CSB IAS ACADEMY

The Road Map to Mussoorie…

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Dear Aspirants,

Welcome to the March edition of *CSB IAS's iMPACT*, crafted to provide you with in-depth analysis and insights essential for the UPSC Civil Services Examination. As the journey toward CSE 2025 intensifies, this edition focuses on key policy developments, economic trends, and governance issues shaping India's trajectory.

This month, we analyze the ***India-Mauritius* and *India-New Zealand relations***, breaking down India's MAHASAGAR doctrine and new economic diplomacy. The ***coal production hike*** highlights India's growing coal demand, while the APAAR ID have important governance implications. Additionally, we examine ***glacier melting, offshore mining, tiger conservation*** and other key developments shaping India's environment and economic landscape.

By aligning these themes with the UPSC syllabus, *iMPACT* remains your go-to resource for refining analytical skills and enhancing answer-writing proficiency. Let this edition empower you with the knowledge and perspectives necessary for success in the Mains Examination.

Happy Learning!
Team CSB IAS

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GENERAL STUDIES-I

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1. COAL PRODUCTION IN INDIA

iMPACT ANALYSIS

SYLLABUS:

GS 1 > Indian Geography >> Coal

REFERENCE NEWS:

India produced a record **one billion tonnes of coal** in fiscal year 2024-25. An official statement said this achievement comes 11 days ahead of last fiscal's 997.83 million tonnes (MT) coal production. Commenting on the development, Prime Minister Narendra Modi said this highlights India's commitment to energy security, economic growth and self-reliance. **India depends on coal for approximately 55% of its energy mix, and around 74% of the country's electricity is generated by coal-based power plants.**

COAL IN INDIA:

Coal is a readily combustible, black or brownish-black **sedimentary rock**, predominantly made of **carbon**.

- India is the **2nd largest consumer of coal**. India is also the **2nd largest producer of coal** with 5th largest geological reserves of coal in the world.
- India imported about 260 million tonnes of coal in FY 2023-24, dominated by non-coking coal (~77% of total imports).
- **Gondwana coal makes up to 98 per cent of the total reserves and 99 per cent of the production of coal in India.**
- The carbon content in Gondwana coal (250 million years old) is less compared to the Carboniferous coal (350 million years old) which is almost absent in India.

- Tertiary coal is 15 to 60 million years old. Carbon content is very low. Mainly confined to the extra-Peninsula- Jammu and Kashmir, Himachal Pradesh, Assam, Arunachal Pradesh etc. Tamil Nadu and the union territory of Pondicherry also bear tertiary coal reserves in the form of lignite.

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- Peat is confined to few areas only, occurring mostly in Nilgiri hills, Kashmir valley (in the alluvium of Jhelum), Kolkata suburbs peat beds and in Ganga delta.

SIGNIFICANCE OF COAL SECTOR IN INDIA:

Energy Security & Power Generation

- **Primary Source of Electricity:** Coal accounts for 74% of India's power generation, making it the backbone of the energy sector.
    - **NTPC (India's largest power producer)** relies heavily on coal, operating **thermal plants like Vindhyachal (4,760 MW), the largest in India**.
- **Base Load Energy Reliability:** Unlike solar and wind, coal provides **continuous power supply**, essential for **industrial and residential needs**.
    - **Darlipali Super Thermal Power Plant (Odisha, 1,600 MW) ensures stable power supply to eastern India.**

Industrial Growth & Steel Production

- **Essential for Steel & Cement Industries:** Coking coal is vital for steel production, while non-coking coal fuels cement and aluminium industries.
    - Tata Steel and JSW Steel import coking coal from Australia due to India's limited reserves. India imports **85% of its coking coal needs**, making domestic coal production crucial for reducing costs.
- **Boosts Infrastructure Development:** Cement production (used in roads, buildings, and railways) depends on coal-fired kilns.
    - UltraTech Cement, India's largest cement producer, uses coal-based energy for 70% of its operations.

Employment Generation & Rural Development

- **Direct & Indirect Job Creation:** The coal sector employs **millions of people** in mining, transportation, and processing industries.
    - **Coal India Limited (CIL) alone employs over 2.5 lakh workers**, making it India's largest public-sector employer.
- **Development of Coal-Rich Regions:** Coal mining develops remote areas by creating townships, hospitals, and schools when they act as growth poles.
    - Korba (Chhattisgarh) and Dhanbad (Jharkhand) have grown into major industrial hubs due to coal mining.

Economic Growth & Revenue Generation

- **Contribution to GDP:** Coal contributes **over 1.5% to India's GDP** through mining, power, and industrial applications.
    - **Odisha earns over ₹15,000 crore annually from coal royalties and taxes.**

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- **Reduces Energy Import Dependency:** India **imports oil and gas but is self-sufficient in coal**, reducing its trade deficit.
    - **Coal production saved India over $20 billion in energy imports in 2023.**
- **Enhancing Energy Security:** Indigenous coal production reduces reliance on expensive LNG and crude oil imports.
    - Coal-based Ultra Mega Power Projects (UMPPs) like Mundra (Gujarat) help meet India's growing energy demands.

CHALLENGES OF COAL PRODUCTION IN INDIA:

Poor Infrastructure & Inefficiencies in Mining

- **Outdated Mining Technology: Most coal mines use open-cast mining**, which is **less efficient and environmentally harmful**.
    - **Jharia coalfield (Jharkhand)** faces frequent **underground fires** due to outdated mining methods.
- **Low Coal Quality & High Ash Content:** Indian coal has **35-45% ash content**, reducing efficiency and increasing **pollution**.
    - **Singrauli coal (Madhya Pradesh) has high ash, affecting power plant efficiency.**
- **Transport & Logistics Bottlenecks:** 60% of coal is transported via rail, but inadequate rakes lead to supply shortages.
    - **Korba (Chhattisgarh) mines face transport delays due to lack of railway connectivity.**

High Import Dependency on Coking Coal

- **Limited Domestic Reserves: India imports 85% of its coking coal** for **steel production**, increasing costs.
- **Trade Deficit & Supply Risks:** Importing coal adds to **India's trade deficit**, making the economy vulnerable to **global price fluctuations**. India **spent $20 billion on coal imports in 2023**, despite having the world's 5th largest reserves.

Environmental & Social Challenges

- **Deforestation & Land Degradation:** Coal mining destroys forests and displaces local communities.
    - Hasdeo-Arand forests (Chhattisgarh) face destruction due to coal mining expansion.
- **Air & Water Pollution:** Coal-based power plants contribute to 50% of India's industrial emissions.

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- Ennore thermal plant (Tamil Nadu) has polluted local water bodies, affecting fisheries.

- **Health Hazards for Workers & Local Communities:** Coal mining causes lung diseases like pneumoconiosis and TB among workers.
  - Dhanbad (Jharkhand) reports high cases of coal dust-related respiratory diseases.

Bureaucratic & Policy Delays

- **Land Acquisition & Rehabilitation Issues:** Acquiring land for coal mining faces resistance from tribals and locals.
  - Adani's coal mine in Godda (Jharkhand) faced protests over displacement.
- **Slow Approval & Environmental Clearances: Coal projects often take years to get clearances, delaying production**.
  - **Chennai Neyveli Lignite expansion took over 7 years for approvals.**

Geopolitical & Supply Chain Disruptions

- **China's Dominance in Coal & Critical Minerals:** China controls global coal supply chains, affecting Indian imports of mining equipment. China's supply restrictions in 2021 increased global coal prices, impacting India's power sector.
- **Coal Price Volatility in Global Markets:** India is highly vulnerable to fluctuations in global coal prices. Russia-Ukraine war led to a 50% rise in global coal prices, straining Indian power plants.

Future Energy Transition & Policy Uncertainty

- **Shift to Renewable Energy:** India is **committed to Net-Zero emissions by 2070**, reducing long-term coal demand.
- India's renewable energy target and India's coal production hike is hyphenated development and present a climate change mitigation- development paradox.
- **Uncertainty in Coal Sector Reforms:** Privatization of coal mining is slow, limiting investment in modern technology. Only 10% of new coal blocks auctioned since 2020 have started production.

WAY FORWARD:

- **Transition to Advanced Mining Techniques:** Adopt underground coal gasification (UCG) and coal beneficiation to improve efficiency and reduce waste. China's Shenhua Group uses UCG to extract deeper coal reserves with minimal land disruption.

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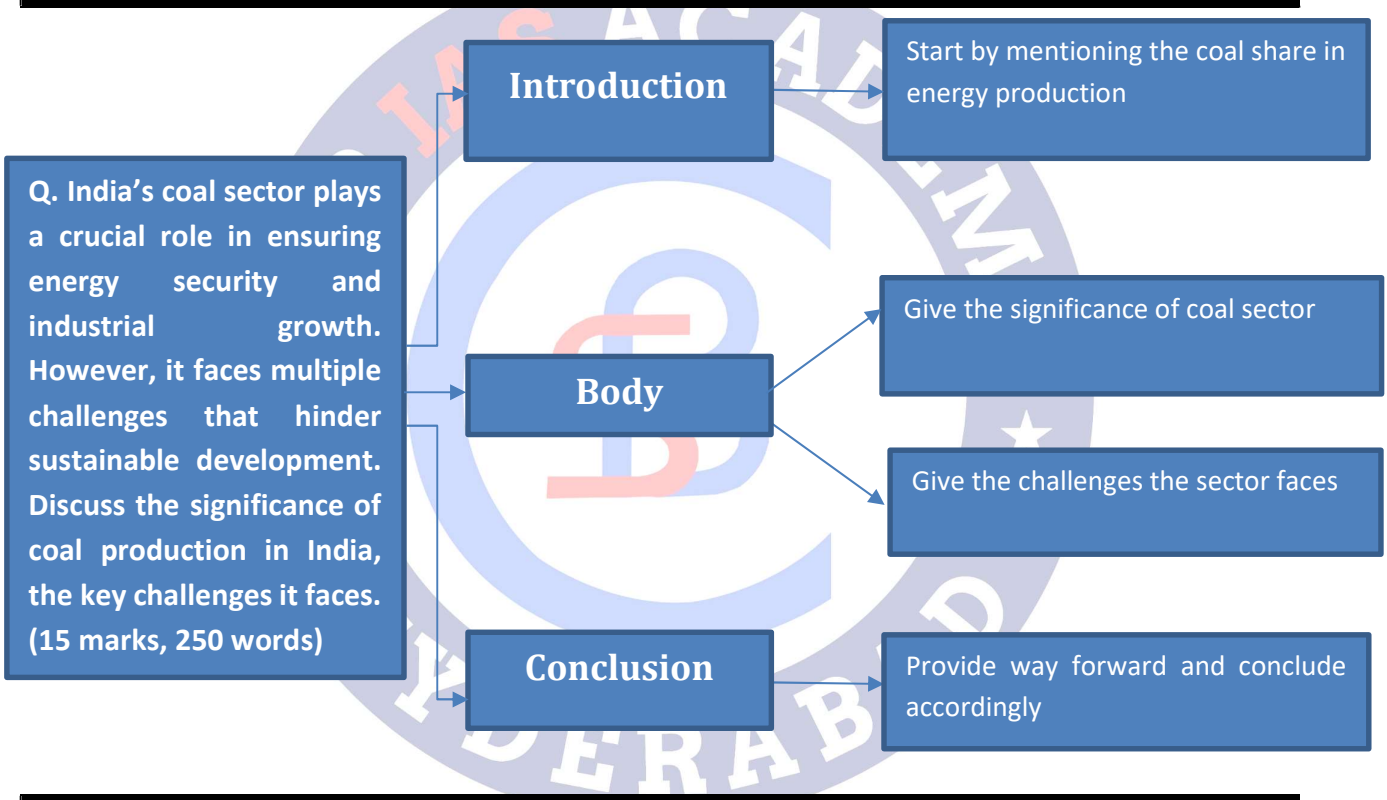
- **Automation & AI in Coal Mining:** Use AI-driven monitoring, autonomous drilling, and drone-based mine surveys to reduce labour risks and improve productivity. Australia's Rio Tinto mines use autonomous trucks and AI-driven logistics to increase efficiency.
- **Development of Washeries & Coal Beneficiation:** Install coal washeries to reduce ash content and improve quality, reducing pollution from power plants. Germany's Ruhr Valley coal plants use advanced washing techniques to enhance fuel efficiency.
- **Develop Indigenous Coking Coal Reserves**: Invest in Jharia (Jharkhand) & Raniganj (West Bengal) for coking coal exploration to reduce import dependence. China has reduced coking coal imports by enhancing deep mining techniques in Shanxi province.
- **Strategic Coking Coal Reserves & Joint Ventures**: Develop long-term supply agreements with Australia, Russia & Mongolia to ensure stable pricing. Tata Steel signed a long-term coking coal supply agreement with Australian miners to stabilize costs.
- **Railway & Inland Waterway Expansion**: Enhance rail-coal linkages and invest in dedicated freight corridors (DFCs) for coal transport. The Eastern DFC project improves coal movement from Jharkhand and Odisha to power plants.
- **Boost Coastal Shipping & Conveyor Belt Systems**: Use conveyor belts for direct mine-to-power plant transport, reducing pollution and transport time. Adani's coal conveyor system in Mundra (Gujarat) reduced logistics costs by 30%.
- **Mine Reclamation & Green Coal Mining**: Ensure abandoned mines are repurposed for afforestation, solar farms, or tourism projects. Germany's Lusatia coal mine was converted into a lake and eco-tourism destination.
- **Carbon Capture & Clean Coal Technology**: Invest in carbon capture, utilization, and storage (CCUS) to cut emissions from coal-fired plants. Norway's Mongstad Plant successfully uses CCUS to trap 80% of emissions.
- **Shifting Towards Coal Gasification & Liquefaction**: Increase coal gasification projects for cleaner energy production. Talcher (Odisha) is developing India's first coal gasification plant for cleaner fuel production.
- **Speed Up Mine Auctions & Private Investment**: Encourage global companies to invest in Indian coal mining through easier FDI norms. China's coal privatization increased efficiency and reduced wastage.
- **Improved Land Acquisition & Community Compensation:** Ensure fair compensation, rehabilitation, and social benefits for displaced communities. The Coal Bearing Areas (Amendment) Bill aims to fast-track land acquisition for coal projects.
- **Hybrid Energy Models: Coal + Solar + Wind**: Use coal-based power plants with integrated solar/wind energy to reduce carbon intensity. NTPC has set up hybrid coal-solar power plants in Madhya Pradesh.

- **Gradual Transition to Cleaner Energy Sources**: Limit coal dependency by diversifying into nuclear, hydro, and renewables. Australia has begun phasing out coal by replacing older plants with hybrid power stations.

PRACTICE QUESTION

Q. India's coal sector plays a crucial role in ensuring energy security and industrial growth. However, it faces multiple challenges that hinder sustainable development. Discuss the significance of coal production in India, the key challenges it faces. (15 marks, 250 words)

APPROACH



MODEL ANSWER

Coal is the **backbone of India's energy sector**, accounting for **74% of electricity generation** and contributing to **industrial development, employment, and economic growth**. India is the **second-largest coal producer globally**, achieving a **record one billion tonnes of coal production in FY 2024-25**.

Significance of Coal Production in India

1. **Energy Security & Power Generation:** Coal contributes 74% of India's electricity generation, ensuring a stable energy supply.

- Vindhyachal Thermal Plant (4,760 MW) is India's largest coal-based power station.

2. **Industrial Growth & Infrastructure Development:** Coking coal is essential for steel production, while non-coking coal fuels cement and aluminium industries.
   - UltraTech Cement, India's largest cement producer, relies on coal for 70% of operations.
3. **Employment & Economic Contribution:** Coal India Limited (CIL) employs 2.5 lakh workers, making it India's largest public-sector employer.
   - Odisha earns ₹15,000 crore annually from coal royalties.
4. **Reducing Import Dependency:** India spent $20 billion on coal imports in 2023, despite having the 5th largest reserves globally.
   - Ultra Mega Power Projects (Mundra, Gujarat) help reduce LNG and crude oil reliance.

Challenges in Coal Production

1. **Outdated Mining Infrastructure & Logistics Bottlenecks:** India's coal sector relies on inefficient open-cast mining, leading to high ash content (35-45%) and lower efficiency.
   - Jharia coalfields (Jharkhand) suffer from underground fires due to outdated mining methods.
2. **High Import Dependency on Coking Coal:** India imports 85% of its coking coal, increasing costs for Tata Steel and JSW Steel.
   - Australia's supply disruptions impact India's steel sector.
3. **Environmental & Health Concerns:** Deforestation, air pollution, and coal dust exposure cause severe health issues.
   - Ennore thermal plant (Tamil Nadu) has polluted local water bodies, affecting fisheries.
4. **Bureaucratic Delays & Land Acquisition Issues:** Land acquisition for coal projects faces opposition from tribals and environmental groups.
   - Godda coal mine (Jharkhand) saw protests over displacement issues.
5. **Global Market Volatility & Energy Transition:** Fluctuations in global coal prices impact India's energy costs.
   - Russia-Ukraine war led to a 50% rise in coal prices, straining power plants.

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Way Forward for a Sustainable Coal Industry

1. **Modernizing Mining Techniques & Infrastructure:** Use AI-driven mining, coal beneficiation, and underground gasification.
    - Australia's Rio Tinto uses AI-driven logistics for efficiency.
2. **Reducing Import Dependency & Enhancing Domestic Reserves:** Develop coking coal reserves in Jharia (Jharkhand) & Raniganj (West Bengal).
    - China reduced imports by improving deep mining in Shanxi province.
3. **Strengthening Transport & Logistics Efficiency:** Expand Dedicated Freight Corridors (DFCs) for seamless coal transport.
    - Eastern DFC project improves coal movement from Odisha and Jharkhand.
4. **Promoting Green Coal Mining & Renewable Integration:** Adopt Carbon Capture & Storage (CCS) and coal gasification for cleaner energy.
    - Norway's Mongstad Plant captures 80% of emissions.
5. **Policy Reforms & Private Investment**: Encourage FDI in coal mining and speed up auctions.
    - China's coal privatization increased efficiency.

Coal remains **vital for India's energy security and economic growth**, but its **long-term sustainability depends on modernization, efficiency, and environmental responsibility**. By **investing in clean coal technology, improving domestic reserves, and integrating renewable energy**, India can create a **balanced energy mix** while ensuring **self-reliance and reduced environmental impact**.

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2. GLACIERS

iMPACT ANALYSIS

SYLLABUS:

GS 1 > Geography >> Glacial ecosystem

REFERENCE NEWS:

Two satellite photos taken 33 years apart show the disappearance of a glacier in Iceland that was the first ice mass to be declared dead as a result of human-caused climate change. Okjökull was a dome-shaped glacier situated around the summit crater on Ok, a 3,940-foot-tall (1,200 meters) shield volcano located 44 miles (71 kilometers) northwest of Reykjavík. The glacier was declared dead in 2014, when Icelandic glaciologists revealed that the ice had become so thin that it was no longer being slowly pulled down the mountain by gravity, meaning it had stopped moving for the first time in tens of thousands of years.

GLACIAL ECOSYSTEM:

Glaciers are large masses of ice that form from accumulated snowfall over centuries, compressing into ice under extreme pressure. They are dynamic systems that flow under their own weight and significantly impact climate, sea levels, and water resources.

- There are **over 275,000 glaciers globally**, covering approximately 700,000 sq km of land that is about 10% of earth's surface.
- Approximately **2% of the Earth's water** is stored in glaciers.
- Ice sheets store around **70% of the world's freshwater**, highlighting the importance of glaciers for global water supply.
- Even with major emission cuts, **over a third of the world's glaciers will melt by 2100**.
- The World Glacier Monitoring Service (WGMS) which tracks 210,000 glaciers show that between 1976 and 2023 a large-scale deglaciation was observed in recent years.
- **Global Distribution of Glaciers**: **Glaciers are found on every continent except Australia**, with the largest concentrations in Antarctica, Greenland, and the Himalayas.
    - Antarctica has 85% of Global Ice. If the Antarctic Ice Sheet melts completely, sea levels will rise by ~58 meters.
    - Greenland is losing ~270 billion tonnes of ice annually due to climate change.
    - The Himalayas (Asia) – "Third Pole" contains ~15,000 glaciers that feed major Asian rivers.

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IMPORTANCE OF GLACIAL ECOSYSTEM TO INDIA:

- **Freshwater Supply & Water Security:** Himalayan glaciers feed India's major rivers, ensuring continuous water flow. Over 65% of India's water comes from glacier-fed rivers (NITI Aayog, 2023).
  - Gangotri Glacier (Uttarakhand): Ganga River (supports 500 million people).
  - Zemu Glacier (Sikkim): Teesta River (lifeline of Northeast India).
- **Ensuring Water Availability in Dry Seasons:** Glaciers store winter snow and release water in summer, maintaining river flow even in droughts.
  - The **Brahmaputra River's dry season flow** depends on glacier melt from Tibet & Arunachal Pradesh.
- **Irrigation Support for Indian Agriculture:** India's agriculture (supporting 50% of the population) depends on glacial meltwater for irrigation.
  - **Punjab & Haryana's wheat and rice crops** rely on **Indus-Ganga water from glaciers**. **Brahmaputra irrigation in Assam & West Bengal** ensures **tea and rice production**.
  - **Over 60% of India's irrigated land relies on glacier-fed rivers** (FAO, 2023).
- **Preventing Crop Failures & Droughts**: Glacial water flow regulates seasonal droughts, preventing crop failures.
- **Cooling Effect & Weather Regulation**: Glaciers reflect sunlight (high albedo), stabilizing India's climate. Without glaciers, **India's average temperature would rise by ~2°C** (IMD, 2023).
- **Impact on Indian Monsoons:** Himalayan glaciers regulate monsoon cycles by influencing wind patterns. The Western Disturbances (rainfall in North India) are linked to Himalayan ice caps.
- **Prevention of Extreme Weather Events:** Stable glaciers prevent extreme droughts and floods. The **Brahmaputra Basin's glacier-fed flow reduces cyclone damage in Assam**.
- **Glacial Rivers Sustain India's Wetlands & Forests:** Glacier-fed rivers support **mangroves, floodplains, and biodiversity hotspots**. The **Sundarbans mangroves (Ganga-Brahmaputra delta) depend on glacial rivers**.
- **Habitat for Endangered Species: Snow leopards, Himalayan brown bears, and ibex depend on glacial ecosystems**. The **Spiti Valley (Himachal Pradesh) is a snow leopard habitat linked to glaciers**. **Over 30% of India's endemic fish species live in glacial river ecosystems** (WWF, 2023).
- **Maintaining Groundwater Recharge:** Glacial melt contributes to groundwater replenishment, preventing desertification. The Indus Basin supports groundwater recharge in Rajasthan & Punjab.

- **Himalayan Glaciers in Indian Spirituality:** Glaciers are **sacred in Hinduism, Buddhism, and indigenous traditions**.
  - **Gangotri Glacier**: **Source of the sacred Ganga River**.
- **Glacier Tourism Boosts India's Economy:** Glacial trekking and pilgrimage attract millions of tourists yearly. **Rohtang Pass & Zanskar Glacier (Ladakh) are major tourist destinations**. The **Himalayan tourism industry generates ₹20,000 crore annually** (Ministry of Tourism, 2023).

CHALLENGES FACED BY GLACIAL ECOSYSTEM ACROSS THE GLOBE:

Since 1900, more than 50% of the world's glaciers have disappeared, and the rate of melting has doubled since 2000 (World Glacier Monitoring Service).

- **Rapid Glacier Retreat Due to Warming:** Rising global temperatures are accelerating glacier melting worldwide. The Arctic has lost 75% of its ice volume since 1979. 2023 was the hottest year on record, and glaciers lost over 267 billion tonnes of ice.
- **Glacial Lake Outburst Floods (GLOFs):** Rapid glacier melting creates glacial lakes, which can burst suddenly, causing catastrophic floods.
  - Chamoli Disaster (India, 2021) – A glacial collapse triggered flash floods, killing 200+ people. The Himalayas have over 5,000 glacial lakes, and over 200 are at risk of GLOFs.
- **Melting Glaciers Contribute to Rising Oceans:** Glaciers contribute ~33% to global sea-level rise (IPCC Report 2023).
  - Thwaites Glacier (Antarctica), known as the "Doomsday Glacier," could raise sea levels by 3 meters if it collapses. Global sea levels have risen by 20 cm since 1900, threatening coastal cities like Mumbai, New York, and Jakarta.
- **Threat to Drinking Water & Agriculture:** Melting glaciers reduce river flows over the time, affecting irrigation and drinking water supply.
  - The Andes glaciers in South America are vanishing, threatening water supply in Peru, Bolivia, and Chile. 80% of glaciers in the Alps could disappear by 2100, impacting Europe's water security.
- **Loss of Cold-Climate Habitats:** Melting glaciers disrupt ecosystems dependent on cold temperatures.
  - The Arctic's polar bear population is declining as sea ice disappears. One-third of Antarctic ice shelves risk collapse due to warming, impacting marine life.
- **Disruptions in Ocean Circulation**: Glacial meltwater alters ocean salinity and circulation patterns.
  - The Gulf Stream in the Atlantic Ocean is slowing, affecting global weather patterns.

- **Mining & Industrial Activities in Glacier Regions**: Coal, oil, and mineral mining near glaciers accelerates their melting.
    - Greenland's mining activities impact local glaciers, increasing melt rates. Black carbon pollution (from industrial emissions) settles on glaciers, increasing heat absorption and melting.
- **Over-Tourism & Glacier Destruction:** Mass tourism in glacier regions increases foot traffic, waste, and ice erosion.
    - Alps Glaciers (Europe) are retreating due to skiing and tourism-related pollution.
- **Glacial Surges & Unpredictable Movements:** Some glaciers experience sudden movements, creating ice avalanches.
    - The Himalayan Karakoram glaciers show both retreat and surge behaviour, leading to unpredictable risks.

CRISIS OF INDIAN GLACIAL ECOSYSTEM:

- **Accelerated Glacier Retreat:** The Gangotri Glacier, one of India's largest, has retreated by over 3 km since 1780. Himalayan glaciers lost over 8 billion tonnes of ice annually from 2000-2020.
- **Extreme Weather & Reduced Snowfall:** The Kedarnath disaster (2013) was worsened by excessive glacial melt and cloudbursts.
- **Glacier-Fed Rivers Are Drying Up:** Sutlej River (Punjab) experienced a 10% decline in water flow due to receding glaciers. By 2050, 30% of Himalayan glaciers could disappear, affecting agriculture and drinking water.
- **Impact on Agriculture & Hydropower**: The Tehri Dam (Uttarakhand) depends on glacier-fed rivers for hydropower, facing reduced generation.
- **Increasing Risk of Sudden Floods:** Chamoli Disaster (2021) – A glacier collapse triggered floods, destroying hydropower projects and killing 200+ people. India has over 9,000 glacial lakes, with over 200 classified as "dangerous" (National Remote Sensing Centre).
- **More Frequent Landslides & Avalanches:** Uttarakhand Tunnel Collapse (2023) was linked to permafrost melting and destabilization.
- **Pollution Accelerating Glacier Melting:** Black carbon from diesel vehicles, forest fires, and industrial emissions settles on glaciers, absorbing more heat. The Himalayas are warming 2 times faster than the global average (ICIMOD Report, 2023).
- **Unregulated Tourism & Infrastructure Development:** Char Dham Highway Project (Uttarakhand) has accelerated deforestation and glacial retreat.
- By 2100, sea levels could rise by over 1 meter due to Himalayan glacier melting.
- The Hindukush Himalayan cryosphere is warming at twice the global average rate.

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WAY FORWARD:

- **Satellite & Drone-Based Glacier Tracking:** ISRO's "National Centre for Polar and Ocean Research" (NCPOR) tracks Indian glaciers via satellites.
- **Establishing Early Warning Systems for Glacial Lake Outburst Floods (GLOFs):** The Sikkim government is installing GLOF warning systems in the Teesta Basin.
- **Expanding the Himalayan Glacier Monitoring Program (HGMP):** The Geological Survey of India (GSI) monitors over 80 Indian glaciers annually.
- **Reducing Black Carbon Pollution & Industrial Impact:** Reducing emissions from diesel vehicles, thermal plants, and open biomass burning. **The "National Clean Air Programme (NCAP)" aims to reduce air pollution by 30% by 2025.**
- **Promoting Electric & Sustainable Transport:** Himachal Pradesh introduced electric buses for tourist routes in Manali & Rohtang Pass.
- **Regulating Construction & Industrial Activities:** Ladakh banned cement plants near glaciers in 2021 to reduce environmental damage.
- **Eco-Friendly Tourism Guidelines: Uttarakhand's "Eco-Tourism Policy" restricts visitors to fragile glacier sites like Gaumukh.**
- **Ban on Plastic & Waste Management Initiatives:** The "Swachh Bharat Mission in the Himalayas" has removed over 1,000 tonnes of plastic waste from glacier regions.
- **Sustainable Infrastructure Planning:** The Char Dham Highway project is using tunnels and elevated bridges to minimize glacier disruption.
- **Glacier-Friendly Water Conservation Programs:** Sonam Wangchuk's Ice Stupa Project in Ladakh stores water for farming communities.
- **Afforestation & Ecosystem Restoration:** Himachal Pradesh's "Green India Mission" is planting trees near glacier-fed rivers.
- **International Cooperation for Glacial Protection:** India must collaborate with China, Nepal, and Bhutan for transboundary glacier monitoring. **India-Nepal "Himalayan Climate Adaptation Programme" studies shared glaciers.**
    - Address the cross-border impacts of **glacier retreat,** develop and enhance global cryosphere data systems and incorporate **Local and Indigenous Knowledge Systems (LINKS)** to improve monitoring and decision-making.
- **Expanding Arctic & Antarctic Research for Glacier Insights: Studying polar glaciers to predict Himalayan glacier trends.**
- The UN will observe 2025 as the **International Year of Glaciers' Preservation**, with **21st March** marked annually as **World Day for Glaciers** starting in 2025.

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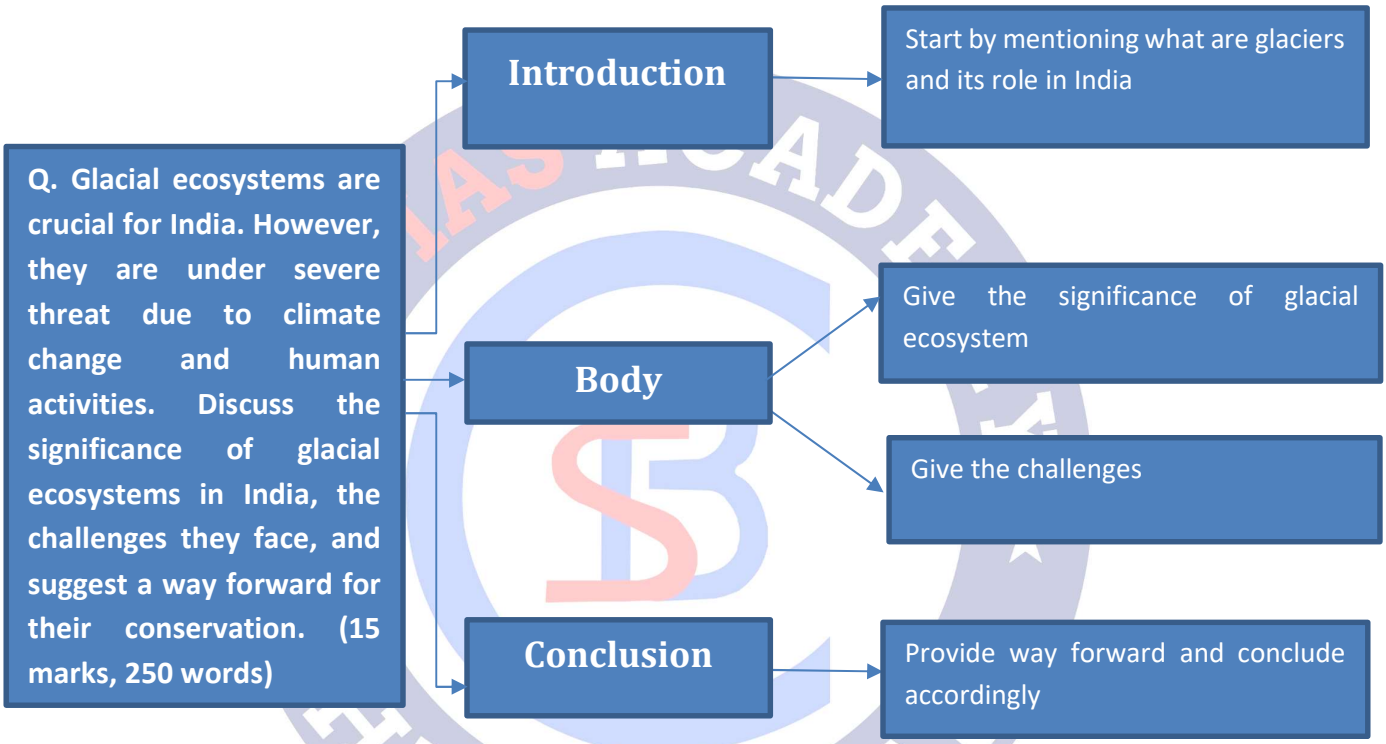
PRACTICE QUESTION

Q. Glacial ecosystems are crucial for India. However, they are under severe threat due to climate change and human activities. Discuss the significance of glacial ecosystems in India, the challenges they face, and suggest a way forward for their conservation. (15 marks, 250 words)

APPROACH



MODEL ANSWER

Glaciers are **large ice masses that regulate climate, store freshwater, and sustain ecosystems**. The **Himalayan glaciers, known as the "Third Pole,"** feed **major Indian rivers like the Ganga, Indus, and Brahmaputra**, supporting over **600 million people**.

Significance of Glacial Ecosystems in India

1. **Water Security & River Systems:** 65% of India's water comes from glacier-fed rivers (NITI Aayog, 2023). Gangotri Glacier (Ganga), Zemu Glacier (Teesta), and Siachen Glacier (Indus).
2. **Agriculture & Irrigation:** Over 60% of India's irrigated land depends on glacial meltwater (FAO, 2023). Punjab & Haryana's wheat-rice farming relies on Indus-Ganga water.

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3. **Hydropower & Energy Security:** 70% of India's hydroelectric power comes from glacier-fed rivers. Tehri Dam (2,400 MW) in Uttarakhand depends on glacier-fed Bhagirathi River.
4. **Climate Regulation & Disaster Prevention:** Glaciers influence monsoon cycles and prevent extreme droughts and floods. The Western Disturbances, which bring winter rainfall, depend on Himalayan glaciers.
5. **Biodiversity & Ecosystem Services:** Glacial rivers sustain the Sundarbans mangroves and Himalayan wildlife. **Snow leopards in Spiti Valley depend on glacier-fed ecosystems.**

Challenges Faced by Indian Glaciers

1. **Rapid Glacier Retreat Due to Climate Change:** Gangotri Glacier has retreated over 3 km since 1780. Himalayan glaciers lost 8 billion tonnes of ice annually from 2000-2020.
2. **Black Carbon Pollution & Industrial Impact:** Diesel emissions, forest fires, and mining accelerate glacier melting. The Himalayas are warming twice as fast as the global average (ICIMOD, 2023).
3. **Unregulated Tourism & Infrastructure Development:** Char Dham Highway Project has increased deforestation and glacial retreat. Glacial tourism in India generates ₹20,000 crore annually (Ministry of Tourism, 2023).

Way Forward for Glacial Conservation

1. **Strengthening Glacier Monitoring & Early Warning Systems:** Use satellites & drones for tracking glacier retreat. ISRO's NCPOR tracks Indian glaciers via satellite data.
2. **Reducing Black Carbon & Industrial Pollution:** Promote electric transport and clean energy. Himachal Pradesh introduced electric buses in glacier regions.
3. **Sustainable Tourism & Infrastructure Planning:** Regulate footfall and waste management in fragile glacier zones. Uttarakhand's "Eco-Tourism Policy" limits visitors at Gaumukh Glacier.
4. **Afforestation & Ecosystem Restoration:** Reforest Himalayan slopes to reduce glacial erosion. Himachal Pradesh's "Green India Mission" promotes reforestation near glaciers.
5. **International Cooperation & Research:** Work with China, Nepal, and Bhutan for transboundary glacier conservation. India-Nepal "Himalayan Climate Adaptation Programme" studies shared glaciers.

Glaciers are **lifelines for India's water, agriculture, energy, and biodiversity**. However, **climate change, pollution, and human activities** are accelerating their decline. **Immediate policy actions,**

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sustainable tourism, and scientific monitoring are essential to **protect India's glaciers for future generations**.

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3. WOMEN EMPOWERMENT

iMPACT ANALYSIS

SYLLABUS:

GS 1 > Women related issues

REFERENCE NEWS:

The Supreme Court said women do not need sympathy but rather, empowerment in society. The oral observation was made on the eve of the International Women's Day, by Justice Bela Trivedi, one of **only two women judges currently serving on the Supreme Court** Bench. The other woman judge in the top court is Justice B.V. Nagarathna, who is in line to become the first woman Chief Justice of India.

Justice Trivedi was correcting a lawyer arguing for an accused in a sexual harassment case, who claimed that everyone's sympathy was with the survivor. "Women do not need sympathy. They need to be empowered. For that, we need strict implementation of the law," Justice Trivedi said, addressed the senior advocate appearing for the accused.

STATUS OF WOMEN IN INDIA:

Women's empowerment in India refers to **the process of enhancing women's economic, social, political, and legal strength** to ensure equal rights, opportunities, and dignity. Empowerment is key to achieving **inclusive development, poverty reduction, and economic growth**.

As per the **UN Women**, Gender Equality refers to the equal rights, responsibilities, and opportunities of women and men and girls and boys. Gender Equality does not mean that women and men will become the same. Rather, it seeks to do away with gender inequality by stipulating that the rights, responsibilities, and opportunities for men and women will not depend on their gender. Gender Equality is considered as both a human rights issue and as a precondition for, and indicator of, **sustainable people-centred development.**

SIGNIFICANCE OF WOMEN EMPOWERMENT IN INDIA

Economic Significance

- **Boosting GDP and Economic Growth:** Women's participation in the economy can increase India's GDP by $770 billion by 2025 (McKinsey Report). Higher labour force participation (LFP) among women leads to greater productivity and innovation.

- **Bangladesh's garment industry** employs **80% women**, contributing **80% of total exports**, boosting GDP.

- **Entrepreneurship and Financial Independence:** Women-led startups and businesses increase household incomes and create jobs. **Self-Help Groups (SHGs)** have empowered over **8 crore rural women** in microfinance and small-scale industries.
  - **Lijjat Papad** – A women-led cooperative with **₹1,600 crore annual turnover**, empowering **45,000+ women**.
  - **Pradhan Mantri Mudra Yojana (PMMY) 70% of beneficiaries are women entrepreneurs**.
  - Unemployment rate reduced from 5.6% to 3.2% as per PLFS report 2023-24
- **Reducing Income Inequality:** Women's empowerment reduces the gender pay gap, ensuring equal pay for equal work. Corporate gender diversity leads to higher profitability (World Bank).
  - **Infosys & Wipro have 35-40% women employees**, promoting workplace equality. Women in India earn **19% less than men** for the same job (ILO Report 2023).

Social Significance

- **Improving Education and Skill Development:** Educated women have better career opportunities, financial stability, and social mobility. Women's education reduces child marriage and improves maternal health.
  - Kerala (96% female literacy) has the lowest infant mortality rate in India.
- **Health and Well-being:** Empowered women make better healthcare choices, reducing maternal and infant mortality. Better access to sanitation, menstrual hygiene, and reproductive health services.
  - Ujjwala Yojana (9 crore LPG connections) reduced indoor air pollution deaths, benefiting rural women.
- **Reducing Gender-Based Violence:** Women's empowerment leads to better legal protections, faster justice delivery, and safer public spaces.
  - **4 lakh crimes against women reported in 2023 (NCRB Report)**, showing **the need for stronger protection**.

Political Significance

- **Greater Political Representation:** More women in leadership result in inclusive and gender-sensitive policies. Women leaders prioritize education, health, and social welfare.
  - **Women in Parliament (2024): 15% representation**, lower than the global average of **25%**.

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- **Strengthening Democracy and Governance:** Women's participation in Panchayati Raj Institutions (PRIs) improves local governance.
    - **West Bengal and Rajasthan** have **highest women Panchayat representatives**, improving **grassroots governance**. **Women-headed Panchayats** have improved **sanitation, education, and welfare schemes** in rural India.

Cultural and Family Significance

- **Breaking Gender Stereotypes:** Women's empowerment challenges traditional gender roles, promoting equal family dynamics. Educated women delay marriage, reduce family size, and invest in child education.
    - **Kanyashree Prakalpa (West Bengal) – Prevented 7 lakh child marriages** by funding girls' education. **Child marriage rate dropped from 47% (2005) to 23% (2023) (NFHS-5)**.
- **Better Child Development and Nutrition:** Mothers' education directly impacts child health, nutrition, and schooling. Reduced malnutrition and stunting among children.
    - **Poshan Abhiyan** – Reduced **child stunting by 6%** in India (2018-2023).
    - **53% of Indian women are anaemic** (NFHS-5), affecting **child health**.

Environmental and Sustainable Development Significance

- **Women in Climate Action:** Women play a crucial role in sustainable farming, water conservation, and afforestation.
    - **35% of India's Self-Help Groups (SHGs) work on climate resilience projects**.
- **Promoting Sustainable Lifestyles:** Women influence household consumption patterns, waste management, and energy conservation. Solar microgrids and clean energy adoption benefit rural women.
    - **Barefoot College (Rajasthan)** – Trains **rural women as solar engineers**, promoting clean energy. **Women-led SHGs are key contributors to India's Swachh Bharat Mission**.

CHALLENGES OF WOMEN EMPOWERMENT IN INDIA:

Economic Challenges

- Female Labour Force Participation Rate is at 41.7% as per PLFS data 2023-24
- India ranked 135 out of 146 in WEF Global Gender Gap Index in 2022
- Economic dependence on men **reduces women's decision-making power**.
- Despite significant workforce participation, women hold only 17% of executive positions with female CEOs earning less than their counterparts according to Deloitte

- Career interruptions due to maternity and care-giving can slow professional growth and reduce economic potential as per Niti Ayog
- Over 60% of rural women work in informal sector as per ILO**.**
- **Women in agriculture (42%) have no land ownership rights**, affecting financial security.
    - **Wipro, Infosys, and TCS** have **only 10-15% women in leadership roles**, highlighting the **"glass ceiling" effect**.
    - **Migrant women workers during COVID-19 lockdown** faced job loss and lacked social security.

Educational Challenges

- Female literacy rate is 71.5% compared to male literacy of 84.7% (NSO 2023).
- Girls' dropout rate at the secondary level (16.6%) is higher than boys (12.5%).
- Despite constituting 48% of higher education enrolments as per AISHE report, women frequently find themselves in lower-paying roles
- **Only 28% of women in India** pursue careers in **science, technology, engineering, and mathematics (STEM)**.
- Lack of **mentorship, gender bias, and workplace discrimination** discourages participation.
    - **Rajasthan and Uttar Pradesh** have **high dropout rates** due to **early marriage and lack of school infrastructure**.

Health and Nutritional Challenges

- **Maternal Mortality Rate at 97 deaths per 100,000 live births (NFHS-5)**, though improved from **130 (2015)**, is still high.
- Lack of **access to maternal healthcare in rural areas** increases risks.
- As per the NFHS-5, 18.7% of women aged 15-49 years are underweight, 21.2% of women aged 15-49 years are stunted, and nearly 53% of women aged 15-49 years are anaemic
- **Only 57% of Indian women use sanitary napkins (NFHS-5, 2023)**.
- **23% of girls drop out of school** due to lack of sanitary facilities.
    - **Janani Suraksha Yojana (JSY)** has reduced **maternal deaths by 40%**, but rural access remains poor.
    - **Tamil Nadu and Rajasthan provide free sanitary pads**, improving school retention.

Social and Cultural Challenges

- Patriarchy and deep-rooted gender norms make women are expected to prioritize domestic roles over careers. Preference for male children leads to female foeticide and lower sex ratio.

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- As per the National Family Health Survey (NFHS-5, 2019-21), the Overall Sex Ratio in India is 1020 females per 1000 males. However, the Sex Ratio at Birth remains low at 929, indicating continued sex selection at birth.
- As per the NFHS-5, 23.3% of women aged 20-24 years were married or in a union before age 18.
- **Early pregnancy leads to health risks, school dropout, and financial dependence**.
    - **West Bengal and Bihar** have the highest rates of **child marriage (25%)**, despite legal bans
- Honor killings and gender-based discrimination restrict women's choices in education, career, and marriage. **Honor killings continue in parts of Haryana, Punjab, and Rajasthan**.

Safety and Gender-Based Violence

- **Over 4 lakh crimes against women were reported in 2023 (NCRB Report)**.
- NFHS-5 found that nearly 1/3rd of women aged 15-49 in India have experienced some form of violence. The most common crimes include cruelty by husbands or in-laws (31%), kidnapping and abduction (19%), assault to outrage the modesty (18.7%) and rape (7.1%)
- **Conviction rates for rape cases remain below 30%**, discouraging women from reporting crimes.
- **1 in 3 women face domestic violence (NFHS-5, 2023)**, yet **only 10% report it**.
- **Street harassment ("eve-teasing")** limits education and work participation.

Political and Legal Challenges

- **Only 15% of MPs in Lok Sabha (2024)** are women, below the **global average of 25%**.
- As per the official data of the Election Commission of India, as of December 2023, the overall average female representation in State Legislatures is just 13.9%.
- **Women hold only 10% of ministerial positions** in the central government.
- **Women's Reservation Bill (2023)** ensures **33% reservation for women in Parliament**.
- **Dowry Prohibition Act (1961)** and **Domestic Violence Act (2005)** are not strictly enforced.
- **Low conviction rates in gender violence cases** weaken justice delivery.
- **Nirbhaya Fund (2013)** remains **underutilized**, despite high crime rates.

WAY FORWARD

- **Effective Implementation of Laws:** Ensure strict enforcement of existing laws like the POSH Act (2013), Domestic Violence Act (2005), and Dowry Prohibition Act (1961). Fast-track courts for gender-based violence cases to ensure speedy justice.
    - **Spain's Fast-Track Courts for Domestic Violence**

- **Strengthening Political Representation:** Implement the Women's Reservation Bill (2023) effectively to increase women's participation in Parliament and State Assemblies. **Encourage leadership training programs** for women in politics and governance.
    - **Rwanda's Women in Politics Model: 61% of Rwanda's Parliament members are women**, highest in the world, due to **mandatory gender quotas**.
- **Increasing Women's Workforce Participation:** Provide mandatory gender pay equity policies to reduce the wage gap. Encourage flexible work arrangements (work-from-home, maternity benefits, safe workplace policies)
    - **Germany's Equal Pay Act**
- **Supporting Women Entrepreneurs and Financial Inclusion:** Expand microfinance and digital banking access for rural women entrepreneurs. Encourage women-led startups through tax benefits and subsidies.
    - **Bangladesh's Grameen Bank Model**
- **Bridging the Gender Gap in Education:** Increase scholarships for girls, especially in STEM (Science, Technology, Engineering, Mathematics) fields. Expand digital literacy programs in rural India to bridge the digital divide.
    - **Kerala's Education Mode**
    - **Bihar's Cycle Scheme for Girls**
- **Enhancing Vocational and Digital Skills:** Encourage STEM education for women to increase their presence in high-paying jobs. Expand digital financial literacy programs to make banking and e-commerce accessible
    - **India's Women in STEM Initiative:** Government launched **"Women in Science and Engineering (WISE)"** to support **female scientists and tech professionals**.
- **Encouraging Women in Decision-Making Roles:** More female representation in corporate boards and management roles. Leadership training programs for women in governance and private sectors
    - **Norway's Corporate Gender Quotas: Requires 40% of company board members to be women**, improving gender equality in leadership.
- **Changing Social Norms and Mindsets: Mass awareness campaigns to change societal attitudes** toward women's rights. **Encourage equal parenting and shared household responsibilities**
    - **Beti Bachao Beti Padhao (BBBP)**
- **Strengthening Global and Regional Collaboration:** Partnering with UN Women, World Bank, and international NGOs for gender equality projects. Adopting best practices from developed nations while customizing them for India's socio-economic conditions
    - **Sweden's Feminist Foreign Policy**
    -

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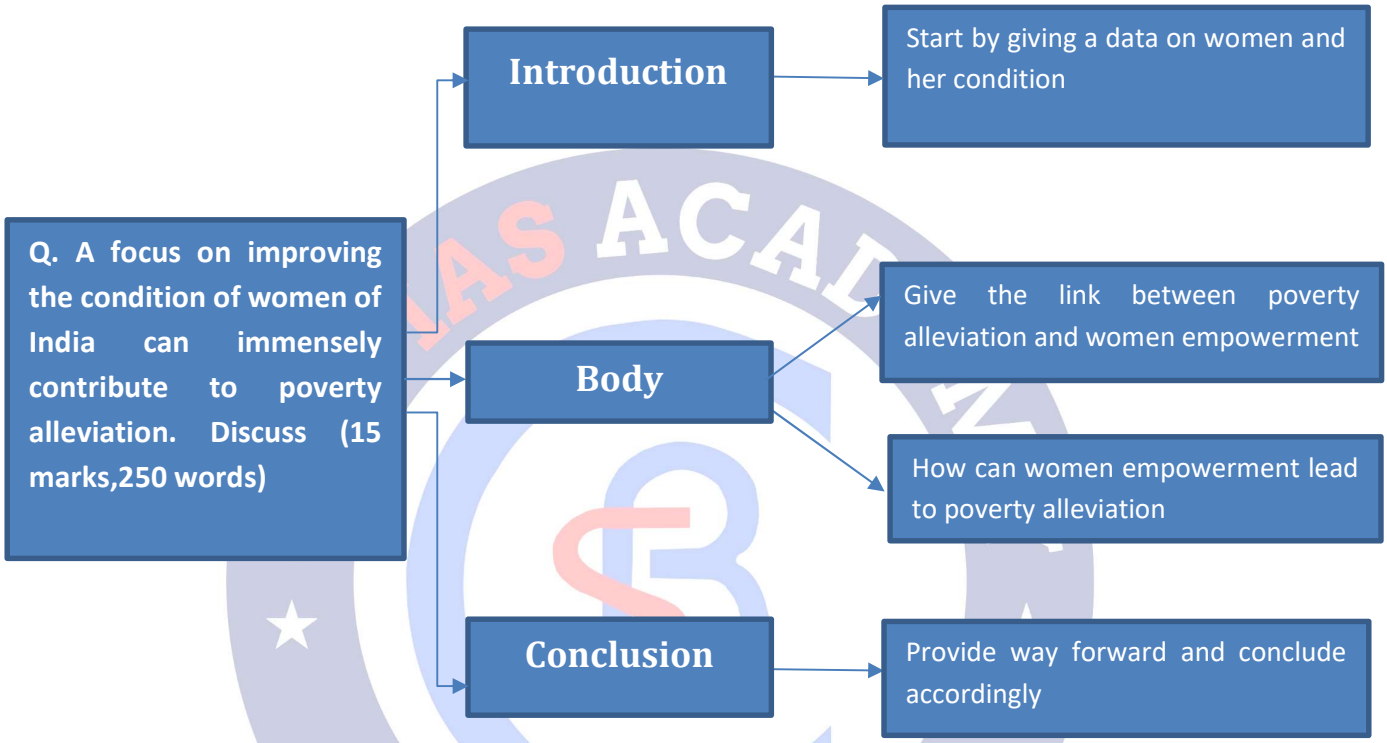
PRACTICE QUESTION

Q. A focus on improving the condition of women of India can immensely contribute to poverty alleviation. Discuss (15 marks,250 words)

APPROACH



MODEL ANSWER

In India, where **48% of the population comprises women**, their economic participation can significantly **boost GDP, enhance social development, and break the cycle of intergenerational poverty**.

Women Empowerment and Poverty Reduction

- **Increasing Workforce Participation: Higher employment among women** increases household income and reduces **economic vulnerability**.
  - Bangladesh's **garment industry (80% women workforce)** led to **higher GDP growth** than India
  - **India's FLFP is only 32.8% (PLFS 2023), compared to China's 63%**.
- **Promoting Women Entrepreneurs:** Women-led businesses **generate jobs and financial independence**, reducing poverty.

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    - **Self-Help Groups (SHGs) empower 8 crore rural women** in microfinance and small-scale industries.
  - **Educated women earn more, invest in their families, and delay early marriage**, reducing poverty risks.
    - Kerala's **96% female literacy rate** has led to **higher female employment and better health outcomes**.
  - **Better maternal health and nutrition** improve economic productivity and reduce healthcare costs.
    - **Poshan Abhiyan (2018)** reduced **child stunting by 6%**, improving workforce potential.
  - **Women in Leadership Roles Drive Inclusive Development: Greater female representation in politics** leads to **pro-poor policies** in health, education, and welfare.
  - **Reducing domestic violence and harassment** increases women's workforce participation.
    - Telangana's **SHE Teams** reduced harassment cases in Hyderabad. **4 lakh crimes against women were reported in 2023 (NCRB)**, restricting economic mobility.
  - FAO suggests that if women farmers had the same access to tools and credit as men, agricultural output in 34 countries would rise by 4% feeding 150 million hungry people

Way Forward for Women-Led Poverty Reduction

1. **Increase Workforce Participation** – Expand **flexible work policies and gender pay equity**.
2. **Enhance Access to Education** – Provide **STEM scholarships for girls** and improve **rural digital literacy**.
3. **Strengthen Financial Inclusion** – Expand **microfinance and credit access for women entrepreneurs** through PM Jan Dhan Yojana and digital literacy.
4. **Improve Healthcare Access** – Universalize **maternal healthcare and menstrual hygiene awareness** through schemes like Poshan Abhiyan
5. **Expand Political Representation** – Implement the **Women's Reservation Bill (33% in Parliament)** effectively.

Investing in women's empowerment is a **proven strategy for poverty alleviation**. Economic inclusion, education, health, and leadership roles for women will **break the poverty cycle and accelerate India's progress toward inclusive and sustainable development**.

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4. URBANISATION IN INDIA

iMPACT ANALYSIS

SYLLABUS:

GS 1 > Society > Urbanisation

REFERENCE NEWS:

- In the Union Budget for 2025-26, the Indian government announced the establishment of a **Rs 1 lakh crore Urban Challenge Fund**. This fund will implement initiatives in areas such as Cities as Growth Hubs, Creative Redevelopment of Cities, and Water and Sanitation.
- Indian cities face severe pollution, weak infrastructure, and climate-related challenges. According to the ***Population Projections for India and States 2011-2036*** **report** by the National Commission on Population, **India's urban population is projected to increase from 31.8% in 2011 to 38.2% by 2036**, highlighting the need for urgent reforms to manage congestion and failing services.

URBANIZATION:

- Urbanization is the process of transformation that occurs as society evolves from predominantly rural to predominantly urban areas. It involves the increase in the proportion of a country's population residing in urban areas, leading to the expansion and growth of cities and towns.

PROCESS OF URBANIZATION:

Socio-cultural phenomenon	Economic process	Geographical process
• **Melting pot** of people with diverse ethnic, linguistic and religious backgrounds.	• **City is a focal point** of productive activities • exists and grows on the **strength of the economic activities** existing within itself.	• **Migration or change of location of residence** of people and involves the movement of people from one place to another

URBAN CLASSIFICATION IN THE INDIAN CENSUS:

- The Indian Census identifies two categories of 'urban' areas:

Census towns — All those places satisfying the following **3 criteria:**

Population of at least 5000 persons.

Minimum population density of 400 persons per sq. km. and

75 percent of the male workforce is employed in non-agricultural activities.

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Statutory towns — those that have urban local bodies like municipal corporations, municipality or municipal committees.

CHARACTERISTICS OF URBAN SYSTEM:

- **High Population Density**: Urban areas, such as Mumbai, have extremely high population densities, which can exceed 21,000 people per square kilometre.
- **Social heterogeneity**: Urban areas tend to have a heterogeneous population with diverse cultural, ethnic, and socio-economic backgrounds.
- **Economic Activity**: Cities are hubs of non-agricultural economic activities, industries, service sectors, and businesses.
- **Infrastructure**: Urban areas have more developed infrastructure, including transportation systems, utilities, and communication networks.
- **Administrative Services**: Cities typically have a concentration of administrative and governmental services.
- **Social Services**: Urban regions usually offer better access to healthcare, education, and social services compared to rural areas**. Ex:** AMRUT Mission

NATURE OF URBANIZATION IN INDIA:

- **High rate of rural-urban migration:**

Substantial increase in urban population due to rural-to-urban migration. For instance, between 2001 and 2011, rural to urban migration contributed about **18% to the total urban population increase.**

- **Distorted urbanization:**

Urbanisation has been directed **towards large cities**; there has been an increasing concentration of population in **million plus cities.**

On the contrary the concentration of population in medium and small towns either fluctuated or declined.

This has resulted in **top-heavy structure** of urban development in India

- **Wide variation in levels of urbanization across Indian states**:

Levels of urbanisation in the states with high per capita income (Maharashtra, Tamil Nadu, Kerala) are generally high, the opposite being the case in less urbanised states.

- **Hidden Urbanization:**

According to a 2015 World Bank report, the **urban sprawl** accounts for 55.3 per cent of the country's total population and that official census figures understate it as only 31 per cent- 'Hidden Population'.

Urban sprawl is the unplanned, low-density expansion of cities into surrounding areas.

This discrepancy is due to the fact that in major cities like Delhi, Mumbai, Hyderabad and Kolkata, population growth has been largest outside the fringes of the official administrative boundaries.

These areas have urban characteristics but do not fulfil the criteria to be designated as urban

SIGNIFICANCE OF URBANIZATION:

- **Economic Growth and Opportunities:**
  - Urbanization accelerates economic development by concentrating industries, services, and employment opportunities.

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- For example, a study by the **Indian Institute for Human Settlements (IIHS)** showed that the top **100 cities contribute about 43% of India's GDP**.

- **Improved Infrastructure and Services:**
  - Cities drive the expansion of transportation networks, including roads, railways, and public transport, enabling efficient movement of people and goods.
  - For example, the **Smart Cities Mission** has promoted urban infrastructure upgrades, including metro rail expansion and smart traffic management systems.
- **Social and Cultural Exchange:**
  - Urban centers serve as melting pots of diverse cultures, languages, traditions, and ideas, fostering greater social integration and cultural dynamism.
  - For example, the **Jaipur Literature Festival** attracts global thinkers, writers, and artists, promoting intellectual and cultural exchange.
- **Education and Skill Development:**
  - Cities provide access to higher education institutions and vocational training centers, enhancing human capital and socio-economic mobility.
  - **For example, all India urban literacy stands at around 84%**, as per the Ministry of Statistics and Programme Implementation (MoSPI).
- **Technological Advancements:**
  - Urbanization fosters research, innovation, and technological progress through the concentration of research institutions, technology parks, and innovation hubs.
  - For example, **Hyderabad's HITEC City** is a major technology and IT hub, attracting global firms and startups.
- **Social and Political Empowerment:**
  - Urban areas become centers for activism, civic engagement, and social movements, providing platforms for advocacy and mass mobilization.
  - For example, **Anna Hazare's anti-corruption movement in Delhi** gained momentum due to the city's dense population and strong civic participation.

CHALLENGES ASSOCIATED WITH URBANIZATION IN INDIA:

- **Overcrowding and Congestion:**
  - Rapid urban growth has led to overcrowding in major cities, straining transportation and civic infrastructure.
  - For example, Mumbai's suburban railway network is often overcrowded, leading to frequent delays and accidents.
  - As per Census 2011, India's urban population reached 377 million, with cities struggling to accommodate this surge.
- **Environmental Degradation and Rising Pollution:**

- Urbanization contributes to severe air, water, and land pollution, affecting public health and economic growth.
  - **Air Pollution:** India has **42 of the world's 50 most polluted cities**, with Delhi experiencing hazardous air quality every winter (*World Air Quality Report, 2023*).Also, the Clean Air Fund estimates that air pollution costs India almost **$95 billion annually in lost productivity and healthcare expenses.**
  - **Water Pollution:** Nearly **50% of India's 603 rivers are polluted**, impacting drinking water and biodiversity (*Central Pollution Control Board*).
  - **Example:** Bengaluru's lakes have turned toxic, with some catching fire due to chemical contamination, while Chennai faces groundwater contamination from recurrent floods.

- **Housing Shortages and Growth of Slums:**
  - High population density and rising real estate costs have resulted in a housing crisis, leading to the proliferation of slums.
  - For instance, **Dharavi in Mumbai** is one of Asia's largest slums, lacking proper sanitation, water, and healthcare access.
  - According to the **Census 2001**, India's total slum population was **42.6 million**, accounting for **15% of the total urban population**.
- **Infrastructure Strain and Service Deficiencies:**
  - The rapid pace of urbanization has outstripped the development of essential infrastructure, including water supply, sanitation, and waste management.
  - For instance, **Bengaluru faces severe water shortages and frequent urban flooding** due to inadequate planning and the destruction of wetlands.
  - A **World Bank report (2015)** states that urban sprawl accounts for **55.3% of India's total population**, significantly higher than official census figures.
- **High Urban Unemployment and Urban Poverty:**
  - Cities are unable to generate adequate employment, leading to urban poverty and informal settlements.
  - For instance, migrant workers in **North Delhi and its outskirts** often live in precarious conditions with limited access to healthcare and education.
  - The **India Urban Poverty Report, 2009**, highlights the "urbanization of poverty," where urban poverty ratios in some states are higher than rural poverty levels.
- **Climate Change and Extreme Weather Events:**
  - Indian cities are increasingly vulnerable to climate change-induced disasters, such as heatwaves, floods, and water scarcity.
  - For example, Mumbai and Bengaluru suffered **devastating floods in 2024**, while North India witnessed **heatwaves nearing 50°C**, causing heat-related illnesses and fatalities.

- Green infrastructure, such as urban parks and green roofs, can mitigate heat levels, while improved drainage systems can reduce flood risks.

- **Poor Urban Governance and the Census Town Dilemma:**
  - A significant portion of India's urban growth comes from census towns—urbanized areas without official urban status—leading to governance gaps and inadequate funding.
  - For example, the number of census towns surged from **1,362 in 2001 to 3,894 in 2011**, yet they continue to be governed as rural areas, limiting access to urban development schemes (*Census of India*).
  - Delayed urban recognition results in unplanned development, insufficient public services, and regional disparities.
- **Inadequate Public Transport and Traffic Congestion:**
  - Poor investments in public transport have led to unsustainable private vehicle use, worsening traffic congestion and pollution.
  - For example, **Delhi's vehicular emissions** significantly contribute to air pollution, particularly in winter months.
  - According to the **World Health Organization (WHO)**, **14 Indian cities rank among the top 20 globally** for the worst air quality.
- **Social Inequality and Fragmentation:**
  - Urbanization has deepened social divides, with marginalized communities lacking access to basic services.
  - For example, the rise of **gated communities and ghettoization** has created economic and social fragmentation, reducing inclusivity in cities.

GOVERNMENT INITIATIVES :

- **Smart Cities Mission:** Aims to transform urban areas with modern infrastructure, digital connectivity, and sustainable solutions to enhance economic growth and quality of life.
- **AMRUT (Atal Mission for Rejuvenation and Urban Transformation):** Seeks to provide basic civic amenities such as water supply, sewage systems, urban transport, and green public spaces, particularly benefiting the poor and disadvantaged.
- **Swachh Bharat Mission:** A nationwide campaign to improve sanitation, waste management, and hygiene, ensuring an open defecation-free (ODF) India.
- **HRIDAY (Heritage City Development and Augmentation Yojana):** Focuses on heritage conservation while integrating urban planning and economic growth to preserve the cultural character of heritage cities.
- **Pradhan Mantri Awas Yojana (PMAY):** Aims to provide affordable housing for urban and rural poor, ensuring "Housing for All" by 2022.

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- **Deen Dayal Antyodaya Yojana – National Urban Livelihood Mission (DAY – NULM):** Enhances employment opportunities for the urban poor through skill development, self-employment, and financial inclusion.
- **Slum Development Programs:**
  - **National Slum Development Program (NSDP)**: Focuses on improving the living conditions in slums.
  - **Integrated Housing & Slum Development Programme (IHSDP)**: Works on housing and basic infrastructure for slum dwellers.
- **Legal and Policy Framework:**
  - **The Constitution (74th Amendment) Act**: Empowers urban local bodies (ULBs) with governance responsibilities for planned urban development.
  - **Metro and Monorail Projects**: Improve urban mobility and reduce congestion in major cities.

WAY FORWARD:

- **Comprehensive Urban Planning & Governance Overhaul:**
  - **Formal Recognition of Census Towns:** States must upgrade census towns to full-fledged urban areas, ensuring access to urban development funds and structured planning.
  - **Strengthening Local Governance:** Decentralized urban management with empowered city governments can improve service delivery and infrastructure development.
- **Pollution Control & Sustainable Infrastructure:**
  - **Air Pollution Mitigation:**
    - Electrification of transport to reduce vehicular emissions.
    - Stricter regulations for construction-related pollution.
    - Expanding urban green spaces.
  - **Water and Waste Management:**
    - Enhancing wastewater treatment and river cleanup programs.
    - Expanding waste processing facilities to reduce landfill overflow.
    - Promoting circular economy practices like recycling and waste-to-energy initiatives.
- **Climate Resilience & Disaster Preparedness:**
  - **Investment in Flood Management Systems:** Modern drainage systems and rainwater harvesting can mitigate urban flooding.
  - **Early Warning Systems & Community Training:** Better forecasting tools and awareness programs can improve disaster preparedness.
  - **Heatwave Mitigation Measures:** Cooling zones, green corridors, and urban forests can counter rising temperatures.
- **Urban Challenge Fund: Incentivizing City-Level Reforms:**

- The **Rs 1 lakh crore Urban Challenge Fund (2025-26 Union Budget)** aims to transform Indian cities into **growth hubs** through targeted initiatives:
  - Encouraging **investment-friendly policies**.
  - Revamping outdated **infrastructure and public spaces**.
  - Prioritizing **clean water supply, waste treatment, and sanitation reforms**.
- A city-level competition could track progress in pollution control, electrification of transport, and sustainable waste management.

Strategic Reforms Recommended by Expert Committees

Several expert committees have provided policy recommendations to strengthen urban governance and infrastructure:

- **15th Finance Commission (N. K. Singh):** Increased fiscal support for urban local bodies, performance-linked incentives, and state-level urban planning units.
- **K. Kasturirangan Committee on Urban Planning Education:** Revamp urban planning education with interdisciplinary studies and collaboration between academia and local bodies.
- **Dr. Isher Judge Ahluwalia Committee on Urban Infrastructure:** Increased infrastructure investment, creation of Urban Infrastructure Funds, and improved tax systems for urban local bodies.
- **Kirit Parikh Committee on Low Carbon Strategies:** Promotion of sustainable transport, energy-efficient buildings, and strict pollution control for industries.
- **Committee for Drafting National Clean Air Programme (NCAP):** City-specific air quality plans, expansion of air monitoring networks, and strict enforcement of emission norms.
- **Committee on Delhi Air Pollution (E. S. L. Narasimhan):** Policies like congestion pricing, incentives for clean vehicles, and expanding urban green spaces.

Case Study:

Indian cities lag behind global urban centers like **Bangkok, London, Dubai, and Singapore**, which excel in infrastructure, sustainability, and governance:

- **Bangkok** – Efficient metro, vibrant street life, strong tourism policies.
- **London** – Well-integrated public transport, green spaces, cultural hubs.
- **Dubai** – Business-friendly policies, modern infrastructure, investment incentives.
- **Singapore** – Smart governance, affordable housing, sustainability-focused urban planning.

Key Takeaways from Singapore's Urbanisation Strategy

- **Efficient land use** and sustainable urban growth.
- **Robust public transport** and green infrastructure.
- **Proactive governance** and climate resilience.
- **Smart city initiatives** and digital governance models.

CONCLUSION:

- The next decade will determine whether Indian cities evolve into **smart, green, and livable spaces** or succumb to **pollution, congestion, and poor governance**. With **strong**

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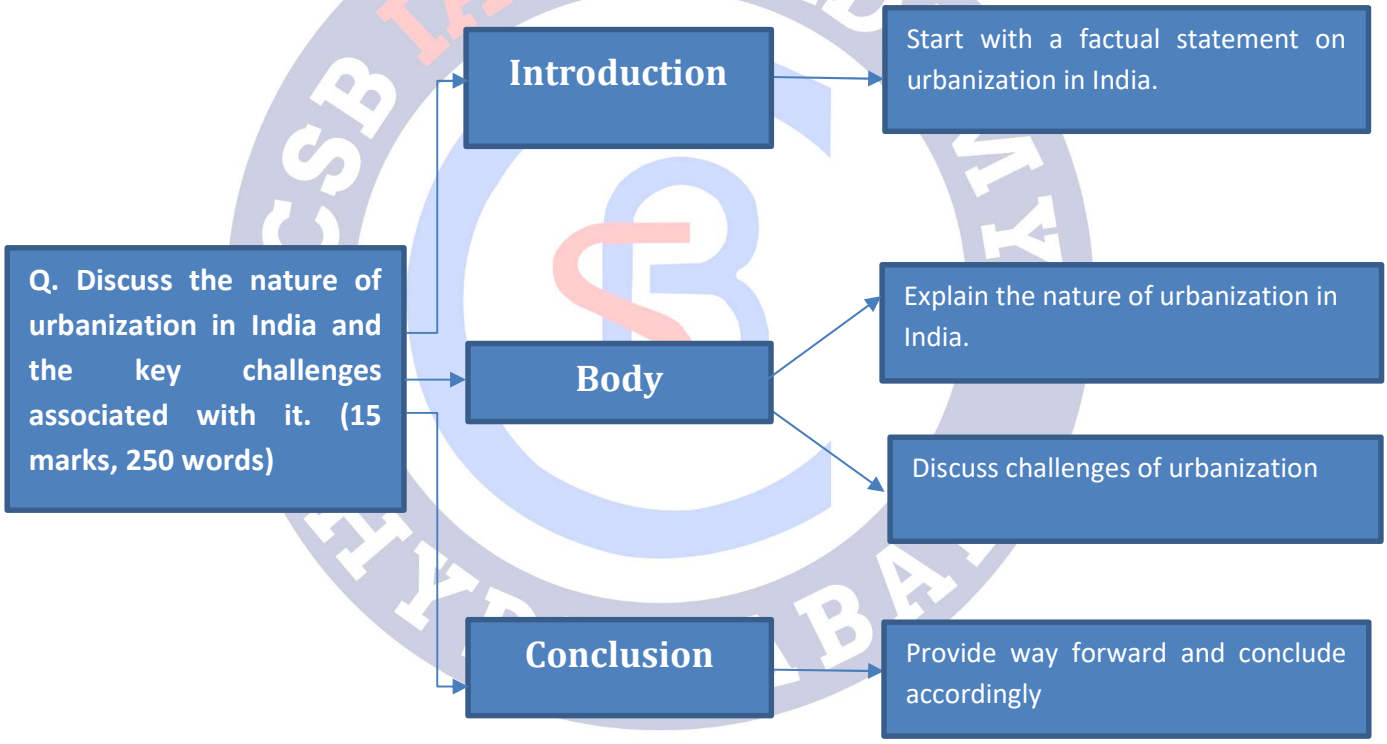
policies, sustainable urban planning, and efficient governance, India can transform its cities into global urban leaders. The **Urban Challenge Fund**, if implemented effectively, can drive **much-needed reforms**, ensuring that cities meet the demands of the **21st century**. Achieving urban stability is also crucial for India's progress towards **Sustainable Development Goal (SDG) 11**, which aims to "make cities and human settlements inclusive, safe, resilient, and sustainable.

PRACTICE QUESTION

Q. Discuss the nature of urbanization in India and the key challenges associated with it. (15 marks, 250 words)

APPROACH



MODEL ANSWER

India's urban population is projected to rise from **31.8% in 2011 to 38.2% by 2036** (*Population Projections for India and States 2011-2036*). However, this growth has led to issues such as pollution, congestion, and inadequate infrastructure. Recognizing this, the **Union Budget 2025-26** introduced the **Rs 1 lakh crore Urban Challenge Fund** to modernize cities through **growth hubs, redevelopment, and water sanitation**.

Nature of Urbanization in India:

1. **High Rate of Rural-Urban Migration**
    - Migration from rural to urban areas due to economic opportunities has driven urban growth.
    - **Example:** Delhi, Mumbai, and Bengaluru see significant migrant influxes.
2. **Distorted Urbanization**
    - Population concentration is skewed toward **million-plus cities**, while small and medium towns experience stagnation or decline.
    - **Example:** Mumbai, Delhi, and Chennai dominate urban growth, while many smaller towns fail to develop proportionally.
3. **Hidden Urbanization**
    - **World Bank (2015): 55.3% of India's population** lives in urban areas, while **official census figures record only 31%**, understating urban expansion.
    - Many urban-like areas remain classified as rural due to outdated administrative definitions.
    - **Example:** Urban sprawl in **Delhi, Mumbai, Hyderabad, and Kolkata** extends beyond official city boundaries.
4. **Regional Variation in Urbanization**
    - Urbanization is higher in states with higher per capita income (e.g., **Maharashtra, Tamil Nadu, Kerala**) and lower in economically weaker states.

Challenges of Urbanization:

1. **Overcrowding & Congestion** – Overburdened transport and civic infrastructure.
    - **Example: Mumbai's suburban railway** suffers from overcrowding.
2. **Pollution & Environmental Degradation**
    - **Example: Delhi's air pollution crisis** (42 of the world's 50 most polluted cities, *World Air Quality Report, 2023*).
    - **Example: Bengaluru's toxic lakes, Chennai's groundwater contamination**.
3. **Housing Shortages & Slum Growth**
    - **Example: Dharavi in Mumbai**, home to over a million people in poor conditions.
4. **Infrastructure & Service Deficiencies**
    - **Example: Bengaluru's water shortages and flooding** due to poor planning.
5. **Unemployment & Urban Poverty**
    - **Example:** Migrant workers in **North Delhi's outskirts** face limited healthcare and education.
6. **Climate Change & Disasters**
    - **Example: Mumbai & Bengaluru floods (2024), heatwaves in North India (50°C)**.
7. **Governance Gaps in Census Towns**
    - **Example:** Census towns **increased from 1,362 (2001) to 3,894 (2011)** but lack urban governance.

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8. **Poor Public Transport & Traffic Congestion**
    - **Example: Delhi's vehicular emissions** contribute to severe air pollution.

Way Forward

- **Urban Planning & Governance Reforms**
    - **Formal recognition of census towns** (*15th Finance Commission*).
    - **Decentralized urban management** for better infrastructure.
- **Pollution Control & Sustainability**
    - **Air Pollution:** Green spaces, electric transport (*E.S.L. Narasimhan Committee*).
    - **Water & Waste Management:** River cleanup, recycling programs (*National Clean Air Programme*).
- **Climate Resilience & Infrastructure Development**
    - **Flood & heatwave mitigation** (*Kirit Parikh Committee on Low Carbon Strategies*).
    - **Investment in urban infrastructure** (*Dr. Isher Judge Ahluwalia Committee*).
- **Urban Challenge Fund (2025-26 Budget)**
    - Modernizing cities with **growth hubs, redevelopment, and sanitation reforms**.

Urbanization in India presents **both opportunities and challenges**. While cities drive **economic growth**, issues like **pollution, congestion, and governance failures** hinder their potential. Implementing the **Urban Challenge Fund**, alongside expert committee recommendations, is **key to making Indian cities sustainable, green, and resilient**, aligning with **Sustainable Development Goal (SDG) 11**.

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5. OFFSHORE MINING

iMPACT ANALYSIS

SYLLABUS:

GS 1 > Geography > Resource geography

REFERENCE NEWS:

- Significant protests have been taking place in **Kerala** over the proposed **offshore mining plan by the Centre.**
- **MPs and Kerala legislators** staged protests in Delhi demanding the withdrawal of the mining plan. The Kerala Legislative Assembly unanimously **passed a resolution** earlier this month **urging the Centre to drop the offshore mining plan**, highlighting concerns over its potential impact on local livelihoods and the marine ecosystem.

