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TNPSC GROUP 1 MAINS – 2023-

ENVIRONMENTAL SCIENCE – FULL

Section – A

விரிவாக விடையளிக்கும் வினாவகை

Detailed answer type question

ஒவ்வொன்றிற்கும் 150 சொற்களுக்கு மிகாமல் விடையளிக்கவும்

Answer not exceeding 150 words each

ஒவ்வொரு வினாவிற்கும் 10 மதிப்பெண்கள்

Each Question carries 10 marks

Answer any 10 questions out of 13 questions.

கொடுக்கப்பட்டுள்ள 13 வினாக்களில் எவையேனும் 10 வினாக்களுக்கு விடையளிக்கவும்

1. **Explain the importance of ecological pyramids in environmental management. Also, indicate different types of ecological pyramids.**
   சுற்றுச்சூழல் மேலாண்மையில் சுற்றுச்சூழல் பிரமிடுகளின் முக்கியத்துவத்தை விளக்குக. மேலும், பல்வேறு வகையான சுற்றுச்சூழல் பிரமிடுகளைக் குறிப்பிடுக

2. **How are fertilisers and pesticides both are beneficial or harmful to the crop? Explain**
   உரங்கள் மற்றும் பூச்சிக்கொல்லிகள் இரண்டும் எவ்வாறு பயிருக்கு நன்மை பயக்கும் அல்லது தீங்கு விளைவிக்கும்? விளக்குக.

3. **What do you mean by solid waste management? Explain the control measures of urban and Industrial waste.**
   திடக்கழிவு மேலாண்மை என்றால் என்ன? நகர்ப்புற மற்றும் தொழிற்சாலை கழிவுகளை கட்டுப்படுத்தும் வழிமுறைகளை விளக்குக

4. **Give detail description of bio diverisity hot-spots in India**
   இந்தியாவில் உள்ள உயிர் பன்முகத்தன்மை மண்டலங்கள் பற்றிய விரிவான விளக்கத்தை அளிக்க.

5. **What are the advantages and disadvantages of solar power over other renewable energy resources? Why is the cost of solar energy decreasing? What is its effect on climate change efforts?**

   மற்ற புதுப்பிக்கத்தக்க ஆற்றல் வளங்களை விட சூரிய சக்தியின் நன்மைகள் மற்றும் தீமைகள் என்ன? சூரிய சக்தியின் விலை ஏன் குறைகிறது? பருவநிலை மாற்ற முயற்சிகளில் அதன் தாக்கம் என்ன?

6. **What are the effects of cyclones? What are different measures for management of cyclones?**

   சூறாவளிகளின் விளைவுகள் என்ன? சூறாவளி மேலாண்மைக்கான பல்வேறு நடவடிக்கைகள் என்ன?

7. **What are threats to biodiversity? Describe habitat loss and its consequences.**

   பல்லுயிர் பெருக்கத்திற்கு என்ன அச்சுறுத்தல்கள் உள்ளன? வாழ்விட இழப்பு மற்றும் அதன் விளைவுகளை விவரிக்க.

8. **What are the factors responsible for ground Water depletion? Write in detail about water conservation methods.**

   நிலத்தடி நீர் குறைவதற்கு என்ன காரணிகள் காரணம்? நீர் சேமிப்பு முறைகள் பற்றி விரிவாக எழுதுக.

9. **Give an account on biodiversity conservation and write about the national parks and sanctuaries of Tamilnadu.**

   பல்லுயிர் பாதுகாப்பு பற்றிய குறிப்பு தந்து தமிழ்நாட்டின் தேசிய பூங்காக்கள் மற்றும் சரணாலயங்கள் பற்றி எழுதுக.

10. **What is global warming? What are its impact on climate change? Discuss the contributing factors and suggest remedial measures.**

    புவி வெப்பமடைதல் என்றால் என்ன? பருவநிலை மாற்றத்தில் அதன் தாக்கம் என்ன? பங்களிக்கும் காரணிகளைப் பற்றி விவாதிக்கவும் மற்றும் தீர்வு நடவடிக்கைகளை பரிந்துரைக்க.

11. **Write short notes on** | சிறுகுறிப்பு வரைக

    a) **Major environmental Movements in India**
       இந்தியாவின் முக்கிய சுற்றுச்சூழல் இயக்கங்கள்
    b) **Impacts of exotic species in Natural Ecosystems**
       இயற்கை சுற்றுச்சூழல் அமைப்புகளில் அயல்நாட்டு இனங்களின் தாக்கங்கள்

12. **Explain the impacts of landslides. Also map the distribution of landslides in India.**

நிலச்சரிவுகளால் ஏற்படும் பாதிப்புகளை விளக்குங்கள். இந்தியாவில் நிலச்சரிவுகளின் பரவலையும் வரைபடம் வரைந்து காண்பிக்க

13. **Explain National Action Plan on Climate Change (NAPCC), objectives and recommendations.**

காலநிலை மாற்றம் (NAPCC), நோக்கங்கள் மற்றும் பரிந்துரைகள் மீதான தேசிய செயல் திட்டத்தை விளக்குக.

Section - B

விரிவாக விடையளிக்கும் வினாவகை

Detailed answer type question

ஒவ்வொன்றிற்கும் 250 சொற்களுக்கு மிகாமல் விடையளிக்கவும்

Answer not exceeding 250 words each

ஒவ்வொரு வினாவிற்கும் 15 மதிப்பெண்கள்

Each Question carries 15marks

Answer any 13 questions out of 12 questions.

கொடுக்கப்பட்டுள்ள 13 வினாக்களில் எவையேனும் 10 வினாக்களுக்கு விடையளிக்கவும்

1. **What do you mean by Climate Change? Discuss its causes and impacts with reference to bio- diversity and depletion of forests.**

காலநிலை மாற்றம் என்றால் என்ன? பல்லுயிர் பெருக்கம் மற்றும் காடுகளின் அழிவு ஆகியவற்றைக் குறிப்பதன் மூலம் அதன் காரணங்கள் மற்றும் தாக்கங்களைப் பற்றி விவாதிக்க.

2. **Give a reasoned account of the problems of degradation and conservation of wetlands in India**

இந்தியாவில் உள்ள சதுப்பு நிலங்களின் சீரழிவு மற்றும் பாதுகாப்பின் சிக்கல்கள் பற்றிய நியாயமான குறிப்பு தருக.

3. **Explain the problems encountered by the Cauvery delta zone. How Cauvery delta's protected special agricultural zone will help in this regard.**

காவிரி டெல்டா பகுதியில் நிலவும் பிரச்சனைகளை விளக்கவும். காவிரி டெல்டாவின் பாதுகாக்கப்பட்ட சிறப்பு வேளாண் மண்டலம் இந்த விஷயத்தில் எவ்வாறு உதவும்.

4. **Explain the EIA procedure in India and briefly mention any five methods for EIA evaluation.**

   இந்தியாவில் சுற்றுச்சூழல் தாக்க நடைமுறையை விளக்கி, சுற்றுச்சூழல் தாக்க மதிப்பீட்டிற்கான ஏதேனும் ஐந்து முறைகளை சுருக்கமாகக் குறிப்பிடவும்.

5. **Explain the types of disasters, disaster management processes and disaster management cycle**

   பேரிடர்களின் வகைகள், பேரிடர் மேலாண்மை செயல்முறைகள் மற்றும் பேரிடர் மேலாண்மை சுழற்சி ஆகியவற்றை விளக்குக.

6. **Briefly elucidate the prospects of ecotourism in Tamilnadu .**

   தமிழ்நாட்டின் சூழல் சுற்றுலாவின் வாய்ப்புகளை சுருக்கமாக விளக்குக.

7. **What is Project Tiger? Has it been able to achieve its objectives? Discuss.**

   புலி பாதுகாப்பு திட்டம் என்றால் என்ன? அதன் நோக்கங்களை அடைய முடிந்ததா? விவாதிக்க.

8. **Explain the earthquake disaster and describe geographical distribution in India.**

   பூகம்ப பேரழிவை விளக்கி, இந்தியாவில் புவியியல் பரவலை விவரிக்க

9. **Briefly describe the Sendai Framework for Disaster Risk Reduction and its adoption in the disaster management policy of India.**

   பேரிடர் அபாயக் குறைப்புக்கான செண்டாய் கட்டமைப்பையும் இந்தியாவின் பேரிடர் மேலாண்மைக் கொள்கையில் அதை ஏற்றுக்கொண்டதையும் சுருக்கமாக விவரிக்க.

10. **What is the role of Indigenous knowledge and Community Based Disaster Management?**

    உள்நாட்டு அறிவு மற்றும் சமூக அடிப்படையிலான பேரிடர் மேலாண்மையின் பங்கு என்ன?

11. **Write a note on minimum standards of relief in provision of food and in disaster situations**

    உணவு மற்றும் பேரிடர் சூழ்நிலைகளில் நிவாரணம் வழங்குவதற்கான குறைந்தபட்ச தரநிலைகள் குறித்து ஒரு குறிப்பு எழுதுக.

12. **Explain the details of Tsunami Warning System of India.**

    இந்தியாவின் சுனாமி எச்சரிக்கை அமைப்பின் விவரங்களை விளக்குக.

13. "India's traditional water management methods are key in the present context." Examine the statement with special focus on water harvesting and disaster management.

'இந்தியாவின் பாரம்பரிய நீர் மேலாண்மை முறைகள் தற்போதைய சூழலில் முக்கியமானது." நீர் சேகரிப்பு மற்றும் பேரிடர் மேலாண்மையில் சிறப்பு கவனம் செலுத்தி அறிக்கையை ஆராய்க.

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TNPSC GROUP 1 MAINS - 2023- REVISION

ENVIRONMENTAL SCIENCE

Question	**Explain the importance of ecological pyramids in environmental management. Also, indicate different types of ecological pyramids.** சுற்றுச்சூழல் மேலாண்மையில் சுற்றுச்சூழல் பிரமிடுகளின் முக்கியத்துவத்தை விளக்குக. மேலும், பல்வேறு வகையான சுற்றுச்சூழல் பிரமிடுகளைக் குறிப்பிடுக
Introduction	Ecological pyramids are a graphical representation of the biomass, energy, or numbers of organisms at each trophic level in a food chain. They are important tools for understanding the structure and function of ecosystems and can be used to assess the health of an ecosystem and to develop management strategies.

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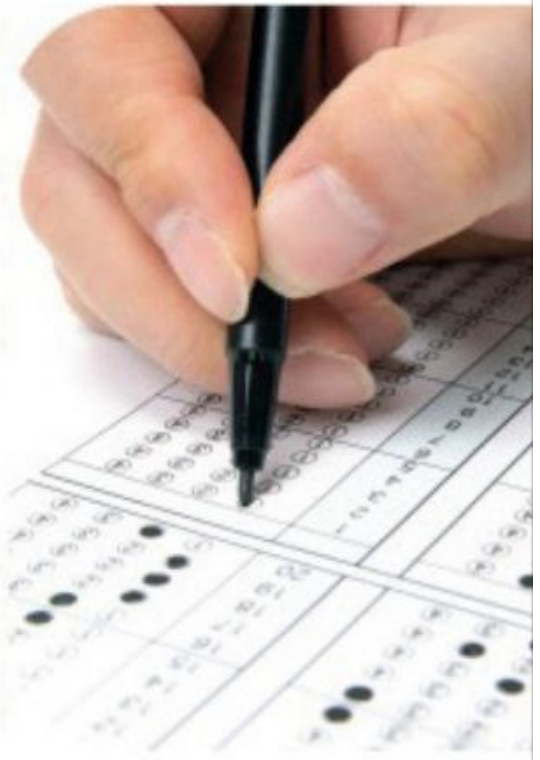

