilai, Durgapur & Rourkela. India is now 8th largest producer of steel in the world.

Locational Factors:

1. Availability of Raw Material: Iron &steel industry uses large quantities of heavy and weight losing raw materials and its localisation is mainly controlled by the availability of raw materials. Coal &iron are the two basic raw materials used by iron and steel industry and on the basis of minimum transportation cost, most of the steel plants are located at three distinct places viz. (1). Near coal fields (2).near iron ore mining centres (3).and at the places between iron ore mines and coal mines. Most of the iron and steel plants are located in Jharkhand, Westbengal, Odisha and Chattisgarh .

These plants are Jamshedpur, Burnpur, Durgapur, Rourkela, Bhilai & Bokaro. Visveswaraya iron &steel works at Bhardravati is a major exception which is located away from raw material region. It is based on hydropower from Sharavati Power Project.

2. Availability of Market: Steel products are quite bulky and it has been estimated that the transport cost per tonne of steel product is about three times more than that of coal or iron ore. Thus, following the theory of minimum transport cost, many centres of iron and steel production tend to be attracted by market. Moreover, recent technological developments in transport and the use of scrap as raw ,material have made market oriented location more advantageous than ever before. Scrap has become very important raw material the world over. Thus, the market has double attraction,as a source of raw material and as the consumer of steel.

3. Sea port location, when some raw materials for industry to be imported and finished steel to be exported then sea port locations are pregerred. In India Vishakhapatnam, Mangore and Ratnagiri iron and steel plants favour sea port location.

Thus, localization of Iron and steel industry in India is determined by three main factors i.e measures of Iron ore mines, location of coal mines or availability of energy source and nearness of market.

14.6 Locational factors for Cotton Textile Industry

Textile includes cotton ,jute ,wool, silk and synthetic fibre textiles. This industry employs maximum population.Textile industries contribute about 12% industrial production, 4% to the GDP and provides employment to about 45 million persons. Exports earning

of textiles industry is 11% . India is the 3rd largest producer of cotton , second largest producer of silk, fifth largest producer of synthetic fibers in the world.

The first modern cotton textile mill was set up at Fort Glaster near Kolkata in 1818 but could not survive so first successful cotton mill was established at Mumbai in 1854. Largest concentration of cotton textile industry is found in Maharastra, Gujrat, West Bengal, U.P, M.P, and Tamil Nadu.

Several factors are responsible for location of cotton textile in certain states.

1) Availability of raw cotton.

2) Cheap and skilled Labour

3) Good Transport facilities

4) Efficient power supply

5) Availability of market

6) Humid climate

7) Financial facilities

8) Port facility

1) **Availability of raw material:** The significance of raw material is evident from the fact that 80% of the industries are located near cotton growing tracts of the country. Some of the important centres such as Ahmedabad, Solapur, Nagpur, Coimbatore and Indore are located in the areas of large scale cotton cultivation. Mumbai is also not for from cotton producing area of Gujarat and Maharastra . However, cotton as a raw material is light weight and non perishable. It hereby looses any weight .Therfore, nearness of raw material site is not essential. Other factors became more important.

2) **Cheap and skilled labour:** Basically , cotton textile is a labour –intensive industry. It requires skilled as well as unskilled labour for various processes of cotton textile manufacturing. Cheap and plenty of labour in india is available in nearby areas of industrial centres.

3**)** **Good Transport facilities:** Easy means of transportation are needed for all industries, and particularly for cotton, the product of which is cheap and for which the market is sometimes situated thousands of miles away. Indian cotton textiles industry is catering to the needsw various consumers living for away because of good transportation system. Moreover, for transportation of raw material from cultivators to factories, efficient and cheap means are required and it is there case of Maharastra, Gujarat, Tamil Nadu, U.P, etc.

4) **Power Supply**: This industry requires constant and cheap sources of power. Most of the industries are located near sources of power. Earlier cotton textile industry was based on power from coal; this can be seen in U.K. In India , industry grew and developed due to availability of hydropower from various dams in Maharastra, Gujarat , Tamil Nadu, U.P and thermal power in case of Madhya Pradesh and West Bengal. Hydropower is comparatively a cheap source, so it is preferred by the industrialist.

