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PAPER - IV - UNIT - I
GENERAL GEOGRAPHY AND GEOGRAPHY OF INDIA WITH SPECIAL REFERENCE TO TAMIL NADU

பொது அறிவு

GENERAL STUDIES

கால அளவு: மூன்று மணி நேரம் **மொத்த மதிப்பெண்: 250**

Duration : 3 Hours **Total Marks : 250**

பிரிவு - அ

SECTION - A

1. **எல் நினோ என்றால் என்ன? மற்றும் இந்திய பருவநிலை எல் லினோவால் எவ்வாறு பாதிக்கிறது என்பதை விளக்குக.**

What is El Nino? and explain how it affects the Indian monsoon.

- The El Nino is the warmer-than-normal phase of the **El Nino Southern Oscillation (ENSO) phenomenon**, during which there are **generally warmer temperatures and less rainfall** than normal in many regions of the world, including India.
- During an El Nino event, the **Sea Surface Temperatures (SST)** in the equatorial Pacific Ocean off the northern coast of South America became at least 0.5 degrees Celsius warmer than the long-term average.
- In the case of a strong El Nino event as occurred in 2015-2016, anomalies can reach as high as 3°C, which is a record.
- The El Nino event is **not a regular cycle, they are not predictable** and occur irregularly at two- to seven-year intervals.
- Climatologists determined that El Nino occurs simultaneously with the Southern Oscillation.

- The Southern Oscillation is a change in air pressure over the tropical Pacific Ocean.

Impact on India:

- **Weak Monsoon for India:** The development of an El Nino in May or June 2023 may cause weakening of the **southwest monsoon season,** which brings around 70% of the total rainfall India receives and on which most of its farmers still depend.
- **sub-seasonal factors such as the Madden-Julian Oscillation (MJO)** and monsoon low-pressure systems **can temporarily enhance rainfall** in some parts as witnessed in the year 2015.
- **Hot Temperatures:** It may also cause **heatwaves** and **droughts** in India and other regions around the world such as South Africa, Australia, Indonesia and the Pacific Islands.
- **Heavier Rainfall in the West**: It brings heavy rainfall and flooding to other regions such as California in the United States and could cause **bleaching and death of coral reefs.**
- **Rising Global Average Temp:** The El Nino in 2023 and going into 2024 may push the global average temperature towards 1.5°C warmer than the preindustrial average.
- The warming of the oceans is also one of the major impacts of an El Nino event.

2. **பிக் பேங் கோட்பாட்டின் ஆதாரங்கள் குறித்து விவாதிக்க.**

Discuss the evidence for the Big Bang Theory.

- The Big Bang theory, the prevailing cosmological model for the universe's origin and evolution, is supported by a wealth of observational evidence. Here are the key pieces of evidence:

Expansion of the Universe:

- **Hubble's Law:** Edwin Hubble's discovery in the 1920s that galaxies are moving away from us at a speed proportional to their distance. This implies that the universe is expanding.

Cosmic Microwave Background (CMB) Radiation:

- **Discovery:** Arno Penzias and Robert Wilson accidentally discovered the CMB in 1964, a faint cosmic background radiation that fills the universe.
- **Significance:** This radiation is the afterglow of the Big Bang, providing a snapshot of the universe when it was just 380,000 years old.

Abundance of Light Elements:

- **Big Bang Nucleosynthesis:** The theory predicts the relative abundance of light elements like hydrogen, helium, and lithium produced in the early universe.
- **Observation:** The observed abundances of these elements closely match the predictions of the Big Bang model.

Age of the Universe:

- **Stellar Evolution:** By studying the ages of the oldest stars, scientists can estimate the minimum age of the universe.
- **Consistency:** The estimated age of the universe based on stellar evolution aligns with the age predicted by the Big Bang theory.

Large-Scale Structure of the Universe:

- **Cosmic Web:** The universe exhibits a large-scale structure of galaxies and clusters of galaxies, forming a cosmic web.
- **Formation:** The Big Bang theory explains the formation of this structure through the gravitational growth of small density fluctuations in the early universe.

3. **செவ்வாய் கிரகத்தில் வாழ்வதற்கான சாத்தியக்கூறுகளை ஆராய்க.**

Analyse the potential for life on Mars.

- The potential for life on Mars is a fascinating topic that has captured the imagination of scientists and the public alike. While no definitive proof of past or present life has been found, there is compelling evidence suggesting that Mars may have once been habitable and could still harbor microbial life.

Evidence for Past Habitability:

- **Liquid Water:** Numerous observations indicate that liquid water once flowed on Mars' surface, carving valleys and forming lakes. This suggests that conditions may have been suitable for life billions of years ago.
- **Organic Compounds:** Rovers like Curiosity and Perseverance have detected organic molecules, the building blocks of life, in Martian rocks and soil.
- **Mineral Deposits:** Certain minerals found on Mars, such as clay minerals, form in the presence of water, further supporting the idea of a wet past.

Potential for Present Life:

- **Subsurface Water:** Scientists believe that liquid water may still exist beneath the Martian surface, where it could potentially support microbial life.
- **Extremophiles on Earth:** On Earth, extremophiles thrive in harsh environments like hot springs, acidic lakes, and deep-sea hydrothermal vents. This suggests that similar life forms could exist on Mars.
- **Protection from Radiation:** Mars' thin atmosphere offers little protection from harmful radiation. However, subsurface environments could shield microbes from this radiation.

Challenges to Life on Mars:

- **Harsh Environment:** Mars' current surface conditions are extremely hostile, with low temperatures, high levels of radiation, and a thin atmosphere.
- **Lack of Oxygen:** The Martian atmosphere is primarily composed of carbon dioxide, making it difficult for oxygen-breathing organisms to survive.

Future Exploration:

- To further investigate the potential for life on Mars, future missions will focus on:
- **Subsurface Exploration:** Drilling into the Martian subsurface to search for signs of past or present life.
- **Sample Return:** Bringing Martian samples back to Earth for detailed laboratory analysis.
- **In-Situ Life Detection:** Developing advanced instruments to detect signs of life directly on Mars.

4. **பூமியின் வளிமண்டலத்தின் கலவை மற்றும் அடுக்குகள் குறித்து எழுதுக.**
Write about the Composition and Layers of Earth's Atmosphere.

Earth's atmosphere is primarily composed of:

- Nitrogen (N2): Approximately 78%
- Oxygen (O2): Approximately 21%
- Argon (Ar): Approximately 0.93%
- Carbon Dioxide (CO2): Approximately 0.04%
- Trace gases: Including water vapor, neon, helium, methane, and others.

Layers of Earth's Atmosphere:

- The Earth's atmosphere is divided into several layers based on temperature variations:

Troposphere:

- The troposphere is the lowest layer and its average height is 13 km and extends roughly to a height of 8 km near the poles and about 18 km at the equator.
- Closest to the Earth's surface
- Contains most of the atmosphere's mass and where weather occurs
- Temperature decreases with altitude

Stratosphere:

- The stratosphere rises to a height of 50 km, above the tropopause.
- Contains the ozone layer, which absorbs harmful UV radiation.
- Temperature increases with altitude due to ozone absorption of UV radiation.

Mesosphere:

- It is located between 50 and 80 kilometres above the surface of the Earth.
- Temperature decreases with altitude
- Meteors burn up in this layer, creating shooting stars

Thermosphere:

- The Thermosphere is located between about 80 and 700 kilometres above Earth’s surface
- The ionosphere (between 80 and 400 km) is a part of it.
- Temperature increases rapidly with altitude due to the absorption of high-energy solar radiation
- The International Space Station orbits in this layer

Exosphere:

- The topmost layer of Earth's atmosphere is known as the exosphere.
- Located between about 700 and 10,000 kilometres above the surface of the Earth.
- Outermost layer where the atmosphere gradually fades into space Satellites orbit in this layer.

5. **கடல் மட்ட உயர்வுக்கு பங்களிக்கும் காரணங்களை குறித்து விவாதிக்க.**
Discuss the factors contributing to sea level rise.

Reasons for Sea Level Rise:

- **Ocean Thermal Expansion:** Instrumental records reveal that the world's oceans have warmed since 1955, accounting for more than 80% changes in the energy content of the Earth's climate system during this period. During the period 1961 to 2003, the 0-3000 m ocean layer has absorbed up to 14.1 × 10^22 Joules, equivalent to an average heating rate of 0.2 Watts/m2 (per unit area of the Earth's surface). Warming of ocean water leads to expansion contributing to rising oceans. WMO estimates that thermal expansion contributed ~50% of the observed rise in water levels (i.e., contributing ~2.3mm/year rise between 2013-2023. It contributed to a rise of ~1.6mm/year between 1993-2002).
- **Glacial Melt from Greenland and Antarctica:** According to the IPCC AR4 (Assessment Report), it is very likely (> 90% probability) that the Greenland Ice Sheet (GIS) shrunk from 1993 to 2003. An assessment of the data suggests shrinking of Greenland Ice Sheet (~50-100 Gigatons/year) contributing to rising global sea levels of 0.14 to 0.28 mm/yr from 1993 to 2003. There is a risk of a much higher sea-level rise due to potential intrusion of sea water under the Antarctic glaciers, as NASA has demonstrated in its recent published scientific studies.
- **Loss of Snow on Land:** Snow cover has decreased in most regions, especially in spring as confirmed by Satellite observations. This means less water trapped in snow and more water in the oceans, leading to rise in water levels.
- **Permafrost:** Permafrost and seasonally frozen ground in most regions have displayed large changes in recent decades. Temperature increases at the top of the permafrost layer of up to 3°C since the 1980s have been reported. Permafrost warming has also been observed with variable magnitudes in the Canadian Arctic, Siberia, the Tibetan Plateau and Europe.
- All the above reasons are attributable to global warming caused by accumulation of Greenhouse Gases generated by anthropogenic activities.
- **Relative Sea Level Changes Due to Vertical Land Motions:** At the local scale, vertical land motions such as uplift or subsidence of the ground

due to tectonic and volcanic activity, sediment loading, groundwater pumping, and oil and gas extraction can produce sea level variations relative to the seafloor.

6. **ஓசியானிக் மற்றும் கண்ட மேலோடு இடையே உள்ள வேறுபாடுகள் என்ன?**

What are the differences between Oceanic and Continental Crust?

Oceanic Crust:

- The oceanic crust is the component of the earth's crust that makes up the ocean basins. This part, which as a density of around 3.0 g/cm3, is made up of dark basalt rocks that contain minerals and substances silicon, magnesium, and oxygen. A unique occurrence of recycling happens to this layer. With time, solid mantle gathers on the underside of the oceanic crust thus forming two layers. The extra weight sinks the layer into the mantle which leads to periodic melting and recycling of the continental crust.

Continental Crust:

- The continental crust is that part of the crust that makes up the earth's surface. In fact, about 40% of the surface of the earth is made up of this layer. The rocks in this layer are made up of light-colored granite rich in minerals and substances like aluminum, oxygen, and silicon. The continental crust has a density of about 2.6 g/cm3 which helps the continents of the world to stay in one place.

Difference Between Oceanic and Continental Crust:

- The first difference between the two layers comes in the composition of the rocks. The oceanic crust is mainly made out of dark basalt rocks that are rich in minerals and substances like silicon and magnesium. By contrast, the continental crust is made up of light-colored granite rocks full of substances like oxygen and silicon. The difference in composition between the mantle and the two layers of the crust is maintained by a process known as partial melting. Essentially, when a rock starts melting but doesn't melt all the way, some minerals and substances are lost by the melting rock while others are retained. Consequently, the layer that is beneath the partially melted rock gains these new minerals and substances thus making that layer denser than the one above.
- Another difference comes in the density of the two layers. From the descriptions, it is clear that the oceanic crust has a higher density than the more buoyant continental crust since the latter floats on top of the

former. Getting into the technicalities, the continental crust has a density of around 3.0 g/cm3 compared to 2.6 g/cm3 of the continental crust. In addition, the continental crust is much thicker than the oceanic crust.

- The continental crust is older than the oceanic crust. This fact can be easily explained by the recycling process of the oceanic crust. The recycling process does not happen to the continental layer. Consequently, this ensures that the oceanic layer is always younger geologically.

7. **இந்தியாவின் சில பகுதிகளில் அதிக ஆண்டு மழைப்பொழிவு பரவுவதை பாதிக்கும் காரணிகளை விளக்குக.**

Explain the factors influencing the distribution of high annual rainfall in certain parts of India.

- India's diverse topography and climatic conditions significantly influence the distribution of rainfall, particularly in regions experiencing high precipitation. The key factors contributing to this variation are:

Monsoon Winds:

- **Southwest Monsoon:** This is the primary source of rainfall in India. Moisture-laden winds from the Indian Ocean bring heavy rainfall to the windward side of the Western Ghats and the northeastern states.
- **Northeast Monsoon:** This monsoon brings rainfall to the southern peninsular region, especially Tamil Nadu and Kerala.

Orographic Rainfall:

- Mountain ranges like the Western Ghats and the Himalayas force moist air to ascend, cool, and condense, leading to heavy rainfall on the windward side.
- The leeward side, however, experiences a rain shadow effect, resulting in arid conditions.

Cyclonic Storms:

- Cyclonic storms originating in the Bay of Bengal and the Arabian Sea bring intense rainfall to coastal regions.

Jet Streams:

- The jet streams influence the movement of monsoon winds and can intensify rainfall in certain regions.

El Niño-Southern Oscillation (ENSO):

- This climate pattern can significantly impact India's monsoon rainfall. During El Niño years, the monsoon is often weak, leading to reduced rainfall.

Specific Regions with High Rainfall:

- The average annual rainfall in India is about **125 cm,** but it has great spatial variations (Refer Figure).
- **High Rainfall Zones (over 200 cm):** These regions include the west coast, Western Ghats, and the sub-Himalayan areas in the northeast, especially parts of the Khasi and Jaintia hills, which receive more than 1,000 cm.
- The Brahmaputra valley and adjoining hills get slightly less, under 200 cm.
- **Medium Rainfall Zones (100-200 cm):** Areas receiving between encompass southern Gujarat, east Tamil Nadu, northeastern Peninsula, and Areas covering Odisha, Jharkhand, Bihar, eastern Madhya Pradesh, northern Ganga plain, and **parts of the northeast.**
- **Low Rainfall Zones (50-100 cm):** Regions like western Uttar Pradesh, Delhi, Haryana, Punjab, Jammu and Kashmir, eastern Rajasthan, Gujarat, and the **Deccan Plateau**.
- **Inadequate Rainfall Zones:** These regions receive less than 50 cm of rainfall in India.
- Certain parts of the Peninsula, notably in Andhra Pradesh, Karnataka, Maharashtra, Ladakh, and most of western Rajasthan.
- **Snowfall:** This phenomenon is **limited to the Himalayan region.**
- **Northeast India:** States like Meghalaya, Assam, and Arunachal Pradesh receive abundant rainfall due to the orographic effect of the Himalayas and the influence of the Bay of Bengal.
- **Western Ghats:** The windward side of the Western Ghats, especially in Kerala and Karnataka, experiences heavy rainfall during the southwest monsoon.
- **Coastal Andhra Pradesh and Telangana:** These regions receive significant rainfall from the Bay of Bengal branch of the southwest monsoon.

8. **இந்திய துணைக்கண்டத்தில் இமயமலையின் முக்கியத்துவம் குறித்து எழுதுக.**

Write about the significance of the Himalayas on the Indian Subcontinent.

- The Himalayas are young fold mountains formed by the convergence of two tectonic plates. They constitute one of the 5 physiographic divisions of India. Along with acting as a grand barrier guarding India's frontiers, they also act as a dividing range between the Tibetan Plateau in the north and India in the south.

Significance of the Himalayas:

- **Climatic Influence:** These ranges significantly affect the climate of India.
- Owing to their high altitude, length, and direction, they effectively interrupt the summer monsoonal winds coming from the Bay of Bengal and the Arabian Sea and trigger precipitation in the form of rain or snow.
- They also prevent cold winter winds from the Siberian region from entering India.
- **Security:** These ranges have been protecting India from outside forces and intruders since ancient times thus serving as a defense barrier for India.
- **Perennial Source of Water:** They are the source of the majority of large rivers of India, which form the footing of life in the entire north India.
- **Forest Wealth:** They host the base of a rich forest that provides fuel wood and a huge diversity of raw materials for forest-based industries.
- **Agriculture:** Though the Himalayan ranges do not provide extensive plains for agricultural activities, some of the slopes have been terraced for cultivation.
- **Minerals:** The Himalayan region is a source of many valuable minerals such as Copper, Lead, Zinc, Nickel, Cobalt, Antimony, Tungsten, Gold, Silver, Limestone, Semi-Precious and Precious Stones, Gypsum, and Magnetite.
- **Hydroelectricity:** Due to the presence of rugged topography and fast-flowing rivers, these mountain ranges hold a huge potential for Hydroelectricity.

9. **இந்தியாவில் தென்மேற்கு பருவமழை முறையை பாதிக்கும் காரணிகளை விமர்சன ரீதியாக ஆராய்க.**

Critically examine the factors affecting the Southwest monsoon system in India.

- The South West Monsoon is a major seasonal wind system that brings substantial rainfall to the Indian subcontinent.
- It typically begins in June and lasts until September, driven by moisture-laden winds from the Indian Ocean.
- The monsoon is characterised by heavy rains and is crucial for agriculture and water resources in India.

Several factors influence the Southwest Monsoon in India:

Pressure Gradient:

- A strong pressure gradient between the high-pressure area over the Indian Ocean and the low-pressure area over the Tibetan Plateau drives the monsoon winds.
- A stronger pressure gradient leads to a stronger monsoon.

Intertropical Convergence Zone (ITCZ):

- The ITCZ, a low-pressure belt near the equator, shifts northward during the summer, bringing moisture-laden winds from the Indian Ocean.
- The position and intensity of the ITCZ significantly influence the monsoon's strength and distribution.

Sea Surface Temperatures (SSTs):

- Warm SSTs in the Indian Ocean provide ample moisture for the monsoon.
- The Indian Ocean Dipole (IOD) and El Niño-Southern Oscillation (ENSO) can influence SSTs and, consequently, the monsoon.

Topography:

- The Himalayas and the Western Ghats play a crucial role in orographic rainfall, where moist air is forced to rise and cool, leading to precipitation.
- The orientation of these mountain ranges influences the distribution of rainfall.

Global Climate Patterns:

- Large-scale atmospheric and oceanic circulation patterns can affect the monsoon's intensity and timing.

Anthropogenic Factors:

- Human activities like deforestation, urbanization, and pollution can indirectly impact the monsoon by altering local climate conditions.

10. **வெப்பமண்டல மற்றும் மிதவெப்ப சூறாவளிகள் இடையே உள்ள வேறுபாடுகளை ஆராய்க.**

Examine the differences between tropical and temperate cyclones.

	Tropical Cyclone	**Temperate cyclone**
Origin	**Thermal Origin**	**Dynamic Origin** – Coriolis Force, Movement of air masses.
Latitude	Confined to 10^0 – 30^0 N and S of equator.	Confined to 35^0 – 65^0 N and S of equator. More pronounced in Northern hemisphere due to **greater temperature contrast**.
Frontal system	Absent	The very cyclone formation is due to frontogenesis.[Occluded Front]
Formation	They form only on seas with temperature more than 26-27^0 C. They dissipate on reaching the land.	Can form **both** on land as well as seas
Season	Seasonal: Late summers (Aug – Oct)	Irregular, But few in summers and **more in winters**.
Size	Limited to small area. Typical size: 100 – 500 kms in diameter. Varies with the strength of the cyclone.	They cover a larger area. Typical size: 300 – 2000 kms in diameter. Varies from region to region.
Rainfall	Heavy but does not last beyond a few hours. If the cyclone stays at a	In a temperate cyclone, rainfall is slow and continues for many days, sometimes even weeks.

	place, the rainfall may continue for many days.	
Wind Velocity and destruction	Much greater (100 – 250 kmph)(200 – 1200 kmph in upper troposphere) Greater destruction due to **winds, storm surges and torrential rains.**	Comparatively low. Typical range: 30 – 150 kmph. Less destruction due to winds but more destruction due to **flooding.**
Isobars	Complete circles and the **pressure gradient is steep**	Isobars are usually 'V' shaped and the pressure gradient is low.
Life time	Doesn't last for more than a week	Last for 2-3 weeks.
Surface anti-cyclones	The tropical cyclones are not associated with surface anticyclones and they have a greater destructive capacity.	The temperate cyclones are associated with anticyclones which precede and succeed a cyclone. These cyclones are not very destructive.
Influence on India	Both coasts effected. But east coast is the hot spot.	Bring rains to North – West India. The associated instability is called 'Western Disturbances'.
Temperature distribution	The temperature at the center is almost equally distributed.	All the sectors of the cyclone have different temperatures
Calm region	The center of a tropical cyclone is known as the eye. The wind is calm at the center with no rainfall.	In a temperate cyclone, there is not a single place where winds and rains are inactive.
Driving force	The tropical cyclone derives its energy from the latent heat of condensation, and the difference in densities of	The energy of a temperate cyclone depends on the densities of air masses.

	the air masses does not contribute to the energy of the cyclone.	