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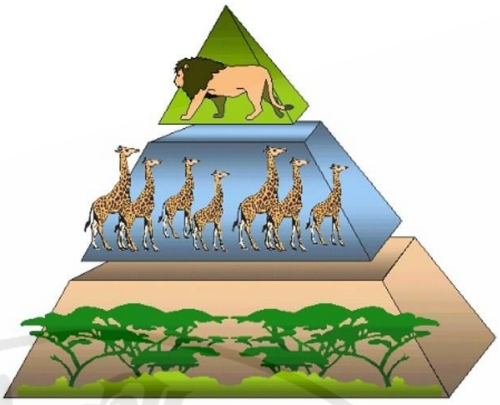
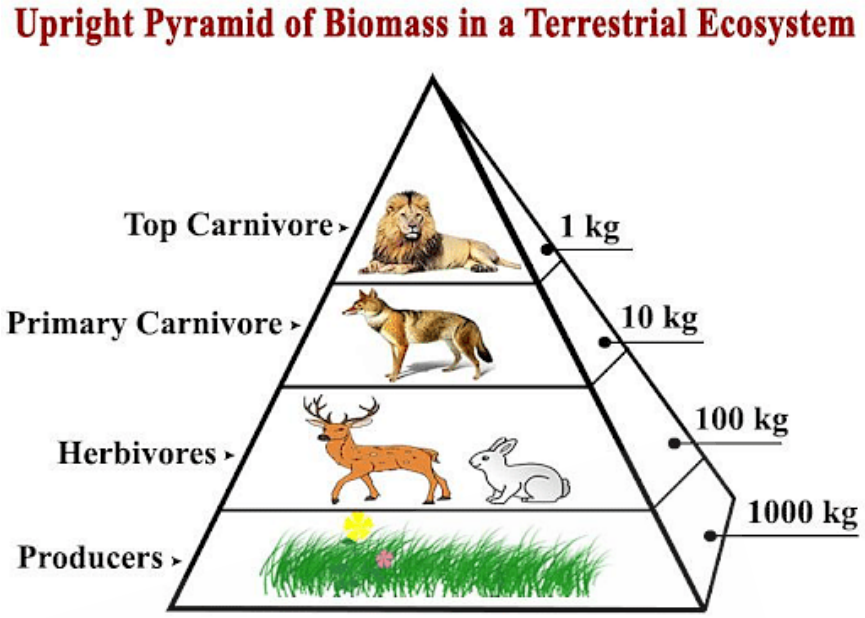
Approaching the answer	Crucial tools in environmental management ❖ **Energy Flow Analysis:** Ecological pyramids show the transfer of energy between trophic levels in an ecosystem. They help in understanding how energy is transferred from producers (plants) to consumers (herbivores, carnivores) and eventually to decomposers. By analyzing energy flow, ecologists can assess the efficiency of energy transfer and identify potential bottlenecks in the ecosystem. ❖ **Biomass Distribution:** Ecological pyramids illustrate the distribution of biomass (the total mass of living organisms) across different trophic levels. This information is essential in determining the overall health and productivity of the ecosystem. A balanced biomass distribution is indicative of a stable and resilient ecosystem. ❖ **Population Dynamics:** These pyramids depict the number of organisms at each trophic level. By studying population dynamics, scientists can identify potential issues related to overpopulation or underpopulation of certain species. This understanding is critical for managing and conserving biodiversity. ❖ **Species Interactions:** Ecological pyramids reveal the interdependence and interconnections between various species within an ecosystem. For example, the pyramid may highlight the importance of top predators in controlling lower trophic levels, thus maintaining ecological balance. ❖ **Ecological Stability:** The shape and structure of ecological pyramids can indicate the stability of an ecosystem. A well-balanced pyramid with a wide base and a gradual tapering towards the top suggests a healthy ecosystem with a stable food chain. Types of Ecological Pyramids: 1. **Pyramid of Numbers:** This pyramid represents the number of individual organisms at each trophic level. It can be upright

(in terrestrial ecosystems) or inverted (in some aquatic ecosystems). In an upright pyramid, the number of producers is the highest, followed by herbivores and then carnivores. In an inverted pyramid, the number of producers may be less than the number of herbivores or carnivores due to the presence of large producers or parasitic relationships.

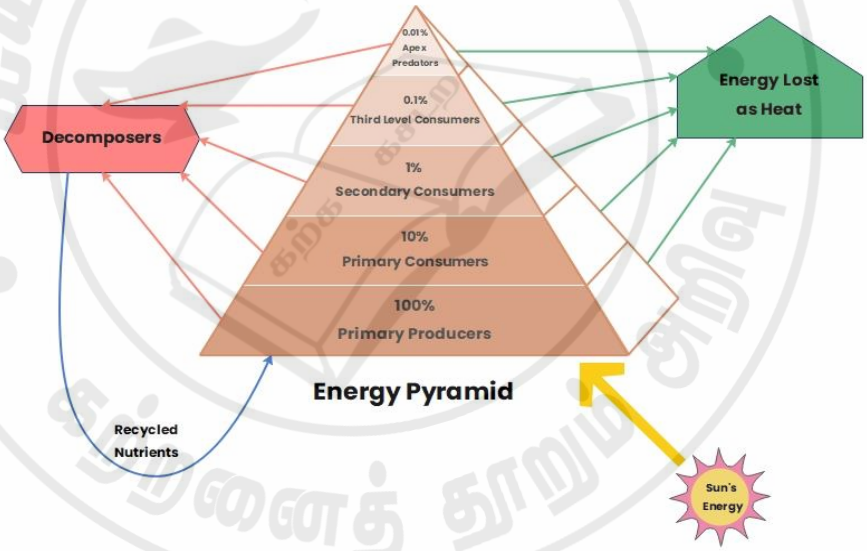
Pyramid of Numbers



2. **Pyramid of Biomass:** This pyramid represents the total biomass (mass of living organisms) at each trophic level. Biomass pyramids typically follow the same pattern as the pyramid of numbers, though they may vary in shape depending on the size of organisms and their growth rates.



3. **Pyramid of Energy:** This pyramid represents the flow of energy through each trophic level. It quantifies the amount of energy available at each level and shows how much energy is transferred from one level to another. Since energy is lost as heat during each transfer, the pyramid of energy always has an upright shape, with the highest energy at the producer level and decreasing energy levels as we move up the food chain.



Conclusion	Understanding ecological pyramids is essential for effective environmental management, conservation efforts, and sustainable resource utilization. By studying these pyramids, ecologists can make informed decisions to preserve biodiversity, protect ecosystems, and maintain the delicate balance of nature.

Question	**How are fertilisers and pesticides both are beneficial or harmful to the crop? Explain** உரங்கள் மற்றும் பூச்சிக்கொல்லிகள் இரண்டும் எவ்வாறு பயிருக்கு நன்மை பயக்கும் அல்லது தீங்கு விளைவிக்கும்? விளக்குக.
Introduction	Fertilizers and pesticides are both used in agriculture to improve crop productivity and protect crops from pests and diseases. However, their benefits and drawbacks are distinct and can have significant impacts on the environment and crop health.

Approaching the answer	**Benefits of Fertilizers in India:** ❖ **Increased Crop Yields:** Fertilizer usage has significantly contributed to boosting crop yields in India, ensuring food security for its vast population. Green Revolution initiatives in the 1960s and 1970s, which promoted the adoption of high-yielding crop varieties along with fertilizer use, led to substantial increases in grain production. ❖ **Soil Fertility Improvement:** Fertilizers replenish essential nutrients in the soil, which are often depleted due to intensive farming practices. Nitrogen, phosphorus, and potassium fertilizers help maintain soil fertility and productivity. ❖ **Crop Diversification:** Fertilizers have enabled the cultivation of crops that have high nutrient demands and were previously difficult to grow in certain regions. This has encouraged crop diversification and expanded the variety of agricultural produce. **Harms of Fertilizers in India:** ❖ **Groundwater Contamination:** Excessive and improper use of fertilizers has resulted in the leaching of nitrate and other chemicals into groundwater, leading to nitrate contamination. This poses health risks, particularly for infants and pregnant women, as high nitrate levels in drinking water can cause methemoglobinemia (blue baby syndrome). ❖ **Soil Degradation:** Over-reliance on synthetic fertilizers, without adequate organic matter incorporation, has led to soil degradation and reduced microbial diversity. The excessive use of nitrogen-based fertilizers can also result in soil acidification. ❖ **Environmental Pollution:** The runoff of fertilizers into rivers and water bodies has contributed to eutrophication, causing algal blooms and harming aquatic ecosystems. **Benefits of Pesticides in India:** ❖ **Pest Control:** Pesticides have been instrumental in controlling pests and diseases that can devastate crops. They help reduce yield losses and improve farm productivity.

	❖ **Protection of Cash Crops:** Pesticides play a crucial role in safeguarding high-value cash crops, such as cotton and vegetables, from pests and diseases, ensuring income stability for farmers. ❖ **Storage and Transportation:** Pesticides protect stored crops from post-harvest pests, preventing losses during storage and transportation. **Harms of Pesticides in India:** ❖ **Health Risks:** Prolonged exposure to pesticides has raised health concerns for farmers and agricultural workers. Accidental or improper use of pesticides can result in poisoning and other health issues. Endosulfan was a highly controversial and widely used pesticide in India for several decades ❖ **Environmental Impact:** Pesticide residues can persist in the environment, affecting non-target organisms, including beneficial insects, birds, and wildlife. Pesticides are a significant contributing factor to the decline of pollinators like bees. ❖ **Pest Resistance:** Repeated use of the same pesticides has led to the development of pesticide-resistant pests, making pest control more challenging and necessitating the use of stronger and potentially more harmful chemicals. ❖ **Biodiversity Loss:** Pesticides have been linked to the decline of beneficial insects, birds, and other wildlife, affecting biodiversity and ecological balance.
Conclusion	Sustainable agriculture practices, along with farmer education and awareness, are essential to strike a balance between the benefits and harms of fertilizers and pesticides in India's agriculture sector, ensuring long-term food security and environmental protection.

Question	**What do you mean by solid waste management? Explain the control measures of urban and Industrial waste.** திடக்கழிவு மேலாண்மை என்றால் என்ன? நகர்ப்புற மற்றும் தொழிற்சாலை கழிவுகளை கட்டுப்படுத்தும் வழிமுறைகளை விளக்குக

Introduction	Solid waste management refers to the collection, transportation, processing, and disposal of solid waste generated by human activities. It encompasses a range of waste types, including household waste, commercial waste, institutional waste, and industrial waste. Proper solid waste management is crucial for public health, environmental protection, and sustainable development.
Approaching the answer	Main components of SWM: ❖ Source reduction: This is the process of reducing the amount of waste that is generated in the first place. This can be done by using less packaging, recycling, and composting. ❖ Collection and transportation: This is the process of collecting waste from homes, businesses, and other sources and transporting it to a treatment or disposal facility. ❖ Treatment and disposal: This is the process of converting waste into a less harmful form or disposing of it in a safe manner. **Control Measures of Urban Solid Waste in India:** ❖ **Source Segregation:** One of the key control measures is the segregation of waste at the source itself. This involves separating waste into different categories such as biodegradable (organic) waste, recyclables (plastics, paper, glass, metals), and non-recyclables. Proper segregation allows for efficient waste processing and recycling. ❖ **Door-to-Door Collection:** Local municipal bodies are responsible for regular collection of waste from households and commercial establishments. An effective door-to-door collection system ensures that waste is promptly and hygienically collected from all areas. ❖ **Waste Processing and Recycling:** India has been gradually shifting towards waste processing and recycling facilities. Technologies like composting, vermicomposting, and biogas generation are used for the treatment of organic waste. Recycling centers are established to process and reuse recyclable materials. ❖ **Sanitary Landfills:** For non-recyclable and non-compostable waste, sanitary landfills are utilized. These landfills are designed

to minimize environmental impacts by employing proper lining and leachate collection systems.

- **Waste-to-Energy (WTE) Plants:** Some urban areas have adopted Waste-to-Energy (WTE) plants, which incinerate waste to generate electricity. These plants help reduce the volume of waste sent to landfills while also producing energy.
- **Public Awareness and Education:** Creating awareness among citizens about waste segregation, recycling, and responsible waste disposal is essential for the success of solid waste management initiatives.

Control Measures of Industrial Solid Waste in India:

1. **Waste Minimization and Reduction:** Industries are encouraged to adopt cleaner production techniques and technologies to minimize waste generation at the source. This includes recycling and reusing materials within the production process.
2. **Effluent Treatment Plants (ETPs):** Industries that generate liquid waste (effluents) are required to set up Effluent Treatment Plants (ETPs) to treat and purify the effluents before discharge. This helps prevent water pollution.
3. **Hazardous Waste Management:** Industries producing hazardous waste must comply with strict regulations for its collection, transportation, treatment, and disposal. Hazardous waste is managed separately due to its potential to cause serious environmental and health risks.
4. **E-Waste Management:** With the increasing generation of electronic waste (e-waste), special attention is given to the proper disposal and recycling of electronic items, which can contain toxic substances.
5. **Waste Exchange and Recycling:** Some industries have adopted waste exchange programs, where one industry's waste becomes another's raw material. This promotes circular economy principles and reduces overall waste generation.

	6. **Laws:** The Municipal Solid Waste Management Rules, 2016: These rules set out the minimum standards for SWM in urban areas.The Hazardous Waste (Management and Handling) Rules, 2000: These rules set out the minimum standards for the management and handling of hazardous waste.
Conclusion	Solid Waste Management is an important environmental issue that needs to be addressed in India. By implementing the control measures mentioned above, the government and the public can work together to improve SWM in the country and protect the environment.

