MODEL ANSWER - 10

Que. 1(a) What are the characteristics of Indian Agriculture

Ans. 1(a) While agriculture's share in India's economy has progressively declined to less than 15% due to the high growth rates of the industrial and services sectors, the sector's importance in India's economic and social fabric goes well beyond this indicator. First, nearly three-quarters of India's families depend on rural incomes. Second, the majority of India's poor (some 770 million people or about 70 percent) are found in rural areas. And third, India's food security depends on producing cereal crops, as well as increasing its production of fruits, vegetables and milk to meet the demands of a growing population with rising incomes.

Challenges

Three agriculture sector challenges will be important to India's overall development and the improved welfare of its rural poor:

Raising agricultural productivity per unit of land: Raising productivity per unit of land will need to be the main engine of agricultural growth as virtually all cultivable land is farmed. Water resources are also limited and water for irrigation must contend with increasing industrial and urban needs. All measures to increase productivity will need exploiting, amongst them: increasing yields, diversification to higher value crops, and developing value chains to reduce marketing costs.

Reducing rural poverty through a socially inclusive strategy that comprises both agriculture as well as non-farm employment: Rural development must also benefit the poor, landless, women, scheduled castes and tribes. Moreover, there are strong regional disparities: the majority of India's poor are in rain-fed areas or in the Eastern Indo-Gangetic plains. Reaching such groups has not been easy. While progress has been made - the rural population classified as poor fell from nearly 40% in the early 1990s to below 30% by the mid-2000s (about a 1% fall per year) – there is a clear need for a faster reduction. Hence, poverty alleviation is a central pillar of the rural development efforts of the Government and the World Bank.

Ensuring that agricultural growth responds to food security needs: The sharp rise in food-grain production during India's Green Revolution of the 1970s enabled the country to achieve self-sufficiency in food-grains and stave off the threat of famine. Agricultural intensification in the 1970s to 1980s saw an increased demand for rural labor that raised rural wages and, together with declining food prices, reduced rural poverty.

Promoting new technologies and reforming agricultural research and extension: Major reform and strengthening of India's agricultural research and extension systems is one of the most important needs for agricultural growth. These services have declined over time due to chronic underfunding of infrastructure and operations, no replacement of aging researchers or broad access to state-of-the-art technologies. Research now has little to provide beyond the time-worn packages of the past. Public extension services are struggling and offer little new knowledge to farmers. There is too little connection between research and extension, or between these services and the private sector.

Improving Water Resources and Irrigation/Drainage Management: Agriculture is India's largest user of water. However, increasing competition for water between industry, domestic use and agriculture has highlighted the need to plan and manage water on a river basin and multi-sectoral basis. As urban and other demands multiply, less water is likely to be available for irrigation. Ways to radically enhance the productivity of irrigation ("more crop per drop") need to be found. Piped conveyance, better on-farm management of water, and use of more efficient delivery mechanisms such as drip irrigation are among the actions that could be taken. There is also a need to manage as opposed to exploit the use of groundwater. Incentives to pump less water such as levying electricity charges or community monitoring of use have not yet succeeded beyond sporadic initiatives. Other key priorities include: (i) modernizing Irrigation and Drainage Departments to integrate the participation of farmers and other agencies in managing irrigation water; (ii) improving cost recovery; (iii) rationalizing public expenditures, with priority to completing schemes with the highest returns; and (iv) allocating sufficient resources for operations and maintenance for the sustainability of investments.

Facilitating agricultural diversification to higher-value commodities: Encouraging farmers todiversify to higher value commodities will be a significant factor for higher agricultural growth, particularly in rain-fed areas where poverty is high. Moreover, considerable potential exists for expanding agro-processing and building competitive value chains from producers to urban centers and export markets. While diversification initiatives should be left to farmers and entrepreneurs, the Government can, first and foremost, liberalize constraints to marketing, transport, export and processing. It can also play a small regulatory role, taking due care that this does not become an impediment.

Promoting high growth commodities: Some agricultural sub-sectors have particularly high potential for expansion, notably dairy. The livestock sector, primarily due to dairy, contributes

over a quarter of agricultural GDP and is a source of income for 70% of India's rural families, mostly those who are poor and headed by women. Growth in milk production, at about 4% per annum, has been brisk, but future domestic demand is expected to grow by at least 5% per annum. Milk production is constrained, however, by the poor genetic quality of cows, inadequate nutrients, inaccessible veterinary care, and other factors. A targeted program to tackle these constraints could boost production and have good impact on poverty.

Sustaining the environment and future agricultural productivity

Overexploited and degrading forest land need mitigation measures. There are proven solutions to nearly all of these problems. The most comprehensive is through watershed management programs, where communities engage in land planning and adopt agricultural practices that protect soils, increase water absorption and raise productivity through higher yields and crop diversification.

More extreme events – droughts, floods, erratic rains – are expected and would have greatest impact in rain-fed areas. The watershed program, allied with initiatives from agricultural research and extension, may be the most suited agricultural program for promoting new varieties of crops and improved farm practices. But other thrusts, such as the livelihoods program and development of off-farm employment may also be key.

Que. 1(b) How the Himalayan rivers are different from the peninsular rivers?

Ans. 1(b) Rivers are the lifelines of a country as they provide the most valuable thing required for the survival "the water". The rivers' water can be used for a variety of purposes such as for drinking, for irrigation, to generate electricity etc. The rivers in India can be categorized into two different categories based on their origin: The Himalayan Rivers and the Peninsular Rivers.

The Himalayan Rivers:

The Himalayan Rivers are the rivers that originate from the Himalayan mountain ranges. These rivers are snow fed; they receive water from the melting ice of the glaciers as well as from the rains. The three main Himalayan Rivers are the Ganga, the Indus and the Brahmaputra. These three rivers flow towards the West and collectively form the Himalayan River System. These rivers are also known as three different river systems as they have many tributaries.

These rivers are very long and generally cover thousands of kilometers before emptying into the sea. These rivers are perennial in nature as they flow throughout the year. They have larger

basins and catchment areas. Furthermore, the mouth of these rivers, the point where they meet the sea, form large deltas, e.g. the Ganges-Brahmaputra delta is the biggest delta in the world.

The Peninsular Rivers:

The peninsular rivers are the rivers that originate from the peninsular plateaus and small hills of India. These rivers are seasonal or non-perennial as they receive water only form the rains and thus cannot maintain water flow throughout the year. Some of the famous peninsular rivers include Kaveri, Narmada, Tapi, Krishna, Mahanadi and Godavari.

As compared to Himalayan Rivers, these rivers are shorter, do not have high erosion activity, and have smaller basin and catchment areas. Furthermore, peninsular rivers are consequent rivers as they follow the direction of the slope

Differences	Himalayan Drainage	Peninsular Drainage
Origin	These rivets originate from the lofty Himalayan ranges and are named as the Himalayan rivers.	These rivers originate in the Peninsular Plateau and are named as Peninsular rivers.
Catchment area	Himalayan rivers have large basins and catchment areas. The total basin area of the Indus, the Ganga and the Brahmaputra is 11.78, 8.61 and 5.8 lakh square km respectively.	These rivers have small basins and catchment areas. The Godavari has the largest basin area of 3.12 lakh square km (which is less than one-third the basin area of the Indus river)
Valleys	The Himalayan rivers flow through deep V – shaped valleys called gorges. These gorges have been carved out by down cutting carried on side by side with the uplift of the Himalayas.	The Peninsular rivers flow in comparatively shallow valleys. These are more or less completely graded valleys. The rivers have little erosional activity to perform.
Drainage Type	These are examples of antecedent drainage.	These are examples of consequent drainage.
Water Flow	The Himalayan rivers are perennial in nature, i.e., water flows throughout the year in these rivers. These rivers receive water both from the S-W monsoons and snow-melt.	The Peninsular rivers receive water only from rainfall and water flows in these rivers in rainy season only. Therefore, these rivers are seasonal or non-perennial.
Stage	These rivers flow across the young fold mountains and are still in a youthful stage.	These rivers have been flowing in one of the oldest plateaus of the world and have reached maturity.
Meanders	The upper reaches of the Himalayan rivers are highly tortuous. When they enter the plains, there is a sudden reduction in the speed of flow of water. Under these circumstances these rivers form meanders and often shift their beds.	The hard rock surface and non-alluvial character of the plateau permits little scope for the formation of meanders. As such, the rivers of the Peninsular Plateau follow more or less straight courses.
Deltas and Estuaries	The Himalayan rivers form big deltas at their mouths. The Ganga-Brahmaputra delta is the largest in the world.	Some of the Peninsular rivers, such as the Narmada and the Tapti form estuaries.

Que. 1(c) Importance of Coastal and Marine Biodiversity Areas (ICMBAs) in India.

Ans. 1 (c)

DIRECTION

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Importance of Coastal and Marine Biodiversity Areas (ICMBAs) in India

10marks

Coastal and marine ecosystems are found in 123 countries around the world These are among the most productive ecosystems in the world. Coastal and marine ecosystems includes sand dunes areas, near shore coastal areas and open ocean marine areas.

The Indian Ocean accounts for 29% of the global ocean area. It includes coral reefs, mangroves, marine organic carbon synthesis, besides coastal lagoons and backwaters. India in Indian Ocean is rated as one of the mega biodiversity centres of the world. In terms of marine environment, India has 7516 km of shore line, 2·02 million sq.km of EEZ (including mainland and islands) Adjoining the continental regions and offshore islands are wide range of coastal ecosystems characterised by unique habitats and thus ecosystems. As for example West Coast is more rocky with headlands and strong surfing due to advancing monsoons, in comparision, East Coast has shelves, beaches and weak upwelling due to retreating monsoons. This however involves hazards (habitat- destruction) by cyclonic circulations.

The coastal, marine biodiversity have

multiplied their significance due to increased vulnerabilities induced by climate change and challenges relating to provisioning regulating, cultural and supporting services. Among the steps taken by India to achieve Aichi Biodiversity Target 11 and National Biodiversity Target 6 which aims to conserve coastal and marine biodiversity - 106 ICMBAs (Important Coastal and Marine

Areas) have been identified by Wildlife Institute of India. 62 of these are in West Coast & 44 in East Coast. Of these 22 ICMBAs have been prioritized for immediate conservation actions and are proposed to be upgraded as PAs and to increase local participation in conservation.

DIRECTION

Profile of mass coral bleaching in Indian Ocean. *10marks*

When corals are stressed by changes in conditions, they turn completely white, the condition called coral bleaching.
Millions of colourful, microscopic algae called zooxanthellae live inside corals and provide it with food and give it colour. In turn coral provides shelter to the algae as an excellent example of symbiotic relation. In the light of external factors as rise in temperature can stress the coral, zooxanthellae can become toxic and they are expelled by the corals, the condition of stressed coral. With zooxanthellae gone, corals appears white. This bleached corals are no longer fed and are at risk of starvation disease and death.
The range of causes that leads to bleaching includes – Sea surface temperature increase
- Runoff and Pollution
- Overexposure to sunlight
- Extreme low tides
- Boat anchors
- Fishing methods & Coral collection

From among these heat stress is the most important cause. Corals survival Temperature - 18°C / above during winters but below 28°C even during summers

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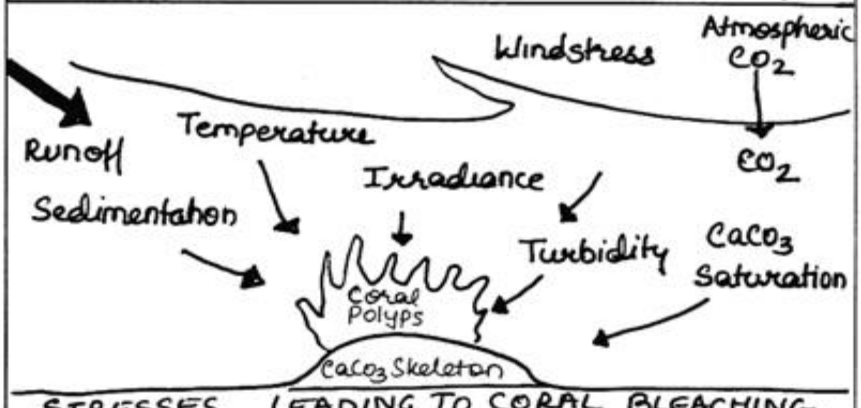
Coral limit to heat stress days - 28 days

The elaborate study carried on by Kurukshetra University in collaboration with Space Application Centre in Indian coral reef regions have established that heat stress is leading to mass coral bleaching in the region. The study includes three mass bleaching years with Andaman, Nicobar Lakshwadeep, Gulf of Mannar and Gulf



STRESSES LEADING TO CORAL BLEACHING

of Kutch as areas of study. In all these years of study viz 1998, 2010 and 2016 Warmest summer month temperature has been @ 31c approximately and duration of thermal stress in the range of 60 days to 90 days. The study also concludes that 50% - 70% of total corals have been bleached since 1998, providing grim picture

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Que. 1(e) What is the difference between deciduous and coniferous forests?

Ans. 1(e) What is the difference between deciduous and coniferous forests?

Deciduous trees are the trees which seasonally shed off their unnecessary parts, especially leaves, from their structure. Most deciduous trees posses broad leaves. Because of the structure of leaves and the pattern of leaf arrangement, the effectiveness of photosynthesis is very much high in deciduous trees. However, it has both positive and negative effects compared to other types of trees. Due to the broad leaf structure, deciduous trees are very much susceptible to tolerate windy and winter weather conditions. Therefore, the falling of unnecessary leaves is necessary at the period of bad weather conditions. It ensures not only a better survival in winter weather conditions but also high water conservation and protection against the predatory actions.

Deciduous characteristics can be frequently observed in most woody plants (oak, maple), shrubs (honeysuckle) and in temperate woody vines (grapes). There are two characteristic deciduous forest types where the majority of the trees shed their foliage at the end of their typical growing season. They are temperate deciduous forests and Tropical and subtropical deciduous forests. Trees in temperate deciduous forests are sensitive to seasonal temperature variations, whereas the other types respond to seasonal rainfall patterns. Therefore, the growth, leaf shedding and dormancy occurring periods vary with the type.

Coniferous trees belong to plant division Phynophyta. These plants bear a cone and it is their flower. Most conifers are evergreen woody plants. Although the leaf shedding is not seasonal as deciduous, they only shed their oldest leaves which have remained on the tree for a long time. Pines, firs, and hemlocks can be named as some well-known conifers. The leaf structure and patterns of arrangement may vary in different conifers. Most of them consist of needle-like leaves whereas some have diverse shapes such as flat, triangular, scale-like, broad, flat strap-shaped and awl-shaped leaves.

In addition, the arrangement of leaves in a majority of conifers is spiral. Leaf shape, arrangement, and many other adaptations can be seen in these trees. They can survive in vast environmental conditions by having adaptations. The general dark green color of leaves may help to absorb the sunlight in shade conditions, whereas the yellowish color of leaves and wax coating collectively promote the growth under high intensity of sunlight. Conifers are largely used in timber and paper production.

Deciduous and coniferous trees are two distinct groups of plants. As the name suggests, deciduous trees shed their leaves seasonally. Whereas, coniferous trees are the trees that produce cones and that have leaves throughout the year. So, this is the key difference between deciduous and coniferous trees. Furthermore, a significant difference between deciduous and coniferous trees is that the deciduous trees show re-growth while re-growth is not seen in coniferous trees.

Moreover, an easily identifiable difference between deciduous and coniferous trees is the shape of their leaves. The deciduous trees have broad and flat leaves while coniferous trees have small needle-like leaves. Besides, most deciduous trees are flowering plants. Hence, they do not produce cones. But, coniferous trees produce cones in order to reproduce. Therefore, this is also a significant difference between deciduous and coniferous trees.

