Que. 1 (a) "Astronomical causes seem to be primarily responsible for climate change" comment

Ans. 1 (a) Although astronomical factors have influenced climate in the geological past, they are not the primary drivers of the rapid climate change observed today. Modern climate change is overwhelmingly driven by human activities, particularly since the industrial revolution. Therefore, the statement is misleading if taken to explain current climate trends

Astronomical causes refer to natural variations in Earth's position and movement relative to the Sun, which influence climate over long timescales (typically tens of thousands to hundreds of thousands of years). These include:

- Milankovitch cycles
- Solar irradiance (variations in the Sun's energy output)
- Sunspot activity
- Cosmic ray flux (potentially affecting cloud formation)

These factors have historically contributed to natural climate cycles, such as ice ages and interglacial periods.

Limitations of Astronomical Explanations for Modern Climate Change

While astronomical factors do affect long-term climate trends, they cannot adequately explain the rapid and unprecedented warming observed since the late 19th century, especially post-1950.

- Milankovitch cycles operate over thousands of years, but the current warming has occurred within a few decades.
- Solar output has remained relatively stable or slightly decreased since the 1970s, while global temperatures have sharply increased.
- Climate models incorporating only natural factors fail to reproduce the warming trend; adding anthropogenic greenhouse gas emissions explains it accurately.

Role of Anthropogenic (Human) Causes

Scientific consensus (e.g., IPCC reports) holds that the primary cause of recent climate change is anthropogenic, especially due to:

Burning fossil fuels → increased CO_2, CH_4, and N_2O

Deforestation → reduces carbon sinks

Industrial activities → emissions and land use change

These lead to the enhanced greenhouse effect, trapping more heat in the Earth's atmosphere.

Que. 1 (b) Enumerate the different stages of highway construction in India during the neo-liberal era.

Ans. 1 (b) The neo-liberal era in India, beginning in 1991 with economic liberalization, marked a significant shift in the country's infrastructure policy, including highway development. The approach became more market-oriented, emphasizing

- public-private partnerships (PPPs)
- institutional reforms, and
- mega-projects

1. Initial Phase (Early 1990s – Mid 1990s): Policy Shift and Institutional Reforms.
Liberalization of the economy in 1991 triggered the need for better infrastructure to support industrial growth and exports. Roads and highways were identified as a bottleneck in economic growth. Key developments:

- National Highways Act amendments (1995) allowed for tolling and private sector involvement.
- Formation of National Highways Authority of India (NHAI) in 1995 to oversee highway development.
- Beginning of Build-Operate-Transfer (BOT) model experiments for private participation.

2. Golden Quadrilateral Phase (1999–2004): Mega Project Push

- Launch of the National Highways Development Project (NHDP
- Flagship project: Golden Quadrilateral (GQ) — 5,846 km of highways connecting Delhi, Mumbai, Chennai, and Kolkata.
- Focus: four-laning and improving connectivity between major metros.
- Introduction of large-scale EPC (Engineering, Procurement, and Construction) and BOT projects.
- Increased funding via cess on petrol and diesel, multilateral loans (e.g., from World Bank, ADB), and toll revenues.

3. North-South and East-West Corridors (2004–2010): Expansion of National Connectivity

- Phase II of NHDP: North-South and East-West Corridors (NS-EW)— over 7,300 km connecting Srinagar to Kanyakumari and Silchar to Porbandar.
- Emphasis on regional balance and connecting backward regions.
- Greater reliance on PPP models, especially BOT (Toll) and BOT (Annuity).
- Start of dedicated tolling infrastructure and highway amenities.

4. Institutional and Policy Deepening (2010–2014): PPP Boom and Challenges

- Further reforms in land acquisition (2013 Act) and environmental clearances.
- Surge in PPP projects led by private infrastructure firms.
- However, execution bottlenecks, financial stress, and regulatory hurdles caused delays and project failures.
- NHAI faced rising non-performing assets (NPAs) in highway sector.
- Government initiated Hybrid Annuity Model (HAM) to reduce risk for private investors.

5. Bharatmala Phase (2017 onwards): Integrated, Strategic Highway Development

* Launch of Bharatmala Pariyojana in 2017 to replace NHDP.

* Target: 65,000 km of highways, focusing on:

- Economic corridors, border roads, port connectivity, greenfield expressways.
- Integration of roads with logistics and freight corridors.
- Heavy use of technology: GIS-based planning, digital monitoring.
- Emphasis on greenfield expressways like Delhi-Mumbai Expressway.
- Funding through monetization of assets (e.g., Toll-Operate-Transfer model), NIIF, and foreign investments.

6. Digital and Smart Infrastructure Phase (2020s–present)

Highways integrated with **smart technologies, FASTag, electronic tolling, intelligent traffic systems.