MORE ON NEWS:

- The Government of India has initiated an offshore mining project under the **Offshore Areas Mineral (Development and Regulation) Act, 2002 (OAMDR Act),** which was **amended in 2023.**
- In the past, offshore excavation was under the **aegis of central government bodies** such as GSI, Indian Bureau of Mining, Atomic Minerals Directorate, etc. But this amendment opened up offshore mining to the private sector.
- The **amended Act** unveiled a **competitive auction** process to **encourage private sector participation** in the exploration of **offshore resources such as polymetallic nodules, lime-mud, and construction sand.**
- In **November 2024**, the Centre launched the first tranche of **e-auctions for 13 offshore blocks.** These blocks include **three off the Kollam coast in Kerala, three off Gujarat, and seven near the Andaman and Nicobar Islands**. The proposed lease period for these mining blocks is **50 years.**

A study conducted by the **Geological Survey of India (GSI) along the Kerala coast** has found that the state's offshore has a huge deposit of **construction-grade sand**, around **745 million tonnes**. At present, mining is under consideration at **three blocks off the Kollam coast** in southern Kerala. The study has found that these blocks have a deposit of **300 million tonnes** of sand. The depth of the sea in that coast is from 48 meters to 62 meters.

WHY KERALA IS OPPOSING OFFSHORE MINING?

Threat to Fisheries and Marine Ecosystem

- The **Kollam Parappu (also known as Quilon Bank)** is one of the most **productive fishing zones** in the southwest coast of India.

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- **Mining operations** will disrupt the seabed, **reducing fish populations** and impacting around **11 lakh fishermen** from **222 coastal villages**.
- **Sea-bottom mining** will create **plumes of sediment**, which can spread across thousands of square kilometers, affecting fish and aquatic ecosystems.
- The **clouding of water** will block sunlight, reducing the **euphotic zone**, which is essential for photosynthesis and marine life.
- Mining activities could release **toxic substances** into the sea, further harming marine biodiversity.

Economic Concerns for Fishermen

- Fishing is a **primary livelihood** for lakhs of people in Kerala.
- Large vessels involved in **mining operations** will obstruct **traditional fishing routes**, affecting both **catch volume** and **fishermen's safety**.
- The **entire royalty from mining revenue will go to the Centre**, with no direct financial benefit to Kerala or its fishing communities.

Union Government's Response

- **Environmental Safeguards:**
  - Union Minister for Coal and Mines **G Kishan Reddy** stated that **130 marine protected areas** were **excluded from the auctioned blocks**.The government has also **identified 106 Important Coastal and Marine Biodiversity Areas (ICMBAs)** to ensure conservation.
- **Mitigation Measures:**
  - The **Offshore Areas Mineral Trust** has been formed, with **coastal states as members**.Funds from the Trust will be used to **mitigate ecological damage** and **support affected communities**.

OFFSHORE MINING:

- Offshore mining involves **extracting minerals from the seabed**, often at depths exceeding 200 meters, and can include various forms like dredging for sand, oil and gas extraction, and deep-sea mining for valuable metals.
- This includes resources such as polymetallic nodules (manganese, nickel, copper, cobalt), construction sand, lime-mud, oil, natural gas, rare earth elements, and aggregates like sand and gravel, all of which are vital for various industrial applications.

OFFSHORE AREA

- As per the OMDR Act, **'offshore area' means the territorial waters, continental shelf, exclusive economic zone and other maritime zones of India.**
- **Section two of the Act** arms the **Centre with the right to control mines and minerals in offshore areas.**
- At the same time, fishing and related **developmental activities up to 12 nautical miles in the sea is a State subject**, as per the seventh schedule of the Constitution.

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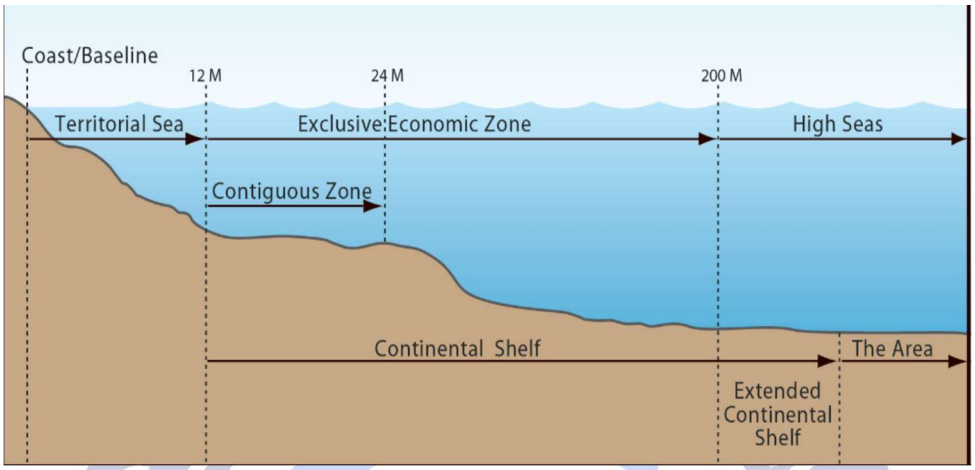
OFFSHORE AREAS MINERAL (DEVELOPMENT AND REGULATION) ACT, 2002 (OAMDR ACT):

- OAMDR Act provides for development and regulation of **mineral resources** in the **territorial waters, continental shelf, exclusive economic zone (and other maritime zones of India.**



- The Act came into force with effect from 15th January 2010 however; **no mining activity has been undertaken in the offshore areas till date.**
- The Act applies to all minerals in the offshore areas **except mineral oils and hydrocarbons.**
- The Government has recently **amended the OAMDR Act in August 2023.**

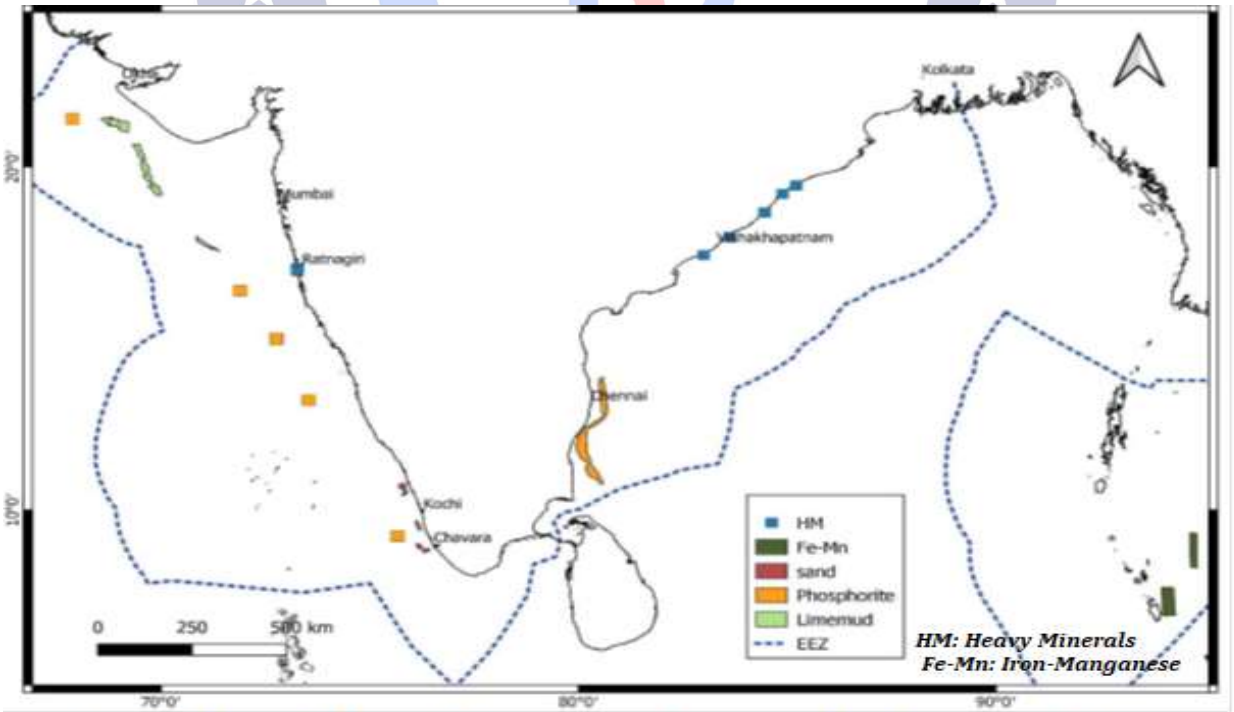


Fig. Offshore Mineral Deposits along the Indian Coastline

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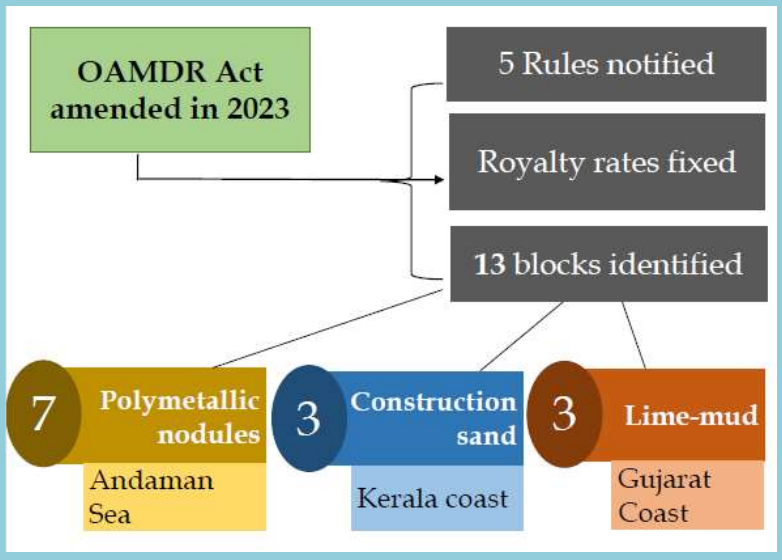
KEY AMENDMENTS IN THE OAMDR ACT IN 2023:

- The amended OAMDR Act introduced an **auction process** as the method for allocating operating rights in offshore areas.
- Operating rights will be granted only to **Government, Government Companies, and Corporations for atomic minerals** with a grade equal to or greater than the threshold.
- The Act established the **Offshore Areas Mineral Trust**, which will be used for exploration, mitigation of adverse impacts from offshore mining, disaster management, research, and for the benefit of affected persons.
- A **fixed lease period of 50 years** has been set for production leases, with no option for lease renewal.
- **Limits on area acquisition** have been imposed, preventing any entity from acquiring more than **45 minutes of latitude by 45 minutes of longitude** for any mineral.
- **Penalties** for unauthorized offshore mining have been increased, with fines up to **₹10 lakh** and imprisonment for up to **5 years**, or both.



SIGNIFICANCE OF OFFSHORE MINERALS AND MINING:

- **Industrial Development:**
  - **Mining, Processing, and Downstream Industry Development**: Offshore mining provides essential raw materials crucial for multiple industries.
  - For example, offshore **sand deposits off Kollam** provide **sustainable construction sand,** while **polymetallic nodules off Gujarat** offer metals like nickel, copper, cobalt, and rare earth elements for **electronics and renewable energy.**
  - This can stimulate the establishment of local **processing facilities** and boost the growth of **downstream industries** like cement production, steel manufacturing, and the chemical and pharmaceutical sectors.
- **Employment Creation:**
  - **Direct Employment**: Offshore mining will create jobs directly related to activities such as resource exploration, analysis, extraction, and infrastructure setup.

- **Indirect Employment**: The offshore mining sector will also drive employment in related industries, including **logistics** (transportation of materials), **marine technology** (innovation in machinery and equipment), and **transportation sectors** (ships, trucks, and rail).

- **Economic Diversification:**
  - Offshore mining can serve as a means of **economic diversification**, reducing reliance on sectors vulnerable to climate change impacts (such as agriculture) or global economic shifts (e.g., tourism).
  - It opens avenues for the growth of **marine-based industries** such as underwater mining, marine biotechnology, and offshore energy (wind or tidal), contributing to a diversified and resilient **blue economy**.
- **Infrastructure Development**:
  - Offshore mining will necessitate the development or upgrade of **ports**, **transportation networks** (roads, rail, shipping lanes), and **processing facilities**. This infrastructure expansion not only facilitates mining but also supports broader economic growth, especially in coastal regions.
  - **Processing plants** can reduce the need for imports, fostering a more robust domestic industry and encouraging sustainable local economies.
- **Environmental Management and Trust Funds:**
  - The establishment of the **Offshore Areas Mineral Trust** ensures the availability of funds for addressing the ecological impacts of mining, supporting **disaster relief** efforts, and promoting **research** into more sustainable mining practices.
  - The trust also ensures that the interests of affected communities, such as **fishermen in Kollam**, are considered, mitigating the social and environmental consequences of offshore mining activities.
- **Technology and Innovation:**
  - Offshore mining requires the development of **advanced technologies**, which can foster **innovation** in marine engineering, machinery, and extraction processes.
  - This drive for technological progress will enable the **transfer of expertise** from global mining companies to local industries, enhancing the skill base and promoting **long-term development** in sectors like **science, engineering, and technology**.
  - Research hubs and marine technology centers can further boost **innovation** in offshore mining practices, leading to breakthroughs in resource extraction and processing.
- **Export Potential and Foreign Investment:**

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- **Strategic Minerals** like nickel, cobalt, and rare earth elements extracted from offshore areas position India as a reliable supplier to global markets, enhancing its competitive edge in the international trade of these critical materials.
- The sector's growth can attract significant **Foreign Direct Investment (FDI)**, bringing in not only capital but also **technology** and **expertise** that boost **global competitiveness**.
- **Offshore mining** also provides a **long-term revenue stream** for states, through steady contracts and consistent demand for critical materials, ultimately benefiting the national economy.

CHALLENGES AND CONCERNS OF OFFSHORE MINING:

- **Environmental Concerns:**
  - **Marine Ecosystem Disruption:** Offshore mining can lead to the destruction of marine habitats, impacting biodiversity and fish populations, especially in sensitive areas like **Kollam** where local fishermen depend on healthy marine ecosystems for their livelihood.
  - **Pollution:** Mining activities can result in sediment plumes and the release of toxic substances, threatening the health of marine life and the quality of water.
  - **Carbon Sequestration Disruption:** Disturbance to seabed sediments may release carbon stored in the seabed, affecting the ocean's role in carbon sequestration.
- **Jurisdictional and Governance Issues:**
  - Section two of the **OAMDR Act arms the Centre with the right to control mines and minerals in offshore areas.**
  - At the same time, **fishing and related developmental activities up to 12 nautical miles** in the sea is a **State subject**, as per the **seventh schedule** of the Constitution.
  - The Union Government's control over offshore mining areas has led to tensions with state governments like Kerala.
  - For instnace, the Union mining ministry has told Kerala governmet that the **three blocks off the Kollam coast are beyond 12 nautical miles, and thus are not under the Kerala government.**
- **Socio-Economic Concerns:**
  - **Impact on Local Livelihoods:** Offshore mining could threaten the livelihood of local communities, particularly **fishermen** who rely on marine resources for income. The disruption of marine life could result in a decline in fish catches.
  - **Unequal Distribution of Benefits:** While offshore mining may generate employment, there are concerns about whether the local population will benefit from these jobs or if the benefits will primarily go to external corporations and investors.

- **Social Conflicts:** The influx of external companies for mining operations might lead to **land disputes**, **displacement of communities**, or disruption of local economies.

- **Technological and Financial Risks:**
  - **High Costs of Operation:** Offshore mining requires advanced technology and substantial investment. The cost of exploration, extraction, and environmental mitigation could make the project financially unfeasible, especially if the expected returns do not materialize.
  - **Risk of Bankruptcy:** The financial instability of mining companies, as seen with **Nautilus Minerals**, demonstrates the risks associated with offshore projects, where environmental and operational challenges lead to delays and financial losses.
- **Legal and Regulatory Challenges:**
  - **Regulatory Gaps:** While offshore mining is governed by the **OAMDR Act**, there may be insufficient regulations to effectively manage and monitor the mining process, leading to potential legal and environmental violations.
  - **International Disputes:** Offshore mining can also raise **international issues**, especially if the resources lie in disputed maritime zones, leading to diplomatic tensions.
- **Global Opposition and Ethical Concerns:**
  - **Global Resistance:** Countries like **Palau** and **Fiji** have called for moratoriums on deep-sea mining, citing concerns about the irreversible damage to marine ecosystems. The growing global opposition could lead to international regulations that could limit or halt mining activities in certain areas.
  - **Ethical Concerns:** The ethical dilemma surrounding the long-term environmental damage and the rights of local communities to have a say in the exploitation of resources beneath their waters is a significant concern.

WAY FORWARD:

- **Clear Regulatory Framework**: Establish a robust, transparent regulatory framework to balance economic development with environmental protection and state interests.
- **State-Central Cooperation**: Facilitate stronger collaboration between the Union and state governments to resolve jurisdictional conflicts and ensure shared benefits from offshore mining.
- **Environmental Safeguards**: Strengthen environmental safeguards, including real-time monitoring and mitigation measures for marine ecosystem protection.
- **Technology and Innovation**: Invest in advanced mining technologies to minimize environmental damage and maximize resource extraction efficiency.

- **Community Involvement**: Ensure active participation of local communities in decision-making processes and benefit-sharing from offshore mining projects.
- **Sustainable Blue Economy**: Focus on sustainable marine-based industries, including offshore energy (wind and tidal), marine biotechnology, and eco-friendly mining practices, in line with India's Blue Economy goals.

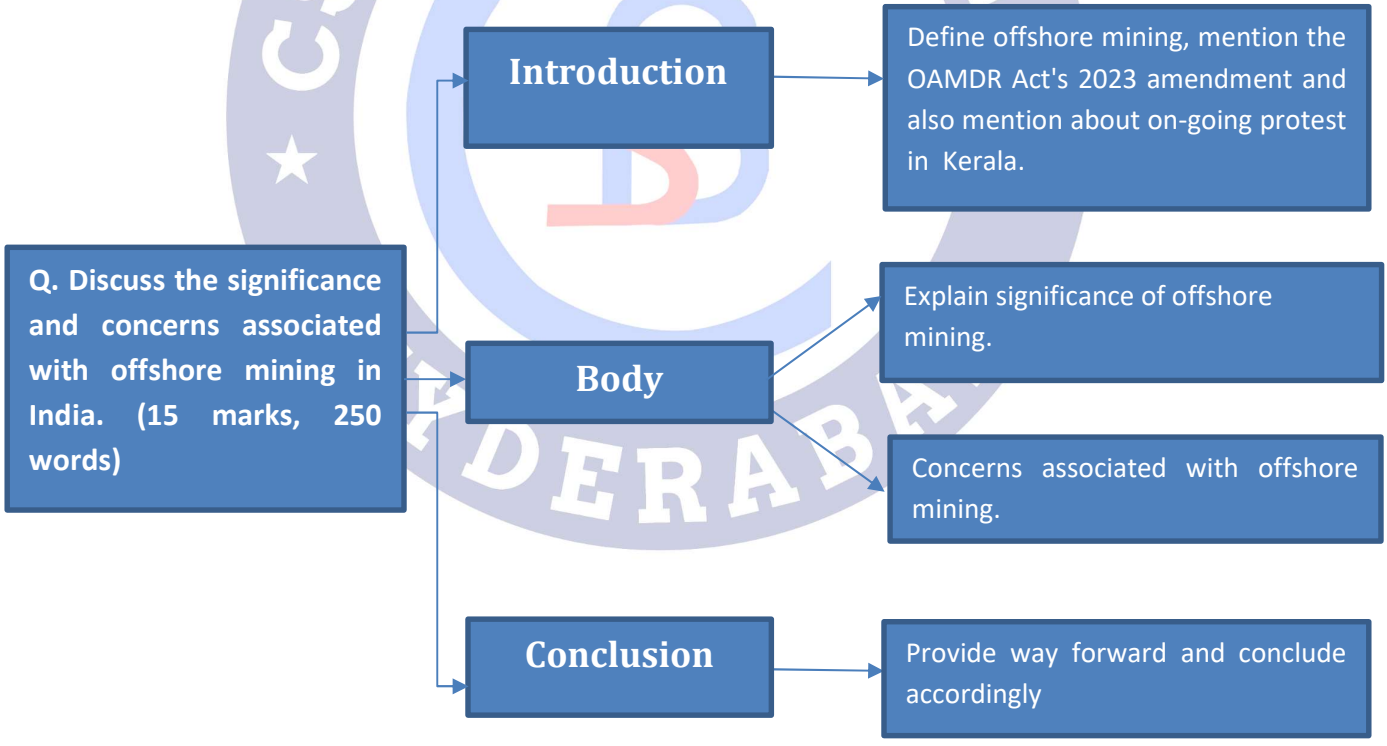
CONCLUSION:

- India can advance its **Blue Economy** by harnessing offshore mining responsibly, addressing challenges through innovation, collaboration, and sustainable practices, while ensuring **economic benefits and protecting marine ecosystems for future generations.**

PRACTICE QUESTION

Q. Discuss the significance and concerns associated with offshore mining in India. (15 marks, 250 words)

APPROACH



MODEL ANSWER

Offshore mining involves extracting **minerals from the seabed**, such as **polymetallic nodules** and **construction sand etc**. In India, **offshore mining is regulated by the Offshore Areas Mineral**

(Development and Regulation) Act, 2002 (OAMDR Act). The **2023 amendment** allows **private sector participation** through competitive auctions. However, this has faced significant opposition, especially in Kerala, due to concerns over its impact on local livelihoods and the marine ecosystem.

Significance of Offshore Mining:

1. **Industrial Development:** Offshore mining provides key raw materials like **construction sand** off Kollam and **polymetallic nodules** off Gujarat, which are vital for industries such as **electronics** and **renewable energy**. This boosts local processing industries like **cement production** and **steel manufacturing**.
2. **Employment Creation:** Offshore mining creates **direct jobs** in exploration and extraction, while **indirect jobs** emerge in **logistics**, **marine technology**, and **transportation**, benefiting local economies.
3. **Economic Diversification:** Offshore mining reduces reliance on vulnerable sectors like **agriculture** and **tourism**, opening avenues for **marine industries** such as **underwater mining** and **offshore energy**, supporting a **blue economy**.
4. **Export Potential and Foreign Investment:** Offshore mining positions India as a **global supplier** of materials like **rare earth elements** and **nickel**, attracting **Foreign Direct Investment (FDI)** and boosting **global competitiveness**.
5. **Infrastructure Development:** Offshore mining requires the development of **ports** and **processing facilities**, reducing **import dependence** and supporting **local economies** through enhanced infrastructure.

Concerns Associated With Offshore Mining:

1. **Environmental Impact:** Mining off Kollam may disrupt **marine ecosystems**, affecting fish populations critical to **11 lakh fishermen**. **Sediment plumes** and **toxic substance release** threaten **marine biodiversity**.
2. **Jurisdictional Disputes:** The **Centre controls offshore areas**, but **12 nautical miles** fall under state jurisdiction, causing conflicts with states like Kerala. For example, the **Kollam mining blocks** are claimed to be beyond Kerala's control by the Centre.
3. **Socio-Economic Impacts:** Offshore mining threatens local **fishermen's livelihoods**, with the **Centre** receiving all royalty payments, leaving **local communities** without financial benefits.
4. **Technological and Financial Risks:** Offshore mining requires **advanced technology** and **high investments**, making projects **economically risky**. The **bankruptcy of Nautilus Minerals** highlights these financial uncertainties.
5. **Legal and Regulatory Gaps:** Insufficient regulations under the **OAMDR Act** may lead to **legal violations** and **environmental degradation**, undermining the sustainability of mining activities.

Way Forward:

- **Clear Regulatory Framework:** Develop a transparent regulatory system to balance **economic growth** with **environmental protection**.
- **State-Central Cooperation:** Strengthen collaboration to resolve **jurisdictional issues** and ensure fair benefit-sharing.
- **Environmental Safeguards:** Implement **real-time monitoring** and **mitigation measures** to protect marine ecosystems.
- **Technology and Innovation:** Invest in **advanced mining technologies** to minimize environmental harm.
- **Community Involvement:** Engage **local communities** in **decision-making** and ensure they benefit from offshore mining.

Offshore mining can drive **economic growth** and contribute to a **blue economy** in India. However, addressing **environmental**, **jurisdictional**, and **socio-economic** challenges through **sustainable practices** and **collaboration** is essential for long-term success.

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GENERAL STUDIES-II

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6. INDIA-NEW ZEALAND RELATIONS

iMPACT ANALYSIS

SYLLABUS:

GS 2 > International Relations >> Bilateral relations

REFERENCE NEWS:

India believes in **development and not in expansionism**, said Prime Minister Narendra Modi, welcoming his counterpart from New Zealand Christopher Luxon. The two sides will "strengthen and institutionalize" defence and maritime cooperation and reminded that both India and New Zealand have fought global terrorism in Mumbai (26/11) and in Christchurch (15 March 2019).

PM Modi further announced that the two countries will celebrate a century of sporting relationship in 2026.

SIGNIFICANCE OF INDIA-NEW ZEALAND RELATIONS:

Strategic Significance

- **Indo-Pacific Security & Maritime Cooperation:** Both nations support a free, open, and rules-based Indo-Pacific, aligning with India's Indo-Pacific Oceans Initiative (IPOI).
    - India and New Zealand reaffirmed commitment to UNCLOS (United Nations Convention on the Law of the Sea), ensuring maritime freedom and peaceful dispute resolution.
    - Defence agreements, including regular naval port calls and military exchanges, enhance strategic cooperation.
- **Regional Influence & Partnerships:** New Zealand's endorsement of India's UNSC permanent membership strengthens India's global standing.
    - Both nations cooperate in ASEAN-led forums like the East Asia Summit, ASEAN Defence Ministers' Meeting Plus, and ASEAN Regional Forum, supporting regional stability.

Economic & Trade Significance

- **Trade & Investment Growth**: Bilateral trade stood at USD 2.5 billion in 2023, with scope for expansion through FTA negotiations launched in 2025. India is a leading exporter of pharmaceuticals, IT services, textiles, and automobiles to New Zealand, while New Zealand exports dairy, wool, timber, and horticultural products to India.
- **Agriculture & Horticulture Cooperation**: Memorandum of Cooperation on Horticulture to enhance research, knowledge-sharing, and post-harvest infrastructure. Letter of Intent on Forestry Cooperation supports sustainable trade in timber and forestry products.
- **Customs & Trade Facilitation:** AEO-MRA (Authorized Economic Operators Mutual Recognition Arrangement) simplifies trade by reducing customs barriers.

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- **Digital Payments & Fintech**: India and New Zealand agreed to explore digital payments collaboration under the FTA framework, potentially expanding UPI-based transactions.

Defence & Security Cooperation

- **Defence Engagements**: **MoU on Defence Cooperation** signed in 2025 strengthens military exchanges, exercises, and training programs. **New Zealand's naval ship HMNZS Te Kaha's port call in Mumbai (2025)** and **Indian Naval vessel Tarini's visit to Christchurch (2024)** signify growing defence ties.
- **Maritime Security**: **India's participation in New Zealand-led maritime task forces** enhances cooperation in counter-piracy, search & rescue, and humanitarian missions.

Geopolitical Significance

- **Counterbalancing China in the Indo-Pacific**: New Zealand has **historically maintained balanced ties with both China and India** but is **increasingly engaging with India** as part of a diversified Indo-Pacific strategy. Strengthening India-New Zealand ties **reduces New Zealand's dependence on China** and aligns it closer to India's vision for regional security.
- **Support for Multilateralism**: **New Zealand supports India's entry into the Nuclear Suppliers Group (NSG)**, strengthening India's global nuclear trade prospects. Both countries advocate **UN reforms and multilateral diplomacy** to address global security challenges.

Diaspora & People-to-People Ties

- **Strong Indian Community in New Zealand**: **Indians make up 6% of New Zealand's population**, significantly contributing to **business, healthcare, education, and technology sectors**. **Indian diaspora organizations** strengthen cultural ties and facilitate bilateral cooperation.
- **Education & Student Mobility**: **Over 20,000 Indian students study in New Zealand**, making India one of the largest sources of international students. **Refreshed Education Cooperation Arrangement (2025)** enhances collaboration between universities and research institutions.
- **Mobility & Skilled Workforce**: **Proposed mobility agreement** within the **FTA framework** will facilitate work visas, skilled labor exchange, and professional recognition.

Cultural & Sports Diplomacy

- **Cricket & Sporting Ties**: India and New Zealand share a **historic sporting rivalry in cricket**, fostering people-to-people engagement. **MoC on Sports signed in 2025** promotes cooperation in hockey, Olympic sports, and coaching programs. **"Sporting Unity" events planned for 2026** mark 100 years of sporting ties between the two nations.
- **Yoga & Traditional Medicine**: Rising interest in **Indian Yoga, Ayurveda, and traditional medicine** in New Zealand encourages cultural cooperation. **Expert dialogues on healthcare collaborations** were initiated in 2025.

- **Film & Cultural Exchanges**: Growing popularity of **Bollywood and Indian classical music** in New Zealand fosters deeper cultural affinity.

Science, Technology & Climate Cooperation

- **Climate Change & Sustainability**: **New Zealand joined India's International Solar Alliance (ISA) in 2024**, promoting solar energy cooperation. **Membership in the Coalition for Disaster Resilient Infrastructure (CDRI)** strengthens New Zealand's commitment to sustainable development.
- **Disaster Management**: Work towards an **MoC on Earthquake Mitigation** to enhance cooperation in seismic risk assessment and disaster preparedness.
- **Tech & Innovation**: Enhanced collaboration in **agri-tech, biotechnology, and space research** supports India's innovation-driven economy. Joint R&D in **green and sustainable technologies** benefits both nations.

CHALLENGES OF THE BILATERAL RELATIONS:

Geopolitical Divergences

- **Balancing Relations with China:** While New Zealand has expressed strong support for an open Indo-Pacific and endorsed India's participation in multilateral forums like the ASEAN Defence Ministers' Meeting Plus and East Asia Summit, it also maintains robust trade and diplomatic relations with China.
    - New Zealand is a key member of China's Belt and Road Initiative (BRI), which is viewed with concern by India, as India is wary of China's growing influence in the Indo-Pacific region.
- **Neutral Stance on Issues Involving India:** New Zealand often adopts a neutral stance on issues such as India's internal policies or conflicts involving India, particularly regarding Kashmir and terrorism.
    - New Zealand's refusal to join international campaigns directly criticizing Pakistan for its involvement in cross-border terrorism has been a point of contention, particularly when India's security concerns are raised in international discussions.

Economic Disparities and Trade Imbalances

- **Limited Trade Volume**: Bilateral trade between India and New Zealand is still relatively small, standing at approximately USD 2.5 billion in 2023, which is modest compared to India's trade with other countries like China or the US.
    - While India is a major importer of agricultural products like dairy, fruits, and wool from New Zealand, the export potential of Indian goods to New Zealand remains limited.
    - New Zealand's imports from India are primarily in the pharmaceuticals, IT services, and automotive sectors, but these sectors do not form a large share of New Zealand's economy.

- **Lack of Comprehensive Free Trade Agreement (FTA):** While there have been FTA negotiations launched in 2025, the absence of a completed agreement has hindered full economic integration.
    - New Zealand's trade agreements with larger economies like China, Australia, and the European Union offer more attractive opportunities for New Zealand's businesses, making it harder for Indian products to penetrate the New Zealand market without favourable trade terms.

Defence and Security Cooperation Limitations

- **Defence Capacity Differences:** While defence engagements have progressed, particularly with joint military exercises and visits, the defence capabilities of India and New Zealand are quite different. India, with its large military and complex security needs, may not always see New Zealand's smaller defence forces as a reliable partner for certain security challenges.
    - New Zealand's military engagements are primarily focused on peacekeeping, humanitarian assistance, and disaster response, whereas India is more concerned with regional security threats, such as China's expansionist ambitions in the South China Sea and the Indian Ocean.
- **Geostrategic Priorities:** New Zealand has traditionally had a Pacific-centrist approach to security and foreign policy, which sometimes leads to differences in strategic priorities compared to India's focus on the Indo-Pacific and its ongoing security concerns with countries like Pakistan and China.
    - While New Zealand is keen on climate change and disaster response cooperation with India, India may view New Zealand's pacifist stance on military intervention as limiting the scope of full-scale security collaboration.
- **Immigration and Work Visa Restrictions**: Although India and New Zealand are negotiating agreements on **skilled worker mobility**, visa policies and restrictions still pose challenges. New Zealand has a **highly regulated immigration system**, which may not be as favorable for Indian professionals.
    - Many Indian students aspiring to study in New Zealand face challenges such as **visa rejections** or **delayed processing times**, which can dissuade Indian talent from choosing New Zealand as a study destination over other countries.
- **Student Safety Concerns**: Although the Indian diaspora plays a significant role in New Zealand, **safety concerns** related to the well-being of Indian students in New Zealand have emerged in the past. Instances of **racist attacks** and **discrimination** in the past have strained relations.

- The tragic **murder of an Indian student in 2008** in Auckland and other such incidents led to diplomatic efforts to improve the safety of Indian nationals in New Zealand.

Cultural and Social Differences

- Different Cultural Perspectives: Despite the strong cultural ties, India's vast cultural diversity and New Zealand's smaller, predominantly European heritage can sometimes create cultural misunderstandings.
    - New Zealand's support for traditional Indian arts, like yoga and classical dance, is growing, but it may not resonate as strongly across the wider population. Similarly, Indian food culture is popular but sometimes criticized for its unfamiliarity or perceived "spiciness" by non-Indian communities.
- Immigration and Integration: While the Indian diaspora has significantly contributed to New Zealand's economy and culture, challenges remain regarding integration. Issues like cultural adaptation and language barriers can create difficulties for the integration of newly arrived Indian immigrants into New Zealand society, despite their growing numbers.
    - Some Indian students and migrants report discrimination in the job market or social circles, especially in smaller towns, which could undermine the inclusive vision of bilateral cooperation.

Climate Change and Environmental Concerns

- **Diverging Environmental Policies**: India, with its rapidly growing economy, faces a delicate balancing act between **economic development** and **environmental sustainability**, while New Zealand's policies are often stricter, emphasizing **carbon neutrality** and **sustainable agriculture**.
    - New Zealand's role in the **International Solar Alliance (ISA)** and its support for **climate action** contrasts with India's push for more comprehensive solutions that also account for **development needs**.

WAY FORWARD:

- **Finalizing a Comprehensive Trade Agreement:** A **bilateral trade pact** focusing on **low-carbon industries, technology, and agri-innovation** will ensure long-term trade growth. India should negotiate **preferential trade terms** for non-dairy agricultural exports (e.g., mangoes, basmati rice) while accommodating New Zealand's interest in **services and clean energy**.
- **Sustainable Supply Chain Development:** Both countries should create **green trade corridors** to promote **low-carbon transportation** and **eco-friendly packaging** for exports. Encourage **direct shipping routes** for lower emissions and better connectivity.

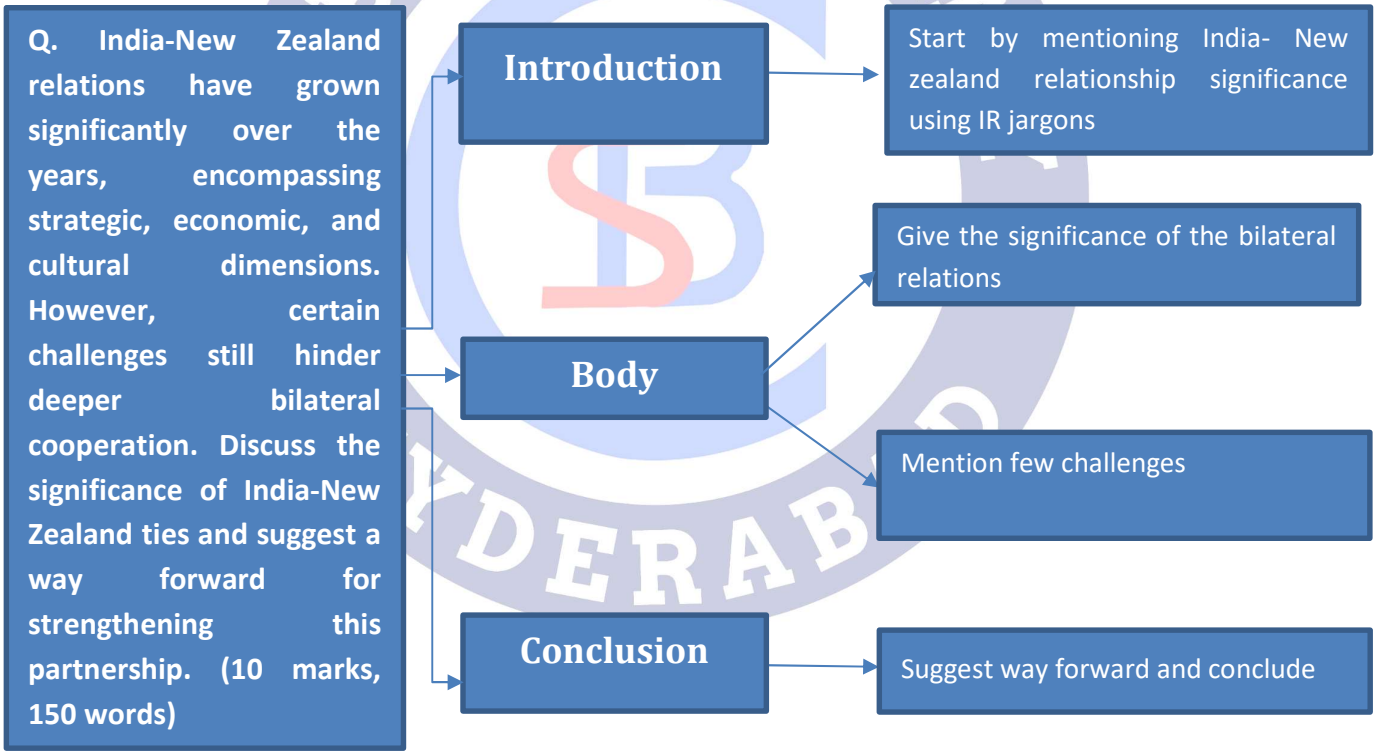
- **Investment in Green and Smart Infrastructure:** New Zealand firms can **invest in India's urban sustainability projects**, such as **smart cities, electric mobility, and water conservation**. India should **attract New Zealand investments** in **clean-tech startups** and **sustainable forestry projects**.
- **Expanding Collaboration in Renewable Energy**: New Zealand should **join India's International Solar Alliance (ISA)** and work on joint **solar and wind projects**. India's expertise in **solar manufacturing** can complement New Zealand's strengths in **wind and geothermal energy**.
- **Joint Climate Research & Policy Sharing**: Establish a **Climate Innovation Fund** to co-develop solutions for **sustainable agriculture, waste management, and carbon neutrality**. Share best practices in **climate-resilient farming** and **green building technologies**.
- **Strengthening Disaster Management Cooperation**: Establish a **bilateral disaster response mechanism** for **earthquakes, cyclones, and floods**, leveraging **New Zealand's expertise in disaster resilience**.
- **Expanding Indo-Pacific Collaboration**: New Zealand should engage more actively in **India-led regional initiatives**, such as the **Indian Ocean Rim Association (IORA)**. Joint participation in **maritime security exercises** can enhance coordination against **illegal fishing, piracy, and smuggling** in the region.
- **Enhancing Cybersecurity & Counterterrorism Collaboration**: Both countries should establish a **Cybersecurity Partnership** to combat **digital threats, misinformation, and financial cybercrimes**. Strengthen **intelligence-sharing on terrorism and transnational crimes**.
- **Sustainable People-to-People Ties**: Streamline **work and student visa approvals** for skilled Indian professionals and researchers in **STEM, healthcare, and sustainability sectors**. Promote a **mutual recognition framework** for Indian degrees and qualifications in New Zealand.
- **Encouraging Educational Partnerships**: New Zealand universities should **partner with Indian institutions** on **climate science, artificial intelligence, and agri-tech** research. Establish more **joint degree programs** to increase student exchanges.
- **Fostering Cultural and Tourism Exchanges**: Promote **sustainable tourism** initiatives, such as **eco-tourism circuits and indigenous heritage tourism** in both countries. Strengthen support for **Indian cultural festivals, yoga centers, and cricket diplomacy** in New Zealand.
- **Encouraging Digital and AI Collaboration**: Develop a **bilateral AI and Digital Innovation Hub** to drive cooperation in **smart cities, fintech, and blockchain**. Encourage **startups and incubators** to collaborate on AI-driven solutions for **agriculture, healthcare, and climate action**.

- **Expanding Space and Research Cooperation**: New Zealand's expertise in **satellite launch services** and India's **ISRO-led space missions** can lead to **joint satellite projects** for **disaster management and environmental monitoring**.

PRACTICE QUESTION

Q. India-New Zealand relations have grown significantly over the years, encompassing strategic, economic, and cultural dimensions. However, certain challenges still hinder deeper bilateral cooperation. Discuss the significance of India-New Zealand ties and suggest a way forward for strengthening this partnership. (10 marks, 150 words)

APPROACH



MODEL ANSWER

India and New Zealand share a growing bilateral relationship based on **democratic values, trade, defence cooperation, and cultural exchanges**. Both countries collaborate on **Indo-Pacific security, multilateralism, climate action, and education**.

Significance of India-New Zealand Relations

- **Strategic & Defence Cooperation: Indo-Pacific Security**: Support for a **free, open, and rules-based Indo-Pacific**, commitment to **UNCLOS**.
  - **Defence MoU (2025)**: Military exchanges, naval visits (**HMNZS Te Kaha's Mumbai visit, INS Tarini's Christchurch visit**).
  - **Terrorism Counteraction**: Shared experience in fighting global terrorism (Mumbai 26/11, Christchurch 2019).
- **Economic & Trade Relations: Bilateral trade** at **USD 2.5 billion (2023)**, potential to expand via **FTA negotiations (2025)**.
  - **Agriculture & Horticulture**: MoU for research, forestry, and post-harvest infrastructure.
  - **Fintech & Digital Payments**: Proposed **UPI integration** under FTA talks.
- **Geopolitical Significance: Countering China's Influence**: Reducing New Zealand's dependence on China.
  - **UNSC Membership**: New Zealand endorses India's bid for **permanent UNSC membership**.
- **People-to-People & Cultural Ties**
  - **Diaspora Strength**: **Indians form 6% of New Zealand's population**.
  - **Education Exchange**: **20,000 Indian students** in New Zealand; renewed **Education Cooperation Agreement (2025)**.
  - **Sporting Relations**: **100 years of sporting ties**, MoC on sports, "Sporting Unity" events (2026).
- **Science, Technology & Climate Cooperation**
  - **Green Energy**: New Zealand joined **India's International Solar Alliance (ISA) (2024)**.
  - **Disaster Management**: Working on **Earthquake Mitigation MoC**.
  - **Joint R&D** in **AI, space research, and agri-tech**.

Challenges in India-New Zealand Relations

1. **Economic Barriers: No FTA yet**, limiting trade potential. India restricts **New Zealand's dairy exports**, while New Zealand enforces **strict biosecurity rules on Indian agricultural imports**.
2. **Geopolitical Divergences: Balanced stance on China**: New Zealand's **Belt & Road Initiative (BRI) membership** raises concerns for India. **Neutral stance on India-Pakistan issues**: Lack of vocal support for India's **counterterrorism efforts**.

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3. **Defence & Security Limitations:** New Zealand lacks a **strong military presence** in Indo-Pacific security operations. **No significant arms trade** between both nations.
4. **Visa & Immigration Hurdles: Strict student and work visa rules** restrict skilled migration. **Indian qualifications not fully recognized** in New Zealand.

Way Forward for Strengthening India-New Zealand Ties

1. **Strengthening Trade & Economic Cooperation: Finalize the FTA** with a focus on **non-dairy agricultural products, digital trade, and services**. **Expand fintech collaboration** via UPI integration and cross-border digital payments.
2. **Enhancing Strategic & Defence Engagement: Increase maritime security cooperation** by including New Zealand in **India-led Indo-Pacific initiatives (IORA, IPOI)**. **Joint military exercises** and deeper intelligence-sharing on cyber threats and terrorism.
3. **Promoting Sustainable Development: Climate Action Partnership**: Joint initiatives in **renewable energy, water conservation, and disaster resilience**. **Encourage green technology investments** in **smart cities and sustainable infrastructure**.
4. **Expanding People-to-People Ties: Ease visa norms** for Indian students and professionals. **Recognize Indian degrees** for better employment opportunities. **Enhance cultural cooperation** via Bollywood, tourism, and yoga diplomacy.

India and New Zealand are natural partners in **trade, Indo-Pacific security, and global governance**. To maximize this partnership, both nations must **resolve trade disputes, align geopolitical interests, and deepen defence and technological cooperation**. With **FTA negotiations, educational exchanges, and climate initiatives**, the relationship can evolve into a **sustainable and strategic alliance** in the 21st century.

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7. JUDICIAL INDEPENDENCE

iMPACT ANALYSIS

SYLLABUS:

GS 2 > Constitution >> Judiciary

REFERENCE NEWS:

Chief Justice of India (CJI) Sanjiv Khanna on Saturday initiated an unprecedented three-member **in-house inquiry** into the conduct of Delhi High Court judge Justice Yashwant Varma following allegations that wads of currency notes were found in his official residence where a fire broke out on March 14.

IN-HOUSE INQUIRY:

An **in-house inquiry** is an internal mechanism established by the Supreme Court of India to investigate complaints of misconduct against judges of the High Courts and the Supreme Court, where such **misconduct does not meet the threshold of "proved misbehaviour" required for impeachment under Article 124 of the Constitution.**

This mechanism was first formulated in 1997 and adopted in 1999 to fill what the judges called "**a yawning gap between proved misbehaviour and bad conduct inconsistent with the high office**", the SC decided to formulate an in-house procedure. Later it revised in 2014 to provide a structured process for handling allegations against judges while maintaining judicial independence.

The procedure is "for taking suitable remedial action against judges, who by their acts of omission or commission, do not follow the accepted values of judicial life, including the ideals expressed by the Supreme Court in the **Restatement of Values of Judicial Life".**

Procedure for In-House Enquiry (Step-by-Step)

- **Filing of Complaint:** A complaint against a judge can be received by, the **Chief Justice of a High Court,** the **Chief Justice of India,** the **President of India**
- **Initial Scrutiny by the CJI:** If the complaint is received by the CJ of HC or the President, they forward it to the CJI. The CJI examines the complaint to determine its seriousness. If the complaint is deemed frivolous or baseless, it can be dismissed at this stage.
- **Preliminary Inquiry by the HC Chief Justice:** If the complaint appears serious, the CJI may request a preliminary report from the HC Chief Justice where the concerned judge serves. The HC CJ evaluates the allegations and submits a report to the CJI.
- **Decision on Deeper Probe:** Based on the preliminary report, the CJI decides whether a deeper investigation is required. If needed, the CJI forms a three-member inquiry committee comprising two Chief Justices of different HCs and one senior HC judge.

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- **Conduct of Inquiry by the Committee:** The committee devises its own procedure in line with natural justice. The concerned judge is given an opportunity to respond to the allegations. The committee investigates the claims and submits a detailed report to the CJI.
- **Findings of the Inquiry Report:** The report must state whether the allegations are substantiated. If substantiated, whether they warrant removal proceedings.
- **Action Based on Inquiry Findings:** If allegations lack substance, the case is closed. If misconduct is found but not serious enough for removal, the CJI may advise the judge on appropriate conduct. Place the report on record for future reference.
- If serious misconduct is established, the CJI may advise the judge to resign or take voluntary retirement. If the judge refuses, the CJI directs the HC CJ not to assign judicial work to the concerned judge. Inform the President & Prime Minister to initiate removal proceedings under Article 124.

JUDICIAL INDEPENDENCE:

Judicial Independence is the principle that the judiciary should function free from external influences—whether from the executive, legislature, or any other entity—ensuring **fair and impartial justice**. This is a fundamental feature of the **Indian Constitution**, vital for **democracy and the rule of law**.

Constitutional Provisions Ensuring Judicial Independence

- **Separation of Powers**: Article **50** (Directive Principles of State Policy) mandates the separation of the **judiciary from the executive** to ensure independence.
- **Security of Tenure**: Judges of the Supreme Court and High Courts **cannot be removed arbitrarily**; they can only be removed through **impeachment under Article 124(4) and 217(1)(b)**.
- **Fixed Salaries and Allowances** – Under Articles **125 and 221**, judges' **salaries cannot be altered to their disadvantage** during their tenure.
- **Power of Contempt** – Article **129 (SC) and 215 (HCs)** empower courts to punish for contempt to maintain authority and impartiality.
- **Judicial Review** – Article **13, 32, 136, 226, and 142** grant the judiciary the power to **strike down unconstitutional laws and executive actions**.

Key Case Laws Supporting Judicial Independence

- **S.P. Gupta v. Union of India (1981) First Judges Case:** The SC ruled that **executive dominance in judicial appointments** was valid. However, it acknowledged the need for **judicial independence** and held that judges must not be influenced by political considerations.
- **Supreme Court Advocates-on-Record Association v. Union of India (1993) Second Judges Case:** Established the **Collegium System**, giving primacy to the judiciary in

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appointments of judges. Held that **"consultation" with the CJI in judicial appointments must mean "concurrence"**, thereby reducing executive control.

- **In Re: Special Reference 1 of 1998 Third Judges Case:** Clarified that the **CJI must consult a Collegium of four senior-most judges** in judicial appointments. Strengthened the **judiciary's role in its own appointments**.
- **National Judicial Appointments Commission (NJAC) Case (2015) Fourth Judges Case:** Struck down the **NJAC Act**, which sought to replace the **Collegium System with a committee including the executive**. Reaffirmed the **primacy of the judiciary in judicial appointments**, citing independence as a part of the **Basic Structure**.
- **Keshavananda Bharati v. State of Kerala (1973):** Established the **Basic Structure Doctrine**, ruling that judicial independence is **a fundamental part of the Constitution** that cannot be altered by Parliament.
- **Union of India v. R. Gandhi (2010):** Held that the **composition of tribunals must ensure judicial independence**. Tribunals **cannot be completely controlled by the executive**.
- **P. Sambamurthy v. State of Andhra Pradesh (1987):** Struck down a provision allowing the **executive to veto High Court orders**, stating it violated **judicial independence**.

SIGNIFICANCE OF JUDICIAL INDEPENDENCE IN INDIA:

- **Protection of Fundamental Rights:** The judiciary acts as the **guardian of the Constitution**, ensuring that fundamental rights (Article **32** & **226**) are protected against arbitrary state action.
    - In **Kesavananda Bharati v. State of Kerala (1973)**, the Supreme Court ruled that the **Basic Structure of the Constitution cannot be altered**, thereby protecting fundamental rights.
- **Ensuring the Rule of Law:** Judicial independence ensures that **laws are applied uniformly** and **no individual or authority is above the law**.
    - In **Maneka Gandhi v. Union of India (1978)**, the SC expanded the scope of **Article 21 (Right to Life and Personal Liberty)**, ruling that **due process is essential before depriving anyone of their liberty**.
- **Preventing Executive and Legislative Overreach:** A **strong and independent judiciary** acts as a check on excessive **executive power** and unconstitutional laws by the **legislature**.
    - In **Golaknath v. State of Punjab (1967)**, the SC ruled that **Parliament cannot amend fundamental rights**, limiting legislative overreach.
- **Fair and Impartial Dispute Resolution:** An independent judiciary ensures **impartial adjudication** in both **civil and criminal cases**, instilling confidence in the legal system.
    - In the **Shah Bano case (1985)**, the SC ruled in favor of **Muslim women's right to maintenance**, despite opposition from religious groups.

- **Strengthening Public Trust in Democracy:** When courts function independently, **citizens trust the judicial process**, ensuring a stable democracy.
    - In **Vineet Narain v. Union of India (1998)**, the SC ensured **free and fair CBI investigations** in corruption cases, reinforcing public faith in institutions.
- **Protecting Minority and Marginalized Rights:** Judicial independence prevents **majoritarianism** and protects vulnerable groups.
    - **Navtej Singh Johar v. Union of India (2018)** struck down **Section 377**, decriminalizing homosexuality and upholding LGBTQ+ rights.
- **Economic Growth and Investor Confidence:** A fair judicial system assures **domestic and international investors** that disputes will be resolved **without bias**, boosting economic confidence.
    - The SC's intervention in contract enforcement cases, such as **Vodafone tax case (2012)**, reassured businesses about India's legal framework.

CHALLENGES OF JUDICIAL INDEPENDENCE IN INDIA:

- **Executive Interference in Judicial Appointments:** The process of appointing judges has often led to conflict between the **executive and the judiciary**.
    - The **National Judicial Appointments Commission (NJAC) case (2015):** The Supreme Court struck down the NJAC Act, which sought to replace the **Collegium system** with a committee including the **Law Minister**. The court ruled that **executive involvement in appointments could compromise judicial independence**.
- **Political Influence and Pressure:** Judges often face **political pressure** in sensitive cases, affecting judicial impartiality.
    - **Justice Loya case (2018):** Justice B.H. Loya, who was hearing the **Sohrabuddin Sheikh encounter case**, died under mysterious circumstances. Allegations were raised that **political interference** may have played a role.
    - **SC Judge Press Conference (2018):** Four senior SC judges, including **Justice Chelameswar and Justice Gogoi**, held an **unprecedented press conference**, stating that **democracy was under threat due to executive interference in the judiciary**.
- **Lack of Judicial Accountability:** While judicial independence is crucial, the **lack of accountability** can lead to misuse of power.
    - **Justice Soumitra Sen (2011) and Justice P.D. Dinakaran (2011):** Both were accused of **financial misconduct and corruption**, but impeachment processes are rare and difficult
- **Delay and Backlog of Cases:** India has **over 4.5 crore pending cases** (as of 2024), weakening public trust in the judiciary.

- The **Ayodhya dispute (Ram Janmabhoomi-Babri Masjid case)** took nearly **70 years** to reach a final judgment in 2019.
- **Commonwealth Games Scam (2010)** and **2G Scam (2008)** cases faced prolonged delays in judgment.

- **Judicial Corruption and Ethical Issues:** Some judges have faced allegations of **bribery and favoritism**, affecting public confidence.
  - **Prasad Education Trust Case (2017):** A bribery scandal involving **judges, lawyers, and middlemen** to influence Supreme Court cases was exposed. A petition was filed to probe corruption in judicial appointments, but the case was dismissed.
- **Controversies in the Use of Contempt of Court:** The **contempt of court law** has been criticized for **suppressing free speech and judicial criticism**.
  - **Prashant Bhushan Case (2020):** Advocate **Prashant Bhushan was fined ₹1 for contempt** after criticizing the judiciary on Twitter. The case raised concerns about the **judiciary stifling criticism instead of encouraging transparency**.
- **Post-Retirement Appointments & "Judicial Favoritism":** Judges accepting **post-retirement positions** in government raises questions about **neutrality in judgments**
  - **Former CJI Ranjan Gogoi (2020)** was nominated to **Rajya Sabha** just **4 months after his retirement**. Critics alleged it was a **reward for his judgments favoring the government**, including the **Ayodhya verdict and Rafale case**.

WAY FORWARD:

- **Collegium System vs. NJAC Debate**
  - **Law Commission (214th Report, 2008)**: Suggested **a more transparent Collegium process** with wider consultation.
  - **Venkatachaliah Commission (2002)**: Recommended a **National Judicial Commission (NJC)** with participation from **judges, executive, and civil society**, ensuring a balance of power**.**
  - **UK's Judicial Appointments Commission (JAC)**: In the **UK**, the **JAC independently selects judges** based on merit, avoiding political interference.
- **Ensuring Judicial Accountability:** While judicial independence is essential, **judicial accountability** is equally crucial
  - **Law Commission (195th Report, 2006)**: Recommended setting up a **National Judicial Oversight Committee** to handle complaints against judges.
  - **The Judges (Inquiry) Bill, 2006**: Proposed **a National Judicial Council** to investigate judicial misconduct.
  - **Restatement of Values of Judicial Life (1997)**: A SC resolution outlining **ethical guidelines for judges**.
- **Reducing Political Influence in the Judiciary**

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- **17th Law Commission Report (2006)**: Recommended **a cooling-off period for judges** before taking government positions.
- **Justice Lokur's Proposal (2019)**: Suggested banning **post-retirement appointments for at least 3 years** to prevent political favoritism.

○ **Addressing Judicial Corruption & Transparency Issues**

- **Judicial Standards and Accountability Bill (2010)**: Proposed a mechanism for **dealing with complaints against judges**.
- **Arun Jaitley's Recommendation (2012)**: Called for **financial disclosures by judges** to improve transparency.

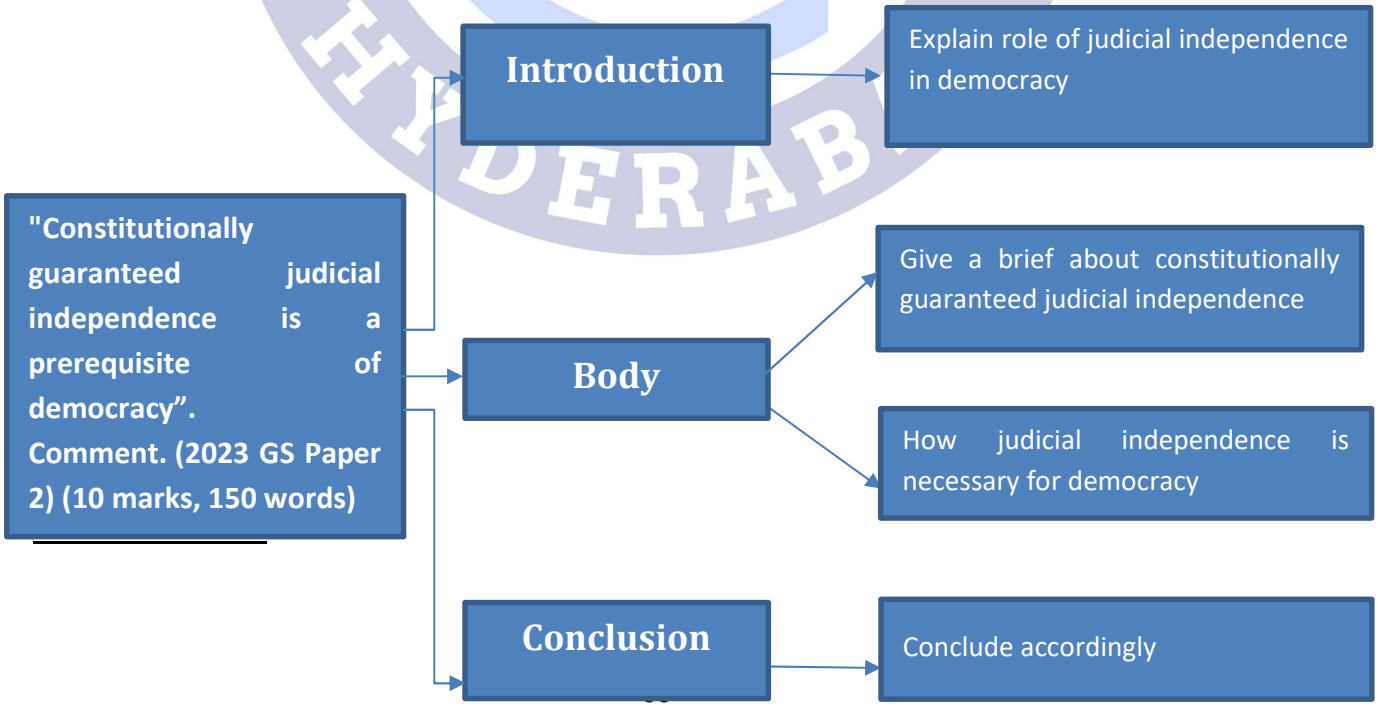
○ **Tackling Case Backlog and Delays**

- **Malimath Committee (2000)**: Suggested **fast-track courts** and better case management.
- **245th Law Commission Report (2014)**: Recommended **increasing the number of judges** and using **technology in courts**.
- **E-Courts Project**: Initiated by the Supreme Court to digitize case records and improve efficiency.

PRACTICE QUESTION

"Constitutionally guaranteed judicial independence is a prerequisite of democracy". Comment. (2023 GS Paper 2) (10 marks, 150 words)

APPROACH



MODEL ANSWER

Judicial independence is the principle that the judiciary should be free from external pressures, ensuring impartial and fair justice. It is constitutionally guaranteed in India to uphold the rule of law and democracy. A robust judiciary acts as a check on the executive and legislature, preventing authoritarianism and safeguarding citizens' rights.

Constitutional Provisions Ensuring Judicial Independence

1. **Separation of Powers (Article 50)** – Mandates the separation of the judiciary from the executive.
2. **Security of Tenure (Articles 124(4) & 217(1)(b))** – Judges can be removed only through an impeachment process.
3. **Fixed Salaries (Articles 125 & 221)** – Judicial remuneration is charged on the Consolidated Fund of India, preventing executive control.
4. **Judicial Review (Articles 13, 32, 136, 226, 142)** – Grants the judiciary power to strike down unconstitutional laws and executive actions.
5. **Power of Contempt (Articles 129 & 215)** – Empowers courts to punish for contempt to ensure judicial dignity.

Judicial Independence as a Prerequisite for Democracy

1. **Guardian of the Constitution**: The Supreme Court protects fundamental rights and upholds constitutional supremacy.
    - Kesavananda Bharati v. State of Kerala (1973) – Established the **Basic Structure Doctrine**, preventing arbitrary amendments by the legislature.
2. **Rule of Law & Due Process**: An independent judiciary ensures that laws are applied uniformly without bias.
    - Maneka Gandhi v. Union of India (1978) – Expanded **Article 21**, making due process integral to personal liberty.
3. **Check on Executive & Legislative Overreach**: Judicial review prevents arbitrary executive actions and unconstitutional laws.

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- The Supreme Court struck down the **NJAC Act (2015)** to preserve the judiciary's independence in appointments.

4. **Protection of Fundamental Rights**: The judiciary acts as the protector of fundamental rights through writ jurisdiction.
    - Vishaka v. State of Rajasthan (1997) – Laid down **guidelines against workplace harassment**, filling a legislative vacuum.
5. **Public Trust & Democratic Stability**: A weak judiciary erodes faith in democracy, leading to instability and authoritarian tendencies.
    - Indira Gandhi v. Raj Narain (1975) – The Allahabad High Court's verdict against the Prime Minister upheld democratic values.

Judicial independence is the backbone of democracy, ensuring fair governance, protection of rights, and checks on power. While India has robust constitutional safeguards, challenges like executive interference, political pressure, and delays persist. Strengthening judicial accountability, reforming appointments, and ensuring transparency are key to upholding democracy and the rule of law.

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8. PUBLIC INTEREST LITIGATION

iMPACT ANALYSIS

SYLLABUS:

GS 2 > Constitution >> Judiciary

REFERENCE NEWS:

Supreme Court judge Justice BV Nagarathna, who is expected to become India's 54th Chief Justice in 2027, recently expressed concerns over the misuse of Public Interest Litigations (PILs), stating that it's time to reflect on this issue. "Where is the real PIL these days," Justice Nagarathna remarked, highlighting that a legal tool intended to rectify injustices has been misused by some, leading to a growing scepticism toward it.

PUBLIC INTEREST LITIGATION:

Public interest Litigation (PIL) means litigation filed in a court of law, for the protection of "Public Interest".

- Any matter where the interest of the public at large is affected can be redressed by filing a Public Interest Litigation in a court of law such as Pollution, Terrorism, Road safety, Construction hazards, etc.
- The expression 'Public Interest Litigation' has been borrowed from **American jurisprudence**, where it was designed to provide legal representation to previously unrepresented groups like the poor, racial minorities, unorganized consumers, citizens who were passionate about environmental issues, etc.
- **PIL is not defined in any statute or in any act.** It has been interpreted by judges to consider the intent of the public at large. It is the power given to the public by courts through judicial activism.
- **The Supreme Court of India and the High Courts have the right to issue PILs**. The concept of PILs stems from the power of judicial review.
- The concept of PILs has diluted the **principle of locus standi,** which implies that only the person/party whose rights have been infringed upon can file petitions.
- Any Indian citizen or organisation can move the court for a public interest/cause by filing a petition in the **Supreme Court under Article 32** and in the **High Courts under Article 226.** The court can treat a letter as a writ petition and take action on it.

ORIGIN AND EVOLUTION OF PIL IN INDIA

- **Strict Locus Standi Rule:** Before PILs were introduced, courts followed the principle of locus standi, meaning that only a person whose rights were directly violated could file a case. This restricted access to justice for marginalized communities who lacked the resources to approach courts.

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- **Birth of PIL in India (1976-1980):** The concept of PIL was introduced in India by Justice P.N. Bhagwati and Justice V.R. Krishna Iyer, who expanded the scope of legal standing to allow public-spirited individuals to file petitions on behalf of the disadvantaged.
    - In **Hussainara Khatoon v. State of Bihar (1979),** a PIL was filed on behalf of undertrial prisoners languishing in Bihar jails without trial. This case marked the beginning of judicial activism in favour of social justice.
- **Expansion of PIL (1980-1990):** During the 1980s, the scope of PIL expanded to address environmental protection, bonded labour, corruption, and human rights violations. The courts allowed PILs to be filed in the form of letters, making justice more accessible.
    - In **M.C. Mehta v. Union of India (1986),** the Supreme Court ruled that the **right to a clean environment is a part of the right to life under Article 21**.
- **Judicial Activism Through PIL (1990-2000):** The 1990s witnessed an increase in PILs addressing women's rights, child labor, and corruption.
    - In **Vishaka v. State of Rajasthan (1997),** a PIL was filed to address workplace sexual harassment after the brutal gang rape of a social worker.
- **Misuse and Regulation of PIL (2000-Present):** In the 2000s, PILs became a tool for judicial activism but also started being misused for political and personal interests. The courts responded by setting guidelines to prevent frivolous PILs.
    - In **Subhash Kashinath Mahajan v. State of Maharashtra (2018),** the Supreme Court ruled that courts should reject frivolous PILs filed for publicity or political gains.

WHY IS PIL SIGNIFICANT IN INDIA?

- **Ensuring Access to Justice for the Marginalized:** India has a large population that is socially and economically disadvantaged. Many people, such as bonded labourers, undertrial prisoners, victims of custodial violence, and displaced communities, lack the resources to approach courts. PIL helps in bridging this gap.
    - **Hussainara Khatoon v. State of Bihar (1979):** The Supreme Court ruled that the right to a speedy trial is a fundamental right under Article 21.
- **Strengthening Fundamental Rights and Human Rights:** PIL has played a critical role in ensuring that fundamental rights are not just theoretical but are actually implemented for the weaker sections of society.
    - **People's Union for Democratic Rights v. Union of India (1982):** The petition exposed exploitation of workers in construction projects for the 1982 Asian Games. The Supreme Court ruled that non-payment of minimum wages violates Article 21 (Right to Life).

- **Environmental Protection and Sustainable Development:** PIL has been instrumental in shaping India's environmental laws by compelling the government to regulate industrial pollution, deforestation, and urban planning.
    - **M.C. Mehta v. Union of India (1986) – Ganga Pollution Case:** The PIL highlighted uncontrolled industrial discharge into the Ganga River. The Supreme Court ruled that the right to a clean environment is part of Article 21.
- **Protection of Women's and Children's Rights:** PIL has been a significant tool in protecting the rights of women and children, particularly against sexual harassment, child labour, and domestic violence.
    - **Vishaka v. State of Rajasthan (1997):** A social worker was gang-raped while preventing child marriage. The Supreme Court formulated the Vishaka Guidelines, which later became the POSH Act, 2013.
- **Holding Government and Public Institutions Accountable:** PIL ensures that the government and public institutions do not act arbitrarily or violate citizens' rights.
    - **Common Cause v. Union of India (2018) – Corruption in Politics:** A PIL was filed to challenge corruption and misuse of public funds by politicians. The Supreme Court ruled that all political donations through electoral bonds must be transparent.
- **Judicial Oversight of Executive Actions:** PIL helps the judiciary intervene in cases of executive inaction where government failures affect public welfare.
    - **Olga Tellis v. Bombay Municipal Corporation (1985):** The Bombay Municipal Corporation planned to evict pavement dwellers without rehabilitation. The Supreme Court ruled that the Right to Livelihood is a part of the Right to Life under Article 21.
- **Protection of Consumer Rights and Public Health:** PIL has played a role in ensuring that consumers receive fair treatment and that public health measures are effectively implemented.
    - **CESC Ltd. v. Subhash Chandra Bose (1992):** The PIL focused on ensuring worker safety and proper health conditions in industries. The Supreme Court ruled that health and safety at workplaces is a fundamental right under Article 21.

CONCERNS SURROUNDING PIL IN INDIA:

- **Increase in Frivolous and Motivated PILs:** PIL was designed to protect the interests of the marginalized, but many petitions today are filed for **publicity, political interests, business rivalries, or personal grievances** rather than genuine public welfare.
    - In 2021, the Supreme Court dismissed a PIL seeking a ban on **Coca-Cola and Pepsi**, calling it a **publicity stunt** with no legal merit.

- In **Subhash Kashinath Mahajan v. State of Maharashtra (2018)**, the Supreme Court emphasized that courts must **reject frivolous PILs that waste judicial resources**.

- **Judicial Overreach and Violation of Separation of Powers:** PILs have sometimes led to **judicial encroachment into executive and legislative functions**, which goes against the principle of **separation of powers**. Courts, through PILs, have issued orders that should ideally be **decided by elected governments or expert committees**. This undermines democratic governance.
    - In **State of Tamil Nadu v. K. Balu (2016)**, the Supreme Court ordered a ban on **liquor sales within 500 meters of highways**, which disrupted businesses, caused job losses, and led to unintended economic consequences.
    - In **Divisional Manager, Aravali Golf Club v. Chander Hass (2008)**, the Supreme Court cautioned against **judicial overreach**, stating that judges should **not act as policymakers**.
- **Burdening of Courts and Delayed Justice:** PILs have significantly increased the workload of courts, contributing to judicial backlog and delays. Many PILs involve matters already under government review or cases that do not require urgent judicial intervention.
    - In 2020, over **20,000 PILs** were pending in various High Courts and the Supreme Court, **delaying constitutional and civil cases**.
    - In **Tehseen S. Poonawalla v. Union of India (2018)**, the Supreme Court stated that courts should avoid PILs that **overburden the judiciary and delay other important cases**.
- **Political and Corporate Misuse of PIL:** Many PILs are filed **to target political opponents, influence elections, or advance business interests** rather than serving genuine public causes.
    - Several PILs were filed against **political leaders just before elections**, often to damage reputations rather than address public concerns.
    - In **Ashok Kumar Pandey v. State of West Bengal (2004)**, the Supreme Court observed that **PIL should not be used as a weapon for political or personal vendetta**.
- **Ineffective Implementation of Court Orders:** Even when PILs result in favourable judgments, **government authorities often fail to implement them effectively** due to administrative challenges, lack of political will, or resistance from vested interests.
    - In **Bandhua Mukti Morcha v. Union of India (1984)**, the Supreme Court ruled for the **abolition of bonded labor**, but even today, thousands remain trapped in forced labor due to poor enforcement.

- **Lack of Proper Guidelines for Admitting PILs:** Currently, there are **no strict legal criteria** for determining whether a PIL is genuine, leading to **inconsistent judicial decisions on admitting PILs**. Some courts accept weak cases, while others reject petitions on **technical grounds**.
    - Some PILs related to **environmental issues** have been admitted without scientific basis, leading to **unnecessary bans on industrial projects**.

WAY FORWARD: STRENGTHENING THE PIL MECHANISM

- **Stricter Scrutiny of PILs:** Courts should establish **clear guidelines for admitting PILs** and conduct **preliminary hearings** to determine their validity.
- **Penalties for Frivolous PILs:** Imposing **heavy fines on baseless PILs** can discourage people from filing petitions for **publicity, political gains, or corporate interests**.
- **Faster Disposal of PIL Cases:** Dedicated **PIL benches** in the Supreme Court and High Courts can ensure **quicker resolution** of genuine cases while preventing backlog.
- **Encouraging Alternative Dispute Resolution (ADR):** Mediation and arbitration should be promoted for **resolving public grievances**, rather than relying entirely on PILs.
- **Better Implementation of Court Orders:** Courts should establish **monitoring mechanisms** to ensure that government agencies **follow through on PIL judgments**.
- In Singapore, courts can impose fines for "vexatious litigation" to prevent PIL misuse.
- Germany has special constitutional courts that handle public interest cases on priority.
- **South Africa's Constitutional Court** has an express mechanism for fast-tracking human rights cases.
- **United States**: The **Supreme Court applies a "standing doctrine"**, ensuring that only those **directly affected** can file lawsuits.
- **United Kingdom**: **Judicial Review applications must pass an initial scrutiny stage**, where only serious public interest cases are admitted.

PRACTICE QUESTION

Q. Public Interest Litigation (PIL) has transformed access to justice in India but has also led to concerns regarding misuse and judicial overreach. Critically analyze the significance and challenges of PIL in India. Suggest measures to ensure its effective implementation. (15 marks, 250 words)

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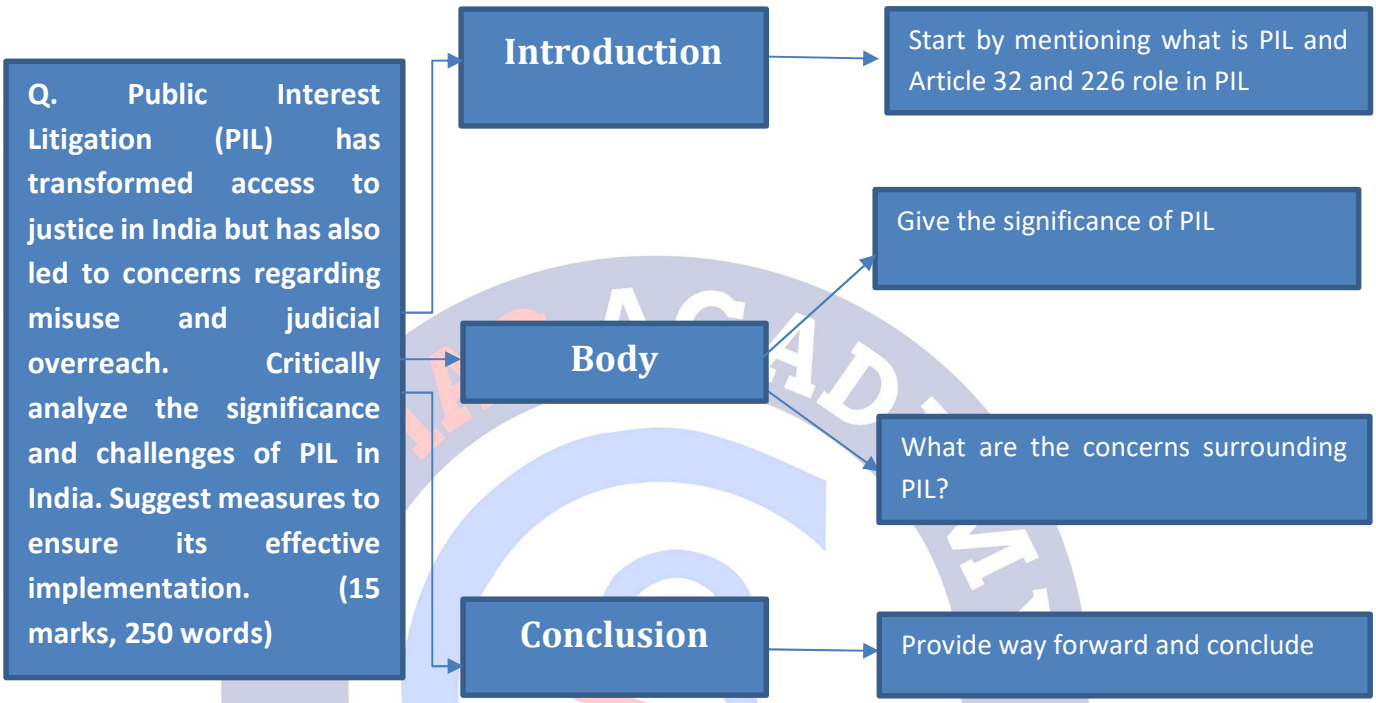
APPROACH



MODEL ANSWER

Public Interest Litigation (PIL) is a judicial innovation in India that allows **any individual or organization** to seek legal intervention in matters affecting public interest. Any Indian citizen or organisation can move the court for a public interest/cause by filing a petition in the **Supreme Court under Article 32** and in the **High Courts under Article 226.**

Significance of PIL in India

- **Ensuring Access to Justice for the Marginalized**: Many disadvantaged groups such as **bonded laborers, undertrial prisoners, and victims of custodial violence** lack the means to approach courts. PILs bridge this gap.
  - *Hussainara Khatoon v. State of Bihar (1979)* → Supreme Court ruled **right to a speedy trial** as a fundamental right under **Article 21**, leading to the release of over **40,000 undertrial prisoners**.
- **Strengthening Fundamental Rights and Human Rights:** PILs have been crucial in enforcing **workers' rights, labor laws, and socio-economic justice**.