11. **தமிழ்நாட்டில் காணப்படும் முக்கிய மண் வகைகள் மற்றும் அவற்றின் விநியோகம் குறித்து விவாதிக்க.**

Discuss the major soil types found in Tamil Nadu and their distribution.

Soils of Tamil Nadu.

- The soils in Tamil Nadu are broadly classified into five types according to their characteristics. They are
  - Alluvial soil
  - Black soil
  - Red soil
  - Laterite soil
  - Saline soil

Alluvial Soil:

- Alluvial soils are formed by the deposition of silt by the rivers. 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, Mayiladuthurai, Nagapattinam, Kallakurichi, Villupuram, Cuddalore, Tenkasi, 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. Black soils are found extensively in the districts of Coimbatore, Madurai, Virudhunagar, Tenkasi, 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.
- 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 Chengalpattu, Kancheepuram, Tiruvallur and Thanjavur districts and some patches over the mountainous region in the Nilgiris.

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.

12. இந்தியாவில் வனவிலங்கு பாதுகாப்பு மற்றும் நிர்வாகத்தின் பல்வேறு நடவடிக்கைகள் குறித்து விவாதிக்க.

Discuss the various measures of wildlife conservation and management in India.

- Wildlife conservation is the practice of protecting wild plant and animal species and their habitat.
- Wildlife conservation aims to ensure that **nature** will be around for future generations to enjoy and recognise the importance of wildlife and **wilderness** for humans and other species alike.
- Wildlife conservation holds significance as wildlife is essential in balancing the **ecosystem** and stabilising different natural processes.
- Wildlife conservation has become even more important in the present times due to the negative effects of **human activity** on wildlife.

Important Wildlife Conservation Projects in India

- Over the years, the governments, along with various Non-Governmental Organizations (NGOs) and international bodies, have launched several wildlife conservation projects in India.

Legal Framework:

- Wildlife (Protection) Act, 1972
- Environment Protection Act, 1986
- The Biological Diversity Act, 2002

India's Collaboration with Global Wildlife Conservation Efforts:

- Convention on International Trade in Endangered Species of Wild Fauna and Flora (CITES)
- Convention on the Conservation of Migratory Species of Wild Animals (CMS)
- Convention on Biological Diversity (CBD)
- World Heritage Convention
- Ramsar Convention
- The Wildlife Trade Monitoring Network (TRAFFIC)

- United Nations Forum on Forests (UNFF)
- International Whaling Commission (IWC)
- International Union for Conservation of Nature (IUCN)
- Global Tiger Forum (GTF)

Some of the most important wildlife conservation projects in India include:

- Project Tiger
- Project Elephant
- Project Lion
- Project Snow Leopard
- Project Cheetah
- Project Hangul
- Project Crocodile
- Project Crocodile
- Project Great Indian Bustard
- Project Dolphin

Methods of In Situ Conservation of Biodiversity:

- Prominent methods of this type of conservation include the creation of Protected Areas.
- Some of the Protected Areas designed for this method of conservation include:
  - National Parks,
  - Wildlife Sanctuaries,
  - Biosphere Reserves,
  - Conservation Reserves,
  - Community Reserves,
  - Sacred Groves, and
  - Coastal and Marine Protected Areas.

13. **இந்தியாவில் நிலத்தடி நீர் குறைவதற்கான முக்கிய காரணங்களை ஆராய்க.**

Examine the major causes of groundwater depletion in India.

- Groundwater depletion refers to the reduction in the amount of water stored underground in aquifers, leading to a decline in water levels. It's a critical issue in India due to its heavy reliance on groundwater for irrigation, drinking water, and industrial purposes.

Major causes for groundwater depletion:

Over-Extraction:

- Excessive pumping for irrigation, industrial, and domestic use surpasses the rate of recharge.
- **Example:** Over 80% of India's irrigation water comes from groundwater, leading to over-extraction in many regions.

Agricultural Practices:

- Intensive farming practices like excessive use of water-intensive crops and inefficient irrigation methods contribute to groundwater depletion.
- **Example:** Cultivation of water-guzzling crops like rice and sugarcane in water-stressed regions like Punjab and Maharashtra.

Urbanization:

- Rapid urbanization leads to increased demand for water, resulting in extensive groundwater extraction for drinking water supply and industrial use.
- **Example:** Cities like Delhi and Chennai face severe groundwater depletion due to rapid urban expansion.

Industrialization:

- Industries often rely heavily on groundwater for processes, leading to significant depletion in industrial areas.
- **Example:** Regions like Gujarat, Maharashtra, and Tamil Nadu, with high industrial activity, experience substantial groundwater depletion.

Deforestation:

- Reduced forest cover decreases infiltration and groundwater recharge, exacerbating depletion.
- **Example:** In states like Rajasthan and Madhya Pradesh, deforestation contributes to groundwater decline.

Climate Change:

- Altered precipitation patterns and rising temperatures affect groundwater recharge rates, aggravating depletion.
- **Example:** Erratic monsoon rains in recent years have impacted groundwater replenishment in many parts of India.

Lack of Regulation:

- Inadequate regulation and enforcement of groundwater management policies allow unsustainable extraction practices to continue unchecked.

- **Example:** Many states lack proper monitoring of groundwater extraction, leading to unchecked depletion.

Groundwater Pollution:

- Contamination from industrial effluents, agricultural runoff, and untreated sewage reduces the availability of usable groundwater, exacerbating depletion.
- **Example:** The Ganga basin suffers from severe groundwater pollution due to industrial and domestic discharge.

பிரிவு - ஆ

SECTION - B

14. **தொழில்களின் அமைவிடத்தைப் பாதிக்கும் புவியியல் காரணிகளை விளக்குக.**

Explain the geographical factors which affect the location of industries.

- Geographical factors play a crucial role in determining the location of industries. Here are some of the key geographical factors:

Availability of Raw Materials:

- **Proximity to Source:** Industries often locate near the source of raw materials to reduce transportation costs. For example, iron and steel industries are often located near iron ore and coal mines.
- **Type of Raw Material:** The type of raw material also influences location. Bulky and heavy raw materials like iron ore and coal are usually processed near their source to minimize transportation costs.

Availability of Water:

- **Industrial Use:** Many industries, especially those involved in chemical processing, textiles, and paper production, require large quantities of water.
- **Cooling:** Water is also used for cooling purposes in various industrial processes.

Availability of Power:

- **Energy Source:** Industries need reliable and affordable power sources. Hydroelectric power, thermal power, and nuclear power are common sources used by industries.
- **Proximity to Power Plants:** Industries may locate near power plants to ensure a consistent supply of electricity.

Availability of Labor:

- **Skilled Workforce:** Industries requiring skilled labor, such as electronics and IT, often locate in areas with a pool of skilled workers.
- **Labor Costs:** Labor costs can significantly impact the location decision. Industries may choose locations with lower labor costs to reduce production expenses.

Transportation Facilities:

- **Accessibility:** Good transportation networks, including roads, railways, and waterways, are essential for the smooth movement of raw materials and finished goods.
- **Connectivity:** Industries often locate near major transportation hubs like ports and airports to facilitate global trade.

Market Proximity:

- **Consumer Base:** Industries may choose locations closer to their target market to reduce transportation costs and delivery times.
- **Distribution Networks:** A well-developed distribution network can help industries reach a wider market.

Land and Climate:

- **Land Availability:** Sufficient land is required for industrial setups, including factory buildings, warehouses, and infrastructure.
- **Climate Conditions:** Some industries, like textile and electronics, may prefer specific climatic conditions for optimal production.
- It's important to note that these geographical factors often interact with each other. For example, the availability of water may influence the availability of hydroelectric power, and the presence of a skilled workforce may attract industries to a particular location.

15. **தமிழ்நாட்டின் முக்கிய புவியியல் அமைப்புகள் மற்றும் அவற்றின் பண்புகள் குறித்து விவாதிக்க.**

Discuss the major physiographic divisions of Tamil Nadu and their characteristics.

Western Ghats:

- Western Ghats extend 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 Pothigai hills are these hills of western 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.

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.
- **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.
- 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.
- The plains of Tamil Nadu may be divided into two, namely
  - Inland plains
  - Coastal plains

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 beach in Kanchipuram and Silver beach in Cuddalore are some of the famous beaches in Tamil Nadu.
- 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.
- Total length of Cauvery river is 805 km.
- 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 calledas 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'.

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 nearly 77% 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.

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.
- 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.
- It is the only perennial river in South India.

16. **தமிழகத்தில் கனிமவள உற்பத்தி மற்றும் அதன் வருவாய் ஆக்கம் குறித்து எழுதுக.**

Write about Mineral resources production and its revenue generation scope in Tamil Nadu.

- Mineral Resources of Tamil Nadu Tamil Nadu is endowed with various major minerals, minor minerals, oil and Natural Gas. These minerals are detailed below:

Major minerals Limestone:

- It manufacturing of lime, cement, chemicals, fertilizers and in metallurgical industries. It is of two types.
  - Crystalline Limestone, which mainly occurs in Salem, Tiruchirapalli, Karur, Dindigul, Madurai, Virudhunagar, Coimbatore and Thoothukudi Districts. predominantly Tiruchirapalli,
  - Crystalline Limestone Fossiliferous Non or Limestone occurs in Ariyalur, and Perambalur Districts.
- **Lignite:** This energy mineral is found in three areas namely Neyveli, Mannargudi and Ramanathapuram. The 10 total reserves of Lignite in

these areas is estimated at 34,764 million tonnes. The Neyveli Lignite Corporation India Limited (NLCIL) has been mining Lignite in Neyveli over an extent of 25,900 hectares in Cuddalore district.

- **Marl:** Marl is a sedimentary rock with mixed composition consisting carbonates. It is a material rich in carbonate minerals, clays and silt. It is used in the manufacturing of fertilizers and cement. It occurs as a sedimentary deposit in association with fossiliferrous limestone in Ariyalur district.
- **Magnesite:** It is a magnesium carbonate mineral. It finds wide use in refractories as flux in sintering, blast furnace, conditioners, ceramic filters and abrasives. One of the World's best Magnesite deposit occur in the Chalk hills of Salem district. Three leases are under operation over an extent of 192.86.0 ha.
- **Vermiculite:** It is a micaceous mineral, which appears brownish yellow in colour. It is used as insulators and in manufacture of vermitiles. TAMIN is mining this mineral over an extent of 23.70.5 ha in Sevathur village, Tirupathur district.
- **Bauxite:** Aluminium is extracted from this ore. Bauxite is also used in refractory, cement, chemical, paint industries and in refining petroleum products. The Shervaroy hills in Salem district and Kolli hills in Namakkal district contain good deposits of Bauxite.
- **Critical Minerals:**
    - **Graphite:** It is a naturally occurring crystalline Carbon used in crucible industry, insulators, electrode, atomic reactors and foundry units. Graphite occurs mainly in Sivaganga and Madurai districts. One lease granted to Tvl. TAMIN Ltd., over an extent of 236.85.0 ha is in operation in Poovandhi village of Sivaganga district.
    - **Molybdenum:** Molybdenum occurs mainly in Dharmapuri and Krishnagiri Districts. It is used to make alloys to increase strength, hardness, electrical conductivity and resistance corrosion and wear.

Platinum Group of Elements (PGE):

- The Platinum group elements are Osmium, Iridium, Ruthenium, Rhodium, Platinum and Palladium. Platinum group of elements occur in Namakkal district. Platinum (Pt) is the most popular element of PGE. The Platinum group metals are a family of six structurally and chemically similar elements that are most valued for their wide range of

industrial, medical, and electronic applications. Platinum is probably the most recognized because of its use in jewellery, but its main application is in the manufacture of catalytic converters.

- **Tungsten:** It is a rare metal found naturally on earth almost exclusively as compounds with other elements. It is used in any electrical and electronic applications. It is used in the form of tungsten carbide for very hard and tough dyes, tools, gauges and bits. Tungsten is used mostly in the production of tungsten steels and in the aerospace industry to fabricate rocket engine nozzle throats and leading-edge reentry surfaces. Tungsten occurs mainly in Madurai district.
- **Atomic Minerals:** Beach sands in Tirunelveli, Thoothukudi and Kanniyakumari districts contain atomic minerals such as Monazite, Garnet, Ilmenite, Rutile, Sillimanite, Zircon and Leucoxene. Beach sand minerals are used as abrasives, semi-conductors, and in atomic reactors. The Indian Rare Earths (India) Limited has been mining these minerals in Kanniyakumari district. Garnet also occurs as placer deposit in Tiruchirapalli district and as rock forming deposit in Madurai district.

Revenue generation 2023-2024:

- Lignite - 343.87 cr
- Limestone - 238.81 cr
- Marl - 3.12 cr
- Magnesite - 0.64 cr
- Graphite - 0.16 cr
- Atomic Minerals - 5.74 cr

17. இந்தியாவில் கிழக்கு நோக்கி பாயும் ஆறுகளின் முக்கிய அம்சங்களை விவரிக்க.

Describe the salient features of East flowing rivers in India.

- East-flowing rivers in India refer to those rivers that primarily flow towards the east, draining into the Bay of Bengal. These rivers play a crucial role in the geographical, ecological, and socio-economic aspects of the regions they traverse.

Origin and Source:

- East-flowing rivers typically originate from the Western Ghats, like the Godavari and Krishna rivers.
- **Example:** The Godavari River originates from the Brahmagiri mountain in Maharashtra.

Length and Catchment Area:

- These rivers often have substantial lengths and cover extensive catchment areas.
- **Example:** The Mahanadi River, with a length of about 858 kilometers, has a significant catchment area.

Drainage Pattern:

- They form an intricate drainage pattern across the Eastern Deccan plateau.
- **Example:** The Krishna River forms a complex network of tributaries in its drainage basin.

Agricultural Importance:

- East-flowing rivers contribute significantly to agriculture by providing fertile alluvial soil.
- **Example:** The Cauvery River facilitates extensive agriculture in the delta regions of Tamil Nadu and Karnataka.

Hydroelectric Potential:

- Many of these rivers possess hydroelectric potential due to their flow characteristics.
- **Example:** The Godavari River supports hydroelectric power generation through various dams, such as the Polavaram Dam.

Cultural Significance:

- East-flowing rivers often hold cultural importance and are associated with myths and legends.
- **Example:** The Ganges, although primarily flowing east in its upper reaches, is revered culturally and religiously.

Bifurcation and Delta Formation:

- Some rivers bifurcate or form extensive delta regions near their confluence with the Bay of Bengal.
- **Example:** The Delta of the Ganges, Brahmaputra, and Meghna rivers, forming the Sundarbans, is the largest mangrove forest.

Industrial Utilization:

- Industries along these rivers utilize water resources for various purposes, contributing to regional economic development.
- **Example:** The Krishna River supports industrial activities in the Krishna Industrial Region of Andhra Pradesh.

18. **இந்தியாவில் நிலக்கரி இருப்பு, விநியோகம் மற்றும் உற்பத்தி குறித்து விவாதிக்க.**

Discuss the reserves, distribution and the production of coal in India.

- The coal sector plays a pivotal role in meeting approximately 55% of India's energy requirements, making it a crucial component of the country's energy landscape.
- Ranking third globally in both reserves and production, the Indian coal sector encompasses a diverse range of coal varieties, each with unique characteristics and applications.

Reserves:

- **Anthracite:** With its high carbon content (above 80%), anthracite serves industrial and metallurgical purposes. However, its reserves are limited, primarily found in the Jammu & Kashmir region.
- **Bituminous:** This abundant coal type (45% to 80% carbon content) is crucial for power generation, cement production, and as coking coal in the steel industry. Major reserves are located in Jharkhand, Odisha, Chhattisgarh, West Bengal, Madhya Pradesh, Telangana, and Maharashtra.
- **Lignite:** Known for its brown color and 40-55% carbon content, lignite is utilized for thermal power generation. Key reserves are situated in Tamil Nadu (Neyveli), Rajasthan, Gujarat, and Jammu & Kashmir.
- **Peat:** At the initial stage of coal formation, peat is not commercially used in India due to its low heating value and high moisture content.

Distribution:

- **Gondwana Coalfields:** Constituting about 98% of India's coal reserves, these coalfields are approximately 300 million years old and are mainly found in peninsular regions such as Damodar Valley (Jharkhand and West Bengal), Mahanadi Valley (Odisha), and Godavari Valley (Andhra Pradesh and Telangana).
- **Tertiary Coalfields:** Aged around 60 million years, these coalfields are located in northeastern states like Assam, Arunachal Pradesh, and Nagaland.

Production:

- India's coal reserves, distributed across Gondwana and Tertiary formations, are estimated at approximately 319 billion tonnes as of 2020.

- Key coal-producing states include Jharkhand, Odisha, Chhattisgarh, West Bengal, Madhya Pradesh, Telangana, and Maharashtra.
- In the financial year 2019-20, India produced around 729 million tonnes of coal, with Coal India Limited (CIL) contributing nearly 80% to the production.

Conclusion

- In conclusion, India's coal sector encompasses diverse coal varieties distributed across geologically significant formations, contributing significantly to the country's energy needs.

19. **இந்திய துணைக்கண்டம் முழுவதும் அடிக்கடி வெப்ப அலைகளை ஏற்படுத்தும் காரணிகளை விளக்கி, இந்தியாவில் ஏற்படக்கூடிய பாதிப்புகளை விவரிக்க.**

Explain the factors causing more frequent heat waves across the Indian subcontinent, describe the possible impacts on India.

- Heatwaves are when a place gets really, really hot for some time. Heatwave criteria include maximum temperature thresholds for plains and hilly regions. Coastal stations have specific criteria based on temperature departure from normal.
- The peak month for India's heatwave is May. For flat areas, it's called a heat wave if the temperature goes up to at least 40 degrees Celsius. But for hilly regions, it's considered a heat wave if the temperature reaches at least 30 degrees Celsius.

Causes of Heatwaves:

Heatwaves can be caused by a combination of natural and human-induced factors. The main causes are:

- **High Atmospheric Pressure Systems:** Heatwaves often occur when high-pressure systems stall over a region. These systems can trap warm air near the Earth's surface and prevent the normal movement of air masses, leading to prolonged periods of hot weather.
- **Global Warming:** The long-term increase in Earth's average temperature, primarily driven by human activities such as burning fossil fuels (coal, oil, and natural gas), deforestation, and industrial processes, contributes to the frequency and intensity of heat waves. Global warming leads to overall warmer temperatures, making extreme heat events more likely.
- **Urban Heat Island Effect:** Urban areas with high population density, extensive concrete and asphalt surfaces, and limited vegetation tend to

absorb and retain more heat, creating localized zones of higher temperatures. This phenomenon, known as the urban heat island effect, can intensify heat waves in cities.

- **Drought and Dry Conditions:** Prolonged periods of drought and lack of precipitation can dry out the soil and reduce available moisture, causing the land to heat up more quickly during heat waves.
- **Climate Variability:** Natural climate variations, such as El Nino and La Nina events, can influence weather patterns and increase the likelihood of heatwaves in certain regions. During El Nino events, for example, warmer ocean waters in the tropical Pacific can lead to changes in atmospheric circulation and weather patterns worldwide.
- **Geography and Topography:** Certain geographic features and topographical conditions can contribute to the development of heat waves. For instance, landlocked valleys and regions surrounded by mountains can trap hot air and lead to temperature spikes.
- **Changes in Wind Patterns:** Shifts in wind patterns can transport hot air from one region to another, intensifying heat waves in areas that are not typically prone to such extreme temperatures.
- **Human Activities:** Local factors, such as land use changes, deforestation, and irrigation practices, can alter the surface characteristics of an area and contribute to heatwave development on a smaller scale.