Question	**Give detail description of bio diverisity hot-spots in India** இந்தியாவில் உள்ள உயிர் பன்முகத்தன்மை மண்டல்ங்கள் பற்றிய விரிவான விளக்கத்தை அளிக்க.
Introduction	India is renowned for having a diverse ecosystem, and 23.39% of its land is covered in trees and forests with nearly 91,000 identified animal species and 45,500 documented plant species. Four of the world's 36 biodiversity hotspots are located in India: The Himalayas, Western Ghats, Indo-Burma area, and Sundaland
Approaching the answer	Biodiversity hotspots are regions with exceptionally high levels of plant and animal species diversity, many of which are found nowhere else on Earth. These areas are also facing significant threats and are at risk of losing their unique biodiversity. In India, there are four recognized biodiversity hotspots, each containing a remarkable array of species and ecosystems. 1. **Western Ghats:** ❖ Location: The Western Ghats is a mountain range running parallel to India's western coast, spanning several states,

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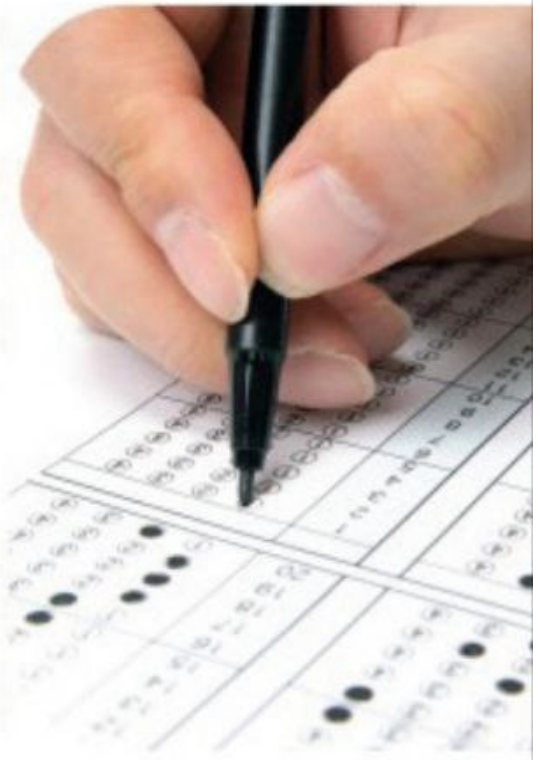

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including Maharashtra, Karnataka, Kerala, Tamil Nadu, and parts of Goa and Gujarat.

- ❖ Biodiversity: The Western Ghats is one of the world's eight hottest biodiversity hotspots. It is home to a vast array of species, including numerous endemic plants, mammals, birds, amphibians, and insects. The region is recognized for its high plant diversity, particularly in its evergreen and semi-evergreen forests.
- ❖ Key Species: Endangered species found here include the Nilgiri tahr, Malabar giant squirrel, lion-tailed macaque, and various species of amphibians, reptiles, and plants.
- ❖ Threats: The Western Ghats face various threats, such as deforestation, habitat fragmentation, unsustainable tourism, mining, and agricultural expansion.

2. **Eastern Himalayas:**
   - ❖ Location: The Eastern Himalayas biodiversity hotspot includes the eastern part of the Himalayan mountain range, covering northeastern Indian states like Arunachal Pradesh, Assam, Sikkim, and parts of northern West Bengal.
   - ❖ Biodiversity: The Eastern Himalayas are renowned for their diverse flora and fauna, including numerous species of plants, mammals, birds, and butterflies. The region boasts rich alpine meadows, temperate forests, and sub-tropical forests, harboring a high level of endemism.
   - ❖ Key Species: Iconic species found in this hotspot include the Bengal tiger, red panda, clouded leopard, and various species of rhododendrons and orchids.
   - ❖ Threats: The Eastern Himalayas face threats from deforestation, habitat degradation, poaching, and infrastructure development, which impact delicate ecosystems and species.
3. **Indo-Burma:**
   - ❖ Location: The Indo-Burma biodiversity hotspot includes northeastern India, along with several Southeast Asian

	countries like Myanmar, Thailand, Laos, Cambodia, and Vietnam. ❖ Biodiversity: This hotspot is incredibly biodiverse, housing a vast range of plant and animal species. The region is known for its lush tropical forests, wetlands, and river systems. ❖ Key Species: Unique species found here include the Asian elephant, hoolock gibbons, Irrawaddy dolphin, and various endemic plant species. ❖ Threats: The Indo-Burma hotspot faces threats from deforestation, illegal wildlife trade, habitat loss due to agriculture and infrastructure development, and mining activities. 4. **Sundaland:** ❖ Location: The Sundaland biodiversity hotspot includes the Andaman and Nicobar Islands in the Bay of Bengal, as well as parts of Indonesia, Malaysia, Brunei, and the Philippines. ❖ Biodiversity: Sundaland is characterized by its vast forests, mangroves, coral reefs, and diverse marine life. It supports a wide variety of unique species. ❖ Key Species: Notable species found here include the orangutan, Sumatran rhinoceros, proboscis monkey, and various endemic bird and reptile species. ❖ Threats: Sundaland faces threats from deforestation, habitat fragmentation, overfishing, and other anthropogenic activities, impacting its rich biodiversity.
Conclusion	These biodiversity hotspots in India and neighboring regions are critical for conservation efforts. They host an incredible range of species, many of which are at risk of extinction due to human activities. Protecting and preserving these areas is vital for maintaining global biodiversity and ensuring the survival of unique and valuable ecosystem

Question	**What are the advantages and disadvantages of solar power over other renewable energy resources? Why is the cost of solar energy decreasing? What is its effect on climate change efforts?** மற்ற புதுப்பிக்கத்தக்க ஆற்றல் வளங்களை விட சூரிய சக்தியின் நன்மைகள் மற்றும் தீமைகள் என்ன? சூரிய சக்தியின் விலை ஏன் குறைகிறது? பருவநிலை மாற்ற முயற்சிகளில் அதன் தாக்கம் என்ன?
Introduction	Solar power is a renewable energy source that uses the sun's energy to generate electricity. It is a clean and sustainable source of energy that has a number of advantages over other renewable energy resources.
Approaching the answer	**Advantages of solar power:** • It is a clean and sustainable source of energy. Solar power does not produce any greenhouse gases or other pollutants, making it a good choice for reducing our reliance on fossil fuels. • It is a reliable source of energy. Solar power can be generated even on cloudy days, and it can be stored in batteries for use when the sun is not shining. • It is a cost-effective source of energy. The cost of solar panels has been decreasing in recent years, making solar power a more affordable option for homeowners and businesses. **Disadvantages of solar power:** • It is not always available. Solar power can only be generated when the sun is shining, so it is not a reliable source of energy for 24/7 power needs. • It requires a large upfront investment. The cost of solar panels and installation can be expensive, but the long-term savings can offset the initial investment. • It can be difficult to integrate into existing power grids. Solar power is a decentralized source of energy, which can make it difficult to integrate into existing power grids.

	Why is the cost of solar energy decreasing? The cost of solar energy has been decreasing in recent years due to a number of factors, including: ❖ Improvements in solar panel technology. Solar panels have become more efficient and less expensive to manufacture in recent years. ❖ Increased government incentives. Many governments offer financial incentives for solar power, such as tax credits and rebates. ❖ Increased demand for solar power. The demand for solar power has been increasing in recent years, which has led to economies of scale. Effect on Climate Change Efforts: ❖ **Reduced Emissions:** The shift towards solar power reduces the reliance on fossil fuels, leading to a decrease in greenhouse gas emissions from the energy sector. ❖ **Renewable Energy Transition:** Solar power plays a crucial role in transitioning from fossil fuels to renewable energy sources, supporting global efforts to mitigate climate change. ❖ **Energy Security:** Solar energy diversifies the energy mix, reducing dependence on fossil fuel imports and enhancing energy security for countries. ❖ **Resilience:** Distributed solar power installations enhance the resilience of energy systems, making them less vulnerable to centralized grid failures and extreme weather events caused by climate change. ❖ **Sustainable Development:** Solar energy supports sustainable development by providing clean electricity, promoting economic growth, and improving access to electricity in remote areas.
Conclusion	India has rapidly embraced solar energy through government initiatives and falling solar costs. It has surpassed 100 GW of cumulative installed solar capacity, with emphasis on rooftop solar and large-scale solar

	parks. The solar sector has become a significant job creator, aiding in environmental benefits and combating climate change. Challenges remain, but the future looks promising with continued advancements.

Question	**What are the effects of cyclones? What are different measures for management of cyclones?** சூறாவளிகளின் விளைவுகள் என்ன? சூறாவளி மேலாண்மைக்கான பல்வேறு நடவடிக்கைகள் என்ன?
Introduction	India is prone to cyclones, especially in the coastal regions, due to its geographical location and proximity to warm ocean waters. A cyclone is a huge strong wind system which blows around thecentre of intense low-pressure area.
Approaching the answer	Cyclones in India are primarily classified into two categories: **1. Bay of Bengal Cyclones:** ❖ The Bay of Bengal is a favorable region for cyclone formation due to its warm sea surface temperatures and high humidity levels. ❖ Cyclones originating in the Bay of Bengal typically impact the eastern coast of India, including states like Odisha, Andhra Pradesh, and West Bengal. ❖ Notable cyclones from the Bay of Bengal include Cyclone Amphan (2020), Cyclone Phailin (2013), and the Super Cyclonic Storm of 1999 that devastated Odisha. **2. Arabian Sea Cyclones:** ❖ The Arabian Sea is another region where cyclones form, but they are generally less frequent and intense compared to those in the Bay of Bengal. ❖ Cyclones originating in the Arabian Sea mostly impact the western coast of India, including states like Gujarat, Maharashtra, and Goa. ❖ Notable cyclones from the Arabian Sea include Cyclone Nisarga (2020) and Cyclone Vayu (2019). **Effects of Cyclones in India:**

- **Loss of Lives and Property:** Cyclones in India can lead to casualties, injuries, and damage to property, including houses, infrastructure, and crops.
- **Displacement and Humanitarian Crisis:** Cyclones can force people to evacuate their homes, leading to displacement and creating humanitarian crises, especially in vulnerable communities.
- **Heavy Rainfall and Flooding:** Cyclones bring heavy rainfall, leading to flooding in low-lying areas, causing damage to homes and disrupting transportation.
- **Storm Surges:** Coastal areas are vulnerable to storm surges, where seawater inundates the land, causing flooding, erosion, and damage to coastal structures.
- **Agricultural Losses:** Cyclones can devastate agricultural lands, resulting in the loss of crops and livelihoods for farmers.
- **Infrastructure Damage:** The strong winds and heavy rainfall associated with cyclones can damage roads, bridges, power lines, and communication networks.

Measures for Management of Cyclones in India:

- **Early Warning Systems:** India has a robust early warning system to track and predict cyclones. The Indian Meteorological Department (IMD) issues warnings and advisories to alert communities in the affected regions.
- **Disaster Preparedness:** Regular drills and training exercises are conducted to enhance disaster preparedness and response capabilities at the community and government levels.
- **Storm Shelters and Evacuation Plans:** Cyclone-prone areas have designated storm shelters and evacuation plans to ensure the safety of people during cyclonic events.
- **Coastal Protection Measures:** Constructing sea walls, embankments, and mangrove restoration help protect coastal areas from storm surges and erosion.

	❖ **Afforestation and Reforestation:** Planting trees and restoring degraded forests can act as natural barriers against wind and rain, reducing the intensity of cyclone impacts. ❖ **Climate Change Adaptation:** Considering climate change impacts in cyclone management strategies to address potential changes in cyclone behavior. ❖ **International Cooperation:** Collaborating with neighboring countries and international organizations for data sharing, resource mobilization, and expertise in cyclone management and disaster response. ❖ **Public Awareness:** Raising awareness among communities about cyclone preparedness and safety measures to enhance their resilience. ❖ **Communication and Information Dissemination:** Utilizing various communication channels to disseminate cyclone-related information and advisories to the public. ❖ **Building Codes and Standards:** Enforcing cyclone-resistant building codes and standards to ensure infrastructure can withstand cyclonic forces.
Conclusion	To manage the impacts of cyclones, India has implemented various measures, including early warning systems, storm shelters, coastal protection measures, disaster preparedness drills, and afforestation. Despite these efforts, cyclones continue to pose challenges, and continuous adaptation and preparedness are necessary to protect vulnerable communities and reduce the potential damage caused by cyclonic events.