5) Availability of market: The entire process of manufacturing is useless until the finished goods reach the market. Nearness of market is essential for quick disposal of manufactured goods. Consumers to get things at cheaper rate . Cotton textile is primarily a market oriented industry. With tropical and sub-tropical climate, all part of India provide vast market for cotton textile industry. West Bengal, Biha , U.P Kerala and Odisha do not grow cotton and still have large number of cotton textile centres because of availability of consumers.

6) Humid climate: Climate plays an important role in the setting up of an industry at a particular place.The best suited location for cotton textile is coastal because of humid climate . The thread during spinning and weaving does not break so frequently. Consequently, majority of cotton textile mills are concentrated in Maharastra and Gujarat. Artificial humidifiers are used in dry areas these days ; but it increases the cost of production. Extreme type of climate, hot, dry or cold not suitable for establishment of cotton textile industry.

7) Financial Facility:- Modern industries are capital intensive and require huge investments. Capitalists are available in Urban areas, banking and insurance facilities are also available in big cities, so most of the Urban centres like ; Mumbai, Kolkata , Delhi, Chenai etc.

8) Port Facility: Textile mills in Gujarat , Maharastra , West Bengal ,Tamil Nadu and Kerala also enjoy port facility for import of machinery and export of finished products. Thus, all the factors are equally significant for location of an industry in a particular area.

14.7 Summary

To sum up, the Industrial clusters of India are fast growing both horizontally as well as vertically. These regions are becoming more and more diversified producing a huge range of products with the increasing demand on the part of consumers. Certain regions are facing problems like congestion, crime, pollution, lack of space for expansion etc. With the advancement in the field of science and technology certain constraints in localization have not been remained rigid, labour has become more mobile, energy can be transmitted from long distances, raw material can be transported with ease etc. In the coming future India is going to be a strong industrial nation.

14.8 Glossary

(i) Cottonopolis- large scale production of cotton textile

(ii) Establish- to set up

(iii) Hinterland- area of influence of city

(iv) Node- area of concentration

(v) Proximity- nearness

(vi) Sluggish- slow

14.9 Short Answer type questions

1) Define an industrial region.

2) Classify industrial regions.

3) Name the factors of localization of industry

4) Briefly discuss the role of energy in industrial development.

5) What is mean by cottonopolis?

14.10 Examination oriented questions

1) Draw an outline map of India and locate the major industrial regions.

2) Discuss the origin, development and problems of Mumbai-Pune Industrial region.

3) Evaluate the factors of localization of Iron and Steel Industries in India.

4) Compare Chotanagpur industrial region wit Delhi-Meerut industrial region.

14.11 Suggested Readings

1. Hussain, Majid (2017). Geography of India, Mc Graw Hill Education.

2. Singh, R.L (2007). India: A Region Geography, National Geographical society of India.

3. Khullar, D.R (2011) India a Comprehensive Geography, Kalyani Publishers, New Delhi.

4. Singh, Gopal (2010) A Geography of India, Atma Ram& sons, New Delhi.

5. Spate O.H.K (1967) India and Pakistan: A general and regional geography

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C. No. : GO-401 **Unit-IV**

BA- IV Semester **Lesson-15**

INDIA: ENVIRONMENTAL PROBLEMS AND MEASURES OF CONSERVATION

Kamlesh Salathia

15.1 Introduction

The study of environment in one way or the other has always been recovery theme in geography . Since 1970 the environmental studies have gained importance in geography and different issues regarding environment are being probed into under the sub-field of environmental geography . Further, geography is the only discipline that can pursue the study of environment in totality because it is a spatial science, it lays stress on

synthesis of all near surface spheres, it includes the studies of all the components of the earth biotic and abiotic both.

With and unplanned utilization of natural and man-made resources, India is facing various environmental problems. A thorough study of these problems and solutions there of are required immediately.

15.2 OBJECTIVES

i) To understand the meaning and significance of environment.

ii) To make the students aware of the various problems of environment.

iii) To discuss the negative impact of various types of pollutions air, noise, soil etc

iv) To find out the measures of conservation of natural and mancontribute to tackle the environmental problems .

