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Introduction

- The study on human population is one of the most important aspects in geography of any region. The human population has many components but the most fundamental are its number, composition, distribution and density. Therefore, it is essential to study these components. The study on these aspects also would reveal the workforce of the country. The population of India as per 2011 census is 1,210.19 million (1,21,01,93,422). It shows an increase of 19.31crores from the population of 2001. Population Census of India provides the detailed information about the demography of India. Along with population, we will study about the transport and communication of India in this chapter.

Population

- The total number of people residing in a country at a specified period of time is called the 'Population' of that country. India is the second most populous country in the world next only to china. India covers only 2.4 percent of the land area of the world, but is the home of

about 17.5 percent of the world's population. It shows that the proportion of population of India is far higher than the proportion of its area. Thus, a little more than one out of every six persons in the world is from India. Our population is almost equal to the combined population of the USA, Indonesia, Brazil, Pakistan, Bangladesh and Japan and total population of these six countries is 1214.3 million.

Census

- Population census is the total process of collecting, compiling, analysing or otherwise disseminating demographic, economic and social data pertaining, at a specific time, of all persons in a country or a well-defined part of a country. It happens in an interval of ten years. The data collected through the census are used for administration, planning, policy making as well as management and evaluation of various programmes by the government.

Distribution and Density of Population

- The term 'Population Distribution' refers to the way the people are spaced over the earth's surface. The distribution of population in India is quite uneven because of the vast variation in the availability of resources. Population is mostly concentrated in the regions of industrial centres and the good agricultural lands. On the other hand, the areas such as high mountains, arid lands, thickly forested areas and some remote corners are very thinly populated and some areas are even uninhabited. Terrain, climate, soil, water bodies, mineral resources, industries, transport and urbanization are the major factors which affect the distribution of population in our country.

- Uttar Pradesh is the most populous state in the country with a population of 199.5 million followed by Maharashtra (112.3 million), Bihar (103.8 million) West Bengal (91.3 million) and the combined Andhra Pradesh (84.6 million). These five states account for about half of the country's population. More than one fourth of the population live only in the two states of U.P and Maharashtra. Sikkim is the least populous state of India(0.61 million). Delhi with 16.75 million population tops among the Union territories.

- The uneven distribution of population in the country is the result of several factors such as physical, socio-economic and historical ones. The physical factors include relief, climate, water, natural vegetation,

minerals and energy resources. Socio-economic factors consists of the religion, culture, political issues, economy, human settlements, transport network, industrialization, urbanization, employment opportunity etc.

Density of population

- Population density is a better measure of understanding the variation in distribution of population. It is expressed as number of persons per unit area usually per sq km. According to 2011, the average density of population of India is 382 persons per sq.km. India is one of the most thickly populated ten countries of the world. The most densely populated state of India is Bihar and the state with least population density is Arunachal Pradesh. Among the union territories, Delhi is the densely populated one with 11,297 per sq.km, while Andaman and Nicobar Islands have the lowest density of population.

Spatial pattern of population density	
Density	**Places**
Very Low density (less than 150 persons per sq.km)	Arunachal Pradesh (17), Andaman and Nicobar Islands (46), Mizoram (52), Sikkim (86) Nagaland (120), Manipur (122), Himachal Pradesh (123), Jammu and Kashmir (124) and Meghalaya (132)
Low Density (150 to 300 persons per sq.km)	Arunachal Pradesh (17), Andaman and Nicobar Island s(46), Mizoram (52), Sikkim (86) Nagaland (120), Manipur (122), Himachal Pradesh (123), Jammu and Kashmir (124) and Meghalaya (132)
Moderate Density (300 to 500 persons per sq.km.)	Gujarat (308), The combined Andhra Pradesh (308) Karnataka (319), Tripura (350), Maharashtra (365), Goa (394), Assam (397) and Jharkhand (414) are the states with moderate population density. Assam has tea estates, Andhra Pradesh, Karnataka and Jharkhand
High Density (500 t0 1000 persons per sq.km)	Punjab (550), Tamil Nadu (555), Haryana (573), Uttar Pradesh (827) and Kerala (859) The union territory of Dadra and Nagar Haveli (698)
Very High Density	West Bengal (1029), Bihar (1102),

(greater than 1000 persons per sq.km)	Lakshadweep (2013), Daman and Diu (2169), Puducherry (2598), Chandigarh (9252) and Delhi (11.297).

Population Growth and Change

- The growth rate of population is an important demographic feature. It not only helps in understanding the population change that a society has undergone in the past but also helps in predicting the future demographic characteristics of an area. Population growth refers to the change in the number of inhabitants of a country/territory during a specified period of time. The growth of population is expressed in percentage and is described as the growth rate of population. The following table shows the decadal growth rate of population from 1901 to 2011.

- Growth of population in India has gone through the different phases. Population of the country in 1901 was 238 million and it grew to 1,210 million over a period of little more than a century. The following are the different stages of population growth of India.

  - **The Period of Stagnant Population (1901-1921):** During the first phase of 20 years (1901-1921), the population of India grew by 15 million. The year 1921 registered a negative growth rate of -0.31% which happened only once throughout the demographic history of India and is called the year of Great Demographic Divide.

  - **The Period of Steady Growth (1921- 1951):** During the second phase of 30 years (1921-1951), the population of India grew by 110 million.

  - **The Period of Steady Growth (1951- 1981):** During the third phase (1951- 1981), the population of India grew from 361 million in 1951 to 683 million in 1981. Growth rate in this period is almost doubled when compared to the previous phase of growth rate. This period is often referred to as the period of population explosion.

  - **The period of High Growth with Definite Signs of Slowing Down (1981- 2011):** Population of India increased from 685 million to 1210 million during this phase. The growth rate of

population decreased from one census to other. This marks the beginning of a new era in the demographic history of India.

- ❖ Population change refers to an increase or decrease of population of an area from one period to another period. Population growth is influenced by the birth rate, death rate and migration. These three make the changes in population. Birth rate refers to the number of live births per thousand people in a year and the Death rate refers to the number of deaths per thousand people in a year. The rapid decline in death rate is the major cause of the rapid growth of population in India.

Migration

- It is the movement of people across regions and territories. It can be internal (within a country) or international (between the countries). Internal migration does not change the size of population of a country but it influences the distribution of population in a nation. It plays an important role in changing the composition and distribution of population. In India, the mass migration is from rural to urban. Unemployment and under employment in the rural areas are the push factors and the employment opportunity and higher wages in the urban areas caused by the industrial development are the pull factors of migration in the country. 45 out of 121 crores of people in India are reported to be migrants as per 2011 census. Migrants constitute about 37% of population. Migrants are 48% from female and 52% from male.

Population composition

- Population composition refers to the characteristics such as age, sex, marital status, caste, religion, language, education, occupation etc. The study of composition of population helps us to understand the social, economic and demographic structure of population.

Age composition

- The age composition of population refers to the number of people in different age groups in a country. It is one of the most basic characteristics of a population. It helps us to understand the proportion of population in dependent and independent category. Population of a nation is generally grouped in to three broad

categories. In India, the children who have less than 15 years of age constitute 29.5% and the people above 60 years constitute 8.0%. So, the dependent population in India is 37.5%and the independent population (16- 59 yrs) is 62.5%. It shows that our country has enormous manpower.

Sex Ratio

- Sex ratio is defined as the number of females per 1000 male population. This is an important social indicator to measure the extent of equality between males and females in a society at a given time. According to 2011 census, the sex ratio of the country is 940 females per 1000 males. This suggests that the size of female population is lower than males. Only in the state of Kerala and the union territory of Pondicherry the sex ratio is greater than 1000. It is 1084 in Kerala and 1038 in Puducherry. The lowest sex ratio is recorded in the union territory of Daman and Diu(618).

Literacy Rate

- The people who are able to read and write are known as literates. It is an important indicator of quality of people. The percentage of literate people to the total population is termed as literacy rate. There has been a steady improvement in the literacy levels in India. India's literacy rate as per 2011 census is 74.04%. From this, the literacy rate of male is 82.14% and the female is 65.46%. It shows that still there is a vast gap (16.68%) between the male and female literacy rates. Kerala ranks first in the country with a literacy rate of 93.91% followed by union territory Lakshadweep with 92.28%. The lowest literacy rate is found in Bihar (63.82 %).

Occupational structure

- The economically active part of a country's population is enumerated during the census operations and stated as workers. Workers are placed under three fold categories in census record. They are main workers, marginal workers and non-workers. According to the Census of India, all those who had worked for the major part of the preceding year (at least 6 months or 183 days) are recorded as main workers. Those who worked for less than six months are recorded as marginal workers and the people who have not worked at all comes

under non- workers. Work participation rate denotes the percentage of total workers i.e., total main and marginal workers to the total population in an area. The work participation rate in India is 39.79% in 2011, out of which the work participation rate of male is 53.25% and the female is 25.51%. From the workers, main workers constitute 75.23% and the remaining 24.77% of the people belong to marginal workers.

Population Dynamics

- Human population dynamics is a field that tracks factors related to changes in the size of population and its characteristics. Predicting population changes is an important aspect of population studies. The demographic trend affects the economic, social, and environmental systems. An increase in human population can affect the quality of natural resources like biodiversity, air, land, and water. The size of Population and characteristics undergoes changes constantly. These changes are reflected clearly in every other aspect of our country.

Problems of over Population

- In India, growing pressure of Population on resource base, created many socioeconomic, cultural, political, ecological and environmental problems. The Population problems vary in space and time and differ from region to region. Some of the major issues created by the overpopulation in our country are overcrowding, unemployment and under employment, low standard of living, malnutrition, mismanagement of natural and agricultural resources, unhealthy environment etc.

Urbanization

- The process of society's transformation from rural to urban is known as urbanization. The level of urbanization of a place is assessed based on the size of population of the towns and cities and the proportion of population engaged in non-agricultural sectors. These two are closely linked to the process of industrialization and expansion of the secondary and tertiary sectors of economy.

Urbanization in India

- The level of urbanization is measured in terms of percentage of urban population. The level of urbanization in the country has increased more than three times from 1901 to 2011. The percentage of urban population of India was 27.82% in 2001 and it rose to 31.16% in 2011 shows an increase of 3 % in a decade. The level of urbanization varies widely among the states. Goa is the most urbanized state with 62.17% of urban population. Himachal Pradesh is the least urbanized state with 10.04% of urban population. Among the Union territories, Delhi is the most (97.50 %) urbanized region followed by Chandigarh (97.25%). Among the major states, Tamil Nadu continues to be the most urbanized state with 48.4% percent of urban population followed by Kerala (47.7%) and Maharashtra (45.2%).

S. No	Type of Towns /UAs / OGs	2001 (in Numbers)	2011 (in Numbers)
1.	Statutory towns	3799	4041
2.	Census Towns	1362	3894
3.	Urban Agglomeration	384	475
4.	Out Growths	962	981

- As per 2011 Census, there are 7,935 towns (statutory and census) in the country. The number of towns has increased to 2,774, from 2001 census. In 2011, 475 Urban agglomeration (UAs) with 981 outgrowths (OGs) have been identified as Urban Agglomerations as against 384 UAs with 962 OGs in 2001 Census. Out of 468 UAs belongs to Class I category, 53 UAs have the population of one million and above each and these urban centres are known as "Million Cities". These are the major urban centres in the country. Among the Million Cities, there are three major Urban Agglomerations with more than 10 million population each and are known as "Mega Cities". They are Greater Mumbai UA (18.4 million), Delhi UA (16.3 million) and Kolkata UA (14.1million).

Impact of Urbanization

- Urbanization and population concentration go hand – in – hand and are closely related to each other. A rapid rate of urbanization in a society is taken as an indicator of its economic development. Urbanization is increasing rapidly in the developing countries

including India. Rural to urban migration leads to population explosion in urban areas. Metropolitan cities like Mumbai, Kolkata and Delhi have more population than that can accommodate. The urban population of India had already crossed the 377million in 2011, which is more than the total population of USA. By 2030, more than 50% of India's population is Expected to live in urban areas. The following are the major problems of urbanization in India

- It creates urban sprawl.
- It makes overcrowding in urban centres.
- It leads to shortage of houses in urban areas.
- It leads to the formation of slums.
- It increases traffic congestion in cities.
- It creates water scarcity in cities.
- It creates drainage problem.
- It poses the problem of solid waste management.
- It increases the rate of crime.

Human Development

- Dr. Mahabub-ul-haq defined as "it is a process of enlarging the range of people's choice, increasing their opportunities for education, health care, income and empowerment. It covers the full range of human choices from a sound physical environment to economic, social and political freedom".

  - **Human Development Indicators**: (as per UNDP) Population trends, health outcomes, education achievements, national income and composition of resources, work and employment, human security, human and capital mobility, supplementary indicators: perceptions of well-being and status of fundamental rights treaties are the human development indicators.

Measuring of Human Development

- Human Development Index (HDI) is a composite index focusing on three basic dimensions of human development: i) Health - Life expectancy at birth ii) Education - Expected years of schooling for school age children and average years of schooling for the adult population. iii) Income - Measured by-gross national income and percapita income.

Human Development Classification

- HDI classifications are based on HDI fixed cut off points, which are derived from the quartiles of distributions of the component indicators. The HDI of less than 0.550 is used for low human development, 0.550 - 0.699 stands for medium human development, 0.700 - 0.799 for high human development and 0.8 or greater for very high human development.

Transportation

- Transport is a system in which passengers and goods are carried from one place to another. Transport system is considered as the lifeline of a country. Earlier man travelled on foot or used animals for transport. With the discovery of wheel, transport was made easier and gradually different means of transport were developed. There are three major means of transport in the world.

Means of Transport		
Land	**Water**	**Air**
• Road ways • Railways • Pipelines	• Inland • waterways • Ocean routes	• Domestic airways • International Airways

Transport Network in India

- Transport is one of the most important components of infrastructure and it is essential for economic development of a country, especially for a large country like India. India has a good transport network of roads, railways, airways and waterways providing necessary connectivity between different parts of the country.

Roadways

- Roads play an important role in carrying goods and passengers for short, medium and long distances. It is highly suitable for short distance services. It is comparatively easy and cheap to construct and maintain roads. Road transport system can establish easy contact between farms, fields, factories and markets and can provide door to door transport services. Roads are the most universal mode of transport. Indian roads are cost efficient. It is used by all sections of people in the society. India has the second longest road network in

the world with a total length of 56,03,293 km as of 2016. About 85% of passengers and 70 % of freight traffic are carried by roads every year. For the purpose of construction and maintenance, roads are classified into National Highways (NH), State Highways (SH), District Roads, Rural Roads (Village roads), Border Roads and International Highways.