Question	**What are threats to biodiversity? Describe habitat loss and its consequences.** **பல்லுயிர் பெருக்கத்திற்கு என்ன அச்சுறுத்தல்கள் உள்ளன? வாழ்விட இழப்பு மற்றும் அதன் விளைவுகளை விவரிக்க.**
Introduction	Biodiversity is the variety of life on Earth, including the different plants, animals, and microorganisms. It is essential for the health of our planet

	and for our own survival. However, biodiversity is under threat from a number of human activities.
Approaching the answer	**Threats to Biodiversity:** ❖ **Habitat Loss and Degradation:** As mentioned earlier, habitat loss and degradation are among the most significant threats to biodiversity. This occurs due to human activities like deforestation, conversion of land for agriculture, urbanization, and infrastructure development. ❖ **Climate Change:** Global warming and climate change disrupt ecosystems, alter natural patterns, and impact species' survival and reproductive behaviors. ❖ **Pollution:** Pollution from various sources, including industrial waste, agricultural runoff, and plastic waste, contaminates air, water, and soil, posing risks to wildlife and ecosystems. ❖ **Overexploitation:** Over-hunting, overfishing, and over-harvesting of natural resources lead to the depletion of species populations and disrupt food chains. ❖ **Invasive Species:** Introduction of non-native species disrupts native ecosystems, outcompetes native species, and alters ecological interactions. ❖ **Disease:** Emerging diseases can have devastating effects on wildlife populations and contribute to species declines. ❖ **Habitat Fragmentation:** Human activities create fragmented habitats, isolating populations and reducing gene flow among species. ❖ **Human Population Growth:** Increasing human population leads to higher demands for resources, putting more pressure on natural habitats and biodiversity. **Habitat Loss in India:**

	❖ **Deforestation:** Large-scale deforestation occurs for agriculture, logging, and urban expansion, especially in states like Maharashtra, Madhya Pradesh, and Odisha. ❖ **Wetland Destruction:** Many wetlands across India have been drained, filled, or converted for agriculture and urban development, affecting migratory bird populations. ❖ **Urbanization:** Rapid urban growth leads to the conversion of natural habitats into concrete jungles, notably in metropolitan areas like Mumbai, Delhi, and Bengaluru. ❖ **Industrialization:** Expansion of industries and mining operations often leads to the destruction of forests and ecosystems, particularly in resource-rich states like Jharkhand and Chhattisgarh. **Consequences of Habitat Loss in India:** ❖ **Tiger Habitat Loss:** The Indian tiger (Bengal tiger) faces threats from habitat loss and fragmentation, reducing the available territory for these iconic big cats. ❖ **Loss of Avian Diversity:** Wetland destruction impacts the habitat of many migratory birds, such as in the Chilika Lake in Odisha, a crucial wintering ground for numerous bird species. ❖ **Gangetic River Dolphin:** Habitat loss and degradation along the Ganges and its tributaries threaten the survival of the endangered Gangetic river dolphin. ❖ **Western Ghats:** Deforestation and land-use change in the Western Ghats have led to the loss of unique biodiversity, including endangered species like the Lion-tailed macaque and the Nilgiri tahr. ❖ **Mangrove Ecosystems:** Coastal mangrove destruction impacts the diverse ecosystems and the species that depend on them, such as the Sundarbans mangrove forest in West Bengal.
Conclusion	To mitigate the consequences of habitat loss in India, conservation efforts are crucial. These include the establishment of protected areas, sustainable land-use practices, habitat restoration, and effective

	implementation of wildlife protection laws. Public awareness and community involvement are equally essential for preserving India's rich biodiversity and ensuring the coexistence of wildlife and human communities.
Question	**What are the factors responsible for ground Water depletion? Write in detail about water conservation methods.** நிலத்தடி நீர் குறைவதற்கு என்ன காரணிகள் காரணம்? நீர் சேமிப்பு முறைகள் பற்றி விரிவாக எழுதுக.
Introduction	According to the Central Groundwater Board of India, 17% of groundwater blocks are overexploited, meaning that the rate at which water is extracted is higher than the rate at which the aquifer can recharge.
Approaching the answer	**Factors Responsible for Groundwater Depletion** ❖ **Excessive Groundwater Extraction:** India heavily relies on groundwater for irrigation, domestic, and industrial purposes. Unregulated and excessive pumping of groundwater, especially in water-stressed regions, leads to depletion. ❖ **Agricultural Practices:** Agriculture is the largest consumer of groundwater in India. Traditional flood irrigation and inefficient irrigation practices result in significant water wastage and groundwater depletion. ❖ **Urbanization and Industrialization:** Rapid urbanization and industrial growth increase the demand for water, leading to increased groundwater extraction and depletion. ❖ **Lack of Water Management:** Inadequate water management practices and a lack of awareness about sustainable water use contribute to over-extraction and groundwater depletion. ❖ **Climate Change:** Changing weather patterns, erratic rainfall, and rising temperatures affect groundwater recharge, impacting the availability of water resources. ❖ **Deforestation and Land Use Change:** Deforestation and land use changes reduce the capacity of the soil to absorb rainwater, limiting groundwater recharge.

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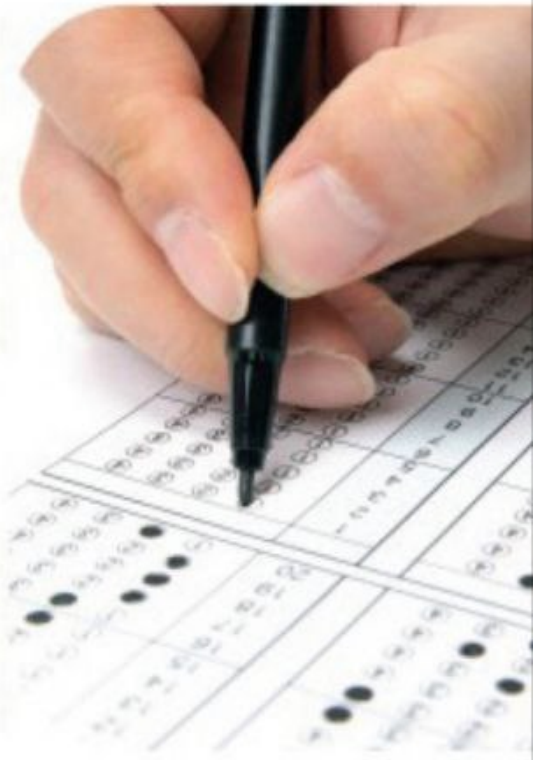

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- **Geological Factors:** Some regions in India have geological conditions that result in limited groundwater recharge or slow replenishment rates.
- **Population Growth:** India's growing population increases water demand, putting additional pressure on groundwater resources.

Water Conservation Methods

- **Rainwater Harvesting:** Promoting rainwater harvesting techniques, such as rooftop rainwater collection and percolation pits, can recharge groundwater and supplement water availability.
- **Watershed Management:** Implementing watershed management programs helps conserve rainwater, control runoff, and enhance groundwater recharge.
- **Micro-Irrigation Techniques:** Encouraging the adoption of micro-irrigation methods, such as drip irrigation and sprinklers, in agriculture reduces water wastage and enhances water use efficiency.
- **Water Recharge Structures:** Constructing artificial recharge structures like check dams, recharge wells, and percolation tanks help replenish groundwater.
- **Water Pricing and Regulation:** Implementing water pricing based on usage and enforcing regulations on groundwater extraction can deter over-exploitation and encourage conservation.
- **Efficient Water Use in Industries:** Encouraging industries to adopt water-efficient technologies and recycle and reuse wastewater helps conserve water resources.
- **Greywater Recycling:** Treating and reusing greywater from households and industries for non-potable purposes reduces freshwater demand.
- **Afforestation and Reforestation:** Planting trees and restoring forests help improve soil health, reduce soil erosion, and increase groundwater recharge.

	❖ **Community Participation:** Involving local communities in water conservation initiatives fosters a sense of ownership and responsibility towards sustainable water management. ❖ **Water Management Programs:** Implementing comprehensive water management programs at the regional and national levels helps balance water demand and supply.
Conclusion	Water conservation in India is vital for water security amid water scarcity and groundwater depletion. Implementing methods, governance, and community participation can ensure water availability for agriculture, domestic use, and industries, supporting economic development and environmental protection.

Question	**Give an account on biodiversity conservation and write about the national parks and sanctuaries of Tamilnadu.** பல்லுயிர் பாதுகாப்பு பற்றிய குறிப்பு தந்து தமிழ்நாட்டின் தேசிய பூங்காக்கள் மற்றும் சரணாலயங்கள் பற்றி எழுதுக.
Introduction	Tamil Nadu is endowed with a rich treasure trove of biodiversity in its forest mainly found in Western and Eastern Ghats. The conservation of biodiversity is of paramount importance to the forest management of the State
Approaching the answer	**National Parks and Sanctuaries of Tamil Nadu:** **. Mudumalai National Park and Wildlife Sanctuary:** ❖ Located in the Nilgiri Hills, it is one of the oldest national parks in India. ❖ Rich in biodiversity, it houses diverse flora and fauna, including elephants, tigers, leopards, and various bird species. **2. Indira Gandhi Wildlife Sanctuary and National Park (Anamalai Tiger Reserve):** • Situated in the Western Ghats, it is a tiger reserve known for its diverse range of mammals, birds, and reptiles. • Home to the endemic and endangered species, the Nilgiri tahr. **3. Guindy National Park:**

	❖ Located in Chennai, it is one of the smallest national parks in India, situated within the city limits. ❖ Provides habitat to blackbucks, spotted deer, and a variety of bird species. **4. Kalakkad Mundanthurai Tiger Reserve:** ❖ A significant tiger reserve located in the Western Ghats. ❖ Rich in biodiversity, it hosts various endemic species, including the lion-tailed macaque and the Nilgiri langur. **5. Gulf of Mannar Marine National Park:** ❖ India's first marine national park, it encompasses coral reefs, seagrass beds, and diverse marine life. ❖ Home to various species of marine animals, including dugongs, turtles, and dolphins. **6. Vedanthangal Bird Sanctuary:** ❖ One of the oldest bird sanctuaries in India, it is a popular destination for migratory birds. ❖ Provides a safe resting place for thousands of birds during the migratory season. **7. Point Calimere Wildlife and Bird Sanctuary:** ❖ Situated in Nagapattinam district, it is a haven for migratory birds and a breeding ground for sea turtles. Megamalai Wildlife Sanctuary ❖ Megamalai Wildlife Sanctuary in Theni & Madurai districs 26910.82ha. It was declared on 2009 and its including the following animals have been seen like Elephant, birds etc.
Conclusion	These national parks and wildlife sanctuaries in Tamil Nadu are essential for biodiversity conservation, ecotourism, and environmental education. They contribute to the protection of numerous plant and animal species, ensure ecological balance, and support the sustainable development of the region.

Question	**What is global warming? What are its impact on climate change? Discuss the contributing factors and suggest remedial measures.**

	புவி வெப்பமடைதல் என்றால் என்ன? பருவநிலை மாற்றத்தில் அதன் தாக்கம் என்ன? பங்களிக்கும் காரணிகளைப் பற்றி விவாதிக்கவும் மற்றும் தீர்வு நடவடிக்கைகளை பரிந்துரைக்க.
Introduction	Global warming refers to the long-term increase in the average temperature of Earth's atmosphere and oceans. It is primarily caused by human activities, especially the emission of greenhouse gases (GHGs) such as carbon dioxide (CO2), methane (CH4), nitrous oxide (N2O), and fluorinated gases. These gases trap heat in the atmosphere, creating a greenhouse effect that leads to a rise in temperatures.
Approaching the answer	**Impact of Global Warming on Climate Change:** ❖ **Rising Temperatures:** Average global temperatures are increasing, leading to more frequent and intense heatwaves. ❖ **Melting Ice and Rising Sea Levels:** Warming temperatures cause glaciers and polar ice caps to melt, contributing to sea-level rise, posing risks to coastal communities and ecosystems. ❖ **Extreme Weather Events:** Global warming intensifies extreme weather events such as hurricanes, droughts, floods, and wildfires. ❖ **Shift in Climate Patterns:** Climate zones and weather patterns are shifting, affecting ecosystems, agriculture, and water availability. ❖ **Ocean Acidification:** Increased CO2 levels in the atmosphere are absorbed by the oceans, leading to ocean acidification, which negatively impacts marine life. ❖ **Biodiversity Loss:** Climate change disrupts ecosystems and habitats, leading to species migration, extinction, and loss of biodiversity. **Contributing Factors to Global Warming:**

- **Burning Fossil Fuels:** The burning of fossil fuels like coal, oil, and natural gas for energy and transportation is the largest source of CO2 emissions.
- **Deforestation:** Cutting down forests reduces their capacity to absorb CO2, contributing to increased atmospheric GHG levels.
- **Agriculture:** Agricultural activities, including rice paddies and livestock, release methane, a potent greenhouse gas.
- **Industrial Processes:** Certain industrial activities, such as cement production and chemical manufacturing, emit GHGs.
- **Waste Management:** Improper waste disposal and decomposition produce methane emissions from landfills.

Remedial Measures for Global Warming:

1. **Transition to Renewable Energy:** Promote the adoption of renewable energy sources like solar, wind, hydro, and geothermal to reduce fossil fuel emissions.
2. **Afforestation and Reforestation:** Planting trees and restoring forests increase carbon sequestration and help mitigate GHG levels.
3. **Energy Efficiency:** Improve energy efficiency in buildings, transportation, and industries to reduce energy consumption and emissions.
4. **Climate-Friendly Agriculture:** Adopt sustainable agricultural practices and promote climate-smart farming techniques to reduce GHG emissions from agriculture.
5. **Waste Management:** Implement waste management strategies that reduce methane emissions from landfills and promote recycling and composting.
6. **International Cooperation:** Collaborate on a global level to set and achieve ambitious emission reduction targets.
7. **Public Awareness and Education:** Raise awareness about climate change and encourage individuals to take action in their daily lives.

	8. **Policy and Regulation:** Implement policies and regulations that incentivize emission reduction, carbon pricing, and sustainable practices.
Conclusion	Addressing global warming requires a concerted effort from governments, industries, communities, and individuals. Combining these remedial measures can help mitigate the impact of global warming, curb climate change, and create a more sustainable and resilient future for the planet.

Question	**a) Major environmental Movements in India** இந்தியாவின் முக்கிய சுற்றுச்சூழல் இயக்கங்கள் **b) Impacts of exotic species in Natural Ecosystems** இயற்கை சுற்றுச்சூழல் அமைப்புகளில் அயல்நாட்டு இனங்களின் தாக்கங்கள்
Keywords	India has witnessed several significant environmental movements that have played a crucial role in raising awareness about environmental issues, advocating for conservation, and influencing policy changes. ❖ **Chipko Movement (1973-1974):** The Chipko Movement, originating in the state of Uttarakhand (then part of the state of Uttar Pradesh), involved hugging and protecting trees from being felled by loggers. Led mainly by women, this movement highlighted the importance of forests for ecological balance and the livelihoods of local communities. ❖ **Silent Valley Movement (1970s):** The Silent Valley Movement took place in Kerala to protect the Silent Valley National Park from a proposed hydroelectric dam project. The movement succeeded in preserving the ecologically sensitive area, which is now recognized for its rich biodiversity. ❖ **Narmada Bachao Andolan (NBA) (1985-present):** NBA is a social and environmental movement that opposes the construction of large dams on the Narmada River. It aims to protect the rights of displaced people, conserve the river's ecosystem, and promote sustainable development.