- Push for sustainable development: EV corridors, green construction methods.
- Continued emphasis on private investment, asset monetization, and infrastructure bonds.
- Expansion of National Infrastructure Pipeline (NIP) and PM Gati Shakti initiative to streamline infrastructure development.

Ques. 1. (c) Discuss the nature of monitoring different types of pollution experienced in India

Ans . 1. (c) Monitoring pollution in India involves a multifaceted approach due to the diverse types of pollution affecting the country.

Air Pollution

Types: Particulate Matter (PM2.5 and PM10), Nitrogen Dioxide (NO2), Sulfur Dioxide (SO2), Carbon Monoxide (CO), Ozone (O3), and Lead.

Monitoring:

Government Agencies: The Central Pollution Control Board (CPCB) and State Pollution Control Boards (SPCBs) are primary agencies responsible for air quality monitoring.

Air Quality Index (AQI): Real-time data on air quality is provided through AQI, which categorizes air quality based on pollutant concentrations.

Monitoring Stations: Networks of monitoring stations across urban and industrial areas measure pollutant levels. Data from these stations are used to assess compliance with air quality standards.

Satellite Data: Satellites provide broad-scale data on air pollution, which helps in understanding regional and transboundary pollution trends.

Water Pollution

Types: Chemical contaminants (heavy metals, pesticides), biological contaminants (bacteria, viruses), and physical pollutants (plastics, sediments). Monitoring:

Water Quality Testing: Regular sampling and testing of water bodies for parameters like Biological Oxygen Demand (BOD), Chemical Oxygen Demand (COD), pH, turbidity, and presence of contaminants.

Government Programs: The National River Conservation Plan (NRCP) and the National Clean Water Programme (NCWP) focus on monitoring and improving water quality in rivers and other water bodies.

Automated Monitoring Systems: Some major rivers have automated systems that provide real-time data on water quality.

Soil Pollution

Types: Heavy metals, pesticides, industrial chemicals, and other contaminants. Monitoring:

Soil Sampling: Regular sampling and analysis of soil for contaminants and nutrient levels.

Research Studies: Universities and research institutions conduct studies to assess soil health and pollution levels.

Government Initiatives: The Ministry of Environment, Forest and Climate Change (MoEFCC) and other agencies work on projects to monitor and manage soil quality.

Noise Pollution

Types: Urban noise (traffic, construction), industrial noise, and social noise (loudspeakers, public gatherings). Monitoring:

Noise Level Measurements: Use of noise meters to measure decibel levels at various locations and times.

Regulations: Implementation of noise pollution rules under the Environment Protection Act and monitoring compliance through designated agencies.

Light Pollution

Types: Over-illumination, glare, and skyglow. Monitoring:

Surveys and Studies: Research studies and surveys assess the impact of artificial light on the environment and human health.

Collaboration with Astronomy Organizations: Collaboration with institutions focused on astronomy to monitor light pollution levels.

Challenges in Pollution Monitoring in India

Data Accuracy and Coverage: Ensuring consistent and accurate data collection across diverse regions can be challenging.

Infrastructure: Limited monitoring infrastructure in rural and remote areas.

Coordination: Effective coordination among various agencies and states is crucial for comprehensive pollution management.

Efforts to improve pollution monitoring include enhancing technology, increasing public awareness, and implementing stricter regulations.

Ques. 1. (d) Discuss Land Capability classification of India. How it helps in land resource planning

Ans . 1. (d) India generally follows the Land Capability Classification system developed by the Soil Conservation Service of the United States Department of Agriculture (USDA). This system classifies land into different classes based on its capability to support different land uses. The classification takes into account factors like soil texture, slope, drainage, and erosion risk.

Class I: Excellent Land

Characteristics: Deep, well-drained soils with gentle slopes.

Uses: Highly suitable for all types of agriculture, including intensive farming and horticulture.

Constraints: Minimal limitations; requires proper management to maintain productivity.

Class II: Good Land

Characteristics: Slightly less ideal than Class I, with moderate slopes or occasional soil limitations.

Uses: Suitable for most types of agriculture with some minor management practices needed to overcome limitations.

Constraints: Limited by factors such as slope, drainage, or soil fertility, but manageable with appropriate practices.

Class III: Moderate Land

Characteristics: Noticeable limitations, such as moderate slopes, erosion risks, or less fertile soils.

Uses: Suitable for agriculture with conservation practices; may be used for forestry or pastures if agriculture is not feasible.

Constraints: Requires significant management efforts to prevent soil erosion and maintain productivity.

Class IV: Poor Land

Characteristics: Severe limitations, such as steep slopes, high erosion potential, or poor soil structure.

