

In India the forest occurs over 22.1 percent area of the country. But according to environmentalists 33% area of any country should be under forest. Among this also only 14 percent are can be called true forest. During the past the ruthless exploitation of the forest have resulted into such a small area. Due to exploitation of forest the resources from the forests are decreasing very fast.

The forest have many advantages. It provides us with wood for furnitures, doors and windows. They supply domestic fuel to rural and tribal people. Bamboos and Sabai grasses provide raw material to the paper industry. 'Katha' is extracted from Khair trees. Besides, forests are the source of sandal, wood, rubber, mahua (for distillation of spirit) and lac. Silk worms are reared on the trees. The forest provides leavers for Biri industry, tanning materials, various types of herbs, and fodder for cattle.

Forest purifies air and lessens the air pollution. Forest gives more rainfall and control flood. It is important for ecological balance.

Soil of India

The Agriculture Research Institute has classified the soils of India into six types. They are the following—

(i) **Alluvial Soil**—It is river-borne soil found in the river basins and the deltaic region. The Great Plain of India between Himalyas and the plateau has been formed by the alluvial soil. In the Ganga plain the younger alluvium is called 'Khadar' and the older alluvium is called 'Bhangar'. The texture of the alluvial soil is generally fine hence they are fertile. In Khadar alluvium there is domination of clay which is sticky and suitable for paddy Jute, Sugarcane, maize etc. The Bhangar alluvium is a mixture of sand and clay and is suitable for a variety of crops.

(ii) **Black Soil**—This soil is formed form basalt rocks. The area of this soil extends over Gujarat, Maharastra, Madhya Pradesh, Andhra Pardesh and Tamilnadu. The total geographical area of this soil is roughly 5 lakh square kilometres. This soil is most suitable for cultivation of cotton, hence it is more famous by the name of Black Cotton Soil. The other crops succesfully grown over this soil are sugarcane, jowar and oilseeds. This soil has great water retaining capacity.

(iii) **Red-Yellow Soil**—This is the main soil of the Penisular India. It is formed from iron-rich metamorphic rocks. Due to the presence of iron its colour is red or yellow. This is highly leached soil and sandy in nature; It covers about 2 lakh square kilometers. The fertility of soil is poor and suitable for millets. At the lower slope the soil is generally more fertile than the upper slope.

(iv) **Laterite Soil**—This soil is the product or warm and humid climate of the plateau region. Generally lateritic soil is formed on top of the hills of the Eastern Ghats, Southern Western Ghats and Assam. This soil is more leached than the red soil. It is infertile and even vegetation do no grow. The soil is noduler and rich in iron and alluminium.

(v) **Desert Soil**—This soil is found in arid and semi-arid region. This is dominated by sand. In Rajasthan it is called Bhur. Due to lack of humus (organic elements) this

soil is infertile. But where irrigation facility exists several crops, viz Jowar, Bajara, Til cotton and wheat are grown.

(vi) **Mountain Soil**—On Himalyas the soil layer is thin coarse and infertile. The poor fertility is due to the fact that fertile elements are washed away by rain. However the soil is rich in humus. On lower slopes thick forests grow but on height only grasses grow. On terraced field paddy and vegetables are cultivated.



Lesson—3

Political Division, Boundary and Geo-politics of India

In Indian Union there are twenty five states, one National Capital Region (given status of a state) and six centrally admistered Union territories. In area they are in the following order.

State	Area (in Km ²)	Population (1991)	Rank	Density
01. Madhya Pradesh	4,43,546	6,61,81,170	6	149
02. Rajasthan	3,42,239	4,40,05,990	9	128
03. Maharastra	3,07,690	7,89,37,187	4	256
04. Uttar Pradesh	2,49,411	13,91,12,287	1	471
05. Andhra Pradesh	2,75,048	6,65,08,008	3	241
06. Jammu-Kashmir	2,22,068	77,18,700	15	76
07. Gujarat	1,96,024	4,13,09,582	10	210
08. Karnatka	1,91,791	4,49,77,201	8	234
09. Bihar	1,73,877	8,63,74,465	2	497
10. Orissa	1,55,707	3,86,59,736	11	202
11. Tamil Nadu	1,30,058	5,58,58,946	7	428
12. West Bengal	38,752	6,80,77,965	5	766
13. Arunachal Pradesh	88,743	8,64,558	24	10
14. Assam	78,438	2,24,14,322	12	284
15. Himachal Pradesh	55,673	51,70,877	17	92

State	Area (in Km ²)	Population (1991)	Rank	Density
16. Punjab	50,362	2,02,81,969	13	401
17. Haryana	44,212	1,64,63,648	14	369
18. Kerala	44,212	2,90,98,518	18	747
19. Meghalay	22,429	17,74,778	21	78
20. Manipur	22,327	18,37,149	20	82
21. Mizoram	21,081	6,89,756	25	33
22. Nagaland	16,579	12,09,546	22	73
23. Tripura	10,486	27,57,504	19	262
24. Sikkim	7,096	4,06,457	26	57
25. Goa	3,702	11,69,793	23	316
26. Delhi (NCR)	483	94,20,446	16	6319
Union Territories				
01. Andaman-Nicobar	8,249	2,80,661	3	34
02. Pondicherry	492	8,07,785	1	1605
03. Dadra & Nagar Haveli	491	1,38,477	4	282
04. Chandigarh	114	6,42,015	2	5620
05. Daman and Diu	112	1,01,586	5	906
06. Lakshdweep	32	51,707	6	1615
India		84,602,688		267

From the point of view of population Uttar Pradesh is the largest state where as Sikkim is the smallest one.

Border—On the border there are many states which make international boundary with other countries. States with Pakistan border are Gujarat, Rajasthan Punjab and Jammu-Kashmir. The states with China border are Jammu and Kashmir, Himachal Pradesh, Uttar Pradesh, Sikkim and Arunachal Pradesh. The border of Arunachal Pradesh and Assam lies with Bhutan. The states adjoining Myanmar border are Nagaland, Manipur

and Mizoram. On the border of Bangladesh lies West Bengal, Meghalay, Tripura and Mizoram. The states adjoining Nepal are U.P., Bihar, W.B. and Sikkim.

The states of India are divided into several regions :

- (i) **Eastern States**—West Bengal, Assam, Meghalay, Arunachal Pradesh, Manipur, Mizoram, Tripura, Nagaland and Sikkim.
- (ii) **Northern States**—Bihar, Uttar Pradesh, Jammu-Kashmir, Himachal Pradesh, Punjab and Haryana.
- (iii) **Western States**—Rajasthan, Gujarat and Maharashtra.
- (iv) **Central States**—Madhya Pradesh.
- (v) **Southern States**—Andhra Pradesh, Tamilnadu, Karnataka and Kerala.
- (vi) **Island territories**—Andaman and Nicobar and Lakshdweep.

Geo-politics of India :

The geo-political importance of India's location—At the present moment the following are the geo-political features of India's location.

1. India's location has been in the centre of the old world. It lies in the southern part of Asia and is thickly populated.
2. Its location is more important with reference to the Indian Ocean. It is located on the main trade route between Europe and Asia. After the opening of Suez canal route it has come on life-line of the international trade.
3. With reference to the present geo-political problems India is surrounded in the north-west by Pakistan and in the north by China, the two main opponents.
4. From geo-political point of view the country is surrounded by poor neighbouring countries barring China. This had resulted in great powers taking great interest in Indian affairs.
5. Due to geographical location only a number of political problems have emerged; e.g., Kashmir problems, Sino-Indian border problem, problems of refugee from Bagladesh, river water disputes etc.

Geo-political Problems (Internal) :

1. Kashmir Problems—Kashmir problem is an important problem which concerns with the unity of the nation. During the British rule it had an independent identity. Though muslims are in the large number, it has always been ruled by Hindu king. After the independence Kashmir became an integral part of the country and under article 370 of the Indian constitution it was given special status. Accordingly the chief minister is called the Prime minister, All India Radio is called Radio Kashmir and land sale and purchase is limited between the people of Kashmir only and none else can purchase

them. As a result the regional feeling has developed among muslims. The interference in the internal matter by Pakistan has further aggravated the situation. Pakistan has also encouraged armed insurgency in Kashmir.

2. Problems of Punjab—After Kashmir, Punjab problem is the country's largest problem. Punjab was created in 1966 on the basis of Punjabi language. During the British rule it was identified as Akali social group but the regional leaders and their political ambitions have given call for separate state called Khalistan. In the last decades gradually this problem has become more serious. Pakistan is playing underhand by training ultras and providing them with weaponaries and encouraging insurgencies. This has further made the leaders of Punjab more ambitious.

3. Problems of Gorkhaland—The demand of Gorkhaland by segregating Darjeeling, Siliguri and Coach Behar from the territory of West Bengal has become a serious problem on the international boundary and a threat to the national unity. From geographical point of view this hilly region has been significant from industrial point of view. Tea, forest and tourism industry have been the basis of the economic well-being of the region. This region is traditionally dominated by the people of Nepali origin Gorkha, Lepcha, Bhutia and refugee from Tibet. The predominance of Gorkha has been the reason for demand of Gorkhaland. So far they have been allowed regional autonomy. This has calmed down the Gorkhaland movement.

4. Problems of Assam—Economic conditions, religion and Tribal conflicts and cultural reasons have given birth to terroism in the north-eastern states. The main problem is in Assam. The demand of Bodoland has taken big dimension and the magnitude of insurgency is growing rapidly day by day. The problem has arisen due to economic imbalance in the region. Besides, the infiltration of muslims from Bangladesh has further aggravated the problem. Generally the people of Assam have been opposing it. Due to military action and liberal policy the government have succeeded in curbing terroism to some extent.