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- *People's Union for Democratic Rights v. Union of India (1982)* → Supreme Court held that **non-payment of minimum wages violates Article 21**.

- **Environmental Protection and Sustainable Development:** PILs have shaped **India's environmental jurisprudence**, leading to stricter pollution control and conservation laws.
  - *M.C. Mehta v. Union of India (1986) – Ganga Pollution Case* → Court ruled that **the right to a clean environment is part of Article 21** and directed regulation of industrial pollution.
- **Protection of Women's and Children's Rights:** PILs have helped in addressing **gender discrimination, workplace harassment, and child labor**.
  - *Vishaka v. State of Rajasthan (1997)* → Led to **Vishaka Guidelines**, forming the basis for the **POSH Act, 2013** on workplace sexual harassment.
- **Holding Government and Public Institutions Accountable:** PILs have exposed **corruption, mismanagement, and arbitrary state actions**, ensuring greater transparency.
  - *Common Cause v. Union of India (2018)* → Supreme Court ruled that **electoral bonds must be transparent** to prevent corruption in political funding.
- **Judicial Oversight of Executive Actions:** PILs have compelled the government to uphold **citizens' rights and prevent unlawful evictions**.
  - *Olga Tellis v. Bombay Municipal Corporation (1985)* → Supreme Court ruled that **Right to Livelihood is a part of Right to Life (Article 21)**, preventing arbitrary evictions of pavement dwellers.

Concerns and Challenges Related to PIL in India

1. **Increase in Frivolous and Motivated PILs:** Many PILs today are filed for **publicity, corporate rivalry, or political gains** rather than genuine public interest.
   - In 2021, the Supreme Court dismissed a PIL seeking a ban on **Coca-Cola and Pepsi**, calling it a **publicity stunt**.
   - *Subhash Kashinath Mahajan v. State of Maharashtra (2018)* → Supreme Court ruled that **frivolous PILs waste judicial resources and should be rejected**.
2. J**udicial Overreach and Violation of Separation of Powers:** Courts have sometimes **interfered in policy matters** that should be decided by the executive or legislature.
   - In *State of Tamil Nadu v. K. Balu (2016)*, the Supreme Court **banned liquor sales within 500 meters of highways**, causing **job losses and economic disruptions**.
   - *Divisional Manager, Aravali Golf Club v. Chander Hass (2008)* → Court warned that **judges should not act as policymakers**.
3. **Burdening of Courts and Delayed Justice:** Over **20,000 PILs** were pending in 2020, increasing **judicial backlog** and delaying constitutional and civil cases.

- *Tehseen S. Poonawalla v. Union of India (2018)* → Supreme Court advised against PILs that **overburden courts and delay genuine cases**.

4. **Political and Corporate Misuse of PIL:** Some PILs are filed to **target political opponents before elections or block business competitors**.
    - Several PILs were filed against **political leaders before elections**, often to damage reputations rather than address public concerns. *Ashok Kumar Pandey v. State of West Bengal (2004)* → Supreme Court ruled that **PIL should not be used as a tool for personal or political vendetta**.
5. **Ineffective Implementation of Court Orders:** Even when PILs result in favorable judgments, **poor enforcement by government agencies** makes them ineffective.
    - *Bandhua Mukti Morcha v. Union of India (1984)* → Supreme Court ordered **abolition of bonded labor**, but thousands remain trapped in forced labor due to weak implementation.
6. **Lack of Proper Guidelines for Admitting PILs:** Many PILs are admitted without clear criteria, leading to **inconsistent judicial decisions**. Some environmental PILs were admitted **without scientific basis**, leading to **unnecessary bans on industrial projects**.

Way Forward: Strengthening the PIL Mechanism

1. **Stricter Scrutiny of PILs:** Courts should establish **clear guidelines for admitting PILs** and conduct **preliminary hearings** before accepting petitions.
2. **Imposing Penalties for Frivolous PILs:** Heavy fines should be imposed on those filing **baseless PILs** for publicity or political gain. Singapore imposes fines for **"vexatious litigation"** to prevent PIL misuse.
3. **Faster Disposal of PIL Cases:** Set up **dedicated PIL benches** in High Courts and Supreme Court to resolve cases **within 6 months**.Germany's **constitutional courts handle public interest cases on priority**.
4. **Encouraging Alternative Dispute Resolution (ADR):** Many PILs involve grievances that can be **resolved through mediation** rather than litigation. Canada refers **public grievances to independent ombudsmen before allowing PILs in courts**.
5. **Ensuring Proper Implementation of Court Orders: Monitoring committees should track compliance** with PIL judgments and report delays to the courts. Japan has a **special system to monitor government compliance with judicial orders**.
6. **Preventing Political and Corporate Misuse:** Courts should **require petitioners to disclose any political or business interests** before filing a PIL.

Public Interest Litigation has **significantly contributed to democracy, justice, and accountability in India**. However, its increasing misuse for **political, corporate, or personal agendas** threatens its credibility. To ensure PIL remains an **effective tool for social justice**, courts must adopt **stricter**

scrutiny, penalties for misuse, faster case disposal, and better implementation of orders. By **learning from global best practices**, India can **balance judicial activism with responsible litigation**.

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9. MENTAL HEALTHCARE

iMPACT ANALYSIS

SYLLABUS:

GS 2 > Social Justice >> Mental Health

REFERENCE NEWS:

The World Health Organization (WHO) launched new guidance to help all countries reform and strengthen mental health policies and systems. It replaces its 2004 mental health policy framework and service guidance package.

Mental health services worldwide remain underfunded, with major gaps in access and quality. In some countries, up to 90% of people with severe mental health conditions receive no care at all, while many existing services rely on outdated institutional models that fail to meet international human rights standards.

FIVE KEY POLICY AREAS UNDER WHO GUIDELINES:

- **Strengthening Leadership and Governance** by ensuring sustainability, accountability and effective implementation of policy reforms.
- **Community-based Mental Health Services** for comprehensive, rights-based, person-centred and recovery-oriented support services.
- **Workforce development:** A diverse, competent and resilient workforce delivering person-centred rights-based services.
- **Person-centred Assessment and Interventions**
- **Expanding Mental Health Sector's role** in addressing social and structural determinants of mental health.

WHO stresses mental health to be integrated as a core component of Universal Health Coverage.

MENTAL HEALTH SITUATION IN INDIA:

WHO defines Mental Health as a state of mental well-being that enables people to cope with the stresses of life, realize their abilities, learn well and work well and contribute to their community. It is an integral part of health and well-being that underpins our individual and collective abilities to make decisions, build relationships and shape the world we live in.

WHO calls Mental Health as a **basic Human right.** According to the WHO, mental illness makes about 15% of the total disease conditions around the world.

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- According to the National Mental Health Survey (NMHS) 2015-16, 10.6% adults in India suffered from mental disorders.
- The treatment gap for mental disorders ranged between 70% and 92% for different disorders.
- The prevalence of mental morbidity was higher in urban metropolitan regions (13.5%) compared with rural areas (6.9%) and urban non-metro areas (4.3%).
- Citing the National Council of Educational Research and Training's (NCERT) Mental Health and Well-being of School Students Survey, the Economic Survey highlights an **increasing prevalence of poor mental health among adolescents** exacerbated by the COVID-19 pandemic, with 11% of students reported as feeling anxious, 14% feeling extreme emotion, and 43% experiencing mood swings.
- In 2019, India's suicide rate was at 12.9 per 1,00,000 persons. This was higher than the regional average of 10.2 and the global average of 9.0. Suicide has become the leading cause of death among those aged 15–29 in India.

REASONS FOR MENTAL HEALTH DETERIORATION IN INDIA:

The deterioration of mental health in India can be attributed to a combination of social, economic, and cultural factors.

SOCIO CULTURAL FACTORS:

- **Stigma and Lack of Awareness**: Mental health issues are often stigmatized in Indian society, leading to discrimination and reluctance to seek help. There is a lack of awareness about mental health disorders and their treatment options.
    - A survey by the National Institute of Mental Health and Neurosciences (NIMHANS) found that 70-80% of people with mental illnesses do not receive treatment due to stigma and lack of awareness.
- **Rapid Urbanisation and lifestyle changes**: Rapid urbanization has led to increased stress, unhealthy lifestyles, and social isolation.
    - The World Health Organization (WHO) has reported that urban populations in India have higher rates of anxiety and depression compared to rural areas.
- **Substance Abuse**: Including alcohol and drug use, is a growing problem that exacerbates mental health issues.
    - The NMHS found that approximately 22.4% of the population in urban areas and 23.3% in rural areas have issues related to substance abuse, contributing to mental health deterioration.
- **Family Dynamics:** Strained relationships, domestic violence, and family pressures can lead to mental health issues.
    - The NMHS reported that family-related stress is a common cause of mental health problems, particularly among women.

- **Gender Disparities**: Women and LGBTQ+ individuals often face gender-based violence and discrimination, leading to mental health issues.
    - According to the NMHS, women are more likely to suffer from depression and anxiety due to societal pressures and violence. Increase in activities of exorcism, counselling especially faced by LGBTQ community.
- **Role of media**: Online abuse, body shaming, beauty standards and other stereotyping has been on the rise and children susceptible to such abuse are also increasing as more social media users are now identified underage.

ECONOMIC FACTORS:

- **Unemployment and Poverty:** Economic stress, unemployment, and poverty and thus financial instability are significant contributors to mental health issues.
    - According to a report by the National Mental Health Survey (NMHS), 31% of urban and 22% of rural populations suffer from mental health problems due to financial stress.
- **Workplace stress:** The competitive nature of the job market and high-pressure work environments contribute significantly to stress and anxiety.
    - A study by the ASSOCHAM found that 42.5% of employees in the private sector in India suffer from depression or anxiety due to work stress.
    - Recent death of EY employee.
- **Poor Mental Health infrastructure:** There is a severe shortage of mental health professionals and facilities.
    - According to WHO, India has only 0.3 psychiatrists and 0.07 psychologists per 100,000 people, far below the recommended levels.
- **Academic Stress:** Students face immense pressure to perform well academically, leading to stress, anxiety, and depression.
    - The National Crime Records Bureau (NCRB) reported that in 2019, over 10,000 students died by suicide due to academic pressure. Events that occur every year in Kota, Rajasthan
- **Low budget Allocation**: Developed countries allocate 5-18% of their annual healthcare budget on mental healthcare, while India allocates roughly 0.05% (Organization for Economic Co-operation and Development, 2014) of its healthcare budget. This is the lowest among all G20 countries. Despite a rise in mental illness issues, the Union Ministry of Health allocated less than 1% of its budget to directly deal with psychological illnesses in 2022.
- **Consumerism**

STEPS TAKEN BY INDIA TO ADDRESS MENTAL HEALTH ISSUE:

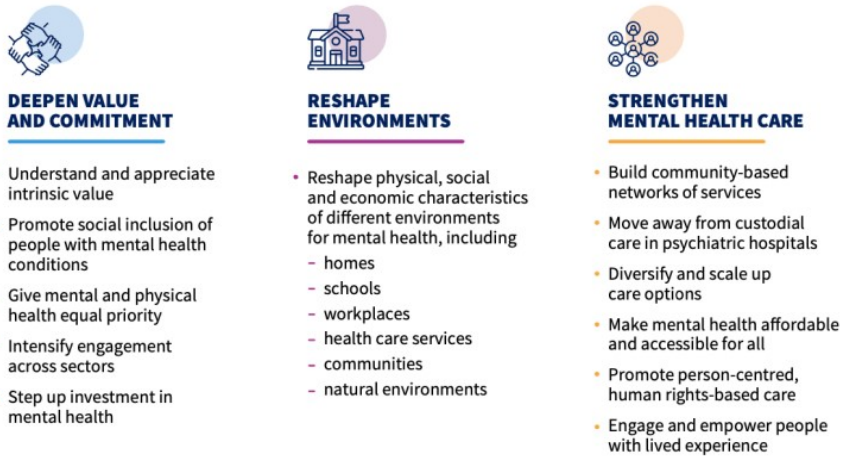
- **The Mental Healthcare Act, 2017:** The Act rescinds the Mental Healthcare Act, 1987 which was criticised for failing to recognise the rights and agency of those with mental illness.
    - The Act seeks to ensure rights of the person with mental illness to receive care and to **live a life with dignity**. It provides the **Right to Access to Healthcare**

- The **Act decriminalised suicide** stating that whoever attempts suicide will be **presumed to be under severe stress**, and shall not be punished for it.

- **Right of Persons with Disabilities Act, 2017**: Acknowledges mental illness as a disability and seeks to enhance the Rights and Entitlements of the Disabled and provide an effective mechanism for ensuring their empowerment and inclusion in society.
- **National Mental Health Programme**: Keeping WHO recommendations, it was introduced in 1982 to provide mental healthcare as a part of general healthcare system
- **National Tele Mental Health Programme**
- **Rashtriya Kishor Swasthya Karyakram- Adolescent friendly health clinics**
- Central government's efforts to **raise the number of psychiatrists** from 0.75 per lakh population in 2021 to the World Health Organization's norm of three psychiatrists per lakh population.
- **Kiran** – a 24/7 toll free helpline by Ministry of Social Justice and Empowerment
- **Manodarpan**: Students will receive psychosocial help as part of an effort under the Atmanirbhar Bharat Abhiyan, with the goal of improving the students' mental health and overall well-being.

WHAT MEASURES CAN BE TAKEN FOR MORE INCLUSIVITY:

- The WHO has recommended Three Paths to transformation towards better Mental Health.



- Standardising guidelines for mental health services across the government and private sectors, and bringing effective pathways for integrating mental health interventions in schools
- Developing an **age appropriate mental health curriculum** for teachers and students, encouraging early intervention and positive language in schools, promoting community-level interactions

- Balancing the role of technology in providing mental health awareness and celebrating diversities and differences.
- Careful mapping and research needs to be undertaken to **produce quality data**, that is essential to understand the size of the problem. This in turn should be utilised to implement a comprehensive approach, supported by heightened political commitment, scientific understanding and a citizen driven movement.

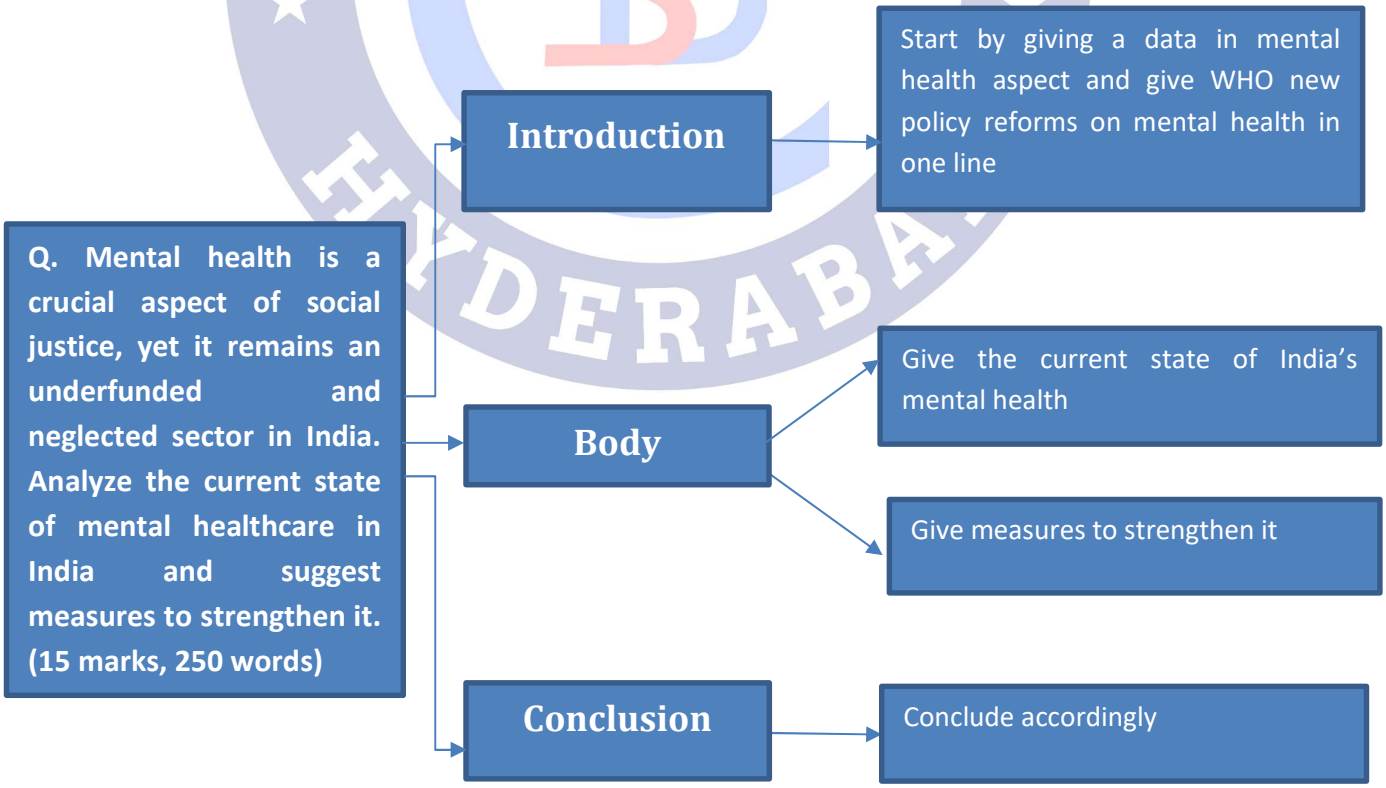
CASE STUDIES:

- Sleep consultants for Olympic participants to manage their stress
- Japan's special ministry dealing with suicides
- Brazil's community gardens have helped residents reconnect by sharing responsibilities and fostering sense of belonging.

PRACTICE QUESTION

Q. Mental health is a crucial aspect of social justice, yet it remains an underfunded and neglected sector in India. Analyze the current state of mental healthcare in India and suggest measures to strengthen it. (15 marks, 250 words)

APPROACH:



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MODEL ANSWER

According to the National Mental Health Survey (NMHS) 2015-16, around 10.6% of adults in India suffer from mental disorders, with a treatment gap ranging from 70% to 92%. The World Health Organization (WHO) has emphasized the need to integrate mental health into Universal Health Coverage, recognizing it as a basic human right.

Current State of Mental Healthcare in India

1. **High Prevalence but Low Awareness:** WHO states that mental illness accounts for about 15% of the total disease burden worldwide. Mental health issues are heavily stigmatized in India, discouraging individuals from seeking treatment.
2. **Poor Mental Health Infrastructure:** India has only 0.3 psychiatrists and 0.07 psychologists per 100,000 people, which is significantly lower than WHO recommendations. The country allocates only 0.05% of its healthcare budget to mental health, the lowest among G20 nations.
3. **Socio-Cultural and Economic Barriers:** Urbanization and changing lifestyles have increased stress levels, leading to a rise in anxiety and depression. Economic distress, unemployment, and workplace stress further contribute to poor mental health. Women, LGBTQ+ individuals, and marginalized communities face additional challenges due to discrimination and societal pressures.
4. **Rising Cases of Suicide:** Suicide is the leading cause of death among people aged 15-29 in India. In 2019, India's suicide rate was 12.9 per 100,000 persons, higher than the regional (10.2) and global (9.0) averages.

Steps Taken by India

1. **The Mental Healthcare Act, 2017:** Recognizes the right to mental healthcare and decriminalizes suicide.
2. **National Mental Health Programme (1982):** Aims to integrate mental healthcare with general healthcare services.
3. **National Tele-Mental Health Programme (2022):** Provides digital counseling and support services.

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4. **Manodarpan Initiative:** Focuses on students' mental health under the Atmanirbhar Bharat Abhiyan.

5. **Kiran Helpline:** A 24/7 toll-free helpline for individuals facing mental health issues.

Measures to Strengthen Mental Healthcare

1. **Policy and Budgetary Reforms:** Increase budgetary allocation for mental health to at least 5% of the healthcare budget, in line with global best practices. Implement WHO's new mental health policy framework for better governance and accountability.

2. **Expanding Mental Health Services:** Promote community-based mental healthcare models to reduce institutionalization. Strengthen mental health facilities in primary healthcare centers (PHCs) and district hospitals.

3. **Addressing Social Determinants:** Integrate mental health support in schools, workplaces, and community settings. Implement stress management programs for students and employees.

4. **Improving Workforce Capacity:** Train more mental health professionals, including counselors and social workers. Incentivize medical students to specialize in psychiatry and psychology.

5. **Reducing Stigma and Raising Awareness:** Conduct mass awareness campaigns to normalize conversations around mental health. Encourage media to portray mental health issues sensitively.

Mental health is a fundamental human right and must be integrated into mainstream healthcare policies. A multi-stakeholder approach involving the government, healthcare providers, educational institutions, and civil society is essential to bridge the existing treatment gap. With adequate funding, policy reforms, and awareness, India can build an inclusive and resilient mental healthcare system.

10. INTERNET SHUTDOWN

iMPACT ANALYSIS

SYLLABUS:

GS 2> Governance > Aspects of Good Governance > Fundamental rights

REFERENCE NEWS:

- India recorded **84 internet shutdowns** in 2024, the highest among all democratic nations, as per a report published by **digital rights organisation Access Now**.
- While this marks a decline from **116 shutdowns in 2023**, India remained the **second-highest globally**, behind only **Myanmar (85 shutdowns)**, where blackouts were imposed by the military junta.

MORE ON NEWS:

- This is the **first time in six years** that India has not been named as the country which saw the most number of internet shutdowns in the world.
- Out of the 84 shutdowns, **41 were related to protests while 23 of them were triggered by communal violence**, as per the report. Five internet shutdowns were imposed by authorities during government job placement examinations last year.
- At least **one internet shutdown** occurred in over **16 Indian states and Union Territories** during 2024.
- **State-wise Data**

Manipur imposed the highest number of shutdowns: **21**

Haryana followed with 12 shutdowns

Jammu & Kashmir also recorded 12 shutdowns

- **Critics have raised concerns** about the **lack of safeguards** in the **Telecommunications Act 2023** and **Telecom Suspension Rules 2024**, urging the repeal of **laws that restrict digital rights** and advocating for **a shutdown-free 2025**.

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- The concern raised by critics is that the **Telecommunications Act 2023** retains provisions from the **colonial-era Telegraph Act, 1885**, allowing government-ordered internet shutdowns **without an independent oversight mechanism**.
- Currently, **shutdown orders are reviewed by a three-member committee** comprising **secretary-level officials at the Centre and in states**, but experts argue that this system **lacks independent accountability** and **fails to provide adequate checks on the exercise of such powers**.

The **Telecommunications Act, 2023** replaces the **Indian Telegraph Act, 1885**, **Wireless Telegraphy Act, 1933**, and **Telegraph Wires (Unlawful Possession) Act, 1950** to modernize telecom regulation. It strengthens government oversight, regulates spectrum allocation, and grants powers **for interception and service suspension in emergencies**. It introduces the **Digital Bharat Nidhi Fund** for digital expansion and research, establishes a **multi-tier dispute resolution system**, and extends jurisdiction to telecom-related offences outside India.

ARGUMENT IN FAVOR OF INTERNET SHUTDOWNS:

- **National Security:**

Internet shutdowns are viewed as a measure for maintaining national security, as they help curb communication among groups that might incite violence or coordinate harmful activities.

For instance, in 2022, **41 out of 75 internet shutdowns** in India were ordered **citing terrorism as the reason** (Software Freedom Law Center (SFLC) report).

- **Control of Misinformation and Rumours**:

Shutdowns can help prevent the spread of misinformation and rumours that can lead to panic and violence.

For instance, during the **Citizenship Amendment Act protests in 2019**, internet shutdowns were imposed to control the spread of rumours that could incite violence.

- **Public Order:**

Managing public order by restricting access to social media during sensitive times helps authorities control public sentiment and prevent mass mobilization that could lead to unrest.

For example, Rajasthan shut down the internet during **Gujjar community protests for reservation**. Similarly, during the **Maratha Quota reservation protests in Pune**, internet services were blocked to prevent the organization of large, potentially violent gatherings

- **Against Ethnic or Communal Tensions:**

In regions with high ethnic or communal tensions, internet blackouts are used to prevent the spread of rumors or hate speech that could lead to riots or clashes. This approach was evident during several shutdowns in states **like Uttar Pradesh and Bihar.** A recent example includes the internet shutdown in **Manipur** last year due to the **Kuki-Meitei ethnic conflict.**

- **Avoid disruptive role:**

In certain extreme situations where rumours through WhatsApp and other social media start playing a disruptive role, it may become necessary to have internet shutdowns. For instance, incidents like the **exodus of North East Indians from Bangalore in 2012** can be avoided with the help of shutdowns.

LAWS RELATED WITH SUSPENSION OF INTERNET SERVICES:

- **Telecommunications Act, 2023**:

The **Telecommunications Act, 2023** has introduced updated regulations governing the suspension of telecom services, effectively replacing the previous framework established under the **Indian Telegraph Act, 1885**, and its associated rules.

Previous Framework:

- The **Indian Telegraph Act, 1885**, empowered the central government to regulate various telecom services, including internet services, and grant licenses for their operation.
- In 2017, the government introduced the **Temporary Suspension of Telecom Services (Public Emergency or Public Safety) Rules** under this Act, allowing for temporary shutdowns of telecom services in specific regions on grounds of public emergency or public safety, with each suspension not exceeding 15 days. These rules derived their authority from **Section 5(2)** of the Indian Telegraph Act, which permitted interception of messages in the interests of the sovereignty and integrity of India. The power to order such shutdowns was vested in senior officials from the Home Ministry at both central and state levels.

Current Status under the Telecommunications Act, 2023:

- The **Telecommunications Act, 2023**, has repealed the **Indian Telegraph Act, 1885**, and introduced new regulations, including the

Telecommunications (Temporary Suspension of Services) Rules, 2024, to govern the suspension of telecom services.

- The 2024 Rules retain several provisions from the 2017 Rules but introduce enhancements to ensure greater transparency and accountability:

Publication of Orders: All suspension orders must now be published, detailing the reasons for the suspension, the specific geographical areas affected, and the duration, which cannot exceed 15 days.

Competent Authority: The authority to issue suspension orders continues to rest with the Home Secretaries of the central and state governments. In unavoidable circumstances, a designated officer of the rank of Joint Secretary or above may issue such orders, provided they are confirmed by the respective Home Secretary within 24 hours.

Review Mechanism: A Review Committee is mandated to convene within five days of the issuance of a suspension order to assess its validity. This committee comprises senior officials, including the Cabinet Secretary at the central level and the Chief Secretary at the state level, along with Secretaries of Legal Affairs and Telecommunications or Home Affairs.

- **Criminal Procedure Code (CrPC), 1973:**

Before 2017, Internet suspension orders were issued **under section 144 of the CrPC**, which gives District Magistrates broad powers during dangerous situations.

Despite the 2017 rules, the government has often used the broad powers under Section 144.

- **Information Technology Act, 2000**

The IT Act has provided limited power to the government to issue individual web content blocking orders, instead of a larger suspension of interest itself.

ARGUMENTS AGAINST INTERNET SHUTDOWNS:

- **Violation of Fundamental Rights**:

Internet shutdowns infringe upon the **right to freedom of speech and expression**, as reiterated by the Supreme Court of India in the landmark **Anuradha Bhasin v. Union of India case.** The court emphasized that **indefinite shutdowns are unconstitutional.**

- **Right to Information**:

Internet blackouts restrict access to information, impacting the public's ability to stay informed about critical issues, including government actions and public health updates.

- **Economic Impact**:

Internet shutdowns result in significant economic losses. For instance, as per the recently released **report by Access Now**, internet shutdowns reportedly cost the country [India] **USD1.9 billion and a loss of USD118 million in foreign investment** in the first half of 2023 alone.

Also, **Gig economy and white-collar employment sectors such as IT, financial and consulting services** rely on internet and shutdowns will freeze their economic activity.

- **Increasing frequency of shutdowns:**

India shuts down Internet services **more than any other democracy in the world**. For instance, as per the Access Now report, in 2023, the **number of internet shutdowns rose by 41%**, from 201 in 2022 to 283 in 2023.

- **Frivolous grounds:**

Internet shutdowns are being implemented for **routine policing, and administrative purposes** such as preventing cheating in exams and preventing local crime.

For instance, the Rajasthan government imposed a shutdown to stop cheating in the Rajasthan Eligibility Examination for Teachers (REET) exam

- **Based on subjective assessment:**

The Standing Committee on Communications and Information Technology in its report *'Suspension of Telecom Services/Internet and its Impact'* noted that **no parameters have been laid down to decide the merit of internet shutdowns** and shutdowns have been ordered based on subjective assessment.

- **Affect free press:**

Journalists may find it impossible to do ground-reporting from already volatile areas.

For example, in a petition in the Supreme Court, **Anuradha Bhasin, a Kashmiri journalist**, stated that she said had put a halt to the work of printing newspapers due to the prolonged internet lockdown.

- **Impact on Education and Healthcare**:

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Internet shutdowns **hinder access to online education and telemedicine services**, disproportionately affecting marginalized communities. For example, the prolonged shutdown in Kashmir in 2019-20 severely impacted students and patients who relied on digital platforms.

- **Disruption of Essential Services**:

Access to government services and subsidies, such as MNREGA payments and other welfare schemes, is impeded during shutdowns, affecting millions of beneficiaries who rely on online systems.

- **Gender-based Violence and Accountability**:

Internet shutdowns make it difficult to document atrocities, including gender-based violence. For instance, the **shutdown in Manipur** made it **harder to document and hold perpetrators accountable for crimes** such as murder, rape, arson, and other gender-based violence, as highlighted in a report on the impacts of the Manipur shutdown.

- **Non-compliance with Legal Standards**:

Many shutdowns do not meet the **'three-part test'** under international law, which requires **actions to be lawful, pursue a legitimate aim, and follow standards of necessity and proportionality.** India's failure to meet these criteria in cases like Jammu and Kashmir and Manipur has drawn criticism from human rights groups.

- **International Human Rights**:

As a signatory to the **International Covenant on Civil and Political Rights and the Universal Declaration of Human Rights**, India is expected to uphold basic human rights standards. Repeated internet shutdowns have been criticized for violating these international commitments.

- **Global Reputation:**

Frequent internet shutdowns can affect a country's global image as a free and open society. For a country like India, which is a growing technology hub, repeated shutdowns can deter international businesses and negatively impact foreign investments.

COURTS ON INTERNET RIGHTS:

In recent years, Indian courts have made several significant rulings regarding internet rights, emphasizing their importance as fundamental rights. Here are some notable cases and decisions:

- **Anuradha Bhasin v. Union of India (2020)**: The Supreme Court of India declared that the right to access the internet is a **fundamental right under Article 19** of the Constitution, which protects the freedom of speech and expression, as well as the right to carry on any trade or business. The court emphasized that internet shutdowns must adhere to the **Temporary Suspension of Telecom Services (Public Emergency or Public Safety) Rules, 2017, and that indefinite shutdowns are unconstitutional.**

- **Faheema Shirin R.K. v. State of Kerala (2019)**: The Kerala High Court recognized the right to access the internet as a fundamental right **under Article 21 of the Constitution**, which guarantees the right to life and personal liberty. The court asserted that internet access is essential for the right to education, aligning its judgment with a UN resolution that advocates for the internet as a critical tool for realizing other human rights.
- **Shreya Singhal v. Union of India (2015):** The Supreme Court of India struck down Section 66A of the IT Act, declaring it unconstitutional for violating the right to freedom of speech and expression under Article 19(1)(a). This landmark **judgment reinforced internet freedom** and clarified that only speech inciting violence or lawlessness can be restricted, not mere advocacy or discussion.

WAY FORWARD

- **Make access to internet a fundamental right:**

States and countries have already declared internet access a fundamental right. In 2016, the United Nations declared internet access a human right.

- **Implement standing committee on Communications and Information Technology recommendations:**
  - **Review the Rules** to address all aspects of internet shutdown and bring them in tune with changing technology to ensure minimum disturbance to the public.
  - Issue **uniform guidelines** for states/UTs, required to be followed while ordering an internet shutdown.
  - **Codify defined parameters** that constitute as public emergency and public safety and put in place a **mechanism to decide the merit** of an internet shutdown.
  - DoT to formulate a **policy to selectively restrict the use of certain services** instead of banning the internet as a whole
  - Conduct a **study on the impacts of internet shutdowns** and its effectiveness in dealing with public safety and public emergency.

- **Data dissemination:**

Government should document the reasons, time, alternatives considered, decision-making authorities and the rules under which the shutdowns were imposed and **release the documents for public scrutiny.**

- **Identify best practices around the world:**

Governments should identify best practices in addressing issues at their source, prioritizing alternative measures to Internet shutdowns.

CONCLUSION:

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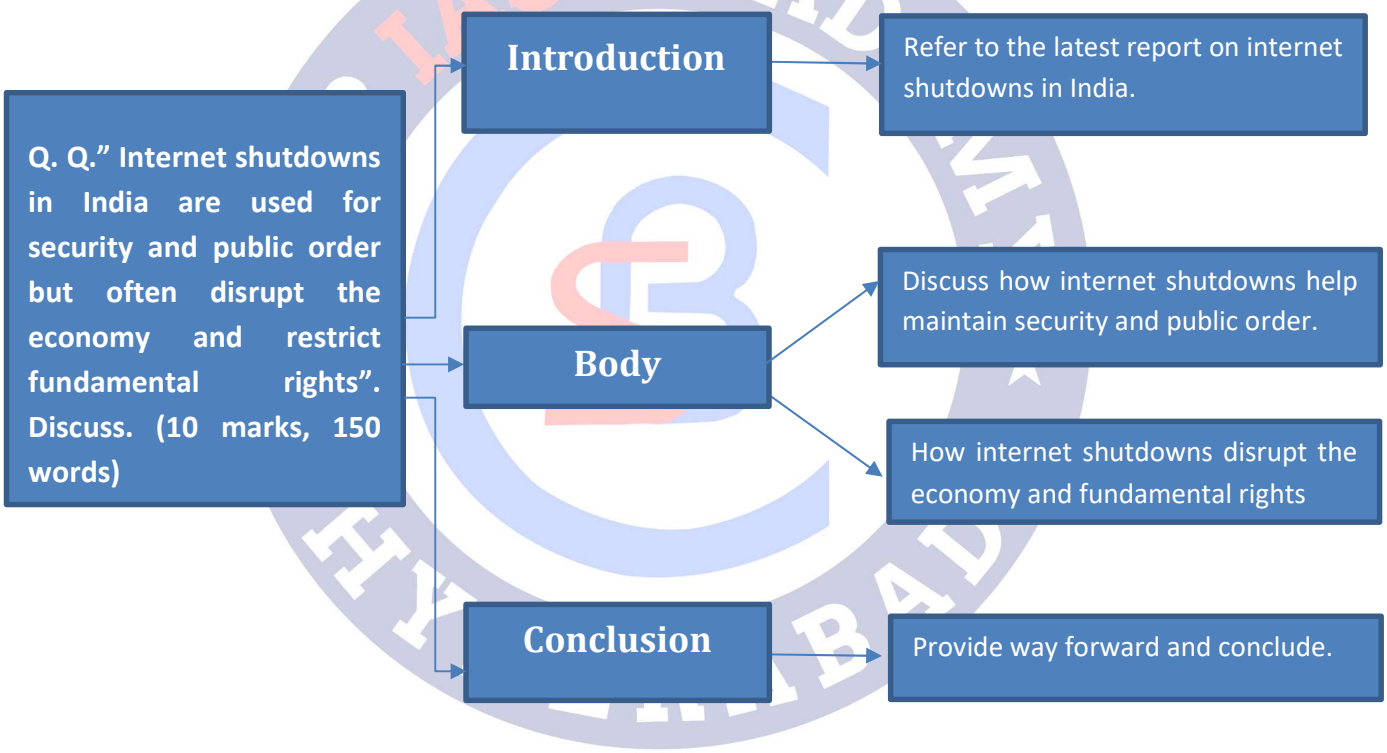
- Internet shutdowns are used for **security and public order** but raise concerns over **rights, economy, and transparency**. The **Telecommunications Act, 2023** lacks **independent oversight**, and courts have upheld **internet access as a fundamental right**. A **balanced, accountable, and transparent approach** is essential to protect both **security and digital freedoms**.

PRACTICE QUESTION

Q." Internet shutdowns in India are used for security and public order but often disrupt the economy and restrict fundamental rights". Discuss. (10 marks, 150 words)

APPROACH



MODEL ANSWER

According to a **report by Access Now**, India recorded **84 internet shutdowns in 2024**, the highest among democratic nations, despite a decline from **116 in 2023**. While authorities justify these shutdowns for **security and public order**, they raise concerns over **economic disruption and fundamental rights violations**.

How Internet Shutdowns Help Maintain Security and Public Order:

1. **National Security** – Shutdowns help prevent **terrorist coordination, cyberattacks, and organized crime** by disrupting online communication among extremist groups. In **2022**, **41 shutdowns** were imposed for security reasons (*SFLC Report*).

2. **Curbing Misinformation and Hate Speech** – During sensitive events like the **2019 Citizenship Amendment Act protests**, shutdowns prevented **rumors and fake news from inciting violence**.

3. **Maintaining Public Order** – During protests and communal tensions, shutdowns help **prevent mass mobilization and escalation**. Rajasthan and Pune shut down the internet during **Gujjar and Maratha quota protests** to avoid large-scale unrest.

4. **Preventing Ethnic or Communal Clashes** – In regions with communal tensions, shutdowns restrict the **spread of provocative messages** that may trigger riots. The **Manipur shutdown in 2023** aimed to curb **Kuki-Meitei ethnic violence**.

5. **Reducing Social Media-Driven Panic** – Misinformation spread via **WhatsApp and social media** has led to panic, such as the **2012 Northeast exodus from Bangalore**. Timely shutdowns can prevent such crises.

How Internet Shutdowns Disrupt the Economy and Fundamental Rights:

1. **Violation of Fundamental Rights** – The **Supreme Court in Anuradha Bhasin v. Union of India (2020)** ruled that **internet access is a fundamental right** under **Article 19**, and indefinite shutdowns are unconstitutional.

2. **Severe Economic Losses** – Shutdowns cost **India $1.9 billion** and **$118 million in lost foreign investment** in **H1 2023** (*Access Now Report*). The **IT sector, digital economy, and gig workers** suffer major setbacks.

3. **Disruption of Essential Services** – Shutdowns hinder **telemedicine, online education, digital payments, and government welfare schemes**, disproportionately affecting marginalized communities, as seen during the **2019-20 Kashmir shutdown**.

4. **Damage to India's Global Image** – Frequent shutdowns **harm investor confidence and India's reputation** as a **technology hub**, deterring **international businesses** and affecting diplomatic relations.

5. **Lack of Oversight and Accountability** – The **Telecommunications Act, 2023** retains **colonial-era provisions** from the **Telegraph Act, 1885**, allowing **shutdowns without independent review mechanisms**, leading to arbitrary restrictions.

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Way Forward

- **Establish Clear Guidelines** – Define strict **parameters for shutdowns** to ensure necessity and proportionality.
- **Use Targeted Restrictions** – Restrict **specific websites or platforms** instead of **blanket shutdowns**.
- **Enhance Transparency** – **Publish suspension orders** with reasons, duration, and areas affected.
- **Strengthen Oversight** – Introduce **independent review mechanisms** for shutdown orders.
- **Adopt Global Best Practices** – Use **fact-checking, rapid response teams, and digital monitoring tools** instead of widespread blackouts.

While internet shutdowns may provide **short-term security benefits**, their **long-term economic, social, and legal costs** make them unsustainable. A **balanced approach**, ensuring **security without infringing on fundamental rights**, is necessary for a **progressive and democratic India**.

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11. INDIA-MAURITIUS RELATIONS

iMPACT ANALYSIS

SYLLABUS:

GS 2 > International relations > India and Neighbours

REFERENCE NEWS:

- Prime Minister Narendra Modi's recent visit to Mauritius as the **chief guest for the country's National Day celebrations** underscores the depth of India-Mauritius ties. This visit, the first since the PM's 2015 trip, highlights the **historical, economic, and strategic importance** of the relationship.

BACKGROUND OF INDIA-MAURITIUS RELATIONS:

- India has close and longstanding relations with Mauritius, an island nation in the Western Indian Ocean, anchored in shared history, demography and culture. A key reason for the special ties is the fact that **Indian origin people comprise nearly 70% of the island's population of 1.2 million** (28% Creole, 3% Sino-Mauritian, 1% Franco-Mauritian).
- Mauritius, a former **French and British colony**, gained **independence in 1968**. The first Indians arrived in **1729** from Puducherry under French rule, working as artisans and masons. During British rule, **nearly 500,000 Indian indentured workers** were brought between **1834 and the early 1900s**, with **two-thirds settling permanently**.
- In 1901, on his journey from South Africa to India, **Mahatma Gandhi stopped in Mauritius**, leaving a lasting impact with his messages on **education, political empowerment, and staying connected with India**. In his honour, Mauritius celebrates its **National Day on March 12**, the anniversary of Gandhi's **Dandi March**.
- Mauritius was one of the handful of important countries with which independent India **established diplomatic relations in 1948, even before the independence of Mauritius.** India was represented by an Indian Commissioner in British-ruled Mauritius between 1948 and 1968 and thereafter, by a High Commissioner after Mauritius became independent in 1968.
- The India-Mauritius relationship is built on **trust, high-level engagement, and close cooperation** in security, development, capacity-building, diplomacy, technical assistance, and cultural ties.

AREAS OF COOPERATION BETWEEN INDIA AND MAURITIUS:

- **Economic and Financial Cooperation:**
  - **Bilateral Trade:**
    - Since 2005, India has been among the largest trading partners of Mauritius. For the **FY 2023-24** Indian exports to Mauritius was **USD 778.03 mn**, Mauritian exports to India was USD 73.10 mn and total trade was USD 851.13 mn. Trade has grown in the last 18 years, from **USD 206.76 million in 2005-06 to USD 851.13 million in 2023-24.**
    - Mauritius is **part of the African Union** and has **preferential trade agreements** with African countries, making it a gateway for Indian businesses.
    - **Comprehensive Economic Cooperation and Partnership Agreement (CECPA):** Signed in February 2021, I**ndia's first trade agreement with an African nation.** Exports under CECPA reached **$3 million in 2023**, with Mauritian exports to India increasing to **$5.7 million in 2024**, mostly in medical devices and textiles.
  - **FDI:**
    - Since 2000, Mauritius has contributed **$175 billion in FDI to India**, accounting for **25% of total FDI inflows**, largely due to the **Double Taxation Avoidance Convention (DTAC)**.
    - However, after the 2016 amendment, annual FDI from Mauritius fell from $15.72 billion (2016-17) to $6.13 billion (2022-23). In FY 2023-24, Mauritius was India's second-largest source of FDI with $7.97 billion, after Singapore. **Indian companies have invested $200 million in Mauritius over the past five years.**
  - **Indian PSUs in Mauritius:**
    - **11 Indian PSUs operate in Mauritius**, including Bank of Baroda, LIC, SBI, Indian Oil, NBCC, and RITES.
- **Maritime Security and Defence Cooperation**
  - **Mauritius as the Sentinel of the Western Indian Ocean:**
    - Mauritius is the **sentinel of the western Indian Ocean**, and maritime security cooperation between the two countries is critical to enhancing India's maritime security.
    - **The Colombo Security Conclave** brings together **India, Sri Lanka, the Maldives, Mauritius, and Bangladesh** to work together to make this ocean space safe and secure.
  - **India's Strategic Investments in Mauritius' Security:**

- Mauritius is a **small island** but has an **Exclusive Economic Zone (EEZ) of 2.3 million square kilometres**, making it strategically significant.
- India has:
  - **Set up a chain of coastal radar stations** to improve maritime surveillance.
  - **Redeveloped the Mauritian island of Agaléga** to serve as a **joint surveillance facility**.
  - Given **Mauritius access to the Indian Navy's Information Fusion Centre for the Indian Ocean Region (IFC-IOR) in Gurugram**, India, to significantly advance **domain awareness in its vast EEZ**.

- **Hydrographic Survey and Intelligence Cooperation:**
  - **India's oceanographic survey ship, INS Sarvekshak,** has completed the survey of 25,000 sq.km of Mauritius' ocean territory, improving maritime domain awareness.
  - At a time when **China's footprint in the Indian Ocean is expanding**, **India-Mauritius maritime security cooperation has assumed special importance**.

- **Infrastructure and Development Assistance**
  - **India's Support for Major Development Projects**
  - India has provided **over $1.1 billion** in **lines of credit and grants** for various infrastructure projects.
  - Key initiatives include:
    - **Metro Express Project** – A modern light rail transit system.
    - **Civil Service College** – Training for Mauritian government officials.
    - **Area Health Centres & Social Welfare Projects** – Expanding healthcare infrastructure.
    - **Small Development Projects** – 51 out of **96 people-centric projects** have already been completed.
    - **Education and Human Resource Development**
  - India has **trained 5,000 Mauritians** under the **Indian Technical and Economic Cooperation (ITEC) programme**.
  - **2,316 Indian students are studying in Mauritius**, while **300-400 Mauritian students come to India annually** for higher education.
- **Humanitarian Assistance & Disaster Response(India as First Responder):**
  - **Covid-19 Pandemic (2020-21):** India provided **13 tonnes of medicines, 10 tonnes of Ayurvedic medicines**, a **Rapid Response Medical Team**, and **1 lakh free Covishield doses (Jan 2021**), followed by 3 lakh additional vaccines on a

commercial basis. Mauritius later **donated 200 oxygen concentrators** to India during its second wave.

- **Wakashio Oil Spill (2020):** India immediately responded by sending **30** tonnes of technical equipment, a 10-member Response Team (Aug 16, 2020), and deploying **INS Nireekshak** to assist in salvaging the **Mauritian Tug 'Sir Gaetan Duval'**

- **Cultural Relations and people-to-people ties:**
  - In 1987, India established the Indira Gandhi Centre for Indian Culture (IGCIC), which is India's largest cultural centre abroad. IGCIC holds classes in Hindustani music, Kathak, Tabla and Yoga for over 2,500 Mauritian students every year.
  - Since 2004, approximately 367 youngsters from Mauritius have participated in 62 batches of the Know India Programme (KIP) of the Ministry of External Affairs.
  - **Indian Community & OCI Card Holders:**
    - 22,188 Indian citizens and 13,198 OCI cardholders.
    - OCI Scheme: Special carve-out for Mauritians of Indian lineage (up to the 7th generation) announced in 2024.
    - Visa Policies: Mauritius offers visa-free entry to Indians for up to one month, while Mauritians receive gratis visas for India.
    - Tourism: Pre-COVID, 80,000 Indians visited Mauritius annually, while 30,000 Mauritians traveled to India. Numbers are recovering to pre-pandemic levels.

WHY MAURITIUS IS SIGNIFICANT FOR INDIA?

- **Major FDI Source:** Mauritius has been a key contributor to India's **foreign direct investment (FDI)**, injecting **$175 billion since 2000** under the **Double Taxation Avoidance Convention (DTAC)**. This has made it **one of the largest sources of FDI into India**.
- **Trade Expansion:** Economic ties have strengthened, with **bilateral trade growing from $206 million (2005) to $851 million (2023-24)**. India's major exports include **pharmaceuticals, cereals, and textiles**, while Mauritius exports **medical devices, vanilla, and refined copper**.
- **Gateway to Africa:** Mauritius' **bilingual workforce and strong financial sector** make it a strategic entry point for **Indian businesses expanding into Francophone Africa**.
- **Strategic Ally in the Indian Ocean:** As a **key partner in India's Indo-Pacific vision**, Mauritius plays a role in shaping regional policies, especially through its membership in the **Indian Ocean Rim Association (IORA)**.
- **Political Support on Global Issues:** India has **backed Mauritius' claim over the Chagos Islands**, reinforcing its **commitment to anti-colonialism and territorial sovereignty**, strengthening diplomatic ties.

- **Indian Ocean Defense Strategy:** Given its **strategic location**, Mauritius is essential for **India's SAGAR (Security and Growth for All in the Region) initiative**, which ensures maritime stability in the Indian Ocean.
- **Countering Chinese Expansion:** As China increases its **naval and economic presence** in the Indian Ocean, India has strengthened **defense ties with Mauritius** to maintain regional influence.
- **Enhanced Security Infrastructure:** India has set up **a coastal radar chain in Mauritius**, upgraded **Agaléga Island's military facilities**, and integrated Mauritius into the **Information Fusion Centre – Indian Ocean Region (IFC-IOR)** to boost intelligence sharing.
- **Multilateral Security Engagement:** Mauritius is an active participant in the **Colombo Security Conclave**, working with **India, Sri Lanka, the Maldives, and Bangladesh** to enhance **maritime security, counter-terrorism, and disaster management**.
- **Deep Historical Connections:** With **nearly 70% of its population tracing Indian ancestry**, Mauritius shares strong **cultural, linguistic, and historical ties** with India.
- **Strengthening Diaspora Bonds:** India's **Overseas Citizenship of India (OCI) policy** extends to **Mauritians with Indian ancestry up to the 7th generation**, fostering **stronger people-to-people ties**.
- **Educational and Cultural Exchange:** India actively engages Mauritian youth through **ITEC training programs, ICCR scholarships, and the Know India Programme (KIP)**, ensuring deeper **educational and cultural linkages**.

CHALLENGES IN INDIA-MAURITIUS RELATIONS:

- **Chagos Archipelago Dispute:** The **Chagos Archipelago, including Diego Garcia**, remains a contentious issue. India supports **Mauritius' sovereignty claim over the islands**, aligning with its anti-colonial stance. However, **the presence of a major U.S. military base complicates the situation**, as Washington has long resisted Mauritius' control over the islands.
  - The recent agreement to transfer sovereignty while maintaining the base has **geopolitical ramifications**, impacting India's broader Indian Ocean strategy.
- **China's Expanding Influence:** China has been strengthening its presence in Mauritius through **strategic investments and loans.**
  - For example, China funded and constructed **the Mauritius Supreme Court**. This growing Chinese footprint poses a challenge for **India's Indo-Pacific strategy**, as Mauritius is a key part of India's **SAGAR (Security and Growth for All in the Region) initiative**.
- **Dependence on Tax Treaties & FDI Decline:**
  - Mauritius has been a major **FDI source for India**, contributing **$175 billion since 2000** under the **Double Taxation Avoidance Convention (DTAC)**. However, the

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2016 DTAC revision led to a decline in FDI, falling from **$15.72 billion (2016-17) to $6.13 billion (2022-23)**, highlighting **India's need to diversify investment sources**.

- **Trade Imbalance:** While bilateral trade has **grown significantly to $851.13 million (2023-24)**, India's **exports ($778.03 million) far exceed imports ($73.10 million)** from Mauritius. This creates **economic dependencies** and raises concerns about the **sustainability of trade relations**.
- **Competition for Infrastructure Investment: India has provided over $1.1 billion in grants and credit lines to Mauritius**, financing **major infrastructure projects**.
    - However, delays in project implementation have created dissatisfaction, providing **China an opportunity to step in with faster execution of projects,** such as the Supreme Court building.
- **Mauritius as a Drug Trafficking Hub: Mauritius has become a transit hub for drug trafficking networks in the Indian Ocean**, affecting regional security.
    - **For example, in 2008, around 2% of the Mauritian population was affected by opioid use**, indicating rising drug abuse linked to trafficking operations. India's maritime security interests are at risk, as illicit activities in Mauritian waters could facilitate smuggling into India's coastal regions.
- **Limited Surveillance Capabilities:** Despite India's support in upgrading Mauritius' maritime security infrastructure (e.g., coastal radar chains and Agaléga surveillance facilities), gaps remain.
    - **Drug traffickers exploit private yachts and maritime routes** that **evade regular inspections**, requiring **stronger intelligence-sharing mechanisms** between the two nations.
- **Surveillance Controversy:** In **April 2022**, an **Indian technical team was accused of unauthorized data interception** at Mauritius' **Baie-du-Jacotet landing station**, leading to a **public outcry**. This **strained trust between the two governments**, with allegations of potential misuse of cyber infrastructure.
- **Managing Diaspora Expectations:** With **nearly 70% of Mauritius' population of Indian origin**, India is expected to **engage sensitively in cultural and diplomatic matters**.
    - **For example, India's extension of the Overseas Citizenship of India (OCI)** scheme to Mauritians with Indian ancestry (up to the 7th generation) strengthens cultural ties, but any missteps in diplomatic messaging can create **perceptions of interference in domestic affairs**.
- **Language and Identity Issues:** While **Hindi and Bhojpuri** are widely spoken, **Mauritius has a significant Francophone population**, and its political and business elite have strong French connections. India must ensure **its cultural outreach does not alienate non-Indian-origin communities**, maintaining balanced engagement with all ethnic groups.

WAY FORWARD:

- **Diversifying Investment Channels:** With **FDI from Mauritius declining post-DTAC revision**, India should **expand investment in fintech, digital economy, and renewable energy**.
- **Balancing Trade Imbalances:** Encouraging **more Mauritian exports to India** in **medical devices, textiles, and processed food** can improve trade balance. Expanding **CECPA** to include **more goods and services** will boost economic ties.
- **Accelerating Infrastructure Development: Timely completion of Indian-funded projects** like the **Metro Express and Social Housing Project** will reinforce trust. **Public-Private Partnerships (PPPs)** can enhance project execution and counter **Chinese infrastructure investments**.

- **Boosting Maritime Surveillance:** Expanding **coastal radar stations** and strengthening **Mauritius' role in the IFC-IOR** will enhance regional security. Upgrading **Agaléga Island** to support joint surveillance operations.
- **Countering Drug Trafficking & Regional Threats:** Establishing **joint security task forces** and increasing **patrol missions** will help combat smuggling routes. Strengthening **Mauritius' role in the Colombo Security Conclave** through **joint naval exercises**.
- **Navigating the Chagos Archipelago Dispute:** India must **balance its support for Mauritius' sovereignty** with its **Indo-Pacific security interests** involving the U.S.
- **Countering China's Influence: Fast-tracking Indian infrastructure projects** to prevent China from filling investment gaps. Strengthening **economic aid and capacity-building programs** to reduce Chinese leverage in Mauritius.
- **Expanding Diaspora Engagement:** While **70% of Mauritians are of Indian origin**, India must ensure **inclusive outreach to French and Creole-speaking communities**.
- **Enhancing Education & Skill Development:** Increasing **ICCR scholarships and joint research programs** will deepen educational cooperation.

CONCLUSION: Mauritius is more than just a close partner; it is a **strategic ally in the western Indian Ocean**. Its **geopolitical significance, economic potential, and deep historical ties with India** make it a critical partner in India's **Indo-Pacific strategy**. As **China expands its influence in the region**, India must **strengthen its economic, military, and diplomatic ties with Mauritius**. **Prime Minister Modi's visit reaffirms this commitment**, ensuring that India-Mauritius relations remain **strong, stable, and mutually beneficial** in an **uncertain global landscape**.

PRACTICE QUESTION

Q. "Mauritius holds strategic, economic, cultural, and geopolitical importance for India". Discuss. (10 marks, 150 words)

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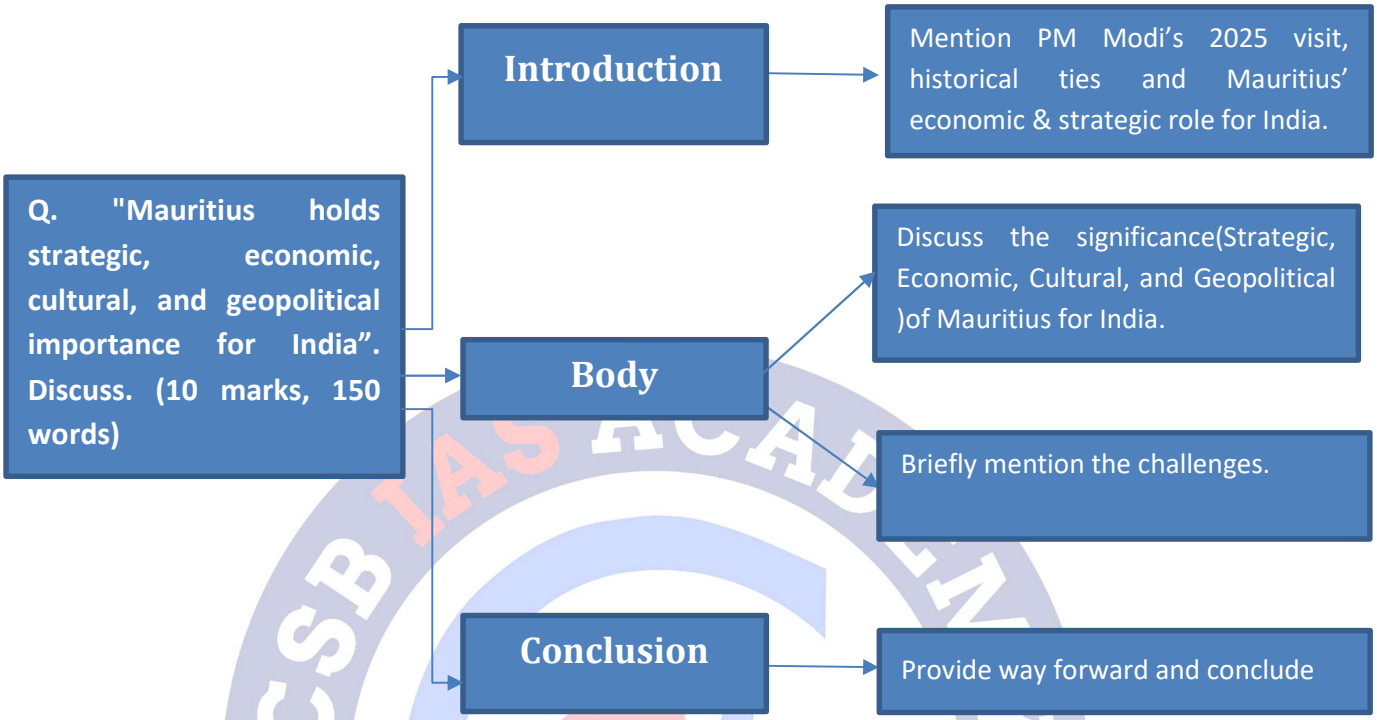
APPROACH



MODEL ANSWER

Prime Minister **Narendra Modi's 2025 visit** to Mauritius as **chief guest for National Day celebrations** highlights the **historical, economic, and strategic importance** of the relationship. With **70% of its population of Indian origin**, Mauritius is a **key partner in India's Indo-Pacific strategy and economic outreach in Africa**.

Significance of Mauritius for India:

Strategic Significance:

- **Maritime Security & SAGAR Initiative:**
    - Mauritius' **location in the Western Indian Ocean** makes it vital for **India's SAGAR initiative** and regional security.
    - India has **set up coastal radar stations and upgraded Agaléga Island for joint surveillance**.
- **Countering China's Influence:**

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- China's growing **economic and strategic footprint** in Mauritius, such as funding the **Mauritius Supreme Court**, poses a challenge for India.
- India must **strengthen defense ties and economic engagement** to maintain influence.

- **Regional Security & Intelligence Sharing:** Mauritius is part of the **Colombo Security Conclave**, enhancing **maritime security and counter-terrorism cooperation**.

Economic Importance:

- **FDI & Trade Growth:**
  - Mauritius has **contributed $175 billion in FDI to India since 2000**, but post-2016 DTAC revisions, inflows declined from **$15.72 billion (2016-17) to $6.13 billion (2022-23)**.
  - Trade increased from **$206 million (2005) to $851 million (2023-24)**, with India exporting **pharmaceuticals, cereals, and textiles**, while Mauritius exports **medical devices and refined copper**.
- **Gateway to Africa & Infrastructure Development:**
  - As part of the **African Union**, Mauritius acts as a **bridge for Indian businesses into Francophone Africa**.
  - India has invested **$1.1 billion in grants and credit lines**, but **delays in execution** risk providing China an opportunity to expand its influence.

Cultural and Diaspora Significance:

- **Strong Diaspora & Educational Ties:**
  - With **70% of Mauritians tracing Indian ancestry**, India fosters strong **cultural and people-to-people ties**.
  - The **OCI scheme** now extends to Mauritians **up to the 7th generation**.
  - **ITEC scholarships, ICCR programs, and the Indira Gandhi Centre for Indian Culture (IGCIC)** strengthen education and skill development.

Geopolitical Relevance

- **Support for Mauritius' Sovereignty:** India supports **Mauritius' claim over the Chagos Archipelago**, but the **presence of a U.S. military base in Diego Garcia complicates diplomacy**. Strengthening **Mauritius' position in the Indo-Pacific** reinforces India's regional influence.

Challenges in the Relationship:

- **Decline in FDI:** Post **2016 DTAC revision, FDI from Mauritius dropped from $15.72 billion (2016-17) to $6.13 billion (2022-23)**, requiring investment diversification.
- **Trade Imbalance:** India's **exports ($778 million) far exceed imports ($73 million)**, creating economic dependency concerns.
- **Security Concerns: Drug trafficking networks in the Indian Ocean** pose a challenge for both nations.
- **Chinese Influence:** China's **strategic loans and infrastructure projects** threaten India's influence.
- **Surveillance Controversy:** The **2022 "sniffing scandal"** involving **Indian technical teams in Mauritius** led to **public mistrust**.

Way Forward:

- **Boost Trade & Investment:** Expand **CECPA**, diversify investment, and promote Mauritian exports.
- **Enhance Security Cooperation:** Strengthen **intelligence-sharing on drug trafficking** and **joint naval exercises**.
- **Counter China's Influence: Fast-track Indian-funded projects** and increase economic aid.
- **Expand Cultural & Educational Engagement:** Strengthen **scholarships and diaspora ties** while ensuring **inclusive outreach**.

Mauritius is a **strategic ally in the Western Indian Ocean**, critical to **India's Indo-Pacific security, economic expansion, and diplomatic reach**. As **China's influence grows**, India must **deepen its engagement through trade, security cooperation, and people-to-people connections**. **PM Modi's 2025 visit reaffirms this commitment**, ensuring strong and mutually beneficial relations.

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12. ASHA WORKERS

iMPACT ANALYSIS

SYLLABUS:

GS 2 > Social justice > Health > Primary healthcare

REFERENCE NEWS:

- Accredited Social Health Activists (ASHA workers) in Kerala have been on a prolonged strike, demanding better wages and recognition as formal workers. Despite their crucial role in public health, they remain underappreciated, receiving only an "honorarium" instead of fair wages. Their struggle highlights broader issues of labor rights and gender inequality in India.

MORE ON NEWS:

- ASHAs receive a nominal **honorarium and performance-based incentives**, which vary across states and programs.
- **Irregular payments and delayed disbursements** are common, often caused by funding shortages between central and state governments.
- **In Kerala, ASHAs receive ₹7,000 per month**, among the **highest in the country** but still below the minimum wage for unskilled labor.
- The current strike demands an increase in **honorarium to ₹21,000 and a one-time retirement benefit of ₹5 lakh.**
- Despite recommendations from the **Parliamentary Standing Committee on Labour (2020) to formalize their employment**, no concrete action has been taken.
- ASHAs gained recognition during the COVID-19 pandemic, with **WHO awarding them** the **World Health Leaders Award (2022)**, but this did not translate into better wages or working conditions.

WHO ARE ASHA WORKERS?

- ASHA workers are **volunteers from within the community** who are trained to **provide information and aid people** in accessing benefits of various healthcare schemes of the government.
- ASHA workers were instituted as community-based health functionaries under the **National Rural Health Mission (NRHM) launched in 2005.**
- Initially rolled out in rural areas, with the launch of the National Urban Health Mission in 2013, it was **extended to urban settings as well.**
- They **act as a bridge** connecting marginalised communities with facilities such as primary health centres, sub-centres and district hospitals.

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- The aim is to have one **ASHA for every 1,000 persons** or per habitation in hilly, tribal or other sparsely populated areas.
- There are around **10.4 lakh ASHA workers across the country.**
- ASHAs are primarily married, widowed, or divorced women between the ages of 25 and 45 years from within the community. They must have good communication and leadership skills; should be literate with **formal education up to Class 8,** as per the programme guidelines.
- ASHA worker earns **around 6,000-8,000 per month**, including monthly honorarium from the Central and State governments, and incentives.

ASHA WORKERS' CONTRIBUTIONS TO THE HEALTH CARE SYSTEM IN THE COUNTRY:

- **Create awareness about health and promote good health practices:**

ASHA will be a **health activist in the community** who will **create awareness on health** and its social determinants and **mobilise the community towards local health planning** and **increased utilisation** and accountability **of the existing health services.**

She would be a **promoter of good health practices** and will also provide a **minimum package of curative care** as appropriate and feasible for that level and **make timely referrals.**

ASHA will **provide information** to the community **on determinants of health** such as **nutrition, basic sanitation & hygienic practices**, **healthy living** and **working conditions**, information on existing health services and the **need for timely utilisation of health & family welfare services.**

- **Maternal and child health:**

ASHA workers **ensure that** women undergo **ante-natal check-up**, **maintain nutrition during pregnancy**, **and deliver at a healthcare facility**. Also they provide **post-birth training on breast-feeding** and **complementary nutrition of children.**

ASHA workers are also tasked with **ensuring and motivating children to get immunised.**

They also counsel **women about contraceptives and sexually transmitted infections.**

- **Pandemic response:**

ASHA workers were a **key part of the government's pandemic response**, with most states using the network **for screening people** in containment zones, **getting them tested**, and taking them to quarantine centres or **help with home quarantine.**

ASHA workers have helped in **spreading awareness at the grassroots level** during the COVID-19 pandemic. They are tasked with informing their local communities **about safety protocols** and **carrying out the vaccination drive.**

For instance, the **WHO** recognized their efforts and awarded them the **World Health Leaders Award in 2022** for their heroic contributions during the pandemic.

- **The first port of call for health related demands:**

ASHA will be the **first port of call for any health related demands** of deprived sections of the population, **especially women and children**, who find it difficult to access health services.

Empowered with knowledge and **a drug-kit** to deliver **first-contact healthcare**, every ASHA is expected to be a **fountainhead of community participation in public health programmes** in her village.

- **Communicable and non-communicable disease management and control:**

ASHA workers provide **medicines daily to TB patients** under directly observed **treatment of the national programme**.

They are also tasked with **screening for infections like malaria** during the season. They also **provide basic medicines and therapies to people** under their jurisdiction such as **oral rehydration solution**, **chloroquine for malaria**, **iron folic acid tablets to prevent anaemia**, and **contraceptive pills**.

They also get **people tested and get their reports** for **non-communicable diseases.**

ISSUES FACED BY ASHA WORKERS:

- **Inadequate payment:**

Unlike Anganwadi workers (AWW) and **Auxiliary Nurse Midwife** (ANM), **ASHA workers do not have a fixed salary**. Since they are **considered "volunteers"**, **governments** are **not obligated to pay them a salary.**

Though **performance-based incentives** are supplemented by a fixed amount in a few Indian States, the total payment continues to remain **low and often delayed**. Also, they do not have opportunity for career progression.

These issues have resulted in **dissatisfaction, regular agitations and protests by ASHAs** in many States of India.

For instance, in Kerala, **ASHAs receive ₹7,000 per month, which is one of the highest** honorariums in India, yet it remains significantly **below the minimum wage for unskilled labor.**

- **Social Stigma and related issues:**

ASHA workers experience **stigma not only in public space but also in private sphere.**

For instance, in most families, **women going out is considered a bad thing**, and **ASHAs are not exempt from this**.

There are instances where **ASHA workers have to experience sexual harassment during field visits.**

Also, **during the pandemic**, ASHA workers are being st**igmatised as carriers of COVID-19** as they come in contact with many people every day.

Also they feel **pressure from family to discontinue their work** because their **honorarium is very low.**

Despite their hard work, they often **face allegations from the community** that they are not doing their job properly.

- **Absence of social security benefits:**

Not being classified as 'employees', ASHAs **do not have access to formal frameworks of social protection.** They instead have to **rely on ad hoc, temporary welfare measures.**

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For instance, in 2018, the Union Gover**nment made ASHAs eligible for life insurance, accident insurance and pension** under the following schemes: Pradhan Mantri Jeevan Jyoti Beema Yojana, Pradhan Mantri Suraksha Beema Yojana, Pradhan Mantri Shram Yogi Maan Dhan. However, the free cover under these schemes appears to only have been **provided for a period of one year.**

- **Lack of Societal Recognition**

Despite their crucial role in public health, ASHA workers are **not perceived as professionals but rather as women performing voluntary service**, which diminishes their status and bargaining power.

Their work is often glorified in moralistic tones, emphasizing their **"commitment to social service" rather than their rights to fair wages and dignified employment.**

- **Government Inaction Despite Recommendations**

The **Parliamentary Standing Committee on Labour in 2020** recommended **formalizing ASHA workers' employment**, but there has been no follow-up action from the government.

During the pandemic, governments organized special events to acknowledge ASHAs' contributions, and some states provided small incentives, but this did not lead to any substantial improvement in their working conditions.

Frontline workers, including ASHAs, have no**t been included in the new Code on Social Security, 2020**, contrary to the recommendations of the Parliamentary Standing Committee on Labour.

WAY FORWARD:

- **Higher remuneration:**

Indian States need to develop **mechanisms for higher remuneration for ASHAs.**

The performance-based incentives should not be interpreted that ASHAs, no matter how much and how hard they work, need to be paid the lowest of all health functionaries. **If they work more**, the system should allow them to be **paid more than even regular government staff.**

States like Kerala, where ASHAs receive a higher honorarium than most states, still fall short of providing fair wages. Increasing the honorarium to at least the minimum wage level should be a priority.

- **Capacity-building and career progression:**

In-built **institutional mechanisms** should be created **for capacity-building**, and **avenues for career progression** for ASHAs to move **to other cadres** such as **ANMs, public health nurses, and community health officers** should be opened.

A few Indian States have started such initiatives but these are smaller in scale and at nascent stages.

- **Social security benefits:**

Extending social security benefits like **pensions, EPF, health insurance** (for ASHAs and their families), etc., should be considered.

The possibility of **ASHAs automatically being entitled** and **having access to a broad range of social welfare schemes** needs to be institutionalised.

The lack of inclusion in the new Code on Social Security, 2020, highlights the urgent need for policy reform to protect ASHA workers under a structured social security framework.

- **Making ASHAs permanent government employees:**

The government should **regularise many temporary posts** in the National Health Mission and **make ASHAs permanent government employees**, considering the **extensive shortage of**

staff in the workforce at all levels, and more so **in the primary health-care system in India**, and the ongoing need for functions being undertaken by ASHAs.

Despite **recommendations from the Parliamentary Standing Committee on Labour in 2020,** no steps have been taken toward granting ASHAs formal worker status. The government must act upon these recommendations to ensure job security.

- **External review:**

While the ASHA programme has benefitted from many internal and regular reviews by the Government, an **independent and external review** of the programme needs to be given urgent and priority consideration.

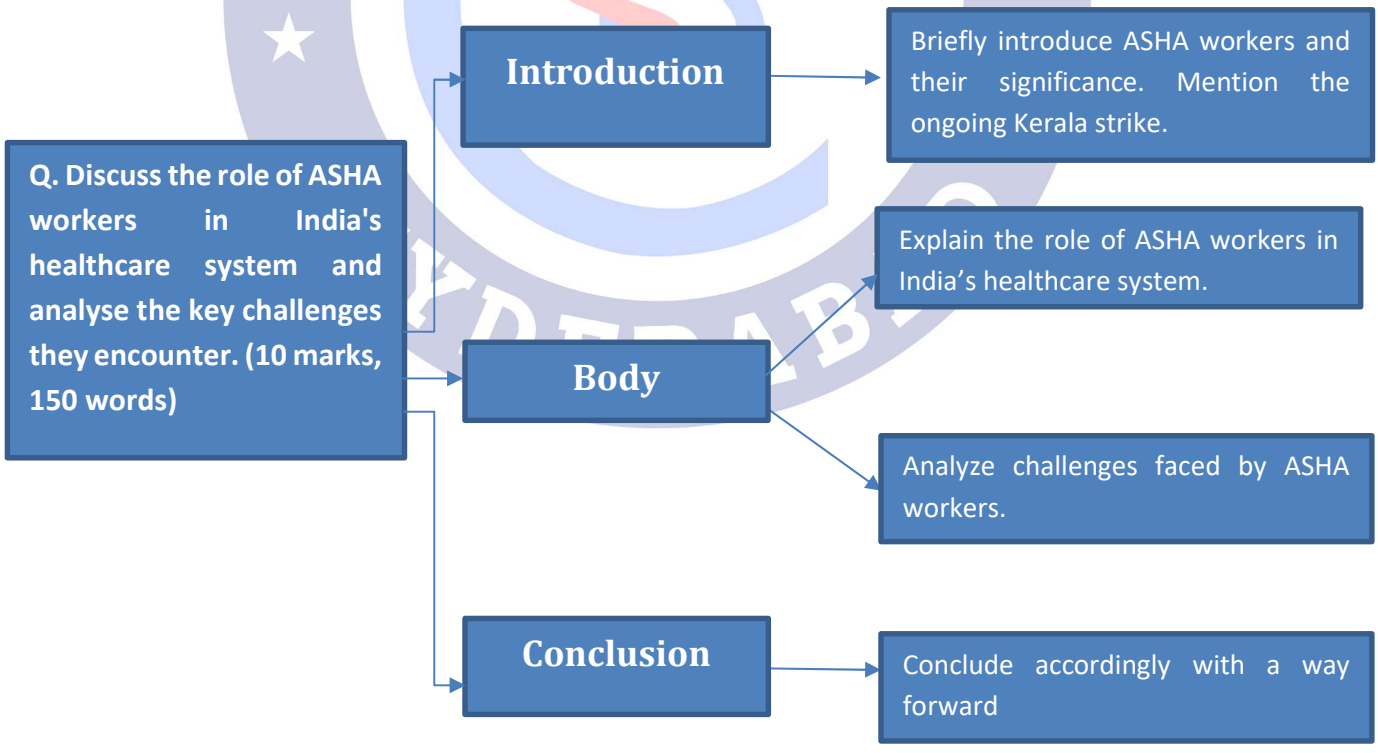
CONCLUSION:

- ASHA workers are vital to India's healthcare system, yet their classification as **"volunteers" denies them fair wages and job security**. Recognizing them as formal workers with proper pay and benefits is essential for **improving healthcare delivery and advancing gender justice.**

PRACTICE QUESTION

Q. Discuss the role of ASHA workers in India's healthcare system and analyse the key challenges they encounter. (10 marks, 150 words)

APPROACH



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MODEL ANSWER

Accredited Social Health Activists (ASHA) workers, introduced under the **National Rural Health Mission (2005)**, connect marginalized communities to healthcare. India has **10.4 lakh ASHAs,** but they receive a **nominal honorarium** (₹7,000 in Kerala), irregular payments, and no social security. Their **ongoing strike in Kerala** demands higher wages and formal recognition.

Role of ASHA Workers in India's Healthcare System:

1. Creating Health Awareness and Promoting Good Practices

- ASHAs educate communities on **nutrition, sanitation, hygiene, and the importance of timely healthcare interventions**.
- They **mobilize communities** to utilize government health services and promote accountability.