Effects of Heatwaves:

- **Health Issues:** High air temperatures impact human health, exacerbating top causes of global death, including respiratory and cardiovascular diseases, diabetes, and renal issues.
- Heatwaves can have significant impacts on health, depending on the timing, intensity, and duration of high temperatures. Exposure to excessive heat can lead to various illnesses, including heat cramps, heat exhaustion, heatstroke, and hyperthermia. Even small differences from normal temperatures can cause increased illness and death, particularly for those with existing health conditions.
- **Economic Losses:** Heatwaves acutely impact large populations, trigger public health emergencies, and lead to excess mortality and socioeconomic consequences, like lost work capacity.

- **Strains Infrastructure**: Power shortages accompanying heatwaves disrupt health facilities, transport, and water infrastructure.
- **Environmental Impact:** Extreme heat can increase the risk of other disasters like droughts and wildfires. It's a leading cause of weather-related deaths, affecting vulnerable groups like older adults and outdoor workers.
- **Effects on Air Quality**: On hot days air quality can worsen due to ground-level ozone production and pollution from air conditioning.
- **Decreases Agriculture Output**: Agriculture can suffer from high temperatures. Plants are affected negatively by hot days, and some crops need cooler nights to grow well.
- **Negatively impact Livestock**: Heatwaves can stress livestock, leading to decreased milk production and slower growth. It can also impact conception rates.

20. **இந்தியாவின் மேற்கு இமயமலையில் அரிய லித்தியம் இருப்புக்களைக் கண்டறிவதன் விளைவுகளை விவரித்து மற்றும் இந்தியாவில் லித்தியம் இருப்புக்களின் முக்கியத்துவத்தை விளக்குக.**

Describe the effects of finding of lithium rare reserves in India's Western Himalaya and explain the importance of lithium reserves in India.

Lithium Reserves in India:

- Lithium is a soft, silvery-white non-ferrous metal and is one of the key components in rechargeable batteries for mobile phones, laptops, digital cameras and electric vehicles.
- It is also used in some non-rechargeable batteries for things like heart pacemakers, toys and clocks.
- The Geological Survey of India (GSI) had for the first time in India's history established Lithium inferred resources of *5.9 million tonnes* in Jammu and Kashmir's Reasi district.
- Months after India's first lithium reserves, the GSI has found another reserve of the crucial mineral in Degana in Rajasthan's Nagaur district.
- These reserves are believed to be much bigger in quantity (than found in J&K) and can meet 80% of the total country's demand.

Status of Other Lithium Deposits in India:

In Chhattisgarh:

- The Ministry of Mines successfully auctioned off India's first lithium block in Chhattisgarh's Korba district recently.
- Also, a private exploration company funded by the National Mineral Exploration Trust (NMET) has found hard rock lithium deposits ranging from 168 to 295 parts per million (ppm) in Korba.

In other states:

- Lithium exploration in other states has not been as fruitful.
- In Manipur, efforts to explore lithium in Kamjong district were stalled due to resistance from locals in the area.
- In Ladakh's Merak block, very close to the border between India and China, a lithium exploration funded by NMET yielded results that are not encouraging.
- In Assam's Dhubri and Kokrajhar districts, the NMET recommended to drop the plan of upgradation of a lithium exploration.
- **Meeting Growing Lithium-ion Battery Demand:** India's lithium demand is projected to increase because more people will be using things like phones, renewable energy batteries, and electric cars in future. The demand for lithium in India is predicted to increase from 1,634 tonnes in 2022 to between 60,000 and 93,000 tonnes by 2050.
- **Reducing Import Dependence:** India currently has no lithium production and relies heavily on lithium-ion imports, which have surged from $94 million in 2014-15 to nearly $3 billion in 2023-24. For ex-India imports almost 70–80 per cent of its lithium and 70 per cent of its lithium-ion from China. Developing domestic lithium reserves could help reduce India's import dependence and associated costs.
- **Supporting Clean Energy Transition:** Lithium is important for lithium-ion batteries, which are key for storing energy from sources like solar and wind power. Access to lithium reserves can help India switch to cleaner energy and keep the power grid stable.
- **Enabling Electric Vehicle Adoption:** Ensuring a stable lithium supply can ensure the adoption of EVs in India and contribute to reducing greenhouse gas emissions from the transportation sector.
- **Strategic Importance:** China has mines in the lithium triangle and has refining capacity for more than half of the world's lithium. China has

previously exerted its dominance, such as in 2010 when it stopped Rare Earth Elements (REE) exports to Japan during a disagreement. This highlights the importance for India to boost its domestic production to reduce its dependence on China for lithium and other critical minerals.

21. **தமிழ்நாட்டின் முக்கிய நதிகள் இணைப்புத் திட்டங்களை குறித்து எழுதுக மேலும் அவற்றின் முக்கியத்துவம் மற்றும் சவால்களை விளக்குக.**

Write about the major river linkage projects in Tamil Nadu and explain their importance and challenges.

- Interlinking of Rivers in India aims to transfer water from surplus to water deficit areas in the country.

Conservation of Water Resources:

- Interlinking of rivers in India improves the availability of surface water resources and reduces the use of groundwater for irrigation and other purposes.
- An increase in surface water resources means to increase in the availability of the arable areas in the country.
- **Crop Productivity**: The Interlinking of Rivers in India can act as a saviour for agricultural areas. As we know the agricultural sector receives most of the labour — population, fluctuations of income and monsoon uncertainty.
- **Health Advantages**: There are many deep boring holes for groundwater in different regions. The water extracted displays high levels of Arsenic, Fluoride and other hazardous chemicals such as Uranium (In Punjab), Nitrate etc.
- In coastal regions, it is common to see contamination of fresh water with saline water.
- Most of the drought areas have water contamination like Arsenide, Fluoride, etc. and sanitation issues. These issues in drought areas can be solved through the interlinking of rivers in India.
- **Use of Waterways**: If we use water as a mode of transport, the interlinking of rivers can carry heavy loads of materials in transportation as compared to truck or roadway transportation.
- Interlinking of Rivers in India also provides a cost-effective mode of transportation.
- **Reduction of Poverty**: Irrigation and agriculture provide livelihood opportunities to the people, thus helping to reduce poverty.

Major River linkage projects in Tamil Nadu:

- Godavari - Krishna - Pennar - Palar – Cauvery link to implement the inter-linking of Peninsular Rivers, viz., Mahanadi - Godavari - Krishna - Pennar - Palar - Cauvery - Vaigai – Gundar.

Pamba - Achankoil - Vaippar Link:

- Pamba - Achankoil - Vaippar Link National Water Development Agency in 1994 prepared a feasibility report for the Pamba – Achankoil - Vaippar Link Project, which envisages diversion of 22 TMC ft. of surplus water of Pamba and Achankoil Rivers of Kerala to Tamil Nadu to irrigate an ayacut of 91,400 hectares in Sankarankoil, Kovilpatti, Sivagiri, Srivilliputhur, Rajapalayam, Sathur and Tenkasi Taluks of Tamil Nadu, which will also help to generate power of 500 MW to Kerala.

Pandiyar – Punnampuzha Project:

- Pandiyar, Punnampuzha and Cholatipuzha are tributaries of the Inter State River Chaliyar. These tributaries originates from the high peaks of Nilgiris hills 83 in Tamil Nadu and flows west into Kerala, and empties in to the Arabian Sea.
- Inter - linking of Thamirabarani - Karumeniyar - Nambiyar Rivers
- Pennaiyar (Sathanur Dam) – Cheyyar link

Challenges for National River Linking Project (NRLP):

- The major issues regarding the **National River Linking Project** are as follows:
- **Loss of Forest Cover** – The interlinking of rivers in India will destroy huge forest areas and biodiversity. There is a threat to the Tiger Reserve, protected areas like wildlife sanctuaries etc. For instance, the Ken-Betwa linking project creates a threat to the Panna tiger reserve in Madhya Pradesh.
- **Rock Structures** – The Interlinking of Rivers in India has to be created through rocky structures. Bombarding them with explosives may alter the physiography and may result in hazards and environmental problems.
- **Invasive Species –** The interlinking of rivers in India may allow the free transport of invasive organisms which may affect biodiversity.

- **Conflict** – Conflict between States about water sharing is a common issue. E.g. River Cauvery between Tamil Nadu and Karnataka, Krishna between Telangana and Andhra Pradesh.
- **Marine Life Threat** – There is a threat to marine life because the reduction of the flow of freshwater into the sea destroys bio-diversity.
- **Displacement of People/Social Cost** – Interlinking of Rivers in India is a very costly project and also rehabilitation of displaced people would hamper more on the budget. It is also argued that the same amount could be spent on the desalination of seawater.
- **Economic Cost** – The massive expenditure on the project and the maintenance costs associated with the dams, canals, tunnels and captive electric power generation will involve huge financial burdens.

22. **இந்தியாவின் தீபகற்ப பீடபூமி எவ்வாறு நாட்டின் பழமையான மற்றும் நிலையான நிலப்பரப்பில் ஒன்றாகும் என்பதை விவரிக்க.**

Describe how India's peninsular plateau is one of the country's oldest and most stable landmass.

- The Peninsular Plateau is a vast expanse of ancient landmass that forms the southern part of India. It is considered one of the oldest and most stable landmasses on Earth, having formed billions of years ago during the Precambrian era. This makes it a significant geological feature and a vital component of India's diverse landscape.

Key factors that contribute to its age and stability:

- **Gondwana Land:** The Peninsular Plateau was once part of the ancient supercontinent Gondwana.
- This landmass began to break apart around 180 million years ago, and India gradually drifted northward, eventually colliding with the Eurasian Plate. This collision formed the majestic Himalayas
- **Crystalline and Metamorphic Rocks:** The plateau is primarily composed of hard, crystalline, and metamorphic rocks. These rocks are highly resistant to weathering and erosion, contributing to the plateau's longevity and stability.
- **Lack of Major Tectonic Activity:** Unlike the Himalayan region, which is still actively forming due to ongoing tectonic plate movement, the Peninsular Plateau has been relatively unaffected by major tectonic forces for millions of years. This lack of significant tectonic activity has allowed the plateau to remain stable and largely unchanged over time.

Features of the Peninsular Plateau of India:

- **Shape:** It is roughly triangular.
- Its broad base lies at the southern edge of the Indo-Gangetic Plains. From here, it tapers downwards up to Kanyakumari.
- **Extent:** Its northern boundary is an irregular line running from Kutch along the western flank of the Aravalis to areas near Delhi, which then moves roughly parallel to the Yamuna and the Ganga up to the Rajmahal Hills and the Ganga Delta.
- **Boundaries:** It is surrounded by hill ranges on all three sides:
- In the north, it is bounded by the Aravali Range, the Vindhya, the Satpura, the Bharmer, and the Rajmahal Hills.
- In the west, it is bounded by the Western Ghats.
- In the east, it is bounded by the Eastern Ghats.
- **Area:** Peninsular India is the largest physiographic unit of India with an area of 16 lakh sq. km.
- The area occupied by the Peninsular Plateau of India equals almost half of the area of the country.
- **Composition:** This old tabular block is made of schists and Archaean genesis.
- It is regarded as a stable shield that hasn't had many structural alterations since it first formed.
- **Slope:** The Peninsular block slopes mostly from west to east.
- This is the reason major peninsular rivers (except Narmada and Tapi) flow from west to east and drain into the Bay of Bengal.
- **Elevation:** The average height of the Peninsular Plateau of India is 600–900 meters above the mean sea level.

Major Plateaus of Peninsular India:

- The Marwar Upland
- The Central Highlands (Madhya Bharat Pathar)
- The Bundelkhand Upland
- The Malwa Plateau
- The Baghelkhand
- The Chotanagpur Plateau
- The Meghalaya Plateau (Shillong Plateau)
- The Deccan Plateau

Significance of the Peninsular Plateau of India:

- As the oldest and the most stable landmass of the Indian subcontinent, the Peninsular Plateau of India carries many significances:
  - **Mineral resources:** The plateau is blessed with large quantities of mineral resources like Iron, Copper, Manganese, Bauxite, Chromium, Mica, Gold, etc.
  - **Coal deposits:** The region contains 98 percent of the Gondwana coal deposits in the country.
  - **Agriculture:** The region is covered with black soil which is found suitable for the production of several crops such as cotton, tea, coffee, rubber, millet, etc.
  - **Forest produce:** Being replete with forest these areas are an abundant source of forest produce like timber, etc.
  - **Rivers:** The rivers in these areas offer great opportunities for the generation of hydroelectricity and provide irrigation facilities for crops.
  - **Tourism:** The place has numerous places of scenic beauty such as Ooty, Pachmarhi, Kodaikanal, Mahabaleshwar, Mount Abu, etc.

23. இந்தியாவில் பல்நோக்கு நதி பள்ளத்தாக்கு திட்ட கருத்துரு மற்றும் நோக்கங்கள் குறித்து விவாதிக்க.

Discuss the concept and objectives of multi-purpose river valley projects in India.

- Multipurpose river valley projects are large-scale infrastructure projects constructed on rivers to fulfill various purposes simultaneously. These projects typically include dams, reservoirs, canals, and powerhouses. By integrating various functionalities, they aim to optimize the use of water resources for agricultural, industrial, and domestic needs while also ensuring ecological balance and environmental protection.

Objectives and Benefits:

- **Irrigation:** The project provides irrigation to about 10 million acres of land in Punjab, Haryana, and Rajasthan.
- **Hydroelectric Power:** It generates over 1,300 MW of electricity, which is distributed to northern states.
- **Flood Control:** The dam helps control floods in the Sutlej basin.
- **Water Supply:** It supplies water to numerous towns and cities in the region.

Objectives of Multipurpose River Valley Projects:

- **Irrigation:** One of the primary purposes of these projects is to provide a reliable and continuous supply of water for irrigation. This is particularly important in a country like India, where agriculture is the backbone of the economy and a significant portion of the population relies on farming for their livelihood.
- **Hydroelectric Power Generation:** Generating electricity through hydropower is a clean and renewable energy source. Many multipurpose river valley projects have hydroelectric plants that harness the kinetic energy of flowing or falling water to produce electricity.
- **Flood Control:** These projects help mitigate the devastating effects of floods by controlling the flow of river water. Dams and reservoirs are designed to store excess water during heavy rains, which can then be released gradually to prevent flooding downstream.
- **Water Supply:** Providing water for domestic and industrial use is another critical function. The reservoirs created by these projects store water that can be treated and supplied to urban and rural areas for drinking, sanitation, and industrial activities.
- **Navigation:** Improving river navigation is a supplementary objective. By regulating the flow of water and maintaining adequate water levels, these projects facilitate the movement of goods and people through inland waterways, which can be more economical and environmentally friendly than road or rail transport.
- **Recreation and Tourism:** Some river valley projects also promote recreational activities and tourism by creating lakes and reservoirs that can be used for boating, fishing, and other leisure activities. This can boost the local economy and provide employment opportunities.

Major Multipurpose River Valley Projects in India are as follows:

- Bhakra-Nangal Project
- Damodar Valley Project
- Hirakud Dam Project
- Sardar Sarovar Project
- Nagarjuna Sagar Project
- Indira Gandhi Canal Project

24. தமிழ்நாட்டின் எரிசக்தி தேவைகளை பூர்த்தி செய்ய புதுப்பிக்கத்தக்க எரிசக்தி ஆதாரங்களின் திறனை மதிப்பிடுக.

Evaluate the potential of renewable energy sources to meet Tamil Nadu's energy demands.

- Tamil Nadu has emerged as a pioneer in the adoption of clean energy and has positioned itself at the forefront of India's transition towards clean energy sources. The State government has made remarkable efforts to achieve energy self-sufficiency, create significant opportunities for solar energy generation in various sectors such as rooftop solar, large-scale solar parks, solar battery hybrid projects and wind-solar hybrid projects.
- Tamil Nadu aims to be India's renewable energy leader by 2030.
- With a maximum demand of 4,769 MW.
- Renewable Energy (Wind and Solar) With installed capacity of 19,628.40 MW, Tamil Nadu holds third position in India in Renewable Energy installed capacity.

Offshore Wind

- As per the study done by National Institute of Wind Energy (NIWE), the Coast of Tamil Nadu from Kannyakumari to Nagapattinam is having the Offshore Wind potential of 35 GW. The SECI (Solar Energy Corporation of India) has floated tender for leasing of sea bed for installation of 4 GW of offshore wind generation capacity.
- Solar Power Tamil Nadu holds fourth position in India with an installed Solar capacity of 8,145.53 MW (including rooftop and CTU connectivity).
- Hydro Power Stations TNGECL's Hydro wing operates and maintains 47 Hydro Power Stations (107 machines with the total installed capacity of 2,321.90 MW) spread over four generation circles viz., Erode, Kadamparai, Kundah, and Tirunelveli.

Potential of Renewable Energy Sources in Tamil Nadu:

- **Solar Energy:** Tamil Nadu receives ample sunlight throughout the year, making it ideal for solar power generation. The state has already installed significant solar power capacity, and there is further potential for expansion, especially in rooftop solar installations.
- **Wind Energy:** Tamil Nadu has a long coastline and favorable wind conditions, particularly in coastal and inland regions. The state has

already established itself as a leader in wind energy generation, and there is scope for further development in suitable locations.

- **Hydropower:** While not as abundant as solar and wind, Tamil Nadu has several rivers and reservoirs that can be harnessed for hydropower generation. Existing hydroelectric power plants can be modernized, and new ones can be constructed in suitable locations.
- **Biomass Energy:** Agricultural residues and municipal solid waste can be converted into biofuels, providing a sustainable source of energy. However, challenges related to collection, transportation, and conversion technologies need to be addressed.

Challenges and Considerations:

- **Grid Integration:** Integrating large-scale renewable energy sources into the existing grid requires significant investments in transmission and distribution infrastructure to ensure reliable and efficient power supply.
- **Storage Solutions:** Developing cost-effective energy storage solutions, such as batteries, is crucial to address the intermittent nature of renewable energy sources like solar and wind.
- **Policy and Regulatory Framework:** A supportive policy and regulatory framework is essential to encourage investment in renewable energy projects and streamline the permitting process.
- **Land Acquisition:** Acquiring land for large-scale renewable energy projects, especially solar and wind farms, can be challenging, particularly in densely populated areas.

25. **நீலக் கொடி (Blue flag) சான்றளிக்கப்பட்ட கடற்கரைகளை விளக்குக மேலும் இந்தியாவில் சுற்றுலாத் துறைக்கான அவற்றின் முக்கியத்துவத்தை குறித்து விவாதிக்க.**

Explain Blue flag certified beaches and discuss their significance for tourism industry in India.

- It is an internationally recognised eco-label that is accorded based on 33 criterias. These criterias are divided into 4 major heads namely,
  - Environmental education and information
  - Bathing water quality
  - Environmental management
  - Conservation and safety services in the beaches

- Blue Flag beaches are **considered the cleanest beaches of the world**. It is an eco-tourism **model endeavouring to provide the tourists/ beachgoers clean and hygienic** bathing water, facilities, a safe and healthy environment and sustainable development of the area.
- The certification is awarded by the Denmark-based non-profit **Foundation for Environmental Education (FEE).** It is awarded annually to beaches and marinas in FEE member countries.

Beaches which have Received the Certification:

- Shivrajpur (Gujarat)
- Ghoghla (Daman & Diu)
- Kasarkod (Karnataka)
- Padubidri beach (Karnataka)
- Kappad (Kerala)
- Rushikonda (Andhra Pradesh)
- Golden beach (Odisha)
- Radhanagar beach (Andaman and Nicobar)
- Kovalam (Tamil Nadu)
- Eden (Puducherry)

Significance for India's Tourism Industry:

- Blue Flag certification holds immense significance for India's tourism industry, offering several benefits:

Enhanced International Reputation:

- **Global Recognition:** Blue Flag certified beaches elevate India's global image as a responsible and eco-conscious tourist destination.
- **Attracting International Tourists:** This certification attracts discerning international tourists who prioritize clean and sustainable tourism experiences.

Boosting Domestic Tourism:

- **Promoting Domestic Travel:** Blue Flag beaches can stimulate domestic tourism, encouraging Indians to explore their own country's pristine coastal destinations.
- **Creating New Tourism Opportunities:** These certified beaches can become hubs for various tourism activities, such as water sports, beach yoga, and nature walks, generating employment and revenue for local communities.