1. Classification of Roads in India

a. National Highways (NH)

- National Highways form the most important system of road transportation in India. These highways are running through length and breadth of the country connecting capitals of states, major Ports, rail junctions, industrial and tourist centres. Ministry of Road Transport and Highways of India, is responsible for the development and maintenance of National Highways in India. The total length of the National Highways (NHs) in India is 1,01,011 km which accounts for 1.8 % of the total road network length in 2016. The longest National highway is NH-7 which runs from Varanasi in Uttar Pradesh to Kanniyakumari in Tamil Nadu covering a distance of 2369 km. The shortest national highway is NH-47A, which runs from Ernakulum to Kochi port (Willington Island) covering a distance of 6 km.

b. State Highways

- The state highways are usually roads that link important cities, towns and district headquarters within the state and connect them with national highways or highways of neighbouring states. These roads are administered and financed by state governments. State Highway runs to the length of 1, 76,166 km as of 2016.

c. District Roads

- District Roads provide connectivity between the district and taluk headquarters with the state highways and national highways. District Roads are constructed and maintained by the Public Works Department of the states. The total length of the road of this category is 5,61,940 km(16.81%) in 2016.

d. Rural Roads (Village Roads)

- Rural roads connectivity is a key component of rural development. These roads are vital for providing links in the rural areas. It links the different villages with their neighbouring towns. They are maintained by Village Panchayats. The total length of rural roads in India is 39,35,337 km as of 2016. Rural roads consist of Panchayat roads, (Zilla Parishad, Panchayat Samiti, Gram Panchayat); roads of the Pradhan Mantri Gram Sadak Yojana (PMGSY) and those constructed by the State PWDs.

e. Border Roads

- These are the roads of strategic importance in border areas. They are constructed and maintained by Border Roads Organization. It was established in 1960 for the development of the roads of strategic importance in the northern and north-eastern border areas. Border Roads Organization has constructed world's highest road joining Chandigarh and Leh in Ladakh. This road runs at an average altitude of 4,270 meters. Golden Quadrilateral: 5,846 km long road of 4/6 lanes connecting, India's four metropolitan cities: Delhi-Kolkata-Chennai-Mumbai-Delhi. This project was launched in 1999. North–South and East-West Corridors: North- South corridor aims at connecting Srinagar in Jammu and Kashmir with Kaniyakumari in Tamil Nadu (including Kochi-Salem Spur) with 4,076km long road. The East-West corridor has been planned to connect Silchar in Assam with the port town of Porbandar in Gujarat with 3,640km of road length. The two corridors intersect at Jhansi.

f. Expressways

- These are multi-lane good quality highways for high speed traffic. Some of the important expressways are; (i)Mumbai-Pune Road, (ii) Kolkata-Dumdum Airport road (iii) Durgapur-Kolkata road and (iv) Yamuna expressway between Delhi and Agra.

g. International Highways

- These are the roads that link India with neighbouring countries for promoting harmonious relationship with them. These highways have been constructed with an aid from world bank under an agreement with the Economic and Social Commission for Asia-Pacific (ESCAP).

These roads connect important highways of India with those of the neighbouring countries such as Pakistan, Nepal, Bhutan, Bangladesh and Myanmar. In India the densest road network is found in the northern plains where it is relatively easy to construct roads. In mountainous area, it is quite difficult to construct roads. Road density is the highest in Kerala and lowest in Jammu &Kashmir.

Railways

- Indian railway system is the main artery of the country's inland transport. Railways cater to the needs of large scale movement of traffic, both for freight and passenger, thereby contributing to economic growth. Railways are considered as the backbone of the surface transport system of India. It promotes national integration by bringing people together. It also promotes trade, tourism, education etc. Railways help in the commercialization of the agriculture sector by facilitating the quick movement of perishable goods. Its role in transporting raw materials to industries and finished goods to markets is invaluable. Indian railway network is the largest in Asia and second largest in the world.

- The length of Indian railways network as of 2017 is 67,368 km with 7,349 railway stations. For operations and management, the Indian Railways is organized into 16 zones. 1) Northern Railway - Delhi 2) North- Western Railway - Jaipur 3) North-Central Railway- Allahabad 4) North-Eastern Railway - Gorakhpur 5) North-East Frontier Railway - Guwahati 6) Eastern Railway - Kolkata 7) East coast Railway - Bhubaneswar 8) East-Central Railway - Hazipur 9) West-Central Railway - Jabalpur 10) Central Railway - Mumbai (VT) 11) Western Railway - Mumbai (Churchgate) 12) Southern Railway - Chennai 13) South- Central Railway - Secunderabad 14) South Eastern Railway - Kolkata 15) South-Western Railway - Hubball and 16) South East Central Railway - Bilaspur.

- The Northern Railway accounts for the longest route length, followed by the Western Railway. On the basis of width of the track, the Indian railways fall under four categories. Broad gauge with a width of 1.676 meter, Meter gauge with a width of 1 meter and Narrow gauge with a width of 0.762 meter and Light gauge with 0.610 meter. In recent times, many developments have taken place in the Indian railways. The arrival of Konkan Railway Corporation (KRC), Mass Rapid

Transit System (MRTS), Metro and Sub-Urban railways provide easy and efficient means of transport. These are very helpful in avoiding traffic congestion and overcrowding in urban areas.

a. Konkan railway

- One of the important achievements of Indian Railways has been the construction of Konkan Railway in 1998. It connects Roha in Maharashtra to Mangaluru in Karnataka and the track measures 760 km. It is considered as an engineering marvel. On its routes, the railway crosses 146 rivers and streams, nearly 2000 bridges and 73 tunnels. Asia's longest tunnel nearly 6.44 km long is in this route. The states of Maharashtra, Goa and Karnataka are partners in this undertaking. The rail link between Banihal in Jammu region and Qazigund in Kashmir valley was opened in 2013. This rail line passes under the Pir Panjal Range through a 11.2 km long tunnel.

b. Metro Railways in India

- There are 8 cities with metro rail connectivity in India. They are Kolkata (West Bengal), Chennai (Tamil Nadu), Delhi, Bengaluru (Karnataka), Gurgaon (Haryana), Mumbai (Maharashtra), Jaipur (Rajasthan) and Kochi (Kerala). The metro in Kolkata is the first one in India. It is also called as Mass Rapid Transit System (MRTS). As of September 2018, India has 507 km of operational metro lines and 381 stations.

Pipeline transport:

- Pipelines provided a very convenient mode of transport to connect oil and natural gas fields, refineries and to the markets. In the past, these were used to transport water to cities and industries. Now solids can also be transported through a pipeline when converted into slurry. The initial cost of laying pipeline is high but subsequent running cost is minimum. It can be laid through difficult terrain as well as under water. It ensures steady supply of goods and reduces the transhipment losses and delays are the major advantages of pipeline transport. Oil field in upper Assam to Kanpur, from Salaya in Gujarat to Jalandhar in Punjab and gas pipeline from the Hazira in Gujarat ot Jagadispur in Uttar Pradesh are the three important network large network of pipeline in the country.

Waterways

- A waterway is an important mode of transport for both passenger and cargo traffic in India. It is the oldest and also the cheapest means of transport and most suitable for carrying heavy and bulky materials from one country to another. It is a fuel-efficient and eco-friendly mode of transport. The water transport is of two types- Inland Waterways and Ocean water ways(sea routes).

a. Inland Waterways

- India has an extensive network of inland waterways in the form of rivers, canals, lakes and backwaters. It depends upon the depth and width of the waterways and the continuity of the water flow. The total navigable length of our country is 14,500 km, out of which about 5,200 km length of rivers and 4,000 km length of canals can be used by mechanized crafts. The total cargo carried by inland waterways is just about 0.1% of the total inland traffic of India. For the development, maintenance and regulation of national waterways in the country, the Inland water ways Authority was setup in 1986.

- The major national waterways are: National Waterway 1: It extends between Haldia and Allahabad, measures 1620 km and includes the stretches of the Ganga- Bhagirathi-Hooghly river system. National Waterway 2: This waterway includes the stretch of the Brahmaputra river between Dhubri and Sadiya a distance of 891 km. National Waterway 3: This waterway extends between Kollam and Kottapuram in the state of Kerala. It is the first national waterway in the country with 24 hour navigation facilities along its entire stretch of 205 km.

b. Oceanic Routes

- Oceanic routes play an important role in the transport sector of India's economy. About 95% of India's foreign trade by volume and 70 percent by value moves through ocean routes. Coastal shipping plays an important role in transport of bulk goods in India. Shipping is not only the most economical mode of transport, it is also an environment friendly mode. The sea and oceanic routes are mainly used for international trade and are connected through ports. There are 13 major and 200 minor or intermediate ports in India. The major

ports are administered by the Central Government and minor ports are managed and administered by various state governments.

- The major ports on the east coast are Kolkata (including Haldia Dock), Paradip, Visakhapatnam, Chennai, Ennore and Tuticorin. The major ports on the west coast are Kandla, Mumbai, Nhava Seva (Jawaharlal Nehru Port), New Mangalore, Marmagao and Kochi. India has four major shipyards. Hindustan shipyard in Vishakhapatnam, Garden Reach workshop in Kolkata, Mazagaon Dock in Mumbai, Kochi Shipyard in Kochi. India is the second largest ship owning country in Asia and ranks 16th in the World.

Air Transport

- Airways are the quickest, costliest, most modern and comfortable means of transport, Air transport facilitates connectivity on a national, regional and international scale. It has made accessibility easier by connecting difficult terrains like high mountains and sandy deserts. It carries passengers, freight and mail. Air transport plays a key role in times of emergency as well as in the event of natural and man-made calamities like floods, epidemics and wars.

- Air transport in India made a beginning on 18th February, 1918 when Henry Piquet carried a mail from Allahabad to Naini. In 1953, eight different airlines which were in operation in the country were nationalised. Domestic Airways fly within the boundaries of a country and International Airways connect major cities of the world. The Indian Airlines and Air India are the two airline services run by the government of India. Indian Airlines provides the domestic air services and Air India provides international air services. Presently, there are 19 designated international airports available in the country.

- These airports are managed by Airports Authority of India. Some of them are Netaji Subhash Chandra Bose International Airport, Kolkata, Chennai International Airport, Chennai, Indira Gandhi International Airport, Delhi, Chhatrapati Shivaji International Airport, Mumbai, Thiruvananthapuram International Airport, Thiruvananthapuram, Sardar Vallabh Bhai Patel International Airport, Ahmedabad, Bangalore International Airport, Bengaluru, Rajiv Gandhi International Airport, Hyderbad etc. Besides this, there

are about 80 domestic airports and about 25 civil enclaves at defence air fields.

a. Pavan-Hans Helicopter Ltd

- Pavan-Hans Helicopter Ltd has been providing Helicopter support services to the petroleum sector, including ONGC and oil India Ltd. It is a public sector company based in New Delhi. Its operations are based at the Juhu Aerodrome in Vile Parle (West) Mumbai. Pavan-Hans is a Mini Ratna–I category public sector undertaking. It often provides services to various state governments in India particularly north east India Inter Island, Ferry services in Andaman & Nicobar Islands, services to Lakshadweep Island etc.,

b. Airports Authority of India (AAI)

- Airports Authority of India (AAI) was constituted in 1995. It provides security to Indian Airports. AAI under the ministry of Civil Aviation is responsible for creating, upgrading, maintaining and managing civil aviation infrastructure in India.

Communication

- Communication is a process that involves exchange of information, thoughts and ideas. Technology does wonders in communication fields. Communication is categorized in to personal and mass communications.

Personal Communication

- The exchange of information between the individuals is called personal communication. It includes post and telegraph services, telephone, mobile phone, short message services, fax, internet, e-mail etc. Personal Communication system enables the user to establish direct contact. The Indian postal network is the largest in the world with 1,55,000 post offices. Of these more than 1,39,000 post offices are located in rural areas. The postal service was opened to the public in the country in 1837. The first Indian postal stamp was issued in 1852 in Karachi. Collecting and delivering mail is the primary function of the department of posts. It introduced the Quick Mail Service in 1975 and today it covers the entire country.

- Them Quick Mail Service functions on the basis of the system of PIN (Postal Index Number) code which was introduced in 1972. The premium products include the Money order, e-money order, Speed Post, Express Parcel Post, Business Post, Media Post, Satellite Post, Retail Post, Greeting Post, Data Post, Speed Net and Speed Passport Services. Cards and envelopes are considered first class mail and are airlifted between stations covering both land and air. The second class mail includes book packets, registered newspapers and periodicals. They are carried by surface mail, covering land and water transport. To facilitate quick delivery of mails in large towns and cities, six mail channels have been introduced recently.

- They are called Rajdhani Channel, Metro Channel, Green Channel, Business Channel, Bulk Mail Channel and Periodical Channel. India has one of the largest telecommunication networks in Asia. Apart from the urban areas more than two-thirds of the villages in India have already been covered with Subscriber Trunk Dialing (STD) telephone facility, while International communication can be made through ISD (International Subscriber Dialing). There is an uniform rate of STD facilities all over India. Telephone is a form of oral communication. It is considered very essential for the growth of commerce. It is the most preferred form as it provides instant communication. Mobile phone, fax and internet are the other personal communication used in the country.

Mass Communication Systems

- Mass Communication enables millions of people to get the information at the same time. It is a great way to provide education as well as entertainment. It helps in creating awareness among the people regard in national policies and programmes. The Mass Communication Systems can provide the information to people in two methods. They are Print Media and Electronic Media.

  - **Electronic Media:** Radio broadcasting in India was started in 1923 by the Radio club of Bombay. Since then it gained immense popularity and changed the social and cultural life of people. It was named as All India Radio (AIR) in 1936 and again it was renamed as Akashwani in 1957. It broadcasts a variety of programs related to information, education and entertainment.

Special news bulletins are also broadcasted on special occasions like session of parliament and state legislatures.

- Television broadcasting has emerged as the most effective audio-visual medium for disseminating information and educating the masses. Television network in India is known as Doordarshan (DD) which started Common National Program (CNP) services and it is extended to the backward and remote rural areas. Internet (contraction of interconnected network) is the global system of interconnected computer networks that use the Internet protocol suite to link devices worldwide.

- Social media are interactive computer-mediated technologies that facilitate the creation and sharing of information, ideas, career interests and other forms of expression via virtual communities and networks. With over 460 million internet users, India is the second largest online market, ranked only behind China. By 2021, there will be about 635.8 million internet users in India. Despite the large base of internet users in India, only 26 percent of the Indian population accessed the internet in 2015. This is a significant increase in comparison to the previous years, considering the internet penetration rate in India stood at about 10 percent in 2011. Furthermore, men dominated internet usage in India with 71 percent to women's 29 percent.

  ❖ **Print Media:** Newspapers are the most common but powerful means of communication come under print media. India has many newspapers which carry information on local, national and international events to the people.

Satellite Communication

- The use of Satellite in getting a continuous and synoptic view of larger area has made this communication system very vital for the country. Satellite images are used for weather forecasting, monitoring of natural calamities, surveillance of border areas etc. The communication through satellites emerged as a new era in communication in our country after the establishment of Indian Space Research Organization (ISRO) in 1969.

- Satellite system in India can be grouped into two-the Indian National Satellite System (INSAT) and the Indian Remote Sensing Satellite System (IRS).The INSAT, established in 1983, is a multipurpose system for telecommunication, meteorological observation and for various other programs. The INSAT series are used for relaying signals to television, telephone, radio, mobile phone. It is also useful in weather detection, internet and military applications.