15.3 Definition of environment

Environment is defined as the social, cultural and physical condition that surround and influence the survival, growth and development of people, animals and plants. Environment includes everything around us. It encompasses both the biotic and abiotic components of the earth. Living things live in their environment. They constantly interact with it and adapt in their environment.

In the early times man lived harmoniously with environment but as the number of human population grew and due to technological development, the degradation of environment started. With a population over 1.3 billion, India is soon set to dislodge China as the most populous country of the world. While India has one of the fastest growing population in the world today, its far behind most others when it comes to preserving the environment and the ecology. Today, our country is riddled with a number of environmental concerns which have only aggravated in the last few decades. It is high time to tackle these issues and find out solutions. No doubt, India is ahead to join the league of top economies internationally, it must stick to a growth path that is environmentally sustainable. Neglecting the environment can create havoc and the damage done may become irreparable.

15.4 Major environmental Problems in India.

Following are some of the major environmental problems that our country is facing today:

AIR POLLUTION: Air pollution is one of the worst problems which has affected India. According to a report from the International Energy Agency (IEA), by 2040 there are likely to be about 9 lakh premature deaths in the country due to the drastic rise in air pollution in the country. India has also 11 out of 20 most polluted cities in the world.

Air pollution is due to the following mechanism:

- CO_2 emission
- Chlorofluoro carbon emission (CFC_s)
- Deforestation
- Thermal pollution
- Over grazing
- Extension of irrigation
- Nitrous oxides

Groundwater Depletion

Rapidly depleting levels of ground water is one of the biggest threat to good security and livelihood in the country. Accessing the ground water has become increasingly difficult over the decades. Excessive exploitation of limited ground water resources for irrigation of cash crops such as sugarcane has caused a percentage point decline in the availability of water within meters from ground level. Low rainfall and drought are also reasons for ground water depletion. The north western and south eastern parts of the country are the worst hit. These are also regions responsible for the most of the country's agricultural production and food crisis in a natural corollary.

Climate Change

The problem of Carbon-dioxide (CO_2) emission has become a major environmental concern. CFC emission, methane, nitrous oxide, thermal pollution etc. leads to global

warming. In may 2016, phalodi in Rajasthan recorded a temperature of 51^0 C, the highest ever in the country. The increasingly tomenting heat waves in the past years are but an indication that global warming and climate change are real challenges that the country is facing now. With the Himalayan glaciers melting at an alarming rate, floods and other such natural disasters are occurring with increasing frequency. The number of forest fires , floods, earthquakes and such other calamities over the past five years have been unprecedented.

Use of Plastics

Unrestrained use of plastics is another major concern in the country. According to data from the Plastindia Foundation, India's demand for polymers is expected to go up from 11 million tonnes in 2012-13 to about 16.5 million tonnes in 2016-17. India's per capita plastic consumption went up from about 4 kg in 2006 to 8 kg in 2010. By 2020, this is likely to shoot up to about 27 kg. to understand the damage that this can cause to the environment, it is important to understand that plastics are one of the least biodegradable materials. An average plastic water bottle could take up to 500 years to decompose naturally.

Loss of Biodiversity

According to International Union for conservation of Nature's Red Data Book, some 47 species of plants and animals in India are listed as critically endangered. Loss of ecology and natural habitats have left many indigenous species, including important one's such as the Siberian Crane, Himalayan Wolf and Kashmir Stag are in grave danger of going extinct. Rapid urbanization, poaching and indiscriminate hunting for leather, meat, fur etc. have rendered these animals critically endangered and the flora or herbal treasure of India in near-extinction conditions. Many of the plants commonly harvested for their medicinal properties are vanishing along with the legacy of Ayurvedic treatment.

Deforestation

Forests are nature's protective shield, but this shield is being erode by man folly and greed. As Gandhi Ji once said, " nature has enough for everybody's need but not for everybody'd greed." Indiscriminate felling of trees is destructive and contra-productive and urgent steps are required to put down this evil with iron hand. It disturbs the ecological

balance, causes environmental pollution, leads to soil erosion, landslides, floods, drying up of water sources, climate changes etc.. according to experts, forest should cover one-third of the land area of country. But in India, forest cover is only 24%.