Uses: Best suited for forestry, wildlife habitat, or recreation rather than intensive agriculture.

Constraints: Difficult to manage for agriculture; prone to erosion and other land degradation issues.

Class V: Very Poor Land

Characteristics: Very steep slopes, severe erosion risks, or very poor soil conditions.

Uses: Suitable for permanent vegetation such as forests or grasslands; not suitable for agricultural use.

Constraints: High risk of erosion and land degradation; requires careful management to avoid environmental damage.

Class VI: Non-Agricultural Land

Characteristics: Extremely severe limitations, such as rock outcrops, very shallow soils, or severe salinity.

Uses: Primarily used for non-agricultural purposes such as construction, mining, or other industrial uses.

Constraints: Land is not suitable for agriculture; management focus is on preservation and safety.

Class VII: Wildlife and Conservation Areas

Characteristics: Land with very special ecological value, such as wetlands, conservation reserves, or critical wildlife habitats.

Uses: Reserved for conservation, wildlife protection, and ecological balance.

Constraints: Protection from human encroachment and development is crucial.

Implementation in India

In India, land capability classification is implemented through various government schemes and programs. Key agencies involved in this process include:

National Bureau of Soil Survey and Land Use Planning (NBSS&LUP): Provides guidelines and conducts surveys for land capability classification.

State Departments of Agriculture and Soil Conservation: Implement land use plans based on the classification to ensure sustainable agricultural practices.

Challenges and Considerations

Diverse Conditions: India's diverse geographical and climatic conditions require localized adaptations of the classification system.

Integration with Development Plans: Balancing land capability with urban and industrial development needs.

Soil Degradation: Addressing soil erosion, salinity, and other degradation issues to maintain land productivity.

Overall, the Land Capability Classification system helps in optimizing land use and managing resources efficiently, ensuring that different areas are used in ways that are sustainable and suited to their inherent characteristics.

Ques. 1. (e) What are the challenge of reforming Indian agricultural markets?

Ans . 1. (e) Agriculture is the primary source of livelihood for about 58% of India's population. Consumer spending in India will return to growth in 2021 post the pandemic-led contraction, expanding by as much as 6.6%. The Indian food industry is poised for huge growth, increasing its contribution to world food trade every year due to its immense potential for value addition, particularly within the food processing industry. The Indian food processing industry accounts for 32% of the country's total food market, one of the largest industries in India and is ranked fifth in terms of production, consumption, export and expected growth.

Markets means a open place or large building where actual buying and selling takes place. The market may extend to a locality, village town, region or a country according to the demand of a commodity. Market includes both place and region in which buyers and sellers are in free intercourse with one another.

Marketing includes those business activities that direct the flow of goods and services from producer to consumer.

Types of agricultural markets in India and their classification

Market for agricultural produce may broadly be divided into three categories

- Wholesale market
- Retail market
- Fairs

Wholesale Markets:

These markets are subdivided into

I. Primary wholesale markets: These markets are periodically held, either ones or twice a week. Agricultural produce comes from neighboring villages. These markets deal in the sale of fruits, vegetables, foodgrains, all household requisites etc. for e.g. Village market

II. Secondary wholesale market: These are also known as mandis. These are situated generally at district or taluka headquaters. Small merchants purchase from primary wholesale market and sale in this markets. Some cultivators directly sell their produce in these markets. Each market comprises area with a 10-20 miles radius. For e.g. District and taluka market.

III. Terminal markets: These are the markets in which the produce is either finally dispose off , direct to consumer or processors or assemble for shipment to foreign countries. These markets are the parts where warehouses and storages are available/ cover a wide area, may be state.

Retail markets: These markets are spread all over the city or town subject to municipal control.

They generally deal in all types of produce and serve the needs of the city people as well as of the surrounding villages. Particular type of market is located in particular locality. Cloth market is one locality and grain, vegetable are in different localities. There is direct selling to consumer.

Fairs: These are held on religious occasions, at pilgrim centre. These markets deal in livestock, agricultural produce etc. for e.g. Magh Mela at Allahabad. There are various dimensions of markets. Any market may be classified on the basis of these Dimensions.

On the basis of free intercourse or degree of competition

1) **Perfect market:** A market said to be perfect, when all potential sellers and buyers are promptly aware of the prices at which transaction takes place, any buyers can purchase from any sellers. The principle underlying a perfect market expects that there must be a uniform price for any one standardized commodity at a particular time at any place, there should not be restriction on the movement of a commodity, there must be a good number of buyers and sellers.

2) **Imperfect market:** A market is said to be imperfect where, some buyers or sellers or both are not aware of the prices at which transactions takes place. There is restriction for movement of goods.