- **Bishnoi Movement (15th century - ongoing):** The Bishnoi community in Rajasthan has a long history of protecting the environment and wildlife. They adhere to strict conservation practices and have sacrificed their lives to protect trees and animals.
- **Save the Western Ghats Movement (ongoing):** This movement advocates for the conservation of the ecologically sensitive Western Ghats, a biodiversity hotspot, against various development projects that may harm the fragile ecosystem.
- **Save the Yamuna Movement (ongoing):** Various movements and protests have been conducted to protect the Yamuna River from pollution and degradation, highlighting the importance of preserving this lifeline for millions of people.
- **Save the Sunderbans Movement (ongoing):** Concerned groups and communities are actively advocating for the preservation of the Sunderbans mangrove forest, a UNESCO World Heritage Site, from the impacts of climate change and industrial activities.
- **Save the Aravallis Movement (ongoing):** Activists and environmentalists are fighting to protect the Aravalli Range, a critical green belt in North India, from illegal mining and urban encroachments.

Impacts of exotic species in Natural Ecosystems

Exotic species, also known as invasive alien species or non-native species, refer to plants, animals, and microorganisms introduced to a new environment outside their native range. When introduced into natural ecosystems in India, these exotic species can have various impacts, both ecological and economic

major impacts include:

- **Biodiversity Loss:** Exotic species can outcompete and displace native species, leading to a reduction in biodiversity. This disrupts ecological balance and may result in the decline or extinction of native flora and fauna.

- **Habitat Degradation:** Invasive species can alter habitats by changing soil composition, nutrient cycling, and water availability, leading to the degradation of natural ecosystems.
- **Threat to Endangered Species:** Exotic species can pose a threat to endangered and vulnerable native species, further jeopardizing their survival.
- **Altered Ecosystem Processes:** The presence of invasive species can modify ecological processes like pollination, seed dispersal, and nutrient cycling, affecting ecosystem health and functioning.
- **Impact on Agriculture:** Invasive species can damage crops and reduce agricultural productivity, causing economic losses to farmers.
- **Health Concerns:** Some exotic species may carry diseases or toxic substances harmful to humans, animals, or other native species.
- **Fire Hazard:** Certain invasive plants, like Lantana camara, are highly flammable, increasing the risk of wildfires in natural areas.
- **Waterway and Infrastructure Damage:** Invasive aquatic plants like water hyacinth can clog waterways, disrupt navigation, and damage infrastructure like dams and irrigation channels.
- **Loss of Cultural and Traditional Knowledge:** Invasive species can negatively impact traditional practices and cultural values associated with native ecosystems.

Examples of Exotic Species Impacts in India:

- **Water Hyacinth (Eichhornia crassipes):** This invasive aquatic plant has spread rapidly in Indian water bodies, choking waterways and affecting aquatic ecosystems, fishing, and water transport.
- **Lantana (Lantana camara):** Lantana is a highly invasive plant that has invaded forest areas, hindering natural regeneration of native vegetation and affecting biodiversity.
- **Asian Tiger Mosquito (Aedes albopictus):** This invasive mosquito species, introduced through international trade, can

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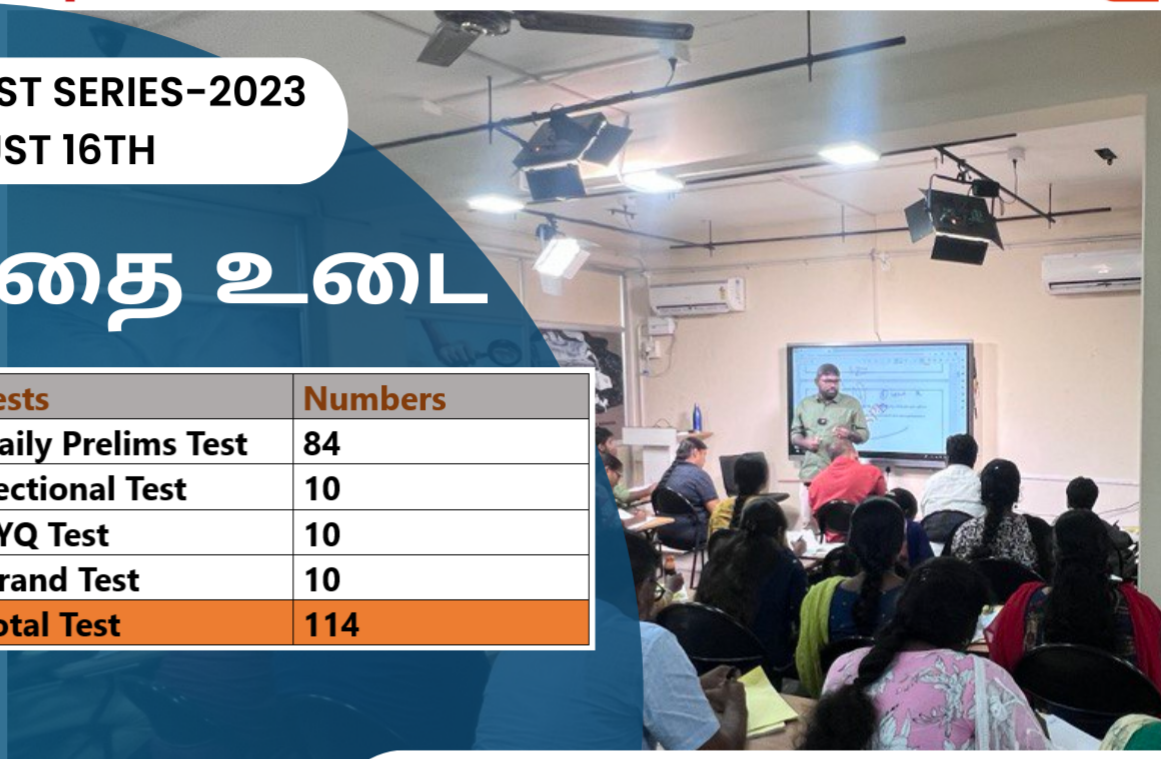

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	transmit diseases like dengue and chikungunya, posing public health risks. ❖ **Parthenium Weed (Parthenium hysterophorus):** Known as 'Congress grass,' it infests agricultural fields, reducing crop yields, and can cause respiratory and skin allergies in humans and livestock.

Question	**Explain the impacts of landslides. Also map the distribution of landslides in India.** நிலச்சரிவுகளால் ஏற்படும் பாதிப்புகளை விளக்குங்கள். இந்தியாவில் நிலச்சரிவுகளின் பரவலையும் வரைபடம் வரைந்து காண்பிக்க
Introduction	India experiences a significant number of landslides due to various geological, topographical, and climatic factors. Landslides are sudden and rapid movements of rock, soil, and debris down a slope.
Approaching the answer	**impacts on both the natural environment and human communities:** ❖ **Loss of Lives and Property:** Landslides can cause fatalities and injuries to people living in the affected areas. They can also lead to the destruction of buildings, infrastructure, and agricultural land. ❖ **Displacement of People:** Landslides can force people to evacuate their homes and communities, leading to displacement and homelessness. ❖ **Environmental Damage:** Landslides can alter landscapes, disrupt ecosystems, and cause habitat destruction, affecting plant and animal life in the affected regions. ❖ **Transportation Disruptions:** Landslides can block roads, railways, and other transportation routes, causing disruptions to travel and commerce. ❖ **Water Body Obstruction:** Landslides can dam rivers and streams, leading to the formation of temporary or permanent lakes, potentially increasing flood risks downstream.

	❖ **Floods and Tsunamis:** In some cases, landslides into water bodies can generate large waves, triggering tsunamis that can further devastate coastal areas. ❖ **Soil Erosion:** Landslides remove vegetation and expose bare soil, increasing the risk of erosion and sedimentation in water bodies. ❖ **Infrastructure Damage:** Landslides can damage or destroy vital infrastructure such as dams, bridges, and power lines. **Distribution of Landslides in India:** ❖ **Himalayan Region:** The northern states of Jammu and Kashmir, Himachal Pradesh, Uttarakhand, and parts of Northeast India are highly susceptible to landslides due to the steep terrain and geological factors. ❖ **Western Ghats:** The hilly regions of states like Kerala, Karnataka, and Maharashtra experience landslides, particularly during heavy monsoon rains. ❖ **Eastern Ghats:** Parts of Odisha and Andhra Pradesh, with their hilly landscapes, are also prone to landslides. ❖ **Central India:** Some hilly areas in Madhya Pradesh, Chhattisgarh, and parts of Jharkhand are susceptible to landslides. ❖ **Coastal Areas:** Landslides can also occur in coastal areas where the terrain is hilly, such as parts of Goa, Konkan region in Maharashtra, and coastal Karnataka.
Conclusion	To manage the impacts of landslides, it is essential to implement measures such as proper land-use planning, slope stabilization techniques, early warning systems, and community awareness programs. The Geological Survey of India (GSI) plays a vital role in mapping and monitoring landslide-prone regions and providing timely information to mitigate risks associated with landslides in India.

Question	**Explain National Action Plan on Climate Change (NAPCC), objectives and recommendations.**

	காலநிலை மாற்றம் (NAPCC), நோக்கங்கள் மற்றும் பரிந்துரைகள் மீதான தேசிய செயல் திட்டத்தை விளக்குக.
Introduction	National Action Plan on Climate Change (NAPCC) is a comprehensive strategy developed by the Government of India to address the challenges of climate change and promote sustainable development. It was launched in June 2008 and encompasses eight national missions, each focusing on specific sectors to achieve India's climate change goals.
Approaching the answer	**Objectives of the National Action Plan on Climate Change (NAPCC):** ❖ **Mitigation:** To reduce the greenhouse gas emissions intensity of India's GDP by promoting cleaner and more efficient technologies in various sectors. ❖ **Adaptation:** To enhance India's resilience to the adverse impacts of climate change by implementing adaptation measures in vulnerable sectors. ❖ **Sustainable Development:** To promote sustainable development and foster climate-resilient growth that ensures social, economic, and environmental well-being. ❖ **Technology Transfer and Capacity Building:** To facilitate the development and transfer of climate-friendly technologies and build institutional capacities for climate action. **Key Recommendations and National Missions under NAPCC:** ❖ **National Solar Mission:** The mission aims to promote the development and use of solar energy for both grid-connected and off-grid applications. The goal is to deploy 20,000 megawatts (MW) of solar power by 2022. ❖ **National Mission for Enhanced Energy Efficiency:** This mission focuses on improving energy efficiency in various sectors, including industries, agriculture, and buildings, to reduce energy consumption and greenhouse gas emissions. ❖ **National Mission on Sustainable Habitat:** The mission aims to promote sustainable urban development by adopting energy-efficient and environmentally friendly building practices.

	❖ **National Water Mission:** This mission focuses on water conservation, improving water use efficiency, and promoting water management practices to adapt to climate change impacts on water resources. ❖ **National Mission for Sustaining the Himalayan Ecosystem:** The mission aims to conserve and protect the fragile Himalayan ecosystems, including biodiversity, forests, and water resources. ❖ **National Mission for a Green India:** This mission aims to increase forest cover and enhance carbon sequestration through afforestation and reforestation efforts. ❖ **National Mission for Sustainable Agriculture:** The mission focuses on promoting climate-resilient agriculture practices, water-use efficiency, and sustainable land management. ❖ **National Mission on Strategic Knowledge for Climate Change:** This mission aims to enhance India's capacity for climate research, data collection, and climate modeling to support policy and decision-making.
Conclusion	The NAPCC provides a roadmap for India's efforts to tackle climate change and aligns with the country's commitments under the United Nations Framework Convention on Climate Change (UNFCCC). It demonstrates India's commitment to sustainable development and its willingness to take action to address the global challenge of climate change while ensuring equitable growth and development for its people.