Degradation of Soil:

Soil erosion and degradation of soil quality is another issue of great concern in India. Deforestation, construction activities, mining etc. have led to large scale soil erosion in the country, especially in hilly parts of north and north-east. In plain areas quality of soil has gone down due to excessive use of fertilizers, very dry conditions or very wet conditions. Poor soil quality has further led to decrease in agricultural production in many areas.

Water Pollution:

This form of environmental degradation occurs when pollutants are directly or indirectly discharged into water bodies adequate treatment to remove harmful compounds. The largest source of water pollution in our country is untreated sewage. Major rivers are getting less and less safe for human usage. Large scale industrialization and less restrictions on setting up of factories has further aggravated the problem. Flora and fauna of water bodies gets affected.

15.5 Measures of Conservation of Environment.

Environmental conservation is related to rational adjustment of man with nature involving, judicious exploitation and utilization of natural resources without disturbing ecological balance.

Environmental conservation includes:

(a) Restrict and regulate the exploitation and utilization of natural resources.

(b) To control environmental degradation and pollution.

(c) To regulate degraded environment to renew the natural resources

(d) To reduce the impact of extreme events and natural disasters.

(e) To make optimum use of natural resources.

(f) To review and revise the existing technological production in term of their adverse effect on the environment

(g) To formulate laws and implement them for environmental protection.

(h) Organizing public awareness programs.

(i) Environmental impact assessment.

The protection of environment is a global issue. It is not an isolated problem of any area. India must be credited for having made significant in its constitution and for having enacted many laws for the protection and improvement of environment.

15.6 Summary

The sum total of physical and elements of particular location on the earth's surface at a specific time span is called environment. With growing population and with the advancement in the field of science and technology, man has started overexploitation of resources and then causing a great damage to the environment. The consequences of these misutilization of environment man is already facing and these problems if not checked or tackled may further lead to serious results . The solution lies in the proper assessment, management and conservation. Environmental policy has to be implemented fully to protect it and save it from further deterioration. The concept t/ fu edl kof sustainable development needs to be adopted for happier and healthier India.

15.7 Glossary

i) **Adopt -** To adjust

ii) **Aggravate-** To further increase the problem

iii) **Dislodge-** to move from former position

iv) **Encompass -** include

v) **Enact-** To make

vi) **Harmonious –** in harmony , pleasant

vii) **Indigenious –**Of the country

viii) **Tormenting –**severe

15.8 Short Answer –type Questions

i) Define Environment.

ii) What is meant by ecology

iii) Define sustainable development

iv) What do you unadjusted by CFCs

v) Enumerate the factors of soil depletion

15.9 Examination Oriented Questions

i) The major environment problems in India

ii) Give significance of environment for man.

iii) Suggest various measures to overcome the problem of air and water pollution in India

15.10 Suggested Readings

1. Hussain, Majid (2017). Geography of India, Mc Graw Hill Education.
2. Singh, R.L (2007). India: A Region Geography, National Geographical society of India.
3. Khullar, D.R (2011) India a Comprehensive Geography, Kalyani Publishers, New Delhi.
4. Singh, Gopal (2010) A Geography of India, Atma Ram& sons, New Delhi.
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C. No. : GO-401 **Unit-IV**

BA- IV Semester **Lesson-16**

MAJOR TOURIST DESTINATION OF INDIAN STATES- HIMACHAL PRADESH AND RAJASTHAN

Kamlesh Salathia

16.1 Introduction

India is naturally a very beautiful country with varied topography. On the one side we have lofty now covered mountains , long mountains ranges with deep valleys, a very vast lush green meadows, large snow grounds, transparent lakes at high altitudes etc on the other hand there are long beautiful beaches and islands which attract lakhs

of people every year from every corner of the world . The rich religions culture and the religious places, annual fairs, historical monuments, vast deserts etc are also major attractions in India. The tourist industry is flourishing at a very fast pace and contributing to states and national economy . Moreover, Indian cultural diffusion is taking place, various countries of the world are adopting Indian value system , so our culture is gaining significance.