Imperfect markets are

- Monopoly market: There is only one seller of the commodity
- Duopoly market: It has two sellers of a commodity.
- Oligopoly market: There are more than two but a still a few sellers of commodity
- Monopolistic competition: A large number of sellers will deal in heterogenous and differentiated form of a commodity

On the basis of area of coverage:

- Village Markets: Buying and selling activities are confined among buyers and sellers of the village or nearby villages mostly for perishable a commodities.
- Regional markets: (District/ Sate) Buyers and sellers for among commodity are drawn large area than the local markets in India there generally exist for food grains.
- National Markets: Buyers and sellers are at National level e,g. Durable goods such as Jute, Tea.
- World Markets: Buyers and sellers drawn from the world biggest markets form area point of view and exist for commodities having world wide demand e.g., Coffee.

Policy makers in India recognize the importance o f well-functioning markets to agricultural growth, food security, and broad-based rural development. Markets facilitate the commercialization and diversification of farming, and they are essential for efficiently bringing food and agricultural products to domestic and international consumers. Well functioning domestic markets can reduce the cost of food and assure stability of supply, which as the recent global food crisis has highlighted, are key to assuring the food security of poor and non-poor households. They also open opportunities for greater value-addition and employment throughout the economy.

The rapid growth of the Indian economy is bringing new forces for change in agricultural marketing and processing systems. Changes in consumer demand are fueled by rising incomes, increasing urbanization, a growing middle class demanding more diversified and higher-quality food, more working women demanding access to prepared or processed foods and more convenient shopping under one roof, and increased exposure to products through wider media penetration (domestic and international television, cable, and internet).

These forces in turn drive changes in the structure of marketing and encourage agricultural diversification

Que. 2 (a) "Digital Agriculture Mission is an alternative for transformation in agriculture sector of India" Discuss

Ans. 2 (a) India's agriculture sector has long been plagued by low productivity, inefficient supply chains, limited access to technology, and climate vulnerabilities. In this context, the Digital Agriculture Mission (2021–2025) launched by the Government of India represents a strategic shift towards using digital technology to address systemic problems in agriculture.

The Digital Agriculture Mission offers a viable alternative path for transforming Indian agriculture. This can be supported with several arguments, while also acknowledging associated challenges.

Digital Agriculture Mission (DAM)

- Launched in September 2021 by the Ministry of Agriculture and Farmers' Welfare.
- Aims to integrate digital technology (AI, ML, IoT, blockchain, GIS, remote sensing) into agriculture.
- Seeks to create AgriStack: a federated farmers' database linked to land records, input subsidies, and services.
- Partners include Microsoft, Amazon Web Services, Patanjali, ESRI India, and others.

Focuses on:

- Precision farming
- Real-time advisory
- Digital credit and insurance delivery
- Improved supply chain efficiency
- Farmer empowerment through data access

As a Transformational Alternative

1. Data-Driven Decision-Making

- Personalized advisories on weather, pest control, and crop selection.
- Farmers can shift from traditional practices to evidence-based agriculture.

2. Improved Market Linkages

- Digital platforms can connect farmers directly to buyers, reducing middlemen.
- E-NAM (National Agriculture Market) and other tools can improve price discovery.

3. Better Access to Financial Services

- Digital land records + farmer identity → easier access to credit, insurance, and subsidies.
- Promotes inclusion of small and marginal farmers.

4. Efficient Resource Use

- Precision agriculture through drones, soil sensors, and satellite imaging can optimize:
- Water use(critical in drought-prone areas)
- Fertilizer application
- Pest management

5. Climate Resilience

- Early warnings and climate-smart advisory help mitigate risks from climate change.

6. Transparency and Accountability

- Digitization reduces corruption and leakage in subsidy delivery (e.g., DBT in PM-KISAN).

Challenges and Concerns

Digital Divide

- Large sections of rural India still lack internet access, digital literacy, and devices.
- Marginalized groups (women, SC/ST farmers) may be excluded.
- **Data Privacy and Ownership**
- Questions over who owns the data (government? private companies?) and how it is used.
- Risk of data misuse and surveillance.

Corporate Involvement

- Partnerships with tech giants may commercialize agricultural data.
- Fears of monopoly and exploitation of small farmers.

Implementation Gaps

- Integrating land records, Aadhaar, bank details, and crop data is complex and often inaccurate.
- Requires state-level coordination, which varies widely.

The Digital Agriculture Mission represents a promising alternative for transforming India's agriculture sector by modernizing farming practices, boosting incomes, and improving sustainability. However, its success depends on addressing structural challenges like the digital divide, data governance, and implementation capacity.

To be truly transformative, digital agriculture must be inclusive, farmer-centric, and supported by physical infrastructure, institutional reform, and capacity-building.