PART – B

Question	**What do you mean by Climate Change? Discuss its causes and impacts with reference to bio- diversity and depletion of forests.** காலநிலை மாற்றம் என்றால் என்ன? பல்லுயிர் பெருக்கம் மற்றும் காடுகளின் அழிவு ஆகியவற்றைக் குறிப்பதன் மூலம் அதன் காரணங்கள் மற்றும் தாக்கங்களைப் பற்றி விவாதிக்க.
Introduction	Climate change refers to long-term alterations in Earth's climate patterns, including changes in temperature, precipitation, wind patterns, and other climate-related parameters. These changes are

	primarily driven by human activities, such as the burning of fossil fuels, deforestation, and industrial processes, which release greenhouse gases (GHGs) into the atmosphere. These GHGs, including carbon dioxide (CO2), methane (CH4), nitrous oxide (N2O), and fluorinated gases, trap heat in the atmosphere, creating a greenhouse effect. As a result, the Earth's average temperature increases, leading to global warming and climate change.
Approaching the answer	**Causes of Climate Change:** ❖ **Burning of Fossil Fuels:** The combustion of fossil fuels like coal, oil, and natural gas for energy and transportation releases large amounts of CO2 into the atmosphere. ❖ **Deforestation:** Cutting down forests reduces the planet's capacity to absorb CO2, contributing to increased GHG levels. ❖ **Agriculture:** Agricultural activities, including livestock farming and rice paddies, emit methane, a potent greenhouse gas. ❖ **Industrial Processes:** Certain industrial activities, such as cement production and chemical manufacturing, release GHGs. ❖ **Waste Management:** Improper waste disposal and decomposition produce methane emissions from landfills. **Impacts of Climate Change on Biodiversity and Depletion of Forests:** ❖ Rising sea levels: Sea levels are rising due to the melting of glaciers and ice sheets. This is causing flooding in coastal areas and erosion of coastlines. ❖ More extreme weather events: Climate change is causing more extreme weather events, such as heat waves, droughts, floods, and storms. These events are causing damage to property and infrastructure, and are also displacing people from their homes. ❖ Changes in agricultural yields: Climate change is causing changes in agricultural yields. This is because plants need different amounts of water and heat to grow, and climate change is making it more difficult for plants to get the conditions they need. ❖ Loss of biodiversity: Climate change is causing the loss of biodiversity. This is because many plants and animals are not able to adapt to the changing climate.

	❖ Deforestation: Deforestation is the clearing of forests for agricultural or other purposes. Deforestation contributes to climate change by releasing carbon dioxide into the atmosphere
Conclusion	Addressing climate change and its impact on biodiversity and forests requires a comprehensive approach, including reducing greenhouse gas emissions, conserving forests, promoting sustainable land-use practices, and fostering international cooperation to combat this global challenge. Protecting biodiversity and preserving forests are vital components of climate change mitigation and adaptation strategies for a more sustainable and resilient future.

Question	**Give a reasoned account of the problems of degradation and conservation of wetlands in India.** இந்தியாவில் உள்ள சதுப்பு நிலங்களின் சீரழிவு மற்றும் பாதுகாப்பின் சிக்கல்கள் பற்றிய நியாயமான குறிப்பு தருக.
Introduction	'Wetland' is a generic term for water bodies of various types, and includes diverse hydrological entities, namely, lakes, marshes, swamps, estuaries, tidal flats, river flood plains, and mangroves. Wetlands are crucial ecosystems that provide numerous ecological, social, and economic benefits, including water purification, flood regulation, habitat for biodiversity, and support for livelihoods.
Approaching the answer	Challenges faced by the Wetlands Ecosystem ❖ **Urbanization and Encroachment:** Rapid urbanization and population growth lead to encroachment and conversion of wetlands for infrastructure development and real estate projects. This results in the loss of wetland habitats and ecosystem functions. ❖ **Agriculture and Land Use Changes:** Expansion of agriculture and unsustainable land-use practices like drainage and conversion of wetlands for farming lead to degradation and reduced water retention capacity of wetlands. ❖ **Pollution:** Industrial discharges, agricultural runoff, and untreated sewage contribute to water pollution, affecting the

water quality of wetlands and harming the plants and animals that rely on them.

- **Invasive Species:** Invasion by non-native plant species can disrupt the natural balance of wetland ecosystems, outcompeting native species and altering habitat structure.
- **Climate Change:** Climate change impacts, such as altered precipitation patterns, rising temperatures, and sea-level rise, threaten the hydrology and biodiversity of wetlands.
- **Over-Exploitation:** Over-fishing and excessive extraction of resources like water, timber, and reeds from wetlands can disrupt ecological balance and lead to degradation.
- **Lack of Awareness and Policy Gaps:** Limited awareness about the importance of wetlands and inadequate policies for their conservation and management contribute to their degradation.

Conservation Efforts:

- **Ramsar Convention:** India is a party to the Ramsar Convention on Wetlands, an international treaty for the conservation and sustainable use of wetlands. Ramsar sites in India receive protection and management measures for their conservation.
- **Wetland Rules and Legislation:** India has enacted the Wetlands (Conservation and Management) Rules, 2017, to regulate activities in wetland areas and prevent their degradation.
- **Wetland Inventory and Assessment:** Regular monitoring, assessment, and inventory of wetlands help in understanding their status and implementing appropriate conservation measures.
- **Ecosystem Restoration:** Restoration projects are undertaken to rehabilitate degraded wetlands, including removal of invasive species, reforestation, and habitat enhancement.
- **Community Participation:** Involving local communities and stakeholders in wetland conservation fosters a sense of ownership and ensures sustainable management practices.

Conclusion	Efforts to conserve and protect wetlands are critical for preserving their ecological services, supporting biodiversity, and ensuring sustainable development in India. Collaboration between government agencies, NGOs, communities, and international partners is vital to address the challenges of wetland degradation effectively.

Question	**Explain the problems encountered by the Cauvery delta zone. How Cauvery delta's protected special agricultural zone will help in this regard.** காவிரி டெல்டா பகுதியில் நிலவும் பிரச்சனைகளை விளக்கவும். காவிரி டெல்டாவின் பாதுகாக்கப்பட்ட சிறப்பு வேளாண் மண்டலம் இந்த விஷயத்தில் எவ்வாறு உதவும்.
Introduction	Cauvery delta is a fan-shaped plain located in the southeastern part of India. It is formed by the deposition of sediments from the Cauvery River, which is one of the longest rivers in India. The delta covers an area of approximately 13,000 square kilometers and is home to over 20 million people.
Approaching the answer	**Problems Encountered by the Cauvery Delta Zone:** ❖ **Water Scarcity:** The region experiences water scarcity, especially during dry seasons, due to over-extraction of groundwater and inadequate water management practices. ❖ **Groundwater Depletion:** Excessive and unsustainable extraction of groundwater for irrigation has led to the depletion of aquifers, affecting water availability for agriculture. ❖ **River Water Disputes:** The sharing of Cauvery river water between Tamil Nadu and Karnataka has been a longstanding issue, leading to conflicts and reduced water flow to the delta during certain periods. ❖ **Soil Salinization:** Due to excessive groundwater extraction and sea-level rise, saline water from the Bay of Bengal intrudes into the delta, affecting agricultural lands and reducing soil fertility. ❖ **Climate Change:** Changing weather patterns, including erratic rainfall and increased frequency of extreme events like droughts and floods, impact crop yields and farming practices.

- **Land Degradation:** Conversion of agricultural land for non-agricultural purposes and improper land-use changes have contributed to land degradation and loss of farmland.
- **Pesticide and Chemical Usage:** Indiscriminate use of pesticides and chemical fertilizers has led to soil and water pollution, affecting both the environment and human health.

Cauvery Delta's Protected Special Agricultural Zone:

In response to these challenges, the Government of Tamil Nadu has declared the Cauvery delta region as a Protected Special Agricultural Zone. This designation aims to safeguard the region's agricultural land and water resources from non-agricultural activities and urbanization.

- **Conservation of Agricultural Land:** The protected status ensures that agricultural land in the delta region is preserved for farming and prevents its conversion for non-agricultural purposes, protecting the livelihoods of farmers.
- **Sustainable Water Management:** The declaration emphasizes sustainable water management practices, including better regulation of groundwater use, to prevent over-extraction and depletion of aquifers, thereby improving water availability for agriculture.
- **Enhanced Agricultural Productivity:** By safeguarding the delta's fertile agricultural land and water resources, the region's overall agricultural productivity is expected to improve, contributing to food security.
- **Preservation of Biodiversity:** The protection of agricultural land can indirectly benefit biodiversity, as undisturbed habitats and green spaces may provide a refuge for wildlife, contributing to ecological conservation.
- **Mitigation of Climate Change Impacts:** By promoting sustainable agricultural practices and preserving natural ecosystems, the protected zone can contribute to climate change

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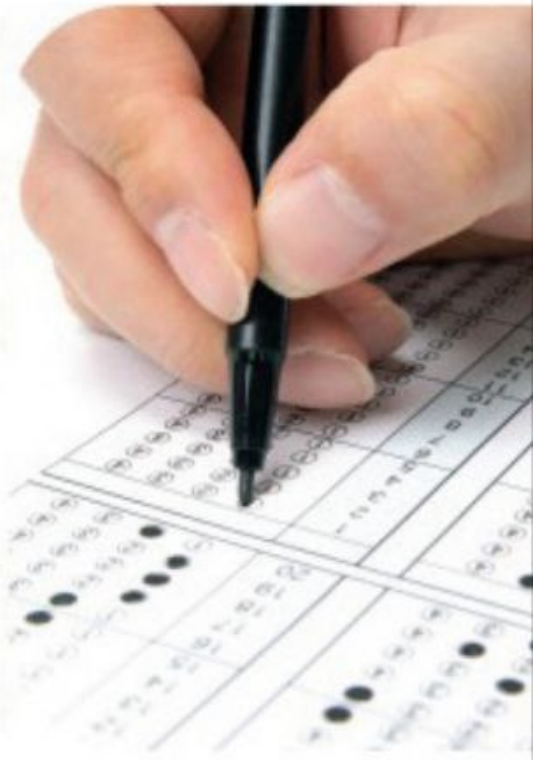

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	adaptation and resilience, reducing the vulnerability of farmers to extreme weather events. ❖ **Socio-Economic Benefits:** The measure is expected to support the livelihoods of farmers and rural communities, as agriculture is a significant source of income in the delta region, leading to rural development and poverty alleviation.
Conclusion	By designating the Cauvery Delta Zone as a Protected Special Agricultural Zone, Tamil Nadu aims to strike a balance between agricultural development and environmental conservation, ensuring a sustainable future for the delta's agriculture and ecosystems. It also signifies the recognition of the region's ecological importance and the need to protect it for the benefit of current and future generations.

Question	**Explain the EIA procedure in India and briefly mention any five methods for EIA evaluation.** இந்தியாவில் சுற்றுச்சூழல் தாக்க நடைமுறையை விளக்கி, சுற்றுச்சூழல் தாக்க மதிப்பீட்டிற்கான ஏதேனும் ஐந்து முறைகளை சுருக்கமாகக் குறிப்பிடவும்
Introduction	Environmental Impact Assessment (EIA) is a process of identifying, predicting, and evaluating the likely environmental impacts of a proposed project or activity. The EIA procedure in India is governed by the Environment Impact Assessment (EIA) Notification, 2006, which was issued by the Ministry of Environment, Forest and Climate Change (MoEFCC).
Approaching the answer	EIA procedure in India is as follows: ❖ Screening: The first step in the EIA procedure is to screen the project or activity to determine if it is likely to have significant environmental impacts. If the project or activity is not likely to have significant environmental impacts, then it is not required to undergo an EIA. ❖ Scoping: If the project or activity is likely to have significant environmental impacts, then it will need to undergo a scoping

	process. The scoping process is used to identify the potential environmental impacts of the project or activity and to determine the scope of the EIA. ❖ EIA Report Preparation: The next step is to prepare an EIA report. The EIA report should identify and assess the potential environmental impacts of the project or activity, and it should also propose mitigation measures to reduce the negative environmental impacts. ❖ Public Consultation: The EIA report must be made available for public consultation. The public has the opportunity to comment on the EIA report and to suggest changes. ❖ Decision-Making: The EIA report is then submitted to the MoEFCC for a decision. The MoEFCC will consider the EIA report and the public comments before making a decision on whether to approve the project or activity. **benefits of the EIA procedure in India:** ❖ It helps to identify and assess the potential environmental impacts of projects and activities. ❖ It helps to ensure that projects and activities are designed and implemented in a way that minimizes their environmental impacts. ❖ It provides a forum for public participation in the decision-making process. ❖ It helps to promote sustainable development.
Conclusion	The EIA procedure in India is still evolving, and there are some challenges that need to be addressed. However, it is an important tool for ensuring that the environmental impacts of projects and activities are considered before they are approved.

Question	**Explain the types of disasters, disaster management processes and disaster management cycle** பேரிடர்களின் வகைகள், பேரிடர் மேலாண்மை செயல்முறைகள் மற்றும் பேரிடர் மேலாண்மை சுழற்சி ஆகியவற்றை விளக்குக.
Introduction	India is one of the most disaster-prone countries in the world. It is prone to a wide range of natural disasters, including floods, cyclones, earthquakes, droughts, and landslides. Disaster management in India is a crucial aspect of governance aimed at reducing the impact of disasters and enhancing the resilience of communities and infrastructure. Given India's vulnerability to various natural and man-made disasters, effective disaster management is of paramount importance
Approaching the answer	**Natural Disasters:** These disasters are caused by natural processes and events, often beyond human control. Some common types of natural disasters in India include: **a) Floods:** Resulting from heavy rainfall, river overflow, or cyclonic activity. **b) Droughts:** Prolonged periods of water scarcity due to inadequate rainfall. **c) Earthquakes:** Sudden release of energy in the Earth's crust, causing ground shaking. **d) Cyclones:** Intense tropical storms with high winds and heavy rainfall. **e) Landslides:** Sudden movement of rock, soil, and debris down a slope. **f) Tsunamis:** Large ocean waves generated by underwater earthquakes or volcanic eruptions. **Man-made (Technological) Disasters:** These disasters result from human activities and technological failures. Examples include: a) **Industrial Accidents:** Chemical spills, explosions, and mishaps in industrial plants. b) **Nuclear Accidents:** Radiation leaks or meltdowns in nuclear power plants.

c) **Urban Fires:** Large-scale fires in urban areas, often due to poor fire safety measures.

d) **Terrorist Attacks:** Deliberate acts of violence or sabotage to cause harm and panic.

e) **Oil Spills:** Accidental release of oil into water bodies, harming marine life and coastal ecosystems.