2. Maternal and Child Health Services

- Ensuring **antenatal care, institutional deliveries, and postnatal care**.
- Promoting **breastfeeding, complementary nutrition, and immunization**.
- Counseling women on **contraceptive use and reproductive health**.

3. Disease Prevention and Control

- Providing **daily medication to TB patients** and conducting **screening for malaria and other communicable diseases**.
- Distributing **oral rehydration solutions, iron folic acid tablets, and contraceptive pills**.
- Supporting **non-communicable disease detection and reporting**.

4. Pandemic Response

- Played a crucial role in **COVID-19 containment efforts, screening, testing, and quarantine management**.
- Led **vaccination drives** and spread awareness about safety protocols.

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- **WHO recognized their efforts with the World Health Leaders Award (2022)**, but this did not improve their working conditions.

5. First Contact for Healthcare Needs

- Acting as the **first point of healthcare access** for marginalized groups.
- Providing **first-contact treatment** with basic drugs and referring serious cases to health facilities.

Challenges Faced by ASHA Workers:

1. Inadequate Payment and Irregular Wages

- ASHAs are considered **volunteers** and are not entitled to **fixed salaries or minimum wages**.
- Their payments are often **delayed due to funding shortages** at the central and state levels.
- **The ongoing Kerala strike demands an increase in honorarium to ₹21,000 and a retirement benefit of ₹5 lakh.**

2. Lack of Social Security Benefits

- ASHAs are excluded from **formal employment benefits like pensions, EPF, and health insurance**.
- Although the government introduced **insurance schemes in 2018**, they were only **temporary**.
- The **Code on Social Security, 2020, does not include ASHAs**, despite parliamentary recommendations.

3. Social Stigma and Workplace Challenges

- **Many families discourage ASHAs from working**, perceiving it as inappropriate for women.
- **Instances of sexual harassment** during field visits.
- **During the pandemic, ASHAs were stigmatized** as potential carriers of COVID-19.

4. Lack of Career Progression

- No structured mechanism for **skill enhancement or career advancement** to roles like ANMs or public health officers.
- Initiatives in some states are **limited in scale** and have not been widely implemented.

5. Heavy Workload and Mental Stress

- ASHAs work long hours, often beyond their assigned duties, without additional compensation.
- They are expected to be available 24/7 for emergencies, leading to **burnout and mental stress**.
- The **increasing responsibilities** (such as pandemic-related duties) without corresponding benefits add to their burden.

Way Forward

- **Higher remuneration:** Ensure ASHAs receive at least the **minimum wage** for unskilled workers.
- **Social security benefits:** Provide **EPF, pension, and health insurance** for ASHAs and their families.
- **Career progression:** Establish **structured training and promotion avenues** to higher healthcare roles.
- **Government recognition:** Implement **Parliamentary Standing Committee (2020) recommendations** to formalize ASHA employment.
- **Independent review:** Conduct **external audits** to assess working conditions and payment mechanisms.

ASHA workers play a **critical role in India's primary healthcare system**, yet their **lack of recognition, low pay, and absence of social security** undermine their contributions. Addressing these issues through **formal employment status, fair wages, and career growth opportunities** is crucial for both **strengthening India's healthcare system and ensuring gender justice**.

13. CUSTODIAL TORTURES IN INDIA

iMPACT ANALYSIS

SYLLABUS:

GS 2 > Polity > Judiciary > Criminal justice system

REFERENCE NEWS:

- Recent judicial developments in the Sanjay Bhandari extradition case (U.K.) and Tahawwur Rana's extradition appeal (U.S.) have highlighted India's failure to enact a comprehensive anti-torture law.
- Concerns over **custodial torture** and India's **non-ratification of United Nations Convention Against Torture (UNCAT)** have been used to challenge these extradition requests.

MORE ON NEWS:

- In **Sanjay Bhandari's case**, the **U.K. High Court** refused to extradite the businessman, accused of **tax evasion and money laundering**, fearing he could face **custodial torture** in India.
- The court also pointed to India's **failure to ratify UNCAT** as a concern. Meanwhile, **Tahawwur Rana**, a Pakistani-origin Canadian businessman wanted for his alleged role in the **26/11 Mumbai attacks**, is fighting his extradition in the **U.S. Supreme Court**. He has echoed similar fears and even cited the U.K. ruling to strengthen his case.

WHAT IS CUSTODIAL TORTURE?

- Custodial torture refers to the **use of physical, mental, or psychological violence** against individuals while they are in **police or judicial custody**.
- It includes **illegal detention, wrongful arrest, humiliation, extortion of information under pressure**, and various forms of **physical, mental, and sexual violence**.
- Although widely condemned, **custodial violence is not explicitly defined under Indian law**.

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STATS:

- A total of **2,152 cases relating to deaths of persons in judicial custody and 155 relating to deaths in police custody** were recorded in 2021-22 (until February 28, 2022) by the National Human Rights Commission (NHRC).
- **UP** accounted for the highest cases of deaths in judicial custody (448) in 2021-22, while **Maharashtra** reported the highest deaths in police custody (29) that year (Source: Ministry of Home Affairs).
- **55 suicides** linked to police torture were recorded in **2020** (Source: National Campaign Against Torture (NCAT))

CAUSES FOR CUSTODIAL TORTURE IN INDIA:

- **Poor Investigation System:**
  - State police officers **lack professional investigative training and modern forensic tools**, leading them to rely on **third-degree methods** to extract confessions.
  - **Instead of evidence-based investigation**, torture is used as a **shortcut to secure confessions**.
- **Massive Judicial Backlog & Slow Trials:**
  - As of **February 2025, over 5 crore cases** are pending in **Indian courts** (**Source: Indian Express**).
  - This **overburdened judicial system** creates **immense pressure** on law enforcement to **deliver quick results**, leading to the use of **custodial violence as a shortcut for expedited justice**.
- **Failure to Pass an Anti-Torture Law**:
  - Despite the **Law Commission's proposal of an anti-torture law in 2017,** India does not have any anti-torture law.
- **Workload & Long Hours Contributing to Brutality:**
  - The **2019 Status of Policing in India Report (SPIR)** found that **police officers work an average of 14 hours per day**, with **80% exceeding the standard 8-hour shift**.
  - Excessive working hours, stress, and lack of mental health support contribute to burnout and reliance on violent interrogation methods to extract confessions.
- **Non-Ratification of UNCAT (1984)**:
  - India signed the **UN Convention Against Torture (UNCAT)** in **1997** but **never ratified it**, preventing legal reforms that could **criminalize torture**.
  - **Recent extradition rejections (Sanjay Bhandari, Tahawwur Rana)** cite **India's failure to ratify UNCAT** as a key concern.
- **Low Conviction Rates:**

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- Due to **poor case-building, weak forensic infrastructure, and lack of training**, conviction rates remain **low**, forcing police to **resort to coercion** to obtain confessions.
- For instance, many custodial deaths and third-degree torture incidents occur **when police fail to gather sufficient evidence** and instead attempt to **force confessions through violence**.

- **Public Pressure & Acceptance of Brutality**
  - **Unrealistic Expectations on Crime Control**: The public **demands swift action** in high-profile cases, leading to tolerance for police excesses, **fake encounters, and third-degree torture.**
  - **Media Sensationalism**: The portrayal of "**encounter specialists**" and **"tough policing"** in films and media normalizes **brutality as an effective tool for justice**.
- **Poor State of Prisons & Custodial Conditions:**
  - Indian prisons operate at **130-150% capacity**, forcing inmates to endure **inhumane conditions, violence, and psychological distress**.
  - **Over 70% of prisoners in India are undertrials**, many **languishing for years without trial**, increasing their vulnerability to **custodial violence, sexual abuse, and forced labor**.
  - Mental and physical torture often pushes detainees to **commit suicide**, as seen in **NHRC reports on police lockup deaths.**
- **Challenges in Evidence Collection:**
  - **Falsification of Custodial Deaths as 'Suicides'**: Many custodial deaths are **reported as suicides** without proper forensic evidence.
  - **Pre-Arrest Torture**: The accused are often **tortured before formal arrest**, allowing police to **claim injuries were pre-existing**.
- **Lack of CCTV & Videography**:
  - Despite **Supreme Court orders mandating CCTVs in police stations**, many lack **functional recording systems**, making **evidence collection difficult**.
  - For instance, in **Common Cause v. Union of India (2018)**, the SC directed **audio-video recording of interrogations**, but implementation remains poor.
- **Absence of Independent Investigation Mechanisms**
  - The **amended section 176 (1A) of the CrPC** mandates **judicial inquiry** into every case of death, rape and disappearance in the custody.
  - Most states have **flouted the mandatory judicial inquiry into custodial deaths**.
  - Probes are generally taken by the police itself, but the fraternity within force undermines the independence of the investigation.
- **Police Investigating Themselves**:

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- Internal police probes lack independence due to **institutional fraternity**, shielding **guilty officers from accountability**.
- **NHRC's Limited Powers**:
  - While NHRC investigates **custodial violence**, it lacks **prosecutorial authority**, reducing its effectiveness.
- **Armed Forces (Special Powers) Act (AFSPA)**:
  - Grants **excessive immunity** to the armed forces, leading to **human rights abuses in conflict zones**.
  - Cases like **Manipur fake encounter killings** (recognized by SC) highlight the misuse of **AFSPA in shielding custodial torture**.

IMPACT OF CUSTODIAL TORTURE IN INDIA:

- **Violation of Fundamental Rights & Human Dignity**
  - **Article 21 (Right to Life & Personal Liberty) is violated** as custodial torture deprives individuals of dignity and protection from inhuman treatment.
  - **International human rights norms like UDHR, ICCPR, and UNCAT prohibit torture**, but India's **failure to ratify UNCAT weakens its credibility**.
- **Physical & Psychological Trauma**
  - Victims suffer **severe physical abuse, lifelong injuries, or death** (**NHRC: 151 police custody deaths in 2021**).
  - **Mental health issues like PTSD, depression, and suicides** are common among survivors (**55 suicides linked to police torture in 2020**).
- **Erosion of Public Trust in Law Enforcement**
  - Custodial violence fuels **public fear, hostility, and lack of cooperation with police**.
  - Cases like **P. Jayaraj & J. Bennicks custodial deaths (Tamil Nadu, 2020)** led to mass protests and demands for police accountability.
- **Breakdown of Criminal Justice System**
  - **Coerced confessions lead to wrongful convictions** and **violate Article 20(3) (Right Against Self-Incrimination)**.
  - **Police focus on torture instead of evidence-based investigation**, allowing actual perpetrators to escape justice.
- **Social & Economic Consequences**
  - Families face **economic hardships, job losses, and legal costs**, especially if the victim was a **breadwinner**. Victims' families suffer **social stigma and isolation**, worsening their marginalization.
- **Diplomatic & International Repercussions**
  - **India's extradition requests have been rejected** due to the risk of torture (**Sanjay Bhandari & Tahawwur Rana cases**).

- **Failure to ratify UNCAT weakens India's global human rights reputation**, leading to criticism from **Amnesty International & Human Rights Watch**.
-

EFFORTS TO PREVENT CUSTODIAL TORTURES:

I. INTERNATIONAL:

- **Universal Declaration of Human Rights, 1948 (UDHR)**
  - **Article 5:** Prohibits **torture and cruel, inhuman, or degrading treatment**.
- **International Covenant on Civil and Political Rights, 1966 (ICCPR)**
  - **Article 6:** Guarantees the **right to life** and prohibits **cruel, degrading, and inhuman treatment**.
- **UN Convention Against Torture (UNCAT), 1984**
  - Requires **effective measures to prevent torture**.
  - **Prohibits extradition** to countries practicing torture.
  - **India: Signed but NOT ratified**.
- **Nelson Mandela Rules (UN Standard Minimum Rules for the Treatment of Prisoners, 2015)**
  - Establishes **international standards for humane treatment of prisoners**.
  - Encourages **independent prison monitoring** to prevent abuse.

II. NATIONAL:

- **Constitutional**:

Article 21: Article 21 states that "No person shall be deprived of his life or personal liberty except according to procedure established by law".

Article 22: Article 22 provides Protection against arrest and detention in certain cases.

Seventh schedule: Police and public order are state subjects as per the Seventh Schedule. So, it is primarily the responsibility of the state government concerned to ensure protection of human rights of the citizens.

- **Bharatiya Nyaya Sanhita (BNS):**

Section 176: Causing hurt by a public servant in custody is punishable with up to **10 years imprisonment**.

Section 177: Causing grievous hurt by a public servant to extract confessions carries **life imprisonment**.

Section 178: Wrongful confinement by a public servant is punishable with up to **10 years imprisonment**.

- **Code of Criminal Procedure (CrPC), 1973:**

Section 46: Prohibits **police from using lethal force** on those **not accused of capital offenses**.

Section 176(1A):

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- **Mandates judicial inquiry into custodial deaths, disappearances, and rapes.However, many states fail to comply.**

Prevents Coerced Confessions:

- Prohibits **threats or inducements** to extract confessions.
- **Confessions must be recorded before a magistrate** for validity.

- **Indian Evidence Act, 1872:**

Section 25: Confessions obtained under **coercion are inadmissible in court**.

- **Protection of Human Rights Act (PHRA), 1993:**

Established NHRC & SHRCs to investigate custodial violence.

NHRC lacks prosecutorial powers, reducing its effectiveness.

SUPREME COURT GUIDELINES ON CUSTODIAL SAFEGUARDS:

- **D.K. Basu vs State of West Bengal (1997)**
  - Landmark ruling laying down 11 mandatory guidelines to prevent custodial torture.
  - Key mandates:
    - Arresting officer must wear identification badges.
    - Family of the arrested person must be informed immediately.
    - Medical examination of detainees must be conducted every 48 hours.
- **Common Cause v. Union of India (2018)**
  - Mandated CCTV installation in all police stations & interrogation rooms.
  - Real-time video recording required to prevent custodial abuse.
  - Despite this ruling, many states have failed to implement full compliance.

WAY FORWARD:

- **Implement important Supreme Court directives in Prakash Singh case (2006):**

Constitute a **State Security Commission** in every state that will lay down policy for police functioning, evaluate police performance etc.

Constitute **Police Complaints Authorities** at the state and district levels to inquire into allegations of serious misconduct and abuse of power by police personnel.

Separate the investigating police from the law and order police to ensure speedier investigation, better expertise and improved rapport with the people.

- **Enactment of a Standalone Anti-Torture Law:** India must **enact a Prevention of Torture Act**, as recommended by the **Law Commission's 273rd Report (2017)**, to criminalize custodial torture explicitly. This law should align with **UNCAT** and impose **strict penalties for public servants involved in custodial torture**.
- **Ratification of UNCAT & Compliance with International Standards: India must ratify the UN Convention Against Torture (UNCAT)** to strengthen its human rights record and facilitate extraditions. **Adopt global best practices** from countries like **UK's Independent Office for Police Conduct (IOPC)** and **Norway's Ombudsman Model**, which ensure **independent oversight and strict accountability**.
- **Capacity building:** The police force must also be provided with **mandatory basic forensic and psychology training and periodic workshops** to sharpen their abilities. Also, Padmanabhaiah Committee on police reforms had recommended the police force should **receive greater training in soft skills** such as communication, counselling and leadership to deal with the public.
- **Strong action against police brutality**: Extra judicial executions are an anathema to the Rule of Law. Hence, fair investigations and stringent legal actions must be taken against all cases of extra judicial killings in the country.
- **Infusion of technology:** Technology must be leveraged wherever possible to improve the reporting of cases, quality of investigation and conviction for offences.
- **Judicial reforms:** Proactive measures must be taken to reduce the vacancies in judicial posts, improve accessibility and reduce the delays in justice.
- **Prison reform:** The government should look at the recommendations made by **Mulla committee and Amitava Roy committee** and ensure humane conditions in the prisons.

PRACTICE QUESTION

Q. "Custodial torture is a serious human rights violation and a major concern in India's criminal justice system". Analyze the key factors contributing to custodial torture and suggest comprehensive measures to prevent it. *(15 marks, 250 words)*

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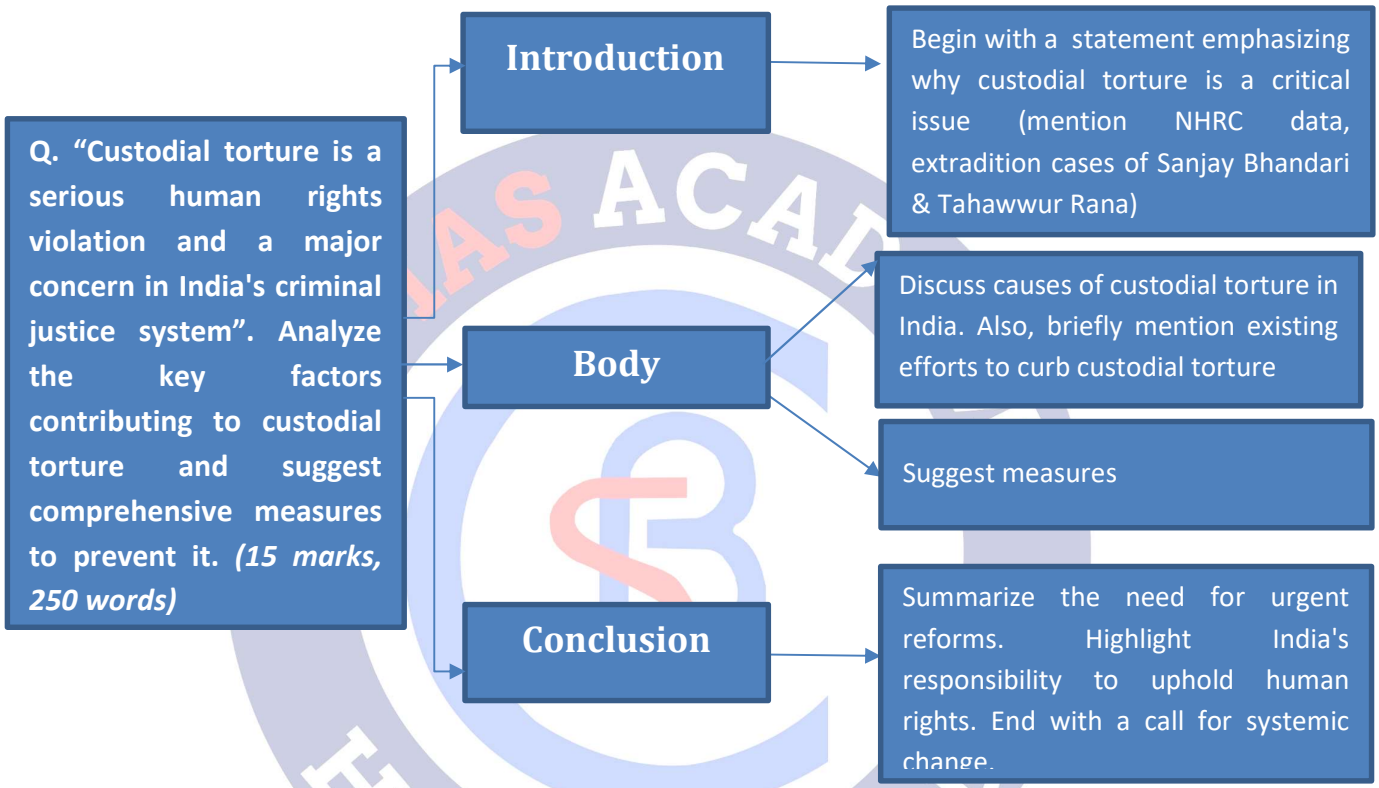
APPROACH



MODEL ANSWER

Custodial torture is a grave human rights violation and a pressing issue in India's criminal justice system, with **the National Human Rights Commission (NHRC) reporting 151 police custody deaths (2021) and 1,569 judicial custody deaths (2020)**, with **the National Campaign Against Torture (NCAT)** highlighting **suicides and sexual violence**. The issue gained global attention as **U.K. and U.S. courts rejected extraditions (Sanjay Bhandari, Tahawwur Rana)** over **India's failure to ratify UNCAT and risks of custodial torture**, reinforcing the need for urgent reforms.

Causes of Custodial Torture in India:

1. Poor Investigation Methods & Over-Reliance on Confessions

- **State police lack forensic expertise and rely on third-degree torture** to extract confessions.
- **Confession-based policing** results in wrongful convictions and a failure to gather proper evidence.

2. Massive Judicial Backlog & Pressure on Law Enforcement

- Over **5 crore cases** are pending in Indian courts (**Indian Express, 2025**), leading to pressure on law enforcement to deliver quick results.
- Police resort to **shortcuts like torture** due to slow trials and low conviction rates.

3. Absence of a Dedicated Anti-Torture Law

- Despite the **Law Commission's 273rd Report (2017)** recommending an anti-torture law, India **has not enacted specific legislation criminalizing custodial torture**.
- **Non-ratification of UNCAT (1984)** has been cited as a reason for rejecting extradition requests (e.g., **Sanjay Bhandari, Tahawwur Rana cases**).

4. Workload & Stress Among Law Enforcement

- **The 2019 Status of Policing in India Report (SPIR)** found that police officers work **14 hours per day**, with **80% exceeding the standard 8-hour shift**.
- Excessive workload leads to **burnout, frustration, and reliance on violent interrogation methods**.

5. Public Pressure & Normalization of Brutality

- **Media glorification of "encounter specialists" and fake encounters** promotes a culture of police violence.
- Public demand for **quick justice** in high-profile cases results in public support for harsh policing methods.

6. Overcrowded & Inhumane Prison Conditions

- **Indian prisons operate at 130-150% capacity**, leading to violence and abuse.
- **Over 70% of prisoners are undertrials**, increasing their vulnerability to custodial violence, sexual abuse, and forced labor.

7. Weak Oversight & Lack of Accountability

- **Most custodial deaths are investigated by the police themselves**, leading to cover-ups.
- The **NHRC lacks prosecutorial powers**, limiting its ability to take strong action against human rights violations.

Efforts to Curb Custodial Torture:

1. Legal Safeguards

- **Article 21 & 22 of the Indian Constitution** ensure the right to life and protection from arbitrary detention.
- **Bharatiya Nyaya Sanhita (BNS) Sections 176, 177, and 178** criminalize custodial torture and wrongful confinement by public servants.
- **Code of Criminal Procedure (CrPC) Section 176(1A)** mandates **judicial inquiry into custodial deaths and disappearances**.

2. Supreme Court Guidelines

- **D.K. Basu vs. State of West Bengal (1997)** laid down **11 mandatory guidelines** to prevent custodial torture.
- **Common Cause v. Union of India (2018)** mandated **CCTV surveillance in all police stations & interrogation rooms**.

3. International Commitments

- India **signed but has not ratified** the **UN Convention Against Torture (UNCAT, 1984)**, affecting its credibility in human rights cases.

Suggestions to Prevent Custodial Torture:

1. Enactment of a Standalone Anti-Torture Law

- **India must pass a Prevention of Torture Act**, as recommended by the **Law Commission (2017)**, prescribing strict punishments for custodial violence.
- The law should be in line with **UNCAT provisions**, ensuring independent investigations and accountability.

2. Police Reforms & Capacity Building

- **Full implementation of Prakash Singh Police Reforms (2006)**:
  - Establish **State Security Commissions** for independent oversight of police conduct.
  - Create **Police Complaints Authorities** at state and district levels to handle custodial abuse complaints.
  - **Separate law enforcement from investigation** to improve professionalism.
- **Training in forensic and psychological investigation methods** to reduce reliance on coercion.

- **Soft skills & human rights training** as recommended by the **Padmanabhaiah Committee on Police Reforms**.

3. Strengthening Oversight & Accountability

- **Strict enforcement of CCTV monitoring (Common Cause Case, 2018)** and real-time auditing of footage.
- **Independent judicial inquiries into custodial deaths**, ensuring compliance with **CrPC Section 176(1A)**.
- **Grant NHRC prosecutorial powers** to take direct action against human rights violations.

4. Ratification of UNCAT & Global Best Practices

- **India must ratify UNCAT** to align its human rights laws with global standards.
- Adopt international best practices like **UK's Independent Office for Police Conduct (IOPC)** and **Norway's Ombudsman Model** for independent oversight.

5. Infusion of Technology

- **Use of body cameras, real-time AI-based monitoring, and automated case tracking** for better oversight of police actions.
- **Mandatory video recording of interrogations** to prevent forced confessions.

6. Judicial & Prison Reforms

- **Reduce judicial vacancies & case backlogs** to ensure faster trials and reduce prolonged detentions.
- **Implement Mulla Committee & Amitava Roy Committee recommendations** for humane prison conditions.

Custodial torture remains a **serious human rights issue** in India, as evidenced by judicial rejections of **extradition requests** citing **torture risks**. Despite constitutional protections and judicial guidelines, custodial violence continues due to **weak enforcement, lack of police accountability, and outdated investigation methods**. Addressing this issue requires a **multi-pronged approach**, including the **enactment of an anti-torture law, ratification of UNCAT, independent police oversight, judicial reforms, and technological interventions**. Strengthening institutional accountability and ensuring adherence to human rights standards is essential to **curb custodial torture and uphold justice in India**

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14. APAAR ID

iMPACT ANALYSIS

SYLLABUS:

GS 2 > Social Justice > Education

REFERENCE NEWS:

- As India embraces digital transformation, the education sector is evolving with **APAAR ID**, part of the **"One Nation, One Student ID"** initiative. It promises seamless academic records and student mobility but raises concerns over **data privacy, security, and oversight**, especially for minors.

WHAT IS AN APAAR ID?

- APAAR, which stands for **Automated Permanent Academic Account Registry**, is a specialized identification system designed for all students in India.
- This initiative is part of the **'One Nation, One Student ID'** program launched by the government, aligning with the **new National Education Policy of 2020.**
- APAAR ID - a unique **12-digit code** will help students to **digitally store, manage, and access all their academic credits**, including Score card, marksheets, gradesheet, degrees, diplomas, certificates & co-curricular accomplishments.
- This ID functions as a **permanent digital identity** for the student in the education ecosystem**.**
- In other words, **what PAN is to an Indian taxpayer, APAAR ID is that to an Indian learner.** Except, there is a key difference – while your future employer cannot look into your prior income details using your PAN, a future employer or education provider could look into your prior academic credits (or what you have learnt so far) and your academic performance (or how well you have learnt) by using your APAAR ID.

WHY APAAR?

- The APAAR ID acts as a **link to DigiLocker**, **an online repository**, where students securely store essential documents like exam results. **Linked to the Academic Bank of Credits (ABC) via the APAAR ID**, it receives academic credits from institutions through the National Academic Depository.

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- This streamlines authentication for admissions or job applications, simplifying the verification of academic records.
- APAAR ensures **accountability and transparency** in education by **tracking student progress and streamlining academic records.**
- It enhances efficiency, r**emoves duplicity, minimizes fraud, and includes co-curricular achievements** for holistic student development. With multiple use cases, APAAR facilitates following;
    1. Facilitate student mobility
    2. Enhance academic flexibility
    3. Empower students to choose their learning paths of their choice
    4. Acknowledge and validate learning achievements
    5. Since **no additional certificates** are required to be provided **except sharing APAAR id where all credentials are stored**, there is no fear of losing hard copy certificates.

The **Academic Bank of Credits (ABC)** is a government-backed digital platform that allows students to **store, transfer, and redeem academic credits**, enabling seamless mobility across higher education institutions. While **DigiLocker stores documents**, **ABC manages academic credits**. Both systems are linked through **APAAR ID** to create a seamless **academic record and credit management system**.

SIGNIFICANCE OF APAAR ID:

- **Centralized Academic Records:**
    - Currently, **academic records are fragmented**, with **marksheets, extra-curricular certificates, and training credentials** stored separately.
    - APAAR **centralizes all academic achievements**, ensuring **education, employment, portability, transparency, and skill progression**.
    - *For instance,* a student transferring from **one school to another** or applying for **higher education abroad** no longer needs to produce multiple documents—APAAR provides a **single, verified source of truth**.
- **Simplifying Verification Processes Through DigiLocker:**
    - APAAR **links academic records** with **DigiLocker**, making documents easily accessible and shareable.
    - This eliminates the fear of **losing certificates** and removes the **need for notarization and attestation**, saving time and administrative costs.
    - *For instance,* students applying for **entrance exams, scholarships, or international programs** can share their APAAR-linked credentials **instantly** rather than submitting multiple hard copies.
- **Instant Credential Verification to Prevent Fraud:**
    - Employers and educational institutions can **instantly verify academic records**, reducing reliance on **physical certificates** and minimizing the risk of **fake credentials**.
    - *For instance,* a **2023 Aspiring Minds Report** revealed that **over 25% of resumes in India contain discrepancies**, causing inefficiencies in hiring.
- **Enabling NEP 2020's Vision of Multidisciplinary and Credit-Based Learning:**
    - NEP 2020 promotes **modular, multidisciplinary education** and **credit-based learning**.

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- APAAR, through the **Academic Bank of Credits (ABC)**, allows students to **earn, store, and transfer academic credits across institutions**, offering flexibility in **higher education and skill-based learning**.
- *For instance,* a student completing an **online certification course from one university** can **transfer those credits** to another university while pursuing a degree.
- **PARAKH (Performance Assessment, Review, and Analysis for Holistic Development)**, a NEP initiative, can leverage APAAR for **competency tracking** across various disciplines.

- **Data-Driven Governance for Educational Planning:**
  - APAAR enables the **Ministry of Education (MoE)** to analyze **real-time data** on:
    - **Educational attainment** based on geography, gender, and caste.
    - **Dropout rates** and transition trends.
    - **Skill gaps and workforce readiness** to align with market demands.
  - This data-driven approach supports **UN Sustainable Development Goal (SDG) 4: Quality Education** by ensuring **evidence-based policymaking**.
  - *For instance,* integrating APAAR with **UDISE+ (Unified District Information System for Education)** can provide **comprehensive monitoring of schooling infrastructure and academic performance**, allowing state governments to allocate resources efficiently.

> The Unified District Information System for Education Plus **(UDISE+)** is a **comprehensive education management system** launched by the **Department of School Education and Literacy,** Ministry of Education. While UDISE+ primarily focuses on **school infrastructure, compliance, financial data, faculty details, and course offerings**, it also records **student demographics and special needs requirements**. However, **unlike UDISE+, APAAR goes further by tracking detailed curricular, co-curricular, and extra-curricular learning experiences**, creating a more holistic academic record.

- **Economic and Workforce Advantages:**

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- APAAR reduces **administrative costs** related to **issuance, verification, and record-keeping** in educational institutions.
- It supports **portability of skills**, a critical need in the **gig economy** and initiatives like **Skill India Mission**.
- APAAR has the potential to integrate with **e-Shram** (National Database for Unorganized Workers), **National Career Service (NCS)** (for job-seekers), and **Udyam Portal** (for MSMEs and entrepreneurship support) to enhance workforce mobility and career opportunities.

- **Direct Benefit Transfers (DBT) and Educational Equity:**
  - APAAR can be used to **streamline scholarships, educational grants, and welfare programs**, ensuring that benefits reach the right students and reducing **leakages**.
  - *For instance,* **PM-SHRI Schools** plan to **use APAAR for targeted welfare distribution**, ensuring that **underprivileged students** receive the necessary educational support.

> The **Pradhan Mantri Schools for Rising India (PM SHRI)** is a centrally sponsored scheme launched by the Government of India to develop over 14,500 existing schools into model institutions exemplifying the key features of the National Education Policy (NEP) 2020.

- **International Recognition and Cross-Border Academic Mobility:**
  - APAAR aligns with **UNESCO's Global Education Monitoring Framework**, ensuring **global recognition of Indian academic credentials**.
  - This simplifies **cross-border education**, making it easier for students to **apply for foreign universities, exchange programs, and employment abroad**.
  - *For instance,* Indian students applying for **higher studies in the US or Europe** can use APAAR to **digitally verify their academic records**, avoiding **paper-based delays** in admissions.

CONCERNS AND CHALLENGES ASSOCIATED WITH APAAR ID

- **Aadhaar Linkage and Legal Concerns:**
  - APAAR **hard-links (directly and mandatorily connected)** with **Aadhaar**, which is **constitutionally optional** for school admissions.

- Supreme Court in **Justice (Retd.) K.S. Puttaswamy v. Union of India (2019) case** ruled that Aadhaar is **not mandatory for enrolling in school.**
- MoE's roll-out makes **Aadhaar quasi-mandatory**, bypassing constitutional provisions.

- **Forced Implementation Despite Being "Voluntary":**
  - Although officially **voluntary**, **MoE instructed Chief Secretaries of States and UTs** to ensure APAAR ID registration, making it **de facto mandatory**.
  - Similarly, **CBSE directed affiliated schools** to achieve **100% saturation**, contradicting the notion of voluntary enrollment.
  - This **undermines the constitutional right** of students and parents to opt-out of Aadhaar-based identification.
- **Precedent of Rolling Out Systems Without Legal Backing:**
  - **APAAR follows a pattern similar to Aadhaar**, where **UIDAI initially implemented Aadhaar without a legal framework**, later challenged in court.
  - Critics have pointed out how **UIDAI bypassed regulatory processes**, a concern now resurfacing with APAAR. Without **legislative approval**, APAAR risks **operating in a legal grey area**.
- **Data Security and Cybersecurity Risks:**
  - There is **minimal information** on how APAAR interacts with **DigiLocker and the Academic Bank of Credits (ABC)**.
  - **Key concerns include**:
    - **How student data is stored, accessed, and secured**.
    - **Whether academic records will be copied over to APAAR's dashboard**.
    - **Potential cyber-attacks targeting a national academic database**.
  - Given the **sensitivity of student data**, ensuring **strong encryption and cybersecurity measures** is crucial.
- **Parental Consent and Data Privacy Concerns:**

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- **Parental consent is required** for APAAR registration, but concerns arise over its **verifiability under Section 9(1) of the Digital Personal Data Protection (DPDP) Act** ,due to the lack of a clear mechanism to ensure genuine and informed consent.

> **Section 9(1)** of the Digital Personal Data Protection (DPDP) Act, 2023 deals with the processing of personal data of **children (below 18 years of age) and individuals with disabilities** who require guardianship.

- Once **Aadhaar data is linked**, it remains in the **ABC system**, even if consent is later withdrawn.
- **Digital rights organizations**, including the **Software Freedom Law Center and Internet Freedom Foundation**, have warned against **excessive data collection** and **unsecure data sharing**.

- **Potential Commercial Exploitation of Student Data:**
  - The **ABC website** indicates APAAR data could be used for:
    - **Personalized learning programs** for early education.
    - **Targeted interventions** for K-12 students (Kindergarten to 12th grade).
    - **Customized study plans** for test preparation.
    - **Skill gap analyses** for industry-aligned upskilling programs.
  - This raises concerns about the **commercialization of student data**, potentially allowing **third-party ed-tech platforms to access and utilize student information**.

WAY FORWARD:

- **Strengthening Data Privacy and Security:**
  - Implement robust **encryption and cybersecurity** measures to prevent **data breaches**.
  - Ensure **transparent policies** on **data access, storage, and usage**, limiting third-party involvement.
- **Ensuring Voluntary and Informed Consent:**
  - Strictly enforce **parental consent verification mechanisms**, aligning with the **Digital Personal Data Protection (DPDP) Act**.

- Provide **opt-in/opt-out** options to ensure **genuine voluntary participation**.

- **Legislative Backing and Regulatory Oversight:**
  - Establish a **clear legal framework** before full-scale implementation, preventing **Aadhaar-like legal challenges**.
  - Form an **independent regulatory body** to oversee **data governance and compliance**.
- **Transparent Implementation and Awareness:**
  - Conduct **public consultations** to address concerns from **students, parents, and educators**.
  - Improve **awareness campaigns** on **APAAR's benefits, privacy safeguards, and redressal mechanisms**.
- **Balanced Approach to Data Utilization:**
  - Limit the **commercial use of student data**, ensuring it serves **educational growth rather than private interests**.
  - Establish **strict data-sharing regulations** to prevent **unauthorized access by third parties**.

CONCLUSION:

- The **APAAR ID initiative** has the potential to **revolutionize academic record-keeping, enhance student mobility, and improve governance** in India's education system. However, concerns regarding **privacy, security, and legal compliance** must be addressed to ensure **trust and inclusivity**. A **transparent, well-regulated, and voluntary** implementation can make APAAR a **powerful tool for education reform** while safeguarding **student rights and data integrity**.

PRACTICE QUESTION

Q. "While APAAR ID aims to enhance transparency and streamline academic records; its implementation has raised several concerns". Discuss the significance of APAAR ID; also examine the concerns and challenges associated with its implementation. (15 marks, 250 words)

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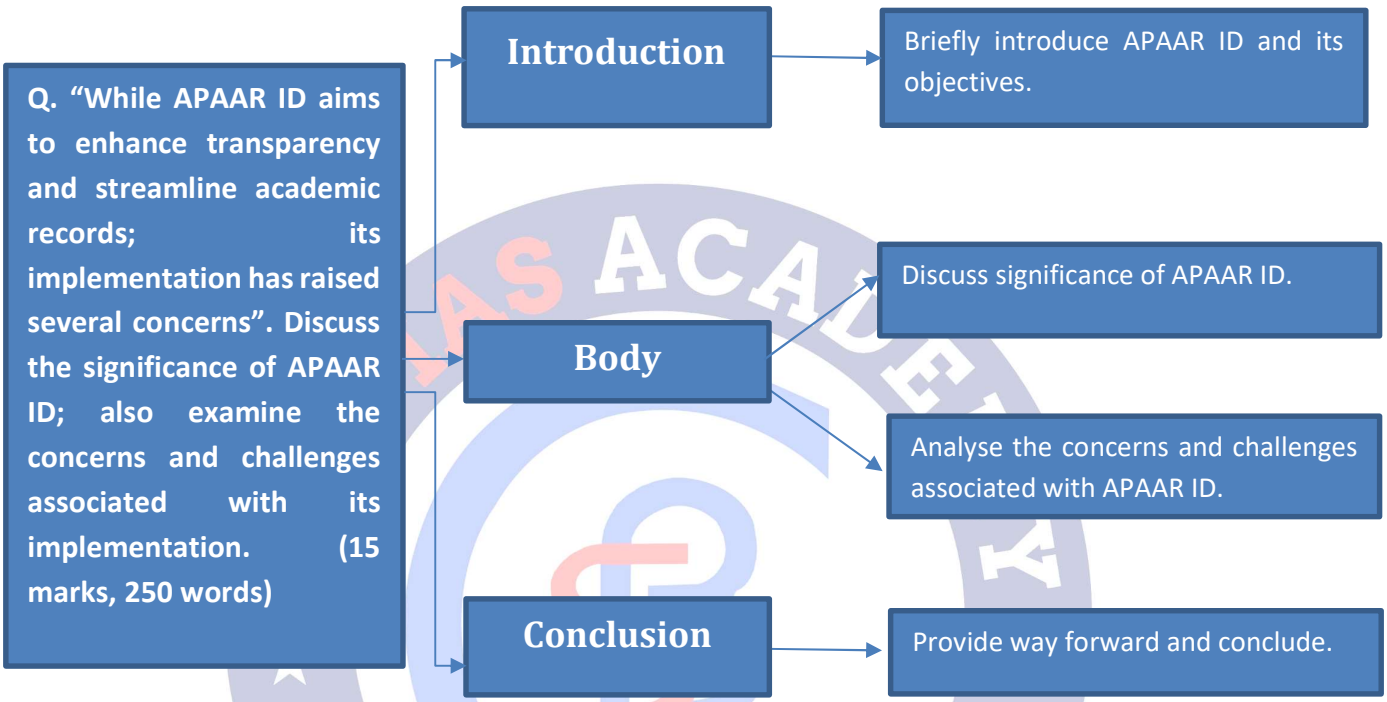
APPROACH



MODEL ANSWER

The **Automated Permanent Academic Account Registry (APAAR) ID** is a **12-digit unique identification number** under the **"One Nation, One Student ID"** initiative of **NEP 2020**. It aims to **digitally store and manage student academic records**, integrating with **DigiLocker and the Academic Bank of Credits (ABC)** for **seamless credit transfers, verification, and student mobility**. However, concerns regarding **privacy, security, legal compliance, and data commercialization** have emerged.

Significance of APAAR ID:

1. Centralized Academic Records & Student Mobility

- APAAR **consolidates academic credentials**, preventing **document loss** and ensuring **seamless transitions**.

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- *Example:* A student shifting schools or applying for higher education **no longer needs multiple documents**—APAAR provides a **single verified record**.

2. Simplified Verification through DigiLocker

- APAAR links with **DigiLocker**, **eliminating the need for notarization and attestation**, saving time and effort.
- *Example:* Students applying for **scholarships or foreign universities** can instantly share **APAAR-linked credentials**.

3. Preventing Fraud and Credential Forgery

- Employers and institutions can **instantly verify academic records**, reducing fake credentials.
- *Example:* A **2023 Aspiring Minds Report** found that **25% of Indian resumes** had discrepancies, affecting hiring.

4. Supporting NEP 2020's Credit-Based Learning

- APAAR, through **ABC**, enables students to **earn, store, and transfer credits across institutions**.
- *Example:* A student completing an **online course** can transfer credits to a degree program.
- **PARAKH (Performance Assessment, Review, and Analysis for Holistic Development)** can use APAAR for **competency tracking**.

5. Data-Driven Governance & Policy Planning

- APAAR helps the **Ministry of Education (MoE)** monitor:
    - **Dropout rates and transition trends**
    - **Skill gaps and workforce needs**
    - **Educational performance by geography, gender, and caste**
- *Example:* **APAAR-UDISE+ integration** enables **real-time school performance tracking** for better policy decisions.

6. Economic and Workforce Benefits

- APAAR **reduces administrative costs** and **supports skill portability** for the **gig economy and Skill India Mission**.
- *Example:* APAAR can integrate with **e-Shram, NCS, and Udyam Portal** to enhance **career mobility**.

7. Direct Benefit Transfers (DBT) and Educational Equity

- APAAR ensures **targeted scholarship distribution**, reducing leakages.
- *Example:* **PM-SHRI Schools** plan to use APAAR for **welfare benefits**, helping underprivileged students.

8. International Recognition and Mobility

- APAAR aligns with **UNESCO's Global Education Monitoring**, enabling **global recognition of Indian credentials**.
- *Example:* Indian students applying for **foreign universities** can use APAAR for **digital verification**, avoiding delays.

Concerns and Challenges Associated with APAAR ID:

1. Aadhaar Linkage & Legal Issues

- APAAR **mandates Aadhaar**, despite it being **constitutionally optional for school admissions** (**Justice K.S. Puttaswamy v. Union of India, 2019**).

2. Forced Implementation Despite "Voluntary" Status

- Though **claimed voluntary**, **States and CBSE mandate full registration**, making it **de facto mandatory**.

3. Lack of Legislative Backing

- Like Aadhaar, APAAR lacks **legal safeguards**, raising concerns about **future misuse**.

4. Data Security & Cyber Risks

- Unclear how APAAR **stores, protects, or prevents unauthorized access** to academic records.
- *Example:* A national data breach could **compromise millions of student records**.

5. Parental Consent & Privacy Concerns

- **Verifiability under the DPDP Act, 2023** is unclear, raising **concerns over misuse of Aadhaar-linked data**.

6. Potential Commercial Exploitation of Student Data

- **ABC suggests APAAR data use** for:
    - **Personalized learning & K-12 interventions**
    - **Test preparation & skill-gap analysis**
- Raises **concerns of student data commercialization** by private ed-tech firms.

Way Forward:

- **Strengthening Data Security** – **Robust encryption & cybersecurity** measures must be enforced.
- **Ensuring Voluntary & Informed Consent** – **Parental consent mechanisms** should be strictly verified.
- **Legal Safeguards** – Establish **clear legislative backing** to avoid future challenges.
- **Transparent Implementation & Public Awareness** – Involve **stakeholders & conduct awareness drives**.
- **Preventing Commercial Exploitation** – Limit **third-party access** and prevent **data monetization**.

APAAR ID has the potential to **modernize education, enhance transparency, and improve student mobility**. However, **privacy, legal, and security concerns** must be addressed through **stronger safeguards and voluntary participation** to make it a **trustworthy and effective educational reform tool**.

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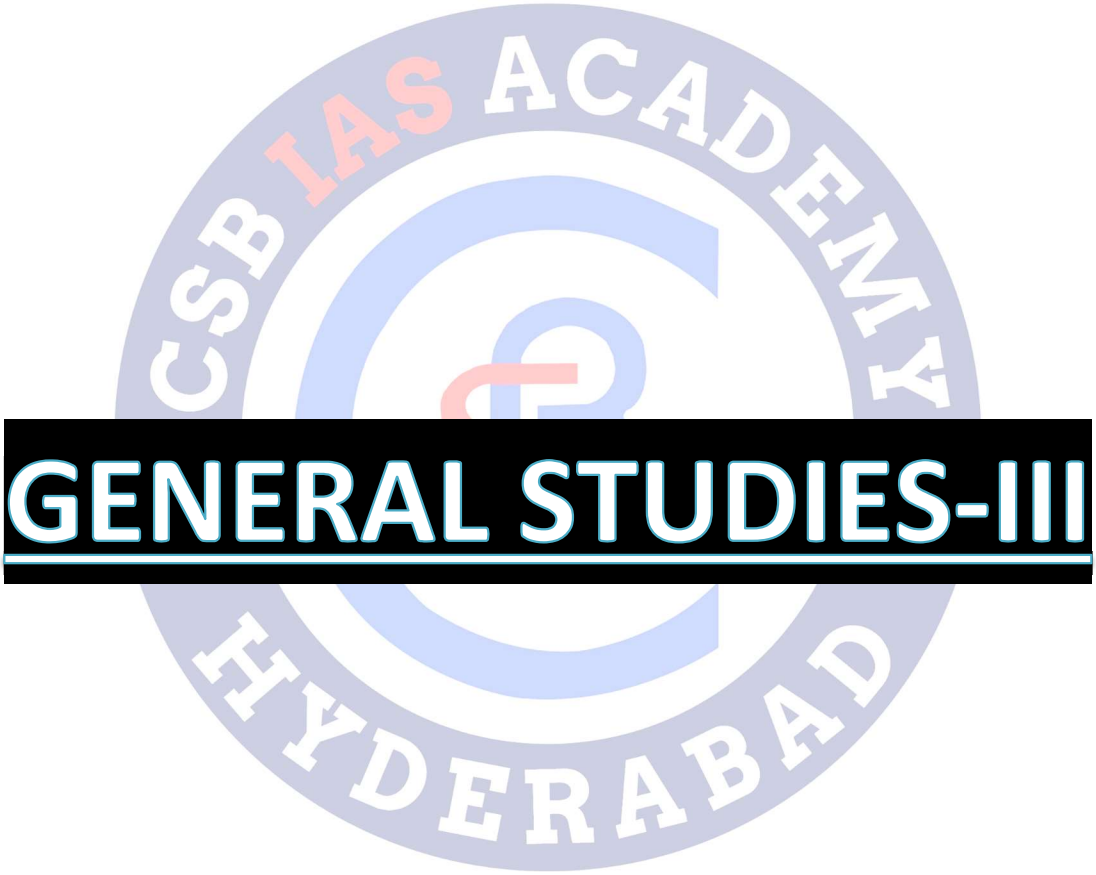

GENERAL STUDIES-III

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15. TECHNICAL TEXTILES

iMPACT ANALYSIS

SYLLABUS:

GS 3 > Economic Development

REFERENCE NEWS:

India continues to rank among the top textile-exporting nations, holding a 4% share in global textiles and apparel exports. The Ministry of Textiles reported a 7% increase in textile and apparel exports, including handicrafts from April to December 2024. It also has been the 5th year of National Technical Textiles Mission under the Ministry of Textiles.

TECHNICAL TEXTILES IN INDIA:

While traditional textiles remain crucial, the rise of technical textiles is reshaping the industry. These are specialized fabrics designed for specific uses, focusing on function over appearance. **They are divided into 12 categories**, each serving a different purpose.

- **Technical textiles** are fabrics made for specific functions and performance, rather than for looks.
- These textiles are designed to meet the needs of various industries like cars, construction, farming, healthcare, and safety.
- They are used in products that help protect people, improve machinery, and solve practical problems, such as in car parts, building materials, medical equipment, and safety gear.

- India is the 6th largest exporter of textiles globally, with a 3.9% share in world textile exports. India is the **fifth-largest** producer of technical textiles globally.
- The sector contributes about **13% of the total textile industry** in India.
- It contributes nearly 2% to the country's GDP.
- The sector is set to grow to **US$350 billion** by 2030 further strengthening India's position in the global market. This growth is expected to create **3.5 crore jobs**.

NATIONAL TECHNICAL TEXTILES MISSION:

The Mission has a target to take the domestic market size of the technical textile sector to $ 40-50 Billion by the year 2024 with an average growth rate of 15-20% per annum.

- Supports R&D in technical textiles, inviting proposals to develop new materials and processes.
- Aims to increase technical textile adoption in India through market promotion and international collaborations.
- Focuses on boosting exports of technical textiles with a dedicated export council.
- Promotes technical textiles education, skill training, and internships in top institutes and industries.

SIGNIFICANCE OF TECHNICAL TEXTILES IN INDIA:

- **Economic and Industrial Growth:** The Indian technical textile market was valued at **₹2 lakh crore (2022)** and is projected to grow at a **CAGR of 10-12%**. The **PLI scheme for textiles** aims to boost investments in man-made fibres and technical textiles, increasing manufacturing capacity.
  - Companies like Reliance Industries, SRF Limited, and Garware Technical Fibres are leading the Indian technical textile market, exporting globally.
- **Infrastructure Development: Geotextiles** are widely used in road construction, railways, and embankments to improve durability and reduce maintenance costs.
  - The Ministry of Road Transport and Highways has made the use of geotextiles compulsory in major highway projects.
  - The National Highways Authority of India (NHAI) is using geotextiles for soil stabilization in projects like the **Char Dham Highway Development Program**.
- **Healthcare and Hygiene:** Technical textiles such as **PPE kits, surgical masks, and bandages** are vital for public health. **India became the second-largest producer of PPE kits** during the COVID-19 pandemic, with production surging from **zero to 4.5 lakh per day** within three months.

- The demand for **antimicrobial and biodegradable medical textiles** is increasing, improving healthcare standards.
- Companies like Welspun India and Lakshmi Machine Works played a key role in mass-producing PPE kits and medical textiles.

- **Defence and Security Applications: Bulletproof vests, flame-resistant uniforms, and parachutes** made from technical textiles enhance national security. The **DRDO** is developing high-performance fabrics for military applications.
  - India's armed forces use **aramid fibre-based bulletproof vests** manufactured under the "Make in India" initiative.
- **Agricultural Productivity:** Agro-tech textiles such as shade nets, anti-hail nets, and mulch films help farmers increase yield and protect crops. These textiles contribute to water conservation, soil protection, and enhanced productivity in arid regions.
  - The Indian Council of Agricultural Research (ICAR) promotes the use of **mulch films and crop covers** in states like Rajasthan and Maharashtra.
- **Environmental Sustainability: Oekotech/Ecotech textiles** are used for waste management, filtration, and air purification, reducing industrial pollution. Geo-textiles prevent soil erosion and landslides, improving ecological balance. Biodegradable technical textiles reduce the environmental footprint of industries.
  - The **Cochin International Airport** in Kerala has incorporated geotextiles to prevent soil erosion and strengthen runways.
- **Employment Generation and Skill Development:** The technical textiles sector is expected to create **10 lakh+ new jobs** by 2025. The **National Technical Textiles Mission (NTTM)** focuses on skill development, increasing India's workforce in this sector.
  - The **Skill India Mission** offers training in technical textiles under the Textile Sector Skill Council (TSC).
- **Export Potential and Global Competitiveness:** India's exports of technical textiles stood at **₹22,000 crore (2022)**, with a target of **₹40,000 crore by 2025**. The **Production Linked Incentive (PLI) scheme** is boosting global competitiveness.
  - **SRF Limited and Garware Technical Fibres** are leading exporters of technical textiles to Europe and the U.S.

CHALLENGES OF TECHNICAL TEXTILES SECTOR IN INDIA:

- **Low Awareness and Market Penetration:** The adoption rate of technical textiles in India is only 5-10%, compared to 30-40% in developed nations like the U.S. and Germany.
  - Farmers in India still rely on traditional methods instead of using **agro-textiles** like mulch films and shade nets, which can improve yield.
- **High Dependence on Imports:** India **imports around 40% of its technical textiles**, especially high-value segments like aramid fibres (used in defence and aerospace). Lack of domestic production capacity leads to higher costs and reliance on foreign suppliers.
  - Indian defence forces still import **high-performance bulletproof fabric** due to inadequate local production capabilities.
- **High Production Costs and Capital-Intensive Industry:** Setting up specialized manufacturing units for technical textiles requires significant investment in machinery,

R&D, and skilled labour. High raw material costs and import duties on synthetic fibres like carbon fibre and aramid fibre make domestic production expensive.

- The **cost of producing geotextiles in India is 20-30% higher** than in China, reducing competitiveness in global markets.

- **Lack of Skilled Workforce and R&D:** The industry faces a shortage of skilled professionals trained in textile engineering, polymer science, and manufacturing technologies. India spends only 0.65% of its GDP on R&D, leading to slower innovation in technical textiles.
  - Countries like Germany invest heavily in textile R&D, while India lags in developing **new textile composites and high-performance fibres**.
- **Inadequate Infrastructure and Testing Facilities:** Lack of world-class testing and certification labs delays product approval and affects exports. The absence of common manufacturing facilities for MSMEs restricts their ability to scale up production.
  - Indian manufacturers struggle to meet global standards (like Oeko-Tex and ASTM) due to limited accredited testing labs.
- **Limited Domestic Demand and Procurement Policies:** Government procurement policies do not mandate the use of technical textiles in many sectors. **Geotextiles are not yet mandatory in all road and railway projects**, limiting domestic demand.
  - In contrast, China has mandated the use of geotextiles in infrastructure projects, boosting local manufacturing. Chinese government preserve mountain ecosystem from soil erosion using technical textiles.
- **Environmental Concerns and Sustainability Issues:** Many technical textiles, such as **polypropylene-based geotextiles**, are non-biodegradable and contribute to plastic waste. The industry lacks large-scale **eco-friendly alternatives** to synthetic technical textiles.
  - **Microplastic pollution from synthetic textiles** is a rising environmental challenge, yet India has limited policies to address this issue.
- **Global Competition and Trade Barriers:** Indian companies face stiff competition from **China, Germany, and the U.S.**, which dominate the high-value technical textile market. **High import duties on machinery** used in technical textiles manufacturing further reduce India's competitiveness.
  - **China controls 40% of the global technical textiles market**, benefiting from government subsidies and economies of scale.

WAY FORWARD:

- **Increase R&D Investments:** India spends only **0.65% of GDP on R&D** compared to **2-3% in developed nations**. Increasing this to at least **2% of GDP** can enhance innovation. **Establish Centers of Excellence (CoEs):** The government should expand CoEs to cover all major technical textile segments.
  - **National Technical Textiles Mission (NTTM)** (2020) recommends creating more **R&D labs and innovation hubs** for developing advanced fibres like **carbon composites and aramid fibres**.
  - **Germany's Fraunhofer Institutes** specialize in R&D for technical textiles, creating **high-value innovations** used in aerospace and defence.

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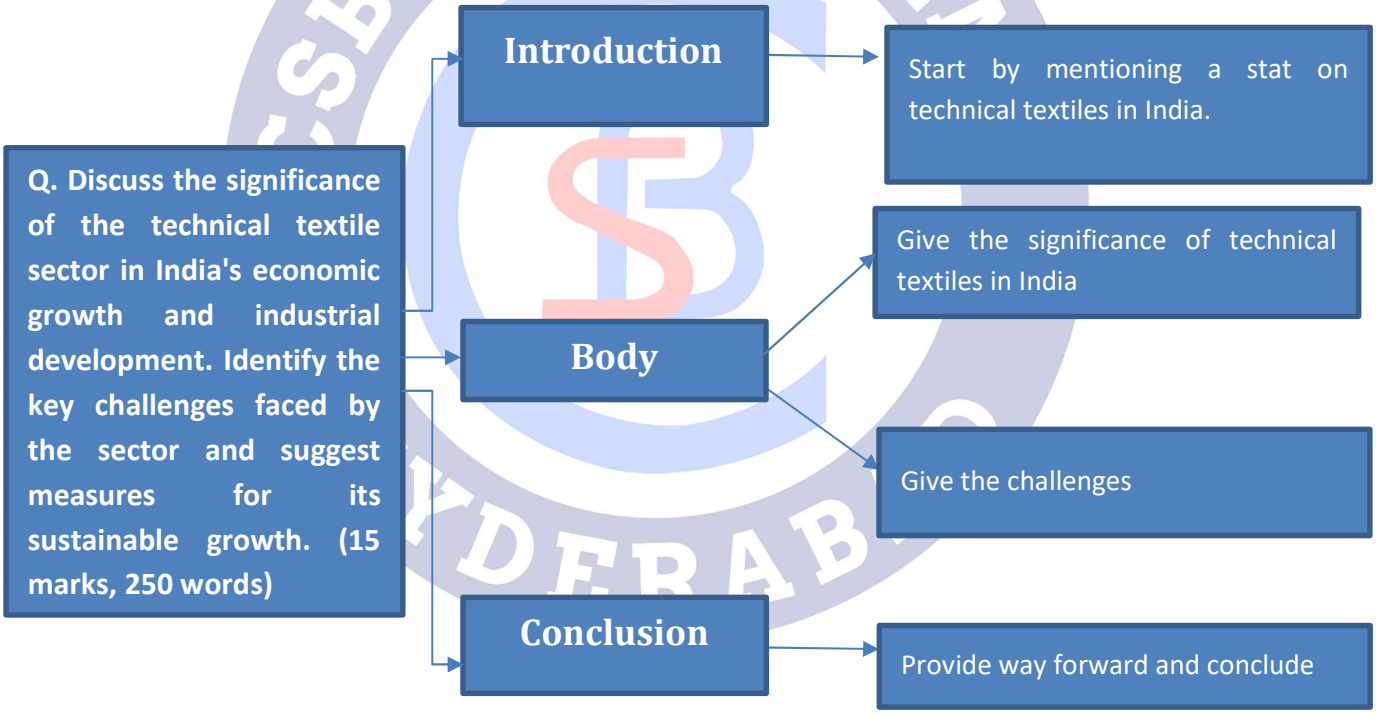
- **Sustainable and Eco-Friendly Manufacturing:** Encourage the use of **organic fibres, bio-based geotextiles, and recyclable materials**. Set up **waste recycling plants** for non-woven technical textiles to reduce landfill waste.
    - **Textile Committee of India** recommends **tax incentives for green textiles** and **compulsory sustainability standards** for technical textiles.
    - **European Union's Green Textile Initiative** promotes **recycling of technical textiles**, reducing environmental damage. India can adopt similar regulations.
- **Skill Development and Workforce Training:** Introduce **specialized courses in engineering institutes and ITIs** to train workers in advanced textile manufacturing. Collaborate with industries to develop **customized skill training programs**.
    - **Kothari Commission on Education** (1966) emphasized **industry-academia collaboration**. This approach can be used to train skilled workers in technical textiles.
    - **Japan's Technical Textile Training Model** integrates hands-on industry training with academic programs, ensuring a highly skilled workforce.
- **Boosting Domestic Manufacturing and Reducing Import Dependence:** The **PM MITRA (Mega Integrated Textile Region and Apparel) scheme** should be expanded to include **technical textile parks**. Promote domestic production of **carbon fibres, aramid fibres, and specialty polymers** to cut costs.
    - **National Manufacturing Policy (2011)** suggests **reducing raw material import duties** and promoting **local production units** for advanced materials.
    - **China subsidizes local production of technical textiles**, making it a global leader. India can implement similar incentives.
- **Expanding Market Demand through Policy Interventions:** Make technical textiles mandatory in key sectors.
    - **Geotextiles for infrastructure projects** (roads, railways).
    - **Agrotextiles for protected farming** (greenhouses, mulching).
    - **Medical textiles in public hospitals** (antibacterial fabrics).
    - **Introduce PLI (Production Linked Incentive) Schemes:** Extend PLI benefits to **high-performance technical textiles**.
    - **Kelkar Committee on Infrastructure (2015)** recommended **making geotextiles mandatory** in all national highway projects.
    - **South Korea mandates geotextiles in all major infrastructure projects**, boosting domestic production.
- **Develop Export-Oriented Policies:** Reduce **export duties** and offer **subsidies for international certifications**. Expand FTAs with countries demanding high-end technical textiles like **Europe, the U.S., and Japan**.
    - **Economic Advisory Council Report (2021)** suggests establishing an **Export Promotion Council for Technical Textiles**.
    - **China exports 40% of its technical textiles** due to strong government-backed export policies.

- **Enhancing Testing and Standardization:** Establish **BIS-certified labs** across India to ensure quality standards for global exports. Make Indian technical textiles **ISO, ASTM, and Oeko-Tex certified** to increase global acceptance.
    - **B.K. Chaturvedi Committee on Exports (2018)** recommended **aligning Indian technical textiles with global certification standards**.
    - **Germany has a strong network of textile testing labs** that help local manufacturers compete globally.

PRACTICE QUESTION

Q. Discuss the significance of the technical textile sector in India's economic growth and industrial development. Identify the key challenges faced by the sector and suggest measures for its sustainable growth. (15 marks, 250 words)

APPROACH



MODEL ANSWER

Technical textiles are engineered fabrics designed for functional applications across industries like automotive, healthcare, defence, and infrastructure. India ranks as the **5th largest producer** and holds a **3.9% share in global textile exports**. The National Technical Textiles Mission aims to boost this sector by expanding domestic production and exports.

Significance of Technical Textiles in India

1. **Economic and Industrial Growth**: The Indian technical textile market is valued at **₹2 lakh crore (2022)** and is projected to grow at a **CAGR of 10-12%**. The **PLI scheme** promotes investments in **man-made fibres and technical textiles**, enhancing manufacturing capabilities.
2. **Infrastructure Development**: **Geotextiles** improve durability in **road, rail, and embankment projects**. **NHAI** mandates geotextiles in projects like the **Char Dham Highway Development Program**.
3. **Healthcare and Hygiene**: India became the **2nd largest producer of PPE kits** during COVID-19. Demand for **biodegradable medical textiles** is increasing.
4. **Defence and Security Applications**: DRDO develops **bulletproof vests** and **flame-resistant uniforms** under the "Make in India" initiative.
5. **Agricultural Productivity**: **Agro-textiles** like **shade nets and mulch films** improve crop yield and water conservation. **ICAR** promotes these in states like **Rajasthan and Maharashtra**.
6. **Environmental Sustainability**: **Oekotech textiles** aid in **waste management, air filtration, and soil erosion control**. **Cochin International Airport** uses geotextiles to **prevent soil erosion**.
7. **Employment Generation and Skill Development**: The sector is expected to generate **10 lakh+ jobs** by 2025. **Skill India Mission** offers specialized training in technical textiles.
8. **Export Potential and Global Competitiveness**: Exports stood at **₹22,000 crore (2022)**, with a target of **₹40,000 crore by 2025**.

Challenges in the Technical Textile Sector

1. **Low Awareness and Market Penetration**: India's adoption rate is **5-10%**, while in **developed nations, it is 30-40%**. Farmers underutilize **agro-textiles** like mulch films.
2. **High Dependence on Imports**: **40% of technical textiles** are imported, including **aramid fibres for defence**.
3. **High Production Costs**: **Setting up manufacturing units** requires heavy investment. **Geotextile production in India is 20-30% costlier than in China**.
4. **Lack of Skilled Workforce and R&D**: India spends only **0.65% of GDP on R&D** compared to **2-3% in developed nations**. Germany leads in textile R&D, while India lags in **developing advanced fibres**.
5. **Inadequate Testing and Certification Infrastructure**: Limited world-class labs affect **export approvals** and **quality standardization**.
6. **Limited Domestic Demand and Procurement Policies**: Lack of government mandates for **geotextiles in infrastructure projects** limits growth.
7. **Environmental Concerns**: Many technical textiles are **non-biodegradable**, contributing to **microplastic pollution**.

8. **Global Competition**: China **dominates 40% of the global market** due to **government subsidies**.

Way Forward

1. **Increase R&D Investments**: **National Technical Textiles Mission (NTTM) (2020)** suggests establishing **innovation hubs**. **Germany's Fraunhofer Institutes** can serve as a model for textile R&D.
2. **Sustainable Manufacturing**: The **Textile Committee of India** recommends **tax incentives for green textiles**. **EU's Green Textile Initiative** focuses on recycling and sustainability.
3. **Skill Development**: **Kothari Commission (1966)** emphasized industry-academia collaboration for workforce training. **Japan's Technical Textile Training Model** offers industry-integrated training.
4. **Boost Domestic Production**: Expand **PM MITRA scheme** to include **technical textile parks**. **National Manufacturing Policy (2011)** suggests lowering import duties on raw materials.
5. **Expand Market Demand through Policies**: **Kelkar Committee (2015)** recommended making geotextiles mandatory in infrastructure. **South Korea mandates geotextiles in all major projects**, boosting domestic demand.
6. **Enhance Export-Oriented Policies**: **Economic Advisory Council Report (2021)** suggests an **Export Promotion Council for Technical Textiles**. **China exports 40% of its technical textiles** due to **strong government policies**.
7. **Improve Testing and Standardization**: **B.K. Chaturvedi Committee (2018)** recommends aligning Indian technical textiles with **global certification standards**.

Technical textiles are key to India's **industrial and economic growth**, offering solutions for **healthcare, defence, and infrastructure**. Addressing **R&D gaps, market penetration, and environmental concerns** while leveraging **global best practices** can position India as a **global leader in technical textiles**.

16. HEAT WAVES

iMPACT ANALYSIS

SYLLABUS:

GS 3 > Disaster Management > Disaster mitigation

REFERENCE NEWS:

- Recently, the India Meteorological Department (IMD) warned of yet another year of **extreme temperature and above-normal heat waves.** Also, **February 2025 was Delhi's hottest February in 74 years**, while Mumbai has already faced **two heat waves before mid-March.**

MORE ON NEWS:

- Climate models suggest that heat extremes are going to get much worse — especially through **longer, more intense, hotter, earlier heatwaves. June 2024** marked the **12th consecutive month** of global mean surface temperatures being **1.5°C above the pre-industrial mean.**

HEATWAVES:

- **A heat wave occurs in a region when abnormally high temperatures are recorded over a long period of time.**
- The World Meteorological Organization (WMO) has not adopted yet a standard and mathematically rigorous definition for heat waves.
- According to IMD, a heat wave is considered if **maximum temperature of a station reaches at least 40^{0}C or more for Plains and at least 30^{0}C or more for Hilly regions**.

(a) Based on Departure from Normal

- Heat Wave : Departure from normal is 4.5^{0}C to 6.4^{0}C
- Severe Heat Wave : Departure from normal is >6.4^{0}C

(b) Based on Actual Maximum Temperature

- Heat Wave : When actual maximum temperature ≥ 45^{0}C
- Severe Heat Wave : When actual maximum temperature ≥47^{0}C

If the above criteria are met at least in two stations in a meteorological sub-division for at least two consecutive days and a heat wave is declared on the second day.

Criteria for describing heat waves for coastal stations:

According to IMD, when the maximum temperature departure is **4.5°C or more** from normal, a heat wave may be described, provided the actual maximum temperature is **37 °C or more**.

Marine heatwave:

- Marine heat waves are periods of extremely high temperatures in the ocean.

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- MHWs have been observed in all major ocean basins over the recent decade. These events are linked to coral bleaching, sea grass destruction, and loss of kelp forests, affecting the fisheries sector adversely.

VULNERABILITY:

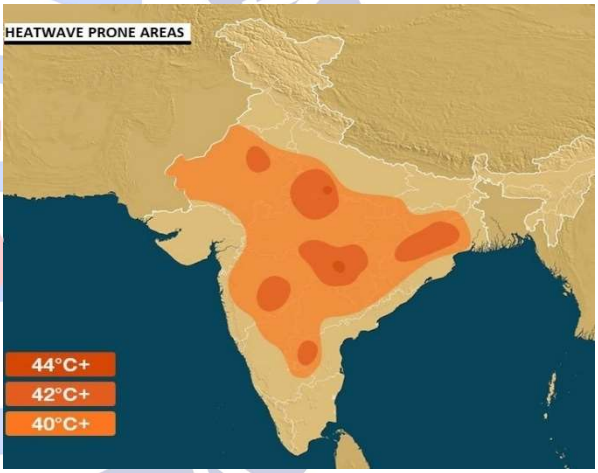
- **Globally:**

Since the 1980s, each decade has been warmer than the previous one. The warmest seven years have all been since 2015; the **top three being 2016, 2019 and 2020.**
World Meteorological Organization (WMO) statements suggests that **Heat-waves are projected to increase in number, intensity and duration** over the most land area in the 21st century.

- **India**:

According to the latest information available from the India Meteorological Department (IMD), the five warmest years on record for India since 1901 are 2016, 2021, 2009, 2017, and 2010, in descending order. **11 out of 15 warmest years were during the recent 15 years** (2007-2021).

Heat waves typically **occur between March and June**, and in some rare cases even extend till July.



Many places in the northwest and cities along the southeastern coast report up to **eight heatwave days per season**. However, the regions in the extreme north, northeast and southwestern India are lesser prone to heatwaves.

CAUSES OF HEAT WAVES:

- **Climate Change:**

Climate change is **driving global temperature higher and increasing the frequency and severity of heat waves.**

According to the **IPCC special report on global warming of 1.5°C**, the increase in global temperatures to within the range of 1.5°C to 2.5°C above pre-industrial levels will **intensify the severity of heat waves** and other extreme weather events.

- **El Nino:**

El Niño years are associated with a **delay in the onset of the Indian Summer Monsoon**. Because most heat waves in India occur during the pre-monsoon season, heat waves during El Niño years are longer and hotter.

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For example, a **strong El Niño event in 2015-16** was associated with significant disruptions to monsoon patterns, contributing to prolonged heat waves in India

- **Shifting jet streams:**

According to a recent study, the **polar jet stream is shifting north** as global temperatures rise. This would wreak havoc on weather in the northern hemisphere, bringing more extreme events like droughts and heat waves to southern Europe and the eastern US.

- **Hot local winds like Loo:**

Loo is a hot wind that originates in the desert regions of Iran, Pakistan and Thar Desert and blows eastwards into the Indian plain region in the months of May and June, usually in the afternoons.

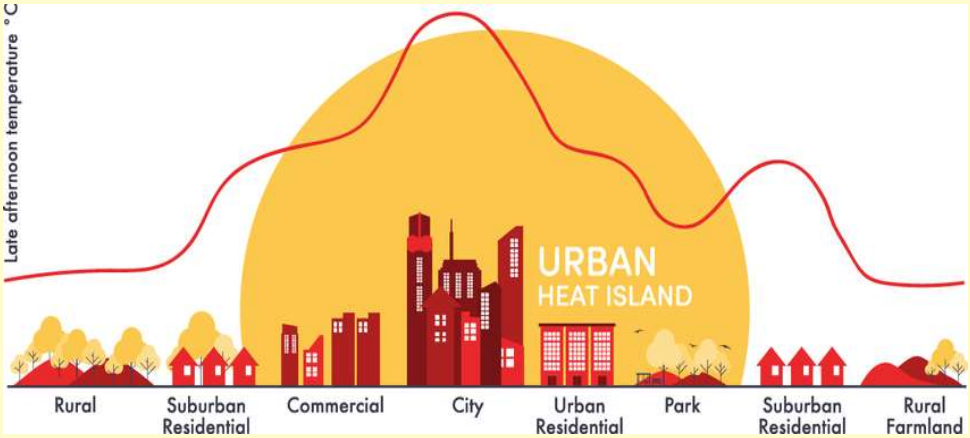
Its temperature invariably ranges between 45°C and 50°C and causes severe heat waves in the plain region.

- **Anthropogenic causes:**

Deforestation and increased constructed area:

- **Reduced level of evapotranspiration** due to rise of concrete jungles and urban sprawls leads to **Urban Heat Islands effect.**

The urban heat island (UHI) effect is a phenomenon where urban areas experience higher temperatures than their rural surroundings. This is mainly due to human activities and the concentration of buildings, roads, and other infrastructure that absorb and retain heat. The World Meteorological Organization notes that the UHI can increase temperatures by 5°C to 10°C, intensifying heatwaves in urban settings



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Pollution: Increased greenhouse gases, aerosols, and particulate matter from activities like power generation and transportation enhance heat waves. These pollutants absorb and re-emit infrared radiation, raising atmospheric heat and intensifying the urban heat island effect in densely populated areas.

Landscape alterations: Land use change, widespread installation of air conditioning, degraded agriculture practices create urban heat islands.

IMPACTS OF HEAT WAVES:

- **Ecological:**

Increase the risk of disasters: Exacerbates already existing risks disasters like droughts and forest fires.

Loss of biodiversity: Heat waves increases the risk of loss of wildlife habitat and loss of biodiversity.

- **Economic**:

GDP loss: Heat waves resulted in a total of nearly USD 60 billion in damage globally in 2018.

Threat to agricultural and allied sector: Combined heat waves and drought can lead soil to dry out and cause severe harvest failures. Heat waves also led to deaths of poultry, cattle etc.

Impact on food production and food security: Heat waves reduce crop yields and disrupt food supply chains, heightening food insecurity.

Loss of work hours and reduction in labour productivity: India would lose 5.8% of its working hours due to heat stress, equivalent to 34 million full time jobs (ILO). Also, according to an ILO study, at temperatures **of 34°C**, workers can lose up to **50% of their work capacity.**

- **Social Impact:**

Called as Silent Disaster: It develops slowly and kills/injures humans and animals. The health impacts of Heat Waves typically involve **dehydration, heat cramps, heat exhaustion and/or heat stroke.**

Increased mortality: 24,000 deaths between from 1992-2015 (NDMA report) However due to efforts from various stakeholders mortality due to heat waves reduced from **2040 in 2015 to 25 in 2018**

Reduced productivity: Due to physiological stress, sometimes leading to illness & death.

Resource Strain and Regional Conflicts: May create a **resource crunch** that escalates tensions over water allocation, exacerbating issues like the **Cauvery water disputes** between regions due to further strained water resources.

Disruption in community infrastructure: May create a resource crunch, which leads to riots and a lack of trust in government machinery.

GOVERNMENT EFFORTS TO COMBAT HEATWAVES IN INDIA:

India has implemented **various policies and initiatives** to mitigate the impact of extreme heatwaves, focusing on **early warning systems, heat action plans, urban cooling strategies, and financial support mechanisms**.

- **Heat Action Plans (HAPs):**
  - India's first **Heat Action Plan (HAP)** was introduced in **Ahmedabad (2013)**, serving as a model for other cities.
  - **Over 23 cities and 13 states** now have HAPs focusing on **early warning, public awareness, and emergency response measures**.
- **Early Warning & Meteorological Forecasting:**
  - **India Meteorological Department (IMD)** issues **heatwave alerts** and provides a **color-coded warning system (Yellow, Orange, Red)** for preparedness.
  - Local authorities use IMD's forecasts to implement **preventive measures such as adjusting work hours and mobilizing medical aid**.
- **NDMA Guidelines on Heatwave Preparedness:**
  - The **National Disaster Management Authority (NDMA)** has issued national guidelines for heatwave management, which include:
- **India National Cooling Action Plan (INCAP) (2019):**
  - Focuses on **energy-efficient cooling, urban heat mitigation, and passive cooling strategies**.
  - Aims to **reduce cooling demand by 20-25% by 2037**, benefiting **urban and rural communities**.
- **Financial & Policy Support:**
  - **15th Finance Commission** has included **heatwave mitigation in the National and State Disaster Mitigation Funds**.
  - **Centrally Sponsored Schemes (CSSs)** such as **AMRUT, Smart Cities Mission, and MGNREGA** support urban heat resilience projects.
- **Urban Planning & Cooling Infrastructure:**
  - **Cool Roof Program** in Hyderabad promotes **reflective roofing to lower indoor temperatures**.

- Several cities have introduced **green building codes, urban afforestation, and heat-resistant infrastructure**.
- **Support for Vulnerable Populations:**
  - Governments have initiated measures like **flexible working hours for outdoor laborers, community cooling centers, and subsidized cooling solutions for low-income households**.