Que. 2 (b) Explain the requirement and benefits of Pradhan Mantri Ujjwala Yojana (PMUY) undertaken by Government of India.

Ans. 2 (b) The Pradhan Mantri Ujjwala Yojana (PMUY) was launched in 2016 by the Government of India to provide clean cooking fuel (LPG) to poor households, especially in rural areas. The need for this scheme arose due to several pressing socio-economic and health-related challenges:

1. Health Hazards from Traditional Fuels

- Millions of rural households used firewood, cow dung, and biomass for cooking.
- This exposed women and children to indoor air pollution, causing respiratory diseases, eye infections, and even premature death.

2. Gender Burden

- Women spent several hours daily collecting firewood, reducing time for education, income-generating activities, or rest.
- Exposure to open fires also led to burn injuries and long-term health risks.

3. Environmental Degradation

- Use of firewood contributed to deforestation and carbon emissions.
- Inefficient fuel burning added to local air pollution.

4. Energy Poverty

- Poor families lacked access to modern energy sources, reinforcing energy inequality and social exclusion.

Key Features of PMUY

- Provides free LPG connections (including a stove and regulator) to Below Poverty Line (BPL) families.
- Financial support of Rs. 1600 per connection.

- Beneficiaries identified through the Socio-Economic Caste Census (SECC) data.
- Later expanded to include SC/ST households, forest dwellers, tea garden workers, and poor families not covered under SECC.
- Phase II (Ujjwala 2.0) launched in 2021 introduced free first LPG refill and hotplate.

Benefits of PMUY

1. Health Improvement

- Significant reduction in indoor air pollution, leading to better respiratory health, especially for women and children.

2. Women Empowerment

- Freed women from the drudgery of collecting firewood.
- Gave them more time for education, self-employment, and childcare.

3. Social Equity

- Helped marginalized groups (e.g., SC/ST, rural poor) access modern energy services.
- Reduced urban-rural energy divide.

4. Environmental Protection

- Encouraged use of cleaner energy, reducing deforestation and local pollution.
- Contributed to India's climate change commitments (e.g., SDG-7: affordable and clean energy).

5. Behavioral Change and Awareness

- Increased awareness about clean cooking practice and health risks of traditional fuels.

Challenges

- Affordability of refills: Many households struggle to afford regular LPG refills after the free one.
- Behavioral inertia: Some continue using traditional fuels alongside LPG (fuel stacking).
- Need for better last-mile delivery infrastructure in remote areas.

Way Forward

The Pradhan Mantri Ujjwala Yojana is a transformative scheme that addresses public health, women's empowerment, environmental sustainability, and energy access. Despite challenges in

refill affordability and behavioral change, it marks a crucial step toward inclusive and sustainable development in India's rural energy landscape.

Que. 2 (c) What is the reasons of frequent forest fires in India? Identify why such fires are considered to be beneficial for maintaining community habitats?

Ans. 2 (c) Forest fires in India are significantly more frequent and intense due to a combination of environmental, climatic, and human factors. Here's a breakdown of the major reasons driving this trend:

Key Drivers of Forest Fires in India

1. Human Activity (90–95%)

- Over 90% of fires are caused by humans—either due to negligence (e.g. discarding cigarette butts, unattended campfires, debris burning) or deliberate actions such as arson, land-clearing, and poaching cover-ups.
- In central India, locals often burn undergrowth to facilitate collection of Non-Timber Forest Produce (like Mahua flowers and Tendu leaves), which frequently leads to uncontrollable wildfires.
- Practices such as slash-and-burn agriculture, shifting cultivation, and fires set to deter wildlife or conceal illegal logging also contribute heavily.
- Sparks from electricity lines and infrastructure development in or near forests occasionally ignite fires.

2. Climatic Conditions & Climate Change

- Rising temperatures, heat waves in March–April, prolonged dry spells, and erratic monsoon patterns reduce soil and vegetation moisture—creating ideal fire conditions.
- The 2023–2024 El Niño was particularly intense, triggering below-average rainfall and extending drought conditions across major forested regions.

3. Fire-Prone Vegetation & Invasive Species

- Forest types like dry deciduous areas, dense grasslands, and chir pine or Lantana camara-infested zones accumulate highly combustible biomass.
- Chir pine needles are resinous and prone to ignition.
- Lantana promotes a cycle of vegetation burning and regeneration.

- Invasion of species like eucalyptus, Prosopis juliflora, and Lantana camara increases fuel load and fire spread potential, especially across Himalayan foothills and the Western Ghats.

4. Seasonality & Geographic Hotspots

- Peak fire season: March through May (pre-monsoon), when excessive dry biomass is present and temperatures soar.