Disaster Management Processes in India:

- **Preparedness:** This involves developing and implementing disaster preparedness plans, conducting drills and simulations, and ensuring the availability of necessary resources and infrastructure for timely response.
- **Mitigation:** The aim is to reduce the vulnerability of communities and infrastructure to disasters through measures such as land-use planning, building codes, and structural reinforcements.
- **Response:** When a disaster occurs, the focus is on providing immediate relief and assistance to affected communities. This includes search and rescue operations, medical aid, food, shelter, and other essential supplies.
- **Recovery:** After the immediate response, the focus shifts to restoring normalcy and rebuilding affected areas. Efforts are made to rehabilitate and support affected communities and rebuild infrastructure.
- **Capacity Building:** Building the capacity of local communities, authorities, and agencies to effectively respond to disasters and undertake disaster risk reduction initiatives.

Disaster Management Cycle:

- **Prevention and Mitigation:** Measures to avoid the occurrence of disasters or reduce their impact are undertaken during this phase.

	❖ **Preparedness:** Activities to enhance the readiness of communities, agencies, and infrastructure to respond to disasters are carried out. ❖ **Response:** Immediate actions are taken to address the needs of affected populations and provide emergency assistance. ❖ **Recovery:** The process of rebuilding and restoring affected areas and communities post-disaster is undertaken. ❖ **Risk Reduction:** Lessons learned from past disasters are applied to improve future disaster management and reduce vulnerabilities.
Conclusion	India has made significant progress in disaster management over the years. The National Disaster Management Authority (NDMA) and various state disaster management authorities play a crucial role in coordinating and implementing disaster management efforts across the country.

Question	**Briefly elucidate the prospects of ecotourism in Tamilnadu .** **தமிழ்நாட்டின் சுசூழல் சுற்றுலாவின் வாய்ப்புகளை சுருக்கமாக விளக்குக.**
Introduction	Ecotourism is defined as "responsible travel to natural areas that conserves the environment, sustains the well-being of the local people, and involves interpretation and education"
Approaching the answer	prospects of ecotourism in Tamil Nadu: ❖ **Biodiversity:** Tamil Nadu is home to a wide variety of biodiversity, including forests, mountains, beaches, and rivers. This biodiversity provides a great opportunity for ecotourism, as people can come to Tamil Nadu to experience the natural beauty of the state. ❖ **Cultural heritage**: Tamil Nadu is also home to a rich cultural heritage, including temples, forts, and monuments. This cultural heritage can also be a major draw for ecotourists, as people can come to Tamil Nadu to learn about the history and culture of the state. ❖ **Affordability**: Tamil Nadu is a relatively affordable destination for ecotourists. This is due to the fact that the cost of living in Tamil Nadu

	is relatively low, and there are a number of budget-friendly options for accommodation and transportation. ❖ **Accessibility**: Tamil Nadu is a well-connected state, with good road, rail, and air connectivity. This makes it easy for ecotourists to get to Tamil Nadu and to explore the different parts of the state. ❖ **Jungle safaris**: Tamil Nadu is home to a number of national parks and wildlife sanctuaries, which offer opportunities for jungle safaris. These safaris allow people to see a variety of wildlife, including elephants, tigers, and leopards. ❖ **Hill stations**: Tamil Nadu also has a number of hill stations, such as Kodaikanal and Ooty. These hill stations offer a break from the heat and humidity of the plains, and they provide opportunities for trekking, camping, and hiking. ❖ **Beaches:** Tamil Nadu has a long coastline, with a number of beautiful beaches. These beaches offer opportunities for swimming, sunbathing, and surfing. ❖ **Bird watching:** Tamil Nadu is also a great place for bird watching. The state is home to over 500 species of birds, including the great Indian bustard, the sarus crane, and the flamingo.
Conclusion	The prospects of ecotourism in Tamil Nadu are very good. The state has a lot to offer ecotourists, including biodiversity, cultural heritage, affordability, and accessibility. With proper planning and management, ecotourism can be a major source of income for Tamil Nadu and can help to protect the state's natural and cultural heritage.

Question	**What is Project Tiger? Has it been able to achieve its objectives? Discuss.** புலி பாதுகாப்பு திட்டம் என்றால் என்ன? அதன் நோக்கங்களை அடைய முடிந்ததா? விவாதிக்க.
Introduction	**Project Tiger** is a wildlife conservation initiative launched in India in 1973 with the primary objective of conserving the endangered Bengal tiger (Panthera tigris tigris). It was initiated by the Government of India under the leadership of Prime Minister Indira Gandhi and is

	administered by the National Tiger Conservation Authority (NTCA) since 2005.
Approaching the answer	**Objectives of Project Tiger:** ❖ To ensure a viable population of Bengal tigers in their natural habitats. ❖ To protect the tiger's natural prey base and their habitats. ❖ To eliminate poaching and illegal trade of tiger parts and derivatives. ❖ To reduce human-tiger conflicts through better management and planning. ❖ To involve local communities in conservation efforts and provide them with economic incentives. **Achievements of Project Tiger:** ❖ **Increase in Tiger Population:** Project Tiger played a crucial role in arresting the decline of the Bengal tiger population. Census data indicates an increase in tiger numbers from around 1,400 in 1973 to over 2,900 tigers in 2018. ❖ **Protected Tiger Reserves:** Several tiger reserves were established under Project Tiger, providing designated protected areas for tigers and their prey. These reserves serve as crucial habitats for tiger conservation. ❖ **Community Involvement:** Project Tiger emphasized involving local communities in conservation efforts. This approach has helped in reducing human-wildlife conflicts and creating a sense of ownership among communities for tiger conservation. ❖ **Anti-Poaching Measures:** Project Tiger implemented various anti-poaching measures, such as the establishment of anti-poaching squads and better patrolling, resulting in a decline in tiger poaching incidents. ❖ **Habitat Protection:** The project focused on habitat protection and restoration, ensuring that tiger habitats are conserved and well-managed. **Challenges and Limitations:**

	❖ **Habitat Fragmentation:** Tiger habitats are often fragmented due to human activities and developmental projects, limiting the gene flow between populations and posing long-term threats to tiger survival. ❖ **Poaching and Illegal Trade:** Despite efforts, poaching of tigers for their body parts and illegal trade continues to be a significant threat to their survival. ❖ **Human-Wildlife Conflict:** As tiger populations increase and their habitats overlap with human settlements, incidents of human-wildlife conflicts have risen. ❖ **Limited Resources:** Inadequate funding and resources hamper effective monitoring and conservation efforts. ❖ **Inadequate Staffing and Infrastructure:** Some tiger reserves face challenges in terms of insufficient staff, equipment, and infrastructure for effective management. ❖ **Climate Change:** Climate change and its impacts on tiger habitats and prey availability pose additional challenges for tiger conservation.
Conclusion	Despite these challenges, Project Tiger has been successful in increasing the tiger population in India. The project has also raised awareness about tiger conservation, and it has worked to protect tiger habitat. With continued effort, Project Tiger can help to save the tiger from extinction.

Question	**Explain the earthquake disaster and describe geographical distribution in India.** பூகம்ப பேரழிவை விளக்கி, இந்தியாவில் புவியியல் பரவலை விவரிக்க
Introduction	An earthquake is a natural disaster that occurs due to the sudden release of energy in the Earth's crust, resulting in seismic waves. These waves cause ground shaking, leading to potential damage to buildings, infrastructure, and loss of life. Earthquakes are caused by the movement of tectonic plates beneath the Earth's surface.
Approaching the answer	**Geographical Distribution in India:**

India is geologically and seismically active, lying in a seismically vulnerable zone where several tectonic plates interact. The country is primarily affected by three major tectonic processes: the Himalayan belt in the north, the Indo-Gangetic plain in the middle, and the seismic zones in the southern part of the country.

1. Himalayan Belt: The Himalayan region is one of the most seismically active zones in India. It is located along the boundary of the Indian and Eurasian tectonic plates. The movement of these plates results in frequent earthquakes in this region. The states of Jammu and Kashmir, Himachal Pradesh, Uttarakhand, Sikkim, and parts of Arunachal Pradesh and Assam are prone to earthquakes due to the Himalayan tectonic activity.

2. Indo-Gangetic Plain: The Indo-Gangetic plain, stretching from the northwest to the eastern part of India, experiences earthquakes due to the Indian plate's movement under the Eurasian plate. States like Bihar, Uttar Pradesh, and West Bengal are part of this seismically vulnerable region.

3. Peninsular India: The peninsular region of India is also susceptible to earthquakes, although the frequency and intensity are lower compared to the Himalayan belt. The eastern and western coasts are relatively stable, while the central parts of peninsular India are prone to seismic activity.

Seismic Zones: India is divided into four seismic zones based on the intensity and frequency of earthquakes:

- **Zone V:** High seismic risk zone with the highest level of intensity. Includes parts of Jammu and Kashmir, Himachal Pradesh, Uttarakhand, Sikkim, the northeastern states, and the Andaman and Nicobar Islands.
- **Zone IV:** High seismic risk zone, including parts of Jammu and Kashmir, Himachal Pradesh, Uttarakhand, and some regions in the northeastern states.

	❖ **Zone III:** Moderate seismic risk zone, covering areas in the Indo-Gangetic plain, parts of Rajasthan, Gujarat, and parts of Maharashtra, Karnataka, and West Bengal. ❖ **Zone II:** Low seismic risk zone, including peninsular India, parts of Bihar, and some areas in Jammu and Kashmir and Himachal Pradesh.
Conclusion	Given India's geographical distribution and seismic activity, earthquake preparedness and awareness are essential to mitigate the impact of potential earthquakes and ensure the safety and resilience of communities and infrastructure.

Question	**Briefly describe the Sendai Framework for Disaster Risk Reduction and its adoption in the disaster management policy of India.** பேரிடர் அபாயக் குறைப்புக்கான செண்டாய் கட்டமைப்பையும் இந்தியாவின் பேரிடர் மேலாண்மைக் கொள்கையில் அதை ஏற்றுக்கொண்டதையும் சுருக்கமாக விவரிக்க.
Syllabus Connect	Disaster Management in India
Keywords	Sendai Farmwork and Indian Disaster management
Introduction	Sendai Framework for Disaster Risk Reduction (2015-2030) is an international agreement adopted at the Third UN World Conference on Disaster Risk Reduction in Sendai, Japan, in March 2015. The framework aims to guide global efforts in reducing disaster risk and building resilience to disasters. It sets strategic priorities and targets for disaster risk reduction over a 15-year period.
Approaching the answer	key objectives of the Sendai Framework are: ❖ **Substantially reduce** global disaster mortality. ❖ **Reduce** the number of affected people and the economic losses caused by disasters. ❖ **Minimize** damage to critical infrastructure and disruption of basic services. ❖ **Increase** the number of countries with national and local disaster risk reduction strategies.

- **Enhance** international cooperation to support developing countries in disaster risk reduction.

Adoption in the Disaster Management Policy of India:

- **National Disaster Management Plan (NDMP):** India has formulated the National Disaster Management Plan, which outlines a holistic and integrated approach to disaster risk reduction, preparedness, response, and recovery.
- **Focus on Local Governance:** The Sendai Framework emphasizes the importance of local governance and community involvement in disaster risk reduction. India has strengthened its local disaster management capacities and involved local communities in risk assessment and preparedness.
- **Investment in Resilient Infrastructure:** India has placed emphasis on resilient infrastructure to reduce the impact of disasters on critical facilities such as hospitals, schools, and communication networks.
- **Early Warning Systems:** The country has developed and implemented early warning systems for various hazards, including cyclones and floods, to issue timely alerts to vulnerable communities.
- **Capacity Building and Training:** India has invested in capacity building and training programs for disaster management personnel, emergency responders, and community volunteers to enhance preparedness and response capabilities.
- **Integration of Climate Change Adaptation:** The Sendai Framework recognizes the link between disaster risk reduction and climate change adaptation. India has integrated climate change adaptation measures into its disaster risk reduction strategies.
- **International Cooperation:** India actively participates in international forums and cooperates with other countries to share knowledge and best practices in disaster risk reduction.