16.2 Objectives

i) To make students aware of the significance of tourism in Indian.

ii) To introduce them to the various tourist places located in different corners of the country.

iii) To have thorough understanding of tourist places in Himachal Pradesh.

iv) To understand the historical , cultural, architectural and physical characteristics of Rajasthan by enquiring into the tourist destination.

16.3 Concept Of Tourism and Tourist Destination

Tourism means people travelling for fun. It includes such activities as sight seeing, camping, riding, boating ,shopping of handcrafts etc. Tourism is dynamic and competitive industry that requires the ability to adopt constantly to customer's changing needs and desires. The Customer's satisfaction, safety and enjoyment are particularly the focus of tourism.

India is a very beautiful nation's with varied physical features and cultural diversity. Right from Kashmir to Kanyakumari and Gujarat to Assam hundred of major tourist places are there which attract huge number of foreign and India tourists every year. These tourist destinations or places themselves are varied their character. These include hill stations , religions places, historical places, educational centers etc. Tourist centers are contributing a lot to state and national economy , providing employment to lakh of people , enriching the culture, educating people and adding to the development of different pockets of the country.

16.4 Tourist Destinations in Himachal Pradesh

The state of Himachal Pradesh is located in western Himalayas Surrounded by majestic mountains , largely covered with forest, having fast flowing rivers and numerous lakes , the beauty of the land is beyond imagination. The word ' Himachal' means 'The land of Snow' Elenation of H.P ranges from 450m to over 6800m above sea level. It covers an area of 55673 KM Shimla capital city is hill station attracting lakhs of people every year from various corners of the n world. Himachal Pradesh is famous for its many outdoor activities such as rock climbing , mountain biking , paragliding ,ice skating , sking ,tracking etc. Tourism contributes a lot to the economy of the state. It provides employment to a major chunk of population.Major places of Tourist attractions in Himachal Pradesh are:-

Shimla, Kullu, Manali, Chamba, Dharamshalla, Dalhausie, Kangra, Kasauli, Hamirpur , Solan, Sirmour , Chail, Khajjiar, Manikaran, Beas Kund , Manimahesh lake etc.

Shimla:- the capital city of the state is a famous hill station situated at an elevation of 2130 m above mean of sea level . During colonial rule it was made summer capital of India because of its enchanting beauty. The hills station famous for its viewpoint s of snow capped humalayan ranges .with lakes, rich grennery , British Architect, the ridge , Mall road , Jakhoo Hill, Shimla welcomes tourists round the year. Rashtrapati Niwas is another interesting colonial structure in Shimla known as the Viceregal Lodge. Himachal State musem is also worthyof visit particularly for those intrusted in history and antiguity. The nearby small hill stations are Chail , Kufri, Mashobra, Tattapani etc.

Kullu:- Kulluis situated on the banks of Beas river. It was earlier called as Kulanthpitha, meaning ;The end of the habitable World'. Kullu vally is also known as the ' the vally of god'The attractions in kullu are more,white water rafting and para gliding are some of the adventurous sports available. The places to vist here are Bijli Mahadev Temple Sultanpur Place, Great Himalayan National Park, Manikaran , Bhringulake etc.

Manali:- Located at an altitude of 2050m abovemean sea level, Manali is a small hill town along the river Beas in Himachal Pradesh. It is believed that Sage

Manu, meditated at this place so town got the name Manali after him. Famous places to visit here are HAdimba Temple built in 1533 AD , Manu temple , the only temple in India , Jagatsukh temple, Arjuna Gufa, Buddhist Monasteries, Musuem of traditional Himachal culture near Hadimba temple, sulphur springs of hot water , Soleng Nullah, Rahala falls with height of 2501 m etc. Rohtang pass at an elevation of 13050feet above mean sea level is an adventure tourist place . Beas Kund , the source of river Beas is located near Rohtang Pass, Manali is also famous fdor adventure sports like trekking , sking , rafting , paragliding, mountains biking and mountaineering.