- The INSAT series, GSAT series, KALPANA-1, HAMSAT, EDUSAT are the major communication satellite used for communication purpose. GSAT–7A is the recent launch (December 19, 2018) for communication programs. INSAT-1B launched on 30th August 1983 is the first communication satellite in INSAT series.

Trade

- Trade is an important phenomenon that decides the economic growth of a country. Trade is an act (or) process of buying, selling or exchanging of goods and services. The primitive method of trade was known as the Barter system where goods were exchanged for goods. Later on, money was introduced as a medium of exchange in buying and selling of goods. The difference in value between the imports and exports is called balance of trade. The situation in which the value of exports exceeds the value of imports is termed as favourable balance of trade and the reverse position is termed as unfavourable balance of trade.

Types of Trade

- Trade in general, is of two types. They are Internal and International. The trade carried on within the domestic territory of a country is termed as Internal trade. It is also called as Domestic trade or Local trade. Land transport (roadways and railways) plays a major role in this trade. Local currency is used in internal trade. It helps to promote a balanced regional growth in the country i.e, tea from Assam, coffee from Karnataka, Rubber and spices from Kerala, minerals from Jharkhand etc., are supplied to different parts of our country. Trade carried on between two or more countries is called International trade. It is also called as external trade or foreign trade. Export and Import are two components of International trade. Export means goods and services sold for foreign currency. Import means goods

and services bought from overseas producers. Waterways and Airways play a vital role in this type of trade. Foreign currency is involved in international trade. The trade between any two countries is called Bilateral trade. The trade between more than two countries is called Mutilateral Trade.

Exports

- The major exports of India are tea, marine products, ores and minerals, leather products, gems and jewels, sports goods, chemicals and related products, plastics and rubber articles, articles of stones, plaster, cement, asbestos, mica, glass ware, paper and related products, base metals, optical, medical and surgical instruments, electronic items, machinery, office equipment's, textiles and allied products.

Imports

- The major imports are petroleum products, pearls, precious stones and semi-precious stones, gold and telecom instruments. India's Trade Performance The volume of India's foreign trade has increased many fold since independence. During 2008 -2009, the volume of trade was 840755 crores and it rose to 1039797 crores in 2016-2017. The import during 2008-2009 was 1374436 crores and was with a deficit of 40679 crores. The import during 2016–2017 rose to 1396352 crores and was with the deficit of 356555 crores. It reveals that not only the balance of trade is unfavourable but also the increase in the level of deficit.

NOTE

- ❖ In India the first census was carried out in the year 1872. But the first complete and synchronous census was conducted in 1881. And the 2011 census represents the fifteenth census of India.
- ❖ The ratio between the economically active and economically inactive of population is termed as Dependency Ratio.
- ❖ Shershah suri built the shahi (Royal) road to strengthen and consolidate his empire from the Indus valley to the Sonar valley in Bengal. This road from Kolkata to Peshawar was renamed as Grand Trunk(GT) road during the British period. At present, it extends from Amristar to Kolkata. It is bifurcated into 2 segments: (a) (NH)-1 from Delhi to Amristar, and (b) NH-2 from Delhi to

Kolkata.

- National Highways Authority of India (NHAI) was established in 1995. It is an autonomous body under the Ministry of Surface Transport.
- The first train steamed off from Mumbai to Thane in 1853, covering a distance of 34 km. In 1951, the systems were nationalized as one unit "The Indian Railways". The headquarter of Indian Railways is New Delhi.
- The first sub-urban railway was started in 1925 in Mumbai.
- Chennai becomes the sixth Indian city with metro railway.
- Gatiman Express is the fastest operational train in India. This train connects New Delhi and Agra and touches 160 km/h. This train takes a travel time of 105minutes to cover 200km journey.
- The state of Meghalaya has no railway network.
- In 2007, the Government of India merged the Air India and Indian Airlines under National Aviation Corporation of India Limited (NACIL). In which NACIL (A) provides international services, NACIL (I) provides domestic services and services to neighbouring countries in south east Asia and middle East.

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(Natural calamities & Disaster management)
Unit – 7
Human Geography of Tamil Nadu

Learning Objectives

- To understand the agricultural factors, major crops and their distribution in Tamil Nadu
- To learn about the water resources of Tamil Nadu
- To study the mineral and industrial resources of Tamil Nadu
- To analyze the population and its composition in Tamil Nadu
- To learn about the man made disasters in Tamil Nadu

Introduction

- Human geography refers to the study of ways of development of human societies and their operation in relation to their physical environment. This chapter focuses on the distribution, characteristics and utilisation of different resources in Tamil Nadu. We have studied earlier that the earth is endowed with a variety of natural resources such as landforms, rivers, soil, natural vegetation, water and wildlife. These resources are useful only when they are utilised. Human beings use these resources using their intelligence and skill. Thus, the human beings are the most significant resource on the earth surface. They turn all these natural resources into useful products with their skills and abilities.

Agriculture

- The word "agriculture" is derived from the Latin words "ager and cultura", which means field and growing. Agriculture is a practice of farming that includes the cultivation of crops, rearing of animals, birds, forestry, fisheries and other related activities. Agriculture is the major occupation in Tamil Nadu. Agriculture has been the mainstay

of the state's economy since independence with more than 65% of the population depends upon this sector for their living. Agriculture provides employment for rural people on a large scale. There is a strong link between agriculture and economic growth. Agriculture constitutes about 21% of the state's economy. However, it fluctuates from one year to another. Paddy, millets and pulses are the principal food crops of the state. Sugarcane, cotton, sunflower, coconut, cashew, chillies, gingelly, groundnut, tea, coffee, cardamom and rubber are the major commercial crops.

Geographical determinants of Agriculture

- Landform, climate, soil and irrigation are the factors that determine the growth of agriculture.

Landform

- Tamil Nadu is a land of diverse landscape comprising of hills, plateaus and plains. Among them the plains are most suitable for agriculture. The plains with alluvial soil enhances agricultural productivity. Example: Plains of cauvery. Agriculture in the plateau is moderate and is poor on the hills.

Climate

- Tamil Nadu is situated in the tropical zone, which is nearer to the equator. The state experiences a tropical climate. Hence, the temperature in Tamil Nadu is relatively high almost throughout the year. So, only the tropical crops are cultivated. Water is another limiting factor of agriculture. Northeast monsoon is the major source of rainfall for Tamil Nadu. Therefore, the major cropping season begins with this season. The rainfall in this season and the irrigation facilities affect agriculture to a large extent.

Soil

- Soil is one of the most essential elements of agriculture. It provides essential minerals or nutrients for the growth of crops and vegetation. The regions of river valleys and the coastal plains are the most

agriculturally productive regions of the state as they are covered with fertile alluvial soil.

Types and regions of Agriculture Practices in Tamil Nadu

Farming type	Area practiced
Subsistence intensive agriculture	Practiced all over Tamil Nadu with few exceptions.
Plantation Agriculture	Hill slopes of Eastern and Western Ghats.
Mixed farming	Banks of River Cauvery and Thenpennai.

Irrigation

- Monsoon rainfall in the state is highly irregular. Further it is seasonal. Hence, irrigation becomes necessary for successful cultivation of crops in the state. In the dry regions, rain-fed crops are cultivated.

The Tamil Nadu Rice Research Institute (TRRI) is an Indian research institute working in the field of rice under Tamil Nadu Agricultural University (TNAU).It is situated at Aduthurai, in Thanjavur district, it was established in April, 1985 in TNAU to meet the research requirements of the region with the help of existing Agricultural Colleges and Research centres and perform lead function for rice and rice based cropping system research.

Cropping Seasons in Tamil Nadu

- Farmers select different crops for different seasons of cultivation. It is based on the temperature and availability of moisture in the soil. Accordingly, the state has the following cropping seasons.

Name	Sowing	Harvesting	Major crops
Sornavari (chittirai pattam)	April-May	August-September	Millets and cotton
Samba (Adipattam)	July-August	January-February	Paddy and sugarcane

Navarai	November - December	February-March	Fruits, vegetables, cucumber and watermelon

Distribution of major crops in Tamil Nadu

Paddy

- Paddy is the most important staple food crop of Tamil Nadu. Ponni and kichadi samba are the major varieties of paddy grown in Tamil Nadu. About 3 million hectares of the state is under rice cultivation. Though it is cultivated all over Tamil Nadu, its cultivation is highly concentrated in Thanjavur, Tiruvarur, Tiruvallur, Kancheepuram, Villupuram, Cuddalore and Tirunelveli districts. It ranks third in the production of rice among the states of India. The deltaic region of river cauvery (the undivided Thanjavur district) is the major rice-producing region of Tamil Nadu. So, this region is rightly called as the "Granary of Tamil Nadu."

Millets

- Millets form staple food of nearly onethird of human population of Tamil Nadu. Sorghum/jowar (cholam), ragi (kezhvaragu) and bajra (kambu) are the major millets. These are grown not only in drier areas but also in the coastal plains. Sorghum is grown in the Coimbatore plateau and Kambam valley. Ragi is grown in Coimbatore, Dharmapuri, Vellore and Cuddalore districts. Bajra is mostly cultivated in Ramanathapuram, Tirunelveli, Karur, Perambalur and Salem districts.

India observed 2018 as national year of millets. FAO has decided to observe 2023 as the International year of millets.

Pulses

- Pulses are the major source of protein. Bengal gram, black gram, green gram, cowpea and horse gram are the important pulses grown in Tamil Nadu. Pulses are grown in a wide range of climatic

conditions mostly in drier regions with or without irrigation. Mild cool climate and a low to moderate rainfall are best suited for these crops. Pulses serve as excellent fodder. Pulses are grown in almost all districts in the state except Chennai, Nilgiris and Kanyakumari. Coimbatore leads in the production of Bengal gram. Vellore and Kanyakumari districts produce red gram.

To promote organic farming a central scheme named 'National Project on Organic Farming' was launched Apart from general things (creating awareness, promoting organic fertilizers, training, capacity building etc.), the scheme provides financial assistance through Capital Investment Subsidy Scheme for agro-waste compost production units, bio-fertilizers/ bio-pesticides production units, development and implementation of quality control regime, human resource development etc.

- Tiruvarur, Nagapattinam and Thoothukudi districts are the principal producers of green gram and black gram. Horse gram is widely cultivated in Dharmapuri and Krishnagiri districts.

Oil Seeds

- Groundnut, gingelly castor, coconut, sunflower and mustard are some of the oilseeds that are grown in Tamil Nadu. Apart from its use in food preparation, it is used in industries as a lubricant, in the manufacture of varnish, soaps, candles, cosmetics and pharmaceuticals. Groundnut is the major oilseed of the state. The cultivation of groundnut is mostly concentrated in Vellore, Tiruvannamalai, Villupuram, Salem and Pudukottai districts. It is also grown to some extent in Dharmapuri, Cuddalore, Perambalur and Madurai. Erode, Ramanathapuram, Sivagangai and Virudhunagar districts are its minor producers. Coconut is grown in Coimbatore, Thanjavur and Kanyakumari districts.

Sugarcane

- It is one of the major cash crops of the state. It is an annual crop. It requires high temperature and heavy rainfall. It grows well in the tropical region. Major sugarcane-producing districts are Tiruvallur,

Kancheepuram, Vellore, Cuddalore, Tiruchirapalli, Coimbatore, Erode and Tirunelveli.

Cotton

- Cotton is a fibre and cash crop. It requires black soil, long frost-free condition and warm and humid weather for its cultivation. Humid weather in the early stages and hot, dry weather during harvest period is suitable for this crop. It is predominantly cultivated in Coimbatore plateau and Vaigai-Vaippar river basins. It is also cultivated in Madurai, Ramanathapuram, Virudhunagar, Tirunelveli, Thoothukudi, Salem and Dharmapuri districts.

Plantation crops

- Tea, coffee, cashew, rubber and cinchona are the major plantation crops of the state. Tamil Nadu ranks second in area and production of tea in India next to Assam. Tea plantations are found in the hills of the Nilgiris and Coimbatore. The Nilgiris is the notable regions for tea plantations. Coffee plants are grown in the hills of Western Ghats as well as Eastern Ghats. It is also found in the hilly slopes of Dindigul, Madurai, Theni and Salem districts. Yercaud, Kolli Hills and Kodaikanal are notable for coffee plantations. Tamil Nadu stands second in area and production of coffee next to Karnataka. Rubber plantations are significant in Kanyakumari. Pepper is confined to the warm and wet slopes of Eastern and Western Ghats of Tamil Nadu. Cashew is extensively cultivated in Cuddalore district.

- Cinchona is planted at heights varying from 1060 to 1280 metres in Anaimalai hills. Cardamom estates are located at few places in the hills of Madurai region at an elevation of 915 to 1525 metres.

TANTEA (TANTEATamil Nadu Tea Plantation Corporation Limited) is one of the Biggest Black Tea Producers in India with high quality clonal tea. Its plantation spreads over nearly 4500 hec. Tamil Nadu Dairy Development Corporation Ltd. was transformed into the newly registered Tamil Nadu Co-operative Milk Producers Federation Limited Popularly known as "Aavin".

Livestock/Animal Husbandry

- Livestock has remained an integral part of socio-economic fabric of rural people. The number of cattle found in Tamil Nadu is 88,92,473. There are 47,86,680 sheep, 81,43,341 goats and 11,73,48,894 poultry animals.

Goat

- Goat is also known as 'poor man's cow' in India. It forms a very important component in dry land farming system. In the marginal or undulating lands unsuitable for rearing of other types of cattle like cow or buffalo, goat is the best alternative. With very low investments, goat rearing can be made into a profitable venture for small and marginal farmers.

Sheep

- Sheep is used for multiple purposes like wool, meat, milk, skins and manure, and forms an important component of the rural economy, particularly in the arid, semi-arid and mountainous areas of Tamil Nadu. It provides a dependable source of income to the shepherds through the sale of wool and animals.

- A variety of cattle breeds are reared in the state for the milk and forms a major component of the rural economy. The poultry hub of Tamil Nadu are Namakkal, Salem, Erode and Coimbatore districts.

Fishing

- Since Tamil Nadu is a coastal state, fishing is one of the major occupations in the state. With widespread reservoirs and rivers, inland fishing also is also seen to a considerable extent. There are about 2500 species of fishes found in different aquatic environments.

Marine Fishing

- The length of the coastline of Tamil Nadu is 1076 km (13% of the country's coastline). The coastal region of the state covers an area of

0.19 million sq.km. An area of 41,412 sq.km of continental shelves of the state favours coastal fishing and Tamil Nadu is one of the leading states in marine fish production. Marine fishing is also called inshore fish or neritic fishing, carried out in oceans and seas. Large mechanised boats are used for fishing. In ocean or seawaters, fishing within few kilometres from the shoreline is called inshore fishing and the fishing far from the shore typically 20–30 miles out in water hundreds and thousands of feet deep is called off-shore fishing. The fish varieties caught are sharks, flying fish, counch, catfish, silver bellies, and crabs. Chennai, Kanyakumari, Tirunelveli, Nagapattinam, Thanjavur and Ramanathapuram districts contribute about 40% to marine fish production in the state. Their coastal location favours fishing in these regions. The state has three major fishing harbours, three medium fishing harbours and 363 fish landing centres. The export of marine products from the state during 2007– 08 accounted for 72,644 metric tons.