WAY FORWARD:

- **NDMA GUIDELINES:**
  - **Early Warning System and Coordination**: Implement systems to alert residents about high and extreme temperatures and enhance preparedness for favorable weather conditions.
  - **Training for Healthcare Professionals**: Develop training programs for medical and community health staff to manage heat-related illnesses effectively.
  - **Public Awareness and Outreach**: Use various media to disseminate tips on protecting against heat waves and treating heat-related illnesses.
  - **Collaboration with NGOs and Civil Society**: Work with these groups to enhance public facilities like bus stands and water delivery systems to better handle heat wave conditions.
  - **State Nodal Agency**: Designate nodal officers at state or district levels to manage Heat Action Plans.
  - **Vulnerability Assessment**: Identify vulnerable populations and establish heat-health alert thresholds.
  - **City-Level Measures**: Analyze factors that cause temperature increases in cities, create heat wave risk maps, identify hot spots, and ensure adherence to building codes.
- **Enhancing Institutional Coordination and Governance**
  - Strengthen **inter-departmental coordination**, as **over 25% of local officials** cited lack of cooperation between government departments as a major barrier to effective heat action (*Source: Sustainable Futures Collaborative Study)*.

- Improve **technical capacity** of local governments by providing **scientific training** and access to **climate projections**.

Sustainable Futures Collaborative (SFC) Study – Analyzed heat action implementation in **nine high-risk Indian cities** using **CMIP6 climate model output** and interviews with **88 government officials** to assess preparedness for escalating heat waves.

- Ensure that **city planners are actively involved** in designing and implementing heat mitigation strategies, as **many city planners lack a legal mandate to act on heat**.

- **Expanding the India National Cooling Action Plan:**
  - Leverage the **India National Cooling Action Plan (INCAP)** to enhance **sustainable and energy-efficient cooling solutions**.
  - Ensure **cooling strategies target the most heat-exposed populations**, such as outdoor workers and low-income communities.
  - Promote **rooftop solar programs** and **tree-planting initiatives** that are better aligned with heat-vulnerable areas.
- **Strengthening Policy and Legislation:**
  - Develop **stronger heat wave preparedness policies**, including **heat-specific labor laws** to regulate working hours and protect workers from extreme conditions.
  - Implement **legal mandates** to incorporate **Heat Action Plans (HAPs) into urban planning** and disaster management policies.
  - Utilize **National and State Disaster Mitigation Funds** to support heat adaptation projects.
  - Encourage **minor procedural tweaks in Centrally Sponsored Schemes (CSSs)** to allow funding for heat resilience programs.
- **Advancing Research and Data Collection**
  - Improve **forecasting models** and access to **localized climate projections**, as currently, **only 5% of officials have access to climate models** predicting heatwave intensity. (*Source: Sustainable Futures Collaborative Study)*.
  - Conduct **assessments on the effectiveness of existing heat action plans (HAPs)** to refine and improve them.

- Study **international best practices in extreme heat governance** and adapt them to India's urban and rural settings.

- **Targeted Support for Vulnerable Populations:**
  - Develop **long-term adaptive measures**, such as **community cooling centers** and **subsidized air conditioning** for vulnerable groups.
  - Establish **insurance programs** to compensate **daily wage workers for lost work hours due to extreme heat**.
  - Retrofit **electricity grids** to **ensure stable power supply** during heatwaves, preventing blackouts and ensuring access to cooling.
  - Work closely with **civil society organizations**, as research shows **governments with strong NGO partnerships are more proactive in heat governance**.

BEST PRACTICE:

- **Heat wave Action Plan of Ahmedabad:**

Ahmedabad was among the **first city to prepare Heat wave Action Plan.**

This plan **provides a framework for other Indian cities** to emulate and help protect their citizens from the extreme heat.

The key lesson learnt from Ahmedabad Heat Wave Action Plan:

- Recognize Heat Wave as a major Health Risk.
- Map out the 'High Risk' Communities.
- Setting up of 'Public Cooling Places'.
- Issue Heat wave alerts through different media.

CONCLUSION:

- India has taken key steps to combat heatwaves through **early warnings, Heat Action Plans, and cooling strategies**, but rising temperatures demand **stronger long-term resilience**. Strengthening **coordination, legal backing, funding, and urban heat mitigation** will be crucial to ensure **sustainable adaptation and protection for vulnerable populations**.

PRACTICE QUESTION

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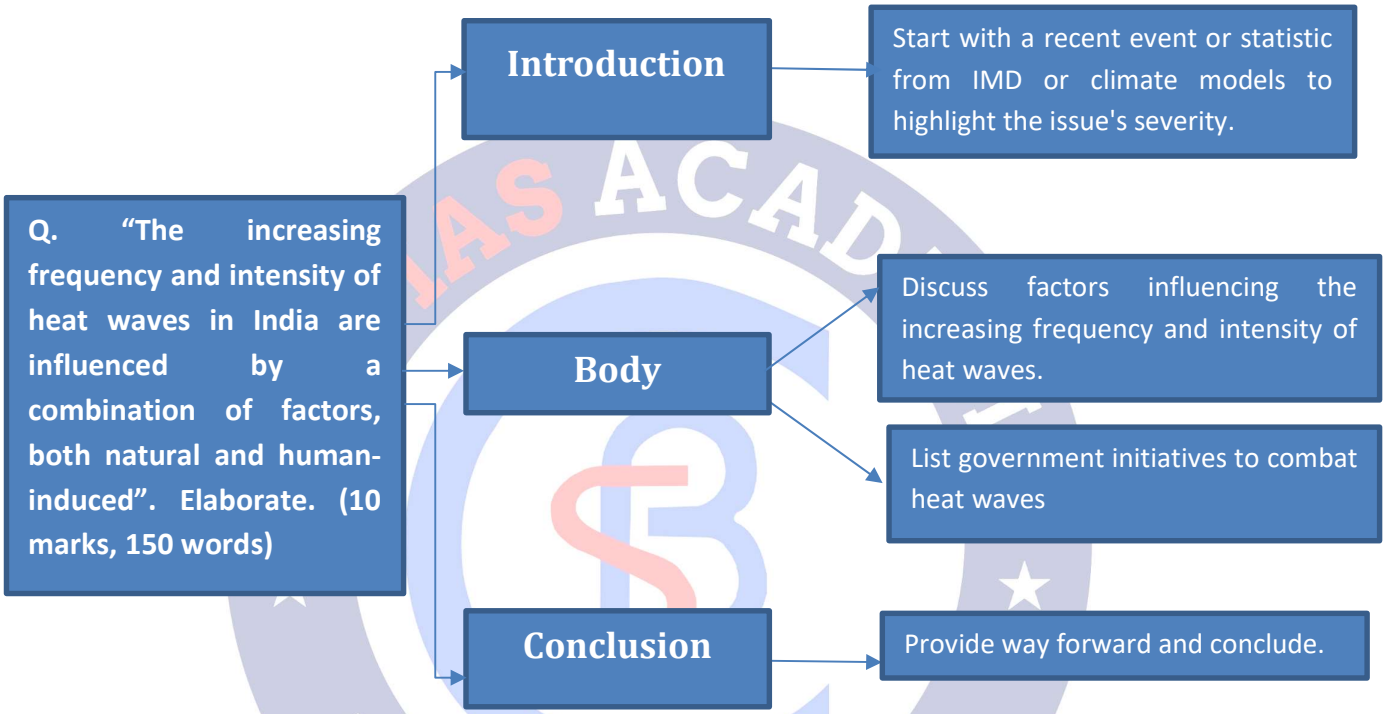
Q. "The increasing frequency and intensity of heat waves in India are influenced by a combination of factors, both natural and human-induced". Elaborate. (10 marks, 150 words)

APPROACH



MODEL ANSWER

The **India Meteorological Department (IMD)** recently warned of another year of **extreme temperatures and above-normal heat waves**. February 2025 was **Delhi's hottest February in 74 years**, and Mumbai has already faced **two heat waves before mid-March**. Climate models predict **longer, more intense, and earlier heatwaves**, with June 2024 marking the **12th consecutive month** of global mean surface temperatures being **1.5°C above pre-industrial levels**.

Factors Influencing the Increasing Frequency and Intensity of Heat Waves:

Natural Factors

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- **Climate Change** – Rising global temperatures are **intensifying heat waves and extreme weather events**. **June 2024** marked the **12th consecutive month** of global mean surface temperatures being **1.5°C above pre-industrial levels** (**Source: IMD**).

- **El Niño** – Associated with a **delay in the Indian Summer Monsoon**, leading to **longer and more intense pre-monsoon heat waves**. The **2015-16 El Niño** event contributed to **severe and prolonged heatwaves across India**.

- **Shifting Jet Streams** – The **northward shift of the polar jet stream** due to **global warming** increases **heatwaves and droughts** in the **northern hemisphere**, worsening extreme weather events .

- **Hot Local Winds (Loo)** – The **Loo**, originating from **Iran, Pakistan, and the Thar Desert**, raises **temperatures between 45°C and 50°C**, leading to **severe heat waves across northern and central India** in **May and June** .

Human-Induced Factors

- **Urban Heat Island Effect (UHI)** – **Deforestation and increased built-up areas** cause **higher urban temperatures** due to **reduced evapotranspiration**. The **World Meteorological Organization (WMO)** notes that **UHI can increase urban temperatures by 5°C to 10°C**, intensifying heat waves in cities (**Source: WMO**).

- **Pollution & Greenhouse Gases** – **Power generation, transportation, and industrial emissions** contribute to **higher atmospheric heat retention**. **Pollutants absorb and re-emit infrared radiation**, worsening **heatwave conditions** .

- **Deforestation & Land Use Change** – **Loss of natural green cover, degraded agriculture, and expansion of urban infrastructure** reduce **evapotranspiration**, exacerbating **heat stress** (**Source: IMD**).

- **Unregulated Infrastructure Growth** – **High air conditioning use, rapid urban expansion, and lack of cooling spaces** increase **localized heat stress**. The **Sustainable Futures Collaborative Study** found that **most Indian cities lack long-term heat mitigation policies**, making urban areas highly **susceptible to extreme heat** (**Source: Sustainable Futures Collaborative Study**).

Government Initiatives to Combat Heat Waves

1. **Heat Action Plans (HAPs)** – Implemented in 23 cities and 13 states, first introduced in Ahmedabad (2013).

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2. **IMD Heatwave Alerts** – Color-coded warnings (Yellow, Orange, Red) for preparedness.
3. **NDMA Guidelines** – Early warning, healthcare training, public awareness, and risk mapping.
4. **India National Cooling Action Plan (2019)** – Aims to reduce cooling demand by 20-25% by 2037.
5. **Financial Support** – 15th Finance Commission funds heatwave mitigation; CSSs (AMRUT, Smart Cities, MGNREGA) support heat resilience.
6. **Urban Cooling Measures** – Cool Roof Program (Hyderabad), green building codes, and afforestation.
7. **Support for Vulnerable Groups** – Flexible work hours, cooling centers, and subsidized cooling solutions.

Way Forward

- **Strengthening Institutional Coordination** – Improve **inter-agency cooperation** and involve **city planners** in heatwave governance.
- **Expanding INCAP Initiatives** – Implement **rooftop solar programs and targeted afforestation**.
- **Strengthening Policy & Legislation** – Enforce **legal mandates for HAPs** and **regulate labor laws for extreme heat conditions**.
- **Enhancing Research & Forecasting** – Improve **climate models and localized heat risk assessments**.
- **Targeted Support for Vulnerable Groups** – Establish **insurance for heat-affected workers** and **power grid retrofits** for cooling access.

The **increasing intensity and frequency of heat waves in India** stem from both **natural and human-induced factors**. While **India's efforts through HAPs, early warning systems, and policy interventions** have improved preparedness, **long-term resilience planning** is essential. Strengthening **coordination, infrastructure adaptation, and heatwave governance** will be key to **protecting vulnerable communities and ensuring sustainable adaptation** to rising temperatures.

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17. LAND REFORMS IN INDIA

iMPACT ANALYSIS

SYLLABUS:

GS 3 > Economic Development > Indian Economy and issues > Land reforms

REFERENCE NEWS:

- The Andhra Pradesh government has introduced a series of **land reforms to overhaul land administration in the state.** These include enacting new laws and amending existing ones, implementing policy changes, introducing administrative modifications to streamline the management of land records, and addressing land disputes. The government claims that these measures are necessary to protect property rights, ensure transparency, and make land governance more efficient.

WHAT IS LAND REFORM?

- **Land reforms** refer to a set of government policies and measures aimed at **redistributing land**, restructuring land ownership, and improving land tenure systems to promote **social justice, reduce inequalities, and enhance agricultural productivity**.
- These reforms typically include **abolition of intermediaries, tenancy regulation, land redistribution, and consolidation of land holdings** to benefit landless farmers and marginalized communities.

MAJOR LAND TENURE SYSTEM DURING COLONIAL PERIOD:

- **Zamindari System (1793):**

Introduced by the **East India Company (Lord Cornwallis)**, this system created **Zamindars** as revenue collectors in **Bengal, Bihar, and Odisha**.

The government took **10/11th of the rent**, while Zamindars could extract as much as they wished, leading to **exploitation of cultivators**. Farmers had **no rights over land** (sale, transfer, or lease), no surplus for investment, and **no incentive to improve productivity**.

- **Mahalwari System (1822):**

The **Mahalwari System** was introduced by **Holt Mackenzie in 1822** and later **reviewed under Lord William Bentinck in 1833**.

Initially implemented in **North India (Agra, Oudh)**, it was later extended to **Madhya Pradesh and Punjab**.

Under this, the **responsibility for collecting the land revenue lied with the village community**

- **Ryotwari System (1820):**

This system was initially introduced in Tamil Nadu and later extended to Maharashtra, Barar, East Punjab, Assam and Coorg.

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Under this system, **the cultivator paid revenue directly to the state without an intermediary** and the riots (individual cultivator) has full rights regarding sale, transfer and leasing of land.

Alexander Read first experimented with this system in Baramahal and Madras. **Thomas Munro**, as Governor of Madras (1820-1827), formalized and expanded it, making it the dominant land revenue system in South India.

NEED FOR LAND REFORMS IN POST-INDEPENDENT INDIA:

- **Flawed system of land ownership under British rule:**

Under British rule, **farmers lacked land ownership**, with **Zamindars and Jagirdars** holding landlordship.

Land was **concentrated among a few**, and numerous **intermediaries, uninterested in cultivation, profited from leasing**.

Tenancy contracts were **highly exploitative**, and **poor land records** led to widespread litigation.

At independence, India inherited a **highly inequitable agrarian system**, making land reforms essential.

- **To ensure distributive justice:**

The Indian Government after independence was committed to land reforms to ensure distributive justice **as was promised during the freedom struggle.**

A committee, under the Chairmanship of **J. C. Kumarappan** was appointed **to look into the problem of land**. The Kumarappa Committee's report **recommended comprehensive agrarian reform measures.**

Consequently, laws were passed by **all the State Governments during the 1950s** with the a vowed **aim of abolishing landlordism, distributing land through imposition of ceilings, protection of tenants and consolidation of land- holdings.**

- **To reduce rural poverty:**

Land reform leads to **increased rural agricultural wages that help in ensuring more income to the rural landless labourers** and thus crucial to rural poverty reduction.

More over **increased access to land for the poor landless masses** by the redistribution of land **ensures them an income guarantee.**

- **Empowerment of women in the traditionally male driven society:**

Land ownership rights would help in strengthening women's agency and giving them opportunities to assert themselves

- **To increase productivity of agriculture:**

Since **owner-cultivated plots of land tend to be more productive than those under sharecropping tenancy**, land reform in the form of tenancy laws that granted security of tenure **could raise productivity by converting sharecroppers into owner-cultivators.**

- **Reduce socio-economic inequality:**

Abolition of intermediaries would **strengthen the position of the actual landholders and cultivators** that help them **to enhance their social and economic stature.**

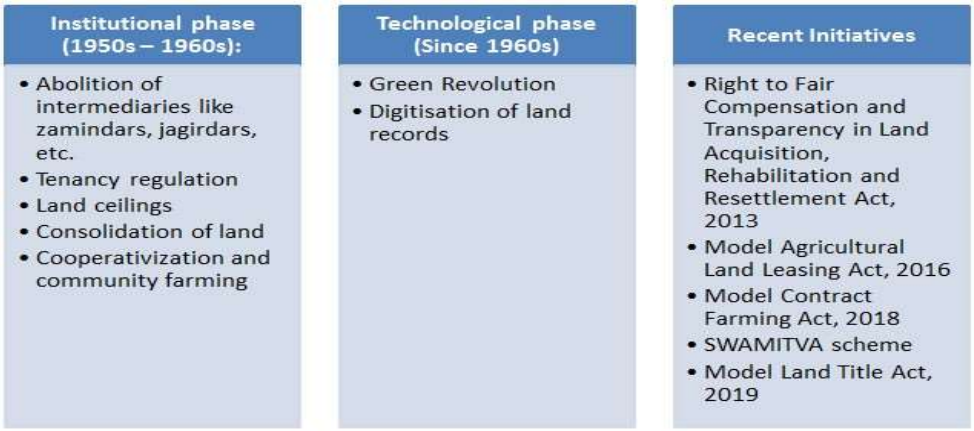
- **Need for Land Reforms in the Post-COVID Economy:**

For the **rural poor, land is both an asset and livelihood source**. The **COVID-19 pandemic** led to **job losses in urban areas**, triggering **reverse migration** and increasing pressure on rural households.

Land ownership became **crucial for access to loans and government relief**, but **unclear and outdated land titles** remain a major hurdle.

LAND REFORM INITIATIVES:

- Efforts taken under land reforms since independence can be summarised as:



Institutional Phase (1950s–1960s)

1. **Abolition of Intermediaries** – **Zamindars and Jagirdars abolished**, affecting **57% of Zamindari land**; **30 lakh tenants gained 62 lakh acres**.
2. **Tenancy Regulation** – **Protected tenants** through **rent control, tenure security, and ownership rights** (e.g., **West Bengal & Kerala**).
3. **Land Ceiling Laws** – **Capped land holdings** to redistribute surplus; **all states enacted laws by 1961-62**, revised in **1972**.
4. **Land Consolidation** – **Reduced fragmentation**, benefiting **Punjab, Haryana, and Western UP**.
5. **Cooperativization & Community Farming** – **Encouraged pooling land** for **mechanization and fair pricing**.

Technological Phase (Since 1960s)

1. **Green Revolution (1967-78)** – **Introduced HYV seeds, irrigation, and mechanization**, making India **food-secure**.
2. **Land Record Digitization** – **DILRMP (2008)** ensures **transparent land records**, with **90.1% villages digitized**.

Recent Initiatives

1. **Land Acquisition & Compensation – 2013 Act ensures fair compensation and rehabilitation**.
2. **Model Land Reforms – Leasing Act (2016) for marginal farmers**; **Contract Farming Act (2018) for regulated agreements**.
3. **SWAMITVA Scheme (2020-25) – Drone surveys grant rural landowners official property rights**.
4. **Draft Model Land Title Act (2019) – State-backed land titles to reduce disputes**, inspired by **Singapore & UK models**.

India's land reforms have evolved **from feudal abolition to digital modernization**, ensuring **transparency, security, and fair ownership**.

SIGNIFICANCE OF LAND REFORMS IN INDIA:

- **Reducing Rural Poverty & Strengthening Livelihoods:**
  - Land reforms have **helped alleviate poverty** by redistributing land to **landless and marginal farmers**, providing them with a **stable source of income and economic security**.
  - **58% of rural households in India remain landless (SECC 2011)**, emphasizing the need for **fair land distribution**.
  - **For instance, operation Barga (West Bengal, 1978)** granted **sharecroppers legal rights**, improving farm productivity and incomes.
  - Securing **tenancy rights, women's land ownership, and tribal land security** will further **reduce inequalities and promote inclusive growth**.
- **Food Security & Agricultural Productivity:**
  - India's population, approximately **1.46 billion in 2025**, necessitates modernized agriculture, efficient land use, and digital land records to ensure food security.

- Land consolidation, sustainable farming, and equitable land distribution can enhance intensive cultivation and boost agricultural output.
- For instance, the **Green Revolution (Punjab & Haryana, 1960s)**, supported by **land consolidation and mechanization**, led to **higher crop yields**.
- Also, operation Barga contributed **36% to West Bengal's agricultural growth**.

- **Promoting Social Equity & Reducing Caste-Based Disparities:**
  - Land ownership has historically been a **source of power**, reinforcing **caste hierarchies** in rural India. **Redistribution of land** has weakened **social inequalities** and **empowered marginalized communities**.
  - For example, **Kerala and West Bengal's land redistribution** empowered **Dalits, Adivasis, and small farmers**, reducing feudalistic structures.
  - Also, the **abolition of intermediaries (zamindars, jagirdars, etc.)** helped dismantle **land-based feudalism**, ensuring a **more egalitarian society**.
- **Supporting Industrialization & Economic Growth:**
  - India's long-term economic growth requires **efficient land policies** for **industrial corridors, SEZs, and business expansion**. **Streamlining land acquisition and reducing disputes** can enhance **land availability for development** and attract **greater investment opportunities**.
  - **Transparent land policies** will **reduce disputes and encourage investments**. For instance, **simplified land acquisition** can **attract FDI and accelerate economic growth**.
  - For example, **Gujarat Industrial Development Corporation (GIDC)** efficiently allocated land, driving **manufacturing expansion**.
- **Managing Urbanization & Smart Cities:**
  - By **2047, over 50% of India's population will be urban**, necessitating **planned land use, affordable housing, and transit-oriented development**.
  - **Land pooling, slum rehabilitation, and mixed-use urban planning** can **ensure sustainable city growth**.

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- **For example, Navi Mumbai Airport's land pooling model** provided fair compensation and stakeholder participation, setting a precedent for urban expansion.

- **Resolving Land Conflicts & Strengthening Legal Frameworks:**
  - **According to World Bank, land disputes cost India $10 billion annually ()**, delaying **infrastructure projects and economic growth**. **Modernizing land records and legal frameworks** is crucial for **reducing disputes**.
  - Strengthening **land titling laws and judicial efficiency** can **ensure faster land transactions and investment stability**.
  - **For instance, PM-SVAMITVA Scheme (2020)** is **digitally mapping rural land**, improving **property rights and dispute resolution**.
- **Ensuring Environmental Sustainability & Climate Resilience:**
  - According to the **Desertification and Land Degradation Atlas of India (2021),** approximately 97.85 million hectares, or **29.77% of the country's total geographical area,** are affected by land degradation. Therefore, the government, through land reforms, can support sustainable land use, afforestation, and climate-smart agriculture.
  - For instance, **Rajasthan's agroforestry projects** restored **10 lakh hectares**, improving **soil health and livelihoods**.
  - **Reforestation, carbon farming, and soil conservation programs** can **restore degraded land and promote sustainability**.

CHALLENGES ASSOCIATED WITH LAND REFORMS IN INDIA:

- **Issues with Zamindari Abolition:**
  - **Retention of Land by Intermediaries:** In many states, intermediaries were allowed to keep land under the guise of "personal cultivation," leading to **mass evictions of tenants** by landlords.
  - **Bureaucratic and Political Nexus:** The **alliance between bureaucrats and landlords** resulted in the **ineffective implementation** of zamindari abolition laws.

- **Uneven Implementation Across States:** While some states implemented reforms effectively, others **failed to fully abolish intermediary control**, leaving portions of the feudal system intact.
- **Limited Impact:** Zamindari abolition laws **removed only the top layer** of intermediaries, allowing many lower-level exploitative structures to persist.

- **Challenges in Tenancy Reforms:**
  - **Lack of Proper Land Records:** Many tenants **lack legal documentation**, preventing them from securing their rights.
  - **Ineffective Implementation:** Only **wealthier tenant groups** benefited, while **poorer tenants remained vulnerable** to eviction.
  - **Legislative Gaps:** Some states **never passed ownership rights laws** for tenants, despite repeated recommendations in national planning documents.
  - **Incomplete Reforms:** While tenancy reforms reduced tenancy in some regions, **only a small percentage of tenants gained ownership rights**.
- **Issues with Land Ceiling Laws:**
  - **Exemptions and Loopholes:** Certain lands, such as **plantation estates**, were **exempted**, limiting the effectiveness of land ceilings.
  - **Judicial Delays:** Legal interventions **protected property rights**, delaying land ceiling implementations.
  - **High Land Ceilings:** Many states **set ceilings too high**, allowing landlords to retain large tracts of land.
  - **Benami Transfers:** Landowners **transferred land to family members, servants, or proxies** to avoid ceiling laws. Some **divorced their spouses but continued to live with them** to bypass land ceiling provisions.
  - **Fragmentation of Land:** Reallocated land led to **fragmentation**, reducing economies of scale and making **mechanization and investment unviable**.
- **Challenges in Co-operative Farming & Land Consolidation:**
  - **Emotional Attachment to Land:** Farmers **resist pooling land** due to **deep personal and cultural ties** to their plots.

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- **Lack of Cooperative Spirit: Caste divisions and social fragmentation** prevent farmers from effectively participating in cooperative farming.
- **Low Awareness & Resistance to Change:** Many farmers are **unaware of modern farming techniques** and **hesitant to adopt cooperative methods**.
- **Limited Capital & Credit Support:** Co-operative farming societies **lack financial resources**, and credit access remains insufficient.
- **Political Influence in Cooperatives:** Many cooperative societies operate **under political party control**, prioritizing **political interests over agricultural productivity**.
- **Mistrust & Mismanagement:** Poor governance and **self-interest among members** weaken cooperative structures, making them **inefficient**.
- **Loss of Independence:** Farmers fear losing **autonomy over their land**, making them reluctant to join cooperatives.

- **Challenges from the Green Revolution:**
  - **Narrow Crop Focus:** The Green Revolution **prioritized wheat and rice**, **neglecting pulses, oilseeds, and coarse grains**, leading to **nutritional imbalances**.
  - **Water Depletion:** The **intensive irrigation** required for wheat and rice **depleted groundwater**, especially in **Punjab and Haryana**.
  - **Soil Degradation: Repeated crop cycles and excessive fertilizer use** stripped the soil of nutrients, increased alkalinity, and **damaged soil health**.
  - **Unequal Benefits:**
  - **Regional Imbalance:** The Green Revolution **benefited only 40% of India's cropped area**, bypassing **eastern, arid, and semi-arid regions**.
  - **Rich Farmers Gained More:** Wealthier farmers **had better access to irrigation, seeds, and credit**, increasing disparities.
  - **Excessive Chemical Usage:** The overuse of **pesticides and synthetic fertilizers** led to **soil toxicity and water pollution**.
  - Ecological damage includes **loss of genetic diversity, deforestation, agrochemical pollution, disrupted landscapes from dams, and noise pollution from machinery**.

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- **Challenges in Land Record Digitization:**
    - **Lack of Coordination Between Departments:** The **Revenue Department, Survey & Settlement Department, and Registration Department** operate separately, causing **discrepancies in textual and spatial land records**.
    - **Insufficient Skilled Manpower:** Many states **lack trained personnel** to manage and update land records.
    - **Slow Mutation Process:** Property mutations (title changes in records) are **delayed**, with no provision for **same-day online updates** in any state or union **territory.**
    - **Incomplete Digitization:** Only **61% of Indian villages** have digitized mutation records, while **39% still rely on outdated, manual records**.
    - **Inconsistent Digitization Across States: Varied land laws and regulations** across states **create non-uniform progress** in land record digitization.
- **Other Challenges in Land Reforms:**
    - **Lack of Uniformity in Land Laws:** Since **land is a state subject**, **inconsistent land policies** across states create **legal and administrative confusion**.
    - **High Volume of Property Disputes:**
        - **Two-thirds of pending court cases** in India relate to **property disputes**. **NITI Aayog estimates** that such cases take an **average of 20 years to settle**.
        - Millions of Indians **cannot use their land as collateral** due to **unclear ownership records**.
    - **Fragmentation & Decline in Agricultural Productivity:**
        - Land fragmentation reduces **productivity** and **prevents large-scale mechanization**.
        - Poor implementation of land reforms has led to **negative impacts on agricultural efficiency**.

WAY FORWARD:

- **Modernizing Land Records** – **Fast-track digitization (DILRMP), integrate blockchain**, and **enhance coordination** between land record departments.

- **Strengthening Land Tenure & Tenancy Rights** – Implement **uniform tenancy laws, real-time record updates**, and **legal support for tenants**.
- **Addressing Land Ceiling & Redistribution** – Close **benami loopholes, enforce ceiling laws**, and promote **voluntary land donation**.
- **Promoting Cooperative & Sustainable Farming** – Support **cooperative farming, access to credit & technology, and climate-smart agriculture**.
- **Ensuring Fair & Transparent Land Acquisition** – Strengthen the **2013 Land Acquisition Act, implement Model Land Title Act (2019)**, and set up **fast-track tribunals**.
- **Balancing Industrialization & Agriculture** – Prevent **arbitrary land acquisition, promote PPPs**, and develop **Special Agricultural Zones (SAZs)** for farmland protection.

CONCLUSION

Land reforms remain **fundamental** to ensuring **social equity, economic growth, and environmental sustainability**. While India has **moved from feudal land structures to digitized records**, challenges **persist in implementation, legal enforcement, and equitable distribution**. A **combination of legal reforms, technological integration, and community-driven initiatives** can make **land governance more transparent, efficient, and inclusive**, ensuring **sustainable rural and urban development**.

PRACTICE QUESTION

Q. Discuss the significance of land reforms in India. Examine the major challenges hindering their effective implementation. (15 marks, 250 words)

APPROACH

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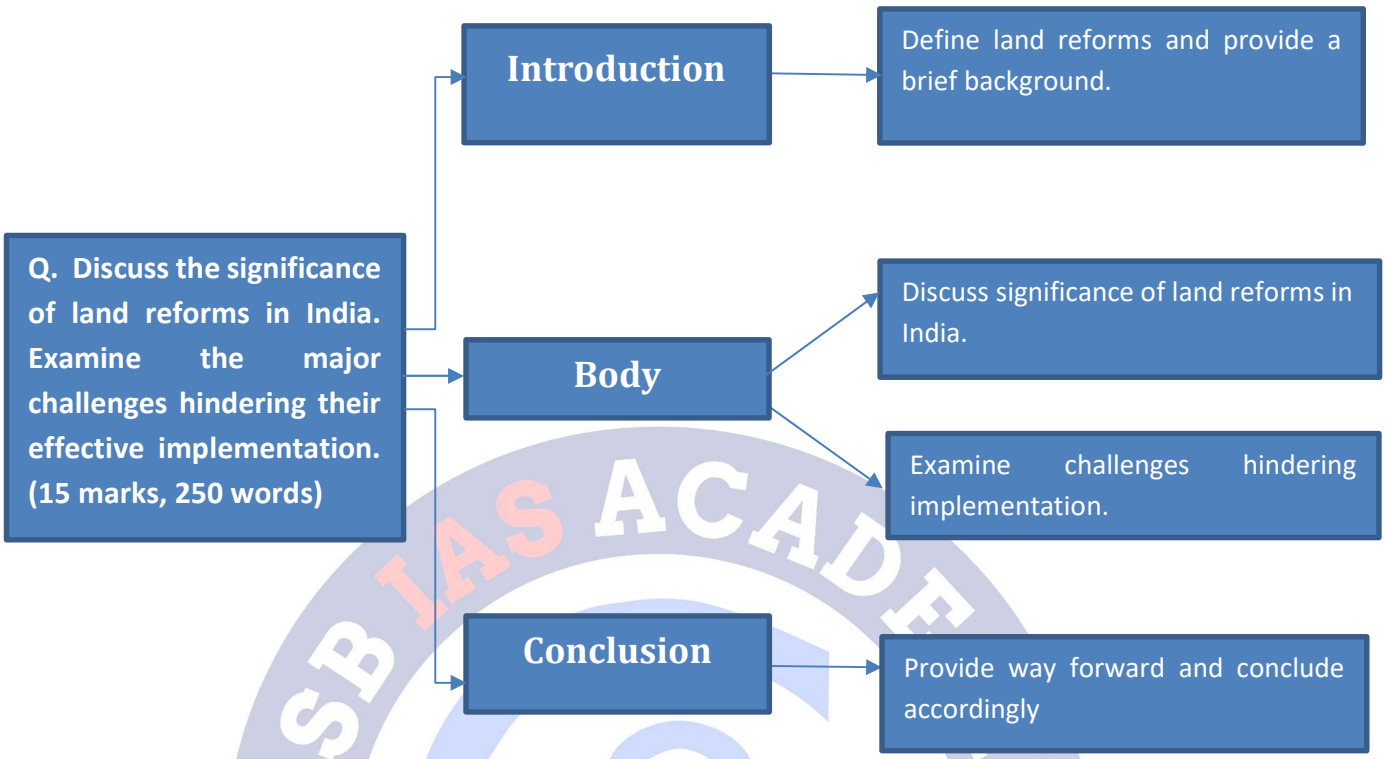

MODEL ANSWER

Land reforms refer to **government policies for redistributing land, restructuring ownership, and improving tenure systems** to promote **social justice, reduce inequalities, and boost agricultural productivity**. In India, land reforms evolved from **abolishing feudal structures (1950s–60s) to digitizing land records and modernizing governance**. While initiatives like **SWAMITVA (2020) and Model Land Title Act (2019)** aim for transparency, **challenges like poor records and legal loopholes** persist. **A balanced legal and technological approach** is key to ensuring **equitable land distribution and sustainable growth**.

Significance of Land Reforms in India:

1. Reducing Rural Poverty & Strengthening Livelihoods

- **Land redistribution** provides **landless farmers a stable income source**, reducing poverty.
- **Example: Operation Barga (West Bengal, 1978)** secured **sharecropper rights**, improving productivity and incomes.

2. Ensuring Food Security & Agricultural Productivity

- **Land consolidation, sustainable farming, and digital records** boost **intensive cultivation and food security**.
- **Example: Green Revolution (Punjab & Haryana, 1960s)** enhanced yields through **land consolidation and mechanization**.

3. Promoting Social Equity & Reducing Caste Disparities

- Land ownership **weakened caste-based hierarchies**, empowering **Dalits and Adivasis**.
- **Example: Land redistribution in Kerala & West Bengal** reduced feudal structures and strengthened cultivator rights.

4. Supporting Industrialization & Economic Growth

- **Efficient land policies** for **industrial corridors, SEZs, and business expansion** attract investment.
- **Example: Gujarat Industrial Development Corporation (GIDC)** facilitated **manufacturing growth** through strategic land allocation.

5. Managing Urbanization & Smart Cities

- **Planned land use, affordable housing, and land pooling** enable **sustainable urban growth**.
- **Example: Navi Mumbai Airport's land pooling model** ensured **fair compensation & smooth urban expansion**.

6. Resolving Land Conflicts & Strengthening Legal Frameworks

- **Land disputes cost India $10 billion annually (World Bank)**, delaying projects.
- **Example: PM-SVAMITVA Scheme (2020)** is **digitizing rural land**, reducing disputes.

7. Ensuring Environmental Sustainability & Climate Resilience

- **Land reforms support afforestation, reforestation, and climate-smart agriculture**.
- **Example: Rajasthan's agroforestry projects** restored **10 lakh hectares, improving soil health**.

Challenges Hindering Effective Implementation:

1. Weak Land Record Management

- **Outdated & inaccurate records** lead to **ownership disputes** and legal conflicts.
- **Poor coordination** between Revenue, Survey, and Registration departments hampers reforms.

2. Land Fragmentation & Inefficient Land Use

- **Generational inheritance** has led to **small, uneconomical farm plots**, reducing productivity.

3. Weak Implementation of Land Ceiling Laws

- **Landlords evade ceiling laws** through **benami transfers** and legal loopholes.
- **Example:** Many **divorced spouses but continued cohabitation** to bypass ceilings.

4. Resistance from Landowners & Bureaucratic Delays

- **Politically influential landowners resist redistribution**, slowing reforms.

5. Challenges in Land Acquisition & Rehabilitation

- **Forced displacement** and **low compensation** trigger **protests & legal battles**.
- **Example:** Delays in infrastructure projects due to **land conflicts**.

6. Environmental & Ecological Concerns

- **Green Revolution's excessive irrigation & fertilizer use degraded soil & water**.
- **Example: Punjab & Haryana suffer severe groundwater depletion** due to high water-demanding crops.

Way Forward

1. **Modernizing Land Records & Digital Integration – Fast-track digitization (DILRMP), integrate blockchain**, and **streamline land records management**.
2. **Strengthening Tenancy Rights – Implement uniform tenancy laws, ensure real-time updates**, and provide **legal aid to tenants**.
3. **Addressing Land Ceiling & Redistribution – Close legal loopholes, enforce ceiling laws, and encourage voluntary land donation**.

4. **Promoting Sustainable Farming – Encourage cooperative farming, access to credit & climate-smart agriculture**.
5. **Ensuring Fair Land Acquisition – Strengthen the 2013 Land Acquisition Act, adopt Model Land Title Act (2019), and set up fast-track tribunals**.
6. **Balancing Industrialization & Agriculture – Prevent arbitrary land acquisition, promote PPPs, and develop Special Agricultural Zones (SAZs)**.

Land reforms are **crucial for social justice, economic development, and environmental sustainability**. While progress has been made **from feudal abolition to digital modernization**, challenges persist due to **legal loopholes, poor land records, and weak enforcement**. A **comprehensive approach integrating legal reforms, technology, and participatory governance** can ensure **equitable land distribution and sustainable growth in India**.

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18. INDIA'S SOCIAL SECTOR

PRACTICE QUESTION

SYLLABUS:

GS 3 > Economic Development

REFERENCE NEWS:

Fund flow into India's social sector fell short of government think tank NITI Aayog's recommendation for 2023-24 by about ₹14 trillion ($170 billion), according to a report by consulting firm Bain and Co. According to report, **social sector spending** in India stands at **6–7% of GDP annually,** combining public and private contributions.

NITI Aayog recommends social sector funding to be 13% of GDP. For 2023-24, that would have been about ₹38 trillion, or 13% of India's nominal GDP of ₹295.36 trillion that year.

SOCIAL SECTOR IN INDIA:

- The **social sector** in India refers to areas of governance and public policy that focus on **human development, social welfare, and quality of life improvement**.
- It includes key sectors such as **education, health, poverty alleviation, employment, social security, and gender equality**.

SIGNIFICANCE OF INDIA'S SOCIAL SECTOR TO ECONOMY AND SOCIETY:

Economic Significance of the Social Sector

- **Human Capital Development and Economic Growth:** A well-educated and healthy workforce leads to **higher productivity, innovation, and economic expansion**.
  - **A 1% increase in literacy rate** can lead to a **1.5% rise in GDP** (World Bank).
  - Countries with **higher Human Development Index (HDI)** tend to have **higher per capita incomes**—e.g., Kerala, with **96% literacy**, has a per capita income **1.5 times higher** than the national average.
  - **Education contributes to 20-25% of India's economic growth**, as per the Economic Survey 2021-22.
  - **India's labour productivity growth** rose from **4.3% (2010-14) to 6.7% (2014-19)** due to better education and skill development (World Bank).

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- **Employment and Skill Development:** To reduce unemployment and boost productivity, the government has launched multiple skill development and employment generation programs.
    - The unemployment rate in India, as per CMIE, is at 6.4% in 2023.
    - Periodic Labour Force Survey (PLFS) 2024, Labour Force Participation Rate (LFPR) overall, increased from 49.3% to 50.4%. Male LFPR from 73.8% to 75.0%, showing a positive trend and female LFPR increased from 24.0% to 25.5%.
    - **PM Mudra Yojana** disbursed **₹23 lakh crore in loans**, creating **4 crore+ jobs**.
    - **Skill India Mission**: Enhances employability of youth through vocational training.
    - **Pradhan Mantri Kaushal Vikas Yojana (PMKVY)**: Provides free skill training and certification.
    - **Startup India & Standup India**: Encourages entrepreneurship and self-employment.
    - **Aatmanirbhar Bharat Rozgar Yojana**: Supports new job creation in the post-COVID era.
- **Healthcare and Workforce Efficiency:** Investment in **public health** leads to **reduced disease burden**, increased productivity, and lower healthcare costs.
    - **Polio Eradication in India (2014)**: Saved **$1.5 billion annually** in treatment costs and increased workforce participation.
    - **Ayushman Bharat (PM-JAY)**: Covered **5 crore hospitalizations**, reducing **out-of-pocket expenditure** and increasing disposable income.
    - **Every $1 invested in healthcare** results in a **return of $4 in economic growth** (WHO).
    - **Health expenditure as % of GDP**: Increased from **1.2% in 2014 to 2.1% in 2023**, improving life expectancy to **70.19 years**.
    - **Infant Mortality Rate (IMR)**: **28 per 1,000 live births (2022)**.
    - **Maternal Mortality Rate (MMR)**: **97 per 100,000 live births** (2022).
    - **Ayushman Bharat (PM-JAY)**: World's largest health insurance scheme, covering 10 crore families.
    - **National Health Mission (NHM)**: Includes Janani Suraksha Yojana (JSY) for maternal health and Rashtriya Bal Swasthya Karyakram (RBSK) for child healthcare.
    - **Mission Indradhanush**: Aims to achieve full immunization coverage for children and pregnant women.
    - **Pradhan Mantri TB Mukt Bharat Abhiyaan**: Focuses on eradicating tuberculosis by 2025.

Societal Significance of the Social Sector

- **Gender Equality and Women Empowerment:** Gender disparities exist in education, employment, and social participation, but various policies aim to bridge the gap.
  - 14% political representation in Lok Sabha.
  - While child marriage has declined, it has been marginal from 27% to 23% in 2019-20 as per NFHS 5.
  - Under-five mortality for girls in India remains 8.3% higher than for boys. Globally this is 14% higher for boys.
  - **Beti Bachao Beti Padhao**: Promotes girl child education and combats gender discrimination.
  - **Mahila Shakti Kendra**: Provides financial and legal support to women.
  - **One Stop Centres (OSC)**: Offer support to women facing violence.
  - **Maternity Benefit (PMMVY)**: Provides financial aid to pregnant and lactating mothers.
- **Education and Social Mobility:** Education reduces **inequality and caste-based discrimination**, fostering a more inclusive society.
  - **Beti Bachao Beti Padhao**: Led to a **9% improvement in female school enrollment** in Haryana, which had a low sex ratio.
  - **Digital India & PM e-Vidya**: Bridging the rural-urban digital divide in education.
  - **India's Gross Enrollment Ratio (GER) in higher education**: Increased from **25.8% (2017) to 28.4% (2023)**. India's **literacy rate** (2023): **77.7%** (as per NSO report).
  - Gender gap in literacy: **Male literacy - 84.7%, Female literacy - 70.3%**.
  - Of the nearly 25 crore students who enrol for school education every year in the country, only **28.3% enrol for higher education** and this is a cause for serious concern.
  - **Right to Education Act (RTE), 2009**: Provides free and compulsory education to children aged 6-14.
  - **Sarva Shiksha Abhiyan (SSA)**: Aims to achieve universal elementary education.
  - **National Education Policy (NEP), 2020**: Focuses on holistic education, vocational training, and digital learning.
  - **Mid-Day Meal Scheme**: Provides free meals to school children to improve nutrition and attendance.
  - **PM SHRI Schools**: A new initiative to modernize school education with smart classrooms and skill-based learning.

- **Poverty Alleviation**: Despite economic growth, **poverty remains a challenge**, especially in rural areas.
    - **Multidimensional Poverty Index (MPI) 2023**: 13.5 crore people lifted out of poverty between 2015-2021.
    - **Poverty in rural India fell from 32.59% to 19.28**% while in urban areas it declined from 8.65% to 5.27% as per Niti Ayog.
    - **National Food Security Act (NFSA), 2013**: Provides subsidized food grains to 67% of the population.
    - **Pradhan Mantri Garib Kalyan Anna Yojana (PMGKAY)**: Free food distribution during COVID-19.
    - **Mahatma Gandhi National Rural Employment Guarantee Act (MGNREGA)**: Guarantees 100 days of wage employment to rural households.
    - **Deendayal Antyodaya Yojana (DAY-NULM and DAY-NRLM)**: Focuses on urban and rural poverty alleviation.
- **Social Security and Welfare:** Social security measures provide **financial and social protection** to vulnerable groups like senior citizens, women, children, and the differently-abled.
    - India's Insurance penetration is 4% compared to 6.5% globally.
    - Only 21% money in bank accounts belongs to women as per NSO data. Only 36% bank accounts are held by women.
    - Only 38% of households in India are digitally literate as per NSS 78th round of the Multiple Indicator Survey.
    - **Pradhan Mantri Jan Dhan Yojana (PMJDY)**: Ensures financial inclusion through bank accounts.
    - **Atal Pension Yojana (APY)**: Provides pension benefits to workers in the unorganized sector.
    - **PM Ujjwala Yojana**: Provides LPG connections to women in poor households.
    - **Poshan Abhiyan**: Focuses on reducing malnutrition among women and children.

KEY CONCERNS IN THE SOCIAL SECTOR:

- **Poor Quality of Education and Low Learning Outcomes**
    - **Insufficient infrastructure**: Lack of classrooms, digital facilities, and well-trained teachers.
    - **High dropout rates**: Due to lack of financial support, poor mid-day meal quality, and inadequate facilities.
    - **Skill gap**: Lower funding leads to inadequate vocational training, affecting employability.

- 23% of government schools **don't have electricity**, and 16% **lack drinking water facilities** (ASER 2023).
- **India's public expenditure on education**: **2.9% of GDP** (2023), far below the **6% target** set by NEP 2020.
- China spends **4.3% of GDP**, USA **6.1%**, while Nordic countries spend **7-8%**.

- **Weak Healthcare System and High Out-of-Pocket Expenditure**
  - **Doctor shortage**: India has 1 doctor per 1,456 people, worse than WHO's recommended 1:1000 ratio.
  - **Limited primary healthcare facilities:** Rural areas lack hospitals and medical staff.
  - **High out-of-pocket expenses (OOPE):** Families bear over 50% of healthcare costs due to inadequate public healthcare.
  - **WHO Report (2023):** 55 million Indians fall into poverty annually due to high medical expenses.
  - **India's health expenditure:** 2.1% of GDP (2023), far below the global average of 6%.
  - **India accounts for 1/3rd of the world's stunted children** (UNICEF 2023).
- **Persistent Poverty and Inequality**
  - Lower investment in poverty alleviation schemes results in slow poverty reduction.
  - Rural-urban divide: Less funding for rural welfare programs leads to unequal development.
  - Budget for MGNREGA (2023-24) reduced to ₹60,000 crore, down from ₹89,400 crore (2020-21), leading to fewer workdays for rural workers.
- **Rising Unemployment and Informalization of Workforce**
  - Lower funding for skill development results in a mismatch between education and industry needs.
  - Limited job creation in the formal sector, leading to more informal and low-paying jobs.
  - Pradhan Mantri Kaushal Vikas Yojana (PMKVY): Trained 1.25 crore youth, but only 20% got formal jobs due to lack of industry linkages.
- **Social Security and Welfare Gaps**
  - Lower pension and insurance coverage for the unorganized sector due to insufficient funding.
  - Inadequate financial support for senior citizens, widows, and differently-abled individuals.
  - **Atal Pension Yojana (APY)**: Covers only 5 crore workers, leaving 90% of informal workers without pension coverage.

- Only 20% of India's workforce has social security benefits, compared to 70-80% in developed countries.

- **Gender Inequality and Women's Empowerment Challenge**
  - Low funding for women-centric schemes results in limited access to healthcare, education, and financial independence.
  - **Budget allocation for Women and Child Development (2023-24)**: Reduced by **8%**, affecting **nutrition and women's safety programs**.
- **Overall Impact on Economic Growth and Development**
  - Lower investment in **human capital development** leads to **lower productivity**.
  - **Social sector spending multiplier**: Every ₹1 spent on **education and health** can add ₹4-5 to GDP (World Bank).
- **Rising Inequality and Social Unrest**
  - Wealth gap widens, leading to social tensions and economic instability
  - Unequal access to resources affects national cohesion and progress.
  - Top 10% of Indians hold 77% of the country's wealth (Oxfam Report 2023), highlighting the inequality gap.

WAY FORWARD:

Increasing Public Investment in Social Sector

- **Kothari Commission (1964-66)**: Recommended **6% of GDP** for education (NEP 2020 reiterated).
- **National Health Policy 2017**: Proposed increasing health expenditure to **2.5% of GDP**, but remains at **2.1%**.
- **Nordic Model (Norway, Sweden, Denmark)**: These countries **invest 7-8% of GDP in education & healthcare**, ensuring universal coverage and strong human development.
- **Kerala**: Allocates **5% of its GSDP to healthcare**, achieving the lowest **infant mortality rate (IMR 6 per 1000 births)** in India.
- **Tamil Nadu**: Has **one of the best Public Distribution Systems (PDS)**, ensuring food security for the poor.

Strengthening Education System

- **NEP 2020**: Focuses on **foundational literacy, digital learning, and vocational training**.
- **Germany's Dual Education Model**: Combines **classroom learning with industry apprenticeships**, ensuring **over 90% employability**.
- **Finland's Education Model**: No exams till age 16, **teacher training is rigorous**, ensuring high learning outcomes.

- **Delhi's "Happiness Curriculum"**: Focuses on **mental well-being and life skills**, improving student engagement.

Improving Healthcare & Universal Health Coverage

- **Bhore Committee (1946)**: Recommended **universal health coverage & primary healthcare strengthening**.
- **UK's NHS Model**: Provides **free universal healthcare** with **3.5% GDP spending on primary care alone**.
- **Thailand's Universal Health Coverage (UHC) Scheme**: Covers **100% of citizens** with **low out-of-pocket expenses**.
- **Tamil Nadu's Drug Procurement Model**: Ensures **low-cost medicines** through centralized procurement.
- **Kerala's Primary Health Centers (PHCs)**: Provides **high-quality maternal and child healthcare services**.

Employment Generation and Social Security Expansion

- **Arjun Sengupta Committee (2006)**: Recommended **universal social security for informal workers**.
- **Germany's Apprenticeship System**: Guarantees **youth employment through industry training programs**.
- **South Korea's Employment Insurance**: Provides **income support & reskilling to unemployed workers**.
- **Karnataka's Skill Development Mission**: Trains youth in **AI, robotics, and manufacturing**.
- **Odisha's KALIA Scheme**: Provides **direct income support to farmers**, reducing rural distress.

Enhancing Poverty Alleviation and Welfare Delivery

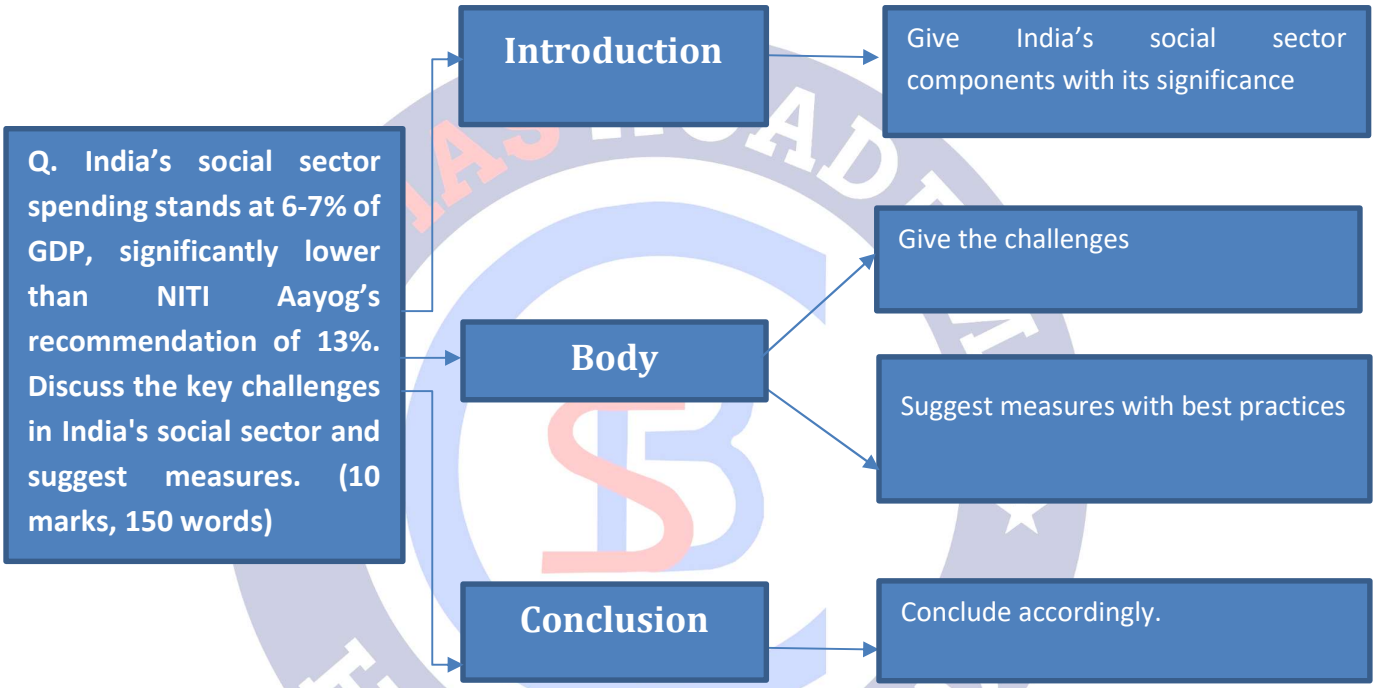
- **UNDP's Direct Benefit Transfer (DBT) Model**: Used in **Brazil & Mexico** for efficient subsidy transfer.
- **China's Targeted Poverty Alleviation Program**: Lifts **10 million people out of poverty annually** through **direct state interventions**.
- **Chhattisgarh's PDS reforms**: Uses **biometric authentication**, reducing leakages.
- **Madhya Pradesh's Ladli Laxmi Yojana**: Provides financial aid for girls' education.

Women's Empowerment and Gender Equality

- **Verma Committee (2013)**: Proposed **fast-track courts & stronger legal protections for women**.

- **Iceland's Equal Pay Law**: Mandates **equal wages for men and women**.
- **Sweden's Parental Leave Policy**: Ensures **equal parental responsibilities** to boost women's workforce participation.
- **Telangana's SHE Teams**: Focuses on **women's safety & crime prevention**.
- **Maharashtra's Financial Inclusion Schemes**: Provides **low-interest loans to women entrepreneurs**.

APPROACH



MODEL ANSWER

The **social sector** in India refers to areas of governance and public policy that focus on **human development, social welfare, and quality of life improvement**, covering **education, healthcare, poverty alleviation, employment, social security, and gender equality**, plays a crucial role in human development. However, **India's social sector spending (6-7% of GDP)** is much lower than the **13% recommended by NITI Aayog**, leading to persistent challenges.

Key Challenges in India's Social Sector

1. **Education Deficiencies**: India spends **only 2.9% of GDP on education**, far below NEP 2020's **6% target**. **50% of Class 5 students** cannot read a Class 2-level text (ASER 2023).

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2. **Healthcare Gaps**: **2.1% of GDP**, far below the **global average of 6%**. **55 million Indians** fall into poverty annually due to healthcare costs (WHO 2023).

3. **Poverty**: **90% of workers lack job security**. MGNREGA funding **reduced from ₹89,400 crore (2020-21) to ₹60,000 crore (2023-24)**.

4. **Gender Inequality**: **Low Female Workforce Participation**: **32.8% (2023)**. **8% reduction in 2023-24**, affecting nutrition and safety programs.

5. **Rising Unemployment and Informalization of Workforce:** Lower funding for skill development results in a mismatch between education and industry needs.
6. **Social Security and Welfare Gaps:** Lower pension and insurance coverage for the unorganized sector due to insufficient funding. Inadequate financial support for senior citizens, widows, and differently-abled individuals.

Way Forward:

- **Education Reforms**: **Finland's education model** (no exams till age 16, high teacher training standards). **Delhi's Happiness Curriculum** (focus on life skills). **Kothari Commission** – Increase education spending to **6% of GDP**.
- **Healthcare Strengthening**: **UK's NHS Model** (universal healthcare). **Tamil Nadu's drug procurement system** (low-cost medicines). **Bhore Committee (1946)** – Strengthen **primary healthcare infrastructure**.
- **Employment and Social Security Expansion**: **Germany's apprenticeship system** (skill-based employment). **Odisha's KALIA Scheme** (direct income support for farmers). **Arjun Sengupta Committee (2006)** – Expand **social security for informal workers**.
- **Gender Equality and Women's Empowerment**: **Iceland's Equal Pay Law**. **Telangana's SHE Teams** (women's safety). **Verma Committee (2013)** – Fast-track courts for **women's safety**.

To achieve **sustainable and inclusive development**, India must **increase social sector spending**, adopt **global best practices**, scale up **successful state-level initiatives**, and implement **expert recommendations**. Strengthening the **social sector** will not only **reduce inequality** but also ensure **long-term economic growth and human development**.

19. CIRCULAR ECONOMY

iMPACT ANALYSIS

SYLLABUS:

GS 3 > Environment and Ecology >> Conservation

REFERENCE NEWS:

India launched the **Cities Coalition for Circularity (C-3),** a multi-nation alliance for city-to-city collaboration, knowledge-sharing, and private sector partnerships for sustainable urban development. This forum would provide a critical platform for policymakers, industry leaders, researchers, and development partners to discuss and implement sustainable solutions for waste management and resource efficiency as economies in the Asia-Pacific region.

Prime Minister Narendra Modi, said India follows and strongly advocates the **P (Pro-Planet People) approach** and highlighted the role of **3Rs and circular economy principles** in ensuring sustainable urban development and resource efficiency. A major milestone was the adoption of the **Hanoi 3R Declaration (2013-2023),** which outlined 33 voluntary goals for shifting towards a more resource-efficient and circular economy.

CIRCULAR ECONOMY:

- A **circular economy** is an **economic system aimed at eliminating waste, reusing resources, and regenerating natural systems**.
- Unlike the traditional **linear economy** (take-make-dispose model), a circular economy promotes **reduce, reuse, recycle, and recover** principles to ensure sustainable development.
- It is a **sustainable economic model** of production and consumption, which involves sharing, leasing, reusing, repairing, refurbishing and recycling existing materials and products for as long as possible. This in turn **extends the life cycle of the product.**

Key Principles of a Circular Economy

- **Design Out Waste and Pollution:** Products should be designed for longevity, repairability, and recyclability. (For example, Apple's self-repair kits for iPhones).
- **Keep Products and Materials in Use**: Reuse, refurbish, remanufacture, and recycle materials instead of discarding them. (For example, Tata Steel in India recycles 99% of its process waste).

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- **Regenerate Natural Systems**: Restoring ecosystems through composting, regenerative agriculture, and sustainable forestry. Dutch agriculture promotes circular farming, reducing chemical fertilizers

CITIES COALITION FOR CIRCULARITY: It is a multi-nation alliance designed **to help urban centres adopt circular economy principles** by integrating sustainable practices into **urban planning, waste management, and resource utilization**.

Some key initiatives for India to promote Circular economy:

- **National Resource Efficiency Policy (NREP)-** launched in 2019 with the objective of promoting sustainable production and consumption patterns, enhancing resource efficiency, and reducing the environmental impact of economic activities.
- **Steel scrap recycling policy and Vehicle scrapping policy** have also been launched with the same objectives.
- **Extended Producer Responsibility (EPR)-** EPR is a regulatory framework that makes manufacturers and producers responsible for the post-consumer waste generated by their products.
- The Government has notified various rules, such as the Plastic Waste Management Rules, e-Waste Management Rules, Construction and Demolition Waste Management Rules, Metals Recycling Policy.
- **Bio-Economy and Biofuels**- Pradhan Mantri JI-VAN Yojana, Galvanizing Organic Bio-Agro Resources (GOBAR) Dhan scheme and Sustainable Alternative Towards Affordable Transportation (SATAT) Scheme, promote circular economy in the agricultural sector by converting agri-waste into ethanol and compressed Bio-gas (CBG).
- **Initiatives of NITI Aayog-** NITI Aayog has taken initiatives to address the challenges in the utilization of waste as resource. Promotion of the usage of fly ash and slag produced in the steel industry in other sectors.

SIGNIFICANCE OF CIRCULAR ECONOMY:

Economic Significance

- **Boosting GDP and Economic Growth:** A circular economy can add $624 billion to India's GDP by 2050 (NITI Aayog). Resource efficiency can improve **India's manufacturing competitiveness** and reduce dependence on imports.
    - The **construction industry** accounts for **30% of India's solid waste**. Circular practices like **using recycled materials** can reduce costs and drive the real estate sector.
- **Job Creation and New Business Opportunities:** The **circular economy can generate 1.4 crore new jobs by 2030** (World Economic Forum). It creates opportunities in **waste management, recycling, renewable energy, and remanufacturing sectors**.
    - The **e-waste recycling industry in India** is expected to grow at **30% CAGR** and create thousands of jobs. Companies like **Attero Recycling** are leading this transformation.

Environmental Significance

- **Reduction in Pollution and Waste Generation:** India generates **62 million tonnes of solid waste annually**, of which **only 43% is processed**. A circular economy can **reduce landfill waste**, **legacy waste** leading to better air, water, and soil quality.
    - India's **Plastic Waste Management Rules (2022)** mandate **Extended Producer Responsibility (EPR)**, ensuring companies recycle plastic waste.
- **Lower Greenhouse Gas (GHG) Emissions:** Circular economy strategies can **reduce India's carbon emissions by 40% by 2050** (TERI Report). Recycling and reusing materials **consume less energy** compared to raw material extraction.
    - **Tata Steel's Zero Waste Circular Economy Model** reuses **99% of process waste**, reducing emissions significantly.
- **Water Conservation and Sustainable Agriculture:** Circular economy practices in agriculture can **reduce water consumption by 20%**. **Recycling wastewater for irrigation** can ensure water security. Reuse of treated greywater can be promoted.
    - **Israel's water recycling system** reuses **85% of wastewater** for agriculture. India can adopt similar models to address its water scarcity issues.

Resource Security and Self-Reliance

- **Reducing Import Dependency:** India depends on imports for **critical raw materials like lithium, cobalt, and rare earth metals**. A circular economy can promote **urban mining and metal recovery from e-waste**, reducing import dependence.
    - **Attero Recycling extracts lithium from used batteries**, supporting India's electric vehicle (EV) industry.

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- **Sustainable Energy Transition:** CE can enhance the **lifespan of renewable energy components**, making the transition to green energy more efficient. Recycling solar panels and wind turbines can reduce **electronic and industrial waste**.
    - **India aims to recycle 10 GW of solar panels by 2030**, creating a sustainable energy supply chain.

Social and Health Benefits

- **Improving Public Health:** Open dumping of waste leads to **air and water pollution**, causing health hazards. Proper waste management in CE reduces diseases like **respiratory infections, diarrhoea, and cancer risks**.
    - **Sweden's circular waste management** ensures **99% waste recycling**, reducing landfill pollution. India can adopt similar models.
- **Enhancing Livelihoods in the Informal Sector: India's informal waste sector employs 1.5 million workers**, who lack proper safety measures. A structured circular economy can improve **working conditions and income stability** for these workers.
    - The **Swachh Bharat Mission** has formalized waste pickers into **organized recycling cooperatives** in cities like Pune.

Industrial and Technological Advancement

- **Circular Manufacturing and Industrial Symbiosis: Industrial waste from one sector can be a resource for another** (Industrial Symbiosis). CE promotes **remanufacturing, refurbishment, and upcycling** to extend product lifespans.
    - **Japan's "Sound Material-Cycle Society"** ensures that **95% of old vehicles are recycled** into new ones.
- **Innovation and Research in Sustainable Materials:** Circular economy encourages **R&D in biodegradable materials, recyclable packaging, and eco-friendly products**.
    - **Reliance Industries' R-Elan fabric** is made from **recycled plastic bottles**, reducing plastic pollution.

Global Competitiveness and Policy Alignment

- **Aligning with Global Sustainability Goals:** A circular economy supports **India's commitment to the Paris Agreement** and **UN Sustainable Development Goals (SDGs)**.
    - The **Netherlands aims to be 100% circular by 2050**, setting an example for India's long-term sustainability goals.
- **Strengthening India's Trade and Exports:** Countries are adopting **strict environmental regulations**; India's exports can benefit from circular production models. **Eco-friendly and sustainable products** can enhance India's global market competitiveness.

- **Germany's Green Dot system** ensures manufacturers take back packaging waste. India can implement similar policies for export industries.

CHALLENGES OF CIRCULAR ECONOMY:

- **Lack of Awareness and Consumer Participation:** Low awareness among industries and consumers limits adoption of circular practices. Businesses still prefer **linear economic models (take-make-dispose)** due to ease of operation.
  - Only 38% of Indian households are digitally literate (NSS 78th Round), making awareness campaigns on circular economy difficult to reach the masses.
  - Consumer preference for cheap, non-recyclable plastic packaging remains high despite bans.
- **Inadequate Waste Collection and Recycling Infrastructure:** India generates 62 million tonnes of solid waste annually, but only 43% is processed (MoHUA Report 2023). Lack of **segregation at source** makes recycling inefficient.
  - E-waste in India (2 million tonnes annually): Only 22% is formally recycled due to poor collection mechanisms.
  - Plastic waste (3.2 million metric tonnes annually): Only 60% is recycled, compared to 90% in Germany.
- **High Initial Investment and Economic Barriers:** Setting up circular economy infrastructure requires high capital investment. Recycling technologies (like urban mining for metals) need government subsidies to become viable.
  - Battery recycling for electric vehicles (EVs) requires advanced technology, and India imports 90% of lithium-ion batteries due to lack of local recycling facilities.
  - Small businesses cannot afford biodegradable packaging, leading to continued use of single-use plastics.
- **Weak Policy Implementation and Regulatory Gaps:** Circular economy policies exist but lack strict enforcement. Extended Producer Responsibility (EPR) for e-waste and plastic lacks monitoring mechanisms.
  - India's EPR policy for plastic waste (2022) covers only 3,000 companies, leaving many small-scale producers unregulated.
  - Construction and Demolition (C&D) waste recycling policy is poorly implemented, leading to 90% of C&D waste being dumped illegally.
- **Fragmented and Informal Waste Management Sector: 90% of waste collection is handled by the informal sector**, which lacks safety, technology, and investment. Formalizing the sector is **challenging due to lack of coordination and policy gaps**.
  - India has **1.5 million informal waste pickers**, but **only 5% are formally recognized**, leading to **low efficiency in recycling processes**.

- **Sweden recycles 99% of waste due to formalized systems**, whereas India still struggles with **waste-to-energy plant failures**.

- **Low R&D Investment in Circular Technologies:** India lags behind in research on biodegradable materials, waste-to-energy, and recycling technologies. **Lack of incentives** for private companies to develop sustainable alternatives.
  - Tata Steel's zero-waste steel production is an exception, while most small and medium industries lack resources to innovate.
  - Japan recycles 95% of vehicles, whereas India scraps over 8 million vehicles annually with poor recycling practices.
- **Limited Market for Recycled Products:** Lack of demand for recycled products due to consumer mindset and lack of standardization. Quality of recycled products is often lower, making them less competitive.
  - Recycled plastics are 10-15% more expensive than virgin plastics, discouraging businesses from using them.
  - India's Green Building Movement is growing slowly, with only 7% of new buildings using recycled materials.
- **Challenges in Agricultural and Water Recycling Sectors:** Circular practices in agriculture (like composting, organic farming, and wastewater recycling) are still underutilized. **Lack of incentives** for farmers to adopt regenerative agriculture.
  - **Zero Budget Natural Farming (ZBNF) in Andhra Pradesh** is **successful**, but adoption remains low due to **lack of financial support**.
  - **Israel recycles 85% of wastewater for agriculture**, whereas India recycles **less than 30% of urban wastewater**.

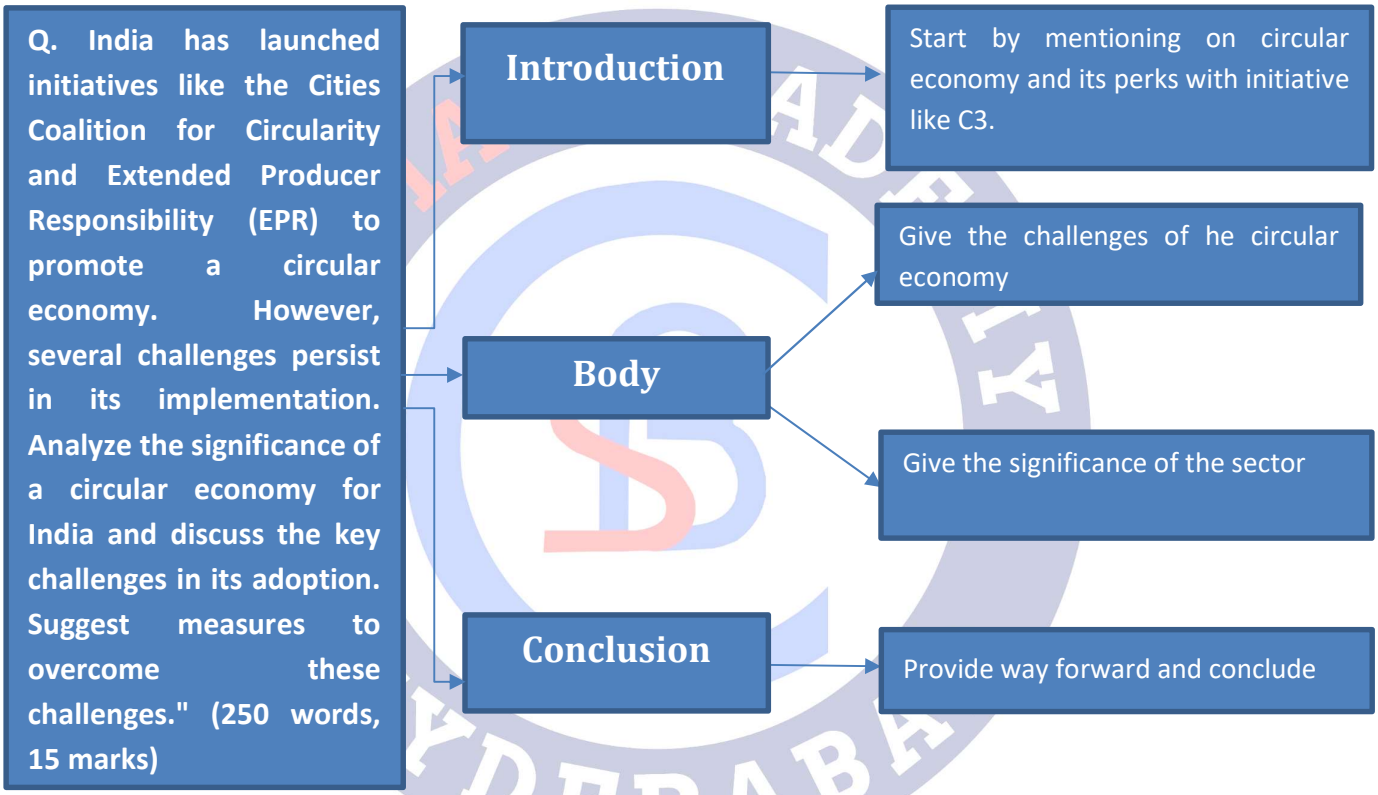
WAY FORWARD:

- **Stronger Policy Enforcement**: Strict monitoring of EPR compliance and penalties for non-compliance. Mandatory circular economy targets for industries.
- **Investment in Recycling Infrastructure:** Develop urban mining plants for extracting metals from e-waste. Encourage public-private partnerships (PPP) in waste management.
- **Awareness and Consumer Engagement:** Implement eco-labeling and tax incentives for sustainable products. Strengthen school and university programs on sustainability.
- **Formalizing the Informal Waste Sector:** Incentivize waste pickers with social security benefits. Implement waste collection cooperatives like Sweden's model.
- **R&D and Innovation Support**: Increase government and private sector funding for circular economy research. Promote biodegradable alternatives and sustainable packaging.

PRACTICE QUESTION

Q. India has launched initiatives like the Cities Coalition for Circularity and Extended Producer Responsibility (EPR) to promote a circular economy. However, several challenges persist in its implementation. Analyze the significance of a circular economy for India and discuss the key challenges in its adoption. Suggest measures to overcome these challenges." (250 words, 15 marks)

APPROACH



MODEL ANSWER

A **circular economy (CE)** is a **sustainable economic model** that focuses on **reducing waste, reusing resources, and regenerating ecosystems**. It has got the potential to add $624 billion to India's GDP by 2050 (NITI Aayog). With initiatives like Cities Coalition for circularity India aims to be a global front runner in sustainable development goals. C3 is a multi-nation alliance designed **to help urban centres adopt circular economy principles** by integrating sustainable practices into **urban planning, waste management, and resource utilization**

Significance of Circular Economy in India

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1. **Economic Growth and Job Creation**: It can generate **1.4 crore new jobs by 2030** (World Economic Forum). The **e-waste recycling industry in India** is growing at **30% CAGR**, creating jobs in waste management.

2. **Environmental Sustainability**: India generates **62 million tonnes of solid waste annually**, but only **43% is processed** (MoHUA Report 2023). CE can reduce **landfill waste and pollution**, improving **air, water, and soil quality**. **Tata Steel's Zero Waste Model** recycles **99% of process waste**, cutting emissions.

3. **Resource Security and Import Reduction**: India **imports 90% of lithium-ion batteries** due to limited domestic recycling. CE can promote **urban mining** to recover metals from e-waste.

4. **Social and Health Benefits**: Open dumping leads to **air and water pollution**, causing **respiratory infections and cancer risks**. Proper waste management under CE reduces these risks. **Sweden recycles 99% of its waste**, reducing landfill-related diseases.

Challenges in Implementing Circular Economy in India

1. **Lack of Awareness and Consumer Participation**: **38% of Indian households lack digital literacy** (NSS 78th Round), making CE awareness campaigns ineffective. **Low demand for recycled products** due to consumer mindset and lack of standardization.
    - **Recycled plastics are 10-15% more expensive** than virgin plastics, discouraging businesses.

2. **Inadequate Recycling Infrastructure: India processes only 22% of its e-waste**, compared to **90% in Germany**. Lack of **waste segregation at source** makes recycling inefficient.
    - **90% of Construction & Demolition (C&D) waste** in India is illegally dumped.

3. **High Initial Investment**: Setting up **urban mining plants and waste-to-energy systems** requires **high capital investment**. Small businesses **cannot afford biodegradable alternatives**.
    - India **imports 90% of lithium-ion batteries** due to lack of recycling facilities.

4. **Weak Policy Implementation and Regulatory Gaps: EPR covers only 3,000 companies**, leaving many small-scale producers unregulated. **Construction and Demolition (C&D) waste management rules** are poorly enforced.

5. **Fragmented Informal Waste Sector**: **1.5 million waste pickers in India** lack social security and access to technology. **90% of waste collection is informal**, reducing efficiency.
    - The **Swachh Bharat Mission** helped formalize waste pickers in Pune, but nationwide implementation is lacking.

Way Forward

1. **Stronger Policy Enforcement: Strict monitoring of EPR compliance** with penalties for non-compliance. **Mandatory CE targets for industries** to increase adoption.
2. **Investment in Recycling Infrastructure**: Establish **urban mining plants** to extract metals from e-waste. Develop **waste-to-energy plants** for sustainable power generation.
3. **Awareness and Consumer Engagement**: **Tax incentives for sustainable products** to increase demand. Introduce **eco-labeling** to identify CE-friendly products.
4. **Formalizing the Informal Sector**: **Incentives for waste pickers** through social security schemes. **Waste collection cooperatives** similar to Sweden's model.
5. **Boosting R&D and Innovation**: Increase **government and private sector funding** for CE technologies. Promote **biodegradable alternatives and sustainable packaging**.

India's transition to a **circular economy** is crucial for **economic growth, resource efficiency, and environmental sustainability**. Despite challenges like **low awareness, weak infrastructure, and policy gaps**, targeted reforms in **policy enforcement, investment, and innovation** can accelerate progress. By **adopting global best practices and strengthening domestic initiatives**, India can become a **leader in the circular economy revolution**.