5. Jharkand Problem—From the point of view of natural resources forest minerals and industries—Chotanagpur is highly properous. The pople of Chotanagpur (tribals) are demanding a separate Jharkhand state by taking tribal dominated areas of Chotanagpur, Eastern Madhya Pradesh, Northern Orissa and South Western West Bengal. The sturggle for Jharkhand state is being steered by Jharkand Mukti Morcha (JMM) and others. The centre of movement is Singhbhum district. The economic development is centred here. It is dominated by people of other states and the local people are neglected. They are also cut off from their own base. The main reason behind this movement is to acquire and improve economic status of the people. The spread of Christianity, the encouragement of regional feelings among the triabals etc. are the reasons behind this movement. They do not want to compromise in less than a separate state.

Geo-political Problem (International) :

1. Sino-Indian Border inpute—Between India and China there is an international boundary running for 3760 Km. This is a mountain boundary which runs from Gilgit

and Ladakh in the north-west through Uttar Pradesh, Sikkim to the north-eastern part in Assam and Arunachal Pradesh to Myanmar, Himalyan ranges, in this part were serving as natural boundary between the two countries and no body cared about it as there was no use giving any consideration to this. There were many independent country along it like Tibet, Nepal and Bhutan. Tibet was a buffer state between India and China. No problem ever arose upto 1912. But in 1912 when China was declared a republic under Sun-Yet Sen, the boundary problem started. In 1914 the British government made an agreement between Tibet and China. The British govt. was represented by Henry Mc. Mahon. The agreement is known by his name and the boundary is known as Mc. Mahon line. This agreement continued valid till 1949. In 1950 after the occupation of Tibet by China there were some skirmishes on the border between China and India. 1956 China strongly protested the boundary between China and Uttar Pradesh. In 1956-57 China constructed a highway through Aksai Chin in Ladakh and thus violated the international border. In 1959 and again in October 1962 China launched a masive attack in Indian border and captured the boundary zone. At present Aksai Chin of Ladakh, some passes of Central Himalyas and some parts of NEFA Sector are under Chinese occupation. Due to above reasons and handing over a chunk of land of Azad Kashmir to China by Pakistan has further complicated the border problems.

2. Indo-Pak-Border Dispute—The independence of India in 1947 created an another country named Pakistan. The division of pre-independence India was on the basis of religion—Hindu & Islam. Thus the boundary between these two countries was cultural or super-imposed boundary. Setting aside northern part the boundary in the other parts remained undisputed India for centuries remained a geographical and cultural unit. Therefore, after the partition there was large scale transfer of population. Indo-Pak-border ran though Sikh religion with Punjab as their regional centre and Islam religion with Kashmir as regional centre they also resulted into conflict. Pak launched an attack through Mujahiddin and occupied some part of Kashmir before the Indian Army was requested to help Kashmir. Indian forces stopped Mujahiddin further advance cease fire line came into operation as border between India and Pakistan in Kashmir. Since then the border dispute continues and India has fought Pak. forces in 1965 and 1971. However, the dispute still continues.

3. Indian and the Indian Ocean—In the world geo-politics the location of Indian Ocean is of very great significance. Since ancient times the Indian Ocean being in the centre of the old world has influenced the geo-politics of the country in the periphery of the Ocean. This Ocean provided the European easy access to south and south-east Asia and established the colonial rule. Keeping in view the geo-political importance of Indian ocean, British took control of eastern gateway ie. Singapore and Malaysia and western gateway is Scheles Island, the islands near Perisan gulf and the Red Sea Islands. By controlling the entry point of the Indian Ocean British colonialist could rule over Eastern Africa, South and South-East Asia safely for a long time.

Even after the colonial rule was over, Great Britain had control over many Islands of the Indian Ocean. This was planned to keep the commercial interest intact. Later

on after the second world war the plan to surround the communist countries the Indian Ocean became very helpful. Now when the influence of communism has become weak, Russia and U.S.A. are coming closer, air power has made the land boundary meaningless, the importance of Indian Ocean as a geo-political entity continues to be strong. The reason is that the N.W. part of the Ocean is rich in oil and all the world power are taking interest. This is clear from the fact that during previous years (1991 and 1998) in the war between Iraq and USA the developed countries sided with the latter. In this war Diego Garcia Island played a significant role. Besides, South and SE Asia and African countries are still the source of raw materials for various industries in Europe and U.S.A. Therefore, various countries have their interest in the Indian Ocean. Even in India its security and the international trade depends upon Indian Ocean. Therefore, India opposes any move by the western world to have control over Indian Ocean and their war installations over its Island. It is believed that Andaman and Nicobar Islands in the east and Lakshadweep in the west can play important role in the geo-politics of the country.



Lesson—4

Agriculture and Forest Resources of India

India is an agricultural country and agriculture is the main source of its economy. The total area under cultivation is 140.72 million hectare which is 46.1 percent of the total area. Out of this area only 35.24 million hectare land is such on which more than one crop is grown. The intensity of cultivation in numerical terms is 125%. Besides net area sown (NSA), 24.91 million hectare (8.3%) land remains fallow which can be managed to be brought under plough. Over 50% of land irrigation facilities is available. On the rest cultivation depends upon the rainfall.

Crop-season—In India there are two Agricultural seasons—Kharif and Rabi. Kharif is connected with monsoon. Sowing begins in June-July and harvested up to October-November. Where monsoon is active for longer duration (North Eastern India, W. Bengal, Eastern Bihar etc.) two kharif crops are obtained as Bhadai and Aghani. Main Kharif crops are paddy, jowar, ragi, maize, cotton and jute.

Rabi is the crop of winter. The crops are sown between October and December and harvested latest by the end of March. The main Rabi crops are wheat, barley, peas, pulses and oil seeds. Rabi crops are fully dependent upon irrigation.

In various parts of the country where irrigation is available during dry season, gamma or summer crops are grown. The gamma crops include paddy, vegetables and fruits.

Food and Non-Food Crops—The crops grown in the country are of two groups—food crops and non-food crops. Food crops include cereals and pulses. Important food crops are paddy, wheat, jowar, bajra, maize and millets. Pulse crops are Tur, gram, Moong, Masoor, Khesari etc. Among non-food crops are sugarcane, cotton, jute, tobacco etc. They are cash crops. Tea, coffee, rubber, spices are plantation crops. Various fruits, coconut, cashew nut, etc. come under horticulture. All these varieties have extensive cultivation in the country.

Production of Chief Crops and their Area—Food crops are grown over 73 percent area. 1950-51 the total production of food crops in the country was 51 m.mt., in 1983-84 it went upto 152 m.mt. and in 1997 it touched 199 m.mt. At the time of independence the total area under food crops was 97.3 m.ha. which has now gone upto 125 m.ha. Although the production has increased in India but there has been great fluctuations from one year to another. A year of drought reduces the total yield e.g. in 1955-56, and 1987-88, when the production fell by 10-20 m.mt.

Food Crop—The following food crops are important.

1. Paddy—This is the main food crops of the country. This is the main food for most of the population. The area under paddy is much larger than other crops taken together. Paddy is grown both as Bhadai and Aghani crops. The area under paddy is 42.2 m.ha. and the total yield of paddy is 81.2 m.mt. West Bengal is the largest producer of paddy. A.P. comes next Other leading producer of paddy are Uttar Pradesh, Punjab and Bihar. Orissa and Tamilnadu are other leading producers.

2. Wheat—Wheat ranks next to the paddy as a food crop. It is the leading crop of the rabi season. 26 m.ha. has been given to wheat and 69.3 m.mt. is produced every year. Uttar Pradesh is the largest producer of wheat. Punjab ranks second. Other producers of wheat are Haryana, Madhya Pradesh, Rajasthan and Bihar. The production of wheat is negligible in South India. After the first Green Revolution the crop which has been benefitted much is wheat.

3. Jowar and Maize—Jowar is the third leading crop of the country. It is grown both as Kharif and Rabi crops. Jowar is grown over 11.7 m.ha. yielding 9.2 m.mt. The leading producers are Maharashtra, Gujarat, Tamilnadu, M.P. and U.P.

Maize is a millet. It is grown in both the seasons—Kharif and Rabi. Kharif is the main season for maize. The cultivation is done over 6 m. hectare of land and the production amounts to 9.1 m.mt.

4. Others—The other food crops are bajra, marua, and various coarse grains. They contribute significantly to food crops.

5. Pulses—A number of pulse crops are grown over the country. Among the chief pulses are gram, tur (Arhar), moong, masur, urad etc. Gram is mainly cultivated in Punjab, Uttar Pradesh, Madhya Pradesh and Bihar. Arhar is grown in Rajasthan, Gujarat, Uttar Pradesh and Bihar, Urad is the main pulses of Punjab, Haryana, Uttar Pradesh and Rajasthan.

Non-Food Crops—Among non-food crops the following are important.

1. Sugarcane—This is the main cash crop of the country. Sugarcane is grown on large scale and yields highest in the world. The total area under sugarcane is 3.9 m.ha., and the total production is 260.2 m.mt. Uttar Pradesh, Punjab and Bihar are the three main sugarcane producers in Northern India. In Peninsular India Maharashtra, Andhra Pradesh, Karnataka are main producer. Some sugarcane is also grown in Rajasthan and Madhya Pradesh. In the last one decade the southern states have excelled in sugar production than the northern states. In southern states the per hectare yield of sugarcane is also very high. The cane crushing period in southern state, is also longer.

2. Cotton—Cotton is most important fibre crop of the country. India is only next to the USA and Russia in cotton production. The cotton is chiefly grown in black cotton soil of the Deccan region. The leading states producing cotton are Maharashtra, Gujarat, Punjab, Madhya Pradesh, Karnataka and Tamilnadu. The total area under cotton is 9.9 million hectare and the annual yield is 14.3 million bales. (bale=170 kg.) The Indian cotton is short stapled and only coarse cloth is manufactured. For refined and very fine cloth long stapled cotton is imported.