Sustainable Tourism Development:

- **Environmental Conservation:** Blue Flag certification promotes sustainable tourism practices, minimizing environmental impact and preserving coastal ecosystems.
- **Community Engagement:** Local communities are actively involved in maintaining the cleanliness and sustainability of these beaches, fostering a sense of ownership and pride.

Improved Infrastructure and Facilities:

- **Upgraded Amenities:** Blue Flag beaches often have better infrastructure, including clean toilets, waste disposal facilities, and first-aid stations.
- **Enhanced Safety Measures:** These beaches prioritize safety, with lifeguards and warning signs in place to prevent accidents.

Positive Impact on Local Economy:

- **Economic Growth:** The influx of tourists to Blue Flag beaches can boost local economies, creating jobs in hospitality, transportation, and retail sectors.
- **Community Development:** Revenue generated from tourism can be used to improve local infrastructure and social services.

26. **இந்தியாவில் சதுப்புநிலக் காடுகளின் பரவல், முக்கியத்துவம் மற்றும் அவை எதிர்கொள்ளும் அச்சுறுத்தல்கள் குறித்து விவாதிக்க.**

Discuss the distribution, significance, and threats to mangrove forests in India.

- **Mangrove** is a type of tree species that grow in intertidal salty environments near the mouths of the delta of rivers along the coasts because they can tolerate frequent flooding and are able to obtain fresh water from rivers and also the nutrients required from salt water.

Features of Mangroves:

- They are salt-tolerant plant species with roots dangling down into the water.
- Since they grow in very high salinity waters, they are adapted to the condition and are salt tolerant.
- They can secrete salt from their leaves to balance the salt intake.
- They have developed roots bearing pneumatophore (or aerial roots).
- These forests are also become quite resistant to high temperatures.
- They exhibit a viviparous mode of reproduction.

Sundarbans:

- Located within the largest mangrove forest in the world. Located in the delta of Rivers Ganges and Brahmaputra on the Bay of Bengal in India & Bangladesh.
- **Sundarbans Tiger Reserve** is situated within the Site and part of it has been declared a "critical tiger habitat" under national law and also a "Tiger Conservation Landscape" of global importance.
- The Site is also home to a large number of rare and globally threatened species such as the critically endangered northern river terrapin (*Batagurbaska*), the endangered Irrawaddy dolphin, and the vulnerable fishing cat.
- It is listed as World Heritage Site and also in UNESCO Biosphere Reserve.

Important Mangroves Region in India:

- **Gujrat:** Gulf of Kutchh, Gulf of Khambhat, Dumas-Ubhrat.
- **Andhra Pradesh:** Coringa East Godavari Delta, Krishna Delta.
- **Odisha**: Bhaitarkanika, Mahanadi, Subarnarekha, Devi-Kauda, Dhamra, Chilka.
- **West Bengal:** Sunderbans.
- **Andaman & Nicobar:** North Andaman, Nicobar.
- **Maharashtra:** Achra-Ratnagiri, Devgarh-Vijay Durg, Veldur, Kundalika-Revdnada, Mumbra-Diva, Vikroli.
- **Goa:** Goa.
- **Karnataka:** Coondapur, Dakshin Kannada/ Hannavar, Karwar, Mangalore Forest Division.
- **Kerala:** Vembanad, Kannur (North Kerala).
- **Tamil Nadu:** Pichavaram, Muthupet, Ramnad, Pulicat, Kaznuveli.

Significance of Mangroves:

- They are a very productive ecosystem and highly rich in biodiversity.
- They provide shelter for a wide variety of marine species and serve as important nursery areas for young marine animals.
- They are home to a wide variety of fish, reptiles such as sea turtles, land turtles, alligators, crocodiles, caimans, snakes, and lizards and invertebrates such as shrimp, crabs, oysters, tunicates, sponges, snails, and insects.

- Their dense root systems trap and hold sediments flowing down rivers and off the land.
- It stabilises the coastline and prevents erosion from waves and storms.
- It protects the coastal system from cyclones, storm surges etc.
- As they regularly experience tidal waves, they have grown resistant to them.

Threats to Mangroves:

- They are under threat from both natural as well as anthropogenic factors.
- In India, more than 50 per cent of Mangrove Forests have been lost during the last 40 years.

Some of the most prominent threats they face can be seen as follows:

Natural Threats:

- Natural calamities like tsunamis and cyclones have been causing a lot of damage.

Anthropogenic Threats:

- Clearing of these forests for agricultural purposes, human settlements and infrastructure (such as harbours), and industrial areas.
- These trees are in demand for wood and fodder.
- The overharvesting of the trees has led to a decline in the forests.
- Due to the construction of dams, the salinity of their habitat area has increased to a very high level which the trees cannot adapt to.
- Blocking of the river water has dried out the area.
- Pollution from agricultural fields and industries including fertilizers, pesticides, and other chemicals carried by river systems can kill the animals living in these forests.
- Oil pollution can also suffocate the trees.
- These forests also need stable sea level to survive but global warming and climate change has led to change in the sea level which disturbs the delicate balance and thus threatens the ecosystem.

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பொது அறிவு
GENERAL STUDIES

கால அளவு: மூன்று மணி நேரம் **மொத்த மதிப்பெண்: 250**
Duration : 3 Hours **Total Marks : 250**

பிரிவு - அ
SECTION – A

(10x 10 = 100)

1. **தமிழ்நாட்டின் பல்வேறு வேளாண் காலநிலை மண்டலங்களை விளக்குக.**
Explain the various agro climatic zones of Tamil Nadu.

- Tamil Nadu is the eleventh largest state in India by area. The land area has been classified into seven agro-climatic zones based on soil characteristics, rainfall distribution, irrigation pattern, cropping pattern and other ecological and social characteristics. The following are the seven agro-climatic zones of the State,

Zone	Districts	Altitude (m)	Annual rainfall (mm)	Crops grown
North Eastern	Kanchipuram, Chengalpet, Tiruvallur, Cuddalore, Villupuram, Kallakuruchi,	100-200	1105	Rice, Pearl Millet, Sorghum, Gingelly, Finger Millet, Groundnut, Red Gram, Sugarcane, Cashew, Mango, Guards, Green Chillies, Brinjal, Tapioca,

	Vellore, Tirupathur, Ranipet, Tiruvannamalai			Yam, Banana, Jack, Guava, Watermelon, Turmeric, Tube rose, Crossandra and Lemongrass.
North Western	Dharmapuri, Salem, Namakkal	200-600	875	Sorghum, Rice, Millet, Groundnut, Horse Gram,Cotton, Sugarcane, Tapioca, Cotton, Gingelly, Chillies, Mango, Banana, Tobacco, Pulses, Jack, Tomato, Radish, Brinjal, Ladies Finger, Pepper, Arecanut, Cocoa, Coconut, Palmarosa, Chrysanthemum, Jasmine, Marigold, Rose, Tuberose, Cutflowers, Turmeric and Red Chillies.
Western	Erode, Coimbatore, Karur (part), Namakkal (part), Dindigul (part), Theni (part)	200-600	715	Sorghum, Pulses, Groundnut, Rice, Millets, Cumbu, Cotton, Sugarcane, Ragi, Black Gram, Sunflower, Green Gram, Gingelly, Red Gram, Turmeric, Maize, Banana, Onion, Castor, Tobacco, Guava, Onion, Guards, Tomato, Tea, Coffee, Coconut, Gloriosa, Flowers, Tapioca, Jasmine, Rose and other Vegetables.
Cauvery Delta Zone (CDZ)	Tiruchi, Perambalur, Pudukottai (part), Thanjavur, Nagapattinam, Mayiladuthurai,	100-200	984	Rice, Cumbu, Maize, Cholam, Ragi, Black Gram, Green Gram, Coconut, Gingelly, Castor, Groundnut, Banana, Onion, Cashew, Betel vine,

	Tiruvarur, Cuddalore (part)			Citrus, Jack and other Vegetables.
Southern	Madurai, Sivagangai, Ramanathapuram, Virudhunagar, Tirunelveli, Tenkasi, Thoothukudi	100-600	857	Rice, Maize, Cumbu, Cholam, Ragi, Black Gram, Greengram, Groundnut, Fodder Crops, Gingelly, Castor, Cotton, Chillies, Banana, Jasmine, Coriander, Onion, Lime, Cashew and Amla.
High Rainfall	Kanniyakumari	100-2,000	1,420	Rice, Banana, Jackfruit, Mango, Tapioca, Cashew nut, Coconut, Clove, Vegetables & Tamarind.
Hilly and High Altitude	Nilgiris, Kodaikanal	> 2,000	2,124	Wheat, Garlic, Lemon, Lime, Pomegranate, Pineapple, Beans, Beetroot, Cabbage, Chowchow, Cotton, Pepper, Coffee, Potato, Banana, Mandarin, Orange, Pear, Cardamom, Cutflowers, Strawberry, Avocado, Tea and Ginger.

2. **இயற்கை விவசாயம் என்றால் என்ன மற்றும் உணவு பாதுகாப்பை உறுதி செய்வதிலும் நிலையான விவசாயத்தை ஊக்குவிப்பதிலும் அதன் முக்கியத்துவம் யாவை?**

What is natural farming and its significance in ensuring food security and promoting sustainable agriculture?

- Natural farming is an agricultural method that emphasizes the use of natural processes and locally adapted ecosystems to grow crops and raise animals, rather than relying on chemical fertilizers, pesticides, and genetically modified organisms.

Significance of natural farming in ensuring food security and promoting sustainable agriculture in India:

- The aim of natural farming is to make farming viable and aspirational by increasing net incomes of farmers on account of cost reduction, reduced risks, similar yields, incomes from intercropping.

- **Food and nutrition security**: Natural farming can help to improve food security for communities in India, especially for small-scale farmers who may not have access to or be able to afford modern inputs.
- By relying on natural techniques, farmers can produce healthy, nutritious food without incurring high costs.

Sustainable Agriculture:

- **Zero Budget Natural Farming (ZNBF):** One of the key practices of natural farming is Zero Budget Natural Farming (ZNBF).
- This is the practice of growing crops without the use of any external inputs, such as pesticides and fertilizers.
- The phrase Zero Budget refers to all crops with zero production costs. The farmers' revenue is increased as a result of ZBNF's guidance towards sustainable farming methods that help to reduce costs and increase yields.
- Reduce cost of production: It is based on the principles of working with natural processes, which helps to reduce the dependence on external inputs such as pesticides and fertilizers. This results in a reduction in the overall cost of production, making it more viable for farmers.
- **Improves soil health:** Natural farming helps to improve soil health, which in turn increases crop yields and reduces the incidence of pest infestation.
- **Help in achieving SDG-2:** Natural farming is not a new concept in India, with farmers having tilled their land without the use of chemicals - largely relying on organic residues, cow dung, composts, etc. since time immemorial.
- This is also in sync with the Sustainable Development Goal (SDG) 2 targeting 'end hunger, achieve food security and improved nutrition and promote sustainable agriculture'.
- **Increase participation of women:** Rural areas may benefit from the creation of employment in labor-intensive organic agriculture and can also facilitate the participation of women who have less access to the formal credit market and often cannot purchase agricultural inputs.
- **Help in job creation and poverty reduction:** From the economic point of view, organic agriculture has several benefits for farmers, including cheaper inputs, higher and more stable prices, and organization in farmer cooperatives.

- In an emerging country like India, sustainable agriculture can help in meeting twin challenges of food security and job creation it also helps in poverty reduction.

Government initiatives related to natural farming:

- **National Programme for Organic Production (NPOP):** It aim to provide focused and well-directed development of natural agriculture and quality products.
- **National Centre for Organic Farming (NCOF):** Promotion of organic farming in the country through technical capacity building of all the stakeholders including human resource development, transfer of technology, promotion and production of quality organic and biological inputs.
- **National Mission for Sustainable Agriculture (NMSA):** It seeks to address problems and issues regarding 'Sustainable Agriculture' in the context of risks associated with climate change by devising appropriate adaptation and mitigation.
- The **Paramparagat Krishi Vikas Yojana (PKVY):** The scheme provide support to cluster formation, certification, training, and marketing.
- **Mission for Integrated Development for Horticulture (MIDH):** It is a Centrally Sponsored Scheme for the holistic growth of the horticulture sector covering fruits, vegetables, root & tuber crops, mushrooms, spices, flowers, aromatic plants, coconut, cashew, cocoa and Bamboo.

3. **ஐக்கிய நாடுகள் சபை 2023 ஆம் ஆண்டை சர்வதேச தினை ஆண்டாக அறிவிப்பதன் முக்கியத்துவத்தை விளக்குக மேலும் தினை உற்பத்தியின் நன்மைகளை முன்னிலைப்படுத்துக.**

Explain the significance of declaring 2023 as international year of millets by the United Nation Organization (UNO) and highlight the benefits of millet production.

- India's proposal to observe an International Year of Millets in 2023 was approved by the **Food and Agriculture Organisation (FAO)** in 2018 and the **United Nations General Assembly** has declared the year 2023 as the International Year of Millets.

Objectives:

- Awareness of the **contribution of millet to Food Security** and nutrition.
- Inspire stakeholders to improve sustainable production and quality of millets.

- Focus on **enhanced investment in research and development** and extension services to achieve the other two aims.

Millets:

- Millet is a **collective term referring to a number of small-seeded annual grasses** that are cultivated as grain crops, primarily on **marginal lands in dry areas in temperate, subtropical and tropical regions.**
- Some of the common millets available in India are Ragi (Finger millet), Jowar (Sorghum), Sama (Little millet), Bajra (Pearl millet), and Variga (Proso millet).
- India is **the largest producer** of millet in the world.
- It Accounts for 20 % of global production and **80% of Asia's production.**

Nutritionally Superior:

- Millets are **less expensive and nutritionally superior** to wheat & rice owing to their high protein, fibre, vitamins and minerals like iron content.
- Millets are also **rich in calcium and magnesium**. For example, Ragi is known to have the highest calcium content among all the food grains.
- Millets can provide nutritional security and **act as a shield against nutritional deficiency,** especially among children and women. Its high iron content can fight high prevalence of anaemia in India women of reproductive age and infants.

Gluten-free a low glycemic index:

- Millets can help **tackle lifestyle problems and health challenges** such as obesity and diabetes as they are gluten-free and have a low glycemic index (a relative ranking of carbohydrate in foods according to how they affect blood glucose levels).

Super Crop at Growing:

- Millets are **Photo-insensitive** (do not require a specific photoperiod for flowering) & **resilient to climate change.** Millets can grow on poor soils with little or no external inputs.
- Millets are **less water consuming and are capable of growing under drought conditions,** under non-irrigated conditions even in very low rainfall regimes.
- Millets have **low carbon and water footprint** (rice plants need at least 3 times more water to grow in comparison to millets).

Initiatives Taken by Government:

- **Initiative for Nutritional Security through Intensive Millet Promotion (INSIMP)**
- **Increase in Minimum Support Price (MSP):** The government has hiked the Minimum Support Price of Millets, which came as a big price incentive for farmers.
- Further, to provide a steady market for the produce, the government has included millets in the public distribution system.
- **Input Support:** The government has introduced provision of seed kits and inputs to farmers, building value chains through **Farmer Producer Organisations** and supporting the marketability of millets.

4. **இந்தியாவின் முக்கிய தொழில்துறை வழித்தடங்களைக் கண்டறிந்து அதன் முக்கியத்துவம் குறித்து விவாதிக்க.**

Identify the major industrial corridors of India and discuss its importance.

- An industrial corridor is basically a **corridor comprising of multi-modal transport services** that would pass through the states as main artery.

Industrial corridors constitute world-class infrastructure, such as:

- High-speed transportation network – rail and road
- Ports with state-of-the-art cargo handling equipment
- Modern airports
- Special economic regions/industrial areas
- Logistic parks/transhipment hubs
- Knowledge parks focused on catering to industrial needs
- Complementary infrastructure such as townships/real estate
- Other urban infrastructure along with enabling policy framework

Five Industrial Corridors:

- **Delhi-Mumbai Industrial Corridor (DMIC)** covers Uttar Pradesh, Haryana, Rajasthan, Madhya Pradesh, Gujarat and Maharashtra.
    - The corridor covers an overall length of 1483 km between the political capital, Delhi, and the business capital, Mumbai, of India.
    - The US $100 bn project is being **funded by the Government of India, Japanese loans, investments by Japanese firms** and through Japan depository receipts issued by Indian companies.

- DMIC Project aims to create futuristic Industrial Cities by leveraging the "High Speed – High Capacity" connectivity backbone provided by the Western Dedicated Freight Corridor (DFC)

- **Chennai-Bengaluru Industrial Corridor (CBIC)** covers Tamil Nadu, Andhra Pradesh and Karnataka. It is being funded by the **Japan International Cooperation Agency (JICA).**
- **Bengaluru-Mumbai Economic Corridor (BMEC)** covers Maharashtra and Karnataka.
- It is being **developed with the help of Britain (UK).**
- The Delhi Mumbai Industrial Corridor Development Corporation (DMICD) and the UK Trade and Investment (UKTI) have been determined as the nodal agencies on the Indian and UK sides respectively.
- **Amritsar-Kolkata Industrial Corridor (AKIC)** covers Punjab, Haryana, Uttarakhand, Uttar Pradesh, Bihar, Jharkhand and West Bengal.
  - The Project extends from Amritsar (Punjab) to Dankuni (West Bengal) for a length of 1839 kms.
  - The Eastern Dedicated Freight Corridor is the backbone of this economic corridor.
- **East Coast Economic Corridor (ECEC)** covers West Bengal, Odisha, Andhra Pradesh and Tamil Nadu. Vizag to Chennai segment of this Corridor has been taken as phase-1.
- **Vizag-Chennai Industrial Corridor (VCIC)** is the first coastal economic corridor in the country. It covers more than 800 km of Andhra Pradesh's coastline and is aligned with the Golden Quadrilateral. It also plays a critical role in the "Act East Policy" of India.

5. **கால்நடை வளர்ப்பு கிராமப்புறங்களில் பண்ணை அல்லாத வேலைவாய்ப்பையும் வருமானத்தையும் வழங்குவதற்கான ஒரு பெரிய ஆற்றலைக் கொண்டுள்ளது. அரசு முன்னெடுக்கப்பட்ட பல்வேறு நடவடிக்கைகள் குறித்து விவாதிக்க.**

Livestock rearing has a big potential for providing non-farm employment and income in rural areas. Discuss various steps initiated by government.

- Livestock sector plays an important role in Indian economy. India has vast livestock resources. India has 56.7% of the world's buffaloes, 12.5% cattle, 2.4% camel (10th in camel population in the world) and 3.1% poultry (2nd largest poultry market in the world). Livestock sector contributes 4.11% of GDP and 25.6% of total Agriculture GDP. Rapid growth of this

sector can lead to more egalitarian and inclusive growth. This is because those engaged in it are mostly small landholders and the landless farmers.

Role of livestock in economy:

- **Income:** Livestock is a source of subsidiary income for many families in India especially the resource poor who maintain few heads of animals. Cows and buffaloes provide regular income to the livestock farmers through sale of milk. Animals like sheep and goat serve as sources of income during emergencies to meet exigencies like marriages, treatment of sick persons, children education, repair of houses etc. The animals also serve as moving banks and assets which provide economic security to the owners.
- **Employment:** A large number of people in India being less literate and unskilled depend upon agriculture for their livelihoods. It provides employment to about 8.8 % of the population in India. The landless and less land people depend upon livestock for utilizing their labour during lean agricultural season.
- **Food:** The livestock products such as milk, meat and eggs are an important source of animal protein to the members of the livestock owners. The per capita availability of milk is around 375 g/day and eggs is 74/annum during 2017-18.
- **Social security:** The animals offer social security to the owners in terms of their status in the society. The families, especially the landless which own animals are better placed than those who do not. Gifting of animals during marriages is a very common phenomenon in different parts of the country.
- **Gender equity:** Animal husbandry promotes gender equality. More than $3/4^{th}$ of the labour demand in livestock production is met by women. The share of women employment in the livestock sector is around 90% in Punjab and Haryana where dairying is a prominent activity and animals are stall-fed.
- **Protection against disasters:** Livestock are the best insurance against the drought, famine and other natural calamities. Majority of the livestock population is concentrated in the marginal and small size of holdings. Further, agricultural productions get valuable organic manure provided by the livestock.