Inland Fishing

- Inland fishing is carried out in lakes, rivers, ponds, estuaries, backwaters and swamps. Oysters and prawns are cultured in original nurseries. Catamaran, diesel boats and floating nets are used in fishing. Tamil Nadu Fisheries Department has introduced several programmes for the betterment of fishing. The major programmes are aquaculture in farm ponds and irrigation tanks, fish seed bank, fish seed rearing, ornamental fish culture and the establishment of Fish Farmer Development Agency. Vellore district leads in the production of inland fish production with 10% of state's production. Cuddalore, Sivagangai and Virudhunagar districts stand second with 9% of inland fish catch each. Fishing sector contributes 1.25% of state's economy.

Second Green Revolution (Eco-Farming or Organic Farming)

In organic farming synthetic fertilizers, pesticides, growth regulator and livestock feed additives are not used. This type of farming rely on crop rotation, crop residues, animal manure, off-farm organic wastes and biological pest control to maintain soil productivity. This farming method is being adopted by very few

farmers in the state. It has to be increased in number.

Water Resource

- Water is the precious gift of nature to humankind and millions of other species living on the earth.

- Tamil Nadu constitutes 4% of India's land area and is inhabited by 6% of India's population, but has only 2.5% percent of India's water resources. More than 95% of the surface water and 80% of the ground water have already been put into use. Major uses of water include human/animal consumption, irrigation and industrial use. The state is heavily dependent on monsoon rains. The annual average rainfall is around 930 mm (47% during the northeast monsoon, 35% during the southwest monsoon, 14% in summer and 4% in winter).

Surface Water Resources	**Numbers**
River Basin	17
Reservoirs	81
Tanks	41,127
Tube wells and other wells	4,98,644
Open wells	15,06,919
Total (Million Cubic metres)	2046788 MCM
Source: Statistical handbook of Tamil Nadu – 2017	

Multipurpose River Valley Projects

- Multipurpose river valley projects are basically designed for the development of irrigation for agriculture and hydropower generation. However, they are used for many other purposes as well.

Mettur Dam

- The Mettur Dam was constructed in a gorge, where river Cauvery enters the plains. It is one of the oldest dam in India. It provides irrigation to Salem, Erode, Karur, Tiruchirappalli, Thanjavur,

Tiruvarur and Nagapattinam districts for about 2,71,000 acres of farmland. The dam, park, major hydroelectric power stations and hills on all sides make this dam an important tourist spot.

Bhavani Sagar Dam

- The Bhavani Sagar Dam is located 80 km away from Coimbatore city in the district of Erode. It has been constructed across the river Bhavani. This dam is one of the biggest earthen dams in the country.

Amaravathi Dam

- The Amaravathi dam is situated 25 km away from Udumalpet in Tirupur district. The dam has been constructed across the river Amaravathi, a tributary of Cauvery. The dam was built primarily for irrigation and flood control. A small hydropower station has also been installed recently. This reservoir is notable for the significant population of mugger crocodiles. It is also a familiar tourist spot.

Krishnagiri Dam

- Krishnagiri dam is situated at a distance of 7 km from Krishnagiri towards Dharmapuri. This dam drains an area of 5428 sq.km. This is a famous tourist spot too. This dam is flooded with tourists during the weekends.

Sathanur Dam

- Sathanur Dam was constructed across the river Thenpennai in Chengam taluk. It is in the midst of Chennakesava hills. The waterholding capacity of the dam is 7321 million cubic feet (full level: 119 feet). About 7183 hectares of land is drained by the left bank canal and 905 hectares by the right bank canal of this dam. It irrigates the land in Thandrampet and Tiruvannamalai blocks. There is also a large crocodile farm and a fish grotto. Parks are maintained inside the dam for tourists and the gardens are used by the film industry.

Mullaiperiyar Dam

- Mullaiperiyar dam was built by the British administration in 1895. It has been constructed on the Periyar river, which originates from Thekkady hills of Kerala. The dam was built mainly for watering the farming land of Tamil Nadu, which is perennially drought-prone. Though the dam is located in the state of Kerala, most of its water is used to irrigate Tamil Nadu. The dam is 175 feet in height and 1200 feet in length.

Vaigai Dam

- This dam built across the river Vaigai near Andipatti. The dam with a height of 111 feet can store water up to 71 feet. It is located 7 km from Andipatti and 70 km from Madurai. This dam was opened on 21 January, 1959. The dam has a unique garden that deserves the surname 'Little Brindavan'. It is a popular picnic spot in Theni district.

Manimuthar Dam

- Manimuthar dam is located about 47 km from Tirunelveli. The gorgeous garden of the dam is located about 5 km from the dam and is accessible through a zig-zag ghat road. Pleasure boating and waterfalls are additional tourist attractions near the dam.

The Papanasam Dam

- It is also known as Karaiyar dam and is located about 49 km away from Tirunelveli. The dam is used to irrigate 34,861 hectares of land in Tirunelveli and Thoothukudi districts. It generates 28 MW of hydro power.

Parampikulam Aliyar Project

- It is a joint venture of Tamil Nadu and Kerala states. It envisages the construction of seven interconnected reservoirs by harnessing the water of seven rivers, which include major rivers of Parambikulam and Aliyar.

- Parappalar project is located near Ottanchatram. Its storage capacity is 167 million cubic feet of water. It is about 75 km from Madurai and is in Palani taluk.

Surface water Resources

- The total surface water potential of the state is about 24,864 mcm (million cubic metre). There are 17 major river basins in the state with 81 reservoirs and about 41,262 tanks. Most of the surface water has already been tapped, primarily for irrigation, where water use is largest. An area of 24 lakh hectares of the land are irrigated by surface water through major, medium and minor schemes.

Ground Water Resources

- The utilizable groundwater resource of the state is 22,423 mcm. The current level of utilization of water is about 13,558 mcm which is about 60 percent of the available recharge, while about 8875 mcm (40 percent) is the balance available for use.

Water Resource Management

- Water resource management is the activity of planning, developing, distributing and managing the optimum use of water resources. The demand for water in Tamil Nadu is increasing at a fast rate both due to increasing population and also due to larger per capita needs triggered by economic growth. The per capita availability of water resources is just 900 cubic metres when compared to the national average of 2,200 cubic metres. Agriculture is the largest consumer of water in the state using 75% of the state's water resources. Demands from other sectors such as domestic and industries have been growing significantly. The state is heavily dependent on monsoon rains. Since the state is entirely dependent on rains for recharging its water resources, monsoon failures lead to acute water scarcity and severe droughts. So, it is important to save water for us and the future generation.

Mineral Resources

- Tamil Nadu is the leading holder of country's resources of vermiculite, magnetite, dunite, rutile, garnet, molybdenum and ilmenite. The state accounts for the country's 55.3% of lignite, 75% of vermiculite, 69% of dunite, 59% of garnet, 52% of molybdenum and 30% of titanium mineral resources.

- Important minerals are found in the state are as follows: Neyveli has large lignite resources. Coal is also availablein Ramanathapuram. Oil and gas are found in the Cauvery basin.

- Iron deposits are found in Kanjamalai region in Salem district and Kalrayan Malai region of Tiruvannamalai district. Magnesite ores are available near Salem. Bauxite is found in Servarayan Hills, Kotagiri, Udagamandalam, Palani and Kollimalai areas. Gypsum is obtained in Tiruchirappalli, Tirunelveli, Thoothukudi and Virudhunagar districts. Ilmenite and rutile are found in the sands of Kanyakumari beach. Limestone is available in Coimbatore, Cuddalore, Dindigul, Kancheepuram, Karur, Madurai, Nagapattinam, Namakkal, Perambalur, Ramanathapuram, Salem and Tiruvallur districts. Magnesite is obtained in Coimbatore, Dharmapuri, Karur, Namakkal, the Nilgiris, Salem, Tiruchirapalli, Tirunelveli and Vellore districts. Feldspar, quartz, copper and lead are also found in some parts of the state.

Industries

- Industries use raw materials and convert them into usable product or goods. Textiles, sugar, paper, leather, cement, electrical equipment, automobiles, information technology and tourism are the major industries of Tamil Nadu.

Textile Industry

- Textile industry is one of the traditionally well-developed industries in Tamil Nadu. The textile mills are concentrated in Coimbatore, Tirupur, Salem, Palladam, Karur, Dindigul, Virudhunagar,

Tirunelveli, Thoothukudi, Madurai and Erode. Tamil Nadu has about 3,50,000 power looms manufacturing cotton fabrics and accounts for 30% of India's exports of textiles products. Erode in Tamil Nadu is well known for marketing of handloom, power loom and readymade garments. Coimbatore is also known as the 'Manchester of Tamil Nadu'. Coimbatore, Tirupur and Erode contribute a major share to the state's economy through textiles. So, this region is referred as 'Textile Valley of Tamil Nadu'. Karur is known as 'The Textile capital of Tamil Nadu'.

Silk Textiles

- Tamil Nadu occupies fourth position in the country in silk production. Kancheepuram silk is unique in its quality and is known for its traditional value all over the world. The annual silk production in Tamil Nadu is around 1200 metric tons. Kancheepuram, Arani, Kumbakonam, Salem, Coimbatore, Madurai and Tirunelveli are the important silk-weaving centres in Tamil Nadu. Ramanathapuram has some specialised areas for the manufacturing of synthetic silk clothes.

Leather Industry

- Tamil Nadu accounts for 60% of leather tanning processes of India and 38% of all leather footwear, garments and components. Hundreds of leather tanneries are located around Vellore and nearby towns, such as Ranipet, Ambur and Vaniyambadi. The Vellore district is the top exporter of finished leather goods in the country. Vellore leather accounts for more than 37% of the country's export of leather and leatherrelated products (such as finished leathers, shoes, garments and gloves). Central Leather Research Institute (CLRI), a CSIR research laboratory, is located in Chennai.

GI Tag

GI(Geographical Indication)is a name or sign used on products which corresponds to a specific geographical location. It provides rights and protection of holders.

Some important GI Tags of Tamil Nadu are:

Place	Products
Aranl	Silk

Kancheepuram	Silk
Coimbatore	Wet Grinder and Coracotton
Thanjavur	Paintings, Art plate, Doll and veenai
Nagercoil	Temple Jewellery
Erode	Turmeric
Salem	Venpattu(salem silk)
Bhavani	Jamakkalam
Madurai	Sungudi
Swamimalai	Bronze Icons
Nachiarkovil	Kuthuvilakku
Pattamadai	Mat
Nilgiri	Orthodox Embroidery
Mahabalipuram	Stone sculpture
Sirumalai	Hill banana
Eathomozhi	Coconut

Paper Industry

- Many paper industries are located in the state. Tamil Nadu Newsprint and Papers Limited (TNPL) is a government of Tamil Nadu enterprise producing newsprint and printing and writing paper at its mill located at Kagithapuram in Karur district. It was started in 1979 with an installed capacity of 2.45 lakh MT of production per annum. TNPL is one of the most accomplished mills in the world, producing different varieties paper of acceptable quality primarily from bagasse and pulpwood. Other paper mills of the state are found in Pukkathurai of Kancheepuram district, Bhavanisagar, Pallipalayam, Paramathi Vellore, Coimbatore, Udamalaipet, Thoppampatti, Nilakkotai and Cheranmahadevi.

Cement Industry

- Cement production and consumption continue to grow despite the general recession in the economy. India is one of the largest cement producers and ranked second in the world with an annual production capacity of 181 million tons. Tamil Nadu Cements Corporation Limited (TANCEM) is one among the major cement producers in Tamil Nadu operating two cement units: one at Ariyalur and another at Alangulam. Asbestos cement sheet plant at

Alangulam and stoneware pipe unit at Virudhachalam are the other units of TANCEM. Sankar Cement, Zuari Cement, Ultratech Cement, Madras Cement and Dalmia Cement are the major private cement brands produced in Tamil Nadu.

Information Technology

- According to National Association of Software and Services Companies (NASSCOM), the southern states continue to account for more than half of the country's total export of software. Tamil Nadu and Andhra Pradesh together account for 59.6% of India's total software exports. Tamil Nadu is the second largest software exporter in the country next to Karnataka.

A special economic zone (SEZ) is an area in which the business and trade laws are different from the rest of the country. SEZs are located within a country's national borders, and their aims include increased trade balance, employment, increased investment, job creation and effective administration.

Special Economic Zones

- Special economic zones (SEZs) provide an internationally competitive and hasslefree environment for exports. Units in SEZ manufacture goods and provide a range of services. SEZs are located in Nanguneri, Ennore, Hosur and Perambalur. IT & ITES SEZ named TIDEL-II and TIDEL-III and Bio-Pharmaceuticals SEZ are located in Chennai and Coimbatore SEZ called the TIDEL Park–IV is located in the city.

The list of IT parks in Tamil Nadu

Tidel Park, Ascendas, Mahindra world city 4 IT & ITES SEZ TIDEL-II, IT & ITES SEZ TIDEL-III, Coimbatore SEZ - Tidel Park

Manufacturing & Engineering Industry

- The manufacturing industry is one of the vibrant sectors of the state economy and contributes significantly to the industrial output.

- The manufacturing industry broadly covers manufacture of machinery and equipment, motor vehicles, basic metal and alloy industries, metal products and repair of capital goods. Tamil Nadu's share of the industrial output is around 11–12% of the country's output and 15% of the country's exports excluding software. Tamil Nadu accounts for about 17% of India's software exports.

Automobile Industries

The share of Tamil Nadu in all-India production of automobiles and heavy vehicles is rather significant. Automobile industry plays a crucial role in the state's economy and has been one of the key driving factors. Contributing 8 percent to state GDP and giving direct employment to 2,20,000 people.

- Tamil Nadu accounts for about 21% of passenger cars, 33% of commercial vehicles and 35% of automobile components produced in India. Major automobile manufacturers like Ford, Hyundai, HM-Mitsubishi, Ashok Leyland, and TAFE have their manufacturing base in Tamil Nadu.

Chemical & Plastic Industry

- The chemical industry is one of the fastest growing sectors of industry and the economy. The sector contributes 13% to the state's GDP and constitutes 8% of the total exports of the country.

Handlooms and Powerlooms

- The handloom sector in the state is the single largest cottage industry providing livelihood to a large number of rural people and promoting export earnings. The handloom sector and its related economic activities generate gainful employment for more than 4.29 lakh weaver households and 11.64 lakh weavers in the state. These societies mainly produce the cloth required for the scheme of 'Free Supply of Uniforms to School Children and Free Distribution of Sarees and Dhotis Scheme'.

Sugar Industry

- Sugar industry in Tamil Nadu is an important agro-based industry. It plays a vital role in the economic development of the state, particularly in rural areas. The sugar industry provides large-scale direct employment to several thousands and indirect employment to several lakhs of farmers and agricultural labourers in the rural areas who are involved in cultivation of sugarcane, harvesting, transporting and other services. There are 34 sugar mills in Tamil Nadu, in which 16 are in the cooperative sector and 18 in the private sector.