3. Jute and Mesta—This is the third cash crop of the country. It is grown in those states where rainfall is heavy with water logging. The leading producers are West Bengal, Bihar, Assam, Tripura and Meghalay. Some Jute is also grown in Orissa, U.P., A.P. and Karnataka. Before the creation of Pakistan, India was world's largest producer of Jute. But after creation of Pakistan, most of the area under jute went to East Pakistan (Bangladesh). But the jute industries remained in India. As a result Jute cultivation and Jute industry in both the countries were affected. Artificial and chemical (synthetic) fibres have also adversely affected the jute cultivation. Jute industry is on the verge of decline and is dying very fast.

4. Tea—Tea is the main plantation crop of India. The tea cultivation is extensive on the southern slope of the Himalayas. In Assam the tea gardens are located in Brahmaputra valley and in West Bengal in Darjeeling district. The two account for over 80 percent tea in the country. Darjeeling tea is renowned for its flavour all over the world. Some tea is also grown in Kangra valley of U.P. In south India tea is cultivated on the slopes of Nilgiri hills. India still ranks first in matters of export in the world. The total area under tea is about 4 lakh hectares and the production of tea is about 810.6 million kg. per annum.

5. Coffee—Coffee is next to tea in importance as a beverage. It is also the most important plantation crop after tea. Coffee is grown in South India. Karnataka, Kerala and Tamilnadu are leading producers of coffee. Coffee is grown over 2.32 lakh hectare of land and about 2.32 lakh tonnes of coffee is produced every year.

6. Rubber—In plantation crop rubber is also very important. The main cultivation of rubber is in Kerala. Some rubber is also cultivated in the rainier part of Karnataka and Tamilnadu.

7. Tobacco—Tobacco is also an important money crop India is world's third tobacco producer after the USA and China. India has 10 percent tobacco areas of the world and contributes to 8 percent of the total world production.

8. Oil seeds—A number of oil seeds are cultivated in the country. The oil is extracted from til (Sesamum), tisi (Rape seed), sarson (mustard), ground nut, coconut, castor, cotton seed etc. Groundnut, mustard are both kharif and rabi. About 25.3 m.ha. land is given to oil seeds and 21.4 mt. is annually produced. The main producers are Tamilnadu, Bihar, Orissa, UP, Madhya Pradesh, Punjab and Maharashtra. India has to import oil to meet the domestic requirements.

The agriculture has been greatly developed in the country after independence. Not only area under crops has increased but the yield per hectare has also gone up very high. The introduction of high yielding variety (HYV) of seeds, use of chemical fertilisers, insecticides, and extension of irrigation facilities have greatly helped in improving the agricultural production.

High Yielding Variety of the Seeds (HYV Seeds)—The introduction of HYV seeds have brought revolution in the country. Their use increased tremendously after the 3rd F.Y.P. The yield went so high that the country became almost self-sufficient in food. These seeds are used where irrigation or other source of water is adequate. The extension of use of these seeds is the gift of the first Green Revolution. The following are the percentage of area over which HYV seeds are sown—

Paddy	68.5 % area
Wheat	90.5 % area
Jowar	51.7 % area
Bajra	52.4 % area
Maize	74.5 % area

Fertilizers & Irrigation—Besides the HYV seeds the use of chemical fertilizers has been very significant for the development of agriculture in the country. In the year 1960-61 per hectare use of chemical fertilizer was 1.9 kg. In 1985-86 it has gone up to 47.4 kg. and in 1990-91 it has reached 67 kg. per hectare. India has now 55 factories producing fertilizers. The present production is about 90.4 lakh tonnes. In order to meet growing demand 27.6 lakh tonnes of fertilizers are imported. India produces only nitrogenous and phosphate fertilizers. There is no raw material available for potash fertilizers. As such the requirement of potash fertilizers is met through import.

Chemical—There are several sources of irrigation in the country the important being canal, tube well, surface well and tank.

Canals—As a source of irrigation canal is the most important. Canal has been in use since very long past. Today it provides irrigation to 39 percent area under irrigation. Uttar Pradesh and Punjab have large network of canals taken out from perennial rivers. In South India rivers have been dammed and the canals have been taken out from the reservoirs. In almost all the states some areas are always irrigated. The perennial canals provide irrigation all round the year but inundation canals provide irrigation during rainy season only. The canals are found in the southern states.

Wells and Tube Wells—This is the main means of irrigation in the country. About 48 per cent of irrigated land is covered by wells. Surface wells provide irrigation to 21% and tubewell 27 percent of the land. The main states with well and tubewell irrigation are U.P., Bihar, Tamilnadu and Maharastra. These states have thick layer of soil and high water table. Tubewell irrigation has tremendously developed in post-independence period. The rural electrification and availability of diesel has encouraged this source of irrigation.

Tanks—Tanks account for 8 percent irrigation in the country. It is popular in southern states where canal and tube wells are not feasible. Tamil Nadu and Andhra Pradesh. lead in tank irrigation but tanks are not perennial source. They dry up during summer when irrigation is most needed. If the rainfall is scant, the tanks remain unfilled and irrigation in the ensuing season becomes inadequate. Tanks have to be kept clean of mud which is a costly affair.

Besides the above three, about 5 per cent land is irrigated by other indigenous means. canal irrigation is easier as well as cheaper among the three. However, there are several disadvantages of canal irrigation: It causes water-logging and converts some area into swamps. The excess soil moisture changes the ecological condition and pattern of crops. The swamps are breeding ground for mosquitos and environment is prone to material diseases.

Irrigation schemes are broadly classified as major medium and minor. The scheme which provides irrigation to over 10,000 hectare of land is called major irrigation schemes (project). The schemes between 2000-10,000 hectares, are medium project and below 2000 hectares are minor schemes. To control the flood and prevent the drought, irrigation is the only solution. In order to control flood, conserve water and the development of irrigation. Central Water Commission has been set-up. There are other organisations also; such as, Central Ground-water Board, Central water & Power Board etc. which have greatly helped in development of irrigation. A large number of Irrigation Projects have been set up in country which have been detailed in the following table.

Name of the Project	Name of the river on which the project is located	State where this project is to located
01. Nagarjun Sagar	Krishna	A.P.
02. Tung-Bhadra	Tungbhadra	A.P. & Karnatak
03. Pochampad	Godavari	A.P.
04. Kosi	Kosi	Bihar, Nepal
05. Sone Canal	Son	Bihar
06. Kakrapara	Tapti	Gujarat

Name of the Project	Name of the river on which the project is located	State where this project is to located
07. Ukai	Tapti	Gujarat
08. Sabarmati	Sabarmati	Gujarat
09. Bhadra	Bhadra	Karnatak
10. Malprabha	Malprabha	Karnatak
11. Chambal	Chambal	M. P. & Rajsthan
12. Mahanadi	Mahanandi	Orissa & M. P.
13. Bhima	Bhima	Maharashtra
14. Krishna	Krishna	Maharashtra
15. Upper Pen Ganga	Pen Ganga	Maharashtra
16. Hirakud	Mahanadi	Orissa
17. Bhakhra-Nangal	Satluj	Haryana, Punjab & Rajasthan
18. Gandak	Gandak	Bihar, U.P.
19. Rajasthan Canal	Satluj	Rajasthan
20. Sharda	Sharda	U. P.
21. Tehri	Bhagirathi	U. P.
22. Farakka	Ganga	West Bengal
23. Mayurakshi (Canada Dam)	Mayurakshi	W. B. & Bihar
24. Damodar Valley (Tilaiya, Konar, Maithon, Panchet etc.)	Damodar	Bihar

Forest Resources—For maintaining ecological balance one-third land should be under forest cover. But in India only 22.8% land is under forest. The thick forest exists only over 14 percent of the land. Thus only 75.5 million hectare of land is under forest cover. It accounts for less than 0.1 ha. of forest per head. In the USA it is 8.8 ha. and Russia 3.5 ha.

The distribution of forest in India is quite uneven. The dense forest occurs in Andaman-Nicobar Islands, western slopes of the Western Ghats and North. Eastern Hills and mountains. To save the forest from ruthless exploitation and to provide shelter to wild life, forest conservation is very essential. Under this both conservation and afforestation have been given top priority. There are many direct and indirect benefit from the forests. It provides wood for building and furnitures, raw material for paper industry, match, wood, lac, silk, plywood, sports goods, tanning materials, fuels, herbs etc. The wood obtained from the forests are teak, sal, sissam, mahua, gambhar, sandal, bamboos etc. All are tropical woods. In Himalyan mountain oak, laurel, chestnut, spruce, pine, fir, magnolia trees are important source of soft wood. Another source of wood is social forestry. They provide fuel to the rural and tribal population and small wood for agricultural implements. It has been able to release the pressure from the forests.

The forests are categorised as Reserved and Protected and their deforestation is prohibited by law. To protect wild life and provide them natural habitat a large number of National Parks and wild-life sanctuaries have been established. The National Parks have been set up by an Act of the central government, where as wild life sanctuaries are established by the state government.