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20. PORT-BASED DEVELOPMENT

iMPACT ANALYSIS

SYLLABUS:

GS 3 > Economic Development >> Infrastructure

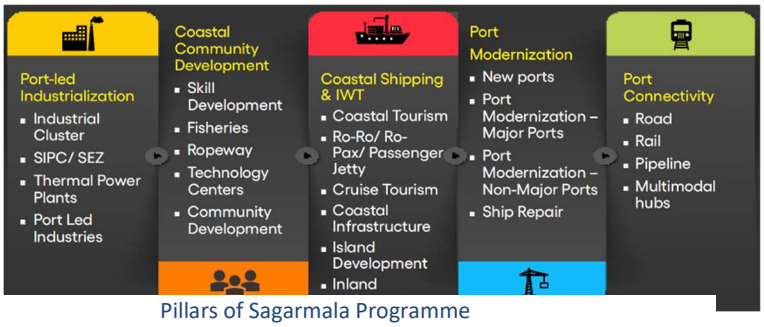
REFERENCE NEWS:

Sagarmala 2.0, aims to attract **₹12 lakh crore investments** over the next decade, focusing on **shipbuilding, repair, breaking, and recycling** to enhance India's maritime sector. At the fourth National Sagarmala Apex Committee (NSAC) meet, Union Minister highlighted Sagarmala's transformative role in **port-led development**.

Currently, **839 projects worth ₹5.79 lakh crore** are being implemented, with **272 projects completed** at **₹1.41 lakh crore**. This includes **234 port modernisation projects** and **279 connectivity projects.** Additionally, **port-led industrialisation, coastal community development, and ₹10,000 crore for 119 projects across coastal states** have been undertaken. Sagarmala 2.0 aims to **bridge infrastructure gaps, drive coastal economic growth, and position India as a global maritime leader**.

SAGARMALA PROGRAMME:

- The Sagarmala Programme, a flagship initiative of the **Ministry of Ports, Shipping and Waterways,** represents a visionary approach by the Government of India to transform the country's maritime sector.
- **Sagarmala aims at port-led prosperity.**
- Sagarmala aims to unlock the untapped potential of India's coastline through **port-led development and coastal community upliftment.**
- Sagarmala seeks to enhance the **performance of the logistics sector** by reducing logistics costs for both domestic and international trade.
- By leveraging coastal and waterway transportation, the program makes logistics more efficient and improving the competitiveness of Indian exports.



Pillars of Sagarmala Programme

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- Sagarmala 2.0 is intended to achieve the **Maritime Amrit Kaal Vision 2047** by positioning India among the world's top 5 shipbuilding nations and expanding port handling capacity to 10 billion metric tonnes annually.
- Key achievements of Sagaramala are:
    - Maritime Infrastructure: More than 100 port modernisation projects have added 230 million tonnes per annum to port capacity.
    - Port Connectivity: Over 80 port connectivity projects have enhanced 1500 km of connectivity to ports.
    - Coastal community development: Fishing harbour projects have positively impacted over 30000 fishermen.

SIGNIFCANCE OF A PORT-LED DEVELOPMENT FOR INDIA:

Boosting Economic Growth & Trade Competitiveness

- **India's Logistics Costs**: India's **logistics cost is 13-14% of GDP**, compared to **8-9% in developed nations**. Efficient ports can **reduce logistics costs**, making Indian exports more competitive.
- **Sagarmala's Economic Impact**: The Sagarmala Programme (2015) aims to reduce logistics costs by ₹35,000-40,000 crore annually. Ports handled 1.48 billion tonnes of cargo in FY 2022-23, a 10% increase from 2021-22.
- **Global Trade Hub Potential**: India's major ports like Jawaharlal Nehru Port Trust (JNPT) and Mundra are becoming key transshipment hubs, reducing dependency on ports like Singapore and Colombo.

Enhancing Connectivity & Reducing Logistics Bottlenecks

- **Sagarmala Connectivity Projects**: 279 connectivity projects worth ₹2.06 lakh crore are improving rail, road, and inland waterways. 92 projects completed, adding 1,500 km of port connectivity.
- **Dedicated Freight Corridors (DFCs)**: Integration of ports with Western and Eastern DFCs enhances seamless cargo movement. JNPT's dry ports in Maharashtra (Navi Mumbai, Wardha) reduce congestion and facilitate faster cargo movement.

Employment Generation & Blue Economy Growth

- **Port-led industrialisation**: ₹55,000 crore investments have led to the development of Coastal Economic Zones (CEZs) and industrial clusters. 9 projects completed out of 14 planned.
- **Fisheries & Coastal Economy**: ₹26,000 crore investment has benefited 30,000 fishermen through better fishing harbours and cold storage.
    - Krishnapatnam Port's SEZ in Andhra Pradesh has attracted significant foreign investments, generating thousands of jobs.

Strengthening Maritime Security & Strategic Presence

- **Naval & Commercial Synergy**: Ports like Chennai, Vizag, and Kochi serve both commercial and strategic purposes. The Sittwe Port in Myanmar (built under India's Kaladan Multimodal Project) enhances India's regional influence.
- **Transshipment & Global Shipping Influence**: India's Vizhinjam Port (Kerala) aims to be a major transshipment hub, reducing dependency on foreign ports.

Promoting Sustainable & Green Shipping

- **Green Ports & Coastal Shipping**: Sagarmala 2.0 focuses on eco-friendly shipbuilding, repair, and recycling. Coastal shipping emits 75% less carbon than road transport, promoting low-emission trade routes.
    - Kandla Port (Deendayal Port) is transitioning towards green energy use.

Boosting India's Shipbuilding Industry & Reducing Import Dependency

- India imports a large share of its shipping fleet, despite having major shipyards like Cochin Shipyard, Mazagon Dock, and Hindustan Shipyard. The global shipbuilding industry is valued at $160 billion, but India's share is less than 1%.
- Development of shipbuilding clusters in Gujarat, Tamil Nadu, and Andhra Pradesh.

Strengthening Ship Repair & Maintenance Industry

- **India's Strategic Location**: India is located along major global shipping routes but lacks world-class ship repair hubs. Most Indian vessels go to Dubai, Singapore, or Colombo for maintenance.
- Planned investments in dry docks and floating docks to cater to global demand.

Enhancing India's Shipbreaking & Recycling Industry

- **India's Leadership in Shipbreaking**: India has 30% of the global shipbreaking market, with Alang (Gujarat) being the world's largest shipbreaking yard. The industry generates steel, machinery, and scrap materials, reducing dependence on imports.
- Alang Shipbreaking Yard handles over 200 ships annually, contributing significantly to steel production.

CHALLENGES OF INDIA'S PORT-LED DEVELOPMENT:

Infrastructure Gaps & Capacity Constraints

- **Port Congestion & Inefficiencies**: India's average turnaround time at ports is 2.5 days, compared to less than 1 day in Singapore and China. Inadequate container handling slows down exports, affecting trade competitiveness.
- **Limited Deep-Draft Ports**: India lacks sufficient **deep-draft ports** to handle large transshipment vessels, leading to reliance on ports like Singapore and Colombo.
    - Vizhinjam Port (Kerala), under construction, aims to reduce transshipment dependency.

High Logistics & Transportation Costs

- **India's logistics cost is 13-14% of GDP**, compared to **8-9% in developed nations**. **Poor last-mile connectivity** results in delays and inefficiencies. **Only 25% of cargo movement is via coastal shipping**, despite being **70% cheaper than road transport**.
    - Despite having a coastline of **7,500 km**, India's freight movement remains **road-dominated (60%)**, increasing costs.

Environmental & Sustainability Concerns

- **Pollution & Coastal Degradation**: Port construction leads to **coastal erosion, loss of biodiversity, and pollution**.
    - **Ennore Port (Tamil Nadu)** faced severe pollution issues affecting local fishermen.
- **Shipbreaking Hazards**: India is a global leader in **shipbreaking (Alang, Gujarat)** but **lacks modern, eco-friendly recycling techniques**.

Slow Implementation & Bureaucratic Delays

- **Delays in Project Execution**: **Out of 839 Sagarmala projects (₹5.79 lakh crore), only 272 have been completed**.
- **Land Acquisition & Clearances**: Acquiring **coastal land for port expansion** faces opposition from **local communities and environmental activists**.
    - The **Chennai Mega Port project**, Great Nicobar Project etc face delays due to land disputes.

Geopolitical & Security Challenges

- **Dependence on Foreign Ports for Transshipment**: Over **25% of India's cargo** is trans-shipped via **Colombo, Singapore, and Dubai**, increasing costs.
- **Chinese Dominance in the Indian Ocean**: China's **String of Pearls strategy** (ports in Gwadar, Hambantota) poses a challenge to India's **maritime security and trade routes**.
    - India's **Chabahar Port in Iran** is aimed at countering China's influence but faces **sanctions-related delays**.

Lack of Skilled Manpower & Innovation

- **Shortage of skilled workers** in shipbuilding, repair, and port logistics.
- **Low adoption of automation & AI** in Indian ports compared to global leaders like Rotterdam and Shanghai.

WAY FORWARD:

Modernizing Port Infrastructure & Enhancing Capacity

- **Developing Deep-Draft Ports:** Build deep-draft ports (18-20 meters) to accommodate large transshipment vessels, reducing reliance on foreign ports.
    - Shanghai Port (China) handles the world's largest ships with deep-draft berths.
- **Port Automation & Smart Operations:** Implement AI-driven cargo handling, blockchain logistics, and automated cranes to reduce delays.

- Rotterdam Port (Netherlands) is fully automated, reducing turnaround time to a few hours.

- **Integrated Port Connectivity:** Invest in rail-road-waterway multimodal networks for seamless cargo movement.
  - Hamburg Port (Germany) has an advanced hinterland connectivity model.

Promoting Green & Sustainable Ports

- **Shifting to Renewable Energy**: Install solar and wind farms at ports to reduce carbon emissions.
  - Los Angeles Port (USA) runs on 100% renewable energy.
- **Eco-Friendly Shipbreaking & Recycling:** Upgrade shipbreaking yards (Alang, Gujarat) with green recycling technology.
  - Norway follows strict environmental regulations for ship recycling.
- **Reducing Maritime Pollution:** Implement low-emission shipping corridors & LNG-powered vessels.
  - Singapore mandates green shipping fuels and carbon credit programs.

Enhancing Coastal Shipping & Inland Waterways

- **Shifting Cargo from Road to Waterways:** Increase coastal shipping share from 25% to 50% to reduce costs and carbon emissions.
  - China's Yangtze River system moves 3 billion tonnes of cargo annually.
- **Developing Smart Inland Ports:** Build inland container depots (ICDs) and dry ports to decongest major ports.
  - Germany's Duisburg Port (largest inland port) efficiently integrates with rail & road networks.

Strengthening Maritime Security & Trade Resilience

- **Developing Indigenous Shipbuilding & Repair Industry:** Boost "Make in India" shipbuilding to reduce import dependency.
  - South Korea is a global leader in shipbuilding due to strong government incentives.
- **Enhancing India's Transshipment Capabilities:** Develop India as a regional shipping hub to rival Colombo & Singapore.
  - Dubai's Jebel Ali Port serves as a key transshipment hub.

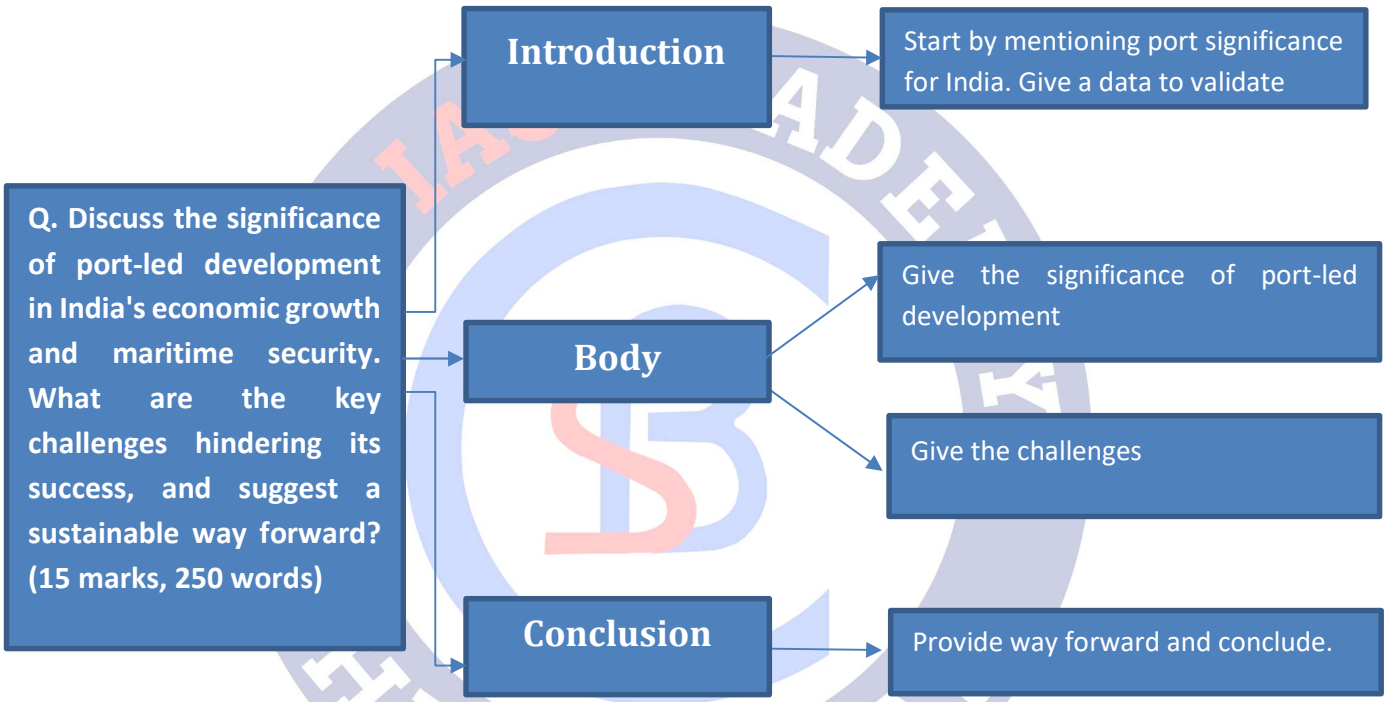
Human Resource Development & Innovation

- **Skilling Workforce in Maritime Technologies:** Establish maritime training institutes for AI-driven port management.
  - Norway trains workers in green ship technologies.
- **Investment in Maritime R&D:** Develop maritime research clusters for ship automation, smart logistics, and sustainability.
  - Singapore's Maritime Innovation Lab focuses on AI-driven port solutions.

PRACTICE QUESTION

Q. Discuss the significance of port-led development in India's economic growth and maritime security. What are the key challenges hindering its success, and suggest a sustainable way forward? (15 marks, 250 words)

APPROACH



MODEL ANSWER

Port-led development is **crucial for India's economic growth, global trade competitiveness, and strategic maritime presence**. Over 95% of India's trade by volume and 65% by value is done using maritime transport facilities at ports

Significance of Port-Led Development

1. **Boosting Economic Growth & Trade:** India's logistics cost (13-14% of GDP) is higher than developed nations (8-9%); efficient ports can reduce costs. Sagarmala aims to reduce logistics costs by ₹35,000-40,000 crore annually. India handled 1.48 billion tonnes of cargo in FY 2022-23, a 10% increase from the previous year.

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2. **Enhancing Maritime Connectivity:** 279 connectivity projects (₹2.06 lakh crore) to improve rail, road, and inland waterway links. JNPT's dry ports in Maharashtra reduce congestion and facilitate faster cargo movement.

3. **Strengthening Maritime Security & Strategic Presence:** Ports like Chennai, Vizag, and Kochi serve both commercial and naval purposes. India's Chabahar Port in Iran counters China's String of Pearls strategy.

4. **Generating Employment & Blue Economy Growth:** ₹55,000 crore investments in Coastal Economic Zones (CEZs) generating industrial jobs. 30,000 fishermen benefited from ₹26,000 crore in coastal infrastructure projects.

Challenges in Port-Led Development

1. **Infrastructure & Logistics Bottlenecks:** India's average port turnaround time (2.5 days) is higher than Singapore and China (<1 day). Limited deep-draft ports force India to rely on Colombo and Singapore for transshipment.

2. **High Logistics Costs & Poor Connectivity:** 60% of freight movement is road-based, despite coastal shipping being 70% cheaper. Land acquisition issues delay expansion of port connectivity projects.

3. **Environmental & Sustainability Concerns:** Coastal erosion and biodiversity loss due to port construction. Alang (Gujarat), the world's largest shipbreaking yard, lacks modern eco-friendly recycling techniques.

4. **Geopolitical & Security Risks:** 25% of India's cargo is transshipped via foreign ports, increasing dependency. China's control over ports in Sri Lanka (Hambantota) and Pakistan (Gwadar) threatens India's maritime security.

Way Forward for Sustainable Port-Led Development

1. **Modernizing Port Infrastructure & Reducing Dependence on Foreign Ports: Develop deep-draft ports (18-20 meters)** to accommodate large transshipment vessels.

   - Shanghai Port (China) efficiently handles mega container ships.

2. **Enhancing Green & Smart Ports:** Use AI-driven port automation and blockchain logistics to improve efficiency.

   - Rotterdam Port (Netherlands) uses full automation, reducing turnaround time.

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3. **Strengthening Coastal Shipping & Inland Waterways:** Increase coastal shipping share from 25% to 50% to reduce costs.
    - China's **Yangtze River system moves 3 billion tonnes annually** via waterways.
4. **Developing Indigenous Shipbuilding & Repair Industry:** Boost "Make in India" shipbuilding to reduce reliance on foreign vessels.
    - South Korea's shipbuilding industry thrives due to government incentives.
5. **Enhancing Maritime Security:** Expand India's naval presence in the Indo-Pacific and EEZ protection.
    - India's Indo-Pacific Oceans Initiative (IPOI) strengthens regional security.

Port-led development under **Sagarmala 2.0 is key to India's economic and strategic rise**. By addressing **infrastructure bottlenecks, logistics inefficiencies, environmental concerns, and geopolitical threats**, India can emerge as a **global maritime powerhouse** and reduce dependency on foreign ports. A **holistic approach integrating economic growth with environmental sustainability** will ensure **long-term maritime prosperity**.

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21. TIGER CONSERVATION IN INDIA

iMPACT ANALYSIS

SYLLABUS:

GS 3 > Environment and Ecology >> Conservation of Wildlife

REFERENCE NEWS:

Madhav National Park in Shivpuri district, Madhya Pradesh, was declared a tiger reserve earlier this month, taking the tally of such reserves in the country to 58. The latest tiger reserve is spread over an area of 1,651 sq km, and currently has six tigers, including a cub. It is hoped that the notification of the new reserve will aid the movement of tigers in the **Ranthambore-Kuno-Madhav National Park corridor,** identified as a promising habitat for a growing tiger population.

TIGER CONSERVATION IN INDIA:

- The upper limit of the tiger population is estimated to be **3925** and the average number is 3682 tigers, reflecting an **annual growth rate of 6.1% per annum**.
- India currently harbours almost **75% of the world's wild tiger population**.
- As per NTCA, big cats occupy around 89000 sq km area.
- Tigers are distributed across the following landscapes- Shivalik Hills and Gangetic plains, Central Indian Highlands and Eastern Ghats, Western Ghats, North Eastern Hills and Brahmaputra floodplains and Sunderbans.
- The largest tiger population of **785 is in Madhya Pradesh**, followed by **Karnataka (563), Uttarakhand (560),** and **Maharashtra (444).**
- The study by the journal Science revealed that only **25% of the tiger habitats were in core areas of the tiger reserves,** while buffer areas accounted for 20% of the big cat's habitat.
- **Corbett with 260 tigers** boasts the largest population of the big cat followed by Bandipur (150), Nagarhole (141), Bandhavgarh (135), Dudhwa etc.
- **Tiger Conservation Plans** (TCPs) ensure:
    - Protection & Habitat Management: For tigers, prey, and co-predators.

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- **Ecologically Compatible Land Use**: Ensuring corridors between reserves while considering local livelihoods.
- **Source-Sink Model**: Source areas have growing tiger populations. Sink areas have declining populations, where new tigers are introduced.

- **How Are Tiger Reserves Established?**
  - A State Government submits a proposal to the Centre.
  - The NTCA reviews it and recommends approval.
  - The State Government then notifies the area as a Tiger Reserve.
- **How Are Tiger Reserves Funded?**
  - Centre provides 60% of conservation funds, and States cover 40%.
  - For Northeastern & Himalayan States, the Centre covers 90% of the funds.

EVOLUTION OF TIGER CONSERVATION IN INDIA:

- **Pre-Independence Period: Tigers were extensively hunted** by British officials and Indian royalty as a symbol of power and bravery. **Deforestation and land conversion** for agriculture and settlements reduced tiger habitats. No formal conservation policies existed.
- **Post-Independence Period (1947-1972)**
  - In 1964, it was estimated that there would have been around 40,000 tigers in the country at the turn of the 20th century.
  - By the 1960s, these numbers were down to between 2,000 and 4,000, attributed to wanton hunting aided by a proliferation of gun licences issued in the years following 1947, improved access to the forest, clearing of large tracts of forests for various purposes, mushrooming of the new businesses of "Shikar Companies" and fur trade
  - **1969:** The **Indian Board for Wild Life (IBWL)** recommended a **total ban on the export of wild cat skins**, including tigers.
  - The 10th Assembly of IUCN met in Delhi and listed the tiger as an endangered species in its Red Data Book. IUCN also passed a resolution calling for a ban on tiger hunting.
  - **1972:** Tiger numbers dropped to 1,863, leading Prime Minister Indira Gandhi to form an 11-member Task Force to study the issue. The Task Force recommended eight tiger forests to be brought under a conservation mission called 'Project Tiger'.
- **Project Tiger (1973 - Present):** April 1, 1973 Project Tiger was launched at Corbett Tiger Reserve.
  - Nine tiger reserves were created across India: Corbett (Uttarakhand), Palamau (Jharkhand), Simlipal (Odisha), Sundarbans (West Bengal), Manas (Assam),

Ranthambore (Rajasthan), Kanha (Madhya Pradesh), Melghat (Maharashtra) and Bandipur (Karnataka)

- The program focused on: **Strict anti-poaching laws, habitat preservation and restoration, relocation of villages from core areas and use of scientific methods for tiger census**

- **Strengthening Conservation Measures:**
  - Project Tiger (replaced by the National Tiger Conservation Authority (NTCA) since 2006 under Wildlife Protection Act 1972) requires every tiger reserve to follow a **site-specific management plan.**
  - It introduced a scientific approach to managing protected areas by creating a **Core Zone – A fully protected area for tigers** and **Buffer Zone – A surrounding area with controlled human activity.**
  - The guidelines focus on protection, habitat improvement, animal estimation, and data collection on wildlife changes.

SIGNIFICANCE OF TIGER CONSERVATION IN INDIA:

- **Ecological Importance**
  - **Keystone Species**: Tigers regulate the population of herbivores like deer, preventing overgrazing and maintaining forest health.
    - In **SatkosiaTiger Reserves**, the extinction of tigers led to an **imbalance in prey species**, negatively affecting the ecosystem.
  - **Umbrella Species:** Protecting tigers leads to the conservation of entire ecosystems, including diverse flora and fauna.
  - **Forest and Water Conservation**: Tiger reserves protect vital forests, which serve as watersheds, ensuring water security for millions.
- **Enhanced conservation management of tiger reserves** in India has helped avoid forest loss, preventing one million metric tons of carbon dioxide equivalent emissions. This represents $93 million in ecosystem services from the avoided social cost of emissions.
  - Among 15 tiger reserves that showed significant results, 11 had avoided deforestation while 4 reserves showed a higher-than-expected rate of forest loss.
- **Eco-Tourism Generates Revenue**: **Corbett Tiger Reserve** (Uttarakhand) attracts **over 3 lakh visitors annually**, generating **₹75 crore in revenue** and supporting thousands of local jobs.
- **Symbol of India's Natural Heritage**: The tiger is India's **national animal**, representing strength and biodiversity
- **International Commitments:**
  - **Global Biodiversity Goals**: Tiger conservation aligns with **UN Sustainable Development Goals (SDGs)** and the **Global Tiger Initiative**.

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- **Cross-Border Collaboration**: Protecting tigers strengthens India's conservation ties with Nepal, Bhutan, and Southeast Asian countries.

- **Human-Wildlife Conflict Reduction:**
  - **Proper Tiger Conservation Reduces Conflict**: Well-managed reserves prevent tigers from straying into human settlements.
  - The **Madhya Pradesh government** used **radio collars and camera traps** to track and prevent tiger movement into villages, reducing human-animal conflict.

CHALLENGES OF TIGER CONSERVATION IN INDIA:

- **Habitat Loss and Fragmentation:** Tiger habitats are shrinking due to deforestation, infrastructure projects, and human encroachment. India has lost **1.4 million hectares of forest** between 2001-2020 (Global Forest Watch).
  - The **Rajaji Tiger Reserve (Uttarakhand)** is divided by highways and railway lines, restricting tiger movement and increasing roadkill incidents.
  - Only **10% of India's tiger population** lives in large, undisturbed habitats, while **90% are in fragmented areas** (NTCA).
  - Discontinuous tiger corridors leading to stranded population and habitats.
- **Human-Wildlife Conflict:** As tiger populations grow and habitat reduce, they increasingly enter human settlements, leading to attacks on livestock and people.
  - India recorded **307 tiger deaths in 2023**, with many cases linked to conflict and retaliation killings (WII).
- **Poaching and Illegal Wildlife Trade:** Tigers are poached for their skins, bones, and body parts, which are highly valued in illegal markets.
  - **124 tigers were poached between 2012-2022**, with many linked to international trafficking (TRAFFIC India).
  - **Organized poaching syndicates**, such as the Baheliya tribe, were responsible for large-scale killings in the early 2000s.
  - **Seizures of tiger parts increased by 42% in South Asia between 2000-2022**, with India accounting for the highest cases (Wildlife Protection Society of India).
- **Climate Change and Rising Temperatures:** Climate change affects prey availability, water sources, and increases natural disasters. Rising temperatures and erratic rainfall impact tiger breeding cycles and prey density.
  - The **Sundarbans Tiger Reserve** is under threat due to **rising sea levels**, with **over 7,000 hectares submerged in the past 20 years** (World Bank Report, 2022).
  - **India's tiger habitat is expected to shrink by 23% by 2070** if global temperatures rise beyond 2°C (WII Study).
- **Lack of Genetic Diversity:** Small, isolated tiger populations face inbreeding, reducing genetic fitness and survival rates.
  - The **Panna Tiger Reserve (Madhya Pradesh)** lost all its tigers in the early 2000s due to genetic stagnation and poaching. Tigers in the **Sariska Reserve** had to be reintroduced from Ranthambore due to local extinction.

- **Only 25-30% of India's tiger reserves have strong genetic diversity** to sustain long-term populations (NTCA, 2023). There has been melanistic tigers in Simlipal Reserve.

- **Insufficient Funding and Management Gaps:** Many tiger reserves lack sufficient financial and human resources for effective conservation. India's **budget allocation for tiger conservation is lower than other wildlife programs**, leading to funding gaps.
  - **Less than 15% of allocated funds** for Project Tiger were used effectively in some states in 2022 (CAG Report).
  - In the **Northeastern and Himalayan states**, **only 50% of tiger reserves have proper monitoring systems** (NTCA, 2023).
- **Canine Distemper Virus (CDV) Threat: A fatal virus** spreading from **domestic dogs to tigers** in reserves like **Ranthambore**. CDV affects the **respiratory, digestive, and nervous systems** of tigers. Previously caused **lion deaths in Gir National Park, Gujarat**.

KEY INITIATIVES OF TIGER CONSERVATION:

- **Conservation Assured Tiger Standards (CA|TS):** Launched in 2013, CA|TS sets global standards for best practices in tiger conservation. **17 tiger reserves in India** are CA|TS-accredited. Helps in fulfilling the **Convention on Biological Diversity's (CBD) goals** and is linked to the **IUCN Green List of Protected Areas**.
- **St. Petersburg Declaration (TX2 Program by WWF)**: Double the world's tiger population by **2022** (Chinese Year of the Tiger). **India is a signatory** to this declaration, launched in 2010. **Nepal is the first country** to achieve the **Tx2 goal** of doubling its tiger population.
- **Other Global Initiatives**
  - **Global Tiger Initiative (GTI) (2008)**: A global alliance including the **World Bank and Global Environment Facility (GEF)**. Initially focused on tigers but expanded to **snow leopards** in 2013. Led by **13 tiger range countries**, including **India, Nepal, Bhutan, Bangladesh, and Russia**.
  - **Global Tiger Forum (GTF)**: An **intergovernmental body for tiger conservation**. **Seven members** India, Nepal, Bhutan, Myanmar, Bangladesh, Cambodia, and Vietnam. Headquarters at **New Delhi, India**.
- **Tiger Corridors in India: NTCA & Wildlife Institute of India** mapped **32 major tiger corridors**. **No legal provision** under the **Wildlife Protection Act, 1972** to notify and conserve corridors. To solve the issue, states should declare corridors as **Eco-Sensitive Zones, Conservation Reserves, or Community Reserves**.
- **Tiger Conservation Foundation (TCF): State Governments establish TCFs** to support **tiger conservation and eco-tourism**. Covers **tiger reserves and nearby landscapes** that serve as corridors for tiger movement.
- **Eco-Bridges for Tigers**: Helps tigers **cross barriers like roads and canals** safely. Telangana built an **eco-bridge over a canal** connecting **Tadoba-Andhari Tiger Reserve (Maharashtra) and Komaram Bheem Asifabad Forest (Telangana)**.

- **E-Eye Surveillance System**: Uses **thermal and infrared cameras** to monitor tigers and prevent **poaching and human-animal conflict**. Being expanded to more **wildlife sanctuaries** for **better tracking and security**.

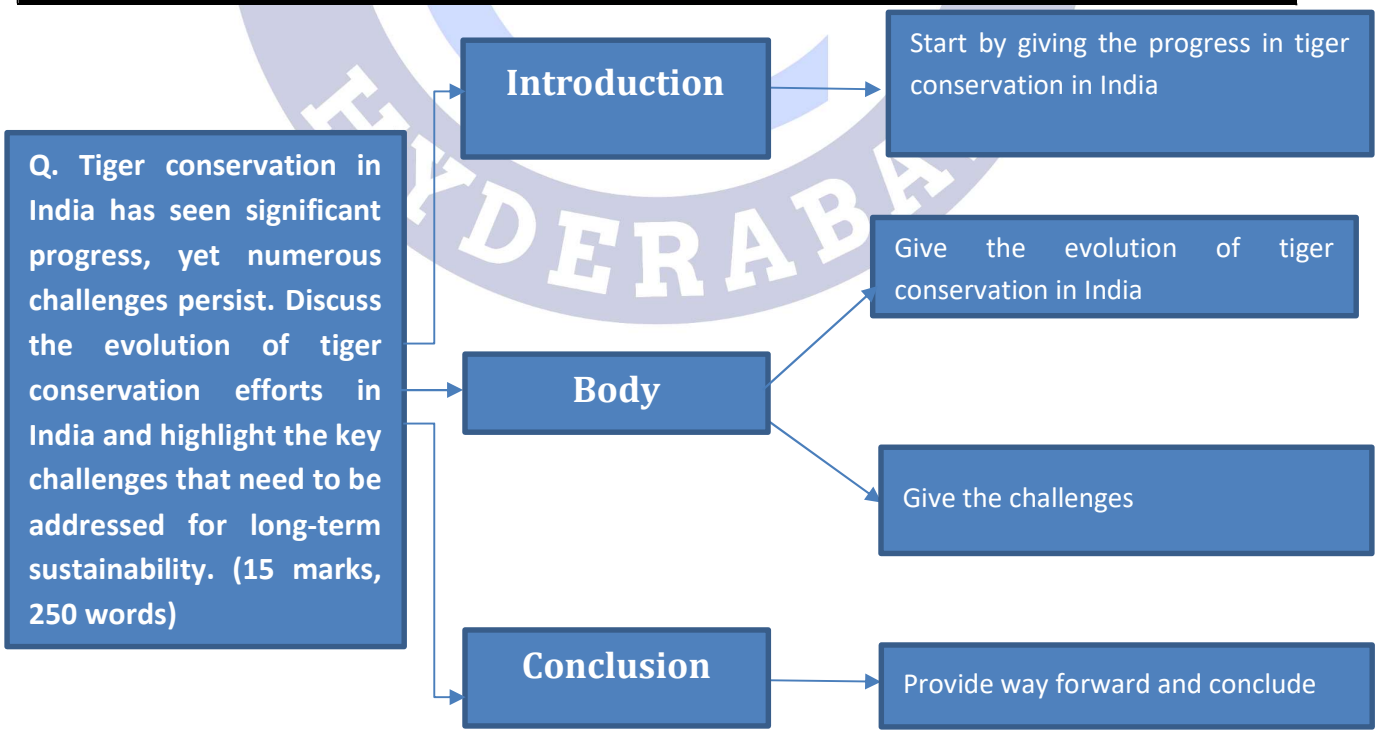
WAY FORWARD:

- **Strengthening Corridors**: Improve connectivity between tiger reserves for genetic diversity.
- **Expanding Conservation Areas**: Convert more forests into protected zones.
- **Advanced Technology Use**: AI-based monitoring, DNA profiling, and drone surveillance.
- **Community-Based Conservation**: Increase participation of local people in protection efforts as seen in Soliga tribes co-existence with tiger in BRT hills.
- **Stronger International Cooperation**: Collaborate with other nations to prevent illegal wildlife trade.

PRACTICE QUESTION

Q. Tiger conservation in India has seen significant progress, yet numerous challenges persist. Discuss the evolution of tiger conservation efforts in India and highlight the key challenges that need to be addressed for long-term sustainability. (15 marks, 250 words)

APPROACH



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MODEL ANSWER

India is home to nearly **75% of the world's wild tiger population**, with **3,682 tigers** recorded in 2023, growing at **6.1% annually**. Despite strong conservation policies, challenges like **habitat loss, poaching, and human-wildlife conflict** continue to threaten tiger populations.

Evolution of Tiger Conservation in India

1. **Pre-Independence Period (Before 1947): Tigers were extensively hunted** for sport and trade by British officials and Indian royalty. **Deforestation and agricultural expansion** led to habitat destruction.

2. **Post-Independence Period (1947-1972):** In 1969 the **Indian Board for Wildlife (IBWL)** recommended a ban on the export of wild cat skins. The **Wildlife Protection Act** was enacted to curb hunting and habitat destruction in 1972.

3. **Project Tiger (1973 - Present): Project Tiger** was launched at **Corbett Tiger Reserve** with **9 reserves**; today, there are **58 reserves covering 89,000 sq km**. **National Tiger Conservation Authority (NTCA)** was established for stricter conservation measures. **Core-Buffer Model** introduced core zones (fully protected) and buffer zones (regulated human activity).

4. **Strengthening Conservation Measures:** India's population grew to **3,682 tigers**, with the highest in **Madhya Pradesh (785), Karnataka (563), and Uttarakhand (560)**. **M-STrIPES, e-Eye surveillance, AI-based tracking, and camera trapping** for better monitoring. Involvement of local populations in **eco-tourism and habitat restoration**.

Challenges in Tiger Conservation

1. **Habitat Loss and Fragmentation:** India lost **1.4 million hectares of forest (2001-2020)** (Global Forest Watch). **Rajaji Tiger Reserve (Uttarakhand)** is fragmented by highways, affecting tiger movement.

2. **Human-Wildlife Conflict:** India recorded **307 tiger deaths in 2023**, many due to human retaliation (WII). **Sundarbans Tiger Reserve** faces frequent tiger attacks due to shrinking mangrove habitats.

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3. **Poaching and Illegal Wildlife Trade: 124 tigers were poached (2012-2022)** (TRAFFIC India). The **Baheliya poaching network** was responsible for major killings in early 2000s.
4. **Climate Change and Rising Temperatures:** India's **tiger habitat may shrink by 23% by 2070** if global temperatures rise by 2°C (WII). The **Sundarbans** has lost **7,000 hectares** to rising sea levels.
5. **Lack of Genetic Diversity:** Only **25-30% of tiger reserves** have strong genetic diversity (NTCA, 2023). **Panna Tiger Reserve lost all its tigers** due to inbreeding and poaching.
6. **Funding and Management Gaps:** Less than **15% of Project Tiger funds** were utilized in some states (CAG Report). **Better financial management and accountability** in tiger conservation projects.
7. **Disease Threat – Canine Distemper Virus (CDV): CDV-infected dogs are spreading the virus** to tigers in **Ranthambore Tiger Reserve**. **Gir National Park** lost several lions to the virus.

Way Forward

1. **Strengthening Tiger Corridors: NTCA & WII identified 32 major corridors**, but there is no legal protection for them. Declare corridors as **Eco-Sensitive Zones or Conservation Reserves**.
2. **Expanding Protected Areas:** Increase **core tiger habitats** and implement **better land-use planning**. Madhav National Park was recently declared a **Tiger Reserve (2024)**.
3. **Use of Advanced Technology: AI-based tracking, thermal drones, and e-Eye surveillance** to detect poaching. **DNA profiling and genetic mapping** for better breeding strategies.
4. **Community Participation and Eco-Tourism: Better compensation schemes** for farmers facing tiger attacks. **Encourage responsible wildlife tourism** to generate revenue for conservation.
5. **International Collaboration:** Strengthen **anti-poaching networks with Nepal, Bhutan, and Bangladesh**. Expand India's role in **Global Tiger Initiative (GTI) and Global Tiger Forum (GTF)**.

Tiger conservation in India has seen **remarkable progress**, but **challenges remain**. **Habitat loss, poaching, and human-wildlife conflict** need urgent attention. With **stronger policies, better funding, advanced technology, and community involvement**, India can continue to be **a global leader in tiger conservation**.

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22. RURAL DEVELOPMENT

iMPACT ANALYSIS

SYLLABUS:

GS 3 > Economic Development >> Rural Economy

REFERENCE NEWS:

The standing committee on rural development and Panchayati Raj Report points out that there is a nominal increase in the Budget Estimates allocation for 2025-26 compared to 2024-25.

KEY OBSERVATIONS AND RECOMMENDATIONS OF THE REPORT:

- **Budget Allocation**: There has been a continuous trend of Budget estimates lower than revised estimates mainly due to demand driven nature of schemes.
- **PESA Act, 1996** lacks effective implementation due to lack of public awareness and sensitization
- 14 out of 34 states/UTs have not received any funds for FY2024-25 under revamped **Rashtriya Gram Swaraj Abhiyan**
- Ministry could not achieve its physical targets (no work has been done in Bihar) under survey of villages and mapping with improvised technology in Village areas scheme **(SVAMITVA)**
- Severe **shortage of trained manpower** or support staff in villages as in only one official managing 5 to 6 gram panchayats in Bihar.
- 60% of allocations are **tied grants** and are restricted whereas untied grants (40%) can only be used for local needs
- **Panchayat elections** are delayed in various states like Karnataka
- Local bodies and Panchayats are heavily relied on grants from the government.

KEY DRIVERS OF RURAL DEVELOPMENT IN INDIA:

Agricultural Growth and Modernization

- **Agricultural Productivity and Diversification:** Agriculture contributes nearly 16% of India's GDP, employing over 46% of the workforce. Improved productivity through **high-yield seeds, modern irrigation, and mechanization** boosts rural incomes.
    - Pradhan Mantri Krishi Sinchayee Yojana (PMKSY) improved irrigation efficiency, covering 99 lakh hectares of land.

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- e-NAM (National Agriculture Market) connects 1.74 crore farmers, improving market access.
- Over 60% of India's net sown area depends on monsoons, making irrigation projects crucial for agricultural sustainability.

- **Animal Husbandry and Dairy Development:** Dairy farming and livestock contribute 4.5% to GDP, supporting 7 crore rural families. Growth in poultry, fisheries, and sericulture enhances rural incomes.
  - Rashtriya Gokul Mission improved indigenous cattle breeds, increasing milk production to 221 million tonnes (2023-24).
  - National Livestock Mission provides subsidized credit to farmers for animal husbandry.

Rural Infrastructure Development

- **Road and Transport Connectivity:** Good infrastructure reduces rural-urban divide and boosts employment. Pradhan Mantri Gram Sadak Yojana (PMGSY) built 7.85 lakh km of rural roads, linking remote villages to markets and healthcare centres.
  - Tripura and Assam recorded a 25% increase in farm income due to improved road connectivity under PMGSY.
  - Rural road density increased from 56 km per 100 sq. km (2014) to 75 km per 100 sq. km (2023), enhancing rural mobility.
- **Rural Electrification and Digital Access:** Saubhagya Scheme provided 100% electricity access to rural households. BharatNet expanded broadband connectivity, covering 1.5 lakh Gram Panchayats.
  - Digital literacy in rural areas improved by 30% due to PM Digital Saksharta Abhiyan (PMGDISHA).
  - Rural mobile penetration reached 80% in 2023, supporting e-governance and financial inclusion.

Employment Generation and Rural Livelihoods

- **Wage Employment Schemes:** MGNREGA provided 289 crore person-days of employment in 2023-24.
  - MGNREGA reduced distress migration in drought-prone regions like Bundelkhand by providing alternative income sources.
  - Women's participation in MGNREGA is 57%, contributing to financial independence.

- **Self-Employment and Skill Development: Deen** Dayal Upadhyaya Grameen Kaushalya Yojana (DDU-GKY) trained 14.5 lakh rural youth for skilled jobs. National Rural Livelihoods Mission (NRLM) empowered 8 crore women through Self-Help Groups (SHGs).
    - Lijjat Papad, a women-led cooperative, generates ₹1,600 crore annually, providing employment to 45,000 women.
    - Over 65 lakh women-led SHGs are active in India, boosting microfinance and entrepreneurship.
    - Kudumbashree in Kerala, a women-led Panchayat initiative, significantly reduced poverty.

Financial Inclusion and Credit Support

- **Rural Banking and Microfinance:** Jan Dhan Yojana opened 50 crore bank accounts, enabling direct benefit transfers (DBTs). Mudra Yojana sanctioned ₹12 lakh crore loans to small entrepreneurs, including farmers and SHGs.
    - In Bihar, 60% of Mudra loans supported small dairy farmers, improving rural credit access.
    - Women received 70% of Mudra loans, increasing their participation in economic activities.
- **Cooperatives and Farmer Producer Organizations (FPOs):** 10,000 FPOs were formed to strengthen collective bargaining power for small farmers.
    - Amul, a successful dairy cooperative, has over 36 lakh farmer members, improving milk pricing and supply chains.

Panchayati Raj and Rural Governance

- **Decentralized Planning and Governance:** 73rd Constitutional Amendment (1992) empowered 2.5 lakh Gram Panchayats for local governance. e-Gram Swaraj portal digitized Panchayat planning and fund utilization.
    - Over 50% of Panchayat seats are reserved for women, ensuring their participation in decision-making.
- **Strengthening Rural Justice and Rights:** SVAMITVA Scheme digitized land records for property rights in 6 lakh villages.
    - Rajasthan digitized 90% of rural land records, reducing land disputes.

Rural Health and Education

- **Rural Healthcare and Nutrition:** Ayushman Bharat provided free healthcare coverage to 40 crore rural beneficiaries. Poshan Abhiyan reduced child malnutrition by 6% between 2018 and 2023.

- Tamil Nadu's Amma Maternity Scheme improved maternal healthcare access in rural areas.
- Over 1.5 lakh Health and Wellness Centres (HWCs) were established under Ayushman Bharat.

- **Rural Education and Digital Literacy:** Samagra Shiksha Abhiyan reduced the rural dropout rate to 16% (from 30% in 2014). E-Vidya Initiative provided digital learning for rural students.
  - Bihar's free bicycle scheme for girls improved female school enrolment by 32%.
  - Over 75% of rural schools now have internet connectivity.

Climate Resilience and Sustainable Rural Development

- **Water Conservation and Afforestation:** Jal Jeevan Mission provided piped water to 13 crore rural households. Over 10 million hectares were restored under the Green India Mission.
  - Rajasthan's water harvesting projects increased groundwater levels by 30%.
  - Over 25% of rural India faces water stress, highlighting the need for conservation programs.
- **Renewable Energy and Rural Electrification:** KUSUM Scheme installed solar pumps for 20 lakh farmers. Over 38% of rural households use renewable energy sources.
  - Barefoot College in Rajasthan trains rural women as solar engineers, promoting sustainability.

CHALLENGES FACED BY RURAL DEVELOPMENT IN INDIA:

- **Insufficient Fund Allocation:** Rural development programs often receive lower-than-required budget allocations, affecting project implementation.
  - The Watershed Development Component of PMKSY (WDC-PMKSY 2.0) received only a 6.98% budget increase, limiting its reach.
  - **Digital India Land Records Modernization Programme (DILRMP) faced a 27.97% budget cut**, affecting land record digitization.
  - **MGNREGA, the largest rural employment program, faced fund shortages**, delaying wage payments in several states.
- **Delay in Fund Transfer to Panchayati Raj Institutions (PRIs):** Over 80% of Gram Panchayats depend on state and central government funds, limiting their financial independence. Delayed fund transfers disrupt infrastructure projects and service delivery.

- **Jharkhand and Bihar reported months-long delays in receiving MGNREGA funds**, leading to incomplete projects. Also Tamil Nadu and Kerala are in a major strife with centre over allocation of MGNREGA.

- **Limited Administrative Capacity of Panchayats:** Most Panchayat members lack training in financial management and governance. Only 15% of Gram Panchayats use digital governance tools, reducing transparency.
    - e-Gram Swaraj Portal was launched to digitize Panchayat accounts, but implementation remains slow in backward districts.
- **Political and Bureaucratic Interference:** State governments often interfere in Panchayat operations, affecting decentralized governance. PRIs have limited autonomy in fund allocation and program execution.
    - In Madhya Pradesh, district officials overruled Panchayat decisions on local employment schemes, reducing community participation.
- **Low Rural Workforce Participation and Unemployment:** Over 65% of India's workforce is rural-based, yet many remain underemployed. Rural youth face a skill mismatch, with limited job opportunities beyond agriculture.
    - Deen Dayal Upadhyaya Grameen Kaushalya Yojana (DDU-GKY) trained 14.5 lakh youth, but placement rates remain low.
- **Declining Agricultural Productivity and Farm Distress:** Over 60% of India's rural population depends on agriculture, yet farm incomes remain low. Climate change, soil degradation, and poor irrigation facilities further impact productivity.
    - Maharashtra recorded over 3,000 farmer suicides in 2022 due to financial distress and debt burdens.
    - PM-KISAN provides ₹6,000 per year to small farmers, but many are excluded due to land record issues.
- **Poor Rural Connectivity:** Road connectivity remains weak in remote villages, affecting market access. Pradhan Mantri Gram Sadak Yojana (PMGSY) has connected 99% of eligible villages, but road maintenance is poor.
    - In Jharkhand, 40% of rural roads built under PMGSY became non-motorable within 5 years.
- **Inconsistent Rural Electrification and Digital Access:** Saubhagya Scheme claims 100% rural electrification, but power cuts remain common. Only 30% of villages have stable broadband connectivity under BharatNet.
    - UP and Bihar reported frequent power outages, limiting irrigation and digital learning in rural areas.

- **Water Scarcity and Depleting Groundwater:** Over 25% of India's rural areas face water stress, affecting drinking water and irrigation. Jal Jeevan Mission aims to provide piped water to all rural households, but implementation is slow.
    - In Rajasthan, groundwater levels dropped by 30% in the last decade, affecting agriculture and drinking water supply.
- **Gender Disparities in Rural Development:** Women's participation in PRIs is 50% due to reservations, but decision-making power is limited. Women in rural areas earn 30% less than men in agricultural wages.
- **Caste and Social Exclusion:** SC/ST-dominated villages receive fewer funds under rural schemes. Manual scavenging and bonded labour continue in some rural pockets.
    - Dalit farmers in Tamil Nadu protested against land allocation discrimination under PM-KISAN.

WAY FORWARD FOR SUSTAINABLE INCLUSIVE RURAL DEVELOPMENT:

- **Enhancing MGNREGA for Sustainable Livelihoods:** Link MGNREGA with climate-resilient jobs, such as water conservation, afforestation, and solar farming.
- **Introduce skill-based employment under MGNREGA** to ensure long-term livelihood security.
    - **Brazil's Bolsa Verde Program:** Provides cash incentives for rural employment linked to environmental conservation. India can adopt this by integrating MGNREGA with eco-friendly job opportunities.
- **Improving Rural Skill Training and Entrepreneurship:** Integrate digital and vocational skills into rural education to reduce dependence on agriculture. Encourage rural micro-entrepreneurship through financial support and market access.
    - **Germany's Dual Vocational Training System** combines **formal education with on-the-job training** to enhance employment readiness.
- **Improving Road, Digital, and Energy Infrastructure:** Ensure maintenance of PMGSY roads to sustain rural connectivity. Expand BharatNet to achieve 100% broadband penetration in rural India. Promote decentralized renewable energy solutions in villages.
    - **China's Rural Electrification Program:** Connected **100% of villages with renewable energy**, reducing dependency on fossil fuels.
- **Strengthening Farmer Producer Organizations (FPOs) and Agro-Processing:** Encourage value-addition industries like food processing, dairy, and organic farming. Expand credit access for small and marginal farmers**.**
    - **Amul's Cooperative Model (India)**

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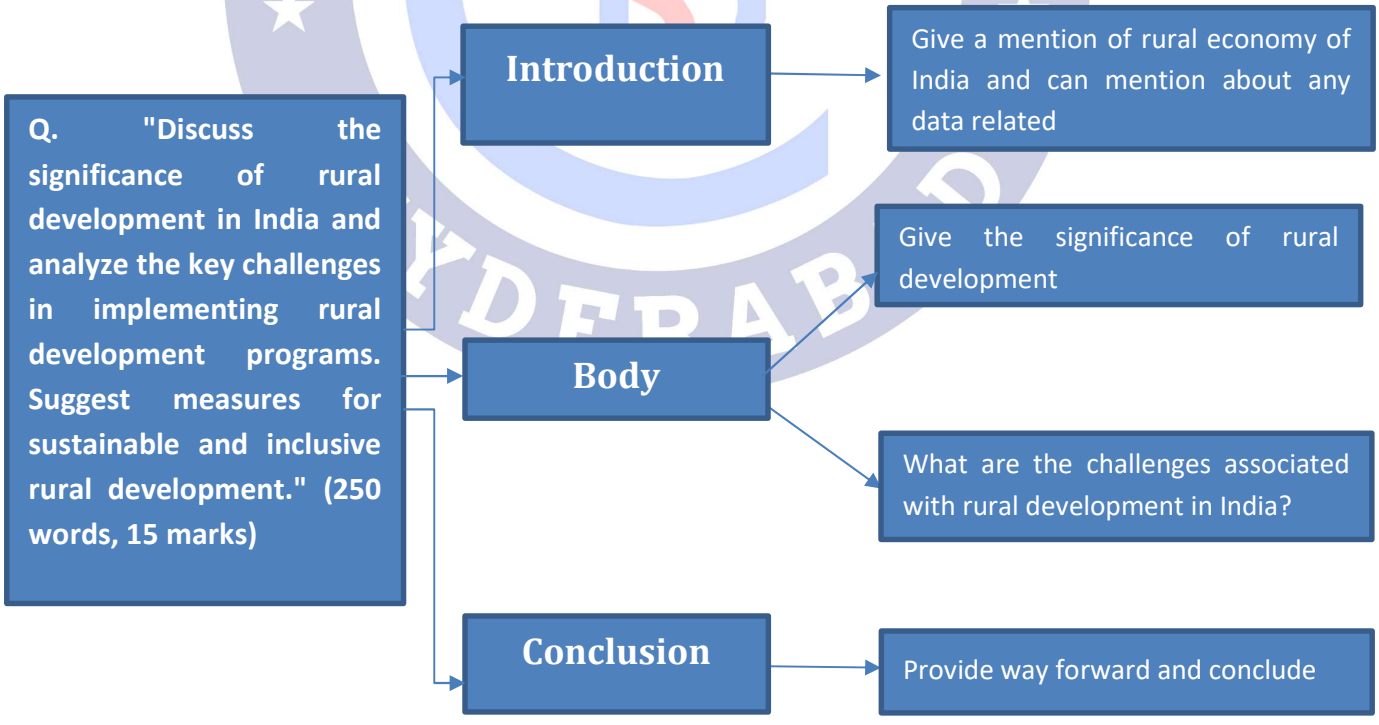
- **Promoting Climate-Resilient and Smart Agriculture:** Increase micro-irrigation coverage under PMKSY to reduce water wastage. Promote organic and regenerative farming to enhance soil fertility.
    - **Israel's Precision Agriculture Model**
- **Ensuring Fiscal Autonomy for Panchayats:** Allow Panchayats to generate revenue through local taxes and user fees. Ensure timely devolution of Finance Commission grants to PRIs.
    - **Kerala's People's Plan Campaign: Ensured bottom-up planning in PRIs with financial independence. India should implement participatory budgeting models across all states.**
- Ensure Fiscal devolution and untied grants to be used for panchayati governance and upgradation.

PRACTICE QUESTION

Q. "Discuss the significance of rural development in India and analyze the key challenges in implementing rural development programs. Suggest measures for sustainable and inclusive rural development." (250 words, 15 marks)

APPROACH



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MODEL ANSWER

With 65% of India's population residing in rural areas, improving agriculture, infrastructure, employment, education, healthcare, and governance is vital. The Standing Committee on Rural Development and Panchayati Raj highlights budget constraints, governance issues, and slow implementation of schemes as major hurdles in rural progress.

Significance of Rural Development in India

1. **Economic Growth and Employment**: Agriculture and allied sectors contribute 16% to GDP, employing 46% of the workforce. MGNREGA provided 289 crore person-days of employment in 2023-24, reducing distress migration.

2. **Infrastructure and Digital Connectivity:** PMGSY built 7.85 lakh km of rural roads, increasing farm incomes by 25% in Tripura and Assam. BharatNet connected 1.5 lakh Gram Panchayats, improving digital access and e-governance.

3. **Financial Inclusion and Rural Entrepreneurship**: Mudra Yojana sanctioned ₹12 lakh crore loans, with 70% of beneficiaries being women. 10,000 Farmer Producer Organizations (FPOs) were created, improving small farmers' incomes.

4. **Social Development and Rural Governance**: Ayushman Bharat covered 40 crore rural beneficiaries under free healthcare. 50% of Panchayat seats are reserved for women, enhancing local governance.

Challenges in Rural Development

1. **Budgetary Constraints and Fund Delays**: Panchayats rely heavily on government grants; only 40% of grants are untied for local needs. Tamil Nadu and Kerala face delays in MGNREGA fund allocation, affecting employment programs.

2. **Weak Governance and Limited Autonomy of PRIs**: Only 15% of Gram Panchayats use digital governance tools, reducing transparency. Delayed Panchayat elections in Karnataka weaken democratic decentralization.

3. **Rural Infrastructure Gaps**: 40% of PMGSY roads in Jharkhand became non-motorable within five years due to poor maintenance. Only 30% of villages have stable broadband connectivity, limiting digital literacy.

4. **Agricultural Distress and Climate Vulnerability**: Maharashtra reported 3,000 farmer suicides in 2022 due to debt and climate shocks. 60% of net sown area depends on monsoons, making irrigation expansion crucial.

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5. **Social Inequalities and Gender Gaps**: SC/ST-dominated villages receive fewer funds under rural schemes. Women in rural areas earn 30% less than men in agriculture, despite 57% participation in MGNREGA.

Way Forward for Sustainable and Inclusive Rural Development

1. **Enhancing Fiscal Autonomy of Panchayats**: Increase untied grants for local governance and project implementation. Adopt Kerala's People's Plan Campaign model for participatory budgeting.
2. **Strengthening Rural Employment and Skill Development**: Expand MGNREGA to include eco-friendly employment, like water conservation. Integrate digital skills in DDU-GKY, following Germany's Dual Vocational Training model.
3. **Improving Infrastructure and Digital Connectivity**: Ensure proper maintenance of PMGSY roads to prevent degradation. Expand BharatNet for 100% broadband access in villages.
4. **Promoting Climate-Resilient Agriculture**: Increase micro-irrigation coverage under PMKSY to reduce monsoon dependency.
5. **Empowering Women and Marginalized Communities**: Monitor real decision-making power of women in PRIs to prevent proxy leadership.

Rural development is key to economic stability, social inclusion, and climate resilience. Strengthening Panchayati Raj Institutions (PRIs), digital infrastructure, rural entrepreneurship, and sustainable agriculture will ensure holistic and inclusive rural development in India.

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23. INTELLECTUAL PROPERTY RIGHTS

iMPACT ANALYSIS

SYLLABUS:

GS 3 > Economic Development

REFERENCE NEWS:

Intellectual Property filings in India have surged – patent applications more than doubled in a decade, trademarks increased 2.5 fold, and design filings grew over threefold, demonstrating the nation's growing commitment to innovations, according to Senior Director (Madrid Registry) of World Intellectual Property Organisation.

Through initiatives like **digitisation of patent filings**, **expedited examination for start-ups**, and **reduced filing fees for MSMEs,** the Intellectual Property Office (IPO), under the **Office of the Controller General of Patents, Designs and Trade Marks**, Department for Promotion of Industry and Internal Trade, Ministry of Commerce and Industry, is making the patent process more accessible and efficient. These reforms have significantly contributed to India's rising global position in patent filings.

India ranked 39th in the 2024 Global Innovation Index

INTELLECTUAL PROPERTY RIGHTS:

Intellectual Property Rights (IPR) refer to the legal protections granted to creators and inventors for their innovations, artistic works, and brand identities. These rights ensure that innovators can benefit from their creations, encourage innovation, and prevent unauthorized use.

- The first patent law in India was enacted in 1856. The Indian Patents and Designs Act, 1911 was the first consolidated IPR law.
- India's Patents Act, 1970 restricted product patents in pharmaceuticals, allowing local drug manufacturing at lower costs. This led to a booming generic drug industry, making India a global pharmaceutical leader. Companies like Cipla and Sun Pharma benefited from this policy.
- India joined the World Trade Organization (WTO) in 1995 and adopted the Trade-Related Aspects of Intellectual Property Rights (TRIPS) Agreement. The Patents Act was amended in 2005 to allow product patents in all fields, including pharmaceuticals and biotechnology.
- The government launched the National IPR Policy in 2016 to strengthen enforcement and innovation. India ranked 40th in the Global Innovation Index in 2023, improving from 81st in 2015 and 39th in 2024.

Types of Intellectual Property Rights in India

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- **Patents:** Patents protect inventions and technological innovations for a period of 20 years. They encourage scientific research, technological advancements, and industrial development.
    - Tata Motors patented its innovative "Ziptron Electric Technology," which contributed to the growth of India's electric vehicle sector.
    - India granted 30,000 patents in 2023, a 50 percent increase from 2020.
- **Copyrights:** Copyrights protect literary, artistic, and musical works for 60 years, encouraging creativity in books, films, music, and digital content. Bollywood movies and music copyrights prevent piracy and unauthorized distribution. The Copyright Act, 1957 was amended in 2012 to cover digital and internet-based content.
- **Trademarks:** Trademarks protect brand names, logos, and slogans, ensuring business identity and preventing counterfeiting.
    - Amul's trademark protects its brand identity from imitation products.
    - Over three lakh trademarks were registered in India in 2023, reflecting business growth.
- **Geographical Indications (GI):** GI tags protect region-specific products linked to traditional knowledge and culture, boosting the rural economy.
    - Darjeeling Tea was India's first GI tag (2004). Other examples include Kanjeevaram Sarees from Tamil Nadu and Mysore Silk from Karnataka.
    - Over 400 GI tags have been granted in India, strengthening local handicrafts and agriculture.
- **Industrial Designs:** Industrial designs protect the aesthetic and visual appearance of a product for 10 years, renewable for five more years.
    - Royal Enfield's unique fuel tank design is protected under industrial design laws.
    - India's Design Act, 2000 aligns with international standards under the WIPO Hague Agreement.
- **Trade Secrets:** Trade secrets protect confidential business information, formulas, and methods from unauthorized disclosure. India lacks specific trade secret laws, but companies use non-disclosure agreements (NDAs) to safeguard them.
    - Coca-Cola's secret formula remains undisclosed under trade secret protection. IT companies like Infosys and TCS protect source codes through trade secret policies.

SIGNIFICANCE OF IPR REGIME IN INDIA:

- **Boosts Research and Development (R&D):** A strong IPR regime encourages businesses, startups, and universities to invest in innovation. Patents and copyrights provide financial incentives for innovators to develop new technologies.

- India's pharmaceutical industry spends $2.5 billion annually on R&D, supported by strong patent laws.
- Bharat Biotech's patented Covaxin contributed to India's COVID-19 vaccine self-reliance.

- **Attracts Foreign Direct Investment (FDI):** Companies prefer investing in countries with strong IPR protection to safeguard their technologies and brands. India's alignment with TRIPS (Trade-Related Aspects of Intellectual Property Rights) in 2005 has improved investor confidence.
  - Samsung and Apple expanded R&D centres in India due to improved patent protections.
  - FDI in pharmaceuticals increased from $1.3 billion (2018) to $3 billion (2022) after patent reforms.
- **Industrial Growth and Global Competitiveness:** India's generic drug industry thrives due to patent protections, ensuring affordability while encouraging innovation.
- **Promotes the Startup Ecosystem and Digital Economy:** Startups rely on patents, trademarks, and copyrights to protect their innovations and brand identity. The National IPR Policy (2016) introduced fast-track patent approvals for startups.
  - Zerodha (fintech) and Flipkart (e-commerce) filed patents for AI-based business solutions. Over 1,500 startups received patent benefits under the Startup India initiative.
  - India's unicorn startups increased from 10 in 2015 to 110 in 2023, supported by strong IPR laws.
- **Protects Indian Brands and Exports:** Trademarks and Geographical Indications (GI) help protect Indian products in global markets. GI tags prevent counterfeiting and unauthorized use of traditional Indian products.
  - Basmati Rice GI protection helped India win a trademark dispute in the European Union (2020).
- **Safeguards Traditional Knowledge and Handicrafts:** GI tags and copyrights protect handmade crafts, textiles, and tribal art from exploitation. Helps local artisans earn fair wages by preventing mass-market imitations.
  - Kanjeevaram Silk (Tamil Nadu) and Pashmina Shawls (Kashmir) have GI tags, ensuring authenticity.
  - India's handicraft exports crossed $4 billion in 2023, partly due to GI protection.
- **Prevents Biopiracy and Unethical Patents:** India's Traditional Knowledge Digital Library (TKDL) prevents foreign entities from patenting Indian medicinal knowledge. Several patents on turmeric, neem, and basmati rice were revoked due to TKDL intervention.

- US Patent Office revoked a patent on turmeric's medicinal properties (1997) after India proved its traditional use.
- Over 2 lakh traditional medicinal formulations are recorded in TKDL, ensuring protection.

- **Encourages Digital and Creative Industries:** Protects creators from piracy and copyright infringement in films, music, and digital content. Encourages Bollywood, OTT platforms, and gaming industries to invest in creative production.
  - Netflix India and Amazon Prime secured copyrights for exclusive content, preventing piracy.
  - Bollywood loses $2.7 billion annually due to online piracy, highlighting the need for stronger enforcement.
  - The Copyright Act was amended in 2012 to cover digital and internet-based content.
- **Boosts Software and AI Innovation:** Patents and copyrights encourage Indian IT and AI startups to protect software innovations. IT giants like Infosys, TCS, and Wipro file patents for AI and blockchain-based solutions.
  - India granted over 1,500 AI-related patents in 2023, reflecting digital transformation.
- **Strengthens National Security and Self-Reliance:** Patents and trade secrets protect critical defence, aerospace, and nuclear technologies. Reduces dependency on foreign defence imports.
  - DRDO filed over 400 patents for defence technologies, boosting self-reliance.
  - ISRO patented GSLV rocket technology, protecting India's space research.

CHALLENGES OF IPR REGIME IN INDIA:

- **Patent Backlogs and Delays in Granting IP Rights:** High number of pending patents, trademarks, and copyrights delays innovation and discourages inventors. The average time to grant a patent in India is 4-5 years, compared to 2 years in the US and Europe.
  - Over 1.5 lakh patent applications were pending in 2023, causing delays in commercializing innovations.
  - The Patent Prosecution Highway (PPH) with Japan (2019) was introduced to fast-track applications, but the backlog remains high.
- **Weak Enforcement and High Piracy Rates:** Counterfeiting, piracy, and patent infringements are rampant, affecting industries like pharmaceuticals, IT, and entertainment. Weak judicial enforcement leads to long legal battles, making it easier for violations to continue.

- Bollywood loses $2.7 billion annually due to piracy, as per the Motion Picture Association.
- Over 20% of medicines sold in India are counterfeit or substandard, as per WHO.
- Only 3,500 IPR infringement cases were registered in India in 2023, despite widespread violations.

- **High Cost and Complexity of Litigation:** IPR disputes in India take an average of 5-7 years to resolve, making enforcement expensive and slow. Startups and MSMEs struggle with legal costs, discouraging them from defending their IP.
  - Pfizer vs. Ranbaxy patent dispute over Lipitor lasted over a decade, affecting market competition.
  - Less than 10% of patent disputes are resolved within three years, leading to delays in innovation.
- **Lack of Awareness Among MSMEs and Startups:** Many MSMEs and artisans do not register their patents, trademarks, or copyrights, losing business opportunities. Limited knowledge of Geographical Indications (GI) results in traditional products being exploited by larger businesses.
  - Over 70% of handicrafts in India lack GI protection, affecting rural artisans.
  - Basmati Rice had to fight for trademark rights in the EU, as Pakistan claimed similar rights.
  - Only 20% of Indian startups file for patents, compared to 60% in China and the US.
- **Biotech, AI, and Digital IP Gaps:** Lack of clear laws for AI-generated content and software patents creates uncertainty in emerging technologies. India does not have explicit laws for AI innovations and genetic research patents.
  - CRISPR gene-editing technology patents face challenges in India's regulatory framework.
  - India granted only 1,500 AI-related patents in 2023, compared to China's 25,000 in the same year.
- **Issues in Compulsory Licensing and Patent Revocation:** India allows compulsory licensing for essential drugs, ensuring affordability but discouraging pharma investments. Global pharma companies hesitate to launch new drugs in India due to patent revocation risks.
  - **Bayer's cancer drug Nexavar lost its patent in India due to compulsory licensing**, reducing foreign pharma investment.
  - **India's pharmaceutical FDI dropped from $3 billion (2022) to $2.5 billion (2023)** due to concerns over weak patent protections.
- **Cross-Border IP Theft and International Disputes:** Weak international enforcement of Indian patents leads to cross-border IP theft. Global companies hesitate to collaborate with Indian firms due to IP risks.

- US and EU firms have repeatedly raised concerns about weak IP protection in India under the USTR Special 301 Report.
- Indian turmeric, neem, and basmati rice faced biopiracy issues when foreign companies tried to patent them.
- Over 200 foreign patents on Indian traditional knowledge have been revoked since 2000 due to legal interventions.

- **Weak Geographical Indications (GI) Protection:** Many traditional Indian products lack global recognition due to weak GI enforcement. Counterfeit versions of Indian GI products are sold in international markets.
  - Fake Darjeeling Tea is sold in the UK and US, reducing profits for Indian tea growers.
  - Madhubani paintings from Bihar face mass production threats from non-Indian markets.

WAY FORWARD FOR STRENGTHENING IPR IN INDIA:

- **Faster Patent Processing**: Increase the number of patent examiners and streamline the patent approval process.
- **Strengthen IPR Enforcement**: Introduce stricter penalties for IP violations and increase police training for IP-related crimes.
- **Increase Awareness:** Conduct workshops for MSMEs, artisans, and startups to educate them about IPR benefits.
- **Reform AI and Biotech IP Laws:** Update IPR laws to cover AI-driven software, biotech, and digital content protection.
- **Improve GI Protection**: Strengthen enforcement of GI tags and promote international recognition of Indian products.
- **Boost IPR Courts:** Establish fast-track IPR courts for quicker resolution of patent and trademark disputes.
- **Encourage International Collaboration:** Partner with WIPO and WTO to align India's IPR laws with global best practices.

BEST PRACTICES:

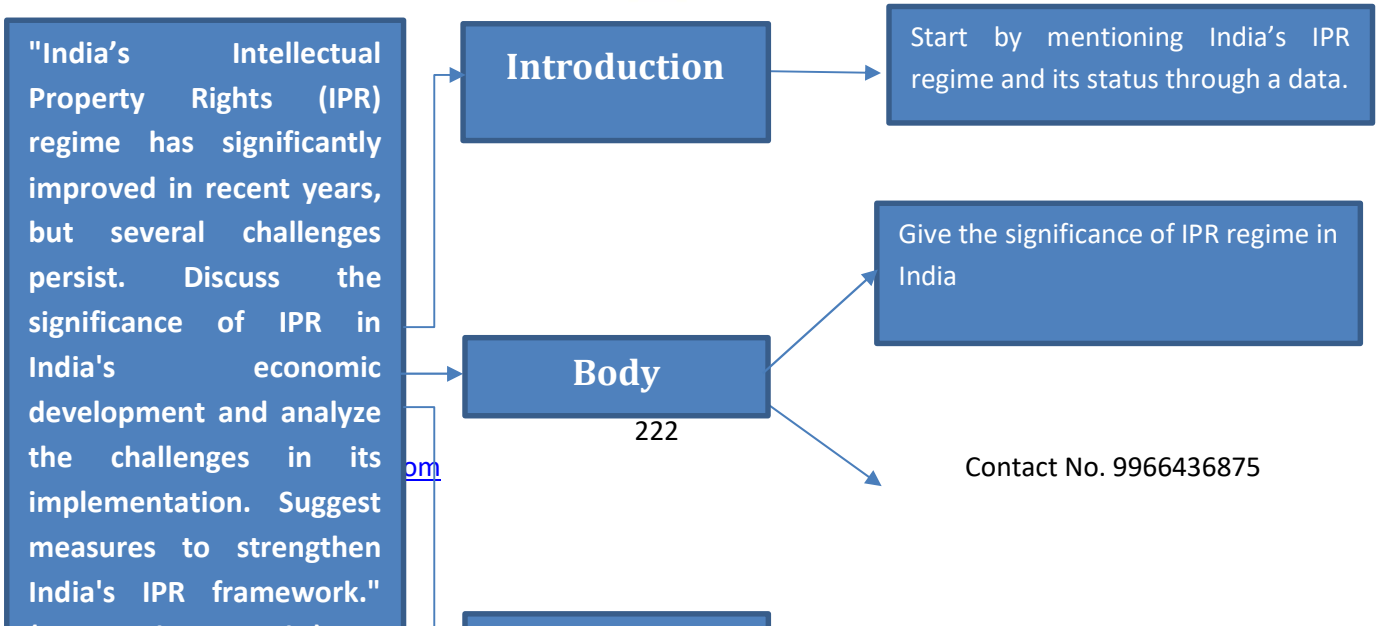
- **United States – Strong IPR Enforcement and Commercialization:** Patent Cooperation Treaty (PCT) Membership enables global patent protection for US innovators. The Court of Appeals for the Federal Circuit (CAFC) ensures speedy resolution of patent disputes. Bayh-Dole Act (1980) allows universities and research institutions to commercialize patents from federally funded research.

- **European Union – Harmonized IPR Framework and Strong GI Protection:** European Patent Office (EPO) provides a single patent application process for multiple EU countries. EU has one of the **strongest GI laws**, ensuring **high-value branding** for traditional products. A **single patent system** for 17 EU member states, reducing costs and improving enforcement.
    - **Champagne (France) and Parmigiano Reggiano (Italy) have global GI protection**, increasing their market value.
- **Japan – Fast-Track Patent Approvals and Strong R&D Protection:** Patent Prosecution Highway (PPH) accelerates patent approvals through collaboration with other countries. A dedicated government body ensures **efficient IP policy implementation**. **Technology Transfer Offices (TTOs)** facilitate **commercialization of research patents**.
- **China – Aggressive IPR Filing and Digital IP Protection: World's highest patent filings (1.5 million in 2023).** China grants patents **within 12-18 months**, compared to 4-5 years in India. Strong enforcement of copyrights in e-commerce and software sectors.
- **South Korea – Incentives for SMEs and Startups in IPR:** Fast-track IP registration for startups and SMEs. IP Financing System allows companies to use patents as collateral for loans. Strict anti-counterfeiting laws to protect tech and pharmaceutical industries.
- **Switzerland – Global Leader in IPR and Innovation:** Ranked No. 1 in the Global Innovation Index (GII) 2023. High investment in R&D, supported by strong IP protections. High patent filing per capita due to a strong innovation ecosystem.

PRACTICE QUESTION

Q. "India's Intellectual Property Rights (IPR) regime has significantly improved in recent years, but several challenges persist. Discuss the significance of IPR in India's economic development and analyze the challenges in its implementation. Suggest measures to strengthen India's IPR framework." (250 words, 15 marks)

APPROACH



Give the challenges of the regime

Provide way forward and conclude

MODEL ANSWER

Intellectual Property Rights (IPR) play a crucial role in **economic growth, innovation, and industrial development**. India has made significant progress through **the National IPR Policy (2016), fast-track patent approvals, and increased filings**. The country ranked **39th in the Global Innovation Index 2024**, reflecting its growing commitment to protecting intellectual property.

Significance of IPR in India

1. **Encourages Research and Development (R&D)**: A strong IPR regime incentivizes innovation in **pharmaceuticals, IT, and biotechnology**.
    - Bharat Biotech's **patented Covaxin** contributed to India's COVID-19 vaccine self-reliance.
2. **Attracts Foreign Direct Investment (FDI)**: Companies prefer investing in **countries with strong IPR protection**.
    - **Example: Samsung and Apple expanded R&D centers in India** due to improved patent protections. **FDI in pharmaceuticals rose from $1.3 billion (2018) to $3 billion (2022)** after patent reforms.
3. **Boosts Startup Ecosystem and Digital Economy**: Startups rely on **patents, trademarks, and copyrights** to protect their innovations.
    - Flipkart and Zerodha filed patents for **AI-driven business models**. **Over 1,500 startups received patent benefits** under the Startup India initiative.
4. **Protects Indian Brands and Exports**: **Geographical Indications (GI) help preserve traditional industries**.
    - **Basmati Rice GI tag helped India win a trademark dispute in the EU (2020). Over 400 GI tags** have been granted, strengthening local handicrafts and agriculture.
5. **Prevents Biopiracy and Unethical Patents**: The **Traditional Knowledge Digital Library (TKDL)** prevents foreign entities from patenting Indian medicinal knowledge. The **US Patent Office revoked a patent on turmeric's medicinal properties (1997)** after India proved its traditional use.
    - Over **2 lakh traditional medicinal formulations** are recorded in TKDL.

Challenges in Implementing IPR in India

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1. **Patent Backlogs and Delays**: **Over 1.5 lakh patent applications were pending in 2023**, delaying innovation. **India takes 4-5 years to grant a patent**, compared to 2 years in the US.
2. **Weak Enforcement and High Piracy Rates**: **Bollywood loses $2.7 billion annually due to piracy** (Motion Picture Association). **Over 20% of medicines sold in India are counterfeit or substandard** (WHO).
3. **High Cost and Complexity of Litigation**: **IPR disputes in India take an average of 5-7 years to resolve**, discouraging small businesses. Pfizer vs. Ranbaxy **patent dispute lasted over a decade**, affecting market competition.
4. **Lack of Awareness Among MSMEs and Startups**: **Over 70% of Indian handicrafts lack GI protection**, affecting rural artisans. **Only 20% of Indian startups file for patents**, compared to 60% in China and the US.
5. **Issues in AI, Biotech, and Digital IP Protection**: **Lack of clear laws for AI-generated content and software patents** creates uncertainty. **India granted only 1,500 AI-related patents in 2023**, compared to China's 25,000.
6. **Weak Geographical Indication (GI) Protection**: **Fake Darjeeling Tea is sold in the UK and US**, reducing profits for Indian tea growers. **Madhubani paintings face mass production threats from non-Indian markets**.