Important Initiatives by the Government:

- **Rashtriya Gokul Mission:** It aims to develop and conserve indigenous breeds of bovine population. This is important to enhance milk production and to make it more remunerative to the farmers.
- **National Livestock Mission:** Its objective is to ensure quantitative and qualitative improvement in livestock production systems and capacity building of all stakeholders.
- **National Artificial Insemination Programme:** To suggest novel methods of bringing about impregnation in female breeds. Also, to prevent the spread of certain diseases which are genital in nature, thereby enhancing the efficiency of the breed.
- **National Cattle and Buffalo Breeding Project**: To genetically upgrade important indigenous breeds on priority basis with a focus on development and conservation.
- **Animal Husbandry Startup Grand Challenge:** To appreciate innovations coming from the villages to expand the dairy sector in India.

6. **இந்தியாவின் வறட்சிப் பகுதிகளில் வறண்ட நில விவசாயத்தின் முக்கியத்துவம் குறித்து விவாதிக்க.**

Discuss the importance of dry land farming in drought-prone regions of India.

- Dryland or dry farming is a cultivation method used in drought-prone areas having rainfall less than 75 cm annually.

Dryland areas include:

- Areas having low rainfall of less than 75 cm annually
- Arid Region
- Semi-arid region
- Sub Humid region
- Uncertain or erratic rainfall areas
- No assured irrigation

Dryland areas in India:

- Rajasthan, Saurashtra region of Gujarat, Marathwada, and Vidarbha region of Maharashtra, Bundelkhand, most part of northern and central Indian, Deccan plateau and rain shadow zone of Western Ghats.

Dryland techniques to reduce evaporation:

- Timely sowing of seed when has enough moisture in soils.
- Mulching

- Weed control
- Shelterbelt along field

Significance of dry farming in drought-prone areas:

- 75 % of farmers are in dryland areas are small and marginal farmers and they are doing subsistence agriculture
- It is the source of the larger portion of agriculture employability
- The majority of crops such as Bajra, Maize, Ragi, Oilseed, Jowar, and Cotton, 30 % of total rice production are done through dry farming methods.
- Dry farming is needed in drought-prone areas to stop desertification.

Challenges:

- Low and uncertain rainfall leads to crop failure
- Larger maturity duration crops are not suitable in the dry region resulting in poor yield
- Poor nitrogen and phosphorous contents in drought-prone areas.

7. இந்தியாவின் மறைந்து வரும் இன மொழியியல் பன்முகத்தன்மையை விமர்சன ரீதியாக மதிப்பிடுக.

Critically assess the vanishing ethnic linguistic plurality of India.

- India is one of unique countries in the world that has the legacy of diversity of languages. The Vice President of India recently inaugurated an online webinar on "Knowledge Creation: Mother Tongue" organized by the Department of Telugu, University of Hyderabad and the Telugu Academy. While observing that language was the lifeline of a civilization, he said it denotes the identity, culture and traditions of the people. It plays an important role in preserving music, dance, customs, festivals, traditional knowledge and heritage. He also stressed the need for giving a special thrust to the respective official language by every State Government.

Linguistic diversity in India:

- The rich demographic mixture of India can be gauged from the fact that it has 28 states and 9 union territories.
- Each State has its own commonly spoken language, and the spoken dialect of the language can change every hundred kilometers.
- Multilingualism is the way of life in India as people in different parts of the country speak more than one language from their birth and learns additional languages during their life time.

- According to the Census of India (2011), there are 121 languages spoken across India.
- Out of these, 22 are scheduled languages, which can be given official status by respective states or be used to conduct administrative work or used in the state legislature; the remaining 99 languages have the status of non-scheduled languages.
- The two official languages of India (federal government) are Hindi and English, while the states have the authority to designate their own official language.
- Though officially there are 122 languages, Peoples Linguistic Survey of India has identified 780 languages, of which 50 are extinct in past five decades.
- The twenty-two languages that are recognised by the Constitution are: Assamese, Bengali, Bodo, Dogri, Gujarati, Hindi, Kashmiri, Kannada, Konkani, Maithili, Malayalam, Manipuri, Marathi, Nepali, Oriya, Punjabi, Sanskrit, Santhali, Sindhi, Tamil, Telugu and Urdu are included in the Eighth Schedule of the constitution.
- 14 of these scheduled languages have more than 10 million speakers each. To put this figure into perspective, the population of some countries, e.g. Norway is much less than 10 million.
- There are around 528 million Hindi speakers, while there are 3 million speakers of Odiya and 1.4 million speakers of Bodo.
- Tamil (declared in 2004), Sanskrit (2005), Kannada (2008), Telugu (2008), Malayalam (2013), and Odia (2014) have been recognised as classical languages with special status and recognition by Government of India.
- The classical languages have written and oral history of more than 1000 years. In comparison to these, English is very young as it has the history of only 300 years.
- Rabindranath Tagore once said “If God had so wished, he could have made all the Indians speak one language, the unity of India has been and shall always be a unity in diversity.”
- There are many more languages that are spoken in India, and astonishingly all these languages further have numerous dialects.

Challenges faced by the linguistic diversity:

- Acquaintance with different languages and dialects enriches the power of expression of an individual or society. Every language has its own qualities. For example, if the softness of Urdu captivates the soul of an individual, Rajasthani generates a different kind of charm.
- When attempts are made to make a language dominate over other languages, it will adversely affect the creativity in vernacular languages and disappoint the common folk.
- In a country where people happen to be very sensitive and sentimental towards the use of their language, any attempt to play with the dignity of any dialect or regional language could compel the authorities to walk on hot bricks.
- Imposition of any language over this linguistic heritage will definitely destroy our cultural and historical melodies.
- This is also noteworthy that the UN has already expressed its concern over the vanishing of several local scripts and languages.
- We are lucky enough to have most of our regional languages and dialects intact enough, but any attempt to damage them will ruin our cultural riches.

8. **வயது பாலின பிரமிடுகள் மற்றும் அதன் வகைகளை விளக்குக.**

Explain age sex pyramids and its types.

- A population pyramid is the graphical representation of the distribution of the population by sex, and age group. It takes the shape of a pyramid when the population is growing. Population pyramids are also known as age pyramids because it is a graphical representation of age.

Structure of age sex pyramids:

- A population pyramid is a graphical representation that demonstrates the distribution of ages across a population.
- It is divided from the centre between male and female individuals. The males are shown on the left side and the females are on the right side from the centre of the graph.
- The population size is shown on the x-axis and ages are shown on the y-axis.

Types of age sex pyramids:

- There are mainly three types of the population pyramid or population graphs

- Expansive
- Stationary
- Constrictive

Expansive Pyramid:

- These types of pyramids have a much larger population of pre-reproductive and reproductive age groups and a population of post-reproductive age groups is very less compared to pre-reproductive and reproductive age groups.
- These types of pyramids are seen in developing countries. Here in these countries, the fertility rate is usually high but life expectancy is very less. So, the base of the pyramid is wide and tapers towards the top with a triangular shape.
- Examples of countries having expansive pyramids are India and Nigeria.

Stationary Population Pyramid:

- Stationary population pyramids have an equal population in each group. That's why the name stationary means the birth and death rates are equal and the population is neither increasing nor decreasing. There are usually not any major changes in the mortality rate and fertility rates.
- The shape of this pyramid is bell-shaped.
- These types of pyramids are generally of the developed countries such as America.

Constrictive Population Pyramid:

- As the name it suggests that the population is decreasing here, these types of pyramids show declining birth rates, low fertility rates, high life expectancy, and low mortality rates.
- These graphs are narrow at the base and show the decreasing size of the population. These graphs are urn-shaped.
- Here the post-reproductive and elderly population is more than the pre-reproductive and reproductive population.
- This type of graph is seen in Japan.

Uses of the Population Pyramid:

- There are various uses of the population pyramid.
- It tells about the composition of the population of any particular area.
- It tells about the number of dependent individuals (Children, elderly people) in any area.
- It also tells us about the difference in sexes of any given area.

- It also tells about the mortality rate and fertility rate.
- Use to find data on the future growth of the population.
- Only 10% of the world's population lives in the southern hemispheres.
- The size of the European population is decreasing and the size of the African population is increasing.
- If every female in the world received secondary schooling, the population could be 3 billion shorts by 2050.

9. **பவளப்பாறைகள் உருவாவதற்கான சாதகமான சூழ்நிலைகள் குறித்து விவாதிக்க.**

Discuss the ideal conditions for formation of coral Reefs.

- Corals are a kind of calcareous rock, chiefly made of the skeletons of minute sea organisms called polyps. Coral reefs and atolls are formed due to the accumulation and compaction of the skeletons of these lime secreting organisms. They form one of the most diverse and productive marine ecosystems on earth housing tens of thousands of marine species.

The ideal conditions for formation of coral reefs:

- **Sunlight:** Corals need to grow in shallow water where sunlight can reach them. Corals depend on the *zooxanthellae* (algae) that grow inside of them for oxygen and other things and since these algae need sunlight to survive, corals also need sunlight to survive. Corals rarely develop in water deeper than 50 meters.
- **Clear water:** Corals need clear water that lets sunlight through. They don't thrive well when the water is opaque. Sediment and plankton can cloud water, which decreases the amount of sunlight that reaches the zooxanthellae.
- **Warm water temperature**: Reef-building corals require warm water conditions to survive. Different corals living in different regions can withstand various temperature fluctuations. However, corals generally live in water temperatures of 20–32° C.
- **Clean water:** Corals are sensitive to pollution and sediments. Sediment can create cloudy water and be deposited on corals, blocking out the sun and harming the polyps. Wastewater discharged into the ocean near the reef can contain too many nutrients that cause seaweeds to overgrow the reef.

- **Saltwater:** Corals need saltwater to survive and require a certain balance in the ratio of salt to water. This is why corals don't live in areas where rivers drain fresh water into the ocean i.e. the estuaries.
- **Abundant Plankton:** Adequate supply of oxygen and microscopic marine food, called phytoplankton, is essential for growth. As the plankton is more abundant on the seaward side, corals grow rapidly on the seaward side.

Absent on west coast of tropical continents:

- **Shallow water:** Coral require fairly good amount of sunlight to survive. The ideal depths for coral growth are 45 m to 55 m below sea surface, where there is abundant sunlight available.
- **Clear salt water:** Clear salt water is suitable for coral growth, while both fresh water and highly saline water are harmful.
- **Abundant Plankton:** Adequate supply of oxygen and microscopic marine food, called plankton [phytoplankton], is essential for growth. As the plankton is more abundant on the seaward side, corals grow rapidly on the seaward side.
- **Little or no pollution:** Corals are highly fragile and are vulnerable to climate change and pollution and even a minute increase in marine pollution can be catastrophic.

Impact of global warming:

- **Coral bleaching:** A warming ocean causes thermal stress that contributes to coral bleaching and infectious disease. Photosynthesis pathways in zooxanthellae are also impaired leading to coral bleaching.
- **Smothering of corals:** Sea level rise may lead to increases in sedimentation for reefs located near land-based sources of sediment. Sedimentation runoff can lead to the smothering of coral.
- **Destruction:** Changes in storm patterns leads to stronger and more frequent storms that can cause the destruction of coral reefs.
- **Impact coral growth:** Changes in precipitation, increased runoff of freshwater, sediment, and land-based pollutants contribute to algal blooms and cause murky water conditions that reduce light and thus inhibit coral growth.
- **Hampers dispersal:** Altered ocean currents leads to changes in connectivity and temperature regimes that contribute to lack of food for corals and hampers dispersal of coral larvae.

- **Death of corals:** Ocean acidification (a result of increased CO2) causes a reduction in pH levels. It leads to dissolution of calcium carbonates which form the skeletons of coral.

10. **புவியியல் தகவல் அமைப்பு என்றால் என்ன? மேலும் அதன் கூறுகள் மற்றும் செயல்பாடுகளை விளக்குக.**

What is geographical information system? and explain its components and functions.

- It is a computing system known as a geographical information system used for different purposes related to checking positions on earth's surfaces, such as: displaying data, storing, checking and capturing.
- 'Father of GIS' - Robert Tomlinson

Components of GIS:

- GIS Components are the primary function to perform geospatial analysis. Geographic information integrates hardware, software, data capturing, managing, analyzing, and displaying all forms of geographically referenced information.

Hardware:

- Hardware is the computer system on which a operate **GIS software**. They attached it to a disk drive storage unit, used for storing data and runs a program.

The Main Hardware components are:

- Motherboard
- Processor
- RAM
- Hard Disk
- Graphics
- Monitor

Software:

- GIS software is a major function of research, analysis, and display geographic information. GIS Tools help to query, edit, run and display **GIS data**. Some **GIS softwares** are; **ArcGIS, QGIS, AutoCAD Map**

The Software components are:

- GIS Tools
- DBMS (Database Management System)
- GUI (Graphical User Interface)

- Query Tools

Data:

- The most important component of GIS is the Data. A GIS will integrate spatial data with other data resources and can even use a DBMS. GIS data is a combination of spatial and tabular data or **Attribute Data**. Spatial can be **Vector** and **Raster**.

People/user:

- People are user of Geographic Information System, they can be handle all the tasks in GIS software. Users can maintain to design and technical specification. It has limited value without the people who manage the system and develop plans for applying it to real-world problems. GIS user is called GIS Analyst or Engineer.

Procedure/method:

- Procedure is more related to the management aspect of GIS. It's referred to lines of reporting, control points, and other mechanism for ensuring the high quality of GIS. A successful GIS operates, which are the models and operating practices unique, well-designed and business rules to each organization. The procedures used to input, analyze, and query data determine the quality and validity of the final product.

Functions of the GIS are listed below:

- Navigation (Routing and Scheduling)
- Surveying
- GIS Applications in Geology
- GIS for Planning and Community Development
- Tourism Information System
- Worldwide Earthquake Information System
- Energy Use Tracking and Planning
- GIS for Fisheries and Ocean Industries
- Traffic Density Studies
- Space Utilization
- Development of Public Infrastructure Facilities
- Location Identification
- River Crossing Site Selection for Bridges
- Regional Planning
- Municipal Infrastructure
- Regional Planning

- Tax Management
- Emergency Services
- Oil Spill Impacts
- Wastewater Management
- Water Quality Management
- Air Emissions
- Hazard Analysis
- Forestry Management
- Population Planning
- Habit Characterization
- Urban Development Planning
- Government uses
- Industrial & Commercial uses
- Business purposes
- Agricultural purposes
- Service purposes
- Social purposes

11. மக்கள்தொகை இடம்பெயர்வுக்கான காரணங்கள் மற்றும் விளைவுகளை விளக்குக.

Explain the causes and consequences of population migration.

- The **International Organization for Migration** (The **United Nations** Migration Agency) defines a migrant as any person who is moving or has moved across an international border or within a state away from his/her habitual place of residence.

Causes:

- **Employment:** Basic reasons for intrastate, interstate (migration from rural to urban areas, urban to urban areas) and external migration can be attributed to the search for better employment in industries, trade, transport, and services.
- **Seasonal Migration:** People seasonally migrate for employment in different areas and different industries.
- For example, significant numbers of people from drought-prone regions migrate seasonally to work in brickmaking, construction, tile factories, and agricultural work.

- **Circular Migration or Repeat Migration** is the temporary and usually repetitive movement of a migrant worker between home and host areas, typically for the purpose of employment.
- **Education:** Due to the lack of educational facilities at their place of residence, people migrate to urban areas in case of internal migration and other countries in the case of international migration for better academic opportunities. By 2020, India will become the world's largest pool of young people, in contrast, there is a lack of opportunities for employment in India, this leads to the emigration of qualified people.
- **Lack of security:** Political disturbances and inter-ethnic conflicts are also one of the reasons for internal and external migration. There can also be forced displacement due to reasons like wars, and internal political instability.
- **Marriage:** Marriage is one important social factor for internal migration and in case of intra-state migrants majority of the migration is from one rural area to another, due to marriage in the case of females.
- **Environmental and Disaster-Induced Factors:** There are migrants who are forced to move from rural to urban areas or from one country to another as a result of an environmental disaster in the form of drought, floods, heatwaves etc, that might have destroyed their homes and farms.

Consequences:

Positive Consequences:

- **Labour Demand and Supply:** Migration fills gaps in demand for and supply of labour, efficiently allocates skilled labour, unskilled labour, and cheap labour.
- **Economic Remittances:** Economic wellbeing of migrants provides insurance against risks to households in the areas of origin, increases consumer expenditure and investment in health, education and assets formation.
- **Skill Development:** Migration enhances the knowledge and skills of migrants through exposure and interaction with the outside world.
- **Quality of Life:** Migration enhances chances of employment and economic prosperity which in turn improves quality of life. The migrants also send extra income and remittance back home, thereby positively impacting their native place.

- **Social Remittances:** Migration helps to improve the social life of migrants, as they learn about new cultures, customs, and languages which helps to improve brotherhood among people and ensures greater equality and tolerance.
- **Food and Nutrition Security:** According to the 2018 State of Food and Agriculture report by Food and Agriculture Organisation (FAO), outmigration often leads to improved food and nutrition security for migrants.
- **Demographic Advantage:** As a result of outmigration, the population density of the place of origin is reduced and the birth rate decreases.
- **Climate Change Adaptive Mechanism:** Migration has also emerged as a possible adaptive mechanism in the context of climate change and the occurrence of extreme weather events like floods, droughts, and cyclones.

Negative Impact:

- **Demographic Profile:** Emigration in large numbers can alter demographic profiles of communities, as most of the young men move out, leaving only the women and elderly to work on the land.
- **Political Exclusion:** Migrant workers are deprived of many opportunities to exercise their political rights like the right to vote.
- **Population Explosion and the Influx** of workers in the place of destination increases competition for the job, houses, school facilities etc and a large population puts too much pressure on natural resources, amenities, and services.
- **Illiterate and Under skilled Migrants** are not only unfit for most jobs, because of a lack of basic knowledge and life skills but are also prone to the victimization of **exploitation, trafficking, psychological abuse,** and gender-based violence in the case of female migrants.
- **Increased Slum:** Mass Migration results into an increase in slum areas, compromising quality of infrastructure and life at the destination, which further translates into many other problems such as unhygienic conditions, crime, pollution, etc.
- **Brain Drain:** Source state suffers from the loss of human capital.

12.அலைகளின் வகைகள் மற்றும் உருவாக்கம் ஆகியவற்றை விளக்குக.

Explain types and formation of tides.

- **Tides** are the rise and fall of seawater caused by the sun and moon's gravitational influences. Tides are primarily **formed** by the earth's and moon's centrifugal and centripetal forces.

Formation of Tides:

- The **gravitational pull** exerted on the Earth by the Sun and the Moon causes tides to form.
- The gravitational pull exerted on the Earth by the Sun and the Moon causes tides to form.
- The Sun's gravitational pull is significantly greater than the Moon's, and this difference is crucial in the formation of tides.
- Tides are classified as either high or low, depending on the size and position of the Sun and Moon.

Types of Tides:

Based on Frequency:

Semi-Diurnal Tides:

- Each day, a semi-diurnal tidal cycle has two almost equal high tides and two low tides.
- The time between high and low tides is around 12 hours and 25 minutes.
- The Indian Ocean is home to the most Semi-Diurnal Tides.
- The following are some of the most common coasts where semidiurnal tides occur: Eastern African Coast and Bay of Bengal.

Diurnal Tides:

- It amounts to four times per day.
- The sun produces two tides, while the moon produces two.
- The tide of Spring It's a very high tide brought on by the Sun's complementary role in relation to the moon.
- In a gravitational system, **syzygy** is the almost straight-line alignment of three celestial bodies (such as the sun, moon, and earth during a solar or lunar eclipse).
- There are two types of syzygy namely
- **Conjunction:** When the moon and the sun are on the same side, it is called a conjunction.
- **Opposition:** When the moon and the sun are on opposite sides of the sky. The magnitude of the tide will be the same in both of these situations.

Mixed Tides:

- The **mixed tidal cycle**, or simply mixed tide, is formed by a tidal cycle with two unequal high and low tides.
- There are semi-diurnal and diurnal oscillations in this tidal cycle.
- It can be found all throughout the Gulf of Mexico and the Caribbean Sea.
- Mixed tides can also be found along the Brazilian coast in the southeast.