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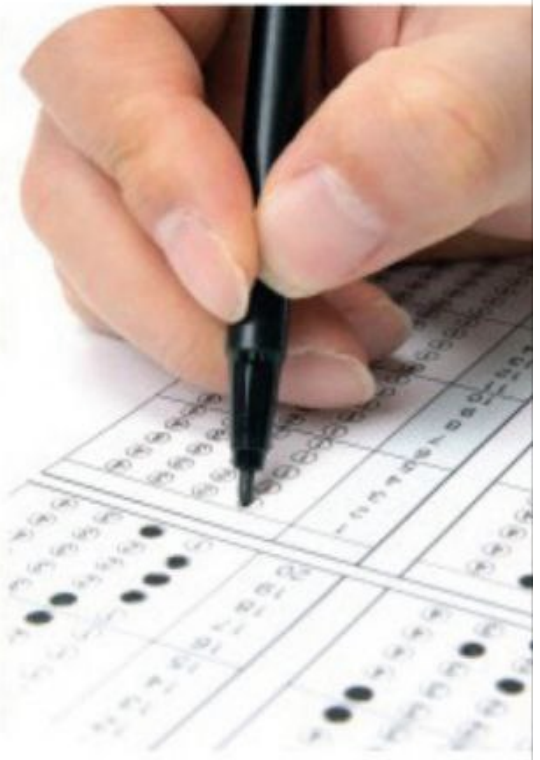

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Conclusion	By aligning its disaster management policy with the principles of the Sendai Framework, India aims to reduce disaster risks, build resilience at all levels, and enhance its capacity to respond effectively to disasters, thereby safeguarding lives and livelihoods.

Question	**What is the role of Indigenous knowledge and Community Based Disaster Management?** உள்நாட்டு அறிவு மற்றும் சமூக அடிப்படையிலான பேரிடர் மேலாண்மையின் பங்கு என்ன?
Introduction	Indigenous knowledge and community-based disaster management (CBDRM) play an important role in disaster risk reduction in India. Indigenous knowledge is the knowledge and practices that have been passed down through generations of people who live in a particular area. This knowledge can be very valuable in disaster risk reduction, as it can help people to understand the risks that they face and to develop ways to mitigate those risks.
Approaching the answer	**Role of Indigenous Knowledge and Community-Based Disaster Management** **1. Early Warning Systems:** Indigenous communities in India often possess traditional knowledge of environmental indicators that can help predict natural disasters. For example, in the coastal regions, fisherfolk have observed behavioral changes in marine life that precede tsunamis. Integrating such indigenous knowledge with modern technology can enhance early warning systems and provide timely alerts to vulnerable communities. **2. Resource Management:** Indigenous communities have developed sustainable resource management practices over generations. In the Himalayan regions, traditional water harvesting and irrigation methods help conserve water and reduce the risk of flash floods and soil erosion during monsoons. **3. Disaster Preparedness and Response:** Indigenous practices include disaster preparedness and response strategies. In flood-prone regions like Assam, some communities build elevated houses on bamboo stilts

	to protect themselves from inundation during floods. They also construct traditional rafts for transportation during flood emergencies. **4. Community Resilience:** Indigenous communities often have well-established social support systems that strengthen community resilience. For instance, in cyclone-prone coastal areas, communities come together to collectively reinforce houses and support each other during cyclone events. **5. Conservation of Biodiversity:** Indigenous knowledge contributes to the conservation of biodiversity, which is crucial for disaster risk reduction. In the Western Ghats, tribal communities have preserved traditional agricultural practices that maintain biodiversity, helping to regulate the water flow and prevent landslides during heavy rains. **6. Fire Management:** In several forested areas, indigenous communities have developed controlled burning practices as part of their traditional forest management. These practices help reduce the risk of severe wildfires and maintain ecological balance. **7. Community Awareness and Education:** Community-Based Disaster Management (CBDM) fosters awareness and education about disaster risks and preparedness at the local level. In various communities across India, CBDM initiatives conduct workshops and awareness campaigns on disaster safety and response measures. **8. Community Mobilization:** During disaster events, community mobilization is critical for effective response. In Uttarakhand, local community members played a significant role in search and rescue operations during the devastating floods in 2013.
Conclusion	The use of indigenous knowledge and CBDRM in disaster risk reduction is an important part of the Sendai Framework for Disaster Risk Reduction. The framework recognizes the importance of local knowledge and participation in disaster risk reduction, and it calls for the use of these approaches to be scaled up.

Question	**Write a note on minimum standards of relief in provision of food and in disaster situations**

	உணவு மற்றும் பேரிடர் சூழ்நிலைகளில் நிவாரணம் வழங்குவதற்கான குறைந்தபட்ச தரநிலைகள் குறித்து ஒரு குறிப்பு எழுதுக.
Introduction	During disasters, ensuring access to adequate and nutritious food is of utmost importance to address the immediate needs of affected populations. The provision of food relief should adhere to minimum standards to safeguard the dignity and well-being of disaster-affected communities.
Approaching the answer	**1. Timely Response:** Prompt response is essential to provide food relief to affected populations. Humanitarian agencies and governments must act quickly to assess needs, mobilize resources, and distribute food within the shortest possible time. **2. Nutritional Adequacy:** Food relief should meet the nutritional requirements of different population groups, including children, pregnant women, and the elderly. Adequate protein, carbohydrates, fats, vitamins, and minerals should be provided to prevent malnutrition. **3. Safe and Hygienic Food:** Food items distributed must be safe for consumption and free from contaminants. Proper storage, handling, and hygiene practices should be followed to prevent foodborne illnesses. **4. Culturally Appropriate Food:** Efforts should be made to respect the cultural preferences and dietary habits of the affected communities. Providing culturally appropriate food ensures acceptability and helps in maintaining social norms. **5. Gender-Sensitive Distribution:** Food relief distribution should consider the specific needs and vulnerabilities of women and girls. Measures should be in place to prevent discrimination and ensure equitable access to food. **6. Inclusive Approach:** Efforts should be made to include marginalized and vulnerable groups, such as people with disabilities, in food relief distribution. Special accommodations should be made to cater to their needs. **7. Transparent and Accountable Distribution:** The process of food distribution should be transparent and accountable. Proper records should be maintained, and feedback mechanisms should be established to address any grievances.

	8. Dignified Provision: Food relief distribution should be conducted in a manner that upholds the dignity of the affected communities. Measures should be taken to avoid creating dependency and preserve the self-respect of beneficiaries. **9. Non-Discrimination:** Food relief should be provided without discrimination based on race, religion, ethnicity, gender, or any other criteria. All affected individuals and communities should receive equal access to food assistance. **10. Long-Term Sustainability:** Efforts should be made to move beyond immediate food relief and promote long-term sustainability. Supporting local food systems and livelihoods can contribute to resilience and recovery. **11. Coordination and Collaboration:** Effective coordination and collaboration among humanitarian organizations, government agencies, and local stakeholders are crucial to ensuring an efficient and comprehensive food relief response.
Conclusion	Adhering to these minimum standards in the provision of food relief during disaster situations ensures that the basic needs of affected populations are met, promoting their well-being and resilience during times of crisis. It also lays the foundation for a more effective and dignified disaster response.

Question	**Explain the details of Tsunami Warning System of India.** **இந்தியாவின் சுனாமி எச்சரிக்கை அமைப்பின் விவரங்களை விளக்குக.**
Introduction	Tsunami Warning System of India is a comprehensive network and mechanism designed to detect and issue timely warnings about potential tsunamis in the Indian Ocean region. The system was established in the aftermath of the devastating Indian Ocean tsunami of December 2004, which caused widespread destruction and loss of life in several countries, including India.
Approaching the answer	**Key Components of India's Tsunami Warning System:** ❖ **Indian Tsunami Early Warning Centre (ITEWC):** The ITEWC is the nodal agency responsible for monitoring seismic activities in

the Indian Ocean and issuing tsunami warnings. It operates under the Indian National Centre for Ocean Information Services (INCOIS), an autonomous body under the Ministry of Earth Sciences.

- **Seismic Network:** The system relies on a network of seismometers and other instruments deployed across the Indian Ocean region to detect earthquake activity. Seismic data from various sources, including global seismic networks, are continuously monitored to identify potential tsunamigenic earthquakes.
- **Sea-Level Monitoring Stations:** Tide gauges and buoys equipped with pressure sensors are installed in coastal areas to monitor changes in sea level. These stations provide real-time data on sea-level variations, which is crucial for confirming the occurrence of a tsunami.
- **Global Telecommunication System (GTS):** India is part of the international GTS, through which it exchanges seismic and sea-level data with other countries and regional tsunami warning centers.
- **International Cooperation:** India collaborates with other countries in the Indian Ocean region and beyond for sharing seismic data and coordinating tsunami warning efforts.

Tsunami Warning Process:

- **Earthquake Detection:** The seismic network continuously monitors the region for earthquake activity. When a potentially tsunamigenic earthquake is detected, its magnitude and location are determined.
- **Tsunami Evaluation:** The ITEWC evaluates the earthquake's characteristics, such as its depth, magnitude, and location, to assess its potential to generate a tsunami.
- **Tsunami Warning Issuance:** If the earthquake is assessed as capable of generating a tsunami, the ITEWC issues a tsunami warning to the concerned authorities and the public. The warning

	includes information on the expected arrival time and the potential impact on coastal areas. ❖ **Communication and Dissemination:** Tsunami warnings are communicated through various channels, including official government agencies, media, and public communication systems. Sirens and other warning devices may also be used in coastal areas to alert people.
Conclusion	Tsunami Warning System of India is continuously monitored, evaluated, and updated to ensure its efficiency and effectiveness in safeguarding coastal communities from the devastating impacts of tsunamis. By integrating science, technology, and public awareness, the system plays a critical role in enhancing disaster preparedness and minimizing the loss of life and property during tsunami events
Question	"**India's traditional water management methods are key in the present context.**" **Examine the statement with special focus on water harvesting and disaster management.** 'இந்தியாவின் பாரம்பரிய நீர் மேலாண்மை முறைகள் தற்போதைய சூழலில் முக்கியமானது.'' நீர் சேகரிப்பு மற்றும் பேரிடர் மேலாண்மையில் சிறப்பு கவனம் செலுத்தி அறிக்கையை ஆராய்க.
Introduction	In Ancient India we had well developed knowledge of water management. This could be cited from the Dholavira, one of the site of the Indus valley civilization. India has a rich heritage of traditional water management practices that have proven to be sustainable, resilient, and effective in addressing contemporary water challenges and disaster situations.
Approaching the answer	**India's traditional water harvesting methods** ❖ **Tankas and Johads:** In Rajasthan and other arid regions, tankas (underground tanks) and johads (small earthen dams) are used to capture rainwater during the monsoon season. These structures store rainwater for extended use during dry periods, preventing runoff and enhancing groundwater recharge. ❖ **Bawris and Stepwells:** Bawris (stepwells) are traditional water storage structures found in parts of Gujarat and Rajasthan. They

collect rainwater and provide a reliable source of water even during droughts.

- **Kulhs and Ahar Pynes:** In the Himalayan region and parts of Bihar, the traditional water diversion systems called kulhs and ahar pynes divert water from streams to irrigate agricultural fields. These methods efficiently manage water flow and distribution.
- **Talabs and Check Dams:** Talabs (small village ponds) and check dams are commonly used in different parts of India to retain rainwater and recharge groundwater. These structures also help in flood moderation by regulating the flow of water during heavy rains.
- **Katta and Eri Systems:** In Tamil Nadu, the Katta and Eri systems involve the construction of earthen bunds or small check dams across streams and low-lying areas to collect rainwater during the monsoon. These structures create small reservoirs that store water for agricultural and domestic use during the dry season.
- **Tanks and Ponds:** Tanks, also known as temple tanks or village ponds, are an integral part of the traditional water harvesting system in South India. These artificial water bodies are designed to capture and store rainwater, providing a reliable water source for irrigation and other purposes.
- **Bund Farming**: In regions with undulating topography like Kerala and parts of Karnataka, farmers practice bund farming. They create small bunds or embankments on slopes to trap rainwater, which seeps into the ground and recharges wells and borewells.
- **Talavu and Kulam**: Talavu (tanks) and kulam (small ponds) are common water harvesting structures in southern states like Kerala and Tamil Nadu. These ponds collect rainwater and groundwater runoff, supporting agriculture and local ecosystems.
- **Vayals and Paddy Fields**: In Kerala, traditional water harvesting is closely linked to paddy cultivation. Vayals, which are natural wetlands or paddy fields, serve as retention basins during heavy rainfall, preventing flooding in other areas.

	❖ **Ooranis and Kalyanis**: In Karnataka, ooranis (community tanks) and kalyanis (stepwells) are constructed to capture rainwater and recharge groundwater. These structures are historically associated with religious and social significance. ❖ **Village Ponds and Bawris**: In regions like Telangana, village ponds and bawris (stepwells) are used for water harvesting and storage. These structures are often connected to traditional rainwater harvesting systems. **Disaster Management:** ❖ **Flood Control:** Traditional water harvesting structures like check dams and johads help in flood control by slowing down the flow of water during heavy rains, reducing the risk of flash floods. ❖ **Drought Mitigation:** Water harvesting methods like tankas and stepwells provide a lifeline during droughts when surface water sources become scarce. These structures ensure the availability of water for both human and livestock consumption. ❖ **Sustainable Water Supply:** Traditional water management practices help maintain a sustainable water supply even during prolonged dry spells or disaster situations when other sources may be inaccessible or disrupted.
Conclusion	India's traditional water management practices have stood the test of time and offer valuable lessons for sustainable water use and disaster management. By incorporating these practices into contemporary approaches and policies, India can enhance water security, disaster resilience, and community well-being in the face of an increasingly uncertain climate and growing water challenges.