At present there are 80 National Parks and over 441 wild-life sancturies in India. They cover a total forest area of about 1.33 lakh sq. lakh sq. km. or 4.5 percent land. Their main purpose is to provide natural habitat to wild animals and save them from extinction. Wild life are magnificent beauty and provides entertainment to the tourists. There are 21 tiger projects in the country to protect tigers from extinction. They are the following—

Name of some Reserves	State	No, of Tigers
01. Simlipal	Orissa	72
02. Betla	Palamu, Bihar	62
03. Bandipur	Karuataka	53
04. Kanha	M.P.	109
05. Melaghat	Maharastra	80
06. Ranthambhor	Rajasthan	38
07. Corbette	U.P.	38
08. Sundarbans	W. Bengal	264
09. Manas	Assam	123
10. Periyar	Kerala	144
11. Sariska	Rajasthan	26

	Name of the Reserves	State	No. of Tigers
12.	Buxa	W. Bengal	15
13.	Indravati	M. P.	38
14.	Nagarjun Sagar	A.P.	65
15.	Namdafa	Arunachal Pradesh	45
16.	Dudhwa	Uttar Pradesh	35
17.	Kalakode	Tamil Nadu	----
18.	Balmiki	Bihar	----
			1104

Besides the above tiger reserves, there are many more important National Parks/Sanctuaries in the country. Some of them are following—

- | | | |
|-----|----------------------|-----------------------|
| 1. | Achnakmar (S) | Bilaspur (M. P.) |
| 2. | Bandhavgarh (NP) | Shahdol (M. P.) |
| 3. | Bangarghtha (NP) | Banglore (Karnataka) |
| 4. | Bhimbandh (NP) | Munger (Bihar) |
| 5. | Bori Villi (NP) | Bombay (Maharashtra) |
| 6. | Chandraprabha (NP) | Varanasi (U.P.) |
| 7. | Dalma (S) | Singhbhum (Bihar) |
| 8. | Ghana Bird Sanctuary | Bharatpur (Rajasthan) |
| 9. | Gir (NP) | Junagarh (Gujarat) |
| 10. | Gautam Budha (S) | Gaya, Bihar |
| 11. | Hazaribag (S) | Hazaribag, Bihar |
| 12. | Kaziranga (NP) | Jorhat, Assam |

In the world 16 centres have been identified for the inclusion in wild life heritage. Three of them are in India alone. They are Kaziranga, Manas and Kalwadev in India.

Biosphere Reserve—In order to protect not only plants and wild life but also small life and organisms 14 Biosphere reserves have been proposed to be set up in the country. Eight of them have already been set-up and six are in the process. They are following—

Biosphere Reserve	State
1. Nilgiri*	Tamil Nadu, Karnatak & Kerala
2. Namdafa	Arunachal Pradesh
3. Nandadevi*	U.P.
4. Uttarakhand*	U.P.
5. Great Nicobar*	Andaman and Nicobar
6. Gulf of Manar*	Tamilnadu
7. Kaziranga	Assam
8. Sundarbans*	W. Bengal
9. Thar Desert	Rajasthan
10. Manas	Assam
11. Kanha	M.P.
12. Norkek*	Meghalay
13. Little Rann of Kutch	Kutch Gujarat
14. Simlipa*	Orissa

* They have been completed.



Lesson—5

Mineral and Industrial Resources

A. Mineral Resources :

India is fairly rich in mineral resources. It has large reserves of iron-ore coal, bauxite, manganese and mica. But the country is deficient in minerals like petroleum, lead, zinc, nickel etc. But the continued exploration of mineral wealth is yielding promising result.

The mineral resources of India are unevenly distributed. The great plains of India are entirely devoid of minerals. Himalya is also very poor. But the peninisular India is quite rich in it. Bihar and Orissa in the N.E. part of India has large concentration of minerals accounting for nearly three-fourths of the country's coal deposits and containing highly rich deposit of iron-ore, manganese, mica, bauxite and radio-active minerals. Mineral deposits are also scattered over rest of the Peninsular India and in parts of Assam and Rajasthan.

1. Iron Ore—The estimated reserve of Iron in India is 17570 m.mt. accounting for one-fourth of the world's known reserves. It includes Hematite (11470 m.mt.) and Magnetite (6100 m.mt). The ore is of good quality with 60-70 percent iron content. It occurs mostly in Bihar, Orissa, Goa, Karntaka, A.P., Tamil Nadu and Maharashtra. Of these, Bihar and Orissa alone account for 75 percent of iron output in the country. The iron-ore belongs to Dharwar age.

2. Coal—It is major industrial fuel and source of energy in the country. India is fortunate possessing extensive coal deposits amounting to 1,76,330 m.mt. Almost the entire coal reserves of India belong to Gondwana age of the geological past. They spread over Damodar valley (Bihar & W.B.), Sone valley (M.P. & Bihar), Mahanandi valley (M.P. & Orissa), Godavari valley (M.P. & A.P.), Wardha valley (Maharashtra) etc. Some Tertiary formation coal are found to exist in Arunachal Pradesh, Assam, Meghalay, jammu and Kashmir and Nagaland. About four-fifths of India's coal reserves lie in Bihar-Bengal belt with Raniganj, Jharia, Giridih, Bokaro and Karnpura are important coal-fields. Among the important coal fields in the south of Damodar valley coalfields are Singrauli, Korba, Raigarh, Sonhat, Sohagpur and Umaria in M.P., Desgarh and Talchir in Orissa Chanda in Maharstra and Singreni in A.P.

3. Lignite—Lignite or brown coal is found in southern part of India. Lignite deposits in India are estimated at about 4290 m.mt. of which Neyveli field in Tamilnadu alone possesses about 3830 m.mt. Some amount of lignite is also found in Gujarat, Rajasthan and Pondicherry.

4. Manganese—Manganese is an extremety valuable mineral used in steel industry. The manganese reserve in the country is about 135 m.mt. and thus ranks third in the world. Orissa is the leading producer of mangahese and is followed by M.P., Maharashtra, Gujarat and Goa. Manganese deposits also occur in A.P., Bihar, Tamilnadu and Rajasthan. In Orissa managnese deposits are located at Keonjhar, Kalahandi, Mayurbhanj and Talcher, Balaghat, Seoni, Chindwara, Jabalpur and Jhabua in M.P. possesses important manganese reserve.

5. Mica—It is another very important mineral and is mostly used in electrical industry, wireless apparatus, aeroplanes, motors and radio set manufacturing industry. India has the largest deposits of mica in the world and contributes about two-thirds of the total world production. Mica is mostly found in Bihar, Rajasthan and Andhra Pradesh. By far the largest proportion of the Indian output of mica is obtained from the 'Mica Belt' of Bihar which traverses through the districts of Gaya, Hazaribag and Munger. Another mica belt is in Rajasthan which passes through Ajmer, Shahpur, Tonk, Bhilwara and Jaipur. Important deposits of mica are also found at Nellore in Andhra Pradesh.

6. Bauxite—It is a source of aluminium. The metal is of great industrial use and the basic requirement of aircraft industry. It is also used for domestic utensils. The reserve of bauxite is estimated at about 2653.7 million metric tonnes. Important bauxite reserves are located in Bihar, Madhya Pradesh and Gujarat. Bauxite deposit also occurs in Tamil Nadu, Karnataka, Maharashtra and Orissa. Some deposits have also been located in U.P., A.P., Kerala, Jammu and Kashmir and Goa. Bauxite is being produced in Lohardaga and Palamu Districts of Bihar, Kaira in Gujarat, Kanti and Jabalpur

in M.P., Salem in Tamil Nadu, Chitaldrug and Belgaum in Karnataka and Kolhapur in Maharashtra. Bauxite is also found in Balaghat, Bilashput and Bastar area of M.P. and Kotli in Jammu and Kashmir.

7. Copper Ore—The Copper Ore in India is very meagre. The Copper ore reserves are estimated at about 578.0 m.mt. with total metallic content of only 63.76 lakh tonnes. Copper ore deposits are located in Singhbhum and Hazaribag districts of Bihar, Alwar, Bhilwara, Jhunjunu and Sirohi districts of Rajansthan, Guntur district of A.P., Chitradurg, Chikmangalur, Hassan and Raichur districts of Karnataka etc. However, almost the whole of present production of copper ore comes from Ghatshila and Maubhandar in Bihar and Khetri Copper fields in Rajasthan.

8. Oil and Natural Gas—The potential oil-bearing area in India is estimated at over 1 million Km². Covering the northern plains, coastal strips, the Thar desert, plains of Gujarat and the Andaman and Nicobar Islands. Important potential oil bearing areas are located in Assam, Tripura, Manipur, West Bengal, Ganga valley, Himachal Pradesh, Kutch, Andhra Pradesh and off-shore areas adjoining. West Bengal, Orissa, A.P., Tamil Nadu, Maharashtra and Gujarat. Total reserves of crude oil are estimated at 510.8 m.mt.

Oil is extracted at Digboi, Bappapung and Hansapung in Lakhimpur District of Assam. New deposits have also been located in Moran and Naharkatiya. Till independence Assam was the only oil producing state in India. Now oil has also been struck in Gujarat near Baroda, Ahmedabad, Ankleshwar, Lunej, Kalol and Navagaon. The discovery of the sea-bed oil field of Bombay High, some 195 kms. off the Bombay coast is also yielding good quantities of oil and is the richest known oil-field in the country. Oil is obtained from a depth of 5-6 Km. from S.L.

9. Atomic minerals—India possesses important mineral deposits of uranium, thorium, graphites, zirconium and beryllium which are used for producing atomic energy and are thus of great economic and strategic significance. Uranium is found in Bihar while thorium occurs in monazite sands of Kerala and Tamil Nadu which are estimated to contain large quantities of ilmenite, zircon and sillimanite. Beryllium occurs in Central Rajasthan.

10. Chromite—It is an important mineral used for manufacture of special steel and stainless steel. The reserves of Chromite amounts to little over 135.3 million tonnes. Orissa, Karnataka, Bihar, Tamilnadu, Maharashtra, Andhra Pradesh and Manipur have Chromite deposits.

11. Gold—Karnataka is the only gold producing state in India. Gold mines are located at Kolar gold field in Kolar district and Hutti miner in Raichur district of Karnataka. Gold is also locate din Ramkrheri gold field of Anantpur district, A. P. Gold is also recovered as by product from working of copper mines in Bihar. India's total gold ore reserve is estimated at 148.5 lakh tonnes with a gold content of 81.06 thousand kilograms.