Tourism Industry

- Tourism is considered as an industry because of its enormous potential in creating employment for a large number of people. In recent years, the state has emerged as one of the leading tourist destinations for both domestic and foreign tourists. Tourism in Tamil Nadu is promoted by Tamil Nadu Tourism Development Corporation (TTDC). The state currently ranks the highest among Indian states with about 25 crore arrivals (in 2013). The annual growth rate of this industry stood at 16%. Approximately 28 lakh foreign and 11 crore domestic tourists visit our state annually. The presence of ancient monuments, pilgrim centres, hill stations, a variety of natural landscapes, long coastline, along with rich culture and heritage make Tamil Nadu the best destination for tourists.

Activity

Plan a visit to a manufacturing unit in your city. Find out how raw materials are converted into finished products. Talk to the workers and manager to know more about the industry.

Plan a field visit with your social science teacher to visit a variety of geographical features, pilgrim centres, monuments, hill stations and prepare a field visit report.

Population

- The term 'population' refers to the number of people living in a defined area. The statistical study of the characteristics of human population is called demography. Demographers make a deep and detailed study of the population. The rapid increase of population may be responsible for retarding economic growth. Hence, overpopulation is one of the major problems confronting our nation with all its evil effects.

Growth of Population in Tamil Nadu

- The total population of Tamil Nadu is 72,140,703 or 7.21 crores as per 2011 Census. Its population was 6.24 crore in 2001 and registered a growth of nearly 1 crore population in a decade. The male and female population of the state in 2011 is 36,137,975 and 36,009,055 respectively and it was 31,400,909 and 31,004,770 in 2001. It shows that the population of the state is shared almost 50% each by male and female. The growth rate of population in the decade 2001–2011 was 15.61% while in the previous decade it was 11.19%. The population of Tamil Nadu forms 5.96% of country's total population as per 2011 Census. In 2001, it was 6.07%.

Distribution of Population

- Based on the actual size of population, Tamil Nadu is divided into the following regions.

Regions of High Population

- Chennai has the highest urban population with 4.219 million people, but the city ranks second in the district-wise count, next to Coimbatore district, which had 4.224 million people as per 2011 Census. Coimbatore, Chennai, Tiruvallur, Kancheepuram, Villupuram, Dharmapuri, Salem, Madurai and Tirunelveli are the most populous districts in the state. Agriculture and industrial development are the main causes of high concentration of population of these districts.

Regions of Moderate Population

- Tiruvannamalai, Cuddalore, Tiruchirapalli and Thanjavur districts have a population 30– 35 lakh. Vellore, Dindugal, Virudhunagar and Thoothukudi districts each have a population of 15–20 lakh. Other than agriculture, small-scale industries and fishing along the coastal areas are the major occupations of people in these districts.

Regions of Sparse Population

- The coastal districts Nagapattinam, Tiruvarur, Pudukottai, Ramanathapuram and Sivagangai have a less than 15 lakh. The Nilgiris district has a population of less than 10 lakh (764,826) population and it is the least populated district as per 2011 Census.

Population Density

- The density of population in Tamil Nadu is 555 per sq.km as per the 2011 Census, while it was 480 per sq.km in 2001. The state ranks 12th among the Indian states in population density. The national average density of population as per the 2011 Census is 382. Chennai is the densest district with 26,903 persons per sq.km followed by Kanyakumari (1106), Tiruvallur (1049), Kancheepuram (927), Madurai (823), Coimbatore (748), Cuddalore (702), Thanjavur (691), Nagapattinam (668), Salem (663), Vellore (646) and Tiruchirappalli (602). These are the regions with high density of population. The least density of population is recorded in the Nilgiris (288 per sq.km) and the other districts have moderate density of population.

Religion

- Hinduism, Christianity and Islam are the major religions in the state. The Hindus constitute 87.58% of the population, followed by Christians (6.12%) and Muslims (5.86%). Jainism (0.12%), Sikhism (0.02%) and Buddhism (0.02%) also have a presence in the state.

- People of other religions constitute 0.01% and the percentage of people with unstated religion is 0.26%.

Urban and Rural Population

- As per 2011 Census, the urban population of Tamil Nadu is 3,49,17,440, which constitutes 48.40% of the total population of the state. The rural population of the state is 3,72,29,590, which constitutes 51.60% of the state population.

Sex Ratio

- The sex ratio represents the number of females per 1000 males. The sex ratio of the state increased from 987 in 2001 to 995 in 2011.

The sex ratio in India is 940 in 2011 as against 933 in 2001. It shows that the sex ratio is more favourable in the state than the country.

- As per 2011 Census, 15 out of 32 districts have recorded the sex ratio of more than 1000 and a similar trend was noticed in the 2001 Census also. Only Sivagangai has recorded the sex ratio of exactly 1000. It is noted that 12 districts have the sex ratio of less than 1000 and it ranges between 980 and 1000. The highest sex ratio is found in the Nilgiris district (1041) followed by Thanjavur district (1031). The lowest sex ratio is reported in Dharmapuri district (946) followed by Salem district (954).

Literacy Rate

- The literacy rate of Tamil Nadu as per the 2011 Census is 80.33%. It was 73.45% in 2001. The male literacy rate is 86.81% and the female literacy rate is 73.86%. The corresponding rates in 2001 were 82.42% for males and 64.43% for females. It may be observed that more than three-fourths of the population is literate among males in all the districts (except Dharmapuri), while more than two-thirds of the population is literate among females in all but eight districts. The districts are Dharmapuri (60.03%), Krishnagiri (64.86%), Tiruvannamalai (65.71%), Villupuram (63.51%), Salem (65.43%), Erode (65.07%), Perambalur (66.11%) and Ariyalur (62.22%).

- The literacy rate for India as per 2011 census is 74.04, of which the male literacy rate is 82.14 and the female literacy rateis 65.46. In 2001, the literacy rate of India stood at 64.8. It was 75.3 and 53.7 for males

and females, respectively. The district of Kanyakumari has reported the highest literacy rate (92.14%) while Dharmapuri district has the lowest rate (64.71%). A high level of literacy rate is also seen in Chennai (90.33%), Thoothukudi (86.52%), the Nilgiris (85.65%) and Kancheepuram (85.29%) districts.

Transport and Communication

Roadways

- The State has a total road length of 167,000 km, In which 60,628km are maintained by state Highways Department. It ranks second in India with a share of over 20% in total road projects under operation in the Public-Private Partnership (PPP) model.

Types of the Roads	Length (Km)
National Highways	4994
State Highways	57291
Corporation & Municipalities Road	23350
Panchayat Union	147543
Village Panchayat Union	21049
Others(Forest Roads)	3348
Commercial	12.13
Non commercial	20.341 Lakhs
Source: Statistical handbook of Tamil Nadu - 2017	

Railways

- Tamil Nadu has a well-developed rail network as part of Southern Railway, headquartered at Chennai. The present Southern Railway network extends over a large area of India's southern peninsula, covering Tamil Nadu, Kerala, Puducherry, minor portions of Karnataka and Andhra Pradesh. Tamil Nadu has a total railway track length of 6,693 km with 690 railway stations in the state. The system connects it with most of the major cities in India. Main rail junctions in the state include Chennai, Coimbatore, Erode, Madurai, Salem, Tiruchirappalli and Tirunelveli. Chennai has a well-established suburban railway network, a mass rapid transport system(MRTS)

and is currently developing a Metro system, with its first underground stretch in operation since May 2017.

Airways

- Tamil Nadu has four major international airports. Chennai International Airport is currently the third largest airport in India after Mumbai and Delhi. Other international airports in Tamil Nadu include Coimbatore, Madurai and Tiruchirapalli airports. It also has domestic airports at Tuticorin and Salem connecting several parts of the country. Increased industrial activity has given rise to an increase in passenger traffic as well as freight movement, which has been growing at over 18% per year.

NH - 44 is the longest national highway in Tamil Nadu which runs from Hosur to Kanniyakumari (627.2 km) Via Dharmapuri-Salem-Karur- Dindigul-Madurai-Tirunelveli.

NH - 785 is the shortest national highway in Tamil Nadu which runs from Madurai to Natham (38 km).

Waterways

- Tamil Nadu has three major ports. They are in Chennai, Ennore and Tuticorin. It has an intermediate port at Nagapattinam and 15 minor ports. The ports are currently capable of handling over 73 million metric tonnes of cargo annually (24% share of India). All the minor ports are managed by the Tamil Nadu Maritime Board, Chennai Port. This is an artificial harbour and the second principal port in the country for handling containers. It is currently being upgraded to have a dedicated terminal for cars capable of handling 4,00,000 vehicles. Ennore intermediate port was recently converted as a major port and handles the major coal and ore traffic in Tamil Nadu.

Communication

- Communication is derived from the Latin word communicare, meaning 'to share'. The act of conveying or exchanging information is called means of communication. They are mass communication and personal communication.

Postal Districts and Headquarters in Tamil Nadu

Zone /districts	Head quarters
Chennai	Chennai
Western	Coimbatore
Central	Thiruchirapalli
Southern	Madurai

Trade

- Export and import are the two components of trade. Export means goods and services sold for foreign currency. Tamil Nadu contributes 12.2% to the country's exports. Import refers to goods and services are brought from overseas producers. Tamil Nadu imports many goods from outside. The difference between the values of export and import is called the balance of trade.

Major Exports of Tamil Nadu	
(i) Agricultural Products	tobacco, cereals, cotton, sugarcane, paddy, groundnut, spices and vegetables.
(ii) Leather Products	wallets, purses, pouches, handbags, belts, footwear and gloves
(iii) Gems and Jewellery	pearls, precious stones, gold jewellery, decorations and antiques
(iv) Chemicals and related products	paper, chemicals, rubber and glass.

Imports of Tamil Nadu

- Machineries like transport equipment, machine tools, non-electrical machinery, electrical machinery, pharmaceutical products, petroleum, fertilizers and newsprint are its major imports. The state contributes 10.94% to the country's trade through major ports.

- The above discussion shows that Tamil Nadu is an important state of India in terms of size, population, resources and economic development. People in the state are well secured. The new schemes introduced by the state government periodically have enabled notable progress in various fields.

Man made Disasters in Tamil Nadu

Definition

- A disastrous events caused directly or indirectly by human actions are called as manmade disaster. Man-made disaster can include hazardous material spills, fires, groundwater contamination, transportation accidents, structure failures, mining accidents, explosions and acts of terrorism.

Industrial Disaster

- Disasters caused by industrial companies either by accident, negligence, or incompetence fall under industrial disasters. Electrical faults seem to be the major reason for industrial disasters in the country. Overheating, aging of the material and use of sub-standared quality of electrical gadgets have been the main factors contributing to the increasing fire accidents in industries. Electricity is not just a life line; It can also take away life when handled improperly', Apart from these, explosions, leaking of poisonous gases, injuries and deaths caused by machines are the other causes of industrial disasters.

- Sivakasi, is considered the "fireworks capital"of India. Series of industrial accidents causing deaths are reporting frequently in the regions of Virudhunagar and Sivakasi where a number of fireworks and match units are in operation. An explosion occurred on 5 September, 2012 in a private firework company. In this incident 40 workers were killed and more than 70 workers were injured. Various measures are being taken by the Government to reduce the fire accidents and casualties caused by industries. In another industrial accident which took place at Coimbatore on 2nd February 2016 in a tyre melting unit, six migrant workers were critically injured.

Stampede

- A situation in which a large number of animals or people running in the same direction in an uncontrolled way causing injuries and deaths is called stamping On 21st April, 2019 seven people were killed and 10 injured in a stampede during a local festival at a temple near Thuraiyur in Tamil Nadu. The incident took place when hundreds of devotees gathered at the Karuppasamy temple in Muthiampalayam village for the 'padikasu' (temple coin) distribution ceremony.

Mitigation

- Hazard mitigation refers to any sustained action taken to reduce or eliminate the longterm risk to human life and property from hazardous conditions.

- ❖ Regular maintenance of machines and wires may reduce the frequency of accidents,
- ❖ Creating awareness and training the workers to be cautious during work hours may help them to reduce risk during disasters.
- ❖ Wearing specially designed dresses and other safety materials would help the workers to protect themselves from any serious injuries.
- ❖ Conducting periodical medical camps would help them to assess their health status. The Provision of having life insurance policies will secure their future.
- ❖ Besides these, the administration should be employees friendly and ready to extend their help in case of any untoward incidents.

Disaster emergency contact number 1077 - Control room of District Collector/Magistrate.

Road Accidents

- The road accidents in India is on very high level. Tamil Nadu leads in the number of road accidents in the country. Increase in road traffic, high speed of vehicles and violation of traffic rules are the causes of

major of accidents. In 2013, 14504 accidents had taken place in the state which resulted in 15563 deaths. In the ten years from 2002-2012, Tamil Nadu tops the list in number of road accidents among the states of India. It is reported that about 15 percent of accidents of the country takes place in Tamil Nadu. The figure of 2017 also puts Tamil Nadu on top with recording of 16157 deaths out of 147913 deaths recorded in the country. Death toll came down rapidly in 2018 to 12213 deaths, a decline of 24.5 percent.

Risk Reduction Measures

- **Before:** Avoid Speeding, Drunk and driving, use helmets and seat belts and follow traffic rules

- **After:** Call police or ambulance; seek medical attention; make an accurate record and exchange information.

KNOW - RISK...!
NO - RISK...!

Basic Road Safety Rules

- Aware of the road signals
- Stop, look and cross
- Listen and ensure whether a vehicle is approaching;
- Don't rush on roads;
- Cross roads in pedestrian crossings;
- Don't stretch hands while driving vehicles;
- Never cross road at bends and stay safe in a moving vehicle.

- Accelerated changes in demographic and economic trends disturb the balance which leads to increased frequency and the negative impact of disaster. At present the society face a challenging mix of demographic, ecological and technological condition which make population more vulnerable to the impact of the calamities. Though the number of natural disasters are in decline than they were in the past, the increasing level of magnitude poses a threat. Besides the various measures taken by the government and the public, education on awareness regarding the disasters may help in the reduction of risks during disasters.

- For the management of disasters in the state, the following forces and organizations are in service.

I. State Disaster Management Authority (Chairman-Chief Minister)
II. Relief/ Disaster Management Department
III. Police
IV. Forest Department
V. Fire and Civil Defence Services
VI. Health Services
VII. Transport Department
VIII. Public Works Department
IX. Veterinary Services
X. Food & Civil Supplied Department.

The Organizations at District Level

(i) District Magistrate (Chairman- District Collector)
(ii) Revenue Department
(iii) Civil Administration,
(iv) Local Police,
(v) Civil Defence,
(vi) Fire & Emergency Services,
(vii) Home Guards (also Local Community, Non-Governmental Organisations, Voluntary Agencies) etc.