Based on the Position of Earth, Sun, and the Moon:

Spring Tides:

- When the sun and the moon are in alignment, spring tides form, pulling the water surface in the same direction.
- A spring tide occurs when high tides are higher and low tides are lower as a result of this. It happens twice in a lunar month.
- The term '**King Tide**' has also been given to it.

Neap Tides:

- Seven days following the spring tide, it occurs.
- The fact that the sun and the moon are at a right angle to each other is the most noticeable feature.
- The first and last quarters of the moon are when this tide happens.
- The moon's gravitational pull and accompanying oceanic bulge are cancelled out by the sun's gravitational pull and resulting oceanic bulge.
- In addition, in neap tides, the high tides are 'lower' and the low tides are 'higher' than in spring tides.

13. **தகுந்த உதாரணத்தை மேற்கோள் காட்டி கடல் வளங்களின் பொருளாதார முக்கியத்துவம் குறித்து விவாதிக்க.**

Discuss the economic importance of marine resources by citing suitable example.

- Marine resources are comprised of Continental shelf, seawater, marine minerals such as polymetallic nodules, marine food, marine energy such as offshore oil and gas and tidal energy, marine tourism, marine port, strategic position, and many more.
- As per the latest report of earth science, 4.1 % of India's GDP comes directly from marine resources.

Example:

- **Fishery:** Marine fisheries wealth around Indian coastline is estimated to have an annual harvestable potential of 4.4 million metric tonnes.

- **Minerals:** Indian Ocean contain vast amount of minerals, including the cobalt, zinc, manganese and rare earth materials. These minerals are needed for electronic industry to make smart phones, laptops and car components etc. This can help Make in India initiative.
- **Energy resources:** The main energy resources present in Indian Ocean are petroleum and gas hydrates. Petroleum products mainly includes the oil produced from offshore regions. Gas hydrates are unusually compact chemical structures made of water and natural gas.
- **Salts:** Seawater contain economically useful salts such as gypsum and common salt. Gypsum is useful in various industries.
- **Manganese Nodules and Crusts:** Manganese nodules contain significant concentrations of manganese, iron and copper, nickel, and cobalt all of which have a numerous economic use.

Importance of these resources in Indian socio-economic progress:

- **Sustainable development:** Marine resources from Indian Ocean can serve as the backbone of India's economic growth and can help India to become a 5 trillion dollar economy by 2022. Blue economy, through sustainable use of oceans, has great potential for boosting the economic growth.
- **Employment generation:** It will provide jobs, improved livelihoods to many. This will help in inclusive growth. E.g improving fishery resources exploitation can provide livelihood to many.
- **Food security:** It will lead to food security through fishery sector and other sea food resources. It would also help in reducing malnutrition issue in India as fishes are good source of nutrition.
- **Energy security:** It will help in diversification of energy resources and will provide new resources for energy e.g. gas hydrates.
- **Efficient transportation and logistics:** Indian Ocean is a major gateway of trade with 80% of global oil trade happening through it. Better connectivity in the region will significantly cut the transport cost and will reduce logistics inefficiencies.
- **Women empowerment:** It will help in women empowerment especially fishery sector by providing them jobs. As these jobs do not require high skills, women will find it easy to earn a livelihood.

- **Climate Change:** Oceans provide an alternate and cleaner source of energy. It also acts as an important carbon sink. This will help in mitigating climate change.

பிரிவு - ஆ

SECTION - B

(10x 15 = 150)

14. தமிழ்நாட்டின் பல்வேறு புவியியல் அடையாளங்களின் பொருளாதார முக்கியத்துவத்தை விளக்குக.

Explain the economic importance of various geographical landmarks in Tamil Nadu.

- Tamil Nadu has the largest tourism industry in India with a percentage share of 21.31% and 21.86% of domestic and foreign tourist visits in the country. According to the 2020 Ministry of Tourism report, the number of domestic arrivals was at 494.8 million making the state the second most popular tourist destination in the country, and foreign arrivals numbered 6.86 million, the highest in the country, making it the most popular state for tourism in the country.
- Tamil Nadu is well renowned for its temple towns and heritage sites, hill stations, waterfalls, national parks, local cuisine, natural environment and wildlife.

Economic importance of various geographical land marks in Tamil Nadu (Tourism):

Chennai:

- Chennai formerly known as Madras, is the capital city of the state, and India's fourth-largest metropolis. The city is known for its beaches, ancient Tamil architecture, Anglo-Indian architecture, cultural festivals and is India's largest shopping destination. Chennai is seen as the gateway to Southern India and is well connected to all parts of India by road, rail and air.

Madurai:

- It is also called Temple city, Athens of East, City of Junctions, City of Festival, Jasmine city, Sleepless city (Thoonga Nagaram).
    - **Meenakshi Temple** - At least 15,000 visitors visit these temples regularly which include both Indians and Foreigners
    - **Thirumalai Nayak Mahal** - The palace is a testament to the Indian art and architecture. There are 248 pillars in the palace, each 58 feet tall

and 5 feet in diameter. The paintings in the palace reflect the art of painting prevailed in the 16th century. Only a part of the largest palace is allowed for sightseeing.

Tiruchirappalli:

- Historical monuments in Tiruchirappalli include the Rockfort, the Ranganathaswamy Temple, Srirangam and the Jambukeswarar Temple, Thiruvanaikaval

Vellore:

- Vellore has historic Vellore Fort and buildings, Government Museum, Science Park, Religious Places like Jalakandeswarar Temple, Srilakshmi Golden Temple, Big Mosque and St. Johns church, Amirthi Zoological Park and Yelagiri Hill station are the among top tourist attractions in and around Vellore City.

UNESCO world heritage site:

- Brihadeeswarar Temple, Thanjavur
- **Group of Monuments in Mahabalipuram**
    - Ratha Temples: Temples in the form of chariots.
    - The 11 Mandapas: Cave sanctuaries dedicated to various deities.
    - Rock Reliefs that include Descent of the Ganges and the Arjuna's Penance.
    - The Shore Temple and the other temples cut out of rock.
    - The Seven Pagodas
        - **Aairam jannal veedu – Karaikudi**
        - **The Nilgiri Mountain Railway**

Hill stations:

- Udagamandalam
- Valparai
- Meghamalai
- Yercaud
- Kolli Hills
- Coonoor

Reasons, Why Tourism Is Important?

- Revenue
- Job Creation
- Cultural Preservation
- Infrastructure Development

- Improved Quality of Life
- Tourism impacts GDP growth
- Tourism is good for rural areas
- Tourism encourages conservation

15. **உலகின் அதிக மக்கள்தொகை கொண்ட நாடாக சீனாவை இந்தியா முந்தியதன் விளைவுகள் குறித்து விவாதிக்க மேலும் பெரும் மக்கள் தொகையை மனித வளமாக மாற்றுவதில் இந்தியாவின் வாய்ப்புகள் மற்றும் சிரமங்களை விளக்குக.**

Discuss the effects of India overtaking China as the world's most populous nation. Explain India's opportunities and difficulties in turning such a big population into a human resource.

- India has overtaken China as the world's most populous nation, according to UN data released Wednesday.
- India's population surpassed 1.428 billion, slightly higher than China's 1.425 billion people, news agency Bloomberg reported the UN's World Population dashboard as saying.
- According to a new UNFPA report, 25 per cent of India's population is in the age group of 0-14 years, 18 per cent in the 10 to 19 age group, 26 per cent in the age bracket of 10 to 24 years, 68 per cent in 15 to 64 years age group, and 7 per cent above 65 years.
- Estimates by different agencies have suggested that India's population is expected to keep rising for nearly three decades before it peaks at 165 crore and then would start declining.
- The United States is a distant third, with an estimated population of 340 million, the data showed in a report that reflects information available until February.
- Population experts using previous data from the UN have projected India would surpass China this month, but the global body's latest report did not specify a date.
- UN population officials have said it was not possible to specify a date because of uncertainty about the data from India and China, as India's last census was held in 2011 and the next, due in 2021, was delayed by the COVID-19 pandemic.
- Although both nations will account for more than a third of the estimated global population of 8.045 billion, population growth in both has been slowing, albeit much faster in China than India.

- The burgeoning population will add urgency for Prime Minister Narendra Modi's government to create employment for the millions of people entering the workforce as the nation moves away from farm jobs. India, where half the population is under the age of 30, is set to be the world's fastest-growing major economy in the coming years.
- Asia's third-largest economy is now home to nearly a fifth of humanity - greater than the entire population of Europe or Africa or the Americas.
- While this is also true for China for now, that's expected to change as India's population is forecast to keep ticking up and touch 1.668 billion by 2050 when China's population contracts to about 1.317 billion.

Advantage from the Demographic Dividend:

- **Increase in Fiscal Space:** Fiscal resources can be diverted **from spending on children to investing in modern physical and human infrastructure** that will increase economic sustainability of India.
- **Rise in Workforce:** With more than **65% of the working age population,** India can rise as an economic superpower, supplying more than half of Asia's potential workforce over the coming decades.
- **Increase in the** Labour Force that enhances the productivity of the economy.
- **Rise in** Women's Workforce that naturally accompanies a **decline in fertility,** and which can be a new source of growth.

Challenges Associated with Demographic Dividend in India:

- **Unfulfilled Educational Requirements**: While over 95% of India's children attend primary school, the **National Family Health Surveys** confirms that **poor infrastructure in government schools, malnutrition, and scarcity of trained teachers** have resulted in poor learning outcomes.
- The **gender inequality in education** is a concern as in India, boys are more likely to be enrolled in secondary and tertiary school than girls.
- **However, in the Philippines, China and Thailand, it is the reverse and in Japan, South Korea, and Indonesia, the gender differences are rather minimal.**
- **Low Human Development Parameters:** India ranked at **131st position by the** United Nations Development Programme (UNDP) **Human Development Index 2020,** which is alarming.

- Therefore, **health and education parameters need to be improved** substantially to **make the Indian workforce efficient and skilled.**
- **Jobless Growth:** There is mounting concern that future growth could turn out to be jobless due to **de-industrialization**, **de-globalization**, and **the industrial revolution 4.0.**
- As per the **NSSO Periodic Labour Force Survey 2017-18**, India's labour force participation rate for the age-group 15-59 years is around 53%, that is, around **half of the working age population is jobless.**
- The **informal nature of the economy** in India is another hurdle in reaping the benefits of demographic transition in India.

Absence of Proper Policies:

- Without proper policies, the increase in the working-age population may lead to rising unemployment, fueling economic and social risks.
- **Rise in the Share of Elderly Population:** A greater proportion of youth at present will result in a greater proportion of elderly in the population in future.
- This will create a **demand for better healthcare facilities and development of welfare schemes/programmes** for elderly people.
- People, typically in **informal employment**, don't have **social security**, it will add burden to the respective state.

16. இந்தியப் பெருங்கடலின் கீழ் நிலப்பரப்பு பற்றிய விரிவான குறிப்பு தருக.
Give a detailed account of bottom relief features of the Indian Ocean.

- The Indian Ocean is smaller than the Pacific and Atlantic Ocean in areal extent and is bounded by, on all of its sides, Asia in the north, Africa in the west, Asia in the east, Australia in the south-east and Antarctica in the south.
- The ocean has contact with the Pacific and the Atlantic oceans in the south near Antarctica.
- The average depth of the ocean is 4000m.
- Major parts of the coastal lands of the Indian Ocean formed by the block mountains of Gondwanaland are compact and solid.
- The coasts of the East Indes are bordered by fold mountain chains.
- The marginal seas are less in number than the Pacific and the Atlantic oceans.

- Significant marginal seas are Mozambique Channel, Red Sea, Persian Gulf, Andman Sea, Arabian Sea, Bay of Bengal etc.
- Malgasy (Madagascar) and Sri Lanka are the big islands whereas Suqutra, Zanzibar, Comoro, Reunion, Secychelles, Prince Edwards, Crozet,
- Kerguelen, St. Paul, Rodriges, Maldive, Laccadive, Andman-Nicobar, Christmas etc. belong to the category of small and tiny islands.
- Indian subcontinent in the north divides the Indian Ocean into Arabian Sea and Bay of Bengal.
- The ocean widens in the south

The Indian Ocean is divided into 3 zones on the basis of regional characteristics:

- **The Western Zone** between African coast and the mid-Indian Oceanic Ridge has large number of islands and the average depth is 3650 m (2000 fathoms).
- **The Eastern Zone** is deepest of all the zones with average depth of 550 m (3000 fathoms). The continental shelves are narrow but have steep slopes.
- **The Central Zone** represents the mid-oceanic ridge where many tiny islands are located.

Continental Shelf:

- There is wide range of variation in the continental shelves of the Indian Ocean.
- Quite extensive shelves are found along the margins of Arabian Sea and Bay of Bengal.
- Similarly, extensive shelves are observed along the eastern coast of Africa and around Madagascar which is itself located on the continental shelves.
- On an average, the continental shelves are very wide (640 km) in the west whereas these are narrow (160 km) along the coast of Java and Sumatra.
- These become further narrow along the northern coast of Antarctica.

Mid-Oceanic Ridge:

- The central ridge or mid-oceanic ridge known as Mid-Indian Oceanic Ridge extends from the southern tip of Indian Peninsula in the north to Antarctica in the south almost in north-south direction and forms a continuous chain of highlands.
- Wherever the central ridge or its branches emerge above the sea level, islands are formed.

- The main central ridge starts from the continental shelf of the southern tip of Indian Peninsisula with average width of 320 km.
- This part of the ridge is known as Laccadive-Chagos Rigde (also known as Maldive Ridge).
- The ridge further extends southward and widens near equator. It is called Chagos- St. Paul Ridge between equator and 30°S latitude where the average width becomes 320 km.
- The ridge further widens to 1,600 km between 30°S and 50°S latitudes and is known as Amsterdam-St Paul Plateau.
- The central ridge bifurcates to the south of 50°S latitude.
- The western branch known as Kerguelen-Gaussberg ridge extends in NW-SE direction between 48°S and 63°S and the eastern branch is known as Indian-Antarctic Ridge.

Ocean Basins:

- The mid-Indian Oceanic Ridge divides the Indian Ocean into two major basins-the eastern and the western basins. These basins are further divided into sub-basins by the branches of the central ridge.
- **Oman basin** faces the Gulf of Oman and is spread over the extensive continental shelf with average depth of 3,658 m.
- **Arabian basin** is located in almost circular shape between Laccadive-Chagos ridge and Socotra – Chagos Ridge with the depth of 3,600m – 5,486m.
- **Somali basin** is bordered by Socotra – Chagos ridge in the north-west. Central Ridge in the east, Seychelles – Mauritius Ridge in the south-west and African coast in the west. The average depth is 3,600m.
- **Mauritius basin** is located between S.W. Indian Ridge and South Madagascar Ridge and extends from 20°S to 40°S latitude. The depth varies between 3,600m and 5,486 m. The deepest part measures 6,391 m depth.
- **Mascarene basin** of oval shape extends between Madagascar and Seychelles – Mauritius Ridge.
- **Agulhas-Natal basin** is an elongated basin which is bordered by Madagascar ridge in the north and north-east, Prince Edward Crozet Ridge in the east and the S.E. African coast in the west and north-west, Average depth is 3,600m.

- **Atlantic- Indian – Antarctic basin** is in fact the eastward continuation of Atlantic – Antarctic Basin. It stretches upto 70°E longitude and is bordered by Prince Edward Crozet Ridge in the north, Antarctica in the south and Kerguelen Gassberg Ridge in the north-east. Average depth is 3,600m.
- **Eastern Indian-Antarctic basin** is located between Amsterdam – St. Paul Plateau and Indian-Antarctic Ridge in the north and north-east and Antarctica in the south. The depth varies from 3,600m to 4,800m. Kerguelen – Gassberg Ridge separates the basin from the Atlantic – Indian-Antarctic Basin.
- **West Australian basin** is the most extensive basin and forms rectangular shape surrounded by S.E. Indian Ridge in the south – west, Ninety East Ridge in the west, continental shelves of Java-Sumatra in the northeast and the continental shelf of west Australia, Average depth varies from 3,600m to 6,100m but the central part of the basin is 6,459 m deep.
- **Mid-Indian basin** is bordered by the central ridge in the west and the south-west, by Ninety East Ridge in the east and by the Bengal plateau in the north. The average depth of outer part ranges from 3,600m to 6,800m while the depth of the central part of the basin ranges between 4,800m and 6,100m.

Deeps and Trenches:

- There are very few deeps and trenches in the Indian Ocean. About 60 per cent of the Ocean consists of deep-sea plains with depth ranging from 3,600m to 5,487m.
- Important deep-sea plains are Somali Abyssal plain.
- Ceylon (Sri Lanka) Abyssal plain, Indian Abyssal Plain, (4,380m) etc.
- Significant trenches are Java or Sunda Trench (7,450m deep), Ob Trench (6,875m deep), Mauritius Trench, Amirante Trench etc.

17. இந்தியாவின் பல மாநிலங்களில் மாற்று நிலைக்குக் கீழே மொத்த கருவுறுதல் விகிதம் குறைவது நாட்டின் எதிர்கால மக்கள்தொகை கட்டமைப்பை எவ்வாறு பாதிக்கும்?

How would a decline in the total fertility rate below the replacement level in many states of India affect the future population structure of the country?

- **Total fertility rate (TFR)** in simple terms refers to the **total number of children born or likely to be born to a woman in her lifetime** if she were subject to the prevailing rate of age-specific fertility in the population.
- TFR of about **2.1 children per woman** is called **Replacement-level fertility**. TFR **lower than 2.1** children per woman - indicates that a **generation is not producing enough children to replace itself**, eventually leading to an outright reduction in population.

Declining Trend of TFR:

- Due to the **sustained family planning programme** spanning decades, the TFR, has declined further from 2.2 reported in 2015-16 to **2.0 at the all-India level.**
- The **TFR is at 1.6 in urban areas and 2.1 in rural India.**
- The total fertility rate, was as high as **6 or more in 1950s**
- It is a very huge development because of maternal and child health improvement.

Reasons for Decline in TFR:

- **Women Empowerment:** The latest data also show significant **progress** on several indicators **related to fertility, family planning, age at marriage and women's empowerment** - all of which have contributed to the decrease in TFR.
- **Contraceptives:** Also, there has been a significant increase in current use of any modern contraceptive method.
- **Contraceptive Prevalence Rate** has increased substantially from 54% to 67% at the all-India level.
- **Reversible Spacing:** Introduction of new **reversible spacing (gaps between children) methods**, wage compensation systems to undergo sterilisation, and the promotion of small family norms also worked well over the years.
- **Government Efforts**: India has for long been working on population control. In fact, **India was the first country to launch a national-level**

family planning programme and the encouraging results that we see now are due to sustained, concerted efforts put together by the Centre, and the state governments.

Significance of Declining TFR:

- **Population Stabilisation**: TFR of 2 is a "definite indicator" of **stability of population in the long term in the country.** A TFR of 2.1 is something a country wants to achieve.
- A fall to 2 means India has achieved the goal of population stabilisation.
- It essentially means that India need not worry too much about a very large population being a challenge to our development.
- **Accelerated Economic Growth:** The younger population profile for the next 2-3 decades will provide an **opportunity for accelerated economic growth.**
- However, in order to leverage this great opportunity for accelerated development, **India should invest in public health and education with skills.**
- **Delayed Peak Population:** This also means we will possibly still become the most populous country in the world - it was expected somewhere between 2024-2028 but it will now be delayed.

Problems:

- **Increasing Female Sterilization:** The survey reveals that the uptake of female sterilisation has gone up to 38% against 36% in 2015-16.
- The **increase in female sterilisation shows that the onus of family planning remains with women,** with men not participating in the process and "shrugging responsibility",
- **Declining Sex Ratio**: India needs to give huge stress on declining sex ratios and the **discrimination towards girls** so that people don't have a high number of children in the hope of having a boy.
- **Concerns of Lower TFR:** TFR **lower than 2.1** children per woman - indicates that a **generation is not producing enough children to replace itself**, eventually leading to an outright reduction in population.
- Thus, TFR lower than 2 (as it is the case in urban areas in India) has its own set of problems. For example, Declining population will lead to an increase in the population of old aged people, as is happening in China.