Regions with the most frequent fire incidents:

- Uttarakhand, Himachal Pradesh (dry pine forests)
- Central India: Odisha, Chhattisgarh, MP, Jharkhand
- North East states
- Latest data: Odisha recorded over 27,120 forest fire incidents between November 2024 and June 2025, making districts like Rayagada, Kandhamal, Malkangiri, and Koraput national hotspots.

Climate change has intensified fire weather—hotter, drier conditions with longer fire seasons increasing ignition likelihood.

Weak early-warning systems and underfunded forest departments hamper rapid response and preparedness.

Community involvement is often minimal, reducing proactive fuel reduction and traditional fire control—despite studies showing traditional practices can reduce fires by over 70%.

Technological gaps while India has satellite monitoring and pre-fire alerts, integration of drones, AI-based models, and real-time surveillance remains limited—though some states like Tamil Nadu are pioneering drone deployment for fire detection and early response.

India faces a rising threat of forest fires driven by a complex mix of human activity, climate stress, combustible vegetation, and systemic vulnerabilities. The pre-monsoon dry season (March–May) exacerbates the risk, particularly in **Himalayan pine belts and central Indian forests.

Solutions need to blend prevention and preparedness—through community engagement, better funding and technology, forest fuel management, and restoration of traditional fire-control systems.

Sankirtan mandalis - Case Study

This initiative has empowered women in Keonjhar and Angul, including the first all-female troupes(due to male migration), and extended their influence into water conservation campaigns.

Since sankirtan was introduced in the campaign, forest fire spread and human-caused ignition have reduced significantly in the targeted villages. The personal involvement of women has boosted local relevance and trust.

- **Cultural Integration** Singing in familiar dialects through devotional melodies makes the messages stick.
- **Community Trust & Voluntary Change** Residents are more receptive to their own voices versus external directives.
- **Female Leadership & Inclusion** Women's role reversal in traditionally male troupes gives new social meaning and empathy.
- **Complementary Strategy** Sankirtan supports technical tools (satellite alerts, AI cameras) by focusing on community behavior change.
- **Political & Social Recognition** National media and political acknowledgement further legitimizes and scales the model.

Forest Fires Beneficial

Though destructive in many ways, low-intensity and controlled forest fires can serve ecological and habitat-maintaining purposes, particularly for certain community habitats and forest types.

1. Promotion of Regeneration

- Fires clear the forest floor of dry leaves and invasive weeds, allowing sunlight to reach the soil and stimulate the germination of native seeds.
- Fire-resistant species like teak, sal, or chir pine often regenerate better after periodic fires.

2. Maintenance of Grassland and Savanna Ecosystems

- Fires prevent woody encroachment in grasslands and savannas, maintaining them as open habitats.
- These ecosystems support species like barasingha, blackbuck, and grassland birds, which rely on open terrain.

3. Nutrient Recycling

- Fire helps in releasing nutrients locked in dry biomass back into the soil, promoting soil fertility.

4. Traditional Ecological Knowledge

- Indigenous and forest-dwelling communities have historically used controlled burning to manage forests sustainably and maintain ecological balance.

5. Pest and Disease Control

- Fires can help control pests, fungi, and pathogens that thrive in dense undergrowth or leaf litter.

Forest fires in India result from a complex mix of natural conditions, human activities, and governance challenges. While uncontrolled and frequent fires are ecologically damaging, low-intensity, seasonal fires—when properly managed—can support ecological balance, biodiversity, and community livelihoods. Thus, a nuanced fire management strategy is needed—one that distinguishes between destructive wildfires and ecologically beneficial fire regimes.

Que. 3 (a) Examine the impacts of USA's decision to enhance tariff on several Indian goods on Indian Economy.

Ans. 3 (a) U.S. tariff hikes on Indian goods is likely to create, the expected impact and broader implications:

1. Overview of the Tariff Hike

- Effective August 7, 2025, the U.S. has imposed a blanket 25% tariff on most Indian-origin goods, excluding certain strategic sectors like pharmaceuticals, semiconductors, and some energy products
- According to Fitch Ratings (covering the fiscal year 2025), the effective average tariff on Indian goods has soared from 2.4% in 2024 to approximately 20.7%

2. Scale & Sectors Affected

- In 2024, India exported around $89 billion $87 billion worth of goods to the U.S.—representing nearly 18% of total exports
- About $60–67 billion in exports are directly exposed to the new tariffs
- Hardest hit sectors include:
- Textiles & apparel (exports $5 billion; U.S. share 25%)
- Gems, jewelry & diamonds ($9 billion)
- Electronics and machinery
- Auto components & engineering goods

- Seafood, spices & processed food items
- Sectors like pharmaceuticals, which contribute $8–9 billion in exports, are exempt from the tariff hike.