	Deciduous Trees	Coniferous Trees
Leaves	Broad, flat leaves that shed annually	Needle-shaped leaves that are retained year-round
Growth Habit	Rapid growth in spring and summer, dormant in winter	Slow, steady growth year-round
Wood Type	Hardwood, denser and stronger than softwood	Softwood, lighter and easier to work with
Ecosystem Role	Provide habitat, food, and aesthetic value	Provide habitat and food, absorb carbon dioxide, stabilize soil
Adaptability	Tolerate a wide range of temperatures and moisture conditions	Adapted to cold, dry environments
Popular Species	Oak, maple, birch, beech, poplar	Pine, spruce, fir, cedar, redwood
Uses	Furniture, flooring, construction, fuel	Timber, paper, furniture, essential oils

Que. 2. (a)What is the impact of Green Revolution on Indian agriculture? Also discuss the characteristics and problems of Green Revolution

Ans.2 (a) In India, the seeds of Green Revolution were first field tested in the drought year of 1964-65. 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. 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. 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 states cannot follow suit and get the benefit of Green Revolution.

The Green Revolution, spreading changed India's status from a food-deficient country to one of the world's leading agricultural nations.

The Green Revolution Objectives

Short Term: The revolution was launched to address India's hunger crisis during the second Five Year Plan.

Long Term: The long term objectives included overall agriculture modernization based on rural development, industrial development; infrastructure, raw material etc.

Employment: To provide employment to both agricultural and industrial workers.

Scientific Studies: Producing stronger plants which could withstand extreme climates and diseases.

Globalization of the Agricultural World: By spreading technology to non-industrialized nations and setting up many corporations in major agricultural areas.

Basic Elements

Expansion of Farming Areas: Although the area of land under cultivation was being increased from 1947 itself, this was not enough to meet the rising demand. The Green Revolution provided assistance in this quantitative expansion of farmlands.

Double-cropping System: Double cropping was a primary feature of the Green Revolution. The decision was made to have two crop seasons per year instead of just one.

The one-season-per-year practice was based on the fact that there is only one rainy season annually. Water for the second phase now came from huge irrigation projects. Dams were built and other simple irrigation techniques were also adopted.

Using seeds with improved genetics: Using seeds with superior genetics was the scientific aspect of the Green Revolution.

The Indian Council for Agricultural Research developed new strains of high yield variety seeds, mainly wheat and rice, millet and corn.

Important Crops in the Revolution:

Main crops were Wheat, Rice, Jowar, Bajra and Maize. Non-food grains were excluded from the ambit of the new strategy. Wheat remained the mainstay of the Green Revolution for years. In 1943, India suffered from the world's worst recorded food crisis; the Bengal Famine, which led to the death of approximately 4 million people in eastern India due to hunger.

Even after independence in 1947, until 1967 the government largely concentrated on expanding the farming areas. But the population was growing at a much faster rate than food production.

This called for an immediate and drastic action to increase yield. The action came in the form of the Green Revolution.

The green revolution in India refers to a period when Indian Agriculture was converted into an industrial system due to the adoption of modern methods and technology such as the use of HYV seeds, tractors, irrigation facilities, pesticides and fertilizers.

It was funded by the US and the Indian Government and the Ford and Rockefeller Foundation.

The Green Revolution in India is largely the Wheat Revolution as the wheat production increased by more than three times between 1967-68 and 2003-04, while the overall increase in the production of cereals was only two times

Positive Impacts of Green Revolution

Tremendous Increase in Crop Produce: It resulted in a grain output of 131 million tonnes in the year 1978-79 and established India as one of the world's biggest agricultural producers. The crop area under high yielding varieties of wheat and rice grew considerably during the Green Revolution.

Reduced Import of Food-Grains: India became self-sufficient in food-grains and had sufficient stock in the central pool, even, at times, India was in a position to export food-grains. The per capita net availability of food-grains has also increased.

Benefits to the Farmers: The introduction of the Green Revolution helped the farmers in raising their level of income. Farmers ploughed back their surplus income for improving agricultural productivity. The big farmers with more than 10 hectares of land were particularly benefited by this revolution by investing large amounts of money in various inputs like HYV seeds, fertilizers, machines, etc. It also promoted capitalist farming.

Industrial Growth: The Revolution brought about large scale farm mechanization 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. Several agricultural products were also used as raw materials in various industries known as agro based industries.

Rural Employment: There was an appreciable increase in the demand for labour force due to multiple cropping and use of fertilizers. The Green Revolution created plenty of jobs not only for agricultural workers but also industrial workers by creating related facilities such as factories and hydroelectric power stations.

Negative Impacts of Green Revolution

Non-Food Grains Left Out : Although all food-grains including wheat, rice, jowar, bajra and maize have gained from the revolution, other crops such as coarse cereals, pulses and oilseeds were left out of the ambit of the revolution. Major commercial crops like cotton, jute, tea and sugarcane were also left almost untouched by the Green Revolution.

Limited Coverage of HYVP: High Yielding Variety Programme (HYVP) was restricted to only five crops: Wheat, Rice, Jowar, Bajra and Maize. Therefore, non-food grains were excluded from the ambit of the new strategy. (The HYV seeds in the non-food crops were either not developed so far or they were not good enough for farmers to risk their adoption.)

Regional Disparities:

Green Revolution technology has given birth to growing disparities in economic development at interred and intra regional levels. It has so far affected only 40 percent 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. It has hardly touched the Eastern region, including Assam, Bihar, West Bengal and Orissa and arid and semi-arid areas of Western and Southern India.

The Green Revolution affected only those areas which were already better placed from an agricultural point of view. Thus the problem of regional disparities has further aggravated as a result of the Green Revolution.

Excessive Usage of Chemicals: The Green Revolution resulted in a large-scale use of pesticides and synthetic nitrogen fertilisers for improved irrigation projects and crop varieties. However, little or no efforts were made to educate farmers about the high risk associated with the intensive use of pesticides.(Pesticides were sprayed on crops usually by untrained farm labourers without following instructions or precautions.) This causes more harm than good to crops and also becomes a cause for environment and soil pollution.

Water Consumption: The crops introduced during the green revolution were water-intensive crops. Most of these crops being cereals, required almost 50% of dietary water footprint. Canal systems were introduced, and irrigation pumps also sucked out the groundwater to supply the water-intensive crops, such as sugarcane and rice, thus depleting the groundwater levels. Punjab is a major wheat- and rice-cultivating area, and hence it is one of the highest water depleted regions in India.

Impacts on Soil and Crop Production: Repeated crop cycle in order to ensure increased crop production depleted the soil's nutrients. To meet the needs of new kinds of seeds, farmers increased fertilizer usage. The pH level of the soil increased due to the usage of these alkaline chemicals. Toxic chemicals in the soil destroyed beneficial pathogens, which further led to the decline in the yield.

Unemployment: Except in Punjab, and to some extent in Haryana, farm mechanization under the Green Revolution created widespread unemployment among agricultural labourers in the rural areas. The worst affected were the poor and the landless labourers.

Health Hazards: The large-scale use of chemical fertilizers and pesticides such as Phosphamidon, Methomyl, Phorate, Triazophos and Monocrotophos resulted in resulted in a number of critical health illnesses including cancer, renal failure, stillborn babies and birth defects.

Green Revolution – Krishonnati Yojana

The government of India introduced the Green Revolution Krishonnati Yojana in 2005 to boost the agriculture sector. Government through the scheme plans to develop the agriculture and allied sector in a holistic & scientific manner to increase the income of farmers.

It comprises of 11 schemes and mission under a single umbrella scheme:

The Evergreen Revolution

The improvements brought out by the Green Revolution came at the cost of adverse environmental effects in areas subjected to intensive farming. However, where population pressure is high, there is no option except to produce more food.

Under the Evergreen Revolution, it is envisaged that productivity must increase, but in ways which are environmentally safe, economically viable and socially sustainable. The evergreen revolution involves the integration of ecological principles in technology development and dissemination.

Overall, the Green Revolution was a major achievement for many developing countries, specially India and gave them an unprecedented level of national food security.

It represented the successful adaptation and transfer of the same scientific revolution in agriculture that the industrial countries had already appropriated for themselves.

However, lesser heed was paid to factors other than ensuring food security such as environment, the poor farmers and their education about the know-how of such chemicals.

As a way forward, the policymakers must target the poor more precisely to ensure that they receive greater direct benefits from new technologies and those technologies will also need to be more environmentally sustainable.

Also, taking lessons from the past, it must be ensured that such initiatives include all of the beneficiaries covering all the regions rather than sticking to a limited field. The awareness of Green Revolution – Krishonnati Yojana must be given to all farmers across the country. The government and the civil society should work towards bringing an Evergreen Revolution

Que. 2. (b) Explain in detail the disparities in Urbanization of India

Ans.2 (b) Urbanisation is a whole process change and consequences where a society gets transformed from agrarian 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.

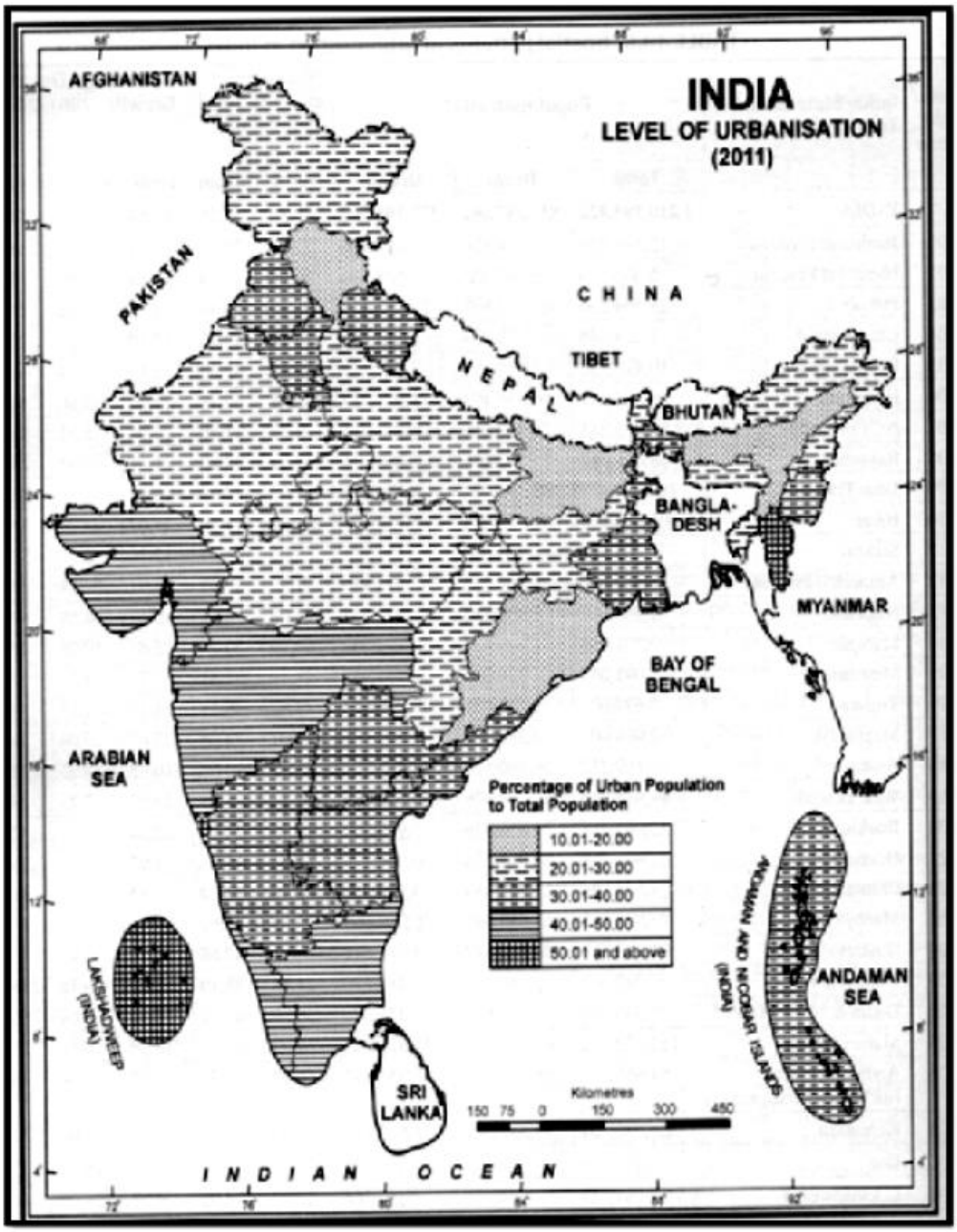
Despite widespread use of the terms 'urban' and 'rural' for centuries, they continue to remain vague and elusive, lacking precise definition. Even if we accept the rural urban dichotomy, it does not in itself, provide us with an adequate frame of reference for defining and identifying urban places. It 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.

Trends in urbanization in India:

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.

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 twofold 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.

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 fourfold 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.



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 urbanization 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 urbanized 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 urbanization is one of the highest in the country but its absolute urban population (50.8 million) is slightly more than that of Uttar Pradesh.

Que. 2. (c) Outline the categories of montane grasslands in India

Ans.2(c) The mountainous regions of the country have different types of grassland communities based on their altitude, slope, aspect and rock strata. They occur as multi-species herbaceous communities over large tracts of land as well as intermixed with shrubs or as undergrowth in open to moderately dense forest areas. The montane grasslands of India can be broadly recognized into the following categories:

(a) Himalayan Sub-tropical grasslands: These are grasslands found on the southern slopes of the **H**imalaya between an altitudinal range of 1000 to 1800 m and are usually found on steeper

rocky slopes with shallow soils. They are also found as lush undergrowth in Pine forests during the rainy season. These grasslands are highly vulnerable to forest fires during the dry summer season, but being fire hardy, the new shoots soon emerge from the underground rootstock providing valuable fodder to the grazing wild herbivores and domestic livestock during the lean season. These grasslands are used by the local communities for fodder collection during the winter after the seeds have fallen and stored for making hay for future use.

(b) Himalayan Temperate grasslands: These are grasslands found on the slopes of the Himalayas in an altitudinal range of 1800 to 3000 m and are usually found on rocky slopes with shallow soils where there is sparse tree growth. These grasslands are dominated by Chrysopogon gryllus, Andropogon tristis, Themeda anathera, Themeda tremula, Erianthus rufipilus, Miscanthus nepalensis, Brachypodium sylvaticum, Bromus unioloides and several other grasses, sedges and are also rich in terrestrial orchids such as Satyrium nepalense, Herminium lancium and Habenaria intermedia. Asteraceae members such as Erigeron and Anaphalis also dominate such grasslands. The blades of Chrysopogon gryllus are used by the villagers for thatching purposes.