Other Minerals—Besides the above several other minerals produced in the country are magnesite, kyanite, sillimanite, fireclay, ilmenite, gypsum, diamond, pyrite, phosphate minerals, barytes, dolomite, limestone etc. Magnesite keyanite and sillimanite are the

three refractory minerals. limonite a source of iron is obtained from beach sands Gypsum is an important mineral largely used in cement and fertilizer industries. Pyrite is the mineral producing sulphur which is essential input for heavy chemical industries. Pyrite deposits occur at Amjhor in Palamu district of Bihar. The main phosphate minerals are obtained from apatite and occurs in M.P., Rajasthan and U.P. Lime-stone is an essential input in the Cement and Iron and Steel industry. It is found in almost all states of India. Total reserve of limestone in the country is estimated at 73200 m.mt. The major limeston producing areas in India are M.P., Tamil Nadu Bihar and Karnataka.

B. Industrial Resources :

Background of the Indian Industries—Although the history of industries in India is quite old but the process of industrialisation on modern lines was mainly initiated by the British entrepreneurs with the establishment of coal, cotton textile and Jute industries during the middle of the 19th century. Later the Indian entrepreneurs also entered the field and established industrial units in cement, iron and steel and entered in so many other sectors also. By the time the First World War erupted, India had only a few industries, important among them being coal, cotton textiles, jute manufacturing, cement, paper, iron and steel etc. The production level in these industries was very low. After the War Government paid some attention and the industrial policy of 1922 was implemented. But this policy gave protection to only some from foreign competition but left several others. Till Second world war the industries remained confined to consumer goods production. During this period some progress was witnessed in such industries as cotton textile, Jute, Sugar, tea vanaspati, Paper, Cement, Iron and Steel etc., but the capital goods sector with a few axceptions remained largely neglected. After independence India made great strides and now the country has a number of industries as a result of several five year plans. Some of the major industries in India are the following—

1. Cotton Textile Industry—The cotton textile industry of India has glorious past, in the form of house hold industry in manufactured cloth of international repute. The 'malmal' of Dacca is still in the memory of the world people. The birth of the modern textile mills date back to the year 1818 when the first mill was started at Fort Gloster near Calcutta. But its real foundation was laid in Bombay with a mill set up in 1883. Early years marked a rapid progress and the number of cotton mills came up at centres like Ahmedabad, Sholapur and Nagpur.

At present Cotton Textile industry is among the largest industries. Till 1951 the total number of mills was only 378. But now the number of Cotton mills has increased to 1035. Of these 752 are spinning mills, 283 are composite mills, 89 mills are in co-operative sector and 173 are owned by NTC/State Textile Corporations. This industry provides employment to 15 million people. The production amounts to 9400 million metres. The mills are developed around Bombay, Ahmedabad, Madras, Bangalore, Kanpur and Culcutta. Nearly all the states of India has cotton mills depending upon local demand but the mills around Bombay and Kanpur are most important. Some mills which have gone sick are managed by National Textile Corporation established in 1968.

The main problem with the Cotton Textile industry is (a) the old and obsolete machinery, (b) fall in demand of cotton textiles in international and national markets, (c) Labour problem (d) increase in input cost etc.

2. Jute Industry—Jute Industry is one of major organised industries of India. As an age-old agro-based industry with a glorious past, has been the largest earner of foreign exchange for the country in the past.

George Auckland set up the first Jute mill in 1834. The progress of the industry was slow during the early years and the export trade in Jute manufacture was negligible. However, the industry soon picked up and witnessed a period of expansion till the partition of the country in 1947.

The partition was a great setback for this industry as jute cultivation area went to East Pakistan (Now Bangladesh) and the industry in India starved of the raw materials. A number of mills were closed down. Great efforts have since been made to increase indigenous production of raw jute with considerable success. This has helped to ease the Jute production. In 1990-91 the total production amounted to 13.89 m.mt.

In 1987-88 there were 66 mills of which 6 belonged to National Jute Manufactures Corporation a public sector enterprise under the ministry of Textiles. This industry provides direct employment to about 2.5 lakh workers. The Jute mills are mostly located on Hooghly side in West Bengal, Katihar, Purnia and Saharsa in Bihar. The main centres in W. Bengal are Krishna Nagar, Kanchan para, Nailhati, Shyamnagar, Barrackpore, Chandannagar, Champadevi, Serampur, Risra. Howrah, Sheopur etc. There are also four mills in A.P. In U.P. two mills are located in Kanpur and one at Gorakhpur. There are also one mill each in M.P. and Assam.

Jute mills have the following problems—(i) falling demand in world market, (ii) old and obsolete machinery, (iii) dearth of raw Jute (iv) labour problem etc.

3. Iron and Steel Industry—Though the beginning of Iron and steel industry was made in India in 1870 with the setting up of Bengal Iron Works and Kulti in West Bengal, the real foundation of the industry was laid down with the establishment to Tata Iron and Steel Company at Jamshedpur in 1907. It was followed by Indian Iron and Steel Co. at Burnpur in 1919 and Mysore Iron Works at Bhadravati (Mysore) in 1923 (later renamed as Visvesvaraya Iron & Steel Works Ltd.), Before independence these units had a total installed capacity of 1.3 m.mt. The industry actually developed in post-independence period with the setting up of the factory at Bhilai, Durgapur, Rourkela, Bokaro, Salem and Visakhapatnam.

Bhilai Steel Plant was among the first to be established in the public sector. Set up with assistance of the U.S.S.R., the plant had initial capacity of 1 m.mt. ingot steel which was later raised to 2.5 m.mt. It has now been expanded to 4 m.mt. capacity.

Durgapur Steel Plant was set up in West Bengal in late fifties with the assistance of Britain. It had an initial capacity of 1 m.mt. of steel ingot which was subsequently expanded to 1.6 m. tonnes. The scheme for modernisation of the plant is in progress the plant is a major producer of railway track materials.

Rourkela Steel Plant was established in Orissa with assistance from West Germany in mid-fifties. Initially designed for annual production of 1 m. mt., it was later expanded to 2.1 m. mt. This plant is also modernised in phased manner.

Bokaro Steel Plant was commissioned in 1978 reflects India's advancement in design, engineering and construction of steel plants as the Indian engineers and equipment suppliers have played a major role in setting up this plant. The plant had initial capacity of 2.5 m. mt. of steel ingot which has been expanded to 4 m. mt.

Salem Steel Plant at Salem started commercial production in March 1982. The plant has a capacity to produce 32,000 tonnes of stainless steel per annum including coils used in the industrial sector and kitchen-ware. The plant is being expanded to have capacity of 65,000 tonnes per annum.

Visakhapatnam Steel Ltd.—This is the 9th steel plant in the country located at Visakhapatnam in Andhra Pradesh. It has been commissioned in 1989. It has a capacity of 2.31 m. mt. of steel ingot. In 8th plan period it may be expanded.

The production of iron and steel industry in 1990-91 has been as follows—

Saleable Steel	9.53 m. mt.
Finished Steel	13.40 m. mt.
Pig Iron	1.39 m. mt.

The public sector units are controlled and managed by SAIL (Steel Authority of India Ltd.) TISCO is the only private Sector Unit.

4. Sugar Industry—Next only to Iron & Steel and Cotton Textile Industries, Sugar is the third largest industries of India. At present the sugar industry provides direct employment to over 4 lakh persons besides providing livelihood to about 25 million sugarcane cultivation. India is the fourth major sugar producing country in the world. The modern Sugar industry dates back to 1903 when some sugar mills were started in Bihar. Initially its growth was slow but after 1932 there was phenomenal growth when the protection was provided. The number of sugar factories increased from 32 in 1932 to 117 in 1937. Since independence the industry has made rapid progress. The number of mills has gone upto 377 in 1987 against 138 in 1950-51. Of these 204 factories are in co-operative sector. There has also been significant increase in the production. In 1950-51 total production was 11.3 lakh tonnes. It went up to 51.5 lakh tonnes in 1980-81 and 119.05 lakh tonnes in 1980-81.

Three-fourth of the sugar mills are in U.P. and Bihar. The low grade of cane and defective location of mills are responsible for high cost of production. Punjab is next to U.P. in cane production in northern India. Maharashtra and Southern states have now dominant position in sugar industry. Here the cane yield is greater, Sugar content is high and cane crushing season also lasts longer. The production of Sugar in India continues to be less than the demand. The main reason is the obsolete machinery and technology and shorter crushing season. Fluctuations in cane productions is also important.

5. Cement Industry—India is the seventh largest cement producer in the world, other six being Russia, Japan, U.S.A., Italy, Germany and France. The foundation of cement industry in this country was laid in 1914 with the setting up of Indian Cement Co. Ltd. at Porbandar in Gujarat. Presently there are 144 cement factories. The industry provides employment to nearly 1 lakh persons. Though the industry is widely dispersed, it has greater concentration in the Southern and Western India. The industry record impressive growth during the sixth plan period. The installed capacity increased from 24.29 m.mt. to 58.3 m.mt. in 1988. The production of cement increased by 100 percent from 18.8 m. mt. in 1980-81 37.3 m.mt. in 1987-88 and 48.9 m.mt. in 1990-91. There are ambitious plans for modernisation of cement industry to meet the growing requirements of cement.

6. Paper Industry—The production of paper is an index of literacy. In order to achieve high literacy rate the importance of paper industry cannot be over emphasized. But the paper production in India is far from satisfactory to meet the growing requirements. At present there are 303 units manufacturing paper and paper board in organised sector with installed capacity of 29.84 lakh tonnes. The production of paper and paper board amounted to 16.62 lakh tonnes in 1987-88 against 1 lakh tonnes in 1950-51. In 1990-91 the production was 20.10 lakh tonnes.