Chamba:-The spectacular beauty of chamber has made this place dear to nature lovers located on the banks of river Ravi and at an altitude of over 900meters above mean of sea level, chamba makes an excellent holiday treat . It is also an important Pitgrimage and historical destination with many temples and forts, Chamba is also famous for its art , annual fair, Banni Mata temple and Lakshmi Narayana temples.

Dharamshala:- has snow clad mountains on three sides and vallay on one side. The mountains being overe 4000m height , one can have excellent view on all sides. Pine trees. Tree gardens along with snow covered mountains render magic to the air . It is occupied by Tibetans and Ttbetan culture is reflected every where in Dharamshalla . This place experience heavy rush of tourists from all over the world every year.. It is famous for Monasteries , culture , nature and shopping of Tibetian goods Nearby place worth seeing is Mcleodganj . It is the Holy Abode of Dalai Lama who has been residency here since Chinese invasion of Lhasa, Tibet in 1959 . Another attrction is the Kangra Art Museum.

Dalhousie:- This hill resort was named as Dalhousie after the first British Governor General Of India , Lord Dalhousie. It is spread over 13 sq KM of area covering five different hills namely, Kathlog, Portreyn, Tehra, Bakrota and Balun. The varying altitudes of land have wide range of vegetation including pine, oak and deodar . Major attractions in Dalhousie are kalatop wildlife Reserve. Damkund Peak Portreyn Mall, Subash Chowk , Gandhi Chowk, Sathdara (seven springs), heritage building like St. Andrew's Church, St Patriek's church , St John's Church and St Francis Church. Dalhousie is also known as " Gate way Of Chamba'. A very beautiful picnic spot near Dalhousie is Kajjiar.

Kasauli:-The hill town of kasauli got its name from Kusmawali or Kusmali, a flower grown in abundance in kasauli from spring to autumn. It is situated at altitude of 1927 m above mean sea level. Kasauli is visited for abundant greenery and flowers in different colours that look absolutely stunning. The hills all around are covered with firs, chestnut, pines , oaks and wild cherry. Places to enjoy in kaauli are Monkey point , Upper Mall, Lower Mall, Lawrance School and temple of Nehra Devi at Sonawar.

Chail:- At an elevation of 2250 m above mean sea level, hill resort of chail developed by the Indian Maharaja Bhupinder Singh of Patiala .Chail is built over three hills namely Rajgarh Hill, Pandean Hills and Sabba Tibba. The main attraction in chail are hunting and fishing lodges, highest criket ground of India , highest gold courses, river Satluj flowing through mountains, wildlife Sanctuary, adventure sports etc.

Solan:- Solan famously called 'The mashroom city of India 'and 'city of Red Gold' due to its abundant mushroom and tenants production . It is famous for scenic beauty, trekking , shoolini devi temple, Dolanji Bon Monestery etc.

Other tourist destinations of Himachal Pradesh are Lahul and Spiti also called ' Little Tibet', Mashorba, palampur , Barat valley, Manikaran and Manimahesh

16.5 Major Tourist Destination of Rajasthan

Rajasthan , the largest state of india covers an area of 3,42,239sq .km which is 10.4% India . Many kings have ruled over this state and it is also known as ' the land of kings'. The state is very rich and varied art, architect and culture.Arvale Range extents from Mt Abu (in sonthernmost) to kheti (in the northeast) Arvali is the oldest mountain range in the world. Western and south western Rajasthan is a true desert , eastern and southeastern parts are comparatively fertile with varied topography.

Ganganagar casual has changed the scenario of the state by bringing about agricultural property.

Rajasthan is ore of the most popular tourist destination in India, for both domestic and international tourists.It attracts tourists for its historical forts, palaces, art and

culture. Endowed with natural beauty and great history, Rajasthan has a flourishing tourism industry. The places of Jaipur , lakes of Udaipur, desert forts and sand dumes of Jodhpur , Bikaner and Jaisalmer, natural beauty of Mount Abu, Dargah of Ajmer, the only temple of Brahma at Pushhkar are most preferred destinations of many tourists. Tourism accounts for 8% of the state's domestic product. Many old and neglected, oiste m alaces and forts have been converted into heritage hotels. Tourism has increased employment, developed transportation and communication, setting up of various cottage and small scale industries and above all has added a lot to the state income.The various tourist destimnation of Rajasthan are Jaipur , Udaipur, Ajmer, Pushkar, Jaisalmer, Bikaner , Barmer, Chittorgarh, Jodhpur, MountAbu, Kota, Ranthampur etc.