3. Estimated Impact on Exports & Economy

- Exports to the U.S. may decline in 2025 due to these tariffs
- GTRI projects a potential 30% drop in affected exports drag on India's GDP growth for FY 26.
- Macroeconomic impact may remain modest overall, given U.S. exports constitute only 2–3% of India's GDP

4. Sector & Market Reactions

Sector-wise impact:

- Textiles, gems, jewelry: Exporters with heavy reliance (40–70%) on U.S. orders are scaling back expansions and warning of job losses and order diversion to competitors like Vietnam or Bangladesh
- Auto components: Though India's auto parts exports to the U.S. ($2.2 billion) are significant, the actual auto exports are minimal—suggesting limited impact but potential opportunity in parts supply chains
- Spices: Key items like cumin and psyllium husk face 25% tariffs, possibly reducing exports by 15% and pressuring Gujarat spice hubs

Market & policy implications:

- Stock markets: Indian indices dipped slightly amid tariffs fears
- Equity sentiment: Export-heavy sectors such as textiles, auto, pharma, and IT are under pressure. Some firms, however, in domestic infra and energy sectors may see defensive positioning
- Rupee & trade policy: Declining export earnings could weigh on the currency. The RBI may consider interest rate cuts (0.5–0.75%) to support economic activity and exporters
- Trade strategy: Indian exporters may diversify markets to EU, ASEAN, Africa; government may offer export incentives (RoDTEP, subsidies); and trade talks with the U.S. are underway to explore tariff rollbacks or reciprocal concessions

Likely Broader Effects

- Competitiveness loss: Indian goods now costlier in U.S.—buyers may shift sourcing to lower-tariff countries (e.g. Vietnam, Mexico).
- Job risk: Significant—in labour-intensive sectors such as textiles and gems.
- Financial pressure: Exporters face tighter margins; Indian export firms and SMEs under strain.
- Policy response: Potential tariff resignations via trade talks; economic stimulus measures; export diversification push; possible retaliation.
- Consumer impact in U.S.: Higher costs on consumer items like apparel, electronics, auto parts, and generic drugs. U.S. inflation concerns voiced by diaspora communities

Way Forward

India can redirect trade flows to other markets and strengthen **domestic substitution** as strategic responses to U.S. tariff hikes, and multiple credible sources confirm this evolving policy direction.

Diversifying Export Markets

India is actively targeting new destinations to reduce reliance on the U.S.:

- FTAs underway with the EU, UK, Canada, Australia, New Zealand, and ASEAN to boost market access and offset U.S. tariffs
- Indian exporters are already redirecting shipments: for example plans to shift volumes toward Europe and the Middle East as a hedge against U.S. market risk

Boosting Domestic Manufacturing & Export Upgrading

- The Make in India and Atmanirbhar Bharat initiatives emphasize boosting domestic production—especially in high-value manufacturing and emerging sectors like electronics, APIs, semiconductors, auto components, and renewable energy
- Production Linked Incentive (PLI) schemes are being expanded across 13 sectors (electronics, pharmaceuticals, textiles, auto, etc.) to incentivize local industry scaling and export competitiveness
- A modernisation push also includes reducing tariffs on raw materials to correct "inverted duty structures", which improves manufacturing competitiveness for domestic producers

Trade Diplomacy and Strategic Measures

- India is engaging bilateral trade talks with the U.S. seeking sector-specific carve-outs or reduced tariffs, while exploring **WTO dispute mechanisms to uphold fair trade rules

- It's leveraging digital trade platforms like iCET to push norms on services, fintech, data sovereignty, where India holds strengths and less exposure to tariffs
- Domestic policy reforms are underway: easing business regulations, improving logistics infrastructure, and offering credit and interest support to vulnerable exporters to build economic resilience

Overall, India is proactively addressing U.S. tariffs by reorienting its trade footprint and reinforcing domestic industrial capacity. While full mitigation of losses is challenging, these strategies enhance long-term sustainability and economic autonomy.

Que. 3 (b) Does Non conventional energy have the prospect for sustainable development in India ? Explain with suitable examples.

Ans. 3 (b) Non-conventional energy (also known as renewable energy) holds significant prospects for sustainable development in India. As the country faces growing energy demand, environmental degradation, and climate challenges, shifting toward clean, renewable energy sources has become both a necessity and an opportunity.

Crucial for Sustainable Development

1. Environmental Sustainability

- Non-conventional sources like solar, wind, hydro, and biomass produce minimal greenhouse gas emissions.
- Reduces dependence on fossil fuels, which are polluting and finite.
- Helps India meet its climate change commitments, including the Paris Agreement and net-zero emissions by 2070.

2. Energy Security

- India imports over 80% of its crude oil. Expanding renewable energy reduces this dependence.
- Renewable sources are domestically available, enhancing energy independence.