Newsprint requirement of the country till recently were largely met through imports. Even as late as 1980-81, India had only one unit in the country, viz., the National Newsprint and Paper Mills Ltd. at Neplanagar in M.P. The newsprint project of Mysore paper mills, Karnataka went into production in 1981 and Hindustan Newsprint Ltd. at Kerala in 1982. the Tamilnadu Newsprint Ltd. also started production in the same year. Now there are five newsprint units in the country with installed capacity of 66.5 thousand tonnes. The capacity in 1980-81 increased to 3 lakh tonnes. The production has also gone up from 51.3 thousand tonnes to 2.87 lakh tonnes.

7. Fertilizer Industry—Fertilizer Industry in India is of recent origin. It occupies a pivotal position in the country. It ranks fourth in the world in the production of nitrogenous fertilizer and occupies sixth position in production of phosphatic fertilizers.

The first Fertilizer factory was set up in 1906 at Ranipet near Madras. TISCO set up Ammonium Sulphate Plant at Jamshedpur in 1919. The first nitrogenous fertilizer plant was established in 1939 followed by Alwayi in Kerala in 1947. However, the real foundation of fertilizer industry was laid down at Sindri in Bihar in 1951. This was followed by second factory at Nangal in Punjab and Trombay in Maharashtra. Today there are 55 fertilizer units manufacturing nitrogenous, phosphatic and complex fertilizers. Another 10 fertilizer projects are under various stages of implementation. There are 9 public undertakings engaged in production of fertilizers. Some major private sector fertilizer producing units are located at Delhi, Kota, Kanpur, Visakhapatnam, Baroda, Varanasi, Bangalore and Goa.

The production of fertilizers has also gone up during the past twentyfive years, but it has failed to keep pace with the increasing requirement. At present the production of fertilizer is as follows—

Nitrogenous fertilizer	69.93 Lakh Tonnes
Phosphatic fertilizer	20.45 Lakh Tonnes
Total	90.38 Lakh tonnes

In order to meet the requirements about 27.93 lakh tonnes of fertilizer is imported. It includes nitrogenous fertilizer and potash fertilizer. There is no production of potash fertilizer in India and so the entire requirements are met by import. This is because the rock phosphate and sulphur required in the manufacture of potassic fertilizers are not available in India.

8. Machine Tool Industry—Machine Tool Industry in India which manufactures mother machines for use in engineering industry has recorded a phenomenal progress. The annual production of machine tools was only about one crore in 1955-56 has increased to over 389.9 crores. Now the industry is producing some most sophisticated high technology machine tools. The industry in last two decades has been able to absorb imported technology and also develop its own design competence. It also makes sizeable contribution to country's export of engineering goods. The public sector Hindustan Machine Tools Ltd. is the major partner in India's machine tool industry.

9. Heavy Electrical Industry—Heavy Electrical Industry comprises equipments used for generation, transmission, distribution and utilisation of electrical power and produces basic items and steam and hydraulic turbines and generators, transformers, boilers switchgears, electric furnace and industrial locomotives. With the requisite capacity created, the heavy electrical industry is now in a position to meet the entire domestic demands. The public sector Bharat Heavy Electricals Ltd. with its three units at Bhopal, Haridwar and Hyderabad is the biggest producer of heavy electrical goods in India.

10. Electronic Industry—It is a faster growing industry in the world. It accounts for nearly one-fifth of the total production of all manufactured goods in the world as a whole. For the past two decades world-wide production of electronics has experienced growth levels higher than that of any other industrial sector.

In India upto 1985 the electronic industry was growing at a compound rate of 20 percent. However, during the last ten years the growth rate has been stepped up. Major products of electronic industry include colour Picture Tubes, LSI Devices, T.V. componemnts, PCBs, EPABX Telephone instruments, Transmission Equipments, Electronic Switching system, Satellite Ground Communication Equipments, TV and Radio Broadcast Equipment, Micro-processor Board System, Super-Mini and Mainframe System, Computer Peripherals etc.

Among the high growth sectors are computer industry, consumer electronic components, communication equipment etc. Export of electronics have increased sharply from 115 crore in 1983 to 475 crore in 1988. Computer software has emerged as one of the single largest export items with export level to around Rs. 100 crore in 1988.

11. Village Industries—Among the cottage and village industries are included such small household enterprise which are widely dispersed over rural and semi-urban areas and which are carried on wholly or primarily with the help of family members as a full time or part-time occupation. Handlooms, handicrafts, sericulture, coir and Khadi industries are the important ones among the wide variety of cottage and village industries in India. These industries have an important place in Indian economy as they provide gainful employment to the largest number of people outside agriculture.

12. Small-scale Industries—A widely used criterion for distinguishing between large and small scale industrial units is the amount or value of investment in fixed capital and machinery. According to this criterion an industrial unit falls in the category of small scale industry if the investment in plant and machinery does not exceed Rs. 35 lakh. This ceiling of investment is Rs. 45 lakh in the case of ancillary industries subject to the proviso that the unit must supply 30 percent of its output to other industrial undertakings for being classified an ancillary unit. Very small industrial unit with an investment of not exceeding 2 lakhs are termed as tiny industries.



Lesson—6

Human Resources in India

Resources means all those which contribute to economic utility. No element can become resource unless utilised by man and make them useful for man and animals. Due to this role of man, he himself is called resources. The human resource is actually the number of persons living in a particular country called population of that country.

The population of India is next only to China in the world. According 1991 census the total population of India has been 846,302,688. Some of the feature of the 1991 census are the following—

Total population	846,302,688
Male population	439,231,456
Female population	407,071,232
Sex Ratio (per 1000 male)	927
Density of population	267
Growth of population	23.85%
Literacy	52.21% (Male 64.13%, Female) 39.29%

Growth of population—The first census on scientific line was conducted in 1872. The next census was held in 1881. Since then census is being conducted at an interval of every ten years. The last census was held in the year 1991. The following table shows the growth of population since 1901.

Census Year (in%)	Population in Crores	Growth rate
1901	23.84	---
1911	25.21	5.75
1921	25.13	(—)0.21
1931	27.90	11.00
1941	31.87	14.22
1951	36.11	13.31
1961	43.92	21.51
1971	54.82	24.80
1981	68.33	24.66
1991	84.63	23.85

From the table the following facts emerge—

- (i) From 1901 to 1921 (during three census years) the growth of population remained un uniform. During this period the population increased by 1.6 crores which was less than 0.2 percent per annum. Due to various epidemic lakhs of people died and so the growth was not only neutralised but recorded negative growth. Due to the failure of the monsoon there were many famines which also took a heavy toll of life.
- (ii) From 1931-1951 the population increased with a medium pace. Development of agriculture, setting up of various industries, development of transport and communication, increased health care and nutritious food reduced the death rate. But the high birth rate increased the gap and natural increases. The relatively low growth rate in 1951 was due to population of India and great transfer of population to West and East Pakistan. Yet during this period there was a growth of 10.98 crore people.
- (iii) Between 1951-1981 population grew at a faster rate. This resulted in steep rise in population. The reason was steep fall in death rate due to various life saving drugs, nutritious food, increased irrigation leading to increased agricultural

production, use of insecticides, chemical fertilizers, improved technology but marginally. Hence the natural increase was tremendous. Therefore, this period is called the period of 'population explosion'. During this period a total of 25.5 crore people were added.

The population in 1991 showed marginal decrease in growth rate (23.85% against 24.66 in 1981). This has been due to stabilisation of death rate but constant fall in birth rate, if this trend continues the subsequent censuses will record sharp fall in growth rate.

Year	Birth rate (per thousand popul.)	Death rate (per thousand popul.)
1901-11	48.1	42.6
1911-21	49.2	48.6
1921-31	46.4	36.3
1931-41	45.2	31.2
1941-51	39.9	27.5
1951-61	41.7	22.2
1961-71	41.2	19.2
1971-81	37.2	15.0
1981-91	30.9	10.8

The growth of population is the function of birth and death rate. The following table shows birth and death rate in the interscensal period.

The above table shows that the birth rate during the present century has come down from 48.1 per thousand to 30.9 per thousand (the fall has been 17.2). On the other hand the death rate has come down from 42.6 per thousand to 10.8 per thousand (the fall has been 31.8). The death rate has now been stabilized at this lowest level, as a result, the longevity of the people has gone up to 59 years.

State-Wise Distribution of Population—The following table shows the total population and the density of various states to understand the regional variation.

State	Population (in crores)	Position in India	Density (Per Km ²)	Position in India
U.P.	13.911	I	471	IV
Bihar	8.637	II	497	III
Maharashtra	7.893	III	256	XI
W. Bengal	6.808	IV	766	I

State	Population (In crores)	Position in India	Density (Per Km ²)	Position in India
A.P.	6.651	V	241	XII
M.P.	6.613	VI	149	XVI
Tamil Nadu	5.586	VII	328	V
Karnataka	4.498	VIII	234	XIII
Rajasthan	4.401	IX	128	XVII
Gujarat	4.131	X	210	XIV
Orissa	3.166	XI	202	XV
Kerala	2.910	XII	747	II
Assam	2.241	XIII	284	IX
Punjab	2.028	XIV	401	VI
Haryana	1.646	XV	369	VII
Jammu & Kashmir (Projected)	0.772	XVI	76	XXI
Himachal Pradesh	0.517	XVII	92	XVIII
Tripura	0.276	XVIII	262	X
Manipur	0.184	XIX	82	XIX
Meghalay	0.177	XX	78	XX
Nagaland	0.121	XXI	73	XXII
Goa	0.107	XXII	316	VIII
Arunachal Pradesh	0.086	XXIII	10	XV
Mizoram	0.069	XXIV	33	XXIV
Sikkim	0.041	XXV	57	XXIII
Union Territories		Lakhs		
Delhi (NCR)	94.20		6319	
Pondicherry	8.08		1605	
Chandigarh	6.42		5620	
Andaman Nicobar	2.83		34	
Dadra & Nagar Haveli	1.38		282	
Daman and Diu	1.02		906	
Lakshdweep	0.52			1615

From the above table the following facts emerge—

- (i) U. P. has the largest population whereas Sikkim has the smallest.
- (ii) Bihar is next only to U.P. in total population but the density is higher than U.P.
- (iii) West Bengal has the highest density of population.
- (iv) The lowest density of population is in Arunachal Pradesh.
- (v) The density of population in Bihar is next to W. Bengal and Kerala.
- (vi) In centrally administered union territories Delhi has the largest number of population and also highest density not among territories but also in the country.
- (vii) Lakshadweep has the lowest population but the density is lowest in Andaman and Nicobar Islands.