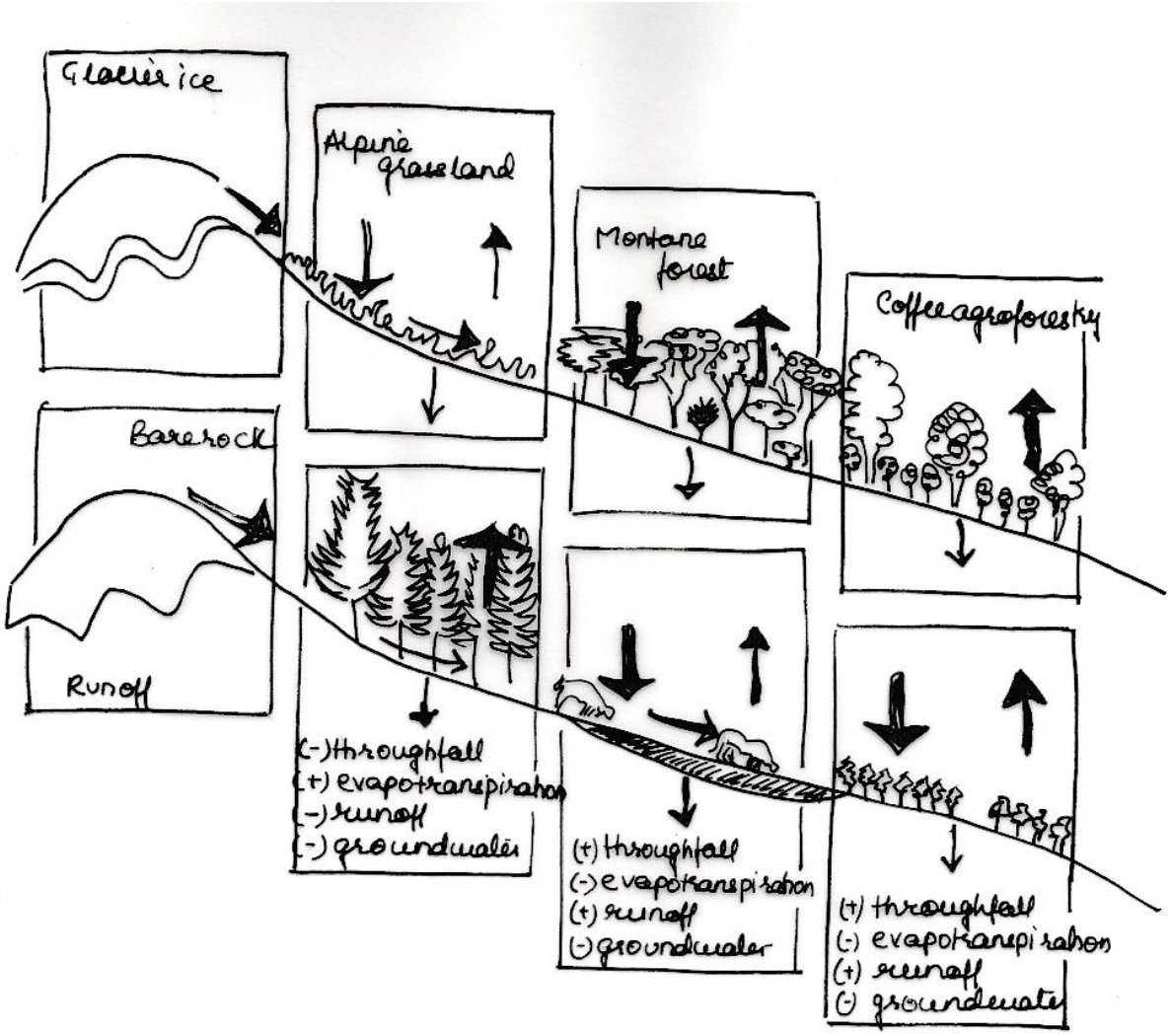
(c) Alpine meadows: The grasslands found above the tree line on the southern face of the Greater Himalaya above an altitude of 3000 m and upto 5200 m are usually referred to as the Alpine meadows. They are known as Marg in Kashmir, Bugyal in Uttarakhand and by various other local names across the mountain range. Being above the tree line, these grasslands extend over several square kilometers and are usually under snow for a large part of the year and thus form a climatic climax community. However, certain lower sub-alpine areas also have similar grasslands forming edaphic climax due to the rocky substrata unsuitable for tree growth. The Chhipla Kedar alpine meadows in Pithoragarh district and Bedini Bugyal of Chamoli district of Uttarakhand are among the most extensive and contiguous patches of alpine meadows found in the Himalaya, each of which is above 300 sq km in expanse. The alpine meadows above 3800 m also forms the habitat of the highly valuable Yar-tsa Gambu or the caterpillar mushroom (Ophiocordyceps sinensis), which is harvested soon after snow melt before the grasses grow to cover them up.

(d)Trans-Himalayan steppes: These are alpine meadows found in the northern face of the Great Himalaya, usually known as the Trans-Himalaya. These areas on account of their location in the rain-shadow region of the South West Monsoons, are arid and very cold due to their proximity to Tibetan plateau and very high altitudes usually above 4000 m asl. Such grasslands are found in Ladakh in Jammu & Kashmir, Lahul, Spiti and Kinnaur districts of Himachal Pradesh and in Nilang, Niti, Malla Johar, Malla Darma and Lapthal areas of Uttarakhand, and

Tso Lhamu plateau of Sikkim. These grasslands are dominated by short grasses which can be classified as 'Steppe' as per the global classification of grasslands. The Trans-Himalayan grassland communities of India are mostly extensions of the Tibetan floral elements.

(e) Grasslands of the North East Hills: These are found in sub-tropical to temperate areas of the North Eastern Hill States south of the Brahmaputra. The major grasslands include Dzukou valley in Nagaland and Manipur, Ukhrul grasslands of Manipur, Saramati grasslands of Nagaland, and the rolling downs of Shillong. These grasslands are characterized by a mixture of floral elements of the Himalayan region, South East Asia and peninsular India and hence form a unique biodiversity rich area. These grasslands are dominated by species of Festuca, Bromus,. The higher altitudes are also rich in orchids and lilies, species of Aconitum, Fritillaria, and Selinum. The lower hill slopes are rich in species of Micostegium, Erianthus, Narenga fallax, Thysanolaena maxima and a variety of montane bamboos.

(f) Grasslands of Central Highlands: These grasslands are found in the Central Indian highlands viz., Vindhyas and Satpuras. These hill ranges are considered the corridors between the Western Ghats and the Himalayas for migration of species. These grasslands are found intermixed with tropical dry deciduous forests on rocky patches among sparse to open tree growth and can be ideally called montane or hill savannas. The grasslands on steep slopes of Vindhyan ranges is dominated by Tripogon jacquemontii, which is found drooping down the slopes. The plateaus of Satpura ranges especially the Pachmarhi plateau has several grasses such as Manisuris.



(g)Western Ghats: The grasslands of the Western Ghats are found on the rocky hill slopes, the high altitude rolling downs and on rocky plateau tops. These grasslands can be broadly classified into the following categories:

1. Plateaus of North Western Ghats: These are grasslands found on the plateaus of the Western Ghats in Karnataka, Goa, and Maharashtra. They are usually short grasses and are ephemeral in nature seen as a green flush during the monsoons and thereafter drying up the seeds dispersed waiting for the rainfall next monsoon. Such grassland communities are common in Panchgani, Mahabaleshwar, Ratnagiri, and Kaas plateau.

2.Shola grasslands: These are high altitudes grasslands of the Western Ghats having an altitude of above 1800 m upto the highest peak of Anaimudi at 2695 m above mean sea level. These grasslands are found between the shola forest patches that occur in the depressions created by

watercourses flowing in these rolling downs. The grasslands of Eravikulam National Park, Mukurti Sanctuary, Kodajadri, Bababudangiri, Agastyamalai, and Poochipara in Silent Valley National Park are all examples of shola grasslands. Unlike the plateau grasslands of Northern Western Ghats, these grasslands receive heavy rainfall throughout the year. One of the important tree species found at the edges of these grasslands is Rhododendron arboreum ssp. nilgiricum.

3. South Western Ghats: The slopes of south Western Ghats of Waynad and Idukki districts of Kerala have more of forest grasses. Several species of Cymbopogon, Chrysopogon and Themeda are also very common in these grasslands. Vetiveria lawsonii is found in abundance in the grasslands of the Kabini in Nagarhole National Park. Short grasses such as Lepturus repens are also found in abundance as undergrowth in Bandipur, Nagerhole and Wynad wildlife sanctuaries. Ischaemum zeylanicolum dominates the undergrowth of forest areas at many places. Dimeria spp. are found in large expanse on rocky hills and their ephemeral flowering is a great delight to the eyes. Jansenella griffithiana, Silentvalleya nairii and Chandrasekharania keralense are some of the unique grasses found here. Arundina gramini folia is a unique orchid found in the grasslands of Silent Valley.

(h) Eastern Ghats: The grasslands of the Eastern Ghats are comparatively drier due to lesser rainfall and lower altitudes of around 700 m above mean sea level. They are highly discontinuous and in small patches unlike the Western Ghats. The major grass community is dominated by Arundinella setosa in the higher altitudes.The Shevroy hills of Yercaud, Javadi hills and Malkangiri represent such grassland communities.

(i) Montane bamboo brakes: These are grassland communities dominated by gregarious dwarf monopodial bamboo species, which when one looks from a distance gives the appearance of a normal grassland. These bamboos may be 1 to 5 metres tall depending on the species. The Arundinaria densiflora brakes of Western Ghats. Arundinaria hirsuta brakes of Khasi hills, Arundinaria rolloana brakes of Dzukou valley in Nagaland and Yushania anceps brakes in the sub-alpine regions of Uttarakhand are some of the examples of montane bamboo brakes. They provide suitable habitat to a variety of pheasants and other birds and mammals and the young shoots are also food to a variety of animals including bears and rodents.

Que. 3. (a)Elaborate on characteristics of annual season cycle in India.

Ans. 3(a) The climatic conditions of India can best be described in terms of an annual cycle of seasons. The meteorologists recognize the following four seasons:

The Cold Weather Season Temperature: Usually, the cold weather season sets in by mid-November in northern India. December and January are the coldest months in the northern plain. The mean daily temperature remains below 21°C over most parts of northern India. The night temperature may be quite low, sometimes going below freezing point in Punjab and Rajasthan. There are three main reasons for the excessive cold in north India during this season : States like Punjab, Haryana and Rajasthan being far away from the moderating influence of sea experience continental climate. The snowfall in the nearby Himalayan ranges creates cold wave situation; and Around February, the cold winds coming from the Caspian Sea and Turkmenistan bring cold wave along with frost and fog over the northwestern parts of India. The Peninsular region of India, however, does not have any well-defined cold weather season. There is hardly any seasonal change in the distribution pattern of the temperature in coastal areas because of moderating influence of the sea and the proximity to equator.

Pressure and Winds: By the end of December (22nd December), the sun shines vertically over the Tropic of Capricorn in the southern hemisphere. The weather in this season is characterised by feeble high pressure conditions over the northern plain. In south India, the air pressure is slightly lower. As a result, winds start blowing from northwestern high pressure zone to the low air pressure zone over the Indian Ocean in the south. Due to low pressure gradient, the light winds with a low velocity of about 3-5 km per hour begin to blow outwards. By and large, the topography of the region influences the wind direction. They are westerly or northwesterly down the Ganga Valley. They become northerly in the Ganga-Brahmaputra delta. During the winters, the weather in India is pleasant but gets disturbed by shallow cyclonic depressions originating over the east Mediterranean Sea and travelling eastwards across West Asia, Iran, Afghanistan and Pakistan before they reach the northwestern parts of India. On their way, the moisture content gets augmented from the Caspian Sea in the north and the Persian Gulf in the south. **Rainfall :** Winter monsoons do not cause rainfall as they move from land to the sea. It is because firstly, they have little humidity; and secondly, due to anti cyclonic circulation on land, the possibility of rainfall from them reduces. So, most parts of India do not have rainfall in the winter season. However, there are some exceptions to it: In northwestern India, some weak temperate cyclones from the Mediterranean sea cause rainfall in Punjab, Haryana, Delhi and western Uttar Pradesh. The precipitation is in the form of snowfall in the lower Himalayas. It is this snow that sustains the flow of water in the Himalayan rivers during the summer months. The precipitation goes on decreasing from west to east in the plains and from north to south in the

mountains. The average winter rainfall in Delhi is around 53 mm. In Punjab and Bihar, rainfall remains between 25 mm and 18 mm respectively. Central parts of India and northern parts of southern Peninsula also get winter rainfall occasionally. Arunachal Pradesh and Assam in the northeastern parts of India also have rains between 25 mm and 50 mm during these winter months. During October and November, northeast monsoon while crossing over the Bay of Bengal, picks up moisture and causes torrential rainfall over the Tamil Nadu coast, southern Andhra Pradesh, southeast Karnataka and southeast Kerala.

The Hot Weather Season Temperature: With the apparent northward movement of the sun towards the Tropic of Cancer in March, temperatures start rising in north India. In most parts of India, temperatures recorded are between 30°-32°C. In March, the highest day temperature of about 38°C occurs in the Deccan Plateau while in April, temperature ranging between 38°C and 43°C are found in Gujarat and Madhya Pradesh. In May, the heat belt moves further north, and in the north-western part of India, temperatures around 48°C are not uncommon.The hot weather season in south India is mild and not so intense as found in north India. The Peninsular situation of south India with moderating effect of the oceans keeps the temperatures lower than that prevailing in north India. So, temperatures remain between 26°C and 32°C. Due to altitude, the temperatures in the hills of Western Ghats remain below 25°C. In the coastal regions, the north-south extent of isotherms parallel to the coast confirms that temperature does not decrease from north to south rather it increases from the coast to the interior. The mean daily minimum temperature during the summer months also remains quite high and rarely goes below 26°C.

Pressure and Winds: The summer months are a period of excessive heat and falling air pressure in the northern half of the country. Because of the heating of the subcontinent, the ITCZ moves northwards occupying a position centred at 25°N in July. The location of the ITCZ attracts a surface circulation of the winds which are southwesterly on the west coast as well as along the coast of West Bengal and Bangladesh. They are easterly or south¬easterly over north Bengal and Bihar. In the heart of the ITCZ in the northwest, the dry and hot winds known as 'Loo', blow in the afternoon, and very often, they continue to well into midnight.Dust storms in the evening are very common during May in Punjab, Haryana, Eastern Rajasthan and Uttar Pradesh. These temporary storms bring a welcome respite from the oppressing heat since they bring with them light rains and a pleasant cool breeze. Occasionally, the moisture-laden winds are attracted towards the periphery of the trough. A sudden contact between dry and moist air masses gives

rise to local storms of great intensity. These local storms are associated with violent winds, torrential rains and even hailstorms.

Variability of Rainfall A characteristic feature of rainfall in India is its variability. The values of coefficient of variation show the change from the mean values of rainfall. The actual rainfall in some places deviates from 20-50 per cent. The values of coefficient of variation show variability of rainfall in India. A variability of less than 25 per cent exists on the western coasts, Western Ghats, northeastern Peninsula, eastern plains of the Ganga, northeastern India, Uttaranchal and Himachal Pradesh and south-western part of Jammu and Kashmir. These areas have an annual rainfall of over 100 cm. A variability of over 50 per cent exists in the western part of Rajasthan, northern part of Jammu and Kashmir and interior parts of the Deccan plateau. These areas have an annual rainfall of less than 50 cm. Rest of India have a variability of 25-50 per cent and these areas receive an annual rainfall between 50 -100 cm.

Que. 3. (b) Name the industrial regions of India. Also discuss the factors of localization of iron and steel industry

Ans.3(b) 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

Major Industrial clusters of India

1 Mumbai –Pune Industrial Region

2 Hugli Industrial Regions

3 Banglore –Tamil Nadu Industrial Region

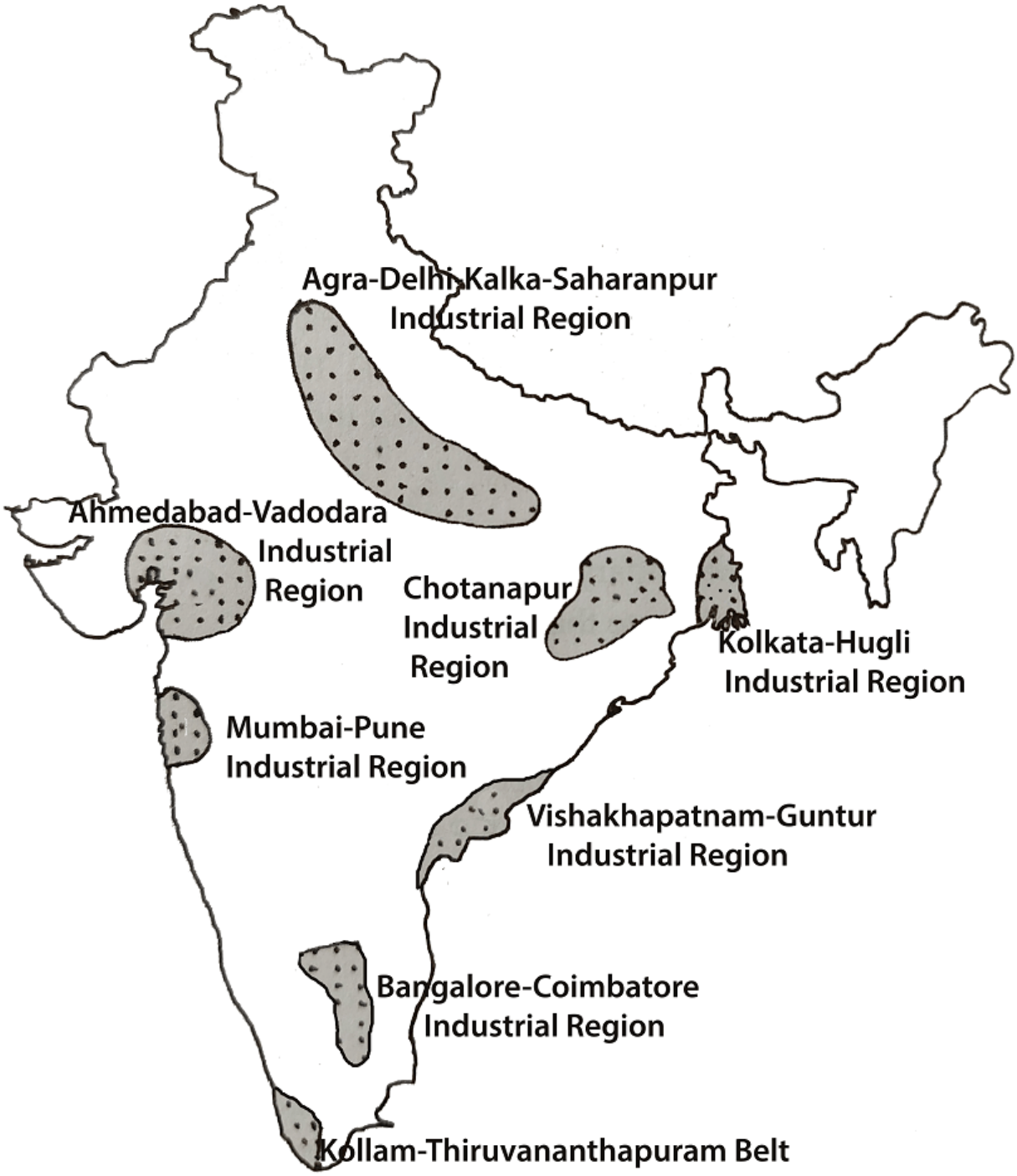
4 Gujrat Industrial Regions

5 Chotnagpur Industrial Region

6 Vishakhapatanan –Guntur Industrail Regions

7 Gurgaon-Delhi –Meerut Industrial Region

8 Kollam- Thirvananthapuram Industrial regions



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:

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, West Bengal, 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.