Related Government Initiatives:

- **Prime Minister's Appeal:** During his **Independence Day Speech** in 2019, the Prime Minister appealed to the country that population control was a form of patriotism.
- **Mission Parivar Vikas:** The Government has launched Mission Parivar Vikas in 2017 for **substantially increasing access to contraceptives** and family planning services in146 high fertility districts with TFR of 3 and above in seven high focus states.
- **National Family Planning Indemnity Scheme (NFPIS):** This scheme was launched in the year 2005 under this scheme **clients are insured in the eventualities of death, complication and failure following sterilization.**
- **Compensation scheme for Sterilization Acceptors:** Under the scheme, the Ministry of Health and Family Welfare provides compensation for loss of wages to the beneficiary and also to the service provider (& team) for conducting sterilizations from the year 2014.

18. இந்தியாவின் செயற்கைக்கோள் வழிசெலுத்தல் அமைப்பில் ஐஆர்என்எஸ்எஸ் நேவிக் திட்டத்தின் பங்கினை விளக்குக.

Elucidate the role of IRNSS NavIC program on the satellite navigation system of India.

Indian Regional Navigation Satellite System (IRNSS): NavIC

- IRNSS is an independent regional navigation satellite system being developed by India. It is designed to provide accurate position information service to users in India as well as the region extending up to 1500 km from its boundary, which is its primary service area. An Extended Service Area lies between primary service area and area enclosed by the rectangle from Latitude 30 deg South to 50 deg North, Longitude 30 deg East to 130 deg East.
- IRNSS will provide two types of services, namely, Standard Positioning Service (SPS) which is provided to all the users and Restricted Service (RS), which is an encrypted service provided only to the authorised users. The IRNSS System is expected to provide a position accuracy of better than 20 m in the primary service area.

Background:

- In 2006, the project was approved by the Government of India and was expected to be completed and implemented by 2015-16.

- The constellations' first satellite (IRNSS-1A) was launched on 1st July 2013 and the seventh and final satellite (IRNSS-1G) was launched on 28th April 2016.
- With the last launch of the constellation's satellite (IRNSS-1G), **IRNSS was renamed Navigation Indian Constellation (NaVIC)** by India's Prime Minister.
- It consists of 8 satellites located at a distance of approximately 36,000 Km. Currently, 7 satellites are active.
- 3 satellites are in Geostationary Orbit (GEO)
- 5 satellites are in inclined Geosynchronous Orbit (GSO)

Role of IRNSS NavIC program :(ISRO)

Navigation:

- NavIC system is useful for Aerial, marines and terrestrial navigation infrastructure.

Maps:

- Charting, Plotting and Geodetic data capture should be done by NavIC technology.

Disaster Management:

- NavIC data will be useful during rescue operation taken by paramilitary forces.

Fleet Management and Vehicle Tracking:

- Important during mining and transport operations.

Mobile phone integration:

- Integration of mobile phones with NavIC act as function of Indian made GPS.

Precise timing:

- Useful for power grids and ATMs

Visual and voice navigation for drivers:

- Integration of NavIC with Artificial Intelligence provides visual and voice navigation for drivers.

Military purpose:

- NavIC can be useful for missile launching technology with precise target hitting capability.
- The Ministry of Road Transport and Highways has mandated that all national-permit vehicles must have such tracking devices. As a pilot,

many fishing boats have been fitted with these devices that have a unique texting facility.

19. கடல் நீரின் உப்புத்தன்மையைப் பாதிக்கும் காரணிகள் குறித்து விவாதித்து, வங்காள விரிகுடாவுடன் ஒப்பிடும்போது அரபிக்கடலில் அதிக உப்புத்தன்மை இருப்பதற்கான காரணத்தை விளக்குக.

Discuss the factors affecting salinity of ocean water and explain the reason for High salinity of Arabian sea comparing with Bay of Bengal.

- Salinity is the term used to define the total content of dissolved salts in sea water.
- It is calculated as the amount of salt (in gm) dissolved in 1,000 gm (1 kg) of seawater.
- It is usually expressed as parts per thousand or ppt.

Share of different salts is as shown below

- Sodium chloride - 77.7%
- Magnesium chloride -10.9%
- Magnesium sulphate -4.7%
- Calcium sulphate -3.6%
- Potassium sulphate -2.5%

Factors affecting salinity of ocean water:

Evaporation:

- The salinity of water in the surface layer of oceans depend mainly on evaporation. Where the evaporation is greater, the salinity is higher, for example, Mediterranean Sea.

Freshwater flow influx:

- Surface salinity is greatly influenced in coastal regions by the freshwater flow from rivers, and in polar regions by the processes of freezing and thawing of ice.
  - Where the freshwater flow into the oceans is greater, the salinity is lower.
  - For instance, at the mouths of rivers such as Amazon, Congo, Ganga etc., the ocean surface salinity is found to be lower than the average surface salinity.

Temperature and density:

- Salinity, temperature and density of water are interrelated. Hence, any change in the temperature or density influences the salinity of an area. In

general, regions with high temperatures are also, regions with high salinity.

Ocean Currents:

- They play an important role in the spatial distribution of dissolved salts in ocean waters.
- The warm currents near the equatorial region push away the salts from the eastern margins of the oceans and accumulate them near the western margins.
- Similarly, ocean currents in the temperate regions increase the salinity of ocean waters near the eastern margins. For instance, Gulf Stream in the North Atlantic Ocean increases the salinity of ocean waters along the western margins of the Atlantic Ocean.

Precipitation:

- Precipitation and salinity share an inverse relationship. In general, regions with higher levels of precipitation have lower levels of salinity. This is the reason why though the equatorial region is as hot as the sub-tropics, it records lower salinity than the sub-tropics since the former receives heavy precipitation in a day.

Atmospheric pressure and Wind direction:

- Anti-cyclonic conditions with stable air and high temperature increase salinity of the surface water of oceans winds help is redistribution of salinity, as they drive away saline waters to less saline areas resulting into decrease of salinity in the former and increase in the latter.

The reason for high salinity of Arabian sea comparing with Bay of Bengal:

Influx of Fresh Water from Rivers:

- This is one of the major factors affecting salinity distribution. Rivers are one of the major sources of freshwater on the earth. Most of the river streams in India take the path from west to east. The freshwater brought by most of the rivers will be discharged to the east coast, Bay of Bengal. While some of the largest rivers of India, like Brahmaputra (Ganga+Yamuna), Godavari, Krishna, Mahanadi, etc discharge into Bay of Bengal; Narmada, Mahi, Periyar, Tapi and Indus (through Pakistan) discharge into Arabian Sea.
- This heavy influx of fresh water brought by rivers decreases the salinity level (calculated as parts per thousand PPT – ‰) of the sea. Bay of Bengal, which is recognised as the largest Bay in the world, has a salinity of 31 ppt

and the Arabian sea has a salinity of 37 ppt. Based on discharge of river water, Bay of Bengal is drained by 77% and Arabian sea by 23% of river streams.

Precipitation from Tropical Cyclones:

- Bay of Bengal, familiar with the tag – "World's hotbed of tropical cyclones" is the origin place for worlds deadliest cyclones. As tropical region receives direct insolation (incoming solar radiation) a Low pressure will be formed in the entire tropical belt, which means both Bay of Bengal and Arabian sea receives an equal amount of heat (forming a Low Pressure).
- Bay of Bengal receives High pressure winds not only from India but also from neighbouring countries like Myanmar, Indonesia, Thailand, etc. As winds move from High pressure to low pressure, Bay of Bengal's sea surface temperature increases, making it an intense Low pressure area. As the sea surface temperature intensifies, it results in ascending of warm and moist air (evaporation) which is absorbed by clouds.
- Cyclones formed here are now intensified and pound the eastern coast of India with an average velocity of 180 km/hr. However, the velocity, wind and precipitation of the cyclone decreases while moving from west to east. As these cyclones bring menacing winds and rains along with them, the heavy downpour taking place on its journey from Bay of Bengal to eastern coast is another reason for salinity dissimilarity.
- We cannot say that cyclones do not form in Arabian sea but since most of its sea surface temperature is blown away by strong Summer monsoon winds coming from South-west direction, it gives fewer chances for formation. Recently, cyclones at Arabian sea are increasing and becoming more deadly. Scientists attributed this to increased water temperatures because of global warming. They also mentioned that historically, cyclones in Arabian sea are averaged by two or three in a year, which are typically weak.
- The minor factors which handle the salinity dissimilarities are existence of ocean currents and winds associated with it. Almost 75% of the seawater comprises salinity of 34 to 35 ppt but the salinity of Bay of Bengal is as low as 31 ppt. Finally, these are some of the major reasons for salinity in differences between Bay of Bengal and Arabian sea.

20. உலகெங்கிலும் உள்ள நகர்ப்புறங்களில் வெப்ப தீவுகளின் வளர்ச்சிக்கு வழிவகுக்கும் காரணிகளை அடையாளம் காணுக.

Identify the factors that lead to the development of heat islands in urban areas around the world.

- Urban heat island may be defined as the local and temporary phenomenon in which certain pockets within a city are experiencing higher heat load than its surrounding area.
- This rise of heat basically happens due to buildings and houses of cities made up of concrete where the heat is trapped and not able to dissipate easily.
- Urban heat island is basically induced due to trapped heat between establishments made up of concrete.
- The temperature variation can range between 3 to 5 degrees Celsius.

Factors that leads to the development of heat islands in urban areas:

Manifold increase in construction activities:

- For building simple urban dwellings to complex infrastructures, carbon absorbing material like asphalt and concrete is needed for the expansion of cities. They trap huge amounts of heat which increases the mean surface temperatures of urban areas.

Dark surfaces:

- Many buildings found in urban areas have dark surfaces, thereby decreasing albedo and increased absorption of heat.

Air conditioning:

- Buildings with dark surfaces heat up more rapidly and require more cooling from air conditioning, which requires more energy from power plants, which causes more pollution. Also, air conditioners exchange heat with atmospheric air, causing further local heating. Thus, there is a cascade effect that contributes to the expansion of urban heat islands.

Urban Architecture:

- Tall buildings, and often accompanying narrow streets, hinder the circulation of air, reduce the wind speed, and thus reduce any natural cooling effects. This is called the Urban Canyon Effect.

Need for mass transportation system:

- Transportation systems and the unimpeded use of fossil fuels also add warmth to urban areas.

Lack of Trees and green areas:

- Which impedes evapotranspiration, shade and removal of carbon dioxide, all the processes that help to cool the surrounding air.

Urban haze:

- The haze of air pollution that hangs over many cities can act as a miniature greenhouse layer, preventing outgoing thermal radiation (heat) from escaping from urban areas.

Urban Heat Islands be Reduced:

- **Increase Area Under Green Cover:** Plantation and effort to increase the area under green cover are the primary requirement to cut heat load within urban areas.
- **Passive Cooling to Reduce Urban Heat Islands:** Passive cooling technology, a widely-used strategy to create naturally ventilated buildings, can be a vital alternative to address the urban heat island for residential and commercial buildings.
- **The IPCC report** cites ancient Indian building designs that have used this technology, which could be adapted to modern facilities in the context of global warming.
- **Other methods** of heat mitigation include using appropriate construction materials.
- Roof and terraces should be painted in white or light colors to reflect heat and reduce the absorption.
- Terrace plantation and kitchen gardening should be promoted.

India's Urban Heat Islands:

- **NASA** has observed that higher incidences of heat islands in urban parts of Delhi is occurring.
- Temperatures were significantly higher in the urban part of Delhi than in surrounding farm areas.
- The image was acquired by **NASA's Ecosystem Spaceborne Thermal Radiometer Experiment (Eco stress)**, which revealed a massive red spot over Delhi and smaller red patches around neighboring cities Sonipat, Panipat, Jind, and Bhiwani.
- Eco stress is a radiometer-equipped device that was sent to the **International Space Station** in 2018 by NASA.

- Eco stress is primarily responsible for assessing the temperature of plants, as well as knowing their water requirements and the influence of the climate on them.
- These red patches in the data of Eco stress indicated greater temperatures i.e, incidents of urban heat islands, whereas the rural areas surrounding cities had lower temperatures.

21. தமிழ்நாட்டில் முக்கியமான பழங்குடி பகுதிகள் யாவை? அவை எதிர்கொள்ளும் சவால்கள் யாவை?

What are the key tribal regions in Tamil Nadu? what challenges do they face?

- **ADIYAN:** The Adiyan origin comprises of myth and it seems to be indicative of the fact that the tribal people were the original inhabitants who were acculturated into the Adiyan tradition by two young "Missionaries". The Aryan influence accounts for the ubiquitous application of the sastra mumbled or recited at all the rituals. This community is distributed in the Wayanad district and the adjoining areas of Kanur district and Kodagu in Karnataka concentration is in the Thirunelly, Thrissileri and Vemam village of Mananthavady taluk (Kerala). In addition Adiyan Community also found in Tamil Nadu. They have their own dialect called "Adiyabhasha"
- **ARANADAN:** The Aranadan found in the Nilambur forests in the Ernad Taluk, Malappuram district and Ernad taluk of the Malabar district of the "Composite" Madras state, before the states of the union of India were reorganized in 1956. Their speech shows feathers of the northern dialect of Tamil Malayalam Telugu and of Kannada.
- **ERAVALLAN:** They live in the Anaimalai hills spread over the Pollachi and Udumalpet taluks of Coimbatore district. They appear to be a primitive tribe, like other aboriginal tribes of Tamil Nadu. Among themselves, they speak a "poor dialect" of Tamil but they are bilingual in Malayalam, which the use for communication with others.
- **IRULAR:** The Irular are the second largest Scheduled Tribe of Tamil Nadu. The name Irula is derived from Tamil word irul meaning darkness or night. Another common name for the Irula of Chennai MGR, South Arcot, Salem, North Arcot Ambedkar, Dharmapuri, Tiruchchirappali and Thanjavur. The Irular speak a Tamil dialect whereas the other groups speak different dialects of the Irula language.

- **KADAR:** The origin of Kadar is vague some say that the Kadar is the Negritos revelling a fusion of several races. The word Kadar means Residents in forest Kadar is plural form of Kadar, so they are the sons of soils of Tamilnadu which they call themselves Kadar, others call them Kadir and Kadan. The Kadars are original inhabitants of Anaimalai and resided in the forests next to Tops lip they were to be found in the Anaimali hills of pollachi Taluk in Coimbatore district with the exception of a few who had migrated to Salem and Thirunelveli Districts in 1961. Anaimalai hills which lie partly in the present Tamilnadu and partly in Kerala. They have their own dialect called as a kada dialect without script. And the Kadar speaks Tamil and Malayalam also.
- **KANIYAN:** The word Kaniyan has been derived from the word kaniya meaning 'foresight' The Kaniyan belief that they were original inhabitants of Travangore region, most Kaniyan were in the foothills of the mountains of the North East part of the Kanniyakumari District, an adjacent to the towns of Nagercoil, Kuzhithurai and Padnamanabhapuram, but some are also distributed in Tirunelveli and Coimbatore Districts. The Kaniyan speak Malayalam, with in the family and with kin groups, they use Malayalam script, with outsiders they speak Tamil and few knew to write in Tamil. At present their children study in Tamil medium schools.
- **KATTU NAICKAN:** The Kattu Naickan get their name the words kadu, which means 'forest' and nayakan which means 'leader' or 'chief'. They are also known as kattu Naickan. They are the aboriginal inhabitants of the Western Ghats and are mainly found in the Nilgiris, in Tamil Nadu. They are believed to be the descendants of the Hidamasura of the Mahabharata epic. They are the aboriginal inhabitants of the Western Ghats and are mainly found in the Nilgiris, in Tamil Nadu and the Nilambur and Wynad hills, adjoining Kerala. The Kattu Naickan, speak their own dialect, which is close to Kannada, within the family and with their kin group. They speak Tamil and Malayalam with others. They use the Tamil script.
- **KOCHUVELAN:** The community has several myths of origin, according to one of which they were descendants of the ancestors of the famous god Ayyappan of Sabarimali. Another describes them as the offspring of a human figure who came out of a mud elephant made by Parvati and trampled upon by Siva. Yet another says that they were crates by Siva to

help Panchali while in exile to wash her clothes while in pollution. They are mainly distributed in the Ranny forest range of the Pathanmthitta Taluk and in the adjoining areas of Kottayam and Idukki districts. The use the Malayalam language for all purposes and use the Malayalam script.

- **KONDA KAPUS:** The Konda Kapus, otherwise known as Konda Doras, inhabit largely the hill slopes and the low lands adjoining the in the Agency portions of the Vizagapatam district. They are the agrestic slaves of the Bagatas. The Konda Kapus speak Telugu Nothing regarding their original tongue is now known.
- **KURICHCHAN:** The Kurichchan has migrated to its present habitat, i.e. Dharamapuri District, from Alambadi forest area in the Kollegal taluk of the present Musore District. Their traditional deity, Muttapa or Rangappa, finding himself uncomfortable in the Musore region, took up a new abode, they narrate. And add that a few Kurichchans followed him till they reached the baramahal tract in Dharmapuri and Hosur regions of Tamil country, where they settled as hunters. According to another kurichchan version, they migrated from the Ponnachin hills of the Musore-Malabar region to the Dharmapuri hills during the Maratha-Musore wars. Historically, this was probably around 1688-89 A.D. Even now, a few Kurichchans remember, in their oral tradition, the rule of Abdul Nabi Khan, Nawab of Cuddapah, who extended his prossessions southwards and by 1714 A.D. made himself ruler of the Baramahal area of Dharmapuri, Hosur and Krishnagiri. The Kurichchan speak Kannada, among themselves and Tamil with others. They use the Tamil and Kannada scripts. Some Kurichchan are conversant in Telugu and Urdu.
- **KURUMBA:** The KURUMBA or KURUMBAS are found in southern past of India in the states of Tamil nadu and Kerala. The Kurumbas are descendants of ancient Pallavas who were scattered over Nilgiris, Wayanad and Mysore, after a Chola onslaught in about 7th or 8th century A.D. The kurumbas in Nilgiris district are divided into five sub-groups. They are Alu Kurumbas, Betta Kurumbas, Jenu Kurumbas, Mullu Kurumbas and Urali Kurumbas. Alu Kurumbas are exclusively living in the taluks of coonoor, Kotagiri and kundah; Betta kurumbas are living along with Jenu kurumbas in the taluk of Gudalur whereas Mullu kurumbas and urali kurumbas are living exclusively in pandalur taluk.

Only those living in the Nilgiri district of Tamil nadu are included in the list of the Scheduled Tribes.

- **KURUMANS:** It is believed that they might have migrated from Karnataka long ago. Most of them live in Dharmapuri district. They speak kannada dialect within their community. They converse inn tamil with others.
- **MALAKKURAVAN:** The malakkuravan who also refer to themselves as the malaikkuravan, are found in kanniyakumari district neigh bouring populations idntify them as a local tribal community. The local people also address them as the malakuravar or the marudamparai colony makkal for easy identification. The community elders believe that they migrated from the north travanvore region during the pandya rule. The malakuravan speak malayalam among themselves and tamil with others. Their dialect is locally known as kuravan malayalam. A few of them know the tamil script.
- **MALASAR:** The Malasar are identified as a small tribal community who live only in the Pollachi taluk of the Coimbatore District. The Malasar believe that they were the orginal inhabitants of Kongu Nadu, the present Coimbatore District. The Malasar live in the foothills of the Anaimalai hills amidst non-tribal cultivators. They speak Tamil among themselves and with others. They use the Tamil script. Some of them are conversant with Kannada and Malayalam.
- **MALAYALI:** The origins and migration to the hills are shrouded in mystery. According to Malayali they are migrated from the scared city of Kanchipuram to the hill areas when parts of Southern India were under Muslim rule. The pr4esent distribution of the Malayali is in the hills of North Arcot, South Arcot Salem, Tiruchirappalli and Dharmapuri. The Malayali speak Tamil among themselves and with other communities. They use the Tamil scrip. Some of them are conversant with Telugu and Kannada.
- **MANNAN:** The Mannan is distributed in the Kanniakumari and Tirunelveli Districts. They are also known as Vannan and Velan. Locally they are identified by their occupation, i.e. laundering clothes. They perceive their distribution at the local level. In other parts of Tamil Nadu, particularly in hilly areas, there is another community. Also called Mannan, but they are a hill tribe and have no connection with the

Scheduled Caste Mannans of Kanniyakumari and Tirunelveli. A legend regarding the origin of the Mannan narrates that, once upon a time, when parameswara and his wife parvathi were amusing themselves, the latter made an earthen elephant which was accidentally trodden on parameswara. From this arose a man who stood bowing before them. He was assigned his present occupation, i.e. washing soiled clothes. Their mother tongue is Tamil, and they use the Tamil script.