Jaipur:- Jaipur , the capital city of the state is major tourist attraction. It is also known as Pink City because of pink coloured building all around . Maharaja Ram singh painted the entire city pink. The places to visit in jaipur are Hawa Mahal, Jantar mantar, Amer fort, city palace, Albert Hall Museum , Nahargarh fort Birla temple, Jal Mahal , Central part , Akhsardham temple, Mahargarh biological park, Raj Mandir cinema , Sambhar lake etc. Jaipur is famous for blue pottery , embroidered lethershoes, tie and dye scarves, exotic wares handicraft etc.Jaipur international airport is nearest airport and can be assessed from all major cities in India . Internationally it is connected to Sharjah, Dubai, Abu Dhabi, Muscat, Bangkok and Singapore.

Udaipur:- Udaipur is known as city of lakes. It is famous for its palaces that exemplify Rajasthan style architecture. The city was founded in 1553 by the Sisodiya Rajput ruler Maharaja Udai singh –II . Most of ther palaces have been converted into Hotels, thus attracting a huge number of tourists. It is located at the foothills of Aravalli Mountains. City is well connected by air route , railways and roads with the rest of country. The main places to vist here are city palace , lake Pichala,LAKE Palace ,Lake Garden Palace , the Royal Museum ,Bagore ki Haveli, Saheliyen ki Bari, Jadish temple etc. Tourists can enjay shopping Beautiful embroided ,tie and dye clothes , footwears, turbans (rajasthani), Jawellery , decorated pieces , crafts etc.

Jodhpur:- it is second largest and second most populated city of rajasthan after Jaipur. The city was founded by Rathore Rajput ruler Rao Jodha Singh of Mewar in 1459 located in the west , the city is only 250 kms from Indo-pak –Border. It is famous for its Heritage, Forts Cuisine. Major attractions are Mehrangarh Fort , Umaid Bharan.

It is also called as Sun City as enjoys bright sunny wearther all year round.

Jaisalmer:- It is apthy named as Golden City because it is located in the heart of the Thar Desert and looks very bright during Sun . The city was founded by Maharaja Jaisal Singh in 1156 A.D. This is a famous tourist spot due to its magnificent architecture and various arts and crafts which are unique to this region.

Golden sand stone is used in the building of city . It was built as a walled city which makes it one of the numerous eateries that offer Italian , french and local cuisines. Places to vist in Jaisalmer are Jaisalmer Fort, Bada Bagh , Patwon ki Haveli, Jam Sand dunes. Thjar Heritage Museum, Gadisar Lake Jain temple, Salim Singh Ki Haveli etc.

Bikaner:-Bikaner is another prime tourist destination founded in 1488 by Rathore Rao Bika. The city is known for its forts and food.Various arts and crafts of this place are also unique , Fairs are held every year that attract a huge number of visitors, Indian and foreigners both.It is famous for its heritage , culture, rat temple, Junagarh temple,Karni mata temple, national research centre on camel, Lalgarh palace etc.

Pushkar:- lying in the Ajmer District of Rajasthan the holy city of pushkar is often described as the king of pilgrimage sites in India . The town is located at the shores of the Pushkar Lake, which was created by the tears of lord Shiva and is one of the oldest cities of India . The most famous here is the colourfulcamel fair for five days every yeaer. The places of visit in Pushkar are Brahma Temple, Savitri temple, Varaha temple, Man Mahal etc.

Chittorgarh:-Also known as Chittor was founded by Maurya Dynaesty . It is a birth place of great warrior Great Maharana Pratap , and Meera Bai, the great Hindu saint , the city contains many different palaces, temples and forts. Chittorgarh

forts is the largest fort in India. It spreads over an area of 2.87 sq Km and its highest elevation point is 1075 m above mean sea level. Other places to visit are Rana Kumbha Palace , Fateh Prakash Palace, Meera temple, Rani Padmini palace etc.