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.

Sea port location, when some raw materials for industry to be imported and finished steel to be exported then sea port locations are preferred. 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

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Que. 3. (c) Examine the geologic framework constituents on Indian plateau.

Ans. 3 (c) About two-thirds of the Indian Peninsula comprises Precambrian rocks .These rocks in parts are covered by Phanerozoic sedimentary suites and by the Deccan plateau basalts. The Indo-Gangetic plain occurring between the Precambrian rocks of the Indian Peninsula and the highly deformed suites of the Himalaya conceals northward dipping Precambrian rocks of which little is known. Precambrian rocks of the Himalaya are highly tectonised due to collision of the Indian Peninsula with the Asiatic mainland and are separated from the southern shield by a northward dipping boundary thrust plane. The continuity of Precambrian across this boundary thrust below the Indo-Gangetic alluvium is, therefore, difficult to establish.

The Precambrian geology of the geographical segments and the provinces therein can be summarized as follows:

Southern part of the Peninsula

The region falls south of Central India Tectonic Zone and southwest of the Godavari rift. Only a small part of the Eastern Ghats occupies the northeastern part. The Precambrian rocks of the southern part of the Indian Peninsula are dominantly granulites, high-grade gneisses with migmatites, greenstones, ancient supracrustal rocks, post-tectonic granites and cover sequences viz. Cuddappah, Kurnool, Bhima, Badami, Kaladgi, Pakhal and Sullavai. The southern part of the Peninsula comprises two provinces. They are (i) Dharwar Province and (ii) Southern Granulite Province. The Dharwar Province falls north of the Southern Granulite Province and the two are separated by Palghat-Kavery shear zone. The Dharwar Province is essentially a granite-greenstone terrain characterized by a number of NNW-SSE trending belts of schistose rocks separated by granitic terrains. The Province is divisible into western and eastern parts along a major shear zone west of the Closepet Granite. The supracrustal schistose rocks (metavolcanics) belong mostly to Dharwar Super group, but relics of an earlier supracrustal sequence have been recognized which predate the granitic gneisses. The tectonometamorphic status of the older and younger schist belts and the gneisses is not very clear. The Southern Granulite Province is made up chiefly of charnockites, mafic granulites and khondalites and is intersected by several shear zones. The province is, however, not solely composed of rocks of granulite facies, but gneisses and supracrustal rocks of amphibolite facies are also abundant. Radiometric dates obtained from this province vary between 3.0 and 2.0 Ga indicating the ages of the parent rocks, their transformation into granulites and also their subsequent retrogression. As a result, this province

includes 2.5 Ga old Nilgiri-Madras belts as well as even 550 Ma old charnockites of Madurai and Trivandrum area. This province is often focused in recent literatures in an attempt to reconstruct the East Gondwanaland by a possible Madagascar-India fit.

Central part of the Peninsula

The central part of the Peninsular Shield forms broadly a rectangular area bounded by the Eastern Ghats, the Mahanadi and Godavari rifts, and the Narmada-Son Lineament (North). This part is made up dominantly of Archaean to Middle Proterozoic basement complexes and Late Proterozoic to Early Palaeozoic platformal cover rocks. The greater part of the area is occupied by granites and gneisses with engulfed and overlying supracrustals of metasedimentary and metavolcanic rocks of Sausar, Sakoli, Bengpal, Bailadila and other suites. In this ancient terrain, a number of Late Proterozoic basins were developed (e.g. Vindhyan, Indravati, Chhatisgarh, Baster, etc.) which are now occupied by unmetamorphosed sediments. The central part has been broadly divided into three provinces, viz. Bastar Province, Satpura Province and Eastern Ghats Province.

The Bastar Province represents major part of the Central Peninsula and includes the rocks of Sukma, Amgaon, Bengpal, Bailadila, Dongargarh and Sakoli belt. The Satpura Province represents a Proterozoic mobile belt (including Mahakoshal belt, Sausar belt. Bilaspur-Raigarh-Surguja belt and Betul-Chindwara belt) trending ENE-WSW to the west of the Chhattisgarh basin and north of the Amgaon, Sakoli and Nandgaon supracrustals. The rocks in the province are extensively deformed and metamorphosed during the Early to Middle Proterozoic.

Eastern and Northeastern part of the Peninsula

This part is separated from the rest of the Indian Peninsula by the Mahanadi rift graben bounding it in the west and south. Different provinces included in this segment are Singhbhum-North Orissa Province, Chhotanagpur Province and Meghalaya Province. The Singhbhum North Orissa Province is characterized by an Archaean continental nucleus (> 3.0 Ga) bounded by the arcuate Singhbhum shear / thrust zone in the north and northwest and Sukinda thrust in the south. This Archaean basement is overlain to the north by Early Proterozoic supracrustals (North Singhbhum Mobile Belt) trending roughly E-W. This belt of supracrustals is bounded by the Chhotanagpur Province, which occurs further towards north. The youngest Precambrian supracrustal sediments in the province occur in the Kolhan basin showing a synclinal structure. Striking characteristics of the Singhbhum-North Orissa Province include wide spread occurrences of Early Archaean tonalite-trondhjemite gneiss and greenstone belts with prominent Banded Iron Formation.

The Chhotanagpur Province represents a sea of composite granitoids with enclaves of metasedimentary rocks, granulites, subordinate mafic/ ultramafic schists and minor anorthosites. Rocks of the Chhotanagpur belt range in age (K/ Ar dates) from 1500 to 800 Ma. The terrain has experienced a series of tectonothermal events spanning over more than a billion years.

The Meghalaya Province is bounded to the south by the Dawki lineament and its northern edge is covered by alluvium of the Brahmaputra River. The Precambrian rocks of the Khasi Hills representing a part of the province have been subdivided into the Gneissic Complex, non-porphyritic granitic rocks, the supracrustals of the Shillong Group, the Khasi Greenstone and porphyritic plutons. The province is a basement reactivated terrain with a Proterozoic tectonothermal history comparing well with the Chhotanagpur terrain. The Gneissic Complex has yielded two Proterozoic dates viz. 1700 Ma and 1150 Ma with the intrusive porphyritic granite plutons yielding ages around 800 and 550 Ma.

North and Northwestern part of the Peninsula

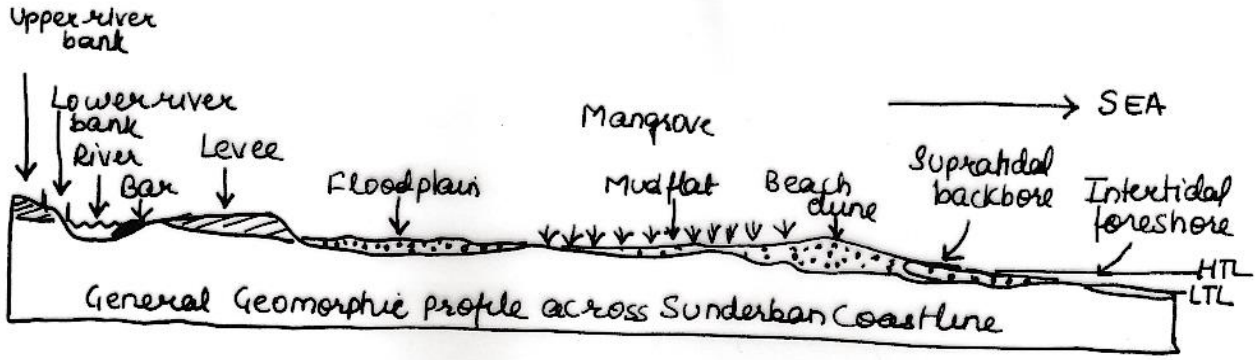
This part is bounded to the south by the Son-Narmada Tapti mega-lineament. Though the western and northern India is treated together here, these two segments are separated from each other by a mega thrust/ fault known as the Great Boundary Fault. Provinces identified in this part are Bundelkhand Province, BGC Province and Aravalli-Delhi Province. The Bundelkhand Province is broadly a triangular segment composed of granite-granodiorite, quartzo-feldspathic gneisses and enclaves of metasedimentary and metavolcanic rocks, quartz-reefs and dykes of dolerite. The existing geochronological data indicate that the rocks were cratonised mainly in the Late Archaean period. The BGC Province is composed of an assemblage (BGC/ Bhilwara Supergroup) of high grade gneisses and granulites, vestiges of greenstones and low grade supracrustals, syn-orogenic granites showing a wide variety of ages (3500 to 2000 Ma) that overlap, the period of deposition of overlying Aravalli-Delhi Supergroup of rocks. The contact between the BGC and the overlying supracrustal suites is a well defined unconformity. Part of the Bhilwara Supergroup appears to represent a continental rift, later developed into an ensimatic orogen. The Aravalli-Delhi province is composed of Proterozoic supracrustal sequences classified as the Aravalli Supergroup and the Delhi Supergroup. In addition, a host of granitic, basic and ultrabasic intrusives and acid extrustives of different ages also occur in the Province. Deposition of the Aravalli rocks (dominated by granite derived sediments, carbonates and volcanics) took place in fault-troughs under eugeosynclinal-miogeosynclinal environment.

Que. 4. (a) Outline the biotic, physiographic and tectonic characteristics of Sunderban delta complex.

Ans.4 (a) The Sundarban Delta Complex, having geo-genetic link to the tectonic Bengal Basin, geographically extends over the eastern India and Bangladesh. It is characterized by prolific growth of rich and diversified mangrove vegetation and forms an integral down drift coastal part of the Bengal Delta Complex that overlies huge thickness of Tertiary marine sediments of the actively subsiding Bengal Basin.

The Bengal Basin, being one of the world's widest, deepest and most tectonically active basins, extends over parts of eastern India, Bay of Bengal Sea and Bangladesh and represents a classical asymmetric pericratonic basin, which originated through different phases of the Tertiary Himalayan orogeny. Being bordered all around by tectonic fabric, the basin has a relatively stable shallow (1-8 km thick sediment) shelf part in the west and northwest facing the Indian shield and a tectonically active southern and eastern fore-deep part centered below the present Ganges – Brahmaputra river mouths. These two parts are separated by a hinge zone marked by high gravity and magnetic anomalies. The Bengal Basin got filled up through the Tertiary marine geosynclinal and shelf sedimentation (>16km thick) followed by gradual progradation of the Quaternary Ganga - Brahmaputra delta fronts towards the southern sea producing the Bengal Delta Complex, the mangrove vegetated Recent – subRecent part of which is popularly known as the Sundarban Delta Complex. Ever since the advent of mangrove ecosystems on the earth in the tropical – subtropical coastal land masses after the breakdown of Gondwanaland, the temporal as well as geographical distribution of mangrove plants are largely controlled by continental drift and Pleistocene glaciation-related environmental and physiographic changes. The present Sundarban mangroves have their widespread ancient counterparts buried under deltaic sediment cover further inland.

The Sundarban Delta Complex and its surroundings have a dynamic physiographical and geomorphological evolutionary history. The region, being a part of the Bengal Basin, represents coalesced multi-generation deltas that have prograded in phases during the positive interglacial eustatic sea level changes occurred during the Plio-Pleistocene time towards the Bay of Bengal leaving behind distinctive multilevel delta surfaces, terraces, palaeochannels and palaeoshorelines and migrating the successive coastline towards southern sea. The Sundarbans represents the mangrove-vegetated Recent-Holocene down drift coastal part of the Bengal Delta Complex.



The Ganges and Brahmaputra river systems mainly drain the area that includes estuaries, few hundreds of delta lobes and islands of latest generation with network of rivulets and tidal creeks or inlets. Towards north the deltas coalesce together to form relatively flat terrain with narrow, scanty and meandering tidal channels. Extensive thick blanket of floodplain deposits, low ridges of natural levees, abandoned channel courses, small pockets of swampy and marshy areas and channel bars characterize a part that constitutes a lower estuarine zone. In the southern part that constitutes a coastal zone, the delta lobes fan out and are separated from each other by wide drainage systems. Here the islands are elongated mostly in north-south direction. The conspicuous coastal landforms include back dunal mudflats-backswamps-saltmarshes and tidal creeks with mangrove vegetation, coast-parallel older stabilized dune ridges & younger mobile dunes and sand sheets, low gradient supratidal and intertidal beaches with mud bank, berms, runnels, tidal flats etc. and offshore bars from land to sea. Biomats are developed locally in patches in the moist and depressed areas. Due to rising sea level, the present coastline is retreating at alarming rate.

Que. 4. (b) Divide India into Meso regions. Discuss any one of these in detail.

Ans. 4 (b) 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. A planning region is a segment of territory (space) over which economic decisions apply. The term 'planning' in the present context means taking decisions to implement them in order to attain economic development. Planning regions may be administrative or political regions such as state, district or the block because such regions are better in management and collecting statistical data. For proper implementation and realization of plan objectives, a planning region should have fairly homogeneous economic, to zoographical and socio-cultural structure. It should be large enough to contain a range of resources provide it economic viability. It should also internally cohesive. Its resource endowment should be that a satisfactory level of product combination consumption and exchange is feasible. It should have some nodal points to regulate the flows.

Planning Region is an area that is large enough to enable substantial changes in the distribution of population and employment to take place within this boundaries, yet which is small enough for its planning problem to be viewed as a whole.

A planning region must be large enough to take investment decisions of an economic size, must be able to supply its own industry with the necessary labour, should have a homogeneous economic structure, contain at least one growth point and have a common approach to and awareness of its problems.

As a whole- A planning region is self created living organism having a life line.

In actual delineation of regions for planning purposes, it becomes necessary to strike a balance between the considerations of homogeneity, nodality and administrative convenience.