- **MUDUGAR:** The Census Report 1961 states that the Mudugar are believed to be the earliest immigrants and that they are of Tamil origin. They settled in Coimbatore, Erode, Madurai and Matheswaran peak Attapadi area. Their speech however is closer to Kannada than to Tamil. Majority of the Vocabulary items are similar to Malayalam, while influence of Kannada and Tulu are also noticeable.
- **PALLEYAN:** The Palleyan are a Tamil speaking tribe found largely in the Palani Hill. These tribes are mostly in the hilly regions also they found in several places like Primed tashil, hashil, kumily, Vandarmed, chakkupallani Panchayats and also in several districts of other state of Kerala. The Palleyan originally belong to the Palani hills. Tamil is their mother tongue. They speak Tamil and use the Tamil Script for both inter-group and intra-group communication.
- **PALLIYAN:** Palliyan are found in Palani hills of Dindigul district and in Western Ghats. Especially in the sensagethope and saduragiri hills, the Puliyankudi areas of Tirunelveli district and vasanadu hills and Bodinaianar in Madurai district. They are found in the hills of Coimbatore, Madurai, Ramnad and Tirunelveli district. Palliyan speak Tamil dialect.
- **PALLIYAR:** The Palliyar are found in the hilly regions of Madurai, Dindugal,Tirunelveli and Virudhunagar districts. In Tamil Nadu they constitute relatively a small group. They speak Tamil (mother tongue of Tamil Nadu).
- **PANIYAN:** The paniyan are distributed in tamilnadu and the adjoining area of kerala and Karnataka. Their concentration more in kerala state.their legendary origin is at a place called lppimala and they are descender from pantirappannara (twelve ancestors) their origin nolting define is known (thurstor 1909). They mainly live in the Nilgiris District.

They separate their own dialect among themselfs they separate tamil and Malayalam with others and use the tamil script.

- **TODA:** The Toda are a prominent tribe of the Nilgiris. The history and origin is not clear. They believe that they were created along with their buffaloes by their great Goddess Thekershi (Toksy). According to them, the Tarthar and the Teivali. There are many version with regard to the history of the Toda. One version is that they are the descendants of Ravana. Another version is that they are the surviving Pallava race who after the fall of their empire took refuge in the Nilgiris. They have their own dialect called as Toda dialect without script. Toda dialect is an Independent language of the Dravidian family affiliated to Tamil.
- **URALI:** The Uralis are found in the Sathyamangalam Taluk of the Erode District of Tamilnadu, Kerala and Karanatka. The Uralis live in the hills of Tamilnadu, Kerala and bordering areas of Karnataka. They dwell at an altitude of 1,800 feet in the jungle of Dimnhu area of Tamilnadu. They speak mixed Tamil and canaries. Their language with words frequently borrowed from Tamil or Kannada according to the language used by the non- tribal.

Major Issues of Tribes in Tamil Nadu:

Educational Issues:

- Dropout rates among the tribal students are incredibly high, especially at the secondary and senior secondary levels.

Religious Issues:

- Tribal people believe in superhumans and supernatural powers, and they worship them as well. This raised many questions in the minds of young educated people. The tribal culture is undergoing a revolutionary change as they contact other cultures.
- The tribal people match Western culture in many aspects of their social lives, while they are abandoning their own culture.
- It has resulted in the decline of tribal life and tribal arts such as dance, music, and various types of craft.

Social Issues:

- Child marriage among tribes is still practiced in states which is constitutionally wrong and has many negative consequences. Some Himalayan tribes practice polyandry and polygamy.

- Such practises are not accepted by mainstream society. Infanticide, homicide, animal sacrifice, black magic, wife swapping, and other harmful practices are still practiced by tribes, which are considered a significant Tribal problem in Tamil Nadu.
- Language is also one of the barriers to tribal education promotion.

Health issues:

- There are questionable issues among the tribal populations in terms of healthcare. One of the weakest links is public health services to Scheduled Tribes.
- The lack of health care personnel who are willing, trained, and equipped to work in Scheduled Areas is a significant barrier to providing public health care to tribal populations.
- In the public health care system in Scheduled Areas, there is a shortage, vacancy, absenteeism, or apathy among doctors, nurses, technicians, and managers.
- The near-complete absence of participation of Scheduled Tribes people or their representatives in shaping policies, making plans, or implementing services in the health sector is one of the reasons for inappropriately designed and poorly organised and managed health care in Scheduled Areas.

Consumption of Tobacco and Alcohol:

- Data from the Xaxa Committee Report 2014 show that men aged 15 to 54 years consume a lot of tobacco, either smoking or chewing. Tobacco use was prevalent in approximately 72 per cent of Scheduled Tribes and 56 per cent of Non-Scheduled Tribes, respectively.

Poverty and Indebtedness:

- The majority of tribes are impoverished. The tribes engage in a variety of simple occupations based on rudimentary technology.
- The majority of the occupations are primary occupations such as hunting, gathering, and agriculture. The technology they utilise for such purposes is of the most basic type. In such an economy, there is no profit or surplus.
- As a result, their per capita income is meagre, much lower than the Indian average. The majority lives in extreme poverty and are in debt to local moneylenders and Zamindars.

- They frequently mortgage or sell their land to the moneylenders to repay the debt. The debt burden is an almost unavoidable tribal problem in India, considering the high-interest rates charged by these moneylenders.

22."மக்கள்தொகை வளர்ச்சியைக் கட்டுப்படுத்துவது சுற்றுச்சூழல் பிரச்சினைகளுக்கு நிலையான தீர்வு" - நியாயப்படுத்துக.

"Controlling population growth is the sustainable solution to environmental problems" - Justify.

- The term "population" basically refers to the number of people living in a specific area, like a city or town, a country, a region, a continent, or the entire world. A census, which is the act of collecting, analysing, assembling, and disseminating statistics about a population, is commonly used by governments to determine the amount of the resident people within their jurisdiction.

Effects of Population Growth on our Environment:

- One of the factors responsible for environment degradation is population growth or population density. In particular, population density plays the most important role in shaping the socio-economic environment. Its effects are felt on the natural environment also.
- **Generation of Waste:** Due to his destructive activities, man has dumped more and more waste in environment. As the man-made waste is not transformed, it causes degradation and the capacity of environment to absorb more waste is reduced. Further, waste leads to air and water pollution.
- **Threat to Biodiversity:** Due to his destructive activities, man has extracted more and more minerals from the earth. Animals have been hunted and plants have disappeared. There has been loss of biodiversity. These have led to ecological imbalance.
- **Strain on Forests:** Man has established new housing colonies. National highways and hydropower projects have been built and forests have been wiped out. These destructive activities have increased and led to ecological imbalance.
- **Urbanization:** Rapid growth of population has led to urbanization which has adversely affected environment. Due to population pressure, natural resources in the cities are depleted at a fast rate due to population pressure.

- **Industrialisation:** Underdeveloped countries are following the policy of heavy industrialisation which is causing environmental degradation. The establishment of such industries as fertilizers, iron and steel, chemicals and refineries have led to land, air and water pollution.
- **Land Degradation:** Intensive farming and excessive use of fertilizers and pesticides have led to over-exploitation of land and water resources. These have led to land degradation in the form of soil erosion, water logging and salination.
- **Transport Development:** Environmental degradation is also due to transport development in the different parts of the world. The automobiles release huge quantities of poisonous gases such as carbon monoxide, nitrogen oxides and hydrocarbons. The development of ports and harbours have led to oil spills from ships adversely affecting fisheries, coral reefs, mangroves and landscapes.
- **Climatic Change:** Climatic changes are irregular due to green house gases. The thin skin of air that surrounds the planet is being affected by human activities as never before. Urban people are still being exposed to unaccepted levels of toxic pollutants. Further, forests are still being degraded by acid deposition generated by faraway industries, and greenhouse gases continue to accumulate in the atmosphere.

Productivity:

- Environmental degradation not only harms health but also reduces economic productivity. Dirty water, inadequate sanitation, air pollution and land degradation cause serious diseases on an enormous scale in developing countries like India.
- These, in turn, reduce the productivity levels in the country. To take specific instances, water pollution has led to declining fisheries in rivers, ponds and canals in both urban and rural areas. Water shortages have reduced economic activity in towns, and cities and villages.
- Soil and hazardous wastes have polluted ground water resources which cannot be used for agricultural and industrial production.
- Soil degradation leading to soil erosion, drought, etc. have led to siltation of reservoirs and blocking of river and canal transport channels. Deforestation has led to soil erosion and consequent loss of sustainable logging potential.
- Loss of bio-diversity has resulted in the loss of genetic resources.

- Last but not the least, atmospheric changes have given rise to disruption of marine food chain, damages to coastal infrastructure due to sea-rise and regional changes in agriculture productivity due to hurricanes in seas.
- Thus, environmental degradation undermines economic productivity of a nation.
- **Technology:** Presently, environmental pollution is caused by old technology which releases gases and pollutants causing chemical and industrial pressure on environment.

Measures for Population Control:

- **Prime Minister's Appeal:** During his Independence Day Speech in 2019, the Prime Minister appealed to the country that population control was a form of patriotism.
- **Mission Parivar Vikas:** The Government has launched Mission Parivar Vikas in 2017 for substantially increasing access to contraceptives and family planning services in146 high fertility districts with TFR of 3 and above in seven high focus states.
- **National Family Planning Indemnity Scheme (NFPIS):** This scheme was launched in the year 2005 under this scheme clients are insured in the eventualities of death, complication and failure following sterilization.
- **Compensation scheme for sterilization acceptors:** Under the scheme Ministry of Health and Family Welfare provides compensation for loss of wages to the beneficiary and also to the service provider (& team) for conducting sterilizations from the year 2014.

23."இந்தியப் பெருங்கடலில் உள்ள கடல் வளங்களால் இந்தியாவின் பொருளாதார மற்றும் சமூக வளர்ச்சிக்கு உதவ முடியும்." - கருத்துரைக்க.
"India's economic and social development can be aided by ocean resources in the Indian Ocean." - Comment.

- India has an exclusive Economic Zone (EEZ) of 2.02 million sq.km and a long coastline of 8,118 km with rich and diverse marine living resources. Government of India is promoting 'Blue Growth Initiative' which focus on utilisation of wealth from the marine and other aquatic resources of the country for improving the lives and livelihoods of fishermen and their families.

Unexploited Important Oceanic resources in Indian Ocean:

- **Fishery:** Marine fisheries wealth around Indian coastline is estimated to have an annual harvestable potential of 4.4 million metric tonnes.

- **Minerals:** Indian Ocean contain vast amount of minerals, including the cobalt, zinc, manganese and rare earth materials. These minerals are needed for electronic industry to make smart phones, laptops and car components etc. This can help Make in India initiative.
- **Energy resources:** The main energy resources present in Indian Ocean are petroleum and gas hydrates. Petroleum products mainly includes the oil produced from offshore regions. Gas hydrates are unusually compact chemical structures made of water and natural gas.
- **Salts:** Seawater contain economically useful salts such as gypsum and common salt. Gypsum is useful in various industries.
- **Manganese Nodules and Crusts:** Manganese nodules contain significant concentrations of manganese, iron and copper, nickel, and cobalt all of which have a numerous economic use.

Importance of these resources in Indian socio-economic progress:

- **Sustainable development:** Marine resources from Indian Ocean can serve as the backbone of India's economic growth and can help India to become a 5 trillion-dollar economy by 2022. Blue economy, through sustainable use of oceans, has great potential for boosting the economic growth.
- **Employment generation:** It will provide jobs, improved livelihoods to many. This will help in inclusive growth. E.g improving fishery resources exploitation can provide livelihood to many.
- **Food security:** It will lead to food security through fishery sector and other sea food resources. It would also help in reducing malnutrition issue in India as fishes are good source of nutrition.
- **Energy security:** It will help in diversification of energy resources and will provide new resources for energy e.g. gas hydrates.
- **Efficient transportation and logistics:** Indian Ocean is a major gateway of trade with 80% of global oil trade happening through it. Better connectivity in the region will significantly cut the transport cost and will reduce logistics inefficiencies.
- **Women empowerment:** It will help in women empowerment especially fishery sector by providing them jobs. As these jobs do not require high skills, women will find it easy to earn a livelihood.

- **Climate Change:** Oceans provide an alternate and cleaner source of energy. It also acts as an important carbon sink. This will help in mitigating climate change.
- Sustainable Development Goal (SDG 14), calls to conserve and sustainably use the oceans, seas and marine resources for sustainable development. India should expedite its efforts to exploit oceanic resources in Indian Ocean. What is required is use of technology to exploit oceanic resources in Indian Ocean. India has rightly launched O-SMART scheme aiming at regulated use of oceans, marine resources for sustainable development in this direction.

24. அதிகமான கூட்ட நெரிசல், இந்திய நகரங்களில் வீட்டுவசதி பற்றாக்குறையின் நீண்டகால பிரச்சனைக்கு வழிவகுக்கிறது. பொருத்தமான உதாரணங்களை மேற்கோள் காட்டி விளக்குக.

Overcrowding leads to chronic problem of shortage of housing in India cities. Explain citing relevant examples.

- Overcrowding is a chronic problem in many Indian cities, and it has led to a shortage of housing. The rapid urbanization in India has resulted in a significant increase in the number of people living in cities, and the demand for housing has far exceeded the supply. This has resulted in a number of issues, including slums, informal settlements, and a lack of affordable housing options.

The main causes of overcrowding in Indian cities:

Rural-urban migration:

- People from rural areas migrate to cities in search of better job opportunities and a higher standard of living. As a result, the population of Indian cities has increased rapidly, leading to a shortage of housing.
- **For example**, in Mumbai, the population density is estimated to be around 20,000 people per square kilometre, which is one of the highest in the world.

High cost of land:

- As cities have expanded, the cost of land has increased significantly, making it difficult for developers to build affordable housing options.
- This has resulted in a situation where only the wealthy can afford to live in well-developed areas of the city, while the poor are forced to live in slums and informal settlements.

Regulatory challenges:

- Land-use regulations, building codes, and zoning laws have made it difficult for developers to build housing options that are affordable for middle and lower-income groups.
- This has led to a situation where many people in Indian cities are forced to live in informal settlements and slums that lack basic amenities like water, sanitation, and electricity.

Conclusion:

- Overcrowding is a chronic problem in Indian cities, and it has led to a shortage of housing. Rural-urban migration, the high cost of land, and regulatory challenges have all contributed to this problem.
- The lack of affordable housing options has resulted in a situation where the poor are forced to live in slums and informal settlements, which lack basic amenities.
- It is important for policymakers to address these issues and work towards providing affordable housing options for all citizens.

25."காலநிலை புலம்பெயர்வோர்" என்ற வார்த்தையின் மூலம் நீங்கள் என்ன புரிந்துகொள்கிறீர்கள்? அவர்களின் நலன் மற்றும் மீள்குடியேற்றத்திற்காக முன்னெடுக்கப்பட்ட கொள்கைகள் மற்றும் திட்டங்கள் குறித்து விவாதிக்க.

What do you understand by the term" climate migrants"? Discuss the policies and schemes initiated for their welfare and resettlement.

- Climate migrants are Migrants that are led by Push factors caused by climate changes such as:
  - Intense Flood
  - Sea level rise
  - Drought or crop failure or water shortage
  - Desertification

World Migration Report 2020:

- In 2018 there were 28 million people internal displacement across the globe due to weather-related events such as cyclones flood
- South Asia's population has the highest number of people, risk of displacement. Bangladesh, India, Pakistan have the highest risk of climate change.
- Rise in sea level due to climate change is the most threat to the Asia Pacific region.

- 37 million people would be displaced on the meter of sea rise and twice will be displaced on 2 meters of sea rise.
- As per World Bank reports,
- 143 million people would be forced to displaced due to climate change from Latin America, Sub Sahara Africa, and South Asia by 2050.
- 40 million climate migrants will be from South Asia. due to:
- Characterized by rainfed farmland.
- Variability in monsoon and warmer temperature
- Crop failure
- Mumbai, Chennai, Chittagong, Dhaka vulnerability to storm surge.

Policies and schemes taken for their welfare and resettlement:

Climate refugees and international law:

- Although people fleeing from places, where they face risks arising from the impacts of climate change, are often referred to as "climate refugees", on most occasions they do not fall within the scope of the refugee definition in Article 1 of the 1951 UN Refugee Convention.
- There are no legally binding agreements obliging countries to support climate migrants.
- The UNHCR (United Nations High Commissioner for Refugees) has thus far refused to grant these people refugee status, instead designates them as "environmental migrants," in large part because it lacks the resources to address their needs.
- Regional refugee instruments like the 1984 Cartagena Declaration and the 1969 OAU Convention offer a wider definition of protecting refugees fleeing conditions that "seriously disturb public order" but these regional instruments long pre-date when climate change was not a global concern.

COP on climate displacement:

- COP identified 'displacement', 'relocation', and 'migration' as some of the concern areas which would be addressed through 'loss and damage' financing.
- The 'loss and damage' framework was developed at COP of UNFCCC, aimed at supporting most impacted countries and viewed as an integral part of climate justice.
- The amount of funding required, and the designation of funders are not determined and remains a concern.

- The climate migrants and climate refugees are yet to find their voice in the global platform.

26. பயிர் பல்வகைப்படுத்தல் என்றால் என்ன? மற்றும் அதை பாதிக்கும் காரணிகளை விளக்குக.

What is crop diversification? and explain the factors affecting it.

- Crop diversification refers to the **addition of new crops or cropping systems to agricultural production** on a particular farm taking into account the different returns from value- added crops with complementary marketing opportunities.

Major cropping systems in India:

- Sequential-cropping, monocropping, **intercropping, relay Cropping, mixed-cropping** and alley cropping.

Factors affecting Crop diversification:

- Over 117 m/ha (63 percent) of the cropped area in the country is completely dependent on rainfall.
- Sub-optimal and over-use of resources like land and water resources, causing a negative impact on the environment and sustainability of agriculture.
- Inadequate supply of seeds and plants of improved cultivars.
- Fragmentation of land holding less favouring modernization and mechanization of agriculture.
- Poor basic infrastructure like rural roads, power, transport, communications etc.
- Inadequate post-harvest technologies and inadequate infrastructure for post-harvest handling of perishable horticultural produce.
- Very weak agro-based industry.
- Weak research - extension - farmer linkages.
- Inadequately trained human resources together with persistent and large-scale illiteracy amongst farmers.
- Host of diseases and pests affecting most crop plants.
- Poor database for horticultural crops.
- Decreased investments in the agricultural sector over the years.

Government Policies and Strategies for Crop Diversification:

- Considering the importance of crop diversification in the overall developmental strategy in Indian agriculture, the government of India has

taken several initiatives for agricultural development in general and crop diversification in particular. These initiatives are as follows:

- **Launching a Technology Mission for the Integrated Development of Horticulture in the Northeastern Region:** The programme will establish effective linkages between research, production, extension, post-harvest management, processing, marketing and exports and bring about a rapid development of agriculture in the region.
- **Implementing National Agriculture Insurance Scheme:** The scheme will cover food crops and oilseeds and annual commercial and horticulture crops. Small and marginal farmers are eligible for 50 percent subsidy under the Scheme.
- **Operationalizing Technology Mission on Cotton:** The Technology Mission will have separate Mini-Missions on technology generation, product support and extension, market infrastructure and modernization of ginning and pressing units.
- **Provision of Capital Subsidy of 25 percent for construction/modernization/expansion of cold storages and storages for horticultural produce.**
- **Creation of Watershed Development Fund:** At the National level for the development of Rainfed lands.
- **Infrastructure Support for Horticultural Development with emphasis on Post-harvest Management.**
- **Strengthening Agricultural Marketing:** Greater attention to be paid for development of a comprehensive, efficient and responsive marketing system for domestic marketing as well as exports by ensuring proper quality control and standardization.
- **Seed Crop Insurance:** A pilot scheme on Seed Crop Insurance has been launched which will cover the risk factor involved in production of seeds.
- **Seed Bank Scheme:** About 7-8 percent of certified seeds produced in the country will be kept in buffer stock to meet any eventualities arising out of drought, floods or any other form of natural calamities.
- **Cooperative Sector Reforms:** Amendment to the National Cooperative Development Corporation (NCDC) Act, 1952, and Replacement of the Multi-State Cooperative Societies (MSCS) Act, 1984.