Mount Abu:- It is the only hill station in Rajasthan situated in the Aravali Mountain Range . It is a part of Sirohi district of the state. Mount Abu is also known a Arbuda Mountain , a place where the great sage Vshishtha retined. The main attractions of the Mount Abu are Dilwara temple, Guru shikar Achalgarh, Nakki Lake, Sunset point, Braham Kumaris Ashram, Wildlife sanctuary, lush green surroundings and bazaars.

Ajmer:- Ajmer is the home of the shrine of Khwaja Moihudin Chisti, a unique pilgrimage for both Hindus and muslims. The places to vist here are Ajmer sharif Dargah, Taragarh fort , Adhai Din ka Thanpra, Anasagar lake etc .In 2015 , ajmer was selected as a heritage site for the HRIDAY-heritage city development and augmentation yojana scheme of Govt of India.

16.6 Summary

In this lesson, students have been made familiar with the tourist destinations of state of Himachal Pradesh and Rajasthan. The significant tourist centres in these states attract people in huge number and it adds to the economy of the state. It also deals to further development of means of transportation, communication network, market etc. Thus, with the growing number of tourists, the state develops from the angle of various sectors and also in turn tourists get more and more comfort and entertainment while visiting. Various products, culture & society get recognition the world over.

16.7 Glossary

(i) **Antiquity-** ancient times

(ii) **Abundance-** in huge quantity

(iii) **Monastery -** Bhome of Monk

(iv) **Pilgrimage-** journey made to sacred place

(v) **Spectacular-** amazing

16.8 Short Answer-type questions:

(i) Define tourism.

(ii) What is camping?

(iii) What do you understand by ill resort?

(iv) Name five main centres of tourist attraction in H.P.

(v) Give economic significance of Tourist Industry.

16.9 Examination oriented questions:

(i) Discuss the various centres of tourist attraction in Rajasthan.

(ii) Throw light on the significance of tourist industry.

(iii) "Tourist Industry of Himachal Pradesh is growing at a very fast rate". Discuss.

(iv) Give problems associated with Tourism in India.

16.10 Suggested Readings

1. Hussain, Majid (2017). Geography of India, Mc Graw Hill Education.
2. Singh, R.L (2007). India: A Region Geography, National Geographical society of India.
3. Khullar, D.R (2011) India a Comprehensive Geography, Kalyani Publishers, New Delhi.
4. Singh, Gopal (2010) A Geography of India, Atma Ram& sons, New Delhi.
5. Spate O.H.K (1967) India and Pakistan: A general and regional geography

16.11 Model Test Paper

Note: Section A is compulsory. It comprises of 8 questions. Each question carries 2 marks. The answer limit is 50 words. In Section B, attempt one question from each unit. Each question is of 16 marks. Answer should not exceed 500 words.

Section-A

(i) Define Western Ghats.

(ii) What is meant by Khadar soils?

(iii) Define monsoons.

(iv) What are Western Disturbances?

(v) Give four characteristics of Evergreen forests.

(vi) Define Green Revolution.

(vii) What is an Industrial Region?

(viii) What is meant by Biodiversity.

Section-B

Unit-I

1. Discuss India in the context of Asia.

OR

2. Give mechanism of India Monsoons and Western Disturbances.

Unit-II

3. What are the various types of soils found in India. Discuss their characteristics and distribution.

OR

4. Discuss the significance of power resources and also give location of coal mines in India.

Unit-III

5. Define Agriculture. Give the characteristics and problems f India Agriculture

OR

6. Discuss the various factors of population distribution in India. Give examples

Unit-IV

7. Divide India into various Macro and Meso regions. Also give basis of Regionalization.

OR

8. Compare and contrast Tourism of Himachal Pradesh and Rajasthan.

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SELF LEARNING MATERIAL
B.A. SEMESTER - IV

Subject : Geography **UNIT : I-IV**
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