10th vol – II
(Geography of Tamilnadu)
Unit – 6
Physical Geography of Tamil Nadu

Learning Objectives

- To know the history of formation of the state
- To study the major physiographic divisions of the state
- To understand the nature of climate, soils and natural vegetation
- To familiarise the students with the geographical conditions of their living places
- To know the major natural disasters and their occurrences in Tamil Nadu

Introduction

- The study of one's own region is the first step to become a global citizen. The purpose of studying our local territory is to understand life in our environment. In the last five lessons, you have learnt about various geographical characterstics of our country. In this lesson and those that follow, we shall learn about the geography of Tamil Nadu. You will get to know about the etymology, history of formation, location, size, physical divisions, rivers, climate, soil and natural vegetation of Tamil Nadu in this chapter.

- Our state Tamil Nadu has a hoary past with a variety of cultural practices and traditions. Its exquisite physiography and climate makes our state unique in India. It has long and sunny beaches, waterfalls, hills, forests and varied fl ora and fauna.

As per, the States Reorganisation Act, 1956, state boundaries were reorganised on some linguistic basis.

Formation of Tamil Nadu

- During Sangam age, the Tamizham was ruled by three great emperors – Cheras, Cholas and Pandyas – and virtuous kings ruling small kingdoms like Adhiyaman and Pari. For a short time, the Tamil country was ruled by the Kalabras, but not much about their time is recorded or known.

- After the Kalabras, the Tamil country came under the control of the Pallavas, Cholas, Pandyas, Marathas, Mughals and Vijayanagara empires in succession until the British took administrative control over the entire country, starting from Madras.

- During the British period, our country was divided into three presidencies, namely Madras, Bombay and Calcutta for political and military purposes. Tamil Nadu and parts of Andhra Pradesh, Kerala, Karnataka and Orissa (Odisha) constituted the Madras Presidency. After independence, following the linguistic division of states, Telugu-speaking areas were bifurcated from the Madras state. After bifurcation, there were only 13 districts in Madras state. The Madras state was renamed as Tamil Nadu by C.N. Annadurai, former Chief Minister of Tamil Nadu, on January 14, 1969.

Location and Size

- Tamil Nadu is one of the 29 states of India, located in the southern most part of the country. This landmass extends from 8°4'N to 13°35'N latitudes and from 76°18'E to 80°20'E longitudes. Its eastern and western extremities are defined by the Point Calimere and the hills of Anaimalai respectively. The northern extremity of the state is marked by Pulicat lake and the southernmost point is Cape Comorin.

- It covers an area of 1,30,058 sq.km and is the 11th largest state in India. It covers 4% of the area of our country.

Boundaries and Neighbours

- Tamil Nadu is bounded by Bay of Bengal in the east, Kerala in the west, Andhra Pradesh in the north, Karnataka in the northwest and Indian Ocean in the south. Gulf of Mannar and Palk Strait separate Tamil Nadu from the Island of Sri Lanka, which lies to the southeast of India. The state has 1,076 km long coastline, the second-longest in India after Gujarat.

Administrative Divisions

- Already we have learnt that the state of Tamil Nadu had only 13 districts at the time of its formation. After that, the state was reorganised several times for the purpose of administrative convenience. At present there are 35 districts in Tamil Nadu, including the newly created districts such as Kallakurichi, Tenkasi and Chengalpet. The administrative divisions of the state are given in the following table.

Divisions	Numbers
Districts	35 (32+3)
Revenue Divisions	76
Taluks	226
Firkas	1,127
Revenue Villages	16,564
Municipal Corporations	15
Municipalities	125
Panchayat Unions (Blocks)	385
Town Panchayats	561
Village Panchayats	12,618
Lok Sabha Constituencies	39
Assembly Constituencies	234
Source: maps of india.com 2019	

Activity

• Find out the coastal districts of Tamil Nadu with the help of a map.
• Group the districts of Tamil Nadu which share their boundary with the states of Andhra Pradesh, Karnatakaand Kerala separately.

Physiographic Divisions

- We have learnt about endogenetic and exogeniec processes in 9th std. Have you ever thought what kind of landforms on which you live? Have you ever noticed the landscapes, you come across while travelling from one place to another? Have you ever wondered how these landforms were formed? Let's see the major physical features of Tamil Nadu and their characteristics.

- Tamil Nadu is located on the Peninsular Plateau, known as Deccan Plateau. It is also a part of the ancient Gondwana land that broke away 135 million years ago during Cretaceous Period. Tamil Nadu has many unique land features which include high eroded mountains, shallow deep valleys and plains. The topography of the state slopes towards east. Based on the major differences in relief, Tamil Nadu is divided into the physical divisions of Western Ghats, Eastern Ghats, Plateaus, Coastal and Inland plains.

All districts of Tamil Nadu except the Chennai, The Nilgiris and Kanyakumari were bifurcated at different points of time.

Western Ghats

- Western Ghats extends from the Niligris in the north to Marunthuvazh Malai at Swamithope in Kanyakumari district in the south. Height of the Western Ghats ranges from 2,000 to 3,000 metres. It covers an area of about 2,500 sq.km. Though the Western Ghats is a continuous range, it has some passes. The passes are Palghat, Shencottah, Aralvaimozhi, and Achankoil. The Niligris, Anaimalai, Palani hills, Cardamom hills, Varusanadu, Andipatti and Agasthiyar hills are the major hills of Western Ghats .

Nilgiri Hills

- The Nilgiri hills is located in the Northwestern part of Tamil Nadu. It consists of 24 peaks with more than 2,000 metres height. Doddabetta is the highest peak (2,637 metres) of this hills followed by Mukkuruthi (2,554 metres). Ooty and Coonoor are the major hill

stations located on this hills. It has more than 2,700 species of flowering plants and the state animal Nilgiri Tahr is found in this hill. Much of the Nilgiris natural montane grasslands and shrublands have been disturbed or destroyed by extensive tea plantations and cattle grazing.

Anaimalai

- Anaimalai is located in the border of Tamil Nadu and Kerala. It is located to the south of Palghat Gap. Anaimalai Tiger Reserve, Aliyar Reserved Forest, Valparai hill station, Kadamparai hydroelectric Power Plant are located on this hills. Aliyar and Tirumurthy dams are located at the foothills of this range.

Palani Hills

- Palani hills are the eastward extension of the Western Ghats. Except its western part, these hills are located in Dindigul district. Vandaravu (2,533 metres) is the highest peak in the Palani hills. Vembadi Shola (2,505 metres) is its second highest peak. The hill station of Kodaikanal (2,150 metres) lies in the south central portion of the range.

Cardamom Hills

- These hills are also known as Yela Mala hills located in the southwestern part of Tamil Nadu. It acquires its name from the cardamom spice, which is commonly grown here. Pepper and coffee are the other crops cultivated over the hills. They meet the Anaimalai hills in the northwest, the Palani hills in the northeast and Varusanadu and Andipatti hills in the southeast.

Peaks in Western Ghats	Height(m)
Doddabetta	2,637
Mukkuruthi	2,554
Vembadisolai	2,505
Perumalmalai	2,234
Kottaimtalai	2,019
Pagasura	1,918

Varusanadu and Andipatti Hills

- Another eastward extension of Western Ghats is Varusanadu and Andipatti hills. Megamalai (the highway mountain), Kalugumalai, Kurangani hill station, and Suruli and Kumbakarai waterfalls are found on these hills. Srivilliputhur Grizzled Squirrel Wild life Sanctuary is located in the southern slope of these hills in Virudhunagar district. Vaigai river and its tributaries originate in this region.

Pothigai Hills

- Its major part lies in Tirunelveli district with its southern slope in the Kanyakumari district. Pothigai hills are called with different names such as the Shiva Jothi Parvath, Agasthiyar hills and Southern Kailash. These hills feature richest biodiversity in the Western Ghats. This area is known for its rich evergreen forest, waterfalls and ancient temples. Kalakkad Mundanthurai Tiger Reserve is located in this region.

Mahendragiri Hills

- This continous range is situated along the border of Kanyakumari and Tirunelveli districts and is a part of the southern range of the Western Ghats. Its average height is 1,645 metres. ISRO Propulsion Complex, a test facility for Indian Space Research Organisation's launch vehicles and satellite propulsion systems, is situated on the lower slopes of this mountain.

The Eastern Ghats

- Unlike Western Ghats, Eastern Ghats is a discontinuous and irregular one. It is dissected at many places by the rivers, which drain into the Bay of Bengal. Its height ranges from 1,100 to 1,600 metres. These hills separate the plains from plateaus. Javadhu, Servarayan, the Kalrayan, Kollimalai and Pachaimalai are the major hills of the Eastern Ghats of Tamil Nadu and are located in northern districts of the state.

Javadhu Hills

- Javadhu hills are an extension of the Eastern Ghats spread across parts of Vellore and Tiruvannamalai districts and separates these two districts. Many peaks with the height of 1,100–1,150 metres are located in this range. Melpattu is its highest peak. The Vainu Bappu Observatory (VBO) Kavalur, which began operations in 1967, is located on these hills. Many parts of this range are covered with bluish grey granites. It is noted for its fruit bearing trees, medicinal herbs and sandalwoods. Due to illegal logging, sandalwood trees are disappeared now.

Kalvarayan Hills

- The name 'Kalvarayan' comes from the word 'Karalar', the ancient name of the present tribes. It is another major range of hills in the Eastern Ghats of Tamil Nadu. This range, along with the Pachaimalai, Aralvaimalai, Javadhu and Servarayan hills, separates the river basins of Cauvery and Palar. The height of this hill ranges from 600 to 1,220 metres. These hills have two sections. The northern section is referred as the Chinna Kalvarayan and the southern one the Periya Kalvarayan. The average height of Chinna Kalvarayan is 825 metres and the Periya Kalvarayan is 1,220 metres.

Servarayan Hills

- It is a mountain range located near the Salem city with the height ranging from 1,200 to 1,620 metres. Th e name of the range comes from a local deity, Servarayan. Th e highest peak in the southern part of the Eastern Ghats is located in this range. Th e peak is Solaikaradu and its height is 1,620 metres. Th e hill station Yercaud, which is known as poor man's Ooty, is located on this range. Servarayan temple is its highest point (1623 metres).

Peaks in Eastern Ghats	Height(m)
Shervarayan temple	1,623
Mazhamalai	1,500
Urgamalai	1,486

Kuttirayan	1,395
Muganur	1,279
Valsamalai	1,034

Districts	**Hills**
Coimbatore	Maruthamalai, Velliangiri and Anaimalai
Dharmapuri	Th eertha malai, Chitteri and Vathalmalai
Dindigul	Pazhamalai and Kodaikanal
Erode	Chenni hills and Sivan hills
Vellore	Javadhu, Yelagiri and Rathinamalai hills
Namakkal	Kolli hills
Salem	Servarayan, Kanjamalai and Chalk hills
Villupuram	Kalvarayan and Gingee hills
Perambalur	Pachaimalai
Kanyakumari	Marunthuvazhmalai
Tirunelveli	Mahendragiri and Agasthiyarmalai
Th e Nilgiris	Nilgiri hills

Kolli Hills

- It is a small mountain range located in Namakkal district. It covers an area of about 2,800 sq.km. It rises up to 1300 metres. This is a mountain range that runs almost parallel to the east coast of South India. Arpaleeswarar temple located on this range is an important pilgrim centre. It has the largest cover of evergreen or shola forest when compared to other parts of the Eastern Ghats. Several coffee plantations, fruits, flowers and silveroak estates are found in this region.

Why are mountain heights measured from mean sea level and not from ground level?

Pachaimalai

- It is the lowest hill range, spreads over the districts of Perambalur, Tiruchirapalli and Salem. In Tamil language, pachai means green. The vegetation in this range is greener than the vegetative cover of the other hills in this region. Hence it is named as 'Pachai malai'. Jackfruit is a popular seasonal agricultural product of this hills.

1. Name the hill resorts of Western Ghats and Eastern Ghats in Tamil Nadu.
2. Is Ooty located on Western Ghats?
3. Name the hill stations located in Western and Eastern Ghats of
4. Tamil Nadu.
5. Why is the Nilgiri hills called as Blue Mountains?
6. 5. What is the kind of landform on which you live and what is its height?

Plateaus

- Plateaus of Tamil Nadu are located between the Western Ghats and the Eastern Ghats. It is roughly triangular in shape and covers an area of about 60,000 sq.km. Its height increases from east to west. Its height ranges between 150 and 600 metres. This plateau is broader in the north and very narrow in the south. It has many subdivisions.

- Bharamahal plateau is a part of the Mysore plateau situated in the northwestern part of Tamil Nadu. Its height ranges from 350 to 710 metres. Dharmapuri and Krishnagiri districts are located in this region.

- Coimbatore plateau lies between the Nilgiris and Dharmapuri districts. Its height varies from 150 to 450 metres. This region includes Salem, Coimbatore and Erode districts. The area of this plateau is bout 2,560 sq.km. Its height varies from 352 to 710 metres. Moyar river separates this plateau from the Mysore plateau.

- Rivers like Bhavani, Noyyal and Amaravathi, which originate from Western Ghats, form valleys in this region. Many intermontane plateaus are found in the region of the Nilgiris. Sigur plateau is one such plateau.

- Madurai plateau found in Madurai district extends up to the foothills of the Western Ghats. Vaigai and Thamirabarani basins are located in this zone.

Plains

- The plains of Tamil Nadu may be divided into two, namely inland plains and coastal plains. Inland plains are drained by the rivers Palar, Ponnaiyar, Cauvery and Thamirabarani. Cauvery plains is one of the most important fertile plains of the state. The plains of Cauvery is found in Salem, Erode, Karur, Tiruchirapalli, Pudukottai, Thanjavur, Tiruvarur and Nagapattinam districts.

- Coastal plains of Tamil Nadu are also called Coromandel or Cholamandalam (land of Cholas) plain, which extends from Chennai to Kanyakumari. It is formed by the rivers that flow towards east drain in the Bay of Bengal. It is more than 80 kilometres wide at some places. Though it is an emerged coast, some parts are submerged into the sea. The sand dunes formed along the coast of Ramanathapuram and Thoothukudi districts are called Teri. Coral rocks are found at the head of Gulf of Mannar in the east coastal plain.

Beaches

- The Coromandel Coast along the Bay of Bengal consists of many beautiful and exotic beaches. The golden sands of Tamil Nadu beaches are scattered with palm and casuarinas groves. Marina and Elliot beaches of Chennai, Kovalam and Silver beaches of Kanyakumari are some of the famous beaches in Tamil Nadu.

Drainage

- Rivers of Tamil Nadu are its lifeline. Though it has many rivers, the rivers of Cauvery, Palar, Ponnaiyar, Vaigai and Thamirabarani are the notable ones. Most of the rivers of Tamil Nadu originate from Western Ghats and flow towards east and drain into the Bay of Bengal. All the rivers of the state are non-perennial except Thamirabarani. It is perennial as it is fed by both the southwest and northeast monsoons.