A planning Region should have:

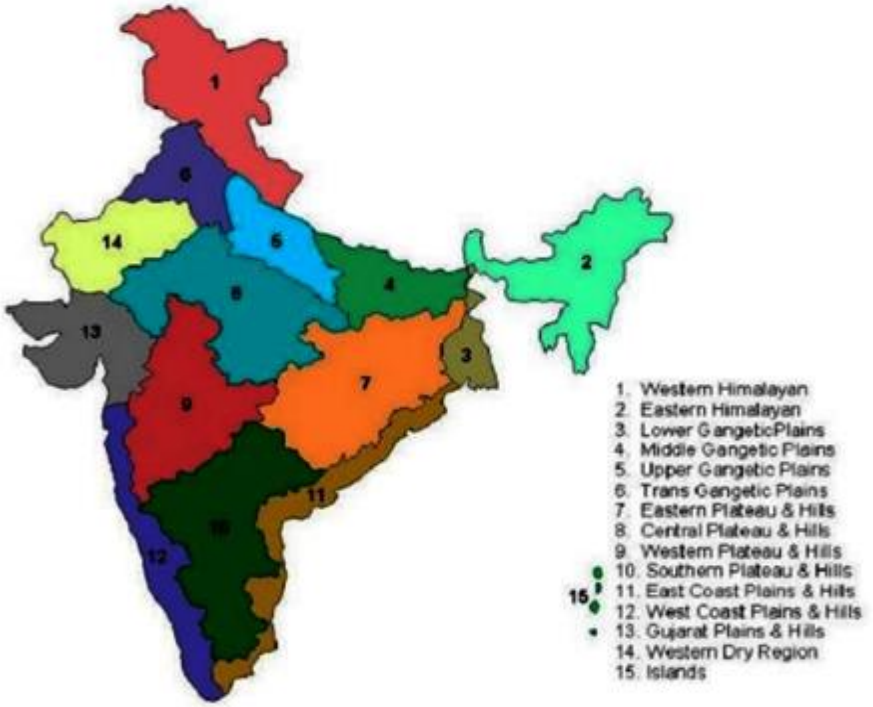
- It should be large enough to contain a range of resources, conditions and attributes so as to serve a desired degree of economic viability and at the same time not too large to make the comprehensive approach too general.
- Its resource position is such that a satisfactory level of product combination for consumption and for exchange would be feasible.
- Planning region is essentially operational in character therefore a high degree of flexibility and elasticity should be maintained in the process of regional delineation.
- The internal homogeneity of the resources should be logically linked up.

- The region should be internally cohesive (closely connected).

Characteristics of a planning Region:

- The region should be geographically contiguous which can be divided into plain, hilly tract, coastal belt etc.
- The people of the region should have social and cultural cohesiveness.
- The region should be a separate unit for data collection and analysis.
- The region should have an economic existence which can be accessed from statistical records.
- It should be small enough to ensure local people's participation in its development.
- It should be under one administrative agency.
- It should not be too small; its geographical size should be big enough to exploit resources. It should be big enough to permit the major part of labour requirements in any employing centre to be met from within the region.
- It should have fairly homogeneous economic structure, i.e, the variation in local proportions of employment and output in agriculture, industry and services should be within a narrow range.
- It should have one or more growth points.
- All the parts of the region should be inter dependent.
- There should be common appreciation of local problems and common aspirations and approaches to their solution; it should permit and encourage competition but not rivalry or apathy between one area and the other.

Macro and Meso Regions of India



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

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.

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.

Que. 4. (c) What are factors exerting influence on Indian Monsoon?

Ans.4.(c) 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.

Factors exerting influence on Indian Monsoon

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.

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.

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 Plateau. 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 500 mb 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.

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.

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.

Discovery of ENSO thus led to establishing important predictor for forecasting Indian monsoon.

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

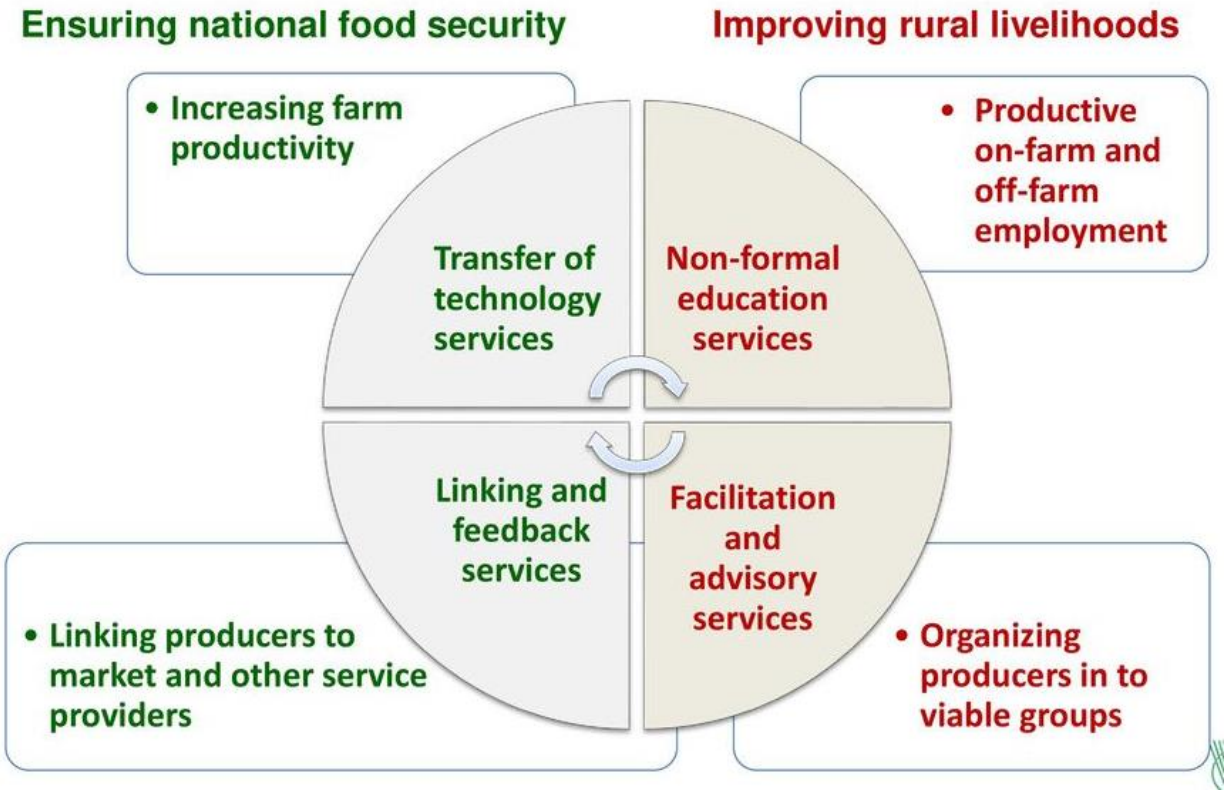
Que. 5 (a) What is the Scope of Agricultural Extension services in India?

Ans. 5 (a) Agricultural extension is the "delivery of information inputs to farmers in order to increase agricultural productivity," as well as the application of scientific research and knowledge to agricultural practices through farmer education. Agricultural extension activities disseminate new ideas and techniques developed by agricultural scientific research centers to farmers.

Agriculture growth depends on various factors such as rainfall, creating irrigation infrastructure, agriculture research and development and prices stabilization, etc.

Besides these, the other critical factor is agriculture extension as it translates innovations in the labs to lands of farmer's. The right information at the right time and place through proper channels is crucial for the farming community to take informed decisions. The extension has been playing an important role in agriculture development for a long time especially during the early period of India's first Green Revolution .It has primarily played a role in disseminating agricultural technologies and management practices and thus greatly accelerating agricultural growth and rural development. With changing in government policies, demand and supply

characteristics of technology, and marketing reforms, agriculture extension system is facing more opportunities together with challenges.



Agricultural extension in India is skewed towards crop production neglecting allied sectors, though the allied sectors such as dairy and fishery significantly contribute towards farmer's household income. However, extension support is weak in the case of animal husbandry and fisheries in India. The public sector extension is currently offering a one-size-fits-all to all category farmers and all kind of products. Considering heterogeneity among farmers, crops they produce, agro-climatic zones, soil types farm resources endowments, enabling policy environment, etc., there is a need for continues capacity building of extension professionals as they lack recent advancements in agriculture technologies and development. In the case of NGO led extension models are relatively efficient and exhibit sensitivity to local priorities, however, they lack capacity and scale to make to create impact at large. It is evident that non-public extension players offering extension services in a localized region without any coordination among the players and even with the public extension. As a result, there is a restriction of good practices developed among individual players and an opportunity to scale applications at large.

Agriculture extension services in India are mainly focusing on crop production mainly focusing on Transfer of Technology (ToT). Around 70 per cent of the Agriculture Research and Education

(R& E) budget was allocated for crop production, while 92 per cent of the budget on agriculture extension was allocated to crop production.

In recent years, consumers' consumption pattern is shifting from cereals based to high-value agricultural products such as Fruits, Vegetables, dairy products etc.

The growth in the High-Value Agriculture sector has been twice or sometimes even thrice that of the crop production. Livestock contributed 26.3 per cent, 15.4 per cent by food-grains and 14 per cent by fruits and vegetables to the gross value of output from agriculture and allied activities. However, Agriculture extension services for such sectors almost nil or unorganized.

Presently, extension service providers such as Public, Private, civil societies are working independently without functional coordination among themselves at field level. As a result, best practices generated by each of the actors not accessible to the wider application.

Majority of the extension service providers in agriculture lack specific standards or quality certification this leads to un accountable in case of any wrong advice to the farmers leading to a loss to the farmers. Thus, extension personnel need to be supported with standardized, certified extension manual that depicts the wide range of strategies, tools and functions that are relevant for their work in different settings. There is no formal mechanism to evaluate extension performance and to understand its impact. Suitable methodologies have to be developed, and senior managers have to be trained in collecting and analyzing the needed data for doing evaluation and impact assessment.

Que. 5 (b) Define Land Capability Classes outlined in India.

Ans. 5 (b) Land capability may be defined as the ability of the land surface to support natural plant growth/ wildlife habitat or artificial crop growth/ human habitat. Thus, it indicates the type of land use [viz., human habitation, agriculture, pastures, forests, wildlife habitat, etc.] that is suitable over a particular type of land. Different lands have different capabilities depending on the land characteristics like slope, soil type, soil depth and erosion conditions. If certain land characteristics are not conducive for agriculture, it is desirable to utilize or ensure the continuity of that land area for other land uses.

The ultimate goal of allocation of various land capabilities over a vast land area with varied characteristics is to achieve complete soil conservation. Complete soil conservation implies perfect soil health and zero soil erosion on a sustained basis. It also facilitates total water conservation and total vegetation conservation. Thereby it results in integrated watershed management on a long term basis. Land capability classification is a system of grouping soils primarily on the basis of their capability to produce common cultivated crops and pasture plants

without deterioration over a long period of time. Land capability classification is subdivided into capability class and capability subclass. Important factors on which the classification is based are:

Group 1 Lands: Generally Suitable for Cultivation

Class I Lands: These lands are nearly level with slopes generally within 1%. The soils are deep, fertile, and easily workable and are not subjected to damaging overflows. There are hardly any restrictions or limitations for their use. These lands are very good lands which can be safely cultivated by using any farming method to grow any crop, even intensively also. However, proper crop rotation and green manure use should be followed to maintain soil fertility [Mal, 1994].

Class II Lands: These lands generally have gentle slope in the range of 1 to 3%. They can be easily cultivated with some conservation practices like contour farming, strip cropping, bund construction or terracing. Therefore one or more of the following limitations exist which slightly reduce the crop choice

- Moderate susceptibility to erosion by wind or water;
- Less than ideal soil depth;
- Somewhat unfavourable soil structure and workability;
- Slight to moderate salinity;
- Occasionally damaging overflows;
- Wetness existing permanently which can be corrected by drainage; and
- Slight climatic limitations on land use and management.

Class III Lands: These lands generally have slopes in the range of 3 to 5% and therefore have severe limitations which further reduce the crop choice or require special conservation practices [like contour farming, strip cropping, cover cropping, bund construction or terracing] or both. Lands in this class have more restrictions than those in Class II Lands due to land characteristics. All the limitations of Class II Lands are applicable here also, but to a greater extent. Hay or pasture crops that completely cover the soil should be preferred. On wet lands of this Class - which usually have heavy and slowly permeable soils, a drainage system along with a suitable cropping plan to improve the soil structure is required.

Class IV Lands: These lands have fairly good soils [i. e., having shallow soil depth and low fertility] and generally have somewhat steep slopes in the range of 5 to 8%. Therefore they have either very severe limitations that largely restrict the crop choice or require very careful management or both. Lands may be suitable only for two to three common crops which build and maintain soil -like the fully covering pastures, with occasional grain crops which can be grown usually once in five years. These lands may have one or more of the following permanent features

- Heavy susceptibility for erosion due to wind, water with severe effects of past erosion;
- Low moisture holding capacity;
- Frequent overflows accompanied by severe crop damage;
- Water logging, excessive wetness and severe salinity; and
- Moderately adverse climate.

Land Capability Sub-Classes: Lands in Classes II, III and IV are further categorised into sub-classes based on the following limitations:

- Risk of erosion or past erosion damage is designated by the symbol 'e';
- Wetness damage or overflow is designated by the symbol 'w';
- Soil root zone limitations are denoted by 's'; and
- Climatic limitations are designated by 'c'.

Group 2 Lands: Generally Not Suitable for Cultivation

Class V Lands: These lands generally have slopes in the range of 8 to 12%. They usually have no to little erosion hazard but have other limitations which restrict their use mainly to pastures, forests, wildlife food and cover. Controlled grazing may be permitted. Some of the examples of Class V Lands are:

- Bottom lands subject to frequent overflows that prevent the normal production of cultivated crops;
- Stony or rocky lands;
- Few ponded areas where soils are suitable for grasses or trees.

Class VI Lands: The lands in this Class have shallow soils and generally have quite steep slopes ranging to 18%. They have severe limitations which restrict their use to pastures with very limited grazing, woodlands, wildlife food and cover. Some of the limitations of these lands which can't be corrected are:

- Severe erosion;
- Stony texture with shallow rocks
- Excessive wetness or overflow
- Low moisture capacity
- Severe climate.

Class VII Lands: The lands in this Class are generally eroded, rough, having shallow soil depth and steeper slopes ranging to 25%. The soils may be swampy or drought prone, with all the

limitations of Class VI Lands even to a higher degree. If there is good rainfall, they may be used for forestry with fully green cover, gully control structures and severely restricted grazing.

Class VIII Lands: These lands are rough with probably the worst soil types and possibly the steepest slopes in excess of 25%. They can only be used with very sound gully control measures for forests –if conducive for tree growth, and also for wildlife habitat. However, tree felling and grazing should be strictly avoided.

Certain lands in Group 2 can be made cultivable with major earthmoving or other effective and costly reclamation operations. In India, both the Class VII Lands and Class VIII Lands are combined as Class VII Lands.

The classification does not include capability of soils for trees, tree fruits, small fruits, ornamental plants, recreation or wildlife. The classes are based on intensity, rather than kind of their limitations for agriculture. Each class includes many kinds of soil and many of the soils in any class require different management and treatment.

LCC	Characteristics
Land Suitable for Cultivation	
I	Very good cultivable, deep, nearly level productive land with almost no limitation or very slight hazard. Soils in this class are suited for a variety of crops, including wheat, barely, cotton, maize, tomato and bean. Need no special practices for cultivation
II	Good cultivable land on almost level plain or on gentle slopes, moderate depth, subject to occasional overland flow, may require drainage, moderate risk of damage when cultivated, use crop rotations, water control system or special tillage practices to control erosion
III	Soils are of moderate fertility on moderate steep slopes subject to more sever erosion and severe risk of damage but can be used for crops provided adequate plant cover is maintained, hay or other sod crops should be grown instead of row crops.
IV	These are good soils on steep slopes, subject to severe erosion, with severe risk of damage but may be cultivated occasionally if handled with great care, keep in hay or pasture but a grain crop may be grown once in 5 or 6 years.
Land unsuitable for cultivation but suitable for permanent vegetation	
V	Land is too wet or stony which make it unsuitable for cultivation of crops, subject to only slight erosion if properly managed, should be used for pasture or forestry but grazing should be regulated to prevent cover from being destroyed.
VI	These are shallow soils on steep slopes, used for grazing and forestry; grazing should be regulated to preserve plant cover; if the plant cover is destroyed, use should be restricted until cover is re-established.
VII	These are steep, rough, eroded lands with shallow soils, also includes droughtly and swampy land, severe risk of damage even when used for pasture or forestry, strict grazing or forest management must be applied
VIII	Very rough land, not suitable even for woodland or grazing, reserve for wild life, recreation or wasteland consideration.