Way Forward to Strengthen India's IPR Framework

1. **Faster Patent Processing: Increase patent examiners** and expand **Patent Prosecution Highway (PPH) partnerships** beyond Japan.
2. **Strengthen IPR Enforcement**: **Introduce stricter penalties** for piracy and counterfeiting. **Use AI and blockchain** for tracking IPR violations like China.
3. **Increase Awareness Among MSMEs and Startups**: **Conduct workshops** and provide **financial incentives** for patent registration.
4. **Reform AI and Biotech IP Laws**: **Update IPR laws** to include **AI-driven software, genetic research, and digital content protection**.
5. **Improve Geographical Indications (GI) Protection**: **Strengthen branding of GI products** like the EU's Champagne and Swiss watches.
6. **Encourage International Collaboration**: **Partner with WIPO and WTO** to align India's IPR framework with global best practices.

A **robust IPR regime is essential for India's economic growth, innovation, and industrial expansion**. While **significant progress has been made in patent filings, trademark registrations, and copyright protection**, **challenges like weak enforcement, litigation costs, and digital IP gaps need urgent reforms**. Strengthening **IPR policies, reducing delays, and aligning with global best practices** will position India as a **leader in innovation and intellectual property protection**.

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24. QUANTUM COMPUTING

iMPACT ANALYSIS

SYLLABUS:

GS 3 > Science and Technology

REFERENCE NEWS:

NITI Aayog's chief executive officer BVR Subrahmanyam released the paper titled, **'Quantum Computing: National Security Implications & Strategic Preparedness'** which reported advancements in quantum technology could potentially expose India to increased risk of technological surprise and strategic blind spots.

QUANTUM COMPUTING:

- Quantum computing is an advanced computing paradigm that leverages the principles of **quantum mechanics** to perform computations **exponentially faster** than classical computers.
- Unlike classical computers, which use **bits (0 or 1)**, quantum computers use **quantum bits (qubits)**, which can exist in multiple states simultaneously due to **superposition** and can interact through **entanglement**.

Key Quantum Concepts:

- **Superposition:** A qubit can be 0, 1, or both at the same time, allowing parallel computation.
- **Entanglement:** Qubits can be correlated over long distances, enabling faster communication and processing**.**
- **Quantum Tunnelling:** Allows quantum particles to bypass energy barriers, enabling optimization problems to be solved efficiently. This principle is critical for the functioning of quantum computer hardware like **quantum dots**.
- **Quantum Interference:** The wave-like characteristics of quantum particles cause interference effects between different probability states that can result in constructive or destructive interference analogous to the interference effects seen in waves. This effect is harnessed in quantum algorithms.

POTENTIAL OF QUANTUM COMPUTING IN INDIA:

Defence & Cybersecurity

- **Quantum cryptography** ensures **unbreakable communication** for military and intelligence agencies. **Quantum key distribution (QKD)** prevents cyberattacks and secures national data.
    - **Fault-tolerant quantum computers** can break public-key encryption algorithms rendering internet security, online banking and communications obsolete.

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- **ISRO & DRDO are developing Quantum Key Distribution (QKD) networks** for secure communication.

- **Intelligence Gathering**: Processing of complex and vast data bases to increased signal intelligence, interception and counter-intelligence operations through a dedicated task force to track global developments and assess India's vulnerabilities.
- **National Security**: Quantum algorithms can optimize logistics, resource allocation and battlefield strategy using quantum AI enabled drones and robots.

Drug Discovery & Healthcare

- Simulates **complex molecular interactions**, reducing drug discovery time from **years to months**.
- Helps in **protein folding** simulations for disease treatment and aids greater dimensions of Genome India Project.
    - **IBM's quantum computer** is used for developing **new antibiotics and cancer drugs**.

Finance & Banking

- **Optimizes portfolio management and fraud detection**. Improves **risk analysis and high-frequency trading strategies**.
    - **Goldman Sachs and JPMorgan Chase** are using quantum computing for financial modelling.

Agriculture & Climate Science

- **Quantum simulations improve weather forecasting and climate modelling** and aids the prediction of India's complex weather system of Monsoons, heat and cold waves etc. Helps in **crop yield prediction and soil analysis**.
    - **IBM's Quantum Weather Forecasting Model** is being explored for Indian agriculture.

Artificial Intelligence & Machine Learning

- Quantum computing can **train AI models exponentially faster**. Enhances **deep learning and natural language processing (NLP)**. This can enable India's development of its own large language model like ChatGPT and Deepseek.
    - **Google's Quantum AI** is working on **faster AI training algorithms**.

Space & Satellite Communication

- Enables **ultra-secure satellite communication** through **quantum entanglement**. Helps in **faster data transmission and deep-space communication**.
    - **China's Micius satellite** has successfully demonstrated **quantum communication between continents**.

Logistics & Supply Chain

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- Optimizes **routes, cargo distribution, and inventory management**. Reduces **fuel costs and transportation time**.
    - **DHL and FedEx are exploring quantum computing** for supply chain optimization.

CHALLENGES OF QUANTUM COMPUTING IN INDIA

- **High Cost and Infrastructure Requirements:** Quantum computers require extreme conditions (near absolute zero temperature) to function, increasing operational costs. Building and maintaining quantum infrastructure (cryogenic cooling, superconducting circuits, and error correction systems) is expensive.
    - India's National Quantum Mission (NQM) (₹6,000 crore, 2023-2031) aims to fund infrastructure, but this is significantly lower than China's investment of $15 billion in quantum R&D.
- **Limited Skilled Workforce and Research Expertise:** Quantum computing requires expertise in quantum mechanics, physics, computer science, and cryptography, but India lacks enough trained professionals. Few universities offer specialized quantum courses, leading to a slow talent pipeline.
    - IIT Madras and IISc Bangalore have started quantum computing courses, but India still lacks large-scale training programs like the USA's Quantum Initiative.
    - China produces over 1,500 PhD graduates in quantum technologies annually, compared to a few hundred in India.
- **Slow Development of Quantum Hardware:** Quantum hardware development in India is in its early stages, with most progress in theoretical research rather than practical implementation. Quantum processors require advanced fabrication technologies, which India does not yet have.
    - Google's Sycamore processor (2019) demonstrated quantum supremacy, but India has no indigenous quantum processor.
    - DRDO and IISc Bangalore are working on quantum chips, but progress is slow compared to IBM's 127-qubit Eagle processor (2021).
- **Quantum Decoherence and Error Rates:** Quantum bits (qubits) are highly unstable, requiring complex error correction mechanisms. Decoherence (loss of quantum state due to environmental noise) remains a major technical challenge.
    - Google's Sycamore processor maintains quantum coherence for only a few microseconds, making calculations unstable.
    - India's quantum projects focus more on theory, and practical error correction systems are still under development.
- **Cybersecurity Risks and Post-Quantum Cryptography:** Quantum computers can break classical encryption threatening national security and banking systems. India lacks a post-quantum cryptography strategy to protect sensitive data from quantum cyberattacks.

    - China's Quantum Communication Satellite (Micius) has demonstrated quantum-secured communication, while India is still in early research stages.
- **Lack of Industry-Academia Collaboration:** Indian quantum research is fragmented, with limited collaboration between universities, government agencies, and private companies. Startups in quantum technology are rare, slowing innovation.
    - IBM, Google, and Microsoft invest billions in quantum startups, while India has very few private investments in quantum computing.
    - Quantum computing research in India is primarily government-driven (ISRO, DRDO, NITI Aayog), with limited private sector participation.
- **Ethical and Geopolitical Challenges:** Quantum technology can be weaponized, leading to ethical concerns and geopolitical competition. India lags behind the US, China, and Europe in setting quantum computing regulations and policies.
    - **China's $15 billion quantum investment** and the **US Quantum Initiative ($1.2 billion)** have global security implications, while **India's quantum strategy is still evolving**. **Lack of a national quantum security framework** puts India at a strategic disadvantage.
- **Slow Adoption of Quantum Technologies in Industries:** Banks, healthcare firms, and logistics companies in India have been slow to integrate quantum solutions due to lack of access and awareness. Cloud-based quantum computing services (IBM Quantum, Microsoft Azure Quantum) are not widely used in India.
    - **Goldman Sachs and JPMorgan Chase** are using quantum computing for **financial modelling**, but **Indian banks have not yet started quantum-based risk analysis**.
    - **Pharmaceutical companies in India** have not explored **quantum computing for drug discovery**, unlike **Pfizer and Roche in the US**.

WAY FORWARD:

- **Increase Investment in Quantum R&D:** Expand **National Quantum Mission funding from ₹6,000 crore to ₹15,000 crore** to match China's investments. Develop **India's first indigenous quantum processor** within the next **5 years**.
- **Develop a Skilled Workforce:** Introduce **quantum computing courses in IITs, IISc, and NITs**. Establish **quantum research fellowships** to retain talent.
- **Enhance Industry-Academia Collaboration:** Encourage **private investment in quantum startups**. Set up **Quantum Research Hubs** in partnership with tech giants like **Google and IBM**.
- **Strengthen Cybersecurity Against Quantum Threats:** Develop **post-quantum cryptography standards** for banks, defence, and government agencies. Secure **India's national communication networks using Quantum Key Distribution (QKD)**.

- **Accelerate Quantum Hardware Development:** Invest in **semiconductor and superconducting technologies** for quantum chips. Establish **quantum computing labs across major IITs and research centres**.
- **International Collaborations:** Partner with **EU, USA, Japan, and Australia** for quantum research. Join **global quantum alliances** to access new technologies.

INDIA AND QUANTUM COMPUTING:

- **National Mission on quantum technologies and applications**: The Government in its 2021 budget allocated INR 8000 Crore towards the National Mission on quantum technologies and applications to spur developments in quantum computing, cryptography, communications, and material science.
- **Quantum Computing Laboratory**: In December 2021, the Indian Army set up a quantum computing laboratory and an AI centre at a military engineering institute at Mhow, Madhya Pradesh. It is also backed by the National Security Council Secretariat (NSCS).
- **Quantum Communication Lab:** The Centre for Development of Telematics (C-DOT) launched a quantum communication lab in October 2021. It can support more than 100 km of standard optical fibre.
- **Collaboration**s: The Defence Institute of Advanced Technology (DIAT) and the Centre for Development of Advanced Computing (C-DAC) agreed to collaborate and develop quantum computers.
- **I-HUB Quantum Technology Foundation:** The Department of Science and Technology and about 13 research groups from IISER Pune launched I-HUB Quantum Technology Foundation (I-HUB QTF) to further enhance the development of quantum tech.
- **Startups**: A number of Start-Ups such as Qunu Labs, Bangalore; BosonQ, Bhilai have also emerged and as a result, they are making inroads in this area.

NATIONAL QUANTUM MISSION: The Union Cabinet, approved the National Quantum Mission (NQM) 2023 at a total cost of Rs.6003.65 crore from 2023-24 to 2030-31, aiming to seed, nurture and scale up scientific and industrial R&D and create a vibrant & innovative ecosystem in Quantum Technology (QT).

- This will accelerate QT led economic growth, nurture the ecosystem in the country and make India one of the leading nations in the development of Quantum Technologies & Applications (QTA).
- The Mission objectives include developing intermediate-scale quantum computers with 50-1000 physical qubits in 8 years in various platforms like superconducting and photonic technology.
- Satellite-based secure quantum communications between ground stations over a range of 2000 kilometers within India, long-distance secure quantum communications with other countries, inter-city quantum key distribution over 2000 km as well as **multi-node Quantum networks with quantum memories** are also some of the deliverables of the Mission.

- The National Quantum Mission will focus on **developing magnetometers** with high sensitivity in atomic systems and Atomic Clocks for precision timing, communications, and navigation.
- It will also support the design and synthesis of quantum materials such as superconductors, novel semiconductor structures, and topological materials for the fabrication of quantum devices. Single photon sources/detectors, and entangled photon sources will also be developed for quantum communications, sensing, and metrological applications.
- Mission Implementation includes setting up of **four Thematic Hubs (T-Hubs)** in top academic and National R&D institutes in the domains:
    - **Quantum Computing**
    - **Quantum Communication**
    - **Quantum Sensing & Metrology**
    - **Quantum Materials & Devices**

PRACTICE QUESTION

Q. "Quantum computing has the potential to revolutionize multiple sectors in India, from national security to healthcare. However, significant challenges exist in its adoption. Analyze the potential of quantum computing in India and discuss the key challenges in its implementation. Suggest a way forward." (250 words, 15 marks)

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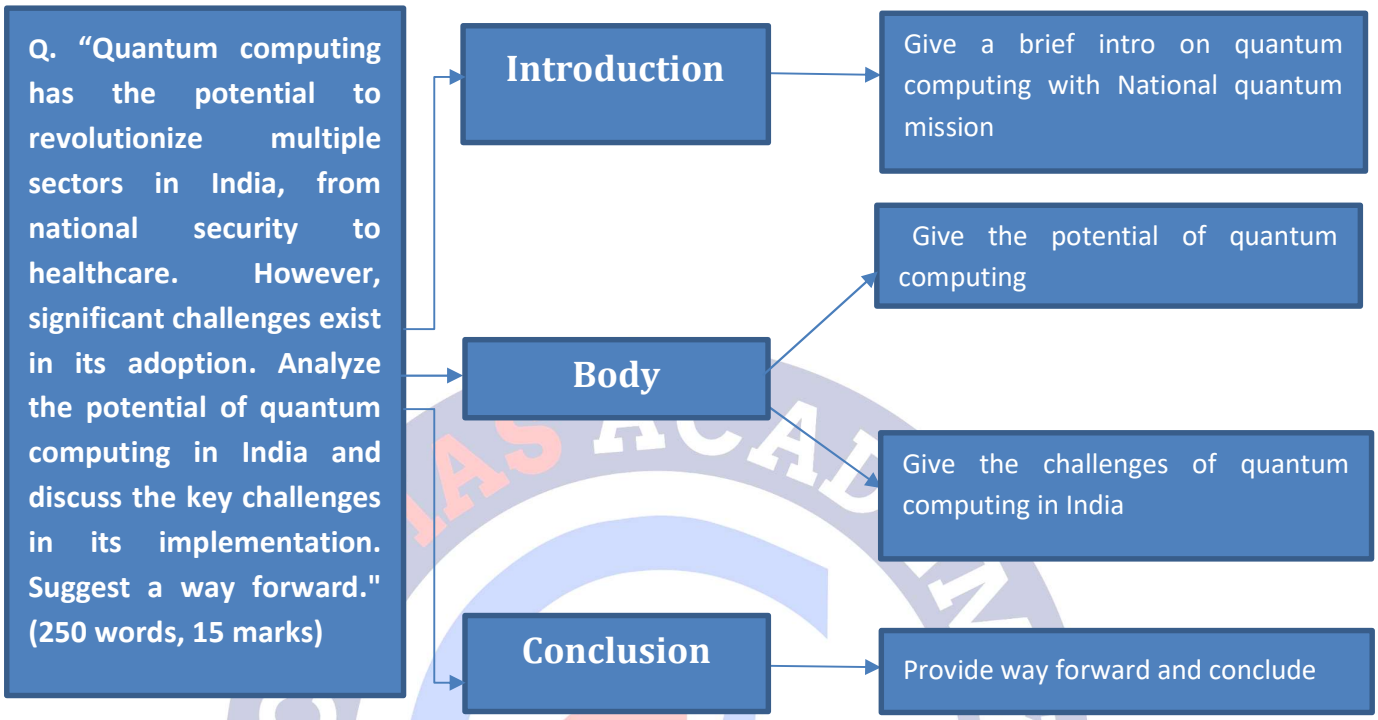
APPROACH



MODEL ANSWER

Quantum computing is an **advanced computing paradigm** that leverages the principles of **quantum mechanics** to solve complex problems **exponentially faster** than classical computers. India has launched initiatives like the **National Quantum Mission (NQM), 2023-2031** to accelerate research in **quantum computing, cryptography, and communication**.

Potential of Quantum Computing in India

1. **National Security & Cybersecurity**: **Quantum cryptography** ensures **unbreakable communication** for **defense and intelligence agencies**. **Quantum Key Distribution (QKD)** prevents cyberattacks and secures **military networks**.
    - *Example:* **ISRO & DRDO are developing QKD networks** for secure government communication.
2. **Healthcare & Drug Discovery**: Simulates **complex molecular interactions**, reducing **drug discovery time from years to months**.
    - *Example:* **IBM's quantum computer is being used for new antibiotics and cancer drugs.**
3. **Finance & Banking**: Optimizes **risk management, fraud detection, and financial modeling**.

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- *Example:* **Goldman Sachs and JPMorgan Chase** use quantum computing for portfolio optimization.

4. **Agriculture & Climate Science**: **Quantum weather forecasting** improves **monsoon predictions** and helps in **crop yield estimation**.
   - *Example:* **IBM's Quantum Weather Forecasting Model** is being explored for **Indian agriculture**.
5. **Artificial Intelligence & Machine Learning**: Accelerates **AI model training and deep learning algorithms**.
   - *Example:* **Google's Quantum AI team is working on faster AI training algorithms**.
6. **Space & Satellite Communication**: Enables **ultra-secure quantum communication between satellites**.
   - *Example:* **China's Micius satellite demonstrated quantum-secured communication between continents.**
7. **Logistics & Supply Chain**: **Optimizes cargo distribution and reduces fuel costs**.
   - *Example:* **DHL and FedEx are testing quantum computing for supply chain optimization**.

Challenges in Quantum Computing in India

1. **High Cost & Infrastructure Constraints**: **Quantum computers require near absolute zero temperatures**, making them expensive. India's **₹6,000 crore National Quantum Mission** is **significantly lower than China's $15 billion investment**.
2. **Limited Skilled Workforce**: India lacks **trained quantum scientists and engineers**. **China produces over 1,500 PhD graduates in quantum technologies annually**, while India lags behind.
3. **Slow Development of Quantum Hardware**: India is **focusing on theoretical research**, but **lacks indigenous quantum processors**. **Google's Sycamore processor (2019) demonstrated quantum supremacy, but India has no comparable system.**
4. **Quantum Decoherence & Error Rates**: **Qubits are unstable**, requiring complex **error correction mechanisms**. **Google's Sycamore processor** maintains quantum coherence for **only a few microseconds**.
5. **Cybersecurity Risks & Post-Quantum Cryptography**: Quantum computers can **break current encryption standards (RSA, AES)**, posing **national security risks**. **China's Quantum Communication Satellite (Micius)** has demonstrated **quantum-secured encryption**, while India is still in **early research stages**.
6. **Weak Industry-Academia Collaboration**: **Most quantum research in India is government-driven (ISRO, DRDO, NITI Aayog)** with **limited private sector participation**. **IBM, Google, and Microsoft invest billions in quantum startups**, while **India has few private investments**.

7. **Slow Industry Adoption**: **Banks, healthcare firms, and logistics companies in India** have been slow to integrate quantum solutions. **Goldman Sachs is using quantum computing for risk analysis, but Indian banks have yet to adopt it.**

Way Forward

1. **Increase Investment in Quantum R&D**: Expand **National Quantum Mission (NQM) funding from ₹6,000 crore to ₹15,000 crore**. Develop India's **first indigenous quantum processor** within the next **5 years**.
2. **Develop a Skilled Workforce**: Introduce **quantum computing courses in IITs, IISc, and NITs**. Establish **quantum research fellowships** to retain talent.
3. **Enhance Industry-Academia Collaboration**: Encourage **private investment in quantum startups**. Set up **Quantum Research Hubs** in partnership with **Google, IBM, and Microsoft**.
4. **Strengthen Cybersecurity Against Quantum Threats**: Develop **post-quantum cryptography standards** for **banks, defence, and government agencies**. Secure **India's national communication networks using QKD**.
5. **Accelerate Quantum Hardware Development**: Invest in **semiconductor and superconducting technologies** for quantum chips. Establish **quantum computing labs across major IITs and research centres**.
6. **International Collaborations**: Partner with **EU, USA, Japan, and Australia** for quantum research. Join **global quantum alliances** to access new technologies.

Quantum computing presents **transformative opportunities for India** in **defense, healthcare, finance, AI, and space sectors**. However, challenges such as **high costs, skill shortages, cybersecurity risks, and slow hardware development** must be addressed. Strengthening **R&D investment, cybersecurity policies, and industry-academia collaboration** will be critical for India's **leadership in quantum technology**. By learning from **China, the US, and the EU**, India can **accelerate its quantum mission and secure its technological future**.

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25. WETLANDS

iMPACT ANALYSIS

SYLLABUS:

GS 3 > Environment & Ecology > Biodiversity > Wetland conservation

REFERENCE NEWS:

- The recent **suo motu public interest litigation (PIL) by the Meghalaya High Court** to oversee wetland conservation in the state underscores the critical importance of these ecosystems. This move aligns with global efforts to protect wetlands, highlighted annually on **World Wetlands Day**, observed every **February 2** since **1971** to commemorate the adoption of the **Ramsar Convention**.
- The **2025 theme**, "Protecting Wetlands for Our Common Future," emphasizes wetlands' role in sustainable development, resonating with the principles of the **Brundtland Report** ("Our Common Future") published by the UN World Commission on Environment and Development in **1987**.

WHAT ARE WETLANDS?

- Wetlands can be defined as **lands transitional between terrestrial and aquatic eco-systems** where the **water table is usually at or near the surface** or the **land is covered by shallow water.**
- **Article 1 of the Ramsar Convention** states that "wetlands are areas of **marsh, fen, peatland or water**, whether **natural or artificial**, **permanent or temporary**, with water that is **static or flowing**, **fresh, brackish or salt**, including areas of **marine water** the depth of which at low tide does not exceed **six meters**".
- Based on this definition, **five major wetland types** are generally recognized:

Marine (coastal wetlands including coastal lagoons, rocky shores, seagrass beds and coral reefs)
Estuarine (including deltas, tidal marshes, mudflats, and mangrove swamps)
Lacustrine (wetlands associated with lakes)
Riverine (wetlands along rivers and streams)
Palustrine (marshes, swamps and bogs)
In addition, there are **human-made wetlands** such as fish and shrimp ponds, farm ponds, irrigated agricultural land including rice paddies, salt pans, dams, reservoirs, gravel pits, wastewater treatment ponds and canals. There are even underground wetlands.

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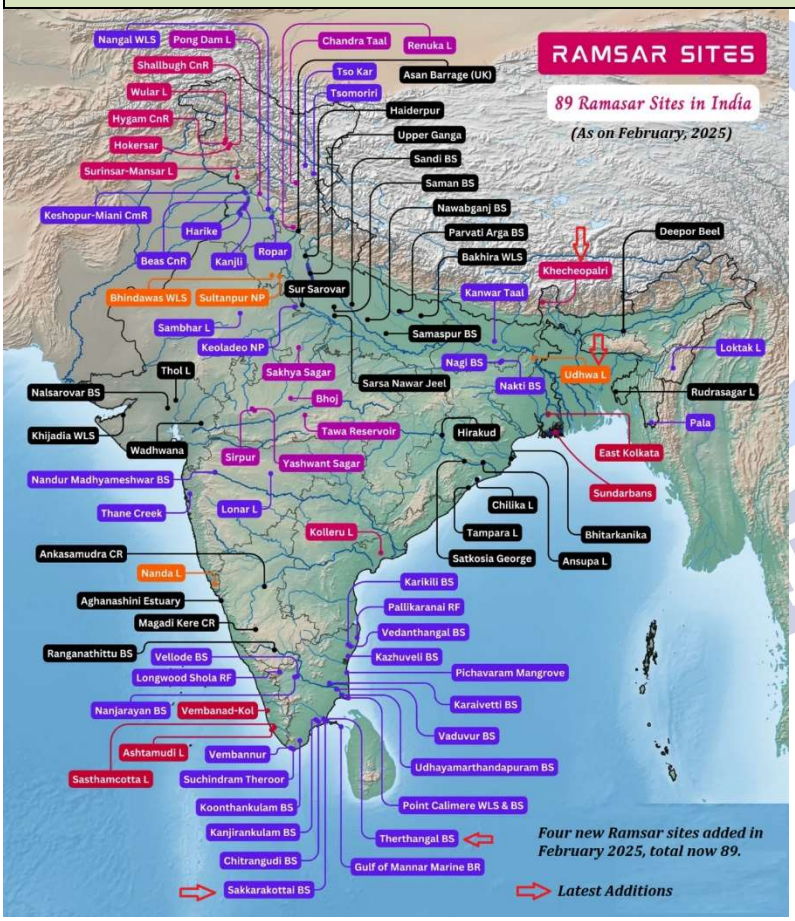
THE RAMSAR CONVENTION:

- **The Convention on Wetlands** is an intergovernmental treaty that provides the framework for national action and international cooperation for the conservation and wise use of wetlands and their resources.
- The signing of the Convention on Wetlands **took place in 1971 at the small Iranian town of Ramsar**, on the southern shore of the Caspian Sea. Since then, the Convention on Wetlands has been **known as the Ramsar Convention**.
- The official name of the treaty is '**The Convention on Wetlands of International Importance especially as Waterfowl Habitat'**.
- The Convention **entered into force in 1975**. It is **neither legally binding** and **nor is a part of UN & UNESCO** conventions.



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STATISTICS:

- India nearly has **4.6% of its land as wetlands** that cover an area of **15.26 million hectares.**
- As of **February 2025**, India has expanded its network of **Ramsar sites**—wetlands of international importance—to **89**, covering an area of approximately **1,359,434 hectares**.
- India is **one of the Contracting Parties to Ramsar Convention**. India **signed it on 1st Feb 1982.**
- During 1982 to 2013, a total of 26 sites were added to the list of Ramsar sites, however, **during 2014 to 2022, the country has added 49 new wetlands to the list of Ramsar sites.**

IMPORTANCE OF WETLANDS:

Ecological Significance:

- **Rich reservoirs of biodiversity:**

Wetlands are **rich reservoirs of biodiversity**.
For instance, around **40% of the world's plant and animal species live or breed** in wetlands.Also, wetlands are essential to **bird life, breeding and migration**

- **Biogeochemical Cycling:**

Wetlands play a huge **role in biogeochemical cycling**. They supply **nitrogen, sulfur, phosphorus, and carbon** to surrounding ecosystems. Further, they are capable of **storing such elements for long periods of time in the soil.**
For instance, **Nitrogen is largely cycled within the wetlands' soil**, but also **escapes to neighboring ecosystems**. Thus wetlands provide nutrients not only for their own uses, but for use by other systems as well.

- **Carbon sink:**

Wetlands are a **major carbon sink**. They have a high capacity to **sequester and store carbon.**
Carbon is taken from the air as CO_2 and used in photosynthesis, but instead of later being released again as carbon dioxide, wetlands are capable of **storing carbon in the sediment in the form of deteriorating organic substance**s. This storage technique allows wetlands to **help decrease the greenhouse effect**.

- **Natural barriers:**

Wetlands function as **natural barriers against forces of nature**.
They **reduce the speeds and heights** of **tidal bores, storm and tsunami** waves, **control floods and reduce soil erosion**.

Economic Significance:

- **Highly productive ecosystem:**

Wetlands are **among the most productive ecosystems** in the world, **comparable to rain forests and coral reefs**.
The combination of **shallow water, high levels of nutrients** is **ideal for the development of organisms** that form the base of the food web and feed many **species of fish, amphibians, shellfish etc**.
For example, wetlands provide the world with nearly **two-thirds of its fish harvest**.
Urban wetlands are essential for preserving **public water supplies**.

- **Sources of food and other diverse products:**

Wetlands are a **vital source for food, raw materials, genetic resources for medicines**.
For instance, wetlands are **a source of timber** in many areas and many plants like **blueberries, mints, and wild rice are produced in wetlands.**
Also, some wetlands are major sources of **hydroelectric power**. E.g.: **Pong Dam Lake (**Ramsar Site**) in Himachal** is a major hydroelectric project across river Beas.

- **Promotes tourism:**

Many wetlands are areas **of natural beauty and promote tourism**. E.g.: **Odisha's Chilka Lake** attracts tourists on a large scale as it is an important habitat and **breeding ground of flamingos in India.**

Recreational And Cultural Significance:

- Wetlands have high **recreational and cultural values**.
- Wetlands have played an important part in human development and are of significant **religious, historical or archeological value to many cultures around the world.**
- For example, the **Tso Moriri lake** in Jammu Kashmir is a **renowned pilgrimage destination for Buddhists.**
- They are also often inviting places for **popular recreational activities** including **hiking, fishing, bird watching, photography and hunting**.

THREATS TO WETLANDS:

- **Urbanization:**

Wetlands are under increasing **developmental pressure for residential, industrial and commercial facilities**.
Often wetlands are **drained or reclaimed** to **meet the rising demands for land.**
Groundwater withdrawals for water supply can lower water levels in some wetland systems, changing habitats for plants, fish or other aquatic life. **Over withdrawal can also lead to rise in salinity.**

- **Agriculture and allied activities:**

Vast stretches of **wetlands have been converted for agriculture**. For instance, **following the Green Revolution** of the 1970s, **vast stretches of wetlands have been converted to paddy fields. Construction of a large number of reservoirs, canals and dams** to provide for irrigation significantly **altered the hydrology of the associated wetlands**.
Livestock grazing, unless managed carefully, can **remove plants that stabilize streambanks** and protect soils from erosion. This can damage some wetland types by causing channel formation and drainage, or can clog streams with sediment.

- **Pollution:**

Wetlands are being severely polluted by the **discharge of municipal sewage**, **agricultural run offs and industrial heavy metal** wastes such as **lead and mercury.**
This results in **rapid eutrophication** and subsequent **deterioration of wetlands.**

- **Invasive Species:**

Wetlands are threatened by **exotic plant and animal species**, often termed as invasive alien species.
For example, **Indian wetlands are threatened by** species such as **water hyacinth, Salvinia and Amazon catfish.** They infest the waterways and compete with native vegetation.

- **Climate Change:**

Increased air temperatures, **variations in rainfall**, **droughts and floods**; and sea level rise could affect wetlands.

CONSERVATION EFFORTS:

National:

- **National Plan for Conservation of Aquatic Eco-systems (NPCA):** A centrally sponsored scheme by the Ministry of Environment, Forest & Climate Change (MoEF&CC), combining National Lake Conservation Plan and National Wetlands Conservation Programme, for conserving wetlands and lakes with cost sharing between the central government and state governments.
- **Wetlands (Conservation and Management) Rules, 2017:** Notified by MoEF&CC under the Environment (Protection) Act, 1986, these rules provide a regulatory framework for the conservation and management of wetlands across India.
- **Amrit Dharohar Initiative:** The Amrit Dharohar initiative, part of the **2023-24 budget announcement**, was launched during **June 2023** to promote unique conservation values of the Ramsar Sites in the country while generating employment opportunities and supporting local livelihoods. The scheme is being implemented in convergence with various Central Government ministries and agencies, State wetland authorities, and a network of formal and informal institutions and individuals, working together for a common cause.
- **Web Portal:** MoEF&CC's dedicated portal (https://indianwetlands.in/) serves as a public platform for information, knowledge sharing, and data repository on wetlands.
- **Centre for Wetlands Conservation and Management (CWCM):** Established under MoEF&CC's National Centre for Sustainable Coastal Management (NCSCM), this centre functions as a knowledge hub for wetland conservation, aiding in policy, management planning, monitoring, and research.

International:

- **The Ramsar Convention:** Adopted in 1971 in Ramsar, Iran, and effective since 1975. Nearly **90% of UN member states** are committed to its three pillars: wise use of all wetlands, designation and management of wetlands of international importance, and international cooperation on transboundary wetlands and shared species.

The Montreux Record:

- The Montreux Record is a **register of wetland sites** on the List of Wetlands of International Importance w**here changes in ecological character have occurred, are occurring, or are likely to occur** as a result of technological developments, pollution or other human interference. **It is maintained as part of the Ramsar List.**
- Currently, **two wetlands in India are in the Montreux record: Keoladeo National Park (Rajasthan) and Loktak Lake (Manipur).Chilika lake (Odisha)** was placed in the record but was later **removed from it**.

- **Wetlands International:**

Wetlands International is a **global not-for-profit organisation** dedicated to the **conservation and restoration of wetlands**.

It is an **International Organisation Partner (IOP) of the Ramsar Convention.**

WAY FORWARD:

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- **Strengthening Policy and Governance**
  - Develop a **comprehensive national wetland policy** ensuring an integrated and ecosystem-based approach.
  - Strengthen the **Wetlands (Conservation and Management) Rules, 2017**, with clear enforcement mechanisms.
  - Enhance **inter-departmental coordination** to streamline wetland governance.
- **Community Participation and Sustainable Livelihoods**
  - Encourage **local community engagement** in wetland management through eco-tourism, organic farming, and sustainable fishing.
  - Integrate **traditional ecological knowledge** with scientific conservation methods.
- **Technology and Scientific Research**
  - Use **remote sensing, AI-based monitoring, and GIS mapping** for real-time wetland assessment.
  - Establish **regional research centers** to study climate change impacts, pollution, and invasive species.
- **Urban Wetland Protection and Restoration**
  - Integrate wetlands into **city planning and urban infrastructure** to enhance resilience.
  - Implement **wetland rejuvenation projects** using nature-based solutions.
- **Financial Support and Incentives**
  - Encourage **CSR initiatives and public-private partnerships** for wetland restoration.
  - Expand **government funding** under programs like the **National Adaptation Fund for Climate Change (NAFCC)**.
- **Public Awareness and Education**
  - Strengthen **awareness campaigns** at schools, universities, and local communities.
  - Promote digital outreach and establish **wetland interpretation centers** at Ramsar sites.
- **Climate Change Mitigation and Resilience**
  - Recognize **wetlands as key carbon sinks** in climate action strategies.
  - Implement **nature-based solutions** to protect wetlands from rising sea levels and extreme weather events.

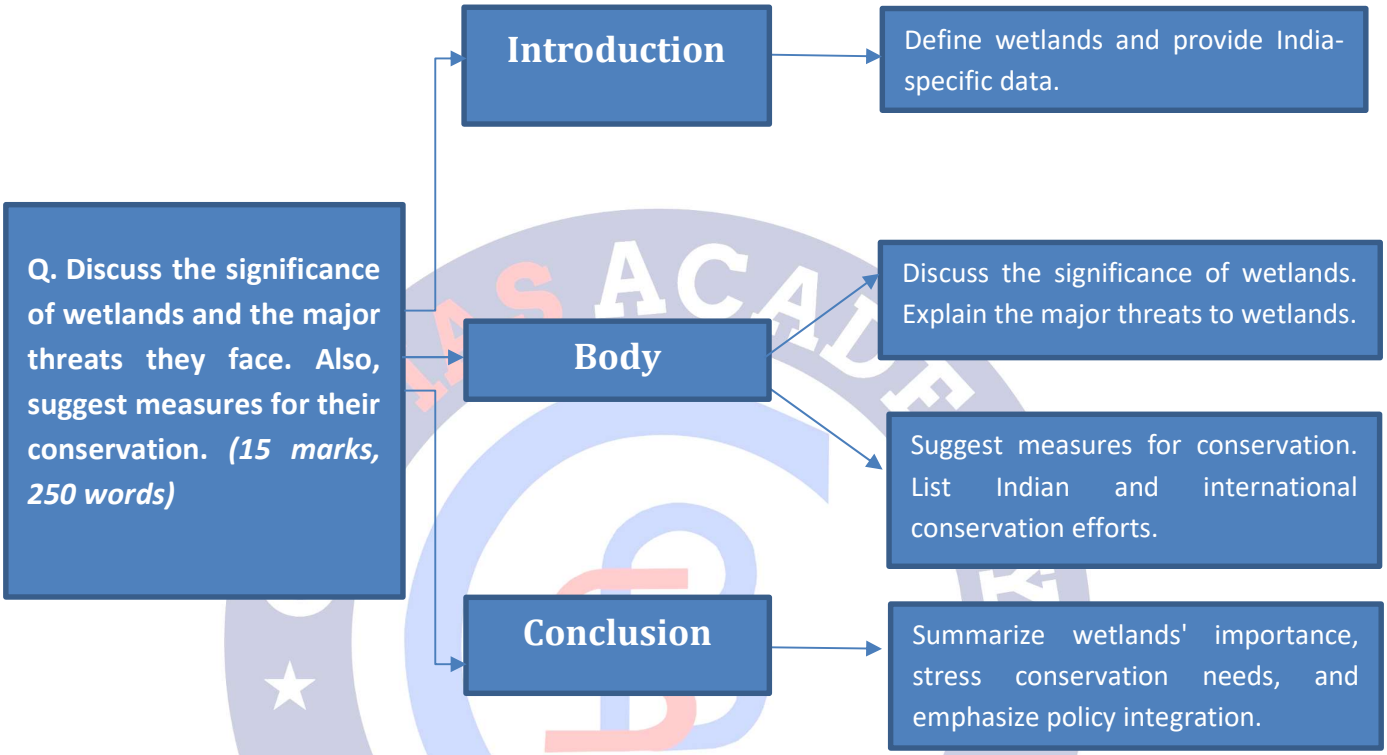
CONCLUSION:

- Wetlands are crucial for **biodiversity, climate resilience, and economic sustainability**, yet face rapid degradation due to **urbanization, pollution, and climate change**. Strengthening **policy, governance, community involvement, technology, and financial incentives** is essential for their protection. **Integrating wetlands into national development strategies** will ensure their long-term survival and continued ecological and economic benefits.

PRACTICE QUESTION

Q. Discuss the significance of wetlands and the major threats they face. Also, suggest measures for their conservation. *(15 marks, 250 words)*

APPROACH



MODEL ANSWER

Wetlands are transitional ecosystems between terrestrial and aquatic environments, where the water table is at or near the surface. According to the Ramsar Convention, wetlands include marshes, swamps, peatlands, lakes, rivers, and even human-made water bodies like reservoirs and rice paddies. India has **4.6% of its land as wetlands**, covering **15.26 million hectares**. As of **February 2025**, India has **89 Ramsar sites** spanning **1,359,434 hectares**, making it one of the most active countries in wetland conservation.

Significance of Wetlands:

- **Ecological Importance**
  - **Biodiversity Hotspots:** Wetlands support **40% of the world's plant and animal species**.
  - **Carbon Sink:** They help **sequester carbon**, mitigating climate change.
  - **Flood and Disaster Control:** Wetlands act as **natural barriers** against floods, tsunamis, and coastal erosion.

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- **Nutrient Cycling:** They play a key role in **biogeochemical cycles**, storing and supplying nitrogen, phosphorus, and sulfur.

- **Economic Importance**
  - **Livelihood Support:** Fisheries, agriculture, and tourism depend on wetland ecosystems.
  - **Hydroelectric Power:** Some wetlands, like **Pong Dam Lake (Himachal Pradesh)**, contribute to power generation.
  - **Water Supply and Purification:** Wetlands naturally filter pollutants and **recharge groundwater**.
- **Cultural and Recreational Importance**
  - Many wetlands have **religious and archaeological significance**, such as **Tso Moriri Lake (Ladakh)**.
  - They provide opportunities for **birdwatching, ecotourism, and research**.

Major Threats to Wetlands:

- **Urbanization and Encroachment**
  - Expansion of cities leads to **wetland destruction** and drainage for construction.
  - **Example:** Mumbai has lost **71% of its wetlands** between **1970-2014**.
- **Agricultural Expansion and Unsustainable Practices**
  - Conversion of wetlands into **farmland** (e.g., **paddy fields after the Green Revolution**).
  - **Dams and irrigation projects** disrupt wetland hydrology.
- **Pollution and Industrial Waste**
  - **Sewage discharge, agricultural runoff, and heavy metals** degrade wetland quality.
  - Rapid **eutrophication** reduces aquatic biodiversity.
- **Invasive Species**
  - **Water hyacinth, Salvinia, and Amazon catfish** threaten India's wetlands by disrupting native ecosystems.
- **Climate Change**
  - **Rising temperatures, irregular rainfall, and sea-level rise** impact wetland ecosystems.
  - **Mangroves and coastal wetlands** are particularly vulnerable.

Measures for Wetland Conservation:

- **Strengthening Policy and Governance**: Implementing **comprehensive national and state-level wetland policies**. **Stronger enforcement of Wetlands (Conservation and Management) Rules, 2017**.

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- **Community Participation and Sustainable Management**: Promoting **eco-tourism and sustainable livelihoods** for local communities. Integrating **traditional wetland management practices** with modern conservation methods.
- **Scientific Research and Technological Monitoring**: **Remote sensing, AI-based wetland monitoring, and GIS mapping** for real-time assessment. Establishing **regional research centers** to study wetland degradation.
- **Urban Wetland Protection and Restoration**: Incorporating wetlands into **urban planning** for flood control and biodiversity conservation. Restoration of **degraded urban wetlands** through nature-based solutions.
- **Financial and Institutional Support**: Expanding **funding under the National Adaptation Fund for Climate Change (NAFCC)**. **Corporate Social Responsibility (CSR) initiatives** for wetland conservation.
- **Awareness and Education**: **Public campaigns, school programs, and digital outreach** to promote wetland conservation. Establishing **interpretation centers at Ramsar sites** for awareness.

Key Conservation Efforts:

National Initiatives:

- **National Plan for Conservation of Aquatic Ecosystems (NPCA)**
- **Wetlands (Conservation and Management) Rules, 2017**
- **Amrit Dharohar Initiative (2023)** – for Ramsar site conservation
- **Centre for Wetlands Conservation and Management (CWCM)**

International Frameworks:

- **Ramsar Convention (1971)** – India is a signatory since 1982
- **Montreux Record** – Keoladeo National Park (Rajasthan) and Loktak Lake (Manipur)
- **Wetlands International** – Global non-profit for wetland restoration

Wetlands are **indispensable for biodiversity, climate resilience, and human well-being**, but they are rapidly declining due to **urbanization, pollution, and climate change**. Effective **policy implementation, community participation, technological advancements, and financial support** are crucial for their long-term conservation. **Mainstreaming wetlands into national development plans** will ensure their ecological and economic sustainability.

26. SPACE DEBRIS

iMPACT ANALYSIS

SYLLABUS:

GS 3 > Science and Technology > Space technology

REFERENCE NEWS:

- With increasing space activity, the issue of space debris and accountability for falling debris has become a significant legal and governance challenge.
- Recent incidents highlight the risks associated with uncontrolled reentries of space objects. In one such case, a **500 kg metal object** fell in **Makueni County, Kenya**, shocking local residents. Experts from the **Kenya Space Agency** identified it as a **separation ring from a space-bound rocket**, though some astronomers expressed skepticism. Similar incidents in Australia and the U.S. have reinforced concerns about the dangers posed by space debris and the need for stronger accountability measures.

WHAT IS SPACE DEBRIS?

- According to NASA, **space debris** encompasses **both natural meteoroid and artificial (human-made) orbital debris.**
- Meteoroids **are in orbit about the sun**, while most **artificial debris is in orbit about the Earth** (hence the term "orbital" debris).
- **Orbital debris** is **any human-made objec**t in orbit about the Earth that **no longer serves useful function.**
- So, **space debris** (orbital debris) refers to **all the human-made objects** such as **whole and abandoned satellites**, pieces of **broken satellites**, **spent rocket stages**, **fragments after anti-satellite weapon strikes (ASAT)** and **other random objects** such as tiny flecks of paint from spacecraft and **even tools left behind by astronauts** during space walks.
- The **majority of them orbit the Earth**, and some even go beyond it. Some of them have made it **to Venus and Mars**. **Twenty tonnes** of them have been **found on the moon**, according to NASA.

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STATISTICS:

- Based on statistical models produced by European Space Agency (ESA)'s space debris office, it is estimated that there are **36,500 objects larger than 10cm**, **1 million objects between 1-10cm**, and an **extraordinary 130 million objects between 1mm to 1cm.**
- At present, **NASA is officially tracking** more than **26,000 pieces of orbital debris** (the **U.S. and Russia/USSR are responsible for over 70% o**f this) that are endangering astronauts and space missions.
- According to NASA, **debris in orbits below 600 kilometres will fall back to Earth** within several years, **but above 1,000 kilometres** it will **continue circling the Earth for a century or more.**
- The **Indian Space Situational Assessment Report (ISSAR) for 2023** by **ISRO** has revealed that more space objects were placed in orbit in 2023 compared to 2022. According to the report, a total of **3,143 objects** originating from **212 launches and on-orbit break-up events** were added to the space object population in 2023, compared to **2,533 objects from 179 launches** in 2022.

CHALLENGES ASSOCIATED WITH SPACE DEBRIS:

- **Risk posed to space exploration:**
  - Debris in **Low Earth Orbit (LEO) travels at speeds of up to 10 km/s,** fast enough to cause **significant damage to satellites, spacecraft, or spacewalking astronauts**.
  - The rising number of pieces of space debris increases the potential danger to all space vehicles, especially those with humans aboard, **like the International Space Station (ISS).**
  - For instance, since its launch in 1999, the **International Space Station (ISS) has performed 29 debris avoidance manoeuvres** up to May 2021.
  - Also, in 2023, **3,033 alerts for close approaches within 1 km** were recorded for ISRO satellites, demonstrating the growing risk of orbital collisions. (Source: Indian Space Situational Assessment Report)

Kessler Syndrome or Kessler Effect:

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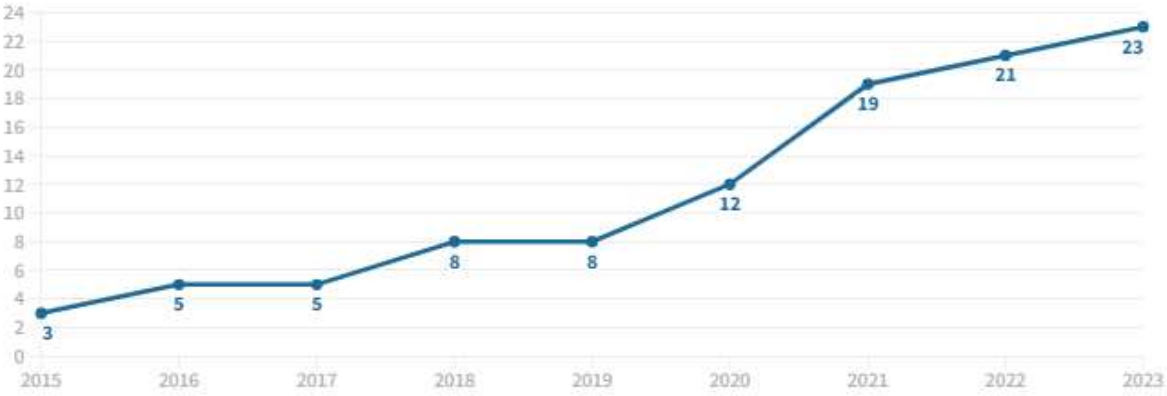
- The Kessler Syndrome is a **theory proposed by NASA scientist Donald J. Kessler** in 1978, used to describe a self-sustaining **cascading collision of space debris** in LEO.
- The Kessler Syndrome is a phenomenon in which the **density of objects in the Low Earth Orbit grows so high** that collisions between two objects could cause **a massive cascade**.
- The collisions could increase the scope of f**urther collisions generating more space junk**.
- This causes **more and more debris problems** and negatively impacts satellites, astronauts and mission planners.

- **Increases the cost of operation:**
  - Space debris is **not only a hazard**; it also **raises the cost of satellite operators**.
  - Satellite **operators in geostationary orbit** have estimated that **protective and mitigation measures** account for **about 5–10% of mission costs**, and for **lower-Earth orbits the cost is higher**, according to an OECD study**.**
  - **Collision Avoidance Costs:** In 2023, ISRO **conducted 23 Collision Avoidance Maneuvers (CAMs),** up from 21 in 2022 and 19 in 2021, demonstrating a rising operational cost for managing space debris threats.

Collission Aviodance Manoeuvres of Indian space assets



Source: ISRO

- **Potential impact on ability of satellite technology:**

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- The density of the space debris may become so great that it **could hinder the ability to use weather satellites** and, hence, monitor weather changes.

- **Impact on environment and human life:**
  - Space debris poses environmental and safety risks both in orbit and on Earth. While smaller fragments burn up in the atmosphere, **larger debris can survive re-entry**, causing damage upon impact.
  - Recent incidents highlight these dangers. In **Kenya, a 500 kg metal object fell in Makueni County**, identified as a **separation ring from a rocket**, raising safety concerns. Similarly, in **Australia, ISRO rocket debris** was discovered on a **beach**, underscoring the **need for stronger space debris regulations** to mitigate environmental and human hazards.
  - In **Siberia**, debris from **Russian Proton rockets** contains **toxic fuel residue, unsymmetrical dimethylhydrazine (UDMH),** a highly carcinogenic substance that contaminates **soil, water, and air**, endangering **plants, animals, and human health**. Additionally, when debris burns up in the atmosphere, it **releases chemicals** that can **deplete the ozone layer** and impact future space missions.

- **Threat to human life**:
  - **Larger debris** poses a danger to human life and property.
  - For instance**, the debris from a large Chinese rocket**, the **Long March 5B**, crashed to earth over the Pacific and Indian oceans. As the **22-tonne core stage of the rocket** hurtled **uncontrollably back to earth**, there were fears that it **might hit a populated area.**

INITIATIVES TO TACKLE THE ISSUE:

NATIONAL:

- **ISRO System for Safe and Sustainable Operations Management (IS4OM)**
  - In 2022, ISRO System for Safe and Sustainable Operations Management (IS 4 OM) has been established towards more focused **efforts to continually monitor the objects posing collision threat**, improve prediction of evolution of space debris environment and **concerted activities to mitigate the risk posed by space debris.**

- **Project NETRA:**
    - The **Indian Space Research Organisation (ISRO)** has initiated 'Project NETRA' **to monitor space debris**.
    - The domestic surveillance system would **provide first-hand information on the status of debris**, which would aid further planning on protecting space assets.
- **India - U.S. pact:**
    - In April 2022, India and the U.S. signed a **new pact for monitoring space objects** at the **2+2 dialogue**.
- **'SPADEX':**
    - To provide **in-orbit servicing**, ISRO **is developing a docking experiment** called 'SPADEX'.
    - It looks at docking a satellite on an existing satellite, **offering support in re-fuelling** and **other in-orbit services** while e**nhancing the capability of a satellite**.
    - This would not only **ensure the longevity of a mission** but would also provide **a futuristic option to combine missions or experiments, thereby promoting reuse and efficient use of satellites**.
- **Collision Avoidance Manoeuvres**:
    - In **2023, ISRO carried out 23 CAMs**, up from **21 in 2022 and 19 in 2021**, to protect its operational satellites.
    - ISRO received **1,37,565 close approach alerts** from **USSPACECOM**, reassessed **3,033 alerts within 1 km**, and coordinated with **SpaceX and EUMETSAT** when necessary.
    - ISRO is also developing **spacecraft shielding** to protect against smaller, untrackable debris.

INTERNATIONAL:

- **Space Debris Mitigation Guidelines:**

- In 2007, the **United Nations General Assembly adopted** the Space Debris Mitigation Guidelines drafted by the **Committee on** the **Peaceful Uses of Outer Space (COPUOS).**
- The guidelines specify, among other things, that **rockets and satellites** should be **designed to produce no debris**, and that satellites in low Earth orbit should **re-enter the atmosphere within 25 years of ending their mission**.

COPUOS is a **forum for discussing the peaceful uses of outer space**, established as a permanent committee of the UN after the Soviet Union launched the first artificial satellite in 1957.

- **RemoveDebris Mission:**
  - RemoveDebris is an **EU (European Union) research project** to develop and fly a low cost in-orbit **demonstrator mission** that aims to de-risk and **verify technologies needed for future ADR (Active Debris Removal) missions.**
- **e.Deorbit mission:**
  - ESA's proposed e.Deorbit mission aims **to capture and safely deorbit a derelict ESA-owned satellite** in a highly trafficked low-Earth orbit.

WAY FORWARD:

- **Reuse and Recycling:**
  - Support space research and technology development to enable **reuse and recycling of satellites** at every stage.
  - Encourage the **private sector** to innovate models that **enhance operational safety** and **minimize debris footprint**.
  - Increase focus on **reusable launch vehicles**, such as **SpaceX Falcon 9**, which reduces waste and costs.
  - Promote **debris-neutral technologies** and **reusable rocket designs** to limit space clutter.
- **Controlled Deorbiting and Self-Destruction of Satellites:**
  - Satellites should be **programmed to deorbit** at the end of their operational life.

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- Modern satellites should be launched into **elliptical orbits**, ensuring they naturally re-enter the atmosphere and burn up.
- Countries should enforce **mandatory deorbiting policies** with launch penalties for non-compliance.

- **Passivation Measures:**
  - **Passivation** prevents **accidental explosions** of defunct satellites by depleting residual energy sources.
  - Includes **fuel venting, battery discharge, and disabling pyrotechnic devices** to reduce post-mission risks.
- **Strengthening International Cooperation and Governance:**
  - **COPUOS must establish binding regulations** requiring **controlled reentries** and **sanctions for non-compliant states**.
  - Countries should **separate sustainability from national security** and **share satellite positioning data** without compromising their strategic interests.
  - International regulations must **restrict the number of satellites per orbital shell** to reduce congestion.
- **Enhanced Tracking and Monitoring:**
  - Expand **tracking systems** like **U.S. Space Fence** and promote real-time **global debris monitoring networks**.
  - Strengthen **satellite shielding** to mitigate risks from **untrackable small debris**.
  - Foster **public-private partnerships** to develop **advanced AI-driven debris prediction models** for better space traffic management.

CONCLUSION:

- The rapid expansion of space activity demands **urgent reforms** in **debris mitigation, satellite management, and global cooperation**. Voluntary guidelines are insufficient; **legally binding rules, stricter compliance mechanisms, and improved tracking** are essential to **ensure the sustainability of outer space** and prevent future risks to Earth's environment and human safety.

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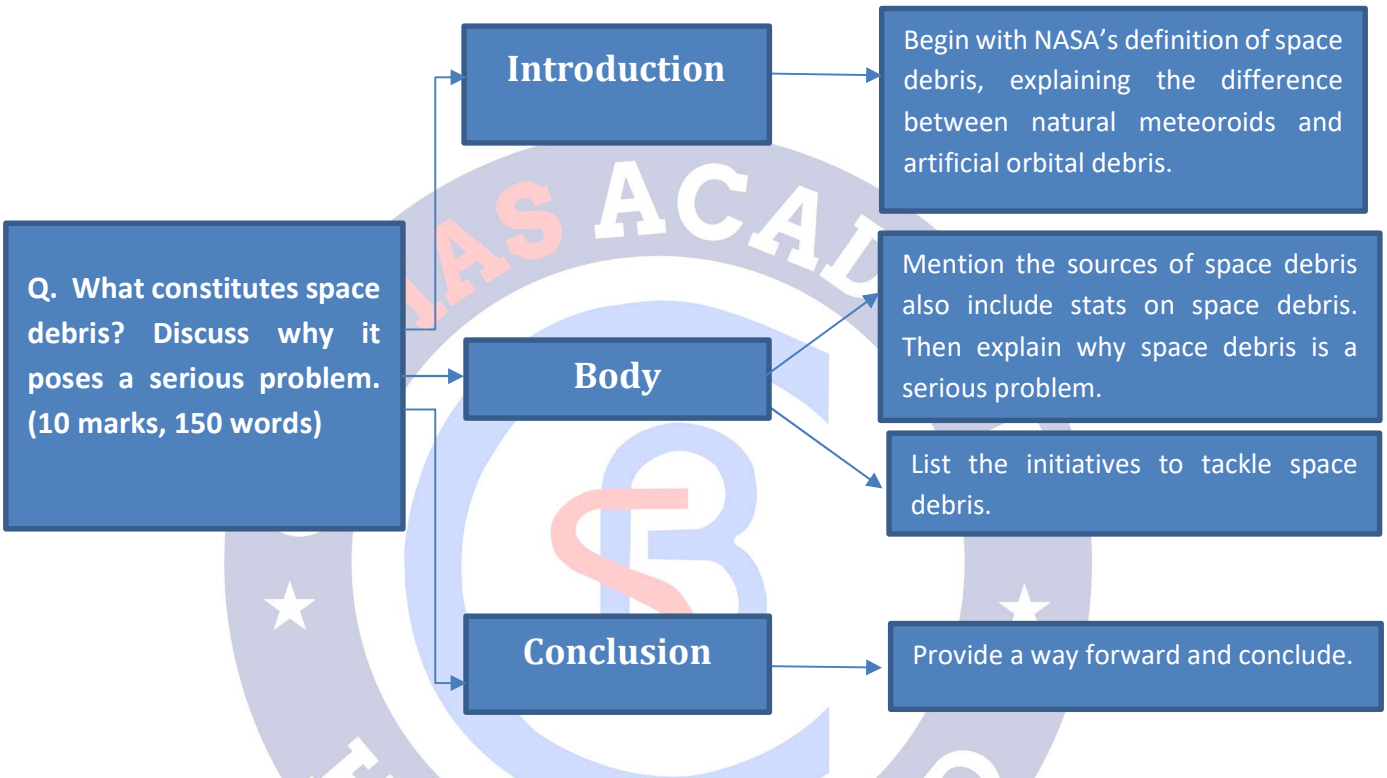
PRACTICE QUESTION

Q. What constitutes space debris? Discuss why it poses a serious problem. (10 marks, 150 words)

APPROACH



MODEL ANSWER

According to **NASA**, space debris includes both **natural meteoroids** and **artificial (human-made) orbital debris**. **Meteoroids orbit the Sun**, while most **artificial debris orbits Earth** (hence the term **"orbital debris"**). **Orbital debris** refers to any human-made object in Earth's orbit that no longer serves a useful function.

It includes **abandoned satellites, broken satellite fragments, spent rocket stages, and debris from anti-satellite weapon tests (ASATs)**. Even **tiny flecks of paint from spacecraft and tools left by astronauts** during spacewalks contribute to space debris. While most debris remains in Earth's orbit, some have traveled beyond, reaching **Venus, Mars, and even the Moon, where 20 tonnes of debris have been found**, according to NASA. The rising threat of space debris poses legal and governance challenges, as seen in recent uncontrolled reentries in Kenya, Australia, and the U.S. Based on statistical models produced by European Space Agency (ESA)'s space debris office, it is

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estimated that there are **36,500 objects larger than 10cm**, **1 million objects between 1-10cm**, and an **extraordinary 130 million objects between 1mm to 1cm.**

Why Space Debris is a Serious Problem?

1. Threat to Space Exploration and Satellites

- Space debris in **Low Earth Orbit (LEO)** travels at speeds of **10 km/s**, fast enough to cause catastrophic damage.
- **International Space Station (ISS) has performed 29 debris avoidance maneuvers** since 1999.
- **In 2023, ISRO detected 3,033 close approaches within 1 km** for its satellites, highlighting growing collision risks.

2. Kessler Syndrome

- A theory proposed by **Donald J. Kessler (1978)** warns of **cascading collisions** in space.
- If debris density increases, **one collision could trigger more collisions**, making space exploration and satellite operations nearly impossible.

3. Rising Operational Costs

- **Collision avoidance measures account for 5-10% of satellite mission costs** (OECD study).
- ISRO conducted **23 Collision Avoidance Maneuvers (CAMs) in 2023**, up from 21 in 2022 and 19 in 2021, increasing operational expenses.

4. Environmental and Human Hazards

- **Uncontrolled reentries** pose threats to human life and property.
    - **Kenya (2024)**: A **500 kg rocket fragment** crashed in Makueni County.
    - **Australia (2023)**: **ISRO rocket debris** was found on a beach.
- **Toxic fuel residues** from **Russian Proton rockets (UDMH)** contaminate **soil, water, and air** in Siberia.
- **Burning debris releases ozone-depleting chemicals**, affecting climate and future missions.

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Initiatives to Tackle Space Debris:

National Efforts:

- ISRO's IS4OM (2022)
- Project NETRA
- India-U.S. Space Pact (2022)
- SPADEX (Space Docking Experiment)
- Collision Avoidance Maneuvers (CAMs)

International Efforts:

- UN Space Debris Mitigation Guidelines (2007)
- RemoveDebris Mission (EU)
- ESA's e.Deorbit Mission

Way Forward:

- **Promote Reuse and Recycling** – Encourage **reusable rockets** (e.g., **SpaceX Falcon 9**) and **satellite servicing**.
- **Controlled Deorbiting** – Implement **mandatory self-destruction** or **graveyard orbits** for defunct satellites.
- **Passivation Measures** – Remove stored energy in satellites to prevent explosions.
- **Stronger Global Regulations** – **COPUOS must enforce binding rules** for **controlled reentries** and **penalize violators**.
- **Advanced Tracking Systems** – Expand **real-time global debris monitoring** and **AI-based prediction models**.

The increasing threat of space debris requires **urgent legal, technological, and policy reforms**. While voluntary guidelines exist, **binding international regulations, stronger compliance, and advanced debris removal methods** are necessary to **ensure the sustainability of space activities** and **protect Earth's environment and human safety**.

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27. CRYPTOCURRENCY

iMPACT ANALYSIS

SYLLABUS:

GS 3 > Science and Technology > Digital Technology

REFERENCE NEWS:

- Recently, U.S. President Donald Trump has signed an executive order to create a **strategic bitcoin reserve**, marking a significant policy shift in the government's approach to cryptocurrency.

MORE ON NEWS:

- The reserve will be built using bitcoin forfeited in **criminal and civil asset forfeiture proceedings**.
- It will function as a **store of value**, with the government committing **not to sell** any of the bitcoin deposited into the reserve.
- The announcement led to a **spike in market value** of these assets.
- Earlier, Trump named five digital assets that will be part of the reserve: Bitcoin (BTC), Ether (ETH), XRP (Ripple), Solana (SOL), and Cardano (ADA).

WHAT IS CRYPTOCURRENCY?

- A cryptocurrency is a form of **digital or virtual currency based on a network** that is **distributed across a large number of computers**.
- Many cryptocurrencies are decentralized networks **based on blockchain technology**.
- **Bitcoin,** first released as open-source software in 2009, is the **first decentralized cryptocurrency.** Other cryptocurrencies include **Ethereum, Litecoin, Cardano, Polkadot, Stellar, Chainlink etc**

Blockchain:

- Blockchain is a system of recording information in a way that makes it difficult or impossible to change, hack, or cheat the system.
- A blockchain is essentially a digital ledger of transactions that is duplicated and distributed across the entire network of computer systems on the blockchain.

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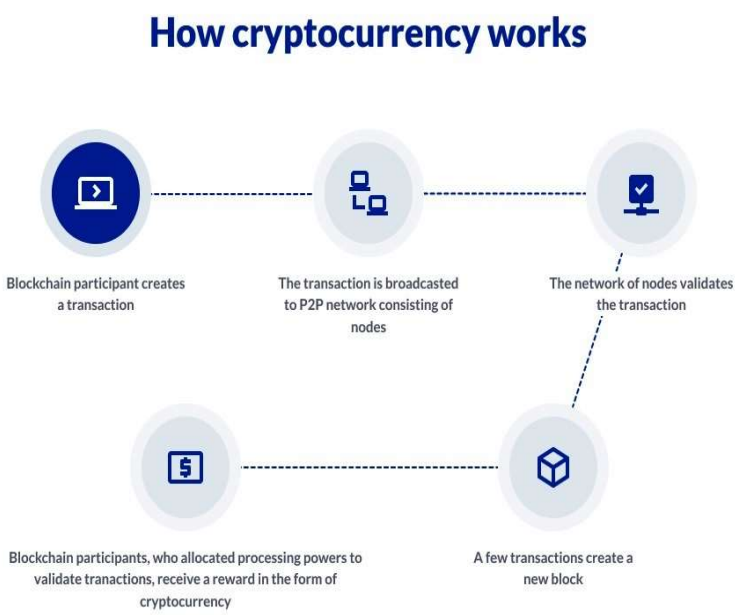

BENEFITS OF CRYPTO CURRENCY:

- **User Autonomy:**

Digital currencies provide users with greater control over their finances compared to traditional fiat systems. The decentralized nature of cryptocurrencies allows for peer-to-peer transactions without the need for approval from external authorities or intermediaries.

- **Security:**

Cryptocurrencies utilize cryptographic techniques, making them highly secure and nearly impossible to counterfeit or double-spend. This security framework ensures the integrity and authenticity of transactions.

- **Decentralization:**

Operating on decentralized blockchain platforms, cryptocurrencies enable users to manage their funds without relying on centralized institutions like banks or governments. This decentralization fosters financial sovereignty and reduces the risk of systemic failures.

- **Cost-Effectiveness:**

Cryptocurrency transactions often incur lower fees than traditional banking methods, as they eliminate many conventional banking charges such as minimum balance fees and overdraft penalties. This cost efficiency is particularly beneficial for international transactions, which can be executed more affordably and swiftly.

- **Privacy:**

Each cryptocurrency transaction is a unique exchange between parties, enhancing user privacy and mitigating risks like identity theft. While transactions are recorded on public ledgers, the identities of the individuals involved are often pseudonymous, providing a layer of confidentiality.

- **Financial Inclusion:**

Cryptocurrencies provide financial services to individuals in regions with limited access to traditional banking, promoting economic participation and growth.

For instance, **El Salvador** was the first country to adopt Bitcoin as legal tender. While the move has faced criticism due to price volatility, it has highlighted cryptocurrency's potential for **financial inclusion in regions with weak banking infrastructure.**

- **Time Efficiency:**

Cryptocurrency transactions are typically processed rapidly, often within minutes, due to the streamlined nature of blockchain technology. This efficiency contrasts with traditional banking systems, where transactions can take several days to finalize.

- **Transparency and Immutability:**

The blockchain technology underpinning cryptocurrencies ensures that all transactions are transparent and immutable, reducing the potential for fraud and enhancing trust.

- **Innovation in Financial Services:**

The rise of cryptocurrencies has spurred innovation in financial services, leading to the development of decentralized finance (DeFi) platforms that offer alternatives to traditional banking products.

CONCERNS ASSOCIATED WITH CRYPTOCURRENCIES:

- **Undermines Financial Stability:**

Cryptocurrencies are highly **volatile**, with sharp price fluctuations that can create **market instability**.

For instance, cryptocurrencies like **Bitcoin** have exhibited extreme price fluctuations, with **volatility three to nearly four times higher than various U.S. equity indices** between 2020 and 2024.

The **lack of a central regulatory authority** makes it difficult for governments to control speculative trading and prevent financial crises.

Their **pseudonymous nature** raises concerns about **tax evasion**, as individuals can use crypto assets to hide wealth and avoid taxation, reducing government revenue.

> The **pseudonymous nature** of cryptocurrencies means transactions are recorded on a public ledger without directly linking them to real-world identities.

- **Fuels Illicit Activities:**

Cryptocurrencies have been widely used for **illegal transactions** on the **dark web**, including drug trafficking, cybercrime, and ransomware payments.

Their **anonymity makes them a tool for terror financing**, as funds can be transferred across borders with minimal oversight.

The rise of **privacy-focused cryptocurrencies** further complicates tracking and law enforcement efforts.

- **Channel for Money Laundering:**

Due to their **decentralized nature**, cryptocurrencies are increasingly being used to **launder illicit funds**.

Criminal organizations can move large sums **across borders undetected**, bypassing **anti-money laundering (AML) laws** and financial regulations.

Regulatory bodies like the **Financial Action Task Force (FATF)** have flagged crypto-related money laundering risks, urging stricter compliance measures.

- **Vulnerable to Cyber Threats:**

While blockchain technology is secure, **crypto exchanges and wallets remain vulnerable to hacks**.

Hackers have stolen **billions of dollars** from exchanges like **Mt. Gox (Japan), FTX (Bahamas), and Coincheck (Japan)**, exposing weak security protocols.

Loss of private keys or exchange collapses can result in **permanent loss of funds for investors**, with no legal recourse.

- **Environmental Impact & Energy Consumption:**

Bitcoin **mining and proof-of-work (PoW) validation require massive computational power**, leading to unsustainable **electricity consumption**.

A single Bitcoin transaction consumes enough electricity to **power 19 U.S. households for a day**.

Countries like **China and Kazakhstan have cracked down on mining operations** due to their strain on energy resources and environmental concerns.

- **Regulatory Uncertainty & Economic Risks:**

Many countries, including **India**, lack a **clear regulatory framework**, creating uncertainty for businesses and investors.

The **Reserve Bank of India (RBI)** has repeatedly warned about **crypto's potential to disrupt monetary policy** and financial stability.

High taxation policies (30% gains tax, 1% TDS) and unclear compliance rules have led several **Indian crypto exchanges and startups—such as WazirX, Vauld, and ZebPay—to shift operations offshore** to countries with **more favorable regulations**, such as **Dubai and Singapore**.

India risks **losing talent and investment** in blockchain technology to **crypto-friendly jurisdictions** unless a **balanced regulatory approach** is adopted.

REGULATION IN INDIA:

As of March 2025, **cryptocurrencies in India remain unregulated**, with no official legal status. The regulatory landscape has evolved over the years:

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2018:

- The **Reserve Bank of India (RBI)** issued a circular prohibiting entities regulated by it from dealing in virtual currencies, effectively banning cryptocurrency trading.

2019:

- **SC Garg Committee** recommended a **complete ban on cryptocurrencies** while proposing a **state-regulated digital currency.**

2020:

- The **Supreme Court of India** overturned the RBI's ban, allowing banks and financial institutions to provide services related to cryptocurrencies.

2021:

- The government announced plans to introduce the **Cryptocurrency and Regulation of Official Digital Currency Bill, 2021**, aiming to create a framework for an official digital currency while proposing a ban on private cryptocurrencies.

Union Budget 2022-23:

- A **30% tax** on income from the transfer of virtual digital assets was introduced, signaling a move towards recognizing and taxing cryptocurrency transactions.
- The government also proposed the launch of a **Central Bank Digital Currency (CBDC)**, known as the **Digital Rupee**, to be issued by the RBI.

WHAT IS CBDC?

- RBI broadly defines **CBDC as the legal tender issued by a central bank in a digital form.**
- CBDC would be **similar to the sovereign paper currency**, though digital.
- According to the concept note released by RBI, CBDC is akin to sovereign paper currency but takes a different form, **exchangeable at par with the existing currency** and **shall be accepted as a medium of payment, legal tender** and a safe store of value.
- Also, CBDCs would **appear as liability on a central bank's balance sheet**.
- India's **CBDC, the Digital Rupee (e₹),** is in an **expanded pilot phase** as of **March 2025**, integrated with **UPI**, adopted by fintech firms, and steadily gaining traction among businesses and consumers.

Recent Developments (2024-2025):

- Despite **strict regulations and high taxation** on cryptocurrency transactions in India, the country has recorded the **highest number of crypto users and adopters globally for two consecutive years (2023 and 2024)**.
    - This indicates that **Indians are actively engaging in cryptocurrency investments and transactions**, even under a **30% tax on gains and a 1% TDS on transfers**, demonstrating a strong and sustained interest in digital assets.
- Major cryptocurrency exchanges, such as **Coinbase**, are engaging with Indian authorities to re-enter the market, indicating potential shifts in regulatory approaches.

- The RBI has been conducting pilot programs for the **Digital Rupee**, with select banks offering CBDC wallets to users, marking a significant step towards integrating digital currency into the mainstream financial system.

WAY FORWARD:

- **Regulatory Clarity:** India should establish a **comprehensive legal framework** that distinguishes between different types of digital assets, ensuring compliance while fostering innovation.
- **Balanced Taxation:** A **revised tax structure** with lower capital gains tax and reduced TDS can encourage domestic investments and prevent capital flight to crypto-friendly nations.
- **Investor Protection & AML Measures:** Strengthening **KYC (Know Your Customer) norms**, **Anti-Money Laundering (AML) policies**, and **consumer protection mechanisms** can mitigate risks while maintaining regulatory oversight.
- **Integration with the Banking System:** Encouraging **collaboration between crypto firms and traditional financial institutions** can promote a hybrid financial ecosystem that leverages blockchain benefits.
- **Public-Private Partnerships:** Engaging with **industry stakeholders, blockchain developers, and global regulators** can help shape policies that support innovation while maintaining financial stability.
- **Environmental Considerations:** Promoting **energy-efficient blockchain protocols** and exploring **green crypto mining solutions** can address concerns over excessive power consumption.
- **Global Coordination:** India should work with international regulatory bodies like the **FATF, IMF, and G20** to establish cross-border crypto regulations and ensure **harmonized policy implementation**.

Case Study 1: The EU and the "Brussels Effect"

- The EU's Markets in Crypto-Assets (MiCA) framework sets global standards for cryptocurrency regulation, influencing other nations. This regulatory approach is a reflection of the **"Brussels Effect,"** where EU regulations set benchmarks that often become international standards. By providing legal clarity on stablecoins, crypto transactions, and service providers, it balances innovation with consumer protection. This structured approach attracts crypto businesses, proving that clear regulations can foster industry growth without stifling innovation.

Case Study 2: Switzerland's "Crypto Valley" Model

- Switzerland has become a global blockchain hub by adopting clear, investor-friendly regulations. The Crypto Valley in Zug (**thriving blockchain and cryptocurrency hub in Zug, Switzerland**) thrives under progressive policies from Swiss regulators, ensuring

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legal certainty while fostering innovation. Switzerland's approach shows that balanced regulations attract investment and drive technological progress without restricting growth.

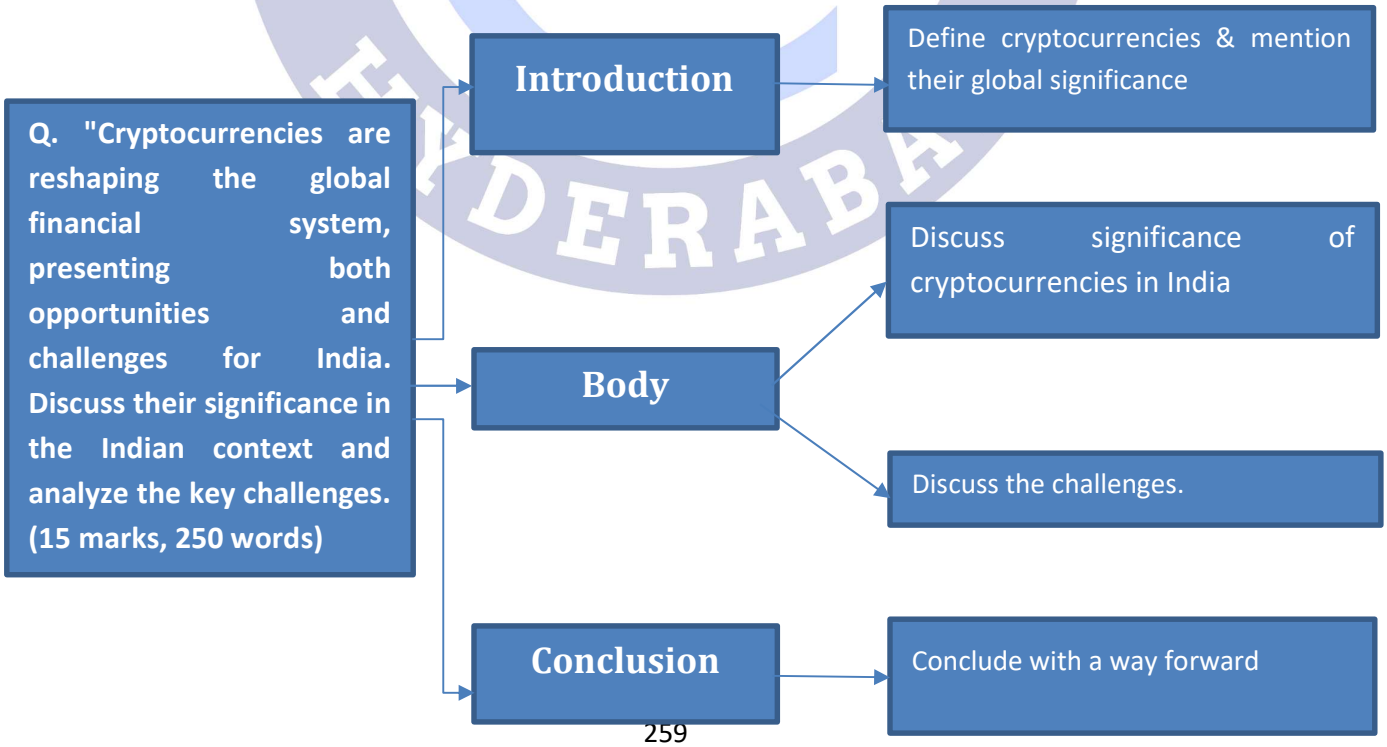
CONCLUSION:

- India stands at a **crossroads in the evolving global crypto landscape**. While countries like the **United States, Switzerland, and the European Union** are embracing **regulatory clarity**, India remains hesitant, navigating **regulatory uncertainty alongside a rapidly growing digital economy**.
- Despite **high taxation and lack of clear regulations**, **crypto adoption in India continues to surge**, reflecting **strong public interest in digital assets**. However, concerns over **financial stability, illicit activities, and environmental impact** persist. A **balanced regulatory framework**—one that fosters **innovation while ensuring investor protection**—can help India **harness crypto's potential and emerge as a leader in the global digital finance revolution**.