Cauvery

- The river Cauvery originates at Talacauvery in the Brahmagiri hills of Kodagu(coorg) district of Karnataka in the Western Ghats. About 416 km of its course falls in Tamil Nadu. It serves as the boundary between Karnataka and Tamil Nadu for a distance of 64 km. It forms Hogenakkal waterfalls in Dharmapuri district. Mettur Dam, also called as the Stanley Reservoir, is located across this river in Salem district. A tributary called Bhavani joins Cauvery on the right bank about 45 km from the Mettur Reservoir. Thereafter, it takes easterly course to enter into the plains of Tamil Nadu. Two more tributaries, Noyyal and Amaravathi, confluence the river on the right bank at Thirumukkudal 10 km from Karur. The river is wider in this region, where it is called as 'Agandra Cauvery'.

- In Tiruchirappalli district, the river branches into two parts. The northern branch is called Coleroon or Kollidam and the southern branch remains Cauvery. From here, the Cauvery delta begins. After flowing for about 16 km, the two branches join again to form the 'Srirangam Island'. The Grand Anaicut, also called as Kallanai was built across the river Cauvery. After Kallanai, the river breaks into a large number of distributaries and forms a network all over the delta. The network of distributaries within the delta of Cauvery in the coast is called as the 'Garden of Southern India'. It merges into Bay of Bengal to the south of Cuddalore.

Pamban, Hare, Krusadai, Nallathanni Theevu, Pullivasal, Srirangam, Upputanni, Island Grounds, Kattupalli Island, Quibble Island and Vivekananda Rock Memorial are some major islands of Tamil Nadu

Palar

- The Palar river rises beyond Talagavara village in the Kolar district of Karnataka. The Palar drains an area of 17,871 sq.km, out of which nearly 57% lies in Tamil Nadu and the rest in the states of Karnataka and Andhra Pradesh. Ponnai, Goundinya Nadhi, Malattar, Cheyyar and Kiliyar are its major tributaries. Its total length is 348 km, out of which 222 km of its course falls in Tamil Nadu. It flows through the

districts of Vellore and Kancheepuram before entering into Bay of Bengal near Kuvattur.

Then Pennaiyar/Then Ponnaiyar

- It originates from the eastern slope of Nandi Durga hills in eastern Karnataka. It drains an area of 16,019 sq.km, of which nearly77% lies in Tamil Nadu. It flows for a distance of 247 km in the southeasterly direction in the districts of Krishnagiri, Dharmapuri, Vellore, Tiruvannamalai, Cuddalore and Villupuram. It branches into two, viz. Gadilam and the Ponnaiyar near Tirukoilur Anaicut. Gadilam joins the Bay of Bengal near Cuddalore and Ponnaiyar near the Union Territory of Puducherry. Chinnar, Markandanadhi, Vaniar and Pambar are its tributaries. Heavy rain at the river's source cause sudden but short-lived floods. The river is extensively dammed for irrigation, especially in Tamil Nadu. There are reservoirs at Krishnagiri and Sathanur across this river. The Ponnaiyar is considered sacred by Hindus and festivals are held during the Tamil month of Thai (January–February).

Vaigai

- Vaigai river rises from the eastern slopes of the Varusanadu hills of Western Ghats of Tamil Nadu. It drains an area of 7,741 sq.km, which lies entirely in the state of Tamil Nadu. It flows through the districts of Madurai, Sivaganga and Ramanathapuram. Its length is 258 km. It discharges its water into the Ramnad Big Tank and some other small tanks. The surplus water from the tanks is finally discharged into Palk Strait near Ramanathapuram.

Thamirabarani

- The name is interpreted as Thamiram (copper) and Varuni (streams of river). The water of this river gives a copper like appearance due to the presence of dissolved suspended red soil. It originates from a peak in Pothigai hills on the Western Ghats above Papanasam in the Ambasamudram taluk. The origin of the river is associated with Sage Agasthiyar. It courses through the districts of Tirunelveli and Thoothukudi and finally flow into the Bay of Bangal near Punnaikayal in Thoothukudi district. Karaiyar, Servalar,

Manimuthar, Gadananathi, Pachaiyar, Chittar and Ramanathi are its main tributaries.

District	Waterfalls
Dharmapuri	Hogenakkal
Thirunelveli	Kalyanatheertham, Courtallam
Theni	Kumbakkarai and Suruli
Namakkal	Agayagangai
Th e Nilgiri	Catherine and Pykara
Salem	Kiliyur
Virudhunagar	Ayyanar
Coimbatore	Vaideki, Sengupathi, Siruvani and Kovaikutralam
Tiruppur	Tirumurthy
Madurai	Kutladampatti
Kanyakumari	Tirparappu, Kaalikesam, Ulakkai and Vattaparai

Climate

- You have already learnt that the Tropic of Cancer divides India roughly into two equal parts and the state Tamil Nadu lies to the south of Tropic of Cancer, which is near the Equator. As it receives vertical sunrays, the temperature of the state is relatively high throughout the year. Though the state falls within the hot climatic zone, the east coast of Tamil Nadu enjoys tropical maritime climate. The Bay of Bengal and Indian Ocean infl uence the climate of the coastal regions. Th e annual temperature ranges from 18o to 43o and the annual rain fall is 958.5 mm.

- While the east coast experiences tropical maritime climate, the western region of the state enjoys the mountainous climate. The is climate prevails over the Blue Mountains, Anaimalai and the Kodaikanal hills. Thick forests and high altitude make the climate of these areas cool and pleasant. The us stations in this region attract thousands of people during the summer season. Low altitude and distance from the sea are the reasons for high temperature and dry conditions in the central part of Tamil Nadu. The migration of

vertical sun's rays leads to the formation of different seasons in Tamil Nadu as follows.

Seasons of Tamil Nadu	
Season	**Period**
Winter Season	January-February
Summer Season	March- May
Southwest Monsoon	June-September
Northeast Monsoon	October –December

Winter Season

- During January and February, the vertical rays of the sun fall between the Tropic of Capricorn and the Equator. Hence, Tamil Nadu and India on the whole receive slanting rays from the sun. So, the weather is slightly cooler during these months. The difference between summer and winter temperature is not very high. Winter temperature in Tamil Nadu varies from 15°C to 25°C. However, in the hill stations, the winter temperature drops below 5°C occasionally. Some valleys in the Nilgiris record even 0°C. This drop in temperature leads to the formation of thick mist and frost. This season is practically dry.

Summer Season

- The apparent migration of the sun towards north during March, April and May results in the reception of vertical sun's rays by South India. Thus there is a steady rise in temperature from the equator. Hence, Tamil Nadu located to the south of Tropic of Cancer, experiences high temperature. Generally the temperature varies from 30°C to more than 40°C. During this season particularly in the month of May, southern part of the state receives some rainfall from pre-monsoon showers (Mango/Blossom showers) and some parts experience convectional rainfall.

1. What is Agni Nakshatram?
2. Group the districts of Tamil Nadu into low, moderate and heavy rainfall regions.

Southwest Monsoon

- The intense heating of the landmass of the north by the sun during March to May creates a well-developed low pressure in North India, which draws wind from the Indian Ocean. This results in the formation of southwest monsoon. During this season, Tamil Nadu is located in the rain shadow region for the wind, which blows from the Arabian Sea. As a result, Tamil Nadu receives only a meagre rainfall from this monsoon. Rainfall during this season decreases from west to east. Coimbatore plateau receives an average of 50 cm rainfall. However, the southern districts like Kanyakumari, Tirunelveli and The Nilgiris record 50–100 cm rainfall during this period. The rainfall is scanty in the eastern part of the state.

Coriolis Force:

An apparent force acts as a result of the earth's rotation defl ects moving objects (such as projectiles or air currents) to the right in the northern hemisphere and to the left in the southern hemisphere.

Northeast Monsoon

- The northeast monsoon season commences from the month of October and lasts till mid-December. The high pressure created over Central Asia and northern part of India becomes the source for the northeast monsoon winds. The apparent migration of the sun from Tropic of Cancer to the Tropic of Capricorn causes a change in receiving temperature and air pressure during this season. It makes the wind to blow towards Bay of Bengal from North India. After reaching Bay of Bengal, the wind gets deflected by Coriolis force and takes the northeast direction. Hence it is known as northeast monsoon. As the northeast monsoon is a part of returning of southwest monsoon wind, it is also called as the retreating monsoon. This is the main rainy season for Tamil Nadu, accounting for its 48% of annual rainfall. Coastal districts of the state get nearly 60% of their annual rainfall and the interior districts get about 40–50% of the annual rainfall during this season.

- Tropical cyclones are common during this season. Cyclone originating from the Bay of Bengal bring heavy rainfall to the east

coastal regions of Tamil Nadu. More than 50% of the state's rainfall is received from tropical cyclones during this period and east coastal region receives 100 to 200 cm of rainfall. The rainfall received by the central and northwestern parts is 50–100 cm. The cyclones sometimes disturb the cultivation of crops and cause severe damage to life and property.

Chinnakallar near Valparai is the 3rd wettest place in India and the wettest place in Tamil Nadu.

Soils of Tamil Nadu

- Soil is the loose material mainly formed by the weathering and erosion of rocks. It forms an important element of agriculture. It provides essential minerals and nutrients for the growth of vegetation. Soil is one of the important non-renewable resources in the world. It takes 300–1,000 years to form two inches of soil. The soil of a place depends on the factors like climate, parent rocks and vegetative cover of the respective places. The soils in Tamil Nadu are broadly classified into five types according to their characteristics. They are alluvial, black, red, laterite and saline soils.

Alluvial Soil

- Alluvial soils are formed by the deposition of silt by the rivers.Alluvial soils are generally fertile as they are rich in minerals such as lime, potassium, magnesium, nitrogen and phosphoric acid. It is deficient in nitrogen and humus. It is porous and loamy. Paddy, sugarcane, banana and turmeric are cultivated in this soil. It is found in the river valley regions and the coastal plains of Tamil Nadu. Generally this type of soil is found in the districts of Thanjavur, Tiruvarur, Nagapattinam, Villupuram, Cuddalore, Tirunelveli and Kanyakumari. It is also found to a small extent along the river valleys in few interior districts.

Black Soil

- Black soils are formed by the weathering of igneous rocks. It is also known as regur soil. As cotton grows well in this soil, it is also called as black cotton soil. This soil is developed over the Deccan lava granite region under semiarid conditions. It is fine textured and clayey in nature. It is poor in phosphoric acid, nitrogen and organic matter. Chief minerals found in this soil are calcium, magnesium, carbonates, potash and lime. Cotton, sorghum, cumbu and fodder crops are the major crops cultivated in the black soil regions of Tamil Nadu. Black soils are found extensively in the districts of Coimbatore, Madurai, Virudhunagar, Tirunelveli and Thoothukudi.

Red Soil

- Red soils cover over two-thirds of the total area of Tamil Nadu. They are found particularly in the central districts of the state. This soil is sandy and loamy in texture. However, the characteristic features of the red soil vary according to its formation and climatic condition under which the soil was formed. Red soil is porous, friable and non-retentive of moisture. The colour of the soil is due to the presence of high content of iron oxides. This soil is poor in nitrogen, phosphorus, acids and humus. paddy, ragi, tobacco and vegetables are the chief crops grown in this soil. Almost all types of crops can be grown in this soil with the application of manure and irrigation facilities. It is dominantly found in Sivagangai and Ramanathapuram districts.

Laterite Soil

- This soil is formed by the process of intense leaching. Laterite soils are found in some parts of Kancheepuram, Tiruvallur and Thanjavur districts and some patches over the mountainous region in the Nilgiris. Crops grown in this soil are paddy, ginger, pepper and plantains. It is also suitable for the cultivation of tea and coffee plants.

Saline Soil

- Saline soils in Tamil Nadu are confined to the Coromandel coast. Vedaranyam has a pocket of saline soil. However, the tsunami waves on December 26, 2004 brought a lot of sand and deposited it all along

the east coast of Tamil Nadu. The tsunami made the coastal areas unsuitable for cultivation to a considerable extent.

Soil Erosion

- Soil is a non-renewable resource. It is very difficult to replace the soil once it gets degraded. Deforestation, overgrazing, urbanisation and heavy rain are responsible for soil erosion in Tamil Nadu. Soil erosion reduces the fertility of soils, which in turn reduces agricultural productivity. So, it is necessary to take intensive care to conserve the soil resources.

Desertification is one of the major problems of Tamil Nadu. According to the desertification atlas prepared by the ISRO. About 12% of the total geographical area is under desertification and land degradation. Theni, the Nilgiris and Kanyakumari are the worst affected districts. About 12,000 hectares (120 Sq.km) were affected by sand deposition in Theni and Rajapalayam.

Natural Vegetation

- Natural vegetation refers to the forest cover. Landforms, nature of soil, temperature and rainfall are the major factors that control the distribution of natural vegetation. As per National Forest Policy, 1988, a minimum of one-third of the total geographical area must be under forest cover. The total forest cover of Tamil Nadu is far lower than this. According to the Tamil Nadu State of Forest Report – 2017 assessment, the area under forest in the state is 26,281 sq.km, which constitutes 20.21% of the total area. Tamil Nadu constitutes 2.99% of India's forest cover. The forest types in the state varies from wet evergreen to scrub forests. The Western Ghats, the longest hill range in the state, is one of the 25 global hotspots of bio-diversity and one of the three mega centres of endemism in India. The following table shows the categories of forest and their areal extent classified under the provision of Indian Forest Act.

Forest Type	Area(sq.km)
Reserved Forest	19,459
Protected Forest	1,782

Unclassified Forest	1,266
Total	22,507
Source: Tamil Nadu stastistical Handbook – 2016---	

Forest Types

- The forest in the state is broadly divided into five types as follows

Tropical Evergreen Forest

- This forest type is found in the regions that receive heavy rainfall. It is a dense, multi-layered forest. It is found in the upper slopes of Western Ghats of Tirunelveli, Kanyakumari, the Nilgiris and Coimbatore districts. The major tree species of this forest are cinnamon, Malabar ironwood, panasa, java plum/jamun, jack, kindal, ayani and crape myrtle. The semievergreen type of forest in the state is found over the regions of sub-tropical climate over the Eastern Ghats. The prominent regions are Servarayan, Kollimalai and Pachaimalai. Species of Indian mahogany, monkey teak, woolly cassia, jack and mango trees are common in this region.

Montane Temperate Forest

- It is found in sheltered valleys of Anaimalai, Nilgiris and Palani hills over a 1000 metres altitude. They are known as 'Sholas'. The trees in this forest are evergreen and usually short. Nilgiri champa, wights litsea and rose apple are the common trees found in this forest.

Tropical Deciduous Forest

- This type of forest lies in the margin of semi-evergreen and evergreen forests. The trees in this forest shed their leaves during the dry season. The trees reach up to a height of 30 metres. Some trees of this forest are silk cotton, kapok, kadamba, dog teak, woman's tounge, axlewood and siris. Bamboos are also common in this type of forests. Some trees of this forest are economically important.

Mangroves

- This type of forest is found in the coastal areas, river deltas, tails of islands and over sea faces where accretion is in progress. The vegetation is typically evergreen, moderate in height and has leathery leaves. The vegetation of this forest is adapted to survive in tidal mud and salt water. Asiatic mangrove, white mangrove, wild jasmine/Indian pivot etc. are some of the notable trees of this forest. Pichavaram, Vedaranyam, Muthupet, Chatram and Thoothukudi are the places in Tamil Nadu where the mangrove forest is found to a considerable extent.