Que. 5 (c) Discuss the potential and significance of hydel power in India.

Ans. 5 (c) 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 Bhakhra Nangal 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 concentration 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 northeastern part of the peninsular plateau. As such they have to depend upon the hydroelectric power to meet their energy requirements.

Que. 5(d) What are hydrometeorological disasters?

Ans. 5(d) Of the 3 main types of natural disasters in the world, geological, hydro-meteorological, and biological, hydrometeorological disasters account for over 75% in terms of the damages including casualties, economic losses, infrastructure damage and disruption to normal life. They include floods, droughts, cyclones of all types, landslides, avalanches, heat waves, cold waves, and debris flow. Of the hydro-meteorological disasters, floods account for the majority of disasters followed by wind storms. Regionally, Asia suffers the most compared to other continents.

In recent years, flood disasters resulting from extreme rainfall have been on the increase in many regions of the world. In developed countries, the usual practice of mitigating flood disasters is by structural means which are unaffordable in most developing countries. The alternative then is to look for non-structural means that involve, among other things, early warning systems. They are cost effective and in some situations the only option.

The primary causes of all hydro-meteorological disasters are water and wind (弼Ì). Precipitation, in many different forms at the upstream end leads to flooding when it is too high and droughts when it is too low. Wind systems caused by differential heating between the equator and the poles assisted by the Coriolis force lead to different forms of cyclones which have uncontrollable destructive power. Landslides and debris flow are triggered by rainfall whereas avalanches are triggered by excessive snowfall which is another form of precipitation. Heat waves are caused by stationary high pressure regions in the atmosphere which remain aloft for up to several weeks

thereby trapping the heat instead of allowing it to lift. Cold waves occur when unusually cold and dense air near the surface in the high latitudes moves into the mid and lower latitudes. In addition to these primary causes, abnormal weather and climate patterns also cause natural disasters which many attribute to 'climate change'.

Types of Floods

Flash Floods: Floods occurring within six hours, mainly due to heavy rainfall associated with towering cumulus clouds, thunderstorms, tropical cyclones or during passage of cold weather fronts, or by dam failure or other river obstruction. This type of flood requires a rapid localized warning system.

River Floods: Floods caused by precipitation over a large catchments area, melting of snow or both. Built up slowly or on a regular basis, these floods may continue for days or weeks. The major factors of these floods are moisture, vegetation cover, depth of snow, size of the catchments basin, etc.

Coastal Floods:- Floods associated with cyclonic activities like Hurricanes, Tropical cyclones, etc. generating a catastrophic flood from rainwater which often aggravate wind-induced storm and water surges along the coast.

Urban Flood: As land is converted from agricultural fields or woodlands to roads and parking lots, it loses its ability to absorb rainfall. Urbanization decreases the ability to absorb water 2 to 6 times over what would occur on natural terrain. During periods of urban flooding, streets can become swift moving rivers, while basements can become death traps as they fill with water.

Ice Jam: Floating ice can accumulate at a natural or human-made obstruction and stop the flow of water thereby causing floods. Flooding too can occur when there the snow melts at a very faster rate.

Glacial Lake Outbursts Flood (GLOF): Many of the big glaciers which have melted rapidly and gave birth to the origin of a large number of glacier lakes. Due to the faster rate of ice and snow melting, possibly caused by the global warming, the accumulation of water in these lakes has been increasing rapidly and resulting sudden discharge of large volumes of water and debris and causing flooding in the downstream.

Drought is a temporary aberration unlike aridity, which is a permanent feature of climate. Seasonal aridity (i.e. a well-defined dry season) also needs to be distinguished from drought. Thus drought is a normal, recurrent feature of climate and occurs in all climatic regimes and is usually characterized in terms of its spatial extension, intensity and duration. Conditions of drought

appear when the rainfall is deficient in relation to the statistical multi-year average for a region, over an extended period of a season or year, or even more.

Snow cover on a slope tends to slide down the slope because of gravity. Conditions affecting stability include the gravitational force component of the snow and resisting forces, such as the frictional resistance of the slope or the anchoring effect of shrubs. In general, avalanches are caused when this balance is lost and when the forces exceed the resistance. Avalanches are rarely observed closely since they normally occur during a short time period of one or two minutes. Major

Causes - Major causes of avalanches can be classified into fixed (prime factors) and variable factors (exciting factors), such as weather conditions and the weight of the snow cover, Avalanches occur when these factors are combined. The types and scale of avalanches can differ depending on the combination of these various factors and their scale.

A heat wave is a prolonged period of excessively hot weather, which may be accompanied by high humidity. There is no universal definition of a heat wave; the term is relative to the usual weather in the area. Temperatures that people from a hotter climate, consider normal can be termed a heat wave in a cooler area if they are outside the normal climate pattern for that area. The term is applied both to routine weather variations and to extraordinary spells of heat which may occur only once a century. Severe heat waves have caused catastrophic crop failures, thousands of deaths from hyperthermia, and widespread power outages due to increased use of air conditioning.

A cold wave is a weather phenomenon that is distinguished by a cooling of the air. Specifically, as used by the U.S. National Weather Service, a cold wave is a rapid fall in temperature within a 24 hour period requiring substantially increased protection to agriculture, industry, commerce, and social activities. The precise criterion for a cold wave is determined by the rate at which the temperature falls, and the minimum to which it falls. This minimum temperature is dependent on the geographical region and time of year.

Que. 5 (e) Map Location 30 words for each entry.

Pong dam also known as the Beas Dam, is an earth-fill embankment dam on the Beas River in the state of Himachal Pradesh, India, just upstream of Talwara. The purpose of the dam is water storage for irrigation and hydroelectric power generation

Bhuntar is a town and a nagar panchayat in Kullu district in the state of Himachal Pradesh, India. It is just 11 km from Kullu town, and lies along National Highway 3. The Kullu Airport is located in Bhuntar. Bhuntar is located on the right bank of the Beas River.

Moidams is a tumulus of the royalty and aristocracy of the medieval Ahom Kingdom in Assam. The royal maidams are found exclusively at Charaideo; whereas other maidams are found scattered in the region between Jorhat and Dibrugarh towns. UNESCO World Heritage Centre.

Nallamalla Nallamala Forest is located in the state of Andhra Pradesh and TelanganaIt is part of the Eastern Ghats. Nagarjunsagar-Srisailam Tiger Reserve the largest tiger reserve in India and spread over five districts of Nandyala, Prakasam, Guntur, Nalgonda and Kadapa District Mahabub Nagar in telangana State falls under it. It has been experiencing forest fire**.**

Munthanthurai Kalakkad Mundanthurai Tiger Reserve located in the South Western Ghats montane rain forests in Tirunelveli district and Kanyakumari district in the South Indian state of Tamil Nadu, is the second-largest protected area in Tamil Nadu. It is part of the Agasthyamala Biosphere Reserve.

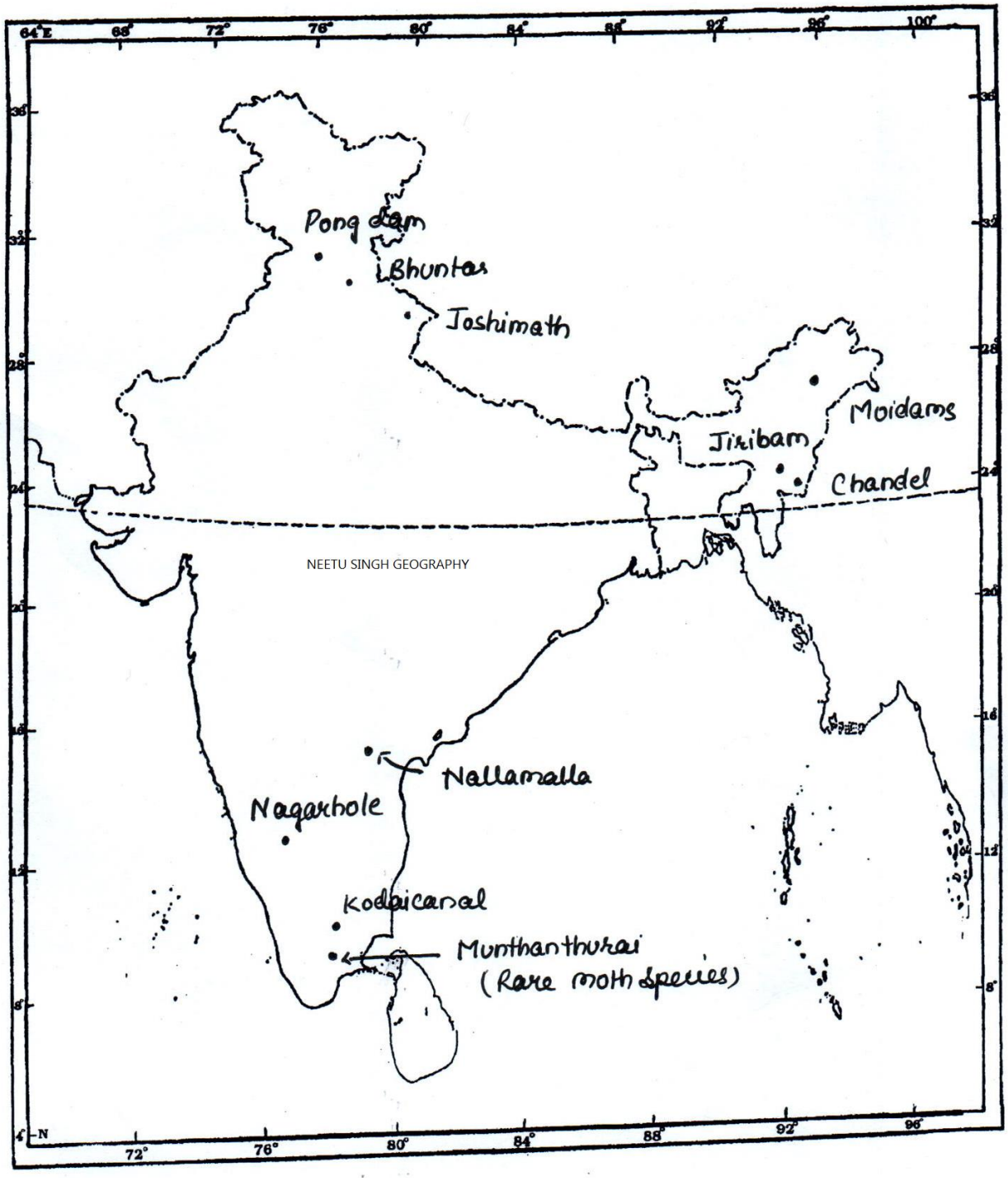
Kodaicanal is a hill town in the southern Indian state of Tamil Nadu. It's set in an area of granite cliffs, forested valleys, lakes, waterfalls and grassy hills. At 2,000 meters above sea level, the town centers around man-made, star-shaped Kodaikanal Lake, bordered by evergreen forest.

Nagarhole National Park, also known as Rajiv Gandhi National Park, is a wildlife reserve in the South Indian state of Karnataka. Part of the Nilgiri Biosphere Reserve, the park is backed by the Brahamagiri Mountains and filled with sandalwood and teak trees. The Kabini River winds through jungle landscapes, home to tigers, Asian elephants and a variety of birds.

Joshimath is a town and a municipal board in Chamoli District in the Indian state of Uttarakhand. Located at a height of 6,150 feet, it is a gateway to several Himalayan mountain climbing expeditions, trekking trails and pilgrim centres like Badrinath.

Chandel also known as Lamka is tiny, but a scenic district in the North-Eastern state of Manipur. It is one of the main nine districts in the state and also the second least populous of all. Situated along the lines of the international border separating India and Myanmar, it has come to be known as Gateway to Myanmar. It lies about 64 kms away from Imphal, with NH-39 passing through**.**

Jiribam is a municipal council in the Jiribam district of the state of Manipur, India. It is one of the fastest-growing towns in Manipur. The town is located on the state's westernmost boundary, adjoining the Cachar district of Assam.

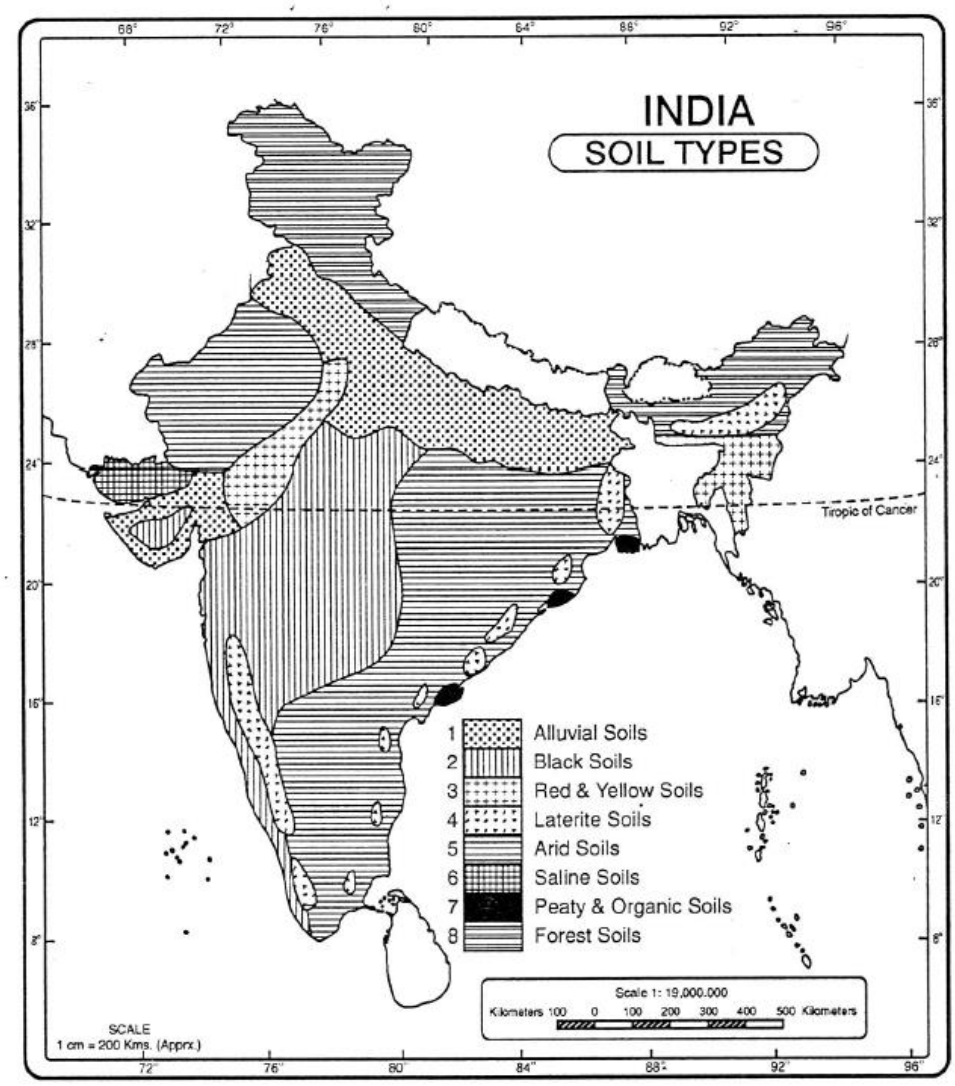


Que. 6(a) What are the main problems of soils in India. Also mention the methods to conserve the soils.

Ans. 6(a) 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

Following are the few characteristics of the Indian Soils:-

- Indian soils are quite old and mature.
- Older Alluvial soils are dominant soils in India.
- Parental rocks and climatic conditions are largely responsible for the formation of older Alluvial soils.
- During dry season, the soils requires irrigation.
- Soils become infertile due to continued cultivation.
- Soil erosion is the major problem of Indian soils.
- Indian soils are mostly deficient in nitrogen, humus and mineral salts.
- The plateau and mountain soils have shallow layers where as the plains have deep soils.



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

- Soil erosion
- Deficiently in fertility
- Expansion of desert
- Water logging
- Alkali Soils
- Wasteland
- Exploitation of land by man
- Encroachment on cultivable land due to urban and transportdevelopment.
- Continued cultivation.
- 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.