Sex-Ratio—Sex-ratio is number of female per 1000 males. In the census of 1991 it has been 927. This is enough to indicate that in the population of India there is predominance of male. The sex-ratio has been fast decreasing since the beginning of the present century.

Year	Sex-ratio
1901	972
1911	964
1921	955
1931	950
1941	945
1951	946
1961	941
1971	930
1981	934
1991	927

The census of 1991 reflects the following characteristics—

- (i) The sex-ratio in the present century has decreased from 972 in 1901 to 927 in 1991.
- (ii) There has been marginal increase in sex-ratio in the census year of 1951 and 1981 from previous census.
- (iii) In Kerala the sex-ratio is 1040 which is highest in the country. Kerala has maintained this ratio in different census years.
- (iv) In 1911 and 1921 the female population was higher than the male population. Similarly, from 1901 to 1961 the period remained favourable for females in Goa, Manipur, Mizoram, Orissa and Tamil Nadu.

- (v) In centrally administered union territories the female population remained higher than male population Daman and Diu between 1911 and 1981. In Lakshdweep it remained so between 1991 and 1981.
- (vi) Among different states the sex-ratio is the lowest in Sikkim being 880. The ratio is also lower in Uttar Pradesh (882), Arunachal Pradesh (861), Haryana (874) and Punjab (888).
- (vii) Among Union Territories lowest sex-ratio is found in Pondicherry.
- (viii) In Bihar the sex-ratio is 912 which is less than the average of the country.

Literacy—The 1991 census recorded that the literacy in the country was 52.21 percent. The male literacy was recorded to be 64.13 percent against 39.42 percent female literacy. The following table gives the literacy picture in different censuses.

Year	% of Literate	Male Literacy	Female Literacy
1901	5.35	9.83	0.60
1911	5.92	10.56	1.85
1921	7.16	12.21	1.81
1931	9.50	15.59	2.93
1941	16.10	24.90	7.30
1951	16.67	34.95	7.93
1961	24.02	34.44	12.95
1971	29.45	39.45	18.69
1981	36.17	46.74	24.88
1991	52.31	64.13	39.29

The 1991 census reveals the following picture of literacy in the country.

- (i) During the present century the literacy has tremendously increased from 5.35% to 52.21%.
- (ii) Whereas male literacy has increased 7 times in term of percentage, the female literacy has increased 60 times.
- (iii) After independence the literacy has increased 3 times in terms of percentage. The male literacy has gone up by 2.5 times and female literacy 5 times.
- (iv) In spite of improvement in literacy the ratio is 5.2.
- (v) In 1991 census the minimum age limit for literacy has been 7 years, whereas in 1981 it was 5 years.

- (vi) Kerala has the highest literacy in the country. It has been recorded as 90.59 percent of the total population, Among the states leading in literacy are Mizoram (81.23%), Goa (76.86%), Tamil Nadu (63.72%), Himachal Pradesh (63.54%), Maharashtra (63.05%), Gujarat (60.91%) and West Bengal (57.92%). In Bihar the literacy is the lowest (38.54%) in the country. The male and female literacy here are 52.69 and 23.19 percent respectively.
- (vii) The rate at which the population in the country has increased, the literacy has not increased with the same pace. This is apparent from the fact that in 1981 the number of illiterate was 30.19 crore which increased to 32.40 crore in 1991. The number of illiterates in Bihar is very high and next to U.P. only.
- (viii) Kerala is the only state which has attained cent percent literacy.

Occupational Structure of Population :

The figures regarding occupational structure in 1991 have not been published. Hence the figures given below are based on 1981 census.

Class	Population	%of the total workers
Agriculture	15.30 Crores	70.7
Mining & Industries	2.64 Crores	12.6
Service function & othera	4.37 Crores	16.7
Total Workers	22.25 Crores	100.00

- (i) The table shows that 2/3 of total workers are engaged in agriculture. This includes 9.15 crores farmers and 5.55 crores of agricultural labourers. About 0.5 crore people are engaged in livestock, forestry and fisheries.
- (ii) The population engaged in various sectors have experienced marginal change. In fact there has been reduction of only 1% in population engaged in agriculture whereas this decrease has been added to the population in tertiary sectors. The population engaged in mining and industries is stable at 12.6 percent.

Rural and Urban Population—In 1981 the urban population in India was 16.22 crores which constituted 23.7 percent of the total population. In the census year 1991 the urban population has been as high as 25.7 percent. In coming years there is possibility of further rise in urban population. The following table gives the growth of urban population and reduction in rural population in terms of percentage.

Year	Urban Population in millions	Urban Population in%	Rural Popul. in%
1901	25.8	10.8	89.0
1911	25.9	10.3	89.6
1921	28.0	11.3	88.7
1931	35.5	12.2	87.8
1941	44.1	14.1	85.9
1951	62.4	17.5	82.4
1961	78.9	18.3	81.7
1971	108.9	20.2	79.8
1981	192.2	23.7	66.4
1991 (Est)	235.7	29.9	70.1

The greatest concentration to urban population is that of large cities particularly those of million cities. 1981 census there were 12 such cities but according to 1991 census their number has swelled to 20. They are the following—

Cities	Population in million
1. Mumbai	12.57
2. Calcutta	10.86
3. Delhi	8.38
4. Chennai	5.36
5. Hyderabad	4.27
6. Bangalore	4.11
7. Ahmedabad	3.28
8. Pune	2.44
9. Kanpur	2.10
10. Lucknow	1.67
11. Nagpur	1.67
12. Surat	1.52
13. Jaipur	1.51
14. Coimbatore	1.12
15. Cochin	1.13

Cities	Population in million
16. Vadodra	1.12
17. Indore	1.10
18. Patna	1.10
19. Madurai	1.09
20. Bhopal	1.06
21. Visakhapatnam	1.05
22. Varanasi	1.02
23. Ludhiana	1.00

- (i) In 1981 Calcutta was the largest city of the country, but in 1991 census the population of Mumbai has exceeded.
- (ii) Serial no. 12 and from 14 to 20 are such cities whose population was less than a million in 1981 census.
- (iii) Surat has gone to 12th position in 1991 but Jaipur which was on 12th position in 1981 has stepped one position down.

Religious Structure of Population—The following table gives the religious structure of population according to 1981 census. The figures of 1991 census are not available.

Religious Group	Population in millions	Percentage of total Population
Hindu	549.78	82.64
Muslims	75.51	11.35
Christain	16.17	2.43
Sikh	13.08	1.96
Budhists	4.72	0.71
Jainese	3.21	0.48
Others	2.77	0.42
Those who did not Disclose their religion	0.06	0.01
Total	665.31	100.00

Main Languages of India—In 1981 census such languages were identified spoken by atleast 1 million person. They are the following—

Language	Popul. in million	Popul. spoken in the world
Hindi	153.73	338
Telgu	44.71	67
Bengali	44.52	181
Marathi	41.42	63
Tamil	37.59	64
Urdu	28.60	90
Gujarati	25.66	38
Malyalam	21.22	33
Kannad	21.58	40
Oriya	19.73	30
Bhojpuri	14.34	---
Punjabi	13.90	81
Sindhi	12.05	16
Assamese	8.96	31
Chhatisgarhi	6.69	---
Magadhi	6.64	---
Maithili	7.12	---
Marwari	4.69	---
Santhali	3.69	5
Kashmiri	2.09	4
Rajasthani	2.99	---
Gondi	1.55	2
Konkani	1.52	4
Dogri	1.30	2
Gorkhali Nepali	1.29	13
Garhwali	1.23	2

Other languages that are spoken by 1 million population are Pahari, Bhili, Oraon, Kumaoni Tulu and Bagri.



Water Resources, Fisheries and Hydro-Electricity

India is extremely rich in water resources. The country is endowed with large network of rivers and vast alluvium to hold ground water. By virtue of its peculiar placement in the foothills of the mighty Himalayas and having the ranges of Satpura, Aravalli and the Deccan Plateau running through it, the country has huge water resources which have been meagerly tapped.

Our water resources can be divided into two categories, viz, surface water resources and ground water resources. Each of these is a part of earth's water circulatory system called hydrological cycle and each one is ultimately derived from precipitation. A part of the annual rainfall is held in the undulating land surface and seeps down beneath to give sub-soil water resources. The amount that does not seep below, flows in the form of streams and joins the river system. Another part which evaporates, forms moisture in the atmosphere which attracts rain and snow. Thus all the forms of water resources are inter-dependent and the loss of one may be the gain of the other.

Irrigation—One of the major use of water resources is for irrigation. In India the climate is extremely dry condition to extremely wet condition. The monsoon rain is highly erratic. The monsoon period ranges between 2-5 months and the rest of the months are dry. To insure against the risk of such vagaries of rainfall, irrigation has to be provided. The rainfall during the year has to be stored up and its utilisation regularised. Conventional and recognised means of irrigation that could be developed in India are tanks, wells (including Tube wells) and canals. Each of these means has its own role and uses in various regions of the country. It is only by developing assured and regular irrigation facilities that we can protect our country-side from economic disasters and develop our agriculture which is the backbone of our economy.