Role of Mangroves in Coastal Zone Management. Mangroves helps in the prevention of coastal erosion from waves and storms. It also protects coral reefs and sea grass meadows from being smothered in sediments.

Pichavaram mangrove forest is located near Chidambaram, Cuddalore district. This is the second largest mangrove forest in the world covering about 1,100 hectares (11 sq.km) of area. It is separated from the Bay of Bengal by a sandbar. It consists of species like Avicennia and Rhizophora. It also supports the existence of rare varieties of shell and fin fishes.

Tropical Thorn Forest

- Thorn forest in Tamil Nadu is found where there is a little rainfall. These forests are found from plains up to 400 meters altitude. The common trees of this forest are rusty acacia, wheel, neem and palm. Shrubs are common vegetation in this type of forest. This type of forest is found in the districts of Dharmapuri, Ramanathapuram, Virudhunagar and some parts of interior districts.

Districts with prominent forest cover in Tamil Nadu	
District	**Area (sq km)**
Dharmapuri	3,280
Coimbatore	2,627

Erode	2,427
Vellore	1,857
The Nilgiris	1,583
Dindigul	1,662

Wild life

- Animals and birds live in forests constitute the wild life. Tamil Nadu has a variety of wild animals, birds and reptiles. hills are an ideal refuge for elephants, bisons, tigers, deer and monkeys. Several Wildlife sanctuaries and National Parks have been set up to protect the animal life in the state. The hills of the state provide an ideal condition for a variety of animals and plants life. The list of Wild lifeSanctuaries, National parks and Biosphere Reserves of Tamil Nadu are listed in the following tables.

S. No	Wildlife Sanctuaries in Tamil Nadu	District	Year of Establishment
1	Mudumalai Wildlife Sanctuary	The Nilgiris	1940
2	Mundanthurai Wildlife Sanctuary	Tirunelveli	1962
3	Point Calimere Wildlife Sanctuary	Nagapattinam	1967
4	Indira Gandhi Wildlife Sanctuary	Coimbatore	1976
5	Kalakad Wildlife Sanctuary	Tirunelveli	1976
6	Vallanadu Black Buck Sanctuary	Thoothukudi	1987
7	Grizzled Giant Squirrel Wildlife Sanctuary	Virudhunagar	1988
8	Kanyakumari Wildlife Sanctuary	Kanyakumari	2007
9	Sathyamangalam Wildlife Sanctuary	Erode	2008
10	Megamalai Wildlife Sanctuary	Theni and Madurai	2009
11	Point Calimere Wildlife Sanctuary - Block A	Thanjavur and Tiruvarur	2013

	and Block B	Nagapattinam	
12	Kodaikanal Wildlife Sanctuary	Dindigul and Theni	2013
13	Gangaikondan Spotted Deer Sanctuary	Tirunelveli	2013
14	Cauvery North Wildlife Sanctuary	Dharmapuri and rishnagiri	2014
15	Nellai Wildlife Sanctuary	Tirunelveli	2015

S. No	**Bird Sanctuaries in Tamil Nadu**	**District**	**Year of Establishment**
1	Vettangudi Birds Sanctuary	Sivaganga	1977
2	Pulicat Lake Birds Sanctuary	Tiruvallur	1980
3	Karikili Birds Sanctuary	Kancheepuram	1989
4	Kanjirankulam Birds Sanctuary	Ramanathapuram	1989
5	Chitrangudi Birds Sanctuary	Ramanathapuram	1989
6	Koonthankulam-Kadankulam Birds Sanctuary	Tirunelveli	1994
7	Vellode Birds Sanctuary	Erode	1997
8	Vedanthangal Birds Sanctuary	Kancheepuram	1998
9	Udayamarthandapuram Birds Sanctuary	Tiruvarur	1998
10	Melaselvanur-Keelselvanur Birds Sanctuary	Ramanathapuram	1998
11	Vaduvoor Birds Sanctuary	Tiruvarur	1999
12	Karaivetti Birds Sanctuary	Ariyalur	2000
13	Theerthangal Bird Sanctury	Ramanathapuram	2010
14	Sakkarakottai Tank Birds Sanctuary	Ramanathapuram	2012
15	Oussudu Lake Birds Sanctuary	Villupuram	2015

S. No	Biosphere Reserves in Tamil Nadu
1	Nilgiri Biosphere Reserve
2	Gulf of Mannar Biosphere Reserve
3	Agasthiyarmalai Biosphere Reserve

- Tamil Nadu is a state with varied climate, landforms and resources. This makes our state a distinct one among the Indian states. In Tamil Nadu, If the available resources are utilised rationally, it may continue to be at top in the country. So, it is the duty of the every individual to strive towards achieving this goal.

Natural Disasters in Tamil Nadu

- A sudden natural catastrophe that causes great damage or loss to lives and properties is called as disaster. The alteration of natural environment by the technology and developmental activities increase the frequency of disasters all over the world. So, it is necessary to aware the measures to be adopted during different types of natural disasters to reduce the risk caused by them.

- According to United Nations office for Disaster Risk Reduction, Disaster Risk Reduction(UNDRR) is the concept and practice of reducing disaster risks through systematic efforts to analyse and reduce the causal factors of disasters. This includes reducing exposure to hazards, lessening the vulnerability of people and property, wise management of land and environment, and improving preparedness and early warning for adverse events.

- Here we will discuss about the natural disasters in Tamil Nadu and the measures to be adopted before, during and after different disasters.

Landslide

- A collapse of a mass of earth or rock from a mountain or cliff is called landslide. Water is the most common trigger of a landslide. Nilgiris in Tamil Nadu is identified as one of the most vulnerable districts in the country and landslides pose a major threat in this area. The other regions which are prone to land slides are Coimbatore and palani hill of Dindigul district where Kodaikanal hill station is located.

Risk Reduction Measures

- Before: Create awareness; stay alert and awake; monitor the news updates; make evacuation plan; listen for any unusual sounds that might indicate moving debris such as trees cracking, boulders knocking and consider leaving the place of landslide if it is safe to do so.

During

- If indoors: Find cover in the section of the building that is farthest away from the approaching landslide; take shelter under a strong table or bench. Hold on firmly and stay until all movement has ceased.

If outdoors

- Move quickly away from its likely path, keeping clear of embankments, trees, power lines and poles; avoid crossing roads and bridges and stay away from the landslide because the slope may experience additional failures for hours to days afterwards.

- After- Stay away from the slide area; listen to local radio or television stations for the latest emergency information; watch for flooding, which may occur after a landslide or debris flow; check for injured and trapped persons near the slide, without entering the direct slide area.

Flood

- Flood is a common one in the coastal districts of Tamil Nadu during northeast monsoon. The recent flood occurred in the state was in 2015. The 2015 South Indian floods resulted from heavy rainfall generated by the annual northeast monsoon in November–December 2015. They affected the Coromandel Coast region of the South Indian states of Tamil Nadu and Andhra Pradesh. More than 500 people were killed and over 1.8 million people were displaced. With the estimates of damages and losses ranging from nearly 200 billion, the

floods were the costliest natural disasters of the year 2015. Tamil Nadu was the worst affected state by this flood. Generally the districts of Kancheepuram, Tiruvallur, Cuddalore, Villupuram, Thanjavur, Tiruvarur, Nagapattinam, Pudukkottai, Ramanathapuram, Tirunelveli and Kanyakumari are the most flood prone districts of the state.

Risk Reduction Measures

- Before: Know about relief centres and evacuation routes; keep emergency phone numbers and important information; fold and roll up things on to higher ground. During: Be quick, keep safe and ensure that children and elderly are safe by leaving the house to a higher ground; turn off all electrical appliances and gas; leave the area before its get too late; do not drive through the water; stay away from power lines or broken power transmission cables and try to keep away from flood water.

- **After:** Make sure to get back inside your house, keep all power and electrical appliances off before it is okay to put them on and wear appropriate dress before cleaning house which is necessary to clean the contamination.

Cyclone

- The coastal regions of Tamil Nadu are often hit by the tropical cyclones formed in Bay of Bengal during northeast monsoon. Occurrence of flood, losses to lives and properties are the recurring one in the state. Based on the cyclone hit areas, the state of Tamil Nadu can be divided into five zones namely very high, high, medium, low and very low cyclone prone zones. Southern part of Chennai, eastern part of kancheepuram, eastern part of Villupuram, northeastern part of Cuddalore and Union Territory of Puducherry fall under the very high cyclone prone zone. Nagapattinam, Tiruvallur, Tiruvarur (except northwestern part), southern part of Thanjavur, eastern part of Pudukkottai, eastern part of Cuddalore, middle portion of Villupuram, eastern part of Tiruvannamalai, western part of kancheepuram, northeastern part of Vellore and northern part of Chennai districts are included in the high cyclone prone zone.

Risk Reduction Measures

- **Before:** Ignore rumours, stay calm, don't be panic; Keep your mobile phones charged to ensure connectivity; use sms; listen to radio; watch TV; read newspapers for weather updates. Keep your documents and valuables in water proof containers; prepare an emergency kits with essential items for survival; secure your house; carry out repairs; don't leave sharp objects loose; untie cattle/animals for their safety. Fishermen should keep a radio set with extra batteries handy; keep boats and rafts tied up safely and don't venture out in the sea.

- **During:** Take care of the old and young, keep all family members inside the house; switch of all electrical appliances, stay in an empty room, movable items should be kept securely tied; try to help your neighbours but, don't go out during cyclone.

- **After:** Those who shifted to the cyclone centre must remain there till instructions are received; strictly avoid loose electrical wires after the cyclone; beware of snakes and other animals immediately after the cyclone; clear debris and carcasses from/near the premise after the cyclone and report losses truthfully and accurately to the authorities.

Drought

- Tamil Nadu is water deficit state. It is almost a regular one and not a seasonal one. It depends mostly on northeast monsoon for its rain. Its failure ends in disastrous. The total assessed water resources in the state amount to 1,587 TMC (Thousand million cubic feet) while the state government's demand estimate is 1,894 TMC. Demand exceeds supply by 19.3%, this happens when rainfall is "normal".

- The government classifies groundwater blocks into different categories. Only 145 of 385 such blocks are classified safe. The others are in various stages of depletion: over-exploited, critical and semi-critical. About 2% of the blocks are already saline. About 64% of the total area of the state is drought prone. Coimbatore, Dharmapuri, Kanyakumari, Madurai, Ramanathapuram, Salem, Tirunelveli, and Tiruchirappalli are the districts which are more drought prone.

- According to the desertification atlas prepared by the ISRO, about 12 percent of the total geographical area is under desertification and land degradation. Theni, Virudhunagar, the Niligris and Kanyakumari are the worst affected districts. To manage the water deficit, rain water harvesting and water conservation methods have to be implemented strictly.

Some methods of water conservation are:

Protection of water from pollution; redistribution of water; rational use of groundwater; population control; renovation of traditional water sources; use of modern irrigation methods; increasing forest cover; changing crop pattern; flood management and use of geothermal water are some of the major water conservation methods.

Forest Fire

- Tamil Nadu is a tropical state. The high temperature during summer leads to occasional forest fire in deciduous and thorn forests.

The recent fire accident in the state took place in 2018. The tragedy happened on March 11 when 37 people from Chennai and Erode regions were returning after a trekking trip to the Kurangani hills in Theni district. The groups were struck in the middle of a forest fire, which ultimately killed 23 people. In the aftermath of the Kurangani forest fire, Tamil Nadu government has banned trekking in the state for two months every year (February15 to April 15).

Risk Reduction Measures

- **Before:** Create defensible space to separate your home from flammable vegetation and materials (30 feet); follow all local fire and building codes; keep all trees and shrubs trimmed. Use approved fire resistant materials; make evacuation plans with family members which include several options with an outside meeting place.

- **During:** Listen to radio; watch tv; read newspapers for updates; if adequate water are available fill buckets with water. turn a light on a room in case of smoke; turn off gas and electrical appliances and be ready to evacuate all family members.

- **After:** Check with fire officials before attempting to return to your home; use caution when re-entering a burned area - flare ups can occur; check grounds for hot spots and check the roof and exterior areas for sparks and embers.

Tsunami

- Though Tsunami is not a common one in India, its incident in 2004 alerted India and the state of Tamil Nadu on this aspect. Almost all the countries situated around the Bay of Bengal were affected by the tsunami waves in the morning hours of 26 December 2004 (between 09:00 and 10:30 hrs IST). The killer waves were triggered by an earthquake measuring 8.9 on the Richter scale that had an epicentre near the west coast of Sumatra in Indonesia. Waves rose up to 6-10 metres and the impact was felt up to the East African coast affecting Somalia, Tanzania and Kenya.

Tremors and Tidal Waves in South India

- Tremors and Tidal waves hit South India and Large Scale devastation was reported. Over a thousand people have been killed in tidal waves in Tamil Nadu, Andhra Pradesh, and Andaman and Nicobar Islands. Tamil Nadu was the "worst affected" state of India in this incident.

- More than 1,500 people have been killed in the state. Casualties reported were very high in Nagapattinam (700), Kanyakumari (250) and Cuddalore (200) districts. Around 125 deaths have been recorded in the state capital of chennai. Earlier, the tsunami was reported in India in 1881 and 1941.

Risk Reduction Measures

- **Before:** if you live in a coastal area, know about tsunami risk and local warning arrangements; develop household emergency plan; know where the nearest high ground is and how you will reach it.

- **During:** Take your get away kit, don't travel areas at risk; move immediately nearest high ground; if you can't escape tsunami, go to an upper storey of the building or climb onto a roof or tree or grab a floating objects; never go to the shore to watch tsunami and listen to local radio stations as emergency management.

- **After:** Continue to listen to the radio; don't return to the evacuation zone until authorities have given all clear; check yourself for injuries and get first aid and help others.

Earthquakes

- India is a vast country which experiences many earthquakes at different periods. Generally high risk zones of the country are located in the north and central parts. The state of Tamil Nadu is located in the moderately low risk zone.

Earthquakes in Tamil Nadu

- **26 September 2001:** A moderate quake occurred in the Bay of Bengal, off the coast of the Union Territory of Puducherry, resulting in three deaths and minor damage to property in Puducherry and coastal Tamil Nadu. It had a magnitude of 5.6 on Richter scale.

- **7 June 2008:** A mild earthquake occurred in the Palar Valley region in Tamil Nadu. It had a magnitude of 3.8 on Richter scale and was felt in many parts of Vellore district.

- **12 August 2011:** A mild earthquake occurred in the Cauvery basin in Ariyalur district. It had a magnitude of 3.5 on Richter scale and was felt in several districts in southern Tamil Nadu. It resulted in one death and caused minor damages in the districts of Cuddalore,

Villupuram, Perambalur and Tiruchirappalli.

- **In 2012**, Chennai experienced a mild tremor with its epicentre in the Indian Ocean.

Risk Reduction Measures

- **During:** Take cover under a strong table or any other piece of furniture and remain under cover until the shaking stops.

- **After:** Proceed cautiously once the earthquake has stopped and always avoid roads, bridges that might have been damaged by the earthquake.