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

- 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.
- 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.
- Crop Rotation: It preserves the productivity of land. Depletion of soil minerals by raising the same crop after year is overcome by cultivating legumes.
- Strip Cropping: It involves the planting of crops in rows or strip to check flow of water.
- Dry farming: This practice is useful for croplands in low and moderate rainfall areas.
- 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.

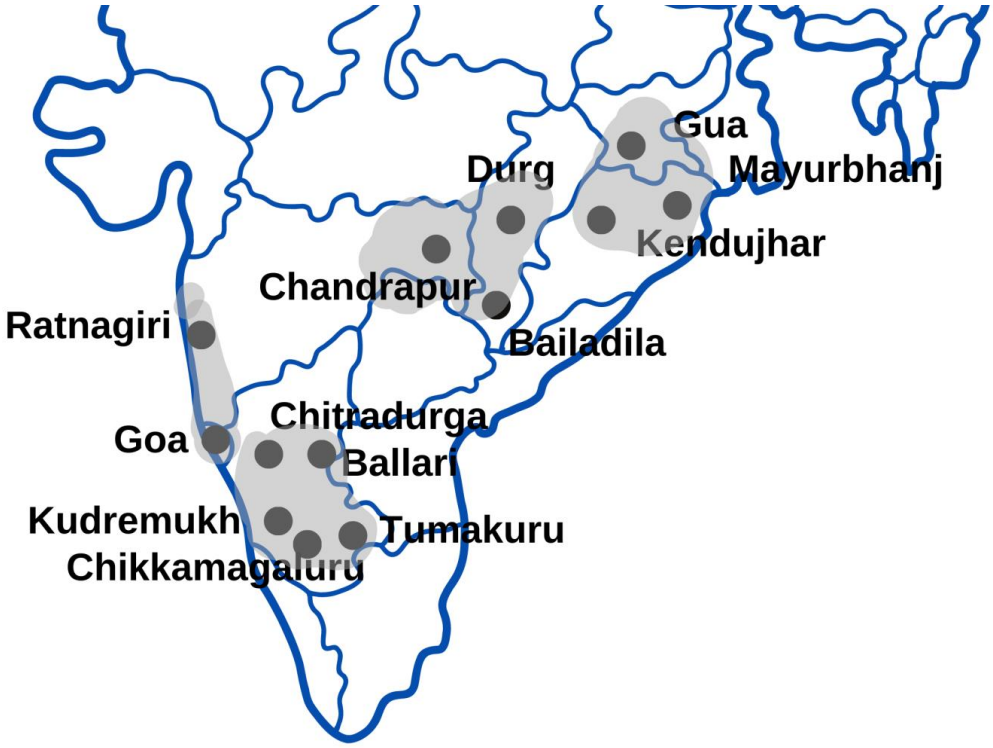
Mechanical Method: These methods are used as supplements to biological methods and include the following:-

- 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.
- Gully Controls: Bunds, dams, drain and diversions should be constructed to check the formation or widening of gullies.
- Basin Listing: It involves construction of small basins along the contours to retain water, which also reduces its velocity.
- Contour terracing: It involves construction of a channel along the slope to intercept and divert the run off water.
- 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.

Que. 6 (b) Discuss the type, production and distribution of Iron ore in India

Ans. 6 (b) 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. 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.



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. 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.

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.

Goa : 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.

Chhattisgarh : Chhattisgarh has about 18 per cent of the total iron ore reserves of India.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.

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 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

Karnataka : Karnataka accounts for nearly 8 per cent of the total iron ore produced in India. In Karnataka production of iron ore has increased by about 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.

Que. 6(c) What are the characteristics and problems of Indian Agriculture?

Ans. 6(c) 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. 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) Zaid is 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.

Some of the outstanding features of Indian agriculture are mentioned as follows.

- **Subsistence agriculture:**
- **Pressure of population on agriculture:**
- **Importance of animals:**
- **Dependent upon monsoon:**
- **Variety of crops**
- **Predominance of food crops:**
- **Insignificant place to given fodder crops:**
- **Labour intensive :**
- **Small and fragmented land-holdings:**

Some of the major problems and their possible solutions have been discussed as follows.

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 the lowest in the world. This is a serious problem which can 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.

Irrigation: 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 and western 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.

Lack of mechanization: In spite of the large scale mechanization of 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.

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.

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.

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.

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. Since the agriculturists' capital is locked up in his lands and stocks, he is obliged to borrow money for stimulating the tempo of agricultural production. The main suppliers of money to the farmer are the moneylenders, traders and commission agents who charge high rate of interest and purchase the agricultural produce at very low price.

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.

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,

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.

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.

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.

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.

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

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.

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.

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.

Que. 7(a) Define Petroleum and discuss the production and distribution of petroleum in India.

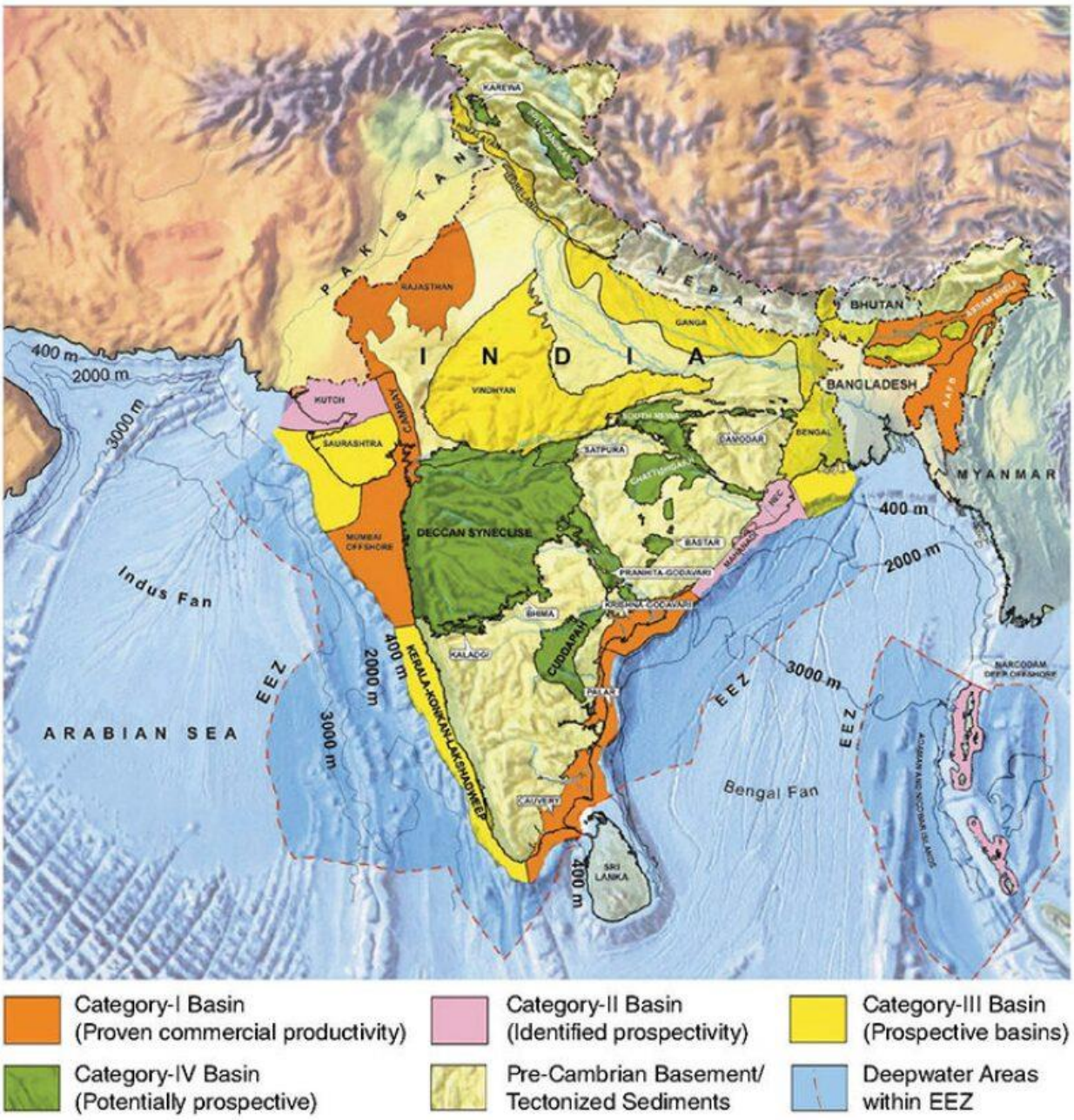
Ans. 7(a) Energy is the primary input in the production of goods and services. The wheels of progress move with the flow of energy. One of the critical elements in raising the standard of living of a country's population is the provision of affordable and reliable energy services in sufficient quantities. 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.

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.

Utilisation of Petroleum. Petroleum and petroleum products are mainly used as motive power. It is a compact and convenient liquid fuel which has revolutionized transportation 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.

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. Gas is still lighter and occurs above oil. Thus on drilling an oil well, one finds gas followed by oil.

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.



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 offshore resources. After that juncture, the off-shore production increased at a much faster rate than the on-shore production.

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.

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

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

The Naharkatiya field : It is located at a distance of 32 km southwest of Digboi at the left bank of BurhiDihing river. Oil from this area is sent to oil refineries at Noonamati in Assam (443 km) and Barauni in Bihar (724 km) through pipeline.

On-shore oil Fields of Western India

Gujarat : Explorations by Oil and Natural Gas Commission (ONGC) 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. 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.

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. Rajasthan produced 6,553 thousand tonnes of oil which accounted for over 17 per cent of

the total production. Thus Rajasthan became the largest on 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 northwest of Mumbai. 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.

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 Godavari, the Krishna and the Cauvery rivers hold great potential for oil and gas production. As such these are both onshore and off-shore areas where extensive exploration has been conducted during the last few years.

The Rawa field in Krishna-Godavari 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 .Some of the outstanding areas which hold possibilities of oil are:

- Jawalamukhi, Nurpur, Dharamsala and Bilaspur in Himachal Pradesh.
- Ludhiana, Hoshiarpur and Dasua in Punjab.

- The Gulf of Mannar off the Tirunelveli coast,
- The off-shore area between Point Catimere and Jaffna peninsula.
- Off-shore deep water area in Bay of Bengal between 12°N-16°N latitudes and 84°E - 86° E longitudes.
- The marine delta region of the Mahanadi, Godavari, Krishna and Cauvery rivers.
- Stretch of sea between South Bengal and Baleshwar coast.
- Off-shore area of the Anadaman and Nicobar Islands.

Que. 7(b) "Tourist Industry of Himachal Pradesh is growing at a very fast rate". Discuss.

Ans. 7(b) 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.

Tourism is one of the quickest developing ventures on the planet .The quantity of travelers worldwide has been enrolling exceptional development and it is normal that this number would in the blink of an eye touch 1 .5 billion. Tourism contributes around 11% of workforce and 10 .2% of worldwide GDP. The dynamic development of this industry is clear from the way that another vacationer is added to the division each 2 .5 second. Himachal Pradesh is now an all-around set and imperative traveler goal and expanding tourism in the state to its potential is the prime focus of the administration for monetary development and success of the state. The nature has given Himachal Pradesh with its unmistakable magnificence and aura with its lavish green valleys; snow secured Himalayan extents, a Zen. Accommodating and agreeable condition, grinning individuals and rich social legacy which visitor would be hard put to discover somewhere else. The outline of Himachal is shaped by Shivalik slopes which are portrayed by shallow valleys and thick backwoods. The mid reaches have the magnificent Himalayan cedar and spruces − taken after by high woods that focalize themselves with snow clad pinnacles of more noteworthy Himalaya.

Tourism in Himachal Pradesh got acknowledgment just in nineteenth century, when the English set up their chain of slope stations. Prior, Himachal had been goal for explorers just, yet now a day's Himachal draws in number of visitors in view of grand magnificence.

Tourism contributes almost 8% of the state's local item which is generally same as that of agriculture part. For advancing tourism, government ought to diagram the arrangement and

determine the activity plan to actualize strategy with watchful arranging and infrastructural advancement, to expand tourism up to 15% by the year 2025 with help of various common social orders and non–governmental associations for the advancement and leading of tourism related exercises.

Objectives

- To set up Himachal Pradesh as a main visitor goal in the nation and abroad.
- To make tourism a prime motor for monetary improvement of the state and as a noteworthy methods for giving work
- To encourage civil societies and non– government organizations for promoting and conducting tourism related activities.
- To advance feasible tourism, which is ecologically perfect as well as prompts financial improvement of the rustic individuals.
- To pull in quality visitors and to build their stay in the state.
- To position Himachal Pradesh as a top destination for enterprise tourism.

Tourism is one industry, which is connected with all improvement offices under their ordinary projects and foundation that assistance to advance tourism. The development of tourism office identifies with incorporate and co–ordinate with divisions like PWD, Urban improvement, I and P H, Wellbeing, Cultivation, Woods, Control and so forth. Proper coordination is probably going to yield great outcomes. Framework in Himachal Pradesh has come up in a portion of the real goals like Shimla, Manali, Dalhousie, Mcleodganj and Kasauli. Need zones incorporate setting up of slope stations, spas and resorts , airplane terminals, vacationer focuses, multiplexes, stopping territories, stimulation focuses, event congregations, ropeways.

Tourism is itself a more extensive term. The products of tourism must permeate down to provincial territories all together that it is really reasonable and dependable. For advancing provincial tourism, towns must be close to existing visitor focuses. Not, even country tourism, state likewise offers new time of nature satisfaction and learning and furthermore gives guests a great presentation to the calm backwoods. This makes it a perfect zone for creating eco–tourism exercises like wilderness safaris, trekking, and shake climbing, outdoors and so on.

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’ Elevation of H.P ranges from 450 m to over 6800 m above sea level. 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:- 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.

Kullu:- Kulluis situated on the banks of Beas river. attractions in kullu are more, white water rafting and para gliding are some of the adventurous sports available. The places to visit here are Bijli Mahadev Temple Sultanpur Place, Great Himalayan National Park, Manikaran , Bhringulake etc.

Manali:- Located at an altitude of 2050 m above mean 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. 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 900 meters above mean of sea level, chamba makes an excellent holiday treat . It is also an important Pilgrimage 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 valley on one side. The mountains being over 4000 m 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 everywhere in Dharamshalla .

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. 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.

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 . Other tourist destinations of Himachal Pradesh are Lahul and Spiti also called ' Little Tibet', Mashorba, palampur , Barat valley, Manikaran and Manimahesh

Different eco−tourism social orders have been built up on CBET (People group Based Eco Tourism) premise to cover the greatHimalayan National Stop (Kullu), Himalayan National Stop (Shimla), Renuka Untamed life Haven (Sirmour) and Potter's Slope Van Vihar(Shimla). The State has shifted geology, atmosphere and woodland cover and is enriched with an immense assortment of widely varied vegetation. At present there are 32 Havens, 2 National Parks and 3 Diversion Holds. Himachal has developed as a critical traveler goal.

Extensive number of religious vacationers visits holy places of worship of state reliably. The tourism office proposes to progress and setup enterprise sports " school in request to prepare youth in Paragliding, Boating , Water sports, Mountaineering, Engine sports and so on in a joint effort with the WHMI Manali and the State Level Affiliations . Indeed, even there is additionally an incredible breadth to setup Spa's, health resorts to advance wellbeing tourism. Capability of Panchkarma urges us to begin this bigly in the state with a specific end goal to draw in bigger number of sightseers for Panchkarma treatment. Preparing the adolescent in Panchkarma (Ayurvedic School Paprola) will be attempted through the bureau of Ayurveda who will then be utilized in spa's and wellbeing resorts. Advancement of neighborhood workmanship and the way of life and era of salary work through it are real segments of our tourism arrangement.

Himachal Pradesh has many undiscovered spots with unspoiled charm that are worth a visit for a quiet rewarding holiday spent amidst the splendor of nature away from crowds. Some tourist places need to be developed to international standards. MaharanaPratapSagar will be developed as world class water sports destination in the state. Promotion of tourism not only gives attraction and charmness to tourists but it is also a source of earnings and employment which makes the state prosperous and healthy.

Que. 7 (c) Discuss the major factors affecting uneven population distribution in India. Discuss in detail population density in India.