Types of Irrigation—The following are the main types of irrigation works in India.

Canals—Canals are the most important means of irrigation in the country. Some canals were constructed by the early Hindu and Mohammedan Kings. Most of the canals, however, are the product of the British rule. At present canals irrigate about 39 percent of the total irrigated land of India. Most of the canals of the country are found in U.P. and Punjab. Storage canals have been constructed in southern states and M.P.

Canals are mainly of three types—Inundation, perennial and storage canals. 'Inundation canals' do not flow through out the year. They obtain water when rivers rise above a certain level during the rainy season. 'Perennial Canals contain' a steady

supply of water and flow throughout the year. In the 'storage works' rain water is stored during the monsoons in huge reservoirs by constructing dams across the mountain valleys. This water is then distributed by canals to the neighbouring areas. The canals in the dry areas of M.P. and Deccan are mostly of this type.

Of all the types of irrigation, canal irrigation is at once the cheapest, easiest and most efficient. It enables the farmers to raise crops many times richer than would be possible otherwise. But even irrigation is not an unmixed blessing. It gives rise to the serious evils of water-logging which renders vast areas of land unfit for cultivation. Such areas also develop malarial conditions which adversely affect the health and efficiency of the people.

Well—Well irrigation is an important type of irrigation in India. Wells are particularly suitable for small farmers. They are also more useful than canals. Water supply from wells is thus the most dependable means of irrigation. There is also no danger to water logging as in the case of canals. Well accounts for about 48 percent (about 27 percent by the tube wells and 21 percent by other wells) of the irrigated area in the country. The irrigated states are U.P., Bihar, Punjab, Tamil Nadu, A.P. and Maharashtra. In these states water table is high, soil is soft and therefore, tube-wells are easily sunk.

Tube wells are an important development in India. They are worked by electricity or diesel oil and thus relieve our cattle of much of the strain. They are being quickly developed in the U.P., Bihar and Punjab. This is because these have ample sub-soil water.

Tanks—Tanks are also an important and ancient sources of irrigation. They are of considerable importance in central and southern Indian states specially in A.P. and Tamil Nadu. In these areas neither the canals can be constructed nor the wells can be dug. Rivers in these areas run dry in summer, the soil is undulating and hard and the water-table is low. About 8 percent of the total irrigated area is irrigated by tanks. Tanks are generally owned by the Government or by the village communities. Tanks suffer from two defects. Firstly, they remain dry if rains fail. Thus no water is available just when it is needed most. Secondly, they require constant cleaning every year because they get silted up.

Punjab, Haryana, Western U.P., parts of Bihar, A.P., Tamil Nadu have assured irrigation facilities. At the end of 1991-92 30.7 m.ha. of land was under major and medium irrigation and 50.4 m.ha. under minor irrigation. Another 2.2 m.ha. is estimated to have been added in 1994-95 (0.7 m. ha through major and medium and 2.2 m. ha through minor irrigation). Thus the total potential likely to have been created by the end of 1994-95 adds up to 82.8 m. ha. But the utilisation was for 72.8 m. ha. The target fixed up for 1994-95 has been 1.7 m. ha. over 1990-91.

Fisheries—One of the major resources connected with the water is the fish. Fish form an excellent supplement of food providing the necessary proteins and its consumption has consequently both qualitative and quantitative values.

Fishes in India is caught both in the sea and inland water bodies. Off the coast of Kerala deep sea fishing is conducted. In rest of the coastal regions coastal fishing over continental shelf is mostly carried. Inland fishing is done mostly in the lakes and ponds and to some extent river. The reservoirs on the rivers are the main source of fish.

The main problem of fishing is the use of small boats indigenously manufactured and lack of mechanised fishing vessel and inadequate freezing facilities for storage and distribution. However, in Kerala deep-sea fishing is conducted by modern craft method under the guidance of Norwegian experts. Besides these, 13 insulated vans have been received and they are being operated by the government through cooperative societies in Mumbai, Madras and Trivandrum. Cold storage plants have also been established at Mangalore, Calicut and Satpate (Mumbai). About 9000 mechanised boats were brought into service in 1971 but now they are over 29,000. The industry is getting modernised and its projects are very promising.

The fish production in the country has increased more than five fold during the last 40 years. It reached a level of 3.8 million tons during 1990-91. It is an important source of protein, foreign exchange earner and employment generator. Special efforts have been made to promote intensive fish farming activity in inland sector. The implementation of two development programmes for inland fisheries—Aquaculture development and National Programme of fish Seed Development have led to encouraging results. As a result inland fish production has reached 1.5 m. ha. tonnes in 1990-91 as against 0.9 m.t. in 1914-85. Its share in total fish production is now 40 percent. In 1991-92 fish production is expected to be about 4 m.t. The marine production export earnings in 1990-91 were of the order of Rs. 890.4 crore and is anticipated to cross 1000 crore during 1991-92.

Hydro-electricity :

Hydro electricity is a very important source of power "Out of the total production of electricity one-third is obtained from hydro-electricity.

Geographical Factors :

The geographical factors associated with hydro power development are fundamental. The physiographic factor of relief must be such that.

- (i) It is possible to have short diversion from head waters above to the turbines below,
- (ii) The rainfall must be such that there is minimum amount of water available through out the year.
- (iii) In case rainfall is unevenly distributed, this would necessitate the construction of storage reservoirs and dams. The occurrence of glaciers and lakes in the

courses of rivers will certainly regulate the flow of rivers much better than anything which an engineer can construct. But it is only in Himalyan rivers that such natural reservoirs are to be found.

Why Reservoir Necessary—The rainfall in India is highly seasonal. The amount of rainfall fluctuates considerably from year to year. North-eastern states W. Bengal and southern part of the western ghats have a longer rainy season than other parts of India with dry season lasting not more than 5-6 months. Obviously this means that the power scheme pure and simple, are difficult in India because the power has to be continuous, whereas the rainfall is seasonal and the rivers are not perennial and, therefore, it is necessary to have artificial reservoirs and dams to regulate the monsoon flow. Another problem of rainfall in India is that occasionally it pours so heavily that any artificial dam that is constructed may burst owing to the enormously high floods which come down with startling suddenness. The dams have to be extra strong and this again increases the cost per unit of energy generated.

Advantage of Hydro-electricity over others—The hydro-electricity has several advantages over others.

- (i) It is much cheaper than any other source of energy.
- (ii) It saves the cost of transport as transmission lines once constructed serves for ever.
- (iii) It is highly efficient source of energy.
- (iv) It is pollution free absolutely.
- (v) Where coal problem and other source of energy is lacking this proves to be boon as it can be carried from a great distance in a remote area also.
- (vi) It is non-exhaustible source of energy and can be used as much as required without any problem of conservation.

Constraints—The constraints of hydro-electric development is mainly economical.

- (i) The initial cost of establishing hydro-electric plant and transmission lines is very costly.
- (ii) The machines and equipments when obsolete must be replaced.
- (iii) Construction of dams and reservoirs becomes essential to regulate the flow of water for generation of electricity.
- (iv) The storage reservoirs are silted up quickly and needs regular removal of silt.
- (v) Transmission lines and other machineries need regular maintenance.
- (vi) The theft of over-head wire for copper and aluminium causes heavy loss and increase cost of production—

The following table gives some of the major river valley projects in different States—

State	River Valley Project	Prod. Capacity in km.
Maharashtra	Tata Hydro-electric Project	2,80,000
	Koyna Hydro-electric Project	2,40,000
Karnataka	Sivasamudram Project	42,000
	Shimsha Project	17,000
	Gandhi Power House (Jog falls)	72,000
	Sharvati Hydel Project I	1,78,200
	Sharvati Hydel Project II	89,100
	Tungbhadra (Left Bank) Project	18,000
	Kalindi Project	2,70,000
Tamil Nadu	Paikara Hydel Project	68,000
	Mettur Dam Project (Kaveri)	48,000
	Papnasam Hydel Project	24,000
	Periyar Hydel Project	1,05,000
Kerala	Pallivasal Hydel Project	36,500
	Sengulam Hydel Project	48,000
	Peringalkuthu Hydel Project	24,600
	Pambai (Sabrigiri) Project	3,00,000
	Iddiki Hydel Project	3,90,000
	Kuttitadi Hydel Project	75,000
Andhra Pradesh	Tungbhadra (Right bank) Project	36,000
	Nizam Sagar multi-purpose Project	15,000
	Srisaillam Hydel Project	3,30,000
	Upper Sileru Hydel Project	1,20,000
	Lower Sileru Hydel Project	4,00,000
A.P. & Orissa	Machkund Hydel Project	1,30,000
Orissa	Hirakud Dam Project	2,73,000
Bihar	D.V.C. (Power House at Tilaiya, Konar, Maithon Panchet)	1,50,000
	Subarnarekha, Hydel Project	5,000
	Kosi Project	----

State	River	Prod. Capacity in km.
West Bengal	Mayurakshi Project	400
Uttar Pradesh	Ganga Canal Project	2,41,000
	Pathri Project	20,400
	Sarda Project	41,000
	Rihand Dam Project	2,50,000
	Yamuna Project	3,20,000
	Matatila Project	30,000
	Ram Ganga Project	1,27,000
M.P. & Rajasthan	Chambal Project	2,00,000
Himachal-Punjab	Bhakra-Nangal Project	1,20,000
Himachal Pradesh	Jogindra Nagar Hydel Project	52,000
Assam	Umtroo Project	7,500
	Total Installed Capacity	14 million kw.
	Production of Hydro-electricity in 1991	8.6 m.k.v.

□

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