PRACTICE QUESTION

Q. "Cryptocurrencies are reshaping the global financial system, presenting both opportunities and challenges for India. Discuss their significance in the Indian context and analyze the key challenges. (15 marks, 250 words)

APPROACH



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MODEL ANSWER

Cryptocurrencies are **digital assets operating on decentralized blockchain networks**, allowing **secure, peer-to-peer transactions** without central authority control. **Popular examples include Bitcoin (BTC), Ethereum (ETH), and Ripple (XRP).** The U.S. government's recent move to create a strategic Bitcoin reserve **signals the growing global acceptance of cryptocurrency.** While countries like **Switzerland and the EU** offer **clear regulations**, India must **balance innovation and regulation** to harness its crypto potential.

Significance of Cryptocurrencies in India:

1. Financial Inclusion

- Cryptocurrencies can **empower unbanked populations** by providing direct access to financial services, especially in remote areas with limited banking infrastructure.
- **Example: El Salvador adopted Bitcoin as legal tender**, highlighting its potential to promote financial inclusion.

2. Decentralization & User Autonomy

- Unlike fiat currencies controlled by central banks, cryptocurrencies allow **peer-to-peer transactions**, reducing dependence on intermediaries like banks.
- This gives users **greater control over their assets**, making transactions faster and more efficient.

3. Innovation & Economic Growth

- The rise of **blockchain-based financial services** (DeFi) and **smart contracts** (Ethereum) has fostered innovation in digital finance.
- India's **thriving fintech sector** can leverage blockchain technology for **secure and cost-effective financial solutions**.

4. Cost-Effective Cross-Border Transactions

- Cryptocurrencies eliminate **intermediaries in international remittances**, reducing transaction fees and delays.
- This can benefit **India's large diaspora** that sends **billions of dollars** in remittances annually.

5. Growing Adoption Despite Regulations

- India has recorded the **highest number of crypto users globally for two consecutive years (2023 & 2024)**, demonstrating **strong public interest despite high taxation and regulatory uncertainty**.
- **Major crypto exchanges like Coinbase** are engaging with Indian authorities to explore market entry, signaling **potential regulatory shifts**.

Challenges Associated with Cryptocurrencies in India

1. Financial Stability Concerns

- **High volatility** makes cryptocurrencies **risky assets**, as seen in Bitcoin's price fluctuations, which are **three to four times higher than major stock indices**.

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- Sudden crashes can **affect investor wealth**, leading to potential economic instability.

2. Regulatory & Taxation Uncertainty

- The **Reserve Bank of India (RBI)** has expressed concerns about cryptocurrencies **disrupting monetary policy**.
- **High taxation (30% on gains, 1% TDS on transactions)** has pushed several Indian crypto startups (e.g., **WazirX, Vauld, ZebPay**) to relocate to **crypto-friendly countries like Dubai and Singapore**.

3. Risk of Illicit Activities & Money Laundering

- Cryptocurrencies have been used for **money laundering, terror financing, and cybercrime** due to their **pseudonymous nature**.
- Regulatory bodies like the **Financial Action Task Force (FATF)** have flagged cryptocurrency transactions as potential risks for **cross-border illicit financial flows**.

4. Cybersecurity & Hacking Threats

- Despite blockchain's security, **crypto exchanges and wallets remain vulnerable to hacking**.

5. Environmental Concerns

- **Bitcoin mining** consumes **massive amounts of electricity**, with a single transaction **using as much energy as 19 U.S. households in a day**.
- **China and Kazakhstan have cracked down on crypto mining** due to its environmental impact.

Way Forward:

- **Regulatory Clarity** – Implement a **comprehensive legal framework** distinguishing between **crypto assets and CBDCs**, following models like **the EU's MiCA framework**.
- **Balanced Taxation** – Reduce **capital gains tax** and revise **1% TDS** to **retain Indian crypto startups** and encourage domestic investments.
- **Investor Protection & AML Measures** – Strengthen **KYC norms, AML policies, and fraud prevention** mechanisms to ensure **secure transactions**.
- **Banking & CBDC Integration** – Encourage **crypto-bank collaboration** and develop **India's Digital Rupee (e₹)** alongside private crypto assets.
- **Green Blockchain Solutions** – Support **eco-friendly mining technologies** to mitigate **environmental concerns**.
- **Global Cooperation** – Align policies with **FATF, IMF, and G20** for **standardized global crypto regulations**.

India is at a **critical juncture in the global crypto revolution**. While **adoption is rising**, challenges persist. A **balanced regulatory approach** can ensure **investor protection, economic stability, and technological advancement**, helping India **emerge as a leader in digital finance**

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28. PHARMACEUTICAL SECTOR

iMPACT ANALYSIS

SYLLABUS:

GS 3 > Economic Development > Indian Economy and issues > Pharmaceutical sector

REFERENCE NEWS:

- Recently, the Indian Pharmaceutical Alliance (IPA), representing 23 major Indian drug manufacturers, has recommended reducing India's basic customs duties on pharmaceutical imports from the US to zero. This suggestion comes in response to concerns about **potential US reciprocal tariff measures.**

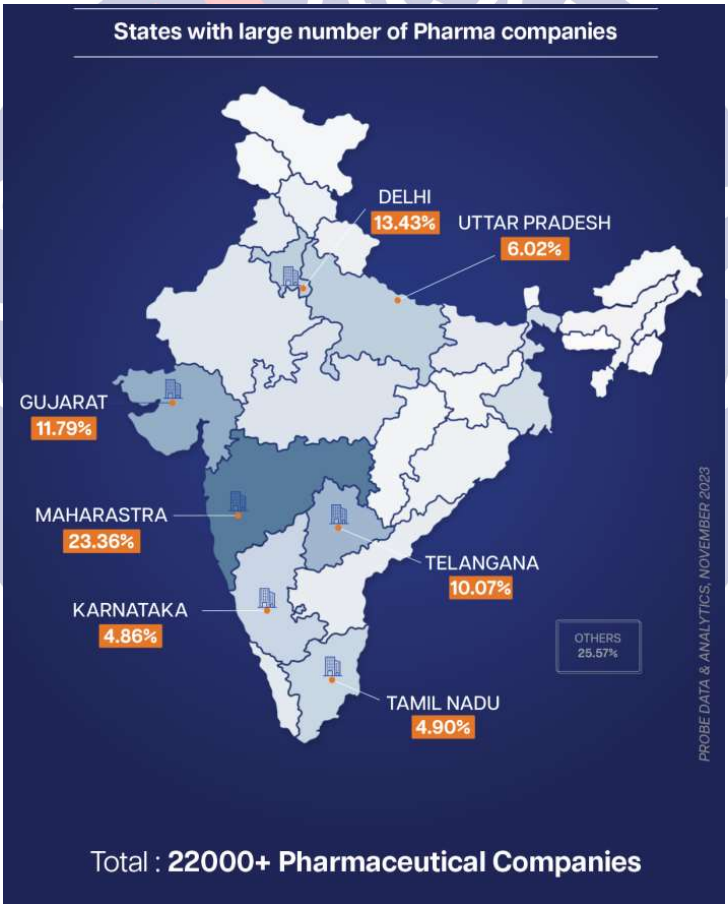
MORE ON NEWS:

- India exports pharmaceutical formulations worth **$9 billion** annually to the US, making up about a **third of its total pharma exports**. Given the profitability of the US market, ensuring continued access is a priority for Indian drug manufacturers.
- While India supplies only 5.6% of the US's total annual pharma imports ($160 billion), it dominates the branded **generics segment, accounting for nearly 50% of such medicines in the US.** Indian generics are widely accepted due to their **affordability—costing about half the global average**—and their role in lowering US healthcare costs.

STATISTICS:

- India's pharma industry is considered to be the **world's third largest by volume** and **14th in terms of value** of production. (source: Ministry of Chemicals and Fertilizers)
- India's pharmaceutical market for FY 2023-24 is valued at **USD 50 billion** with domestic consumption valued at USD 23.5 billion **and export valued at USD 26.5 billion.** (source: Ministry of Chemicals and Fertilizers)
- Globally, it ranks **4th in terms of generic production and 17th in terms of export value** of bulk actives and dosage forms. Indian exports are destined to more than **200 countries** around the globe including highly regulated markets of **US, West Europe, Japan and Australia**. (source: Ministry of Chemicals and Fertilizers).
- Indian pharmaceutical sector supplies over **50% of global demand for various vaccines**, **50% of generic demand in the US** and **25% of all medicine in the UK.**

- Presently, over **80% of the antiretroviral drugs used globally** to combat AIDS are supplied by Indian pharmaceutical firms. India is rightfully known as the **"pharmacy of the world"** due to the low cost and high quality of its medicines. (Source: IBEF)
- Indian pharmaceutical market is estimated to touch **US$ 130 billion** in value by the end of 2030. (Source: IBEF)
- Economic Survey 2020 acclaimed Pharma sector **as one of the top 5 sector which reduce trade deficit of India.**
- India's medical devices market stood at USD 10.36 billion in FY20. The market is **expected to increase at a CAGR of 37% from 2020 to 2025 to reach USD 50 billion.**



INDIA'S OPPORTUNITIES IN THE PHARMA SECTOR:

- **Market Size and Growth Potential:**
  - According to the Indian Economic Survey 2021, India's domestic pharmaceutical market is expected to **triple in size within the next decade**.

- The market size of India's pharmaceutical industry is projected to reach **$130 billion by 2030** and **$450 billion by 2047** (*Source: IBEF*).
- Also, India is **ranked third globally in pharmaceutical production by volume** and **14th by value**, highlighting its cost-effectiveness.

- **Human Resource and R&D Capabilities:**
  - India has **one of the lowest manpower costs** while maintaining **high expertise in pharmaceutical sciences**.
  - The country boasts a **large talent pool of scientists and engineers**, making it an attractive destination for R&D investments.
  - Government incentives such as the **Production Linked Incentive (PLI) scheme** encourage pharmaceutical companies to expand research and manufacturing capacity.
- **Economic and Demographic Growth as a Driver:**
  - **Rising economic growth and expanding health insurance coverage** are driving higher healthcare spending.
  - **A growing, aging, and more health-conscious population** is increasing demand for high-quality medicines.
  - The global demand for **generic drugs has been growing at 10-15% annually**, with India playing a significant role in supplying affordable alternatives.
- **Global Demand and Export Potential:**
  - **Patent expiration in the US, Europe, and Japan** is creating opportunities for Indian firms to expand in these markets.
  - India's **pharmaceutical exports stood at $25.4 billion in FY23** (*Source: IBEF*).
  - **India is a key global supplier of low-cost generic medicines**, producing over **50% of global vaccine demand** and **50% of US generic drug demand**.
- **Cost Competitiveness and Manufacturing Strength:**
  - With a **vast network of over 11,000 drug manufacturing units**, India benefits from economies of scale.

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- The **low cost of raw materials and labor** makes Indian pharmaceuticals highly competitive globally.
- India has the **highest number of USFDA-approved plants** outside the US, reinforcing its reputation as a high-quality drug manufacturer.

- **Medical and Pharmaceutical Tourism:**
  - India is a **leading destination for medical tourism**, with patients from across the world seeking affordable and high-quality healthcare.
  - The **cost of medical treatment in India is 60-80% lower** compared to Western countries, boosting demand for pharmaceuticals.
- **Traditional Medicine and AYUSH Expansion:**
  - The **government's promotion of AYUSH (Ayurveda, Yoga, Unani, Siddha, and Homeopathy)** is creating **new markets for herbal and alternative medicines**.
  - India's **herbal medicine market** is expected to grow significantly, offering new avenues for pharmaceutical players.
- **Increasing Foreign Direct Investment (FDI):**
  - The pharmaceutical sector has received **cumulative FDI inflows of $20 billion+ since 2000** (*Source: DPIIT*).
  - Government policies encouraging **100% FDI under the automatic route** have made India an attractive destination for global pharma investments.

Challenges Facing the Indian Pharmaceutical Sector

- **Policy and Regulatory Challenges:**
  - **Intellectual Property Rights (IPR) Issues**: India's patent regime, particularly **Section 3(d) of the Patents Act**, prevents **patenting minor modifications of known drugs.** While this keeps drug prices low, **pressure from the US and other countries** to dilute or remove this provision could impact India's generic drug industry.
  - **Price Control Mechanisms**: The **Drugs Price Control Order (DPCO)** limits the pricing of essential medicines, reducing profit margins for pharmaceutical firms and discouraging investment in new drug development.

- **Taxation Issues**: The **MRP-based GST levy** places an undue tax burden on pharmaceutical companies, making drugs costlier for both manufacturers and consumers.
- **Weak Drug Regulation and Oversight**: Inadequate **data collection on drugs** and **poorly trained drug inspectors** contribute to malpractices such as counterfeit drugs and unethical sales practices.

- **Dependence on Imports for Active Pharmaceutical Ingredients (API):**
  - Despite being a **leading global supplier of medicines**, India imports **over 70% of its Active Pharmaceutical Ingredients (APIs) from China**, making the sector vulnerable to **supply chain disruptions and price volatility**.
  - The **COVID-19 pandemic and geopolitical tensions** highlighted the risks of overdependence on a single country for critical raw materials.
  - Government efforts such as **Production Linked Incentive (PLI) schemes** aim to **boost domestic API manufacturing**, but progress remains slow.
- **Quality Concerns and Global Reputation:**
  - **Poor quality enforcement** has led to regulatory action against Indian drug manufacturers by global health authorities. The **EU, USFDA, and WHO** have flagged and even banned certain Indian pharmaceutical products due to quality violations.
  - Weak domestic **regulatory oversight** and **gaps in compliance enforcement** continue to pose challenges in maintaining **India's reputation as a reliable medicine supplier.**
- **Unethical Marketing and Ethical Concerns:**
  - **Doctor-Pharma Nexus**: Pharmaceutical companies have been criticized for providing **freebies, luxury trips, and gifts to doctors** in exchange for preferential drug prescriptions.
  - **Lack of Training for Medical Representatives**: Many medical representatives lack adequate training, leading to **misleading promotion of drugs** and unethical sales tactics.

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- **Prevalence of Quackery**: A large number of unqualified medical practitioners (quacks) continue to **prescribe and dispense medicines without proper knowledge**, putting patient lives at risk.

- **Poor Research and Development (R&D) Investment:**
  - **Low R&D Spending**: India's pharmaceutical industry primarily focuses on **reverse engineering existing drugs**, with **minimal investment in innovative drug discovery**.
  - **Limited Academia-Industry Collaboration**: There is a **lack of synergy between universities and pharma companies**, leading to slow innovation and underutilization of research potential.
  - **Big Pharma's Risk Aversion**: With **global pharmaceutical companies reducing investments in new drug development**, Indian firms have an opportunity to step up. However, **limited funding and regulatory hurdles** remain key barriers.

MAJOR GOVERNMENT INITIATIVES:

- **Production Linked Incentive(PLI) Scheme for**
  - Bulk Drugs
  - Medical Devices
- **Institutions:**
  - **Central Drugs Standard Control Organization (CDSCO) Source**
    - It is the Central Drug Authority for **discharging functions assigned under the Drugs and Cosmetics Act**
  - **National Pharmaceutical Pricing Authority (NPPA)**
    - It is a government **regulatory agency** that **controls the prices of pharmaceutical drugs in India**
    - The NPPA regularly **publishes lists of medicines and their maximum ceiling prices.**
- **Pharmaceuticals and Medical Devices Bureau of India (PMBI)**

- To implement **Pradhan Mantri Bhartiya Janaushadhi Pariyojana.**

- **National Biopharma Mission:**
  - The National Biopharma Mission (NBM) is an **industry-Academia Collaborative Mission** for accelerating **biopharmaceutical development** in the country.
  - Under this Mission the Government has launched **Innovate in India (i3) programme** to **create an enabling ecosystem to promote entrepreneurship and indigenous manufacturing in the sector.**
  - The mission will be **implemented by Biotechnology Industry Research Assistance Council (BIRAC).**
  - The mission **was approved in 2017 at a total cost of Rs 1500 crore and is 50% co-funded by World Bank loan.**

- **Initiatives in Medical Device Sector**
  - **100% FDI is allowed under automatic route** in this sector
  - Setting up of **'Medtech Parks'**
  - **Production Linked Incentive (PLI) scheme**
  - Scheme for **Promotion of Medical Device Parks**
  - **EEPC India's Medical Device Expo**
    - It seeks to link suppliers and vendors and help build a robust manufacturing eco-system**.**

- **Pradhan Mantri Bhartiya Janaushadhi Pariyojana**
  - It aims to provide **quality medicines at affordable prices** to the masses.
  - Under this scheme **PMBJP stores** have been set up **to provide generic drugs**, which are available at **lesser prices but are equivalent in quality and efficacy** as expensive branded drugs.

- **Affordability:**
  - **Jan Aushadhi Suvidha Sanitary Napkin at Rs. 1 per pad**

- **Drugs and Cosmetics Act, 1940**
  - It aims to **regulate the import, manufacture and distribution of drugs** in India.
  - The primary objective of the act is to **ensure that** the **drugs and cosmetics sold in India are safe, effective** and **conform to state quality standards**.

WAY FORWARD:

- **Increase Budgetary Allocation:** Raising healthcare spending from **1.8% of GDP to 2.5-3%**, as outlined in the **National Health Policy 2017**, is crucial. A separate budget for **biopharmaceutical research and development** can enhance innovation and drug discovery.
- **Enhancing Ease of Doing Business:** Simplification of regulatory processes and streamlining approvals will improve operational efficiency and attract private sector investment.
- **Reducing Dependence on China for APIs:** A **National Plan for API self-sufficiency** is necessary to strengthen domestic production and mitigate risks associated with excessive reliance on imports.
- **Strengthening Integrated Healthcare Capabilities:** Expanding **telemedicine, home care, and senior healthcare services** can improve accessibility and equity in critical healthcare services.
- **Rationalizing GST for the Pharma Sector:** Reforming GST policies to **unlock embedded tax credits** will enhance cost efficiency and ensure affordability within the healthcare supply chain.
- **Strengthening Industry-Academia Collaboration:** Aligning academic curricula with **industry requirements** and incentivizing research will help **develop a skilled workforce** and position India as a leader in personalized medicine.
- **Implementing the Mashelkar Committee Recommendations:** Reforming the **Drug Regulatory System**, establishing a **National Drug Authority**, and strengthening **State Drug Control Organizations** will improve drug safety and regulatory oversight.

Continued Government Support: Maintaining **customs duty concessions** for essential medicines and **import duty exemptions for rare disease drugs** will ensure accessibility and affordability.

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- **Ethical Reforms in Pharma Marketing:** Stricter **guidelines against freebies and incentives** for doctors will promote transparency and ethical practices in the industry.
- **Strengthening Intellectual Property Rights (IPR) Policies:** Encouraging pharmaceutical companies to **increase patent filings** while balancing affordability can drive innovation and global competitiveness.
- **Utilizing Traditional Knowledge:** Leveraging **Ayurveda, Unani, and Siddha** for drug development can create new opportunities in alternative medicine and global exports.

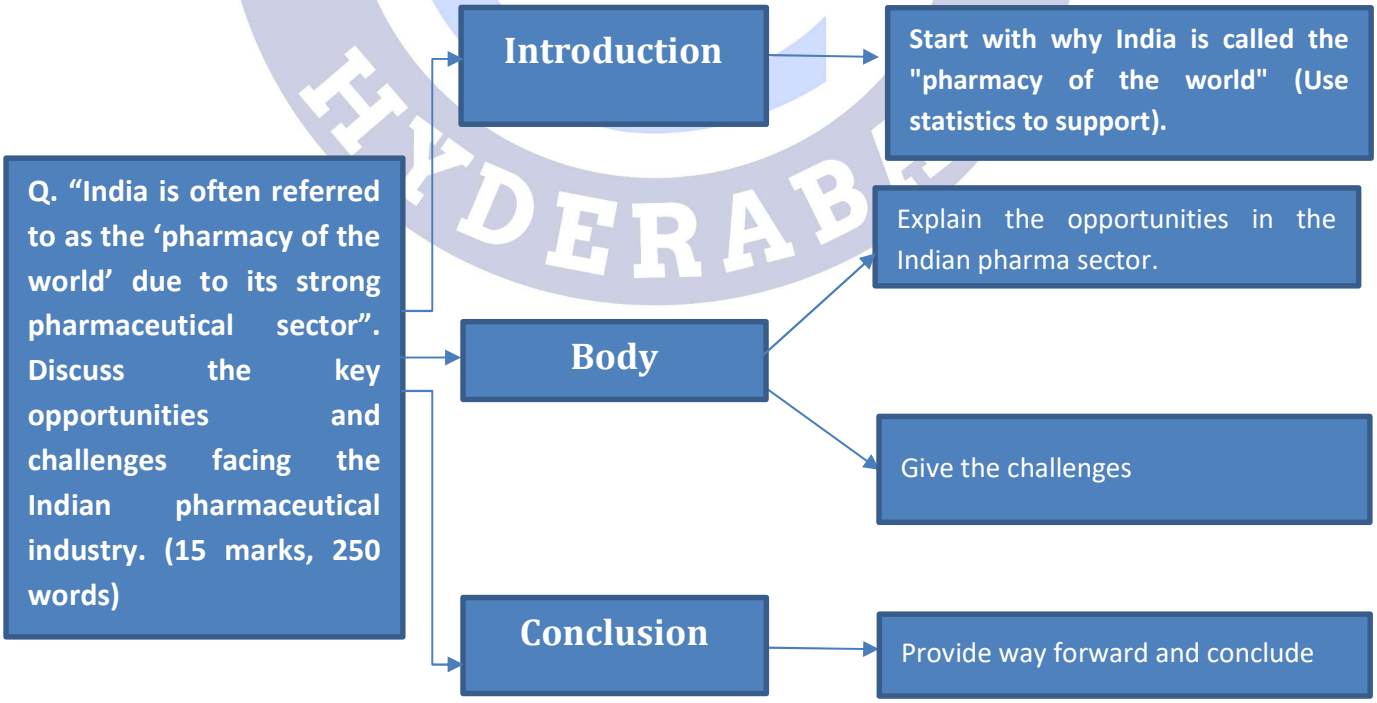
CONCLUSION:

- India's pharmaceutical sector is a global leader, but challenges like **regulatory hurdles, API dependence, and low R&D investment** must be addressed. Strengthening **self-reliance, innovation, and policy support** will ensure sustainable growth while maintaining affordability and global competitiveness.

PRACTICE QUESTION

Q. "India is often referred to as the 'pharmacy of the world' due to its strong pharmaceutical sector". Discuss the key opportunities and challenges facing the Indian pharmaceutical industry. (15 marks, 250 words)

APPROACH



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MODEL ANSWER

India is known as the **'pharmacy of the world'** due to its **large-scale production of affordable, high-quality medicines and vaccines**. The country ranks **4th globally in generic production** and supplies **over 50% of global vaccine demand, 50% of generic drugs in the US, and 25% of all medicines in the UK** (*Source: IBEF*). Additionally, **over 80% of antiretroviral drugs used globally to combat AIDS** are produced by Indian firms. With a **$50 billion market in FY 2023-24**, India is a key global pharma player, but challenges like **API dependence and regulatory hurdles** must be addressed for sustained growth.

Opportunities in the Indian Pharmaceutical Sector:

1. Expanding Market Size and Global Demand

- India's **pharmaceutical industry is projected to reach $130 billion by 2030 and $450 billion by 2047** (*Source: IBEF*).
- Patent expirations in the **US, Europe, and Japan** present a major opportunity for Indian generic drug manufacturers.
- The **global generic drug market is growing at 10-15% annually**, with India as a key supplier.

2. Cost Competitiveness and Manufacturing Strength

- India ranks **3rd globally in pharmaceutical production by volume** and **14th by value** (*Source: Ministry of Chemicals and Fertilizers*).
- With **11,000+ drug manufacturing units** and the highest number of **USFDA-approved plants outside the US**, India benefits from **economies of scale and high production efficiency**.

3. Strong Human Resource and R&D Capabilities

- India has a **large pool of skilled scientists and engineers**, ensuring a strong research base for **drug discovery and biotech innovations**.
- Government incentives like the **Production Linked Incentive (PLI) scheme** support investment in R&D and manufacturing expansion.

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4. Growth in Medical Tourism and AYUSH Market

- India is a **leading destination for medical tourism**, with treatments costing **60-80% less than in Western nations**.
- The **AYUSH sector (Ayurveda, Unani, Siddha, Homeopathy)** is expanding, creating new opportunities in **herbal medicine and alternative therapies**.

5. Rising Foreign Direct Investment (FDI)

- India's **pharma sector has attracted over $20 billion in FDI since 2000** (*Source: DPIIT*), supported by **100% FDI under the automatic route**.

Challenges Facing the Indian Pharmaceutical Sector:

1. Regulatory and Policy Challenges

- **Intellectual Property Rights (IPR) Issues**: Pressure from the US and other countries to **dilute Section 3(d) of the Patents Act**, which prevents patenting minor drug modifications, could impact India's generics industry.
- **Price Control Mechanisms**: The **Drugs Price Control Order (DPCO)** restricts pricing, reducing profit margins and discouraging new drug development.

2. Dependence on Active Pharmaceutical Ingredients (APIs)

- **Over 70% of APIs are imported from China**, making India vulnerable to supply chain disruptions and price fluctuations (*Source: IBEF*).
- Government initiatives like the **PLI scheme for bulk drugs** aim to boost domestic API production, but progress is slow.

3. Quality Concerns and Reputation

- Some **Indian pharmaceutical products have been banned by EU and USFDA** due to quality concerns, affecting global credibility.
- Weak **drug regulation and enforcement** lead to compliance gaps in certain segments.

4. Ethical Issues in Pharma Marketing

- **Unethical marketing practices**, including offering **freebies and incentives to doctors**, undermine ethical standards.
- **Prevalence of quackery** (unqualified medical practitioners) in rural areas increases patient safety risks.

5. Low Research & Development (R&D) Investment

- **India spends less than 1.5% of its pharmaceutical revenue on R&D**, compared to **15-20% in developed nations**.
- Limited **academia-industry collaboration** slows down innovation in **new drug discovery and biotechnology**.

Way Forward

- **Strengthening Domestic API Production:** Reduce dependence on China by **expanding API manufacturing** through the **PLI scheme and tax incentives**.
- **Enhancing R&D and Industry-Academia Collaboration:** Increase **government funding for drug research** and promote **public-private partnerships** in pharmaceutical innovation.
- **Regulatory Reforms for Better Compliance:** Strengthen **CDSCO** (Central Drug Standard Control Organization) oversight and implement **Mashelkar Committee recommendations** to ensure quality standards.
- **Encouraging Ethical Pharma Marketing Practices:** Implement **stricter guidelines ondoctor-pharma relationships** to prevent unethical promotional tactics.
- **Expanding Global Market Penetration:** Diversify export destinations beyond the US and Europe to **emerging markets in Africa, Latin America, and Southeast Asia**.

India's pharmaceutical sector is a **global leader in generics and vaccines**, but **regulatory challenges, API dependence, and low R&D spending** remain concerns. **Government initiatives like the PLI scheme, PMBJP, and National Biopharma Mission** are crucial in addressing these issues. With **strong policy support and innovation-driven growth**, India can strengthen its global leadership while ensuring affordable healthcare.

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29. MANGROVES

iMPACT ANALYSIS

SYLLABUS:

GS 3 > Environment & Ecology > Mangroves

REFERENCE NEWS:

- Tamil Nadu has witnessed a **significant expansion of its mangrove cover**, nearly **doubling from 4,500 ha in 2021 to 9,039 ha in 2024**, as per a report by Anna University's Centre for Climate Change and Disaster Management. This remarkable growth is attributed to both new mangrove plantations and the conservation of existing forests across multiple districts.
- Mangroves play a **crucial role in coastal protection, biodiversity conservation, and carbon sequestration**.

MORE ON NEWS:

- The **'Blue Carbon Monitoring for Mangroves of Tamil Nadu'** report highlights Tiruvarur (2,142 ha), Thanjavur (2,063 ha), Cuddalore (1,117 ha), and Nagapattinam (1,021 ha) as major contributors to the State's mangrove expansion, with **Tiruvarur and Thanjavur alone accounting for nearly 50%** of the total cover.
- Mangroves in **Cuddalore (249 tonnes/ha), Tiruvarur (145 tonnes/ha), and Thanjavur (77.5 tonnes/ha)** serve as **efficient carbon sinks**, significantly aiding climate resilience. In contrast, **lower-density regions like Villupuram (2.59 tonnes/ha) and Tiruvallur (13.1 tonnes/ha)** store lesser carbon.

WHAT ARE MANGROVES?

- Mangroves are **salt tolerant plant communities found in tropical and sub-tropical intertidal regions** of the world.
- Such areas are characterised by **high rainfall** (between 1000 mm to 3000 mm) and **temperature** (between 26-35°C). They occur worldwide in the **tropics and subtropics**, mainly between latitudes 25° N and 25° S.
- Mangroves are restricted mainly to the tropical areas as they **cannot tolerate the extreme cold events** typical of the temperate zone.

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FEATURES OF MANGROVES:

Mangroves adapt to challenging environments like waterlogged and anoxic soils through distinct features:

- **Halophytes:** They filter up to 90% of salt from seawater and can excrete excess salt through leaf glands.
- **Water Retention:** Mangroves store water in succulent leaves, with a waxy coating to reduce evaporation.
- **Pneumatophores:** Pencil-like roots act as snorkels for air intake, aiding survival during tidal floods.
- **Prop Roots:** Dense aerial roots provide stability against waves and tides.
- **Lenticellated Bark:** Oxygen enters through pores in the bark and roots, suitable for low-oxygen conditions.
- **Viviparous:** Seeds germinate while still on the tree, ready to root upon falling

MANGROVES IN INDIA:

- According to the **India State of Forest Report 2023**, India's mangrove cover is **4,991.68 square kilometers, accounting for 0.15% of the country's total geographical area.** This reflects a **decrease of 7.43 square kilometers** compared to the previous assessment in 2021.
- **West Bengal has the highest mangrove coverage, accounting for 42.45% of the total**, followed by Gujarat at 23.66%, and the Andaman & Nicobar Islands at 12.39%.

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- Notably, **Gujarat experienced a reduction of 36.39 square kilometers** in mangrove cover, while **Andhra Pradesh and Maharashtra recorded increases** of 13.01 square kilometers and 12.39 square kilometers, respectively.

SIGNIFICANCE OF MANGROVES:

- **Ecosystem services**:

Abode of biodiversity: Mangrove forests make up one of the most productive and biologically diverse ecosystems on the planet. They are home to an array of species, making them **an important biodiversity hotspot**.

Nursery for species: Mangroves serve as valuable **nursery areas for fish and invertebrates.** These habitats provide a rich source of food while also offering refuge from predation.

Biological barrier: The ability to retain sediments flowing from upstream prevents contamination of downstream waterways and protects sensitive habitat like **coral reefs and seagrass** beds below.

Water filtration: With their **dense network of roots** and surrounding vegetation, mangroves filter and trap sediments, heavy metals, and other pollutants, thereby maintaining water quality.

- **Economic significance**:

Fisheries: Mangrove forests are home to a large variety of fish, crab, shrimp, and mollusk species. This form an essential source of food and income for coastal communities around the world.

Timber and plant products: Mangrove wood is **resistant to rot and insects**, making it for construction and fuel. Mangroves also provide **minor forest products such as honey and resin**.

Tourism: Often located near to coral reefs and sandy beaches, the forests provide a rich environment for tourist activities like **recreational tours, snorkelling and birdwatching**.

- **Shoreline stabilisation**:

The dense root systems of mangrove forests trap sediments flowing down rivers and off the land. This helps **stabilizes the coastline and prevents erosion from waves and storms**.

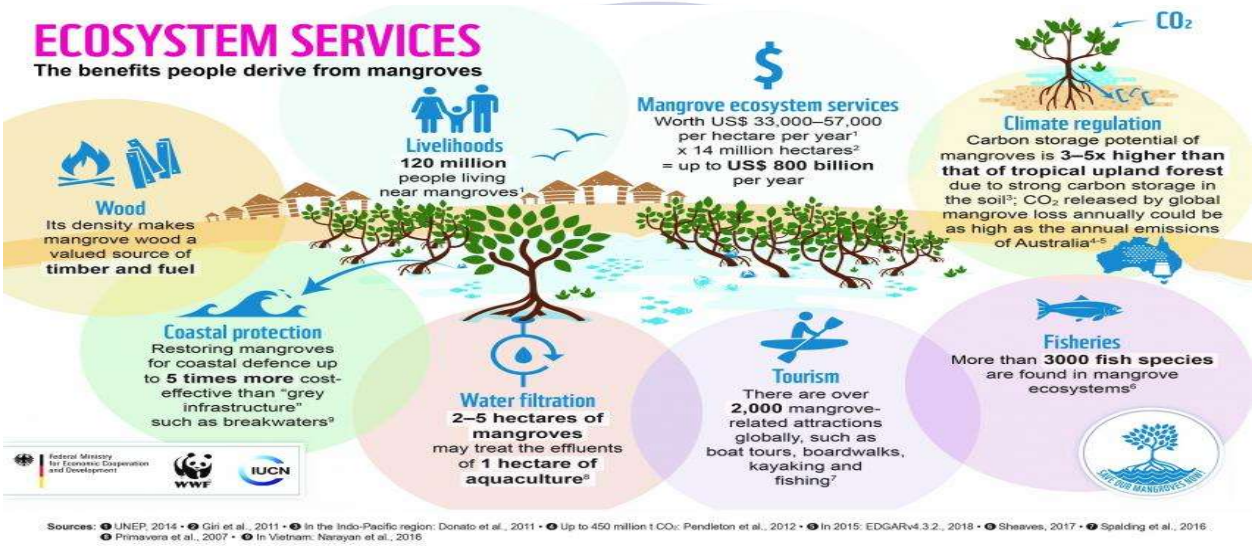
- **Natural barrier**:

As risks from climate change brings about extreme weather events, mangrove forests can help lessen devastation in coastal areas.

For instance, a mangrove forest could reduce the effects of **a Category 5 storm** to the intensity and effects of a **Category 3 storm.**

- **Carbon sinks**:

Mangroves absorb up to **four times more carbon dioxide** per area than terrestrial forests, making them highly effective at mitigating climate change. Protecting and expanding these forests enhances their carbon scrubbing capabilities. For instance, the **State of the World's Mangroves 2024 report** said that mangroves store an average of **394 tonnes of carbon per hectare.**



EXISTING PROTECTION MEASURES:

NATIONAL:

- **Constitutional Provisions:** Article 48A obligates the state to protect and improve the environment.
- **National Committee on Mangroves, Wetlands, and Coral Reefs:** Formed in 1993 to advise on policies and programs for marine conservation.
- **MISHTI Programme:** Launched in June 2023 to expand mangrove cover by planting 540 square kilometers across 11 states and two Union territories.
- **Centrally Sponsored Scheme for Conservation and Management of Mangroves:** Managed by the Ministry of Environment, it provides funds to states for mangrove conservation plans.

- **Marine Protected Areas (MPAs) under WPA:** Mangroves are designated as National Parks or Wildlife Sanctuaries under the Wildlife (Protection) Act, 1972.
- **Environment (Protection) Act, 1986 (EPA):** Empowers the government to regulate environmental pollution, indirectly protecting mangroves.
- **Coastal Regulation Zone (CRZ) Notification:** Prohibits development and waste disposal in coastal ecosystems.
- **State Government Efforts:** Various state laws and initiatives protect mangroves, like Maharashtra's Mangrove and Marine Biodiversity Conservation Foundation.
- **Magical Mangroves Campaign:** A national campaign by Godrej & Boyce and WWF India to promote mangrove conservation through various activities.

INTERNATIONAL:

- **Ramsar Convention:** An international treaty focusing on the conservation and sustainable use of wetlands.
- **Agenda 21 of the Rio Declaration:** Advocates for the protection and sustainable use of oceans and coastal areas.
- **Red List of Ecosystems (RLE) Framework of IUCN:** Aims to assess the global status of ecosystems for conservation and management decisions.

THREATS TO MANGROVES:

- **Change in Land-use:**

The area of mangrove forest continues to shrink due to activities such as shrimp aquaculture and salt farms, which involve clearing, dredging, and diking. The removal of mangroves allows strong waves to erode vital sediments, impeding seedling growth and nutrient retention.

For instance, according to the **"State of the World's Mangroves, 2024"** report, the conversion of mangroves for **aquaculture, oil palm plantations and rice cultivation** accounted for **43.3% of global mangrove loss** between 2000 and 2020.

According to the report, **shrimp aquaculture** has severely impacted mangroves since the 1980s, causing significant losses in areas like **Kerala and Eastern India**, as well as countries like **Indonesia and Brazil.**

- **Irresponsible tourism:**

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Unregulated tourism has taken its toll on the environmental integrity of the mangroves. **Creation of walkways and tourist amenities and littering** is changing the physical characteristics of mangrove forests.

For instance, in **Andaman & Nicobar Islands**, increased tourism pressure has resulted in **mangrove cutting for resorts and recreational spaces**, affecting **coastal biodiversity**.

- **Pollution**:

Municipal wastes and agricultural runoff containing pesticides, antibiotics and other pollutants are making its way into water supplies. Another major threat is from **thermal pollution and oil spills**, as they smother mangrove roots and suffocate the trees.

For example, a 2023 study by the National Centre for Sustainable Coastal Management (NCSCM) found that **mangrove areas in Mumbai's Thane Creek have suffered 20% biomass loss due to oil spills and heavy metal pollution** from industrial discharge.

- **River diversion**:

Dams and irrigation reduce the amount of water reaching mangrove forests, **changing the salinity level of water** in the forest.

For example, the **construction of Farakka Barrage** in 1975 has altered fresh water flow around the delta, thereby altering the ecology of Sundarbans.

- **Lumber industry**:

Chopping down mangroves for charcoal and timber is an important cottage industry. While harvesting has taken place for centuries, in some parts of the world it is no longer sustainable, threatening the future of the forests.

- **Invasive species:**

Plantation of fast-growing non-native mangrove species has been used as a tool for mangrove restoration in several countries. However, **the fast-growth ability has made some species invasive** and gradually replacing co-occurring native mangroves. For example, the **red mangrove (Rhizophora mangle), native to South Florida**, was introduced in Hawai'i to stabilize shorelines but turned invasive, altering local ecosystems and biodiversity.

Also, the **'Blue Carbon Monitoring for Mangroves of Tamil Nadu'** report highlighted the presence of the highly invasive ***Prosopis juliflora*** in mangrove forests across Thoothukudi, Ramanathapuram, Thanjavur, Tiruvarur, and Kattur in Tiruvallur.

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Prosopis juliflora is a highly invasive, drought-resistant species that outcompetes native vegetation, depletes groundwater, and alters soil composition, threatening biodiversity in mangrove ecosystems.

- **Climate change**:

Mangroves need freshwater to maintain the estuarine conditions they thrive in. But as sea-levels rise, the swamps become more saline, threatening some tree species go extinct.

According to the **"State of the World's Mangroves, 2024"** report, mangroves in the **Lakshadweep archipelago and along the Tamil Nadu coast** face critical endangerment mainly due to rising sea levels influenced by global warming.

- **Natural threats**:

Powerful storms and hurricanes may also severely damage mangrove habitats. Winds, waves, and flooding may be destructive enough to clear entire mangrove islands.

- **Shortcomings in legislations and enforcement**:

Forest law enforcement in India appears weak, and penalties devised by various legal instruments such as the Forest Act 1927 are ineffective. Also, since the CRZ is only a notification, it could not be enforced strictly.

WAY FORWARD:

- **Scientific Restoration and Sustainable Management**
  - Implement **mangrove afforestation and restoration** projects in degraded coastal zones.
  - Use **native mangrove species** for reforestation to prevent invasive species from disturbing ecosystems.
- **Integrated Coastal Zone Management (ICZM)**
  - Strengthen **ICZM policies** to balance **development and conservation** efforts.
  - Enforce **coastal buffer zones** to protect mangroves from industrial and urban encroachment.
- **Community Participation and Alternative Livelihoods**

- Engage **local communities** in conservation through participatory programs.
- Promote **sustainable livelihoods** like **eco-tourism, sustainable fishing, and beekeeping** to reduce dependency on mangrove exploitation.

- **Strengthening Legal Framework and Enforcement**
  - Convert **Coastal Regulation Zone (CRZ) rules into law** for stricter enforcement.
  - Impose **harsher penalties** for illegal deforestation, land conversion, and pollution.
- **Mapping, Monitoring, and Research Support**
  - Conduct **regular mangrove mapping** using satellite imagery and GIS-based tools.
  - Encourage **scientific studies on climate resilience** and carbon sequestration potential of mangroves.
- **Public Awareness and Education**
  - Launch **awareness campaigns**, seminars, and workshops to educate citizens about the role of mangroves in **climate mitigation and biodiversity conservation**.
  - Introduce **mangrove conservation in school and university curricula**.
- **International Collaboration and Climate Action**
  - Strengthen **cooperation under global frameworks** like the **Ramsar Convention** and **UNFCCC**.
  - Develop **carbon credit schemes** to incentivize mangrove conservation and afforestation.

CONCLUSION

- Mangroves are **critical ecosystems** that offer **coastal protection, biodiversity support, and carbon sequestration**, making them indispensable in the fight against **climate change and environmental degradation**. However, **urbanization, pollution, and rising sea levels** continue to threaten their existence. To safeguard these invaluable ecosystems, **scientific conservation, legal enforcement, community participation, and sustainable development** must be prioritized. Strengthening mangrove protection efforts will ensure a **resilient and ecologically balanced future** for coastal communities and marine biodiversity.

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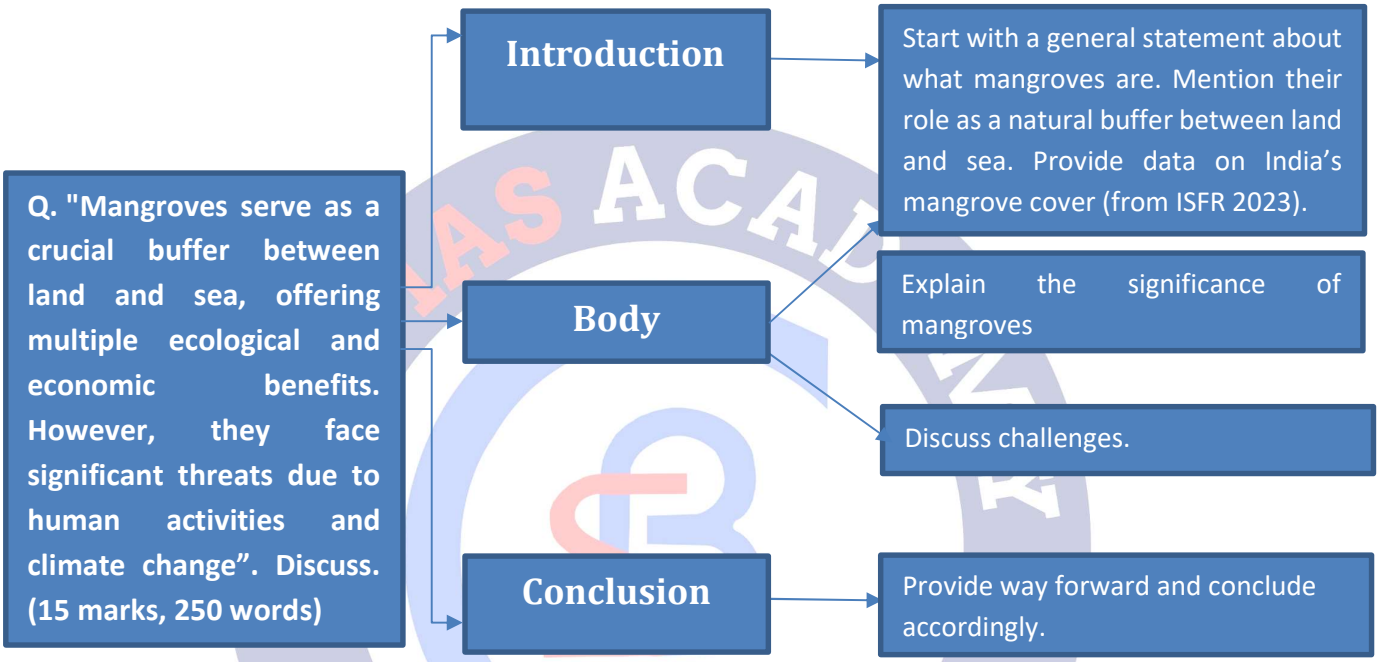
PRACTICE QUESTION

Q. "Mangroves serve as a crucial buffer between land and sea, offering multiple ecological and economic benefits. However, they face significant threats due to human activities and climate change". Discuss. (15 marks, 250 words)

APPROACH



MODEL ANSWER

Mangroves act as a **natural buffer between land and sea, protecting coastal regions from storm surges, tidal waves, and erosion**. Their dense roots **stabilize shorelines, filter pollutants, and support biodiversity**, making them vital for **climate resilience and local economies**. According to the **India State of Forest Report 2023**, India's **mangrove cover stands at 4,991.68 sq km (0.15% of total geographical area)**. West Bengal has the highest mangrove cover followed by Gujarat and Andaman & Nicobar Islands.

Significance of Mangroves:

1. **Coastal Protection and Climate Resilience**
    - Act as **natural barriers against cyclones, tsunamis, and storm surges**, minimizing coastal damage.
    - Help **stabilize coastlines and prevent erosion**, mitigating the impact of rising sea levels.

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- As per the **State of the World's Mangroves, 2024**, mangroves **reduce wave energy by 66-80%**.

2. **Biodiversity Hotspots and Marine Nurseries**
   - Provide **breeding and nursery grounds** for **fish, crustaceans, and migratory birds**.
   - Support several **endangered species**, such as the **Royal Bengal Tiger (Sundarbans) and Saltwater Crocodile**.
3. **Carbon Sequestration and Climate Mitigation**
   - **Absorb four times more carbon dioxide** per unit area than terrestrial forests.
   - Store an average of **394 tonnes of carbon per hectare**, as per the **State of the World's Mangroves, 2024**.
4. **Economic and Livelihood Support**
   - Sustain **fisheries, timber, honey production, and medicinal plant extraction**, benefiting **millions of coastal dwellers**.
   - Contribute to **eco-tourism**, particularly in **Sundarbans, Bhitarkanika, and Pichavaram**.
5. **Water Filtration and Soil Stability**
   - **Filter pollutants, heavy metals, and sediments**, improving coastal water quality.
   - **Dense root systems trap sediments**, stabilizing the shoreline and **reducing coastal erosion**.

Threats to Mangroves:

1. **Land Use Change and Encroachment**
   - Large-scale **conversion of mangroves for shrimp farming, aquaculture, and urban development**.
   - The **State of the World's Mangroves, 2024** report states that **43.3% of global mangrove loss between 2000-2020** was due to **agriculture and aquaculture**.
2. **Unregulated Tourism**
   - Expansion of **resorts, walkways, and recreational spaces** destroys mangrove habitats.
   - Example: **Andaman & Nicobar Islands**, where mangroves have been **cleared for tourism infrastructure**.
3. **Industrial and Plastic Pollution**
   - **Oil spills, heavy metal discharge, and untreated sewage** degrade mangrove ecosystems.
   - Example: A **2023 study by NCSCM** found that **Mumbai's Thane Creek mangroves** suffered **20% biomass loss** due to industrial pollution.
4. **River Diversion and Reduced Freshwater Flow**
   - **Dams and irrigation projects** alter **salinity levels**, affecting mangrove growth.

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- Example: The **Farakka Barrage (1975)** impacted **freshwater inflow into the Sundarbans**, disrupting biodiversity.

5. **Invasive Species**
   - **Prosopis juliflora**, an aggressive invader, is replacing native mangroves and **altering soil composition**.
   - The **Blue Carbon Monitoring for Mangroves of Tamil Nadu (2024)** report highlights its **spread in Thanjavur, Tiruvarur, and Ramanathapuram**.
6. **Climate Change and Rising Sea Levels**
   - **Increasing sea levels and temperature fluctuations** threaten mangrove ecosystems.
   - The **State of the World's Mangroves, 2024** reports that **Lakshadweep and Tamil Nadu mangroves** face **critical endangerment due to rising sea levels**.

Way Forward

- **Afforestation and Restoration** – Expand **mangrove plantations using native species** to restore degraded areas.
- **Integrated Coastal Zone Management (ICZM)** – Strengthen **coastal buffer zones** to prevent further encroachment.
- **Legal and Policy Enforcement** – Strengthen **Coastal Regulation Zone (CRZ) laws** and **impose stricter penalties** for illegal deforestation.
- **Community-Based Conservation** – Involve **local communities in afforestation, sustainable fishing, and eco-tourism**.
- **Scientific Monitoring** – Utilize **GIS mapping and remote sensing** to track **mangrove loss and climate resilience**.

Mangroves are vital for **coastal protection, biodiversity, and climate mitigation** but face threats from **urbanization, pollution, and climate change**. Ensuring their survival requires **scientific restoration, legal enforcement, and sustainable development** through **global and local collaboration** for climate resilience.

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30. DEEP OCEAN MISSION

iMPACT ANALYSIS

SYLLABUS:

GS 3 > Science and Technology > National institutions & initiatives

REFERENCE NEWS:

- Recently, India completed wet testing of its Matsya-6000 submersible, capable of **diving up to 6 km below the surface** to look for underwater minerals off the coast.
- Matsya-6000 has been developed by the National Institute of Ocean Technology as part of the Samudrayaan Project under India's Deep Ocean Mission.
- The launch of the **first deep-sea manned vehicle** is planned for later this year — it will put India in a select group of nations with the capability **to send humans to these depths.**

DEEP OCEAN MISSION (DOM):

- The **Deep Ocean Mission (DOM)** is India's ambitious quest to explore and harness the depths of the ocean. As part of this initiative, India will, for the first time, embark on a **journey to a depth of 6,000 metres in the ocean** using an indigenously developed submersible with a three-member crew.
- DOM was approved by the Union Cabinet **in 2021 at a cost of nearly Rs 4,077 crore** over a **five-year period in a phased manner**.
- **Ministry of Earth Sciences (MoES)** will be the nodal Ministry implementing this multi-institutional ambitious mission.
- Deep Ocean Mission with be a **mission mode project** to support the Blue Economy initiatives of the government.
- **The mission has six pillars:**

  i. Development of technologies for deep-sea mining and a manned submersible to carry **three people to a depth of 6,000 metres** in the ocean. The submersible will be equipped with a suite of scientific sensors, tools and

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an integrated system for **mining polymetallic nodules** from the **central Indian Ocean;**

ii. Development of **ocean climate change advisory services**, involving an array of ocean observations and models to understand and provide future climate projections;

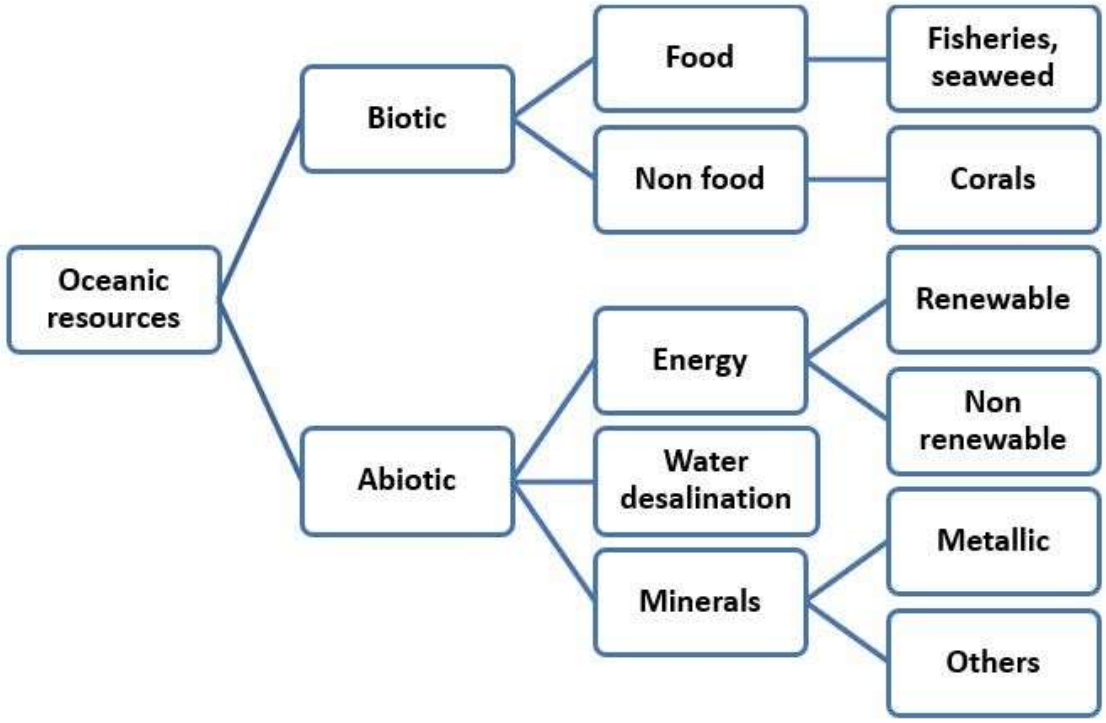
iii. Technological innovations for the **exploration and conservation of deep-sea biodiversity;**

iv. Deep-ocean survey and exploration aimed at identifying potential sites of multi-metal hydrothermal sulphides mineralisation along the Indian Ocean mid-oceanic ridges;

v. **Harnessing energy and freshwater** from the ocean; and

vi. Establishing an advanced **Marine Station for Ocean Biology**, as a hub for nurturing talent and driving new opportunities in ocean biology and blue biotechnology.

DEEP SEA RESOURCES:



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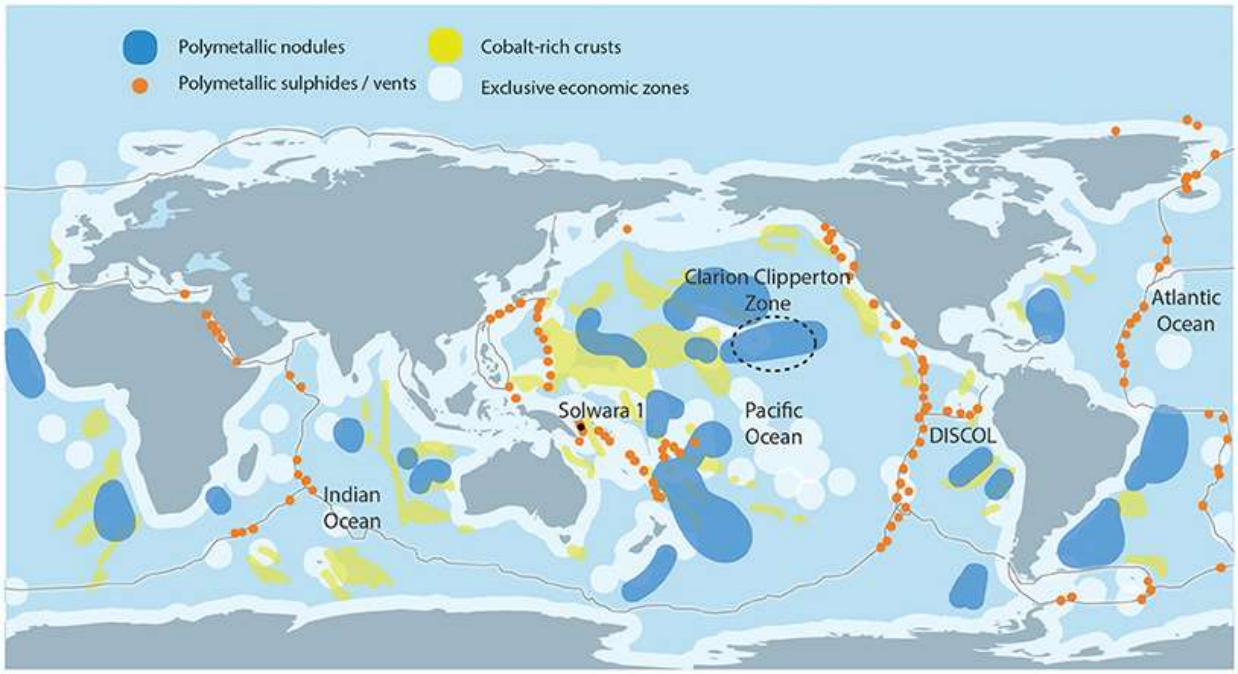
- Traditionally, resources such as fish, oil and gas have been taken from the sea for many decades.
- More recently, oceans are being targeted as a source of **renewable energy**. Eg: Ocean thermal energy conversion to produce electricity for desalination.
- The most significant targets for new deep-sea mining efforts are **polymetallic sulphides**, **manganese nodules** and **cobalt-rich ferromanganese crusts**.
- On a longer run, there will be interest in the potential extraction **rare earth elements** (REEs) in deep-sea muds and **gas hydrates** in the ocean floor. Gas hydrates are a crystalline solid formed of water and gas. It looks and acts much like ice, but it contains huge amounts of methane.



KEY DEVELOPMENTS IN INDIA'S DEEP OCEAN MISSION (DOM):

- **Samudrayaan: India's First Manned Ocean Mission**
  - **Launched in 2021**, Samudrayaan makes India one of the few nations (USA, Russia, Japan, France, China) with manned deep-sea exploration capabilities.
  - Aims to **explore polymetallic nodules, gas hydrates, hydrothermal sulfides, and cobalt crusts** at depths of **1,000-5,500 meters**.
  - **Matsya 6000 submersible** is being developed with **ISRO, DRDO, and IITM**.
  - **About Matsya 6000 Submersible:**
    - Indigenous crewed submersible capable of reaching 6,000 meters.
    - Completed wet testing in February 2025 at L&T Shipbuilding, Chennai.

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- Shallow-water trials (500m) in late 2025; deep-sea trials (6,000m) in 2026.
- **Technological Advancements**
  - **Autonomous Underwater Vehicle (AUV)** captured **hydrothermal vents at 4,500m** (Dec 2024).
  - **Varaha Mining System**:
    - **Self-propelled deep-sea mining vehicle** for **polymetallic nodules (5,000-6,000m depth)**.
    - **Completed locomotion trials at 5,270m (2024)**; next phase focuses on **slurry transportation trials**.
- **Infrastructure Development: New research vessel under construction**, expected operational in **three years** to support **deep-sea surveys**.
- **Budgetary Support: ₹600 crore allocated** for **Samudrayaan**, reaffirming India's commitment to deep-sea exploration.
- **International Collaboration: India collaborating with global partners** to enhance **deep-sea technology and sustainable resource utilization**.

SIGNIFICANCE OF THE DEEP OCEAN MISSION (DOM)

- **Strengthening India's Blue Economy:**
  - India has a **7,517 km coastline**, supporting **30% of its population**, and an **Exclusive Economic Zone (EEZ) of 2.2 million sq. km**.
  - The **Deep Ocean Mission (DOM)** will **accelerate exploration of the EEZ and the continental shelf**, aiding **economic growth** by unlocking **marine-based industries**.
  - The mission aligns with **India's "New India 2030" vision**, where the **blue economy is a core objective**.
  - Exploration of **polymetallic nodules, gas hydrates, and oil reserves** will boost **marine-based trade and industry**, particularly in **blue manufacturing**.
- **Enhancing Energy Security:**
  - The mission's **offshore energy initiatives** can **diversify India's energy basket**, moving beyond fossil fuels.
  - **Ocean-based renewable energy sources** (including **wave energy, ocean thermal energy conversion (OTEC), and gas hydrates**) can provide sustainable alternatives.
  - DOM will enable technological advancements in subsea energy extraction, supporting **India's transition to clean energy**.
- **Strengthening Mineral Security:**
  - **The central Indian Ocean holds 380 million metric tonnes of polymetallic nodules**, rich in copper, manganese, nickel, iron, and cobalt.

- India has been **allocated 75,000 sq. km in the central Indian Ocean** and **10,000 sq. km at 26°S** by the **International Seabed Authority (ISA)**.
- **Deep-sea mining technology (Varaha)** will help **secure long-term access to critical minerals** needed for electronics, batteries, and defense industries.
- This will reduce **India's dependence on foreign mineral imports**.

- **Advancing Sustainable Development Goals (SDGs):**
  - **Land-based mineral extraction is unsustainable** due to environmental concerns, prompting the need for **alternative resources**.
  - **SDG 14 (Life Below Water)** calls for the **sustainable use of ocean resources**—DOM is India's response to this challenge.
  - **Deep-sea environmental impact assessments (EIAs)** are being conducted to ensure **minimal ecological disruption** in mining activities.
  - The mission promotes **sustainable harvesting of deep-sea resources**, integrating conservation and industrial development.
- **Strengthening India's Research and Innovation Ecosystem:**
  - DOM will **boost research in marine biology, climate modeling, and deep-sea technology**.
  - The **Marine Station for Ocean Biology** will serve as a hub for innovation in blue biotechnology, driving advancements in **pharmaceuticals, nutraceuticals, and marine bioengineering**.
  - Advanced ocean observation systems will enhance India's **climate change modeling and weather forecasting capabilities**.
- **Boosting Indian Industries & MSMEs:**
  - The development of **deep-sea submersibles (Matsya6000), mining systems (Varaha), and** underwater communication networks will boost industrial capacity.
  - **Indigenous manufacturing** of deep-sea equipment, ships, and support infrastructure will create **new markets for Indian MSMEs and startups**.
  - Defense and commercial applications of deep-sea technologies will position India as a supplier of deep-sea exploration solutions.
- **India's Rise as a Leader in Deep-Sea Mining:**
  - **Currently, only a few nations (US, China, France, Japan, Russia, and South Korea)** possess deep-sea mining capabilities.
  - **India's successful trial of Varaha at 5,270m depth** marks a major milestone, strengthening its position in global mineral extraction.
  - India is aiming to **develop autonomous seabed mining systems**, reducing reliance on **imported technology**.

- **Indigenous Technological Capabilities & Self-Reliance:**
  - The development of **Matsya6000, Varaha, and related deep-sea technologies** will place India among the **few nations with deep-sea mining expertise**.
  - India's approach to **indigenous technology development (Atmanirbhar Bharat)** will ensure **long-term self-reliance in ocean exploration**
  - **Integration of artificial intelligence, robotics, and underwater navigation systems** will enhance India's **deep-sea domain awareness**.
- **Strategic Advantage for India:**
  - **Global Positioning in Deep-Sea Governance:**
    - **Deep-sea mineral exploration lacks clear international regulations**—India's early investment in DOM ensures it will have a say in **shaping future global policies**.
    - China's **extensive deep-sea fleet and subsea capabilities** pose challenges—India's mission will provide a **counterbalance in the Indian Ocean region**.
  - **Strengthening Maritime Security and Underwater Domain Awareness:**
    - **China's development of deep-sea cable-cutting devices** has raised security concerns—India must **develop protective mechanisms for undersea infrastructure**.
    - **95% of global internet traffic depends on undersea cables**—securing these assets is **vital for national security and digital connectivity**.
    - The **Matsya6000 submersible and deep-sea sensors** will provide **real-time monitoring of India's maritime domain**.

CHALLENGES AND CONCERNS OF THE DEEP OCEAN MISSION (DOM):

- **Absence of International Legislation:**
  - Sustainable extraction and equitable sharing of **deep-sea resources from global commons** require **strong international regulations**, which are currently absent.
  - The **United Nations Convention on the Law of the Seas (UNCLOS)** governs maritime zones **but lacks specific provisions for deep-sea mining governance and ecological protections**.
  - China, France, the US, Japan, and Russia are already leading in deep-sea technologies—**India must proactively position itself** in international negotiations for deep-sea resource regulation.
- **Economic Viability of Deep-Sea Mining:**
  - The **International Seabed Authority (ISA)** estimates that **deep-sea mining will be commercially viable only if at least three million tonnes are mined per year**.

- For instance, India is still in the **trial phase with Varaha**, and extensive **technological advancements** are needed to reach such large-scale extraction levels.
- **Scaling up mining technology** requires **massive investments** in **high-power extraction and transportation systems**.

- **Technological and Engineering Challenges:**
  - The deep ocean environment is **one of the most hostile places on Earth**—with pressures exceeding **600 times that at sea level**.
  - **Human-rated submersibles like Matsya6000** need **highly specialized construction materials**, such as **titanium alloys**, to withstand these conditions.
  - **Remotely operated and autonomous underwater vehicles (ROVs/AUVs)** struggle with communication difficulties, as electromagnetic waves do not propagate well underwater.
  - **Powering deep-sea mining vehicles (Varaha)** requires **1 MW of energy per hour**, which can only be supplied from a surface vessel—**creating logistical challenges**.
- **Environmental and Ecological Risks:**
  - **Disruption of Seafloor and Benthic Ecosystems**
    - **Deep-sea mining can stir up fine sediments**, creating large **plumes of suspended particles** that can **disrupt benthic ecosystems**.
    - These plumes could **smother marine life**, affecting species adapted to low-light, stable environments.
    - Many deep-sea species are **endemic** and have **long lifespans with slow reproduction rates—disturbances could lead to species extinction**.
    - **Landing and maneuvering vehicles on the soft, muddy seabed** is an added challenge, as heavy equipment could **sink into the ocean floor**.
  - **Impact on the Pelagic Ecosystem:**
    - **Suspended sediment plumes** can **reduce ocean productivity**, which will **disrupt food chains and marine biodiversity**.
    - **Filter feeders such as corals and sponges** could struggle to survive in sediment-laden waters.
    - **Disruptions to deep-sea microbial communities** could affect **nutrient cycling, carbon sequestration, and climate regulation**.
  - **Pollution from Mining Activities:**
    - **Noise, vibrations, and light pollution** caused by **mining equipment and surface vessels** could impact **marine mammals such as whales, dolphins, and tuna**.
    - **Oil spills and fuel leaks from mining vessels** pose additional risks, as cleanup in **deep-sea environments is challenging**.

        - The potential **leakage of toxic metals** into marine ecosystems could **bioaccumulate** in fish and seafood, posing risks to **human health**.
- **Security and Strategic Concerns:**
    - **China's deep-sea activities pose a geopolitical challenge**—with **the world's largest fleet of submersibles**, China is **actively developing deep-sea military capabilities**.
    - The **recent unveiling of a Chinese deep-sea cable-cutting device** highlights vulnerabilities in **India's subsea infrastructure**.
    - For instance, **95% of India's internet traffic relies on undersea cables**—securing these assets is a **national security priority**.
    - The **development of deep-sea surveillance and domain awareness** is critical to counter potential threats from **China and other maritime powers**.
- **Ethical and Legal Considerations:**
    - **Deep-sea mining raises ethical concerns regarding marine biodiversity conservation**—India must balance economic gains with **long-term environmental sustainability**.
    - **Local and indigenous communities dependent on fisheries** could be impacted if deep-sea ecosystems are altered.
    - India must establish a **clear policy framework for sustainable deep-sea resource extraction** to align with **global best practices and environmental commitments**.

WAY FORWARD

- **Strengthen International Regulations** – Engage with **ISA and UNCLOS** to establish clear legal frameworks for **resource sharing and environmental protections**.
- **Advance Deep-Sea Technologies** – Enhance **AI-driven navigation, robotics, and high-pressure materials** to improve **Matsya6000** and deep-sea mining efficiency.
- **Ensure Environmental Sustainability** – Implement **strict EIAs, eco-friendly mining techniques, and phased pilot projects** before commercial extraction.
- **Boost Domestic Industry & MSMEs** – Promote **indigenous manufacturing of deep-sea equipment** and support **startups in deep-sea exploration technologies**.
- **Strengthen Maritime Security** – Develop **underwater surveillance systems** to **protect India's undersea assets** from threats like **China's deep-sea cable-cutting devices**.
- **Develop a Sustainable Economic Model** – Balance **resource extraction with marine conservation** and ensure benefits **reach coastal communities**.

CONCLUSION:

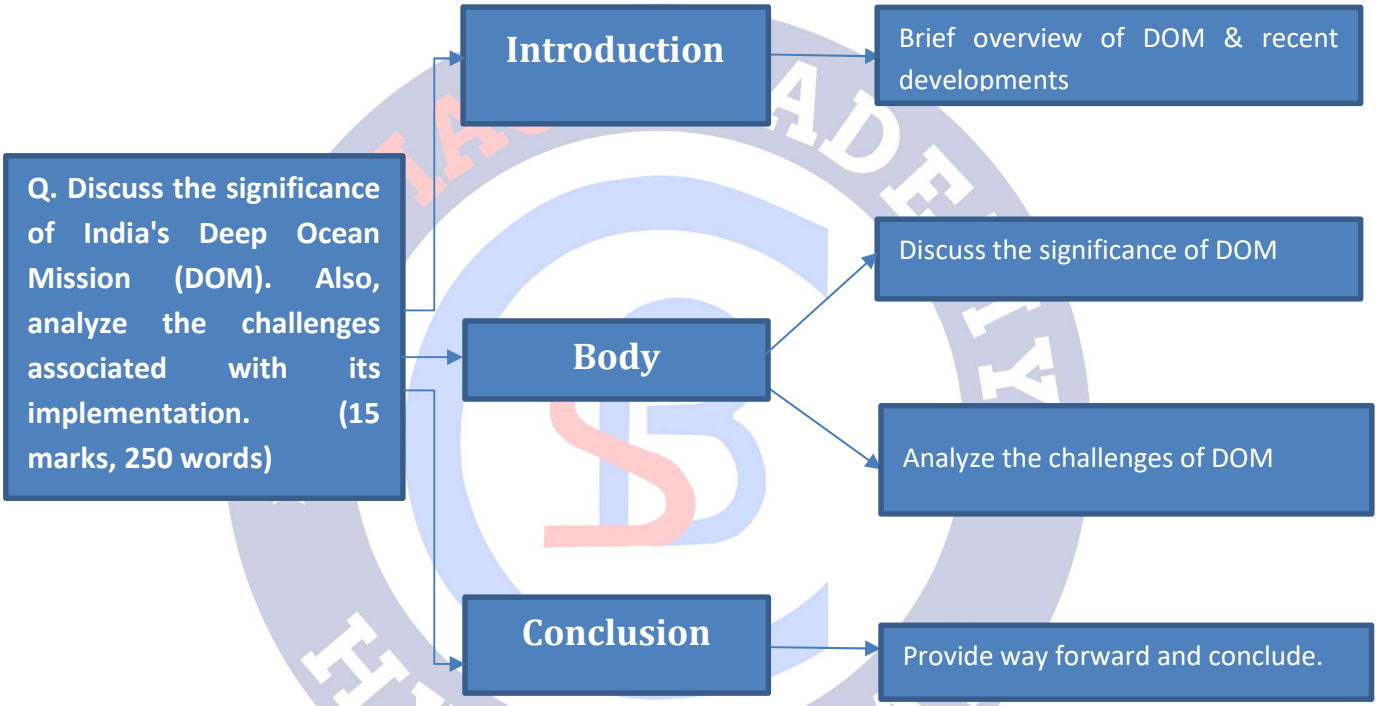
- India's **Deep Ocean Mission (DOM)** is a **strategic leap in deep-sea exploration, mineral security, and maritime dominance**. With **Matsya6000, Samudrayaan, and Varaha**, India is advancing towards **technological self-reliance** in ocean research. However, **challenges like environmental risks, legal gaps, and security threats must be managed**

proactively. A **balanced approach** combining **global cooperation, indigenous innovation, and sustainable mining practices** will ensure DOM's long-term success, securing India's **economic and strategic interests in the deep sea**.

PRACTICE QUESTION

Q. Discuss the significance of India's Deep Ocean Mission (DOM). Also, analyze the challenges associated with its implementation. (15 marks, 250 words)

APPROACH



MODEL ANSWER

India's **Deep Ocean Mission (DOM)**, approved in **2021** with a **₹4,077 crore budget**, aims to **explore deep-sea resources** and strengthen **marine research, energy security, and mineral extraction capabilities**. The **Ministry of Earth Sciences (MoES)** is leading the mission, which includes **developing a crewed submersible, Matsya 6000, under the Samudrayaan project**. Recently, India **successfully conducted wet testing of Matsya 6000**, marking a significant step toward human-crewed deep-sea exploration.

Significance of DOM:

1. **Strengthening India's Blue Economy**

- India has a **7,517 km coastline and a 2.2 million sq. km Exclusive Economic Zone (EEZ)**.
- DOM supports **marine-based industries, deep-sea fisheries, and sustainable energy solutions**.

2. **Enhancing Energy Security**
   - Focuses on **harnessing ocean-based renewable energy** like **ocean thermal energy conversion (OTEC) and gas hydrates**.
   - Diversifies India's energy basket, reducing dependence on fossil fuels.
3. **Securing Critical Minerals**
   - India's **allocated seabed in the Central Indian Ocean (75,000 sq. km) contains 380 million metric tonnes of polymetallic nodules**.
   - DOM will help reduce dependence on **imported minerals for electronics, batteries, and defense sectors**.
4. **Scientific and Technological Advancement**
   - Development of **Matsya 6000 (a 6,000m depth-rated submersible)** will enhance **deep-sea research and exploration**.
   - Establishment of the **Marine Station for Ocean Biology** will promote **blue biotechnology and climate change studies**.
5. **Strategic Maritime and Security Benefits**
   - China has developed **deep-sea cable-cutting devices**, posing security risks.
   - DOM will enhance **India's underwater domain awareness and secure critical undersea infrastructure**.

Challenges in Implementation:

1. **Absence of International Regulations**
   - **UNCLOS lacks a legal framework for deep-sea mining**, leading to uncertainties in resource sharing and environmental accountability.
2. **Economic Viability**

- **Deep-sea mining is commercially viable only if at least 3 million tonnes are extracted annually**, requiring large-scale technological advancements.

3. **Technological and Engineering Constraints**
    - Deep-sea operations face **extreme pressure (600 times sea level pressure), lack of light, and harsh environmental conditions**.
    - **Powering deep-sea vehicles like Varaha (India's deep-sea mining system) requires significant energy supply and durability advancements**.
4. **Environmental and Ecological Risks**
    - **Seafloor mining can disrupt marine ecosystems, affecting biodiversity and nutrient cycles**.
    - **Sediment plumes from mining can impact oceanic food chains and coral reef survival**.
5. **Security and Strategic Challenges**
    - China's growing **subsea military capabilities and dominance in deep-sea mining** pose geopolitical challenges for India.
    - **Lack of undersea surveillance infrastructure leaves critical assets like submarine cables vulnerable**.

Way Forward

- **International Legal Framework** – India should engage with **ISA and UNCLOS** to formulate **global rules for deep-sea resource utilization**.
- **Technological Advancements** – Invest in **AI-driven deep-sea navigation, pressure-resistant materials, and eco-friendly mining techniques**.
- **Environmental Safeguards** – **Strict Environmental Impact Assessments (EIAs)** and **pilot projects** before large-scale extraction.
- **Strengthening Maritime Security** – Develop **underwater sensor networks** to protect **subsea assets from external threats**.
- **Boosting Domestic R&D** – Promote **indigenous deep-sea technology development**, encouraging **MSMEs and startups** in the blue economy.

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The **Deep Ocean Mission** is a **crucial step toward securing India's deep-sea resources, strengthening its economy, and ensuring strategic maritime dominance**. However, addressing **technological, environmental, and security challenges** is essential for sustainable success. A **balanced approach** with **global cooperation, indigenous innovation, and strong regulatory frameworks** will ensure that India **emerges as a leader in deep-sea exploration and resource utilization**.

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