Ans.7 (c) 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.

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.

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 northeast 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.

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.

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.

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.

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.

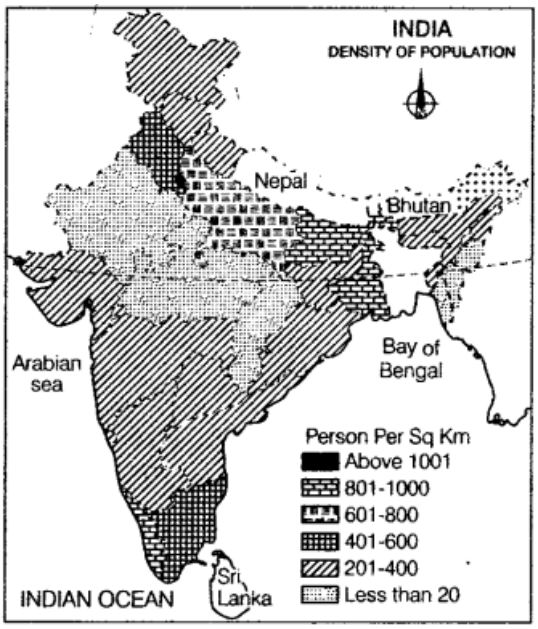
Transport : Growth of population is directly proportional to the development of transport facilities. The northern plain of India has a dense network of transport routes and is a densely populated region. The peninsular plateau has moderate network of transport routes and is moderately populated area.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

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. 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. Therefore, the density of population of India in 2011 is 382 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. 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 2001-11 alone, 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.

Areas of Extremely Low Density: Areas having 100 persons per sq. 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.



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.

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.

Areas of Very 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.

Que. 8 (a) "India has a large variation in climate from region to region", explain it with climatic regions of India.

Ans. 8 (a) India has a large variation in climate from region to region, due to its vast size.

Tropical rainy climate: This regions belonging to this group experience persistent high temperatures which normally do not go below 18°C even in the coolest month. There are two climatic types which fall under this group.

Tropical monsoon rain forest:

This type of climate is found in the west coastal plain and sahyadris and in parts of Assam. The temperature is high, not falling below 18.2ºC even during winter and rising to29ºC in April and May, the hottest months. Mangalore records 29.3ºc in April, because of heavy rainfall and squally winds, the period of southwest monsoon is quite cool. The average annual rainfall exceeds 200 cm: Mangalore receives 250 cm. the south west monsoon breaks out here earlier and lasts longer than in most other parts of the country. December to March is the dry months with very little rainfall. The heavy rain is responsible for the tropical wet forests in these regions, which consists of a large number of species of animals. Evergreen forests are the typical feature of the region. Dense, forests and plantation agriculture with crops like tea, coffee and spices are the characteristics vegetation in the area.

Tropical wet and dry or savanna climate:

Most of the peninsula, except the semi arid zone in the leeside of the Sahyadris experiences this type of climate. Winter and early summer are long dry periods with temperature above 18°C. Summer is very hot and the temperatures in the interior low level areas can go above 45°C during May. The rainy season is from June to September and the annual rainfall is between 75 and 150 cm. Only central eastern Tamil falls under this tract and receives rainfall during the winter months of late November to January. The natural vegetation all over the area is savanna. A variety of crops with or without irrigation are raised in the area. Nagpur has a mean temperature of 35.4 degree C for May which is the hottest month and 20.7 degree C for December the coldest month in the year. The natural vegetation all over the area is savanna.

Dry climate group:

This group consists of regions where the rate of evaporation of water is higher than the rate of moisture received through precipitation. It is subdivided into three climate types.

Tropical semi-arid steppe climate:

The rain-shadow belt, running southward from central Maharashtra to Tamil Nadu, in the leeside of the Sahyadris and Cardamom Hills come under this type of climate of low and uncertain rainfall.

A long stretch of land situated to the south of Tropic of Cancer and east of the western ghats and the Cardamom Hills experiences this climate. It includes Karnataka, interior and western Tamil Nadu, western Andhra Pradesh and central Maharashtra. This area receives minimal rainfall due to being situated in the rain shadow area. This region is a famine prone zone with very unreliable rainfall which varies between 40 to 75 cm annually.

Towards the north of Krishna River the summer monsoon is responsible for most of the rainfall, while to the south of the river rainfall also occurs in the months of October and November. The coldest month is December but even in this month the temperature remains between 20°C and 24°C. The months of March to May are hot and dry with mean monthly temperatures of around 32°C. The vegetation mostly comprises grasses with a few scattered trees due to the rainfall. Hence this area is not very well suited for permanent agriculture. The climate is suitable only for dry farming and livestock rearing.

Tropical and sub-tropical desert:

Most of western Rajasthan falls under this climate type characterized by scanty rainfall. Cloud bursts are largely responsible for all the rainfall seen in this region which is less than 30 cm. These happen when the monsoon winds penetrate this region in the months of July, August and September. The rainfall is very erratic and a few regions might not see rainfall for a couple of years. The summer months of May and June are very hot with mean monthly temperatures in the region of 35°C and highs which can sometimes reach 50°C.

During winters the temperatures can drop below freezing in some areas due to cold wave. There is a large diurnal range of about 14°C during summer which becomes higher by a few more degrees during winter. This extreme climate makes this a sparsely populated region of India. This type of climate occurs over a broad crescent from Punjab to Kachchh between the Thar Desert to its west and the more humid climates of the Ganga Plain and the Peninsula to its east and south respectively. The climate, therefore, is transitional between these two areas. The annual rainfall is not only low but it is also highly erratic.

Tropical and sub-tropical steppe:

The region towards the east of the tropical desert running from Punjab and Haryana toKathiawar experiences this climate type. This climate is a transitional climate falling between tropical desert and humid sub-tropical, with temperatures which are less extreme than the desert climate. The annual rainfall is between 30 to 65 cm but is very unreliable and happens mostly during the summer monsoon season. Maximum temperatures during summer can rise to 40°C. The vegetation mostly comprises short coarse grass. Some crops like jowar and bajra are also cultivated. The western part of Barmer, Jaisalmer and Bikaner districts of Rajasthan and most of the part of Kachchh form the sandy wastes of the Thar which experiences a typical desert climate. Ganganagar has recorded a maximum temperature of 50 degree C, the highest record.

Humid sub-tropical climate group:

The temperature during the coldest months in regions experiencing this climate falls between 18 and 0°C. It has one climatic subdivision in India.

Humid sub-tropical with dry winters:

This climate experience in the foothills of the Himalayas, Punjab-Haryana plain adjacent to the Himalayas, Rajasthan east of the Aravalli range, Uttar Pradesh, Bihar and northern part of West Bengal and Assam. The rainfall is received mostly in the summer and is about 65 cm in the west and increases to 250 cm annually to the east and near the Himalayas. The winters are mainly dry due to the land derived winter winds which blow down the lowlands of north India towards the Bay of Bengal. The summers are hot and temperatures can reach 46°C in the lowlands. May and June are the hottest months. Winter months are mostly dry with feeble winds. Frost occurs for a few weeks in winter. The difference in rainfall between the east and the west gives rise to a wide difference in the natural vegetation and crops.

Mountain climate:

In the Himalayan mountains the temperature falls by 0.6°C for every 100 m rise in altitude and this gives rise to a variety of climates from nearly tropical in the foothills to tundra type above the snow line. One can also observe sharp contrast between temperatures of the sunny and shady slopes, high diurnal range of temperature, inversion of temperature, and variability of rainfall based on altitude.

The northern side of the western Himalayas also known as the trans-Himalayan belt is arid, cold and generally windswept. The vegetation is sparse and stunted as rainfall is scanty and the winters are severely cold. Most of the snowfall is in the form of snow during late winter and spring months. The area to the south of the Himalayan range is protected from cold winds coming from

interior of Asia during winter. The leeward side of the mountains receives less rain while the well exposed slopes get heavy rainfall. The places situated between 1070 and 2290 m altitudes receive the heaviest rainfall and the rainfall decreases rapidly above 2290m. The great Himalayan range witnesses heavy snowfall during winter months of December to February at altitudes above 1500m. The diurnal range of temperature is also high. The states of Jammu and Kashmir, Himachal Pradesh, Uttarakhand, Arunachal Pradesh, and Sikkim experience this kind of weather.

Que. 8 (b) What are the locational determiners of cotton textile industry in India ?

Ans. 8 (b) 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 Maharashtra, Gujarat, West Bengal, U.P, M.P, and Tamil Nadu.

Several factors are responsible for location of cotton textile in certain states.

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 Maharashtra . However, cotton as a raw material is light weight and non perishable. It hereby looses any weight .Therefore, nearness of raw material site is not essential. Other factors became more important.

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.

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 needs 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 Maharashtra, Gujarat, Tamil Nadu, U.P, etc.

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 Maharashtra, 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.

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.

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.

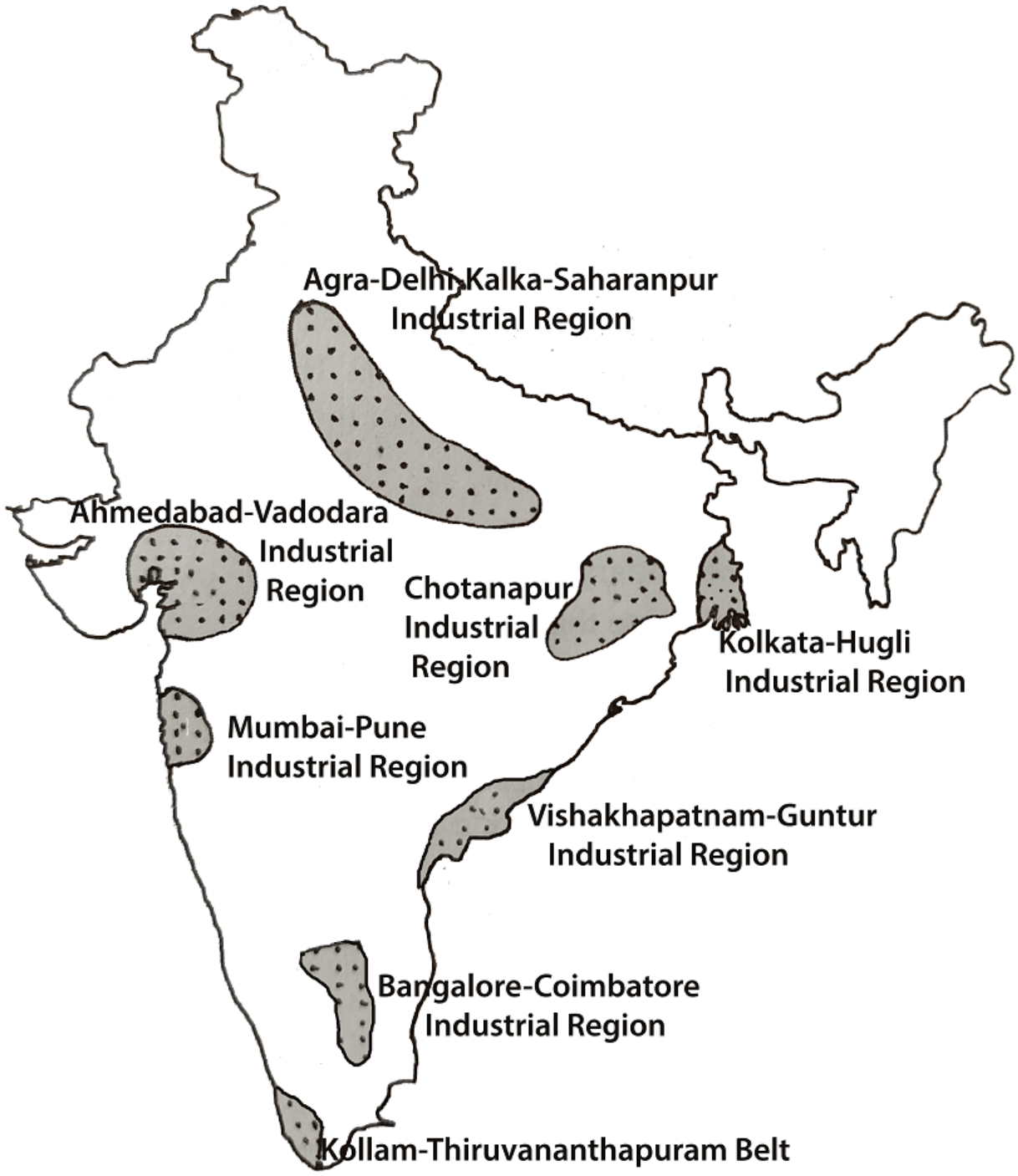
Extreme type of climate, hot, dry or cold not suitable for establishment of cotton textile industry.

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, Chennai etc.

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.

Ques 8 (c) Discuss the origin, development and problems of Mumbai-Pune Industrial region.

Ans 8 (c) 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.


Agra-Delhi-Kalka-Saharanpur
Industrial Region
Ahmedabad-Vadodara
Industrial
Region
Chotanapur
Industrial
Region
Kolkata-Hugli
Industrial Region
Mumbai-Pune
Industrial Region
Vishakhapatnam-Guntur
Industrial Region
Bangalore-Coimbatore
Industrial Region
Kollam-Thiruvananthapuram Belt

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:

- Raw material
- Source of power
- Labour
- Means of Transportation
- Market
- Other factors like climate, Government policies, capital, water, land, etc.
- New factors in changing situation with the advancement of Scientific and Technological development.

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 .

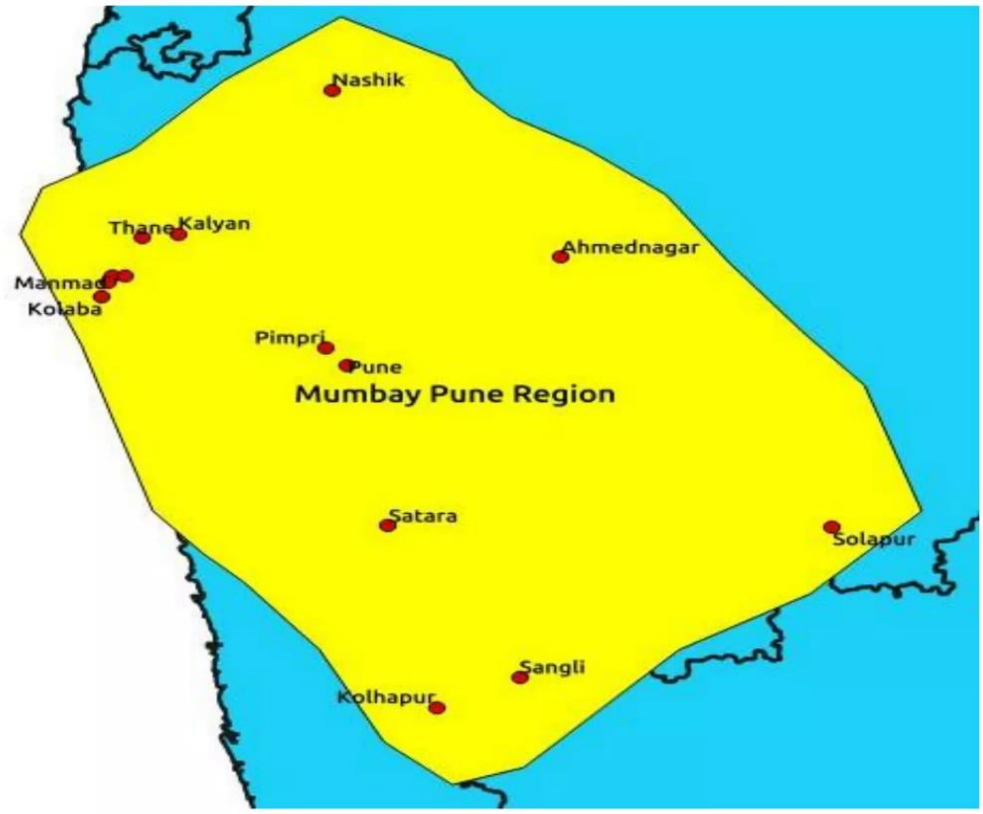
ii) Coastal humid climate ideal for weaving and spinning.

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 shipbuilding.

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 area can further solve the problem of congestion of this region.