3. Economic Benefits

- The renewable energy sector is labor-intensive, creating employment in rural areas (e.g., installation, maintenance of solar panels, wind turbines).

- Local entrepreneurship in decentralized systems (like solar micro-grids) empowers communities.

4. Accessibility and Inclusion

- Non-conventional energy enables off-grid electrification in remote and tribal regions.
- Solar mini-grids, for instance, have brought power to villages in Rajasthan, Assam, and Jharkhand, improving education, healthcare, and livelihoods.

Examples Supporting the Prospect

- Solar Power in Rajasthan & Gujarat
- The Thar Desert region hosts massive solar parks (e.g., Bhadla Solar Park, the world's largest).
- Promotes clean power and land-use optimization.
- Wind Energy in Tamil Nadu and Karnataka
- Wind corridors have been developed, contributing significantly to grid-connected renewable capacity.

International Solar Alliance (ISA)

Headquartered in Gurugram, India leads global efforts to promote solar energy cooperation, showcasing its commitment to clean energy leadership.

Government Initiatives

- National Solar Mission, PM-KUSUM (solar for farmers), and Green Hydrogen Mission demonstrate strategic commitment.
- India's renewable energy installed capacity (excluding large hydro) surpassed **130 GW by 2025.

Challenges to Address

- Intermittency: Solar and wind are variable sources; need for storage solutions (like batteries).
- Grid integration: Requires investment in smart grids and transmission infrastructure.
- Land acquisition and local resistance to large projects in ecologically sensitive zones.

Conclusion

India's transition to non-conventional energy is both viable and essential for sustainable development. With the right mix of policy support, innovation, and investment, renewable

energy can drive India toward a cleaner, more inclusive, and self-reliant future, benefiting both the economy and the environment.

Que. 3 (c) "MGNREGA is a successful welfare oriented Act for the upliftment of rural people in India" Elucidate.

Ans. 3 (c) MGNREGA, enacted in 2005 and implemented in 2006, is a right-to-work legislation guaranteeing at least 100 days of unskilled wage employment per rural household per year, with legal safeguards like unemployment allowance if work isn't provided within 15 days after application . Jobs must be within 5 km of the applicant's residence, offered at a minimum wage, and at least half of these jobs are reserved for women

MGNREGA Promotes Rural Inclusion

1. Income and Livelihood Security

- Offers guaranteed wages—this helps rural households smooth consumption and reduce distress migration.
- Wages are paid via bank accounts or digital payment systems, which supports financial inclusion, bringing rural workers into formal banking channels

2. Empowerment of Women and Marginalized Groups

- Legally mandates at least 50% of jobs for women; in Prayagraj during FY 2024-25, women accounted for 46.7% of total MGNREGA workdays.
- Women are increasingly appointed as 'mates' (supervisors), earning daily wages and gaining leadership roles in rural governance

3. Asset Creation and Local Infrastructure

- Typically funds water harvesting, irrigation, land leveling, plantation, and flood control — all contributing to long-term community resilience, environmental protection, and agricultural support
- In Madhya Pradesh, MGNREGA has created farm-ponds, check dams, and helped nearly 32 lakh people with Rs.1500 crore in wages this year alone
- In Uttarakhand's Almora, the scheme is used for cultivating medicinal plants, providing both livelihood and land regeneration to 400 rural families, generating over 15,500 person-days of employment

Challenges Affecting Inclusion

Delayed Wage Payments

- MGNREGA mandates payment within 15 days of job completion, but delays remain common. For instance, Haveri district saw Rs.16 crore in overdue wages, affecting 1.5 lakh workers—violating statutory timelines and harming livelihoods
- In Kalaburagi, farmers waited two years for dues after constructing cattle sheds, delaying finances and prompting protests at gram panchayats.

Digital Exclusion via New Tech Systems

- The mandatory Aadhaar-Based Payment System (ABPS) and NMMS (app-based attendance) launched since 2023 have caused exclusions and wage losses.
- Reports indicate many workers lose pay due to app failures, low digital literacy, and lack of device access. About 41% of gram panchayats reported no NMMS device usage as of early 2023
- Workers protested—for example, at Jantar Mantar—demanding rollback of mandatory digital attendance and Aadhaar linkage, along with increased funding and timely payments

Success stories of MGNREGA in practice—real examples where the scheme has advanced livelihood security, environmental resilience, women's empowerment, and community development:

Environmental Restoration & Rural Employment

- River revival in Uttar Pradesh: Under the "One District–One River" initiative, the Pili River in Jaunpur and Noon River in Kanpur were rejuvenated using MGNREGA labour for de-silting, embankment work, and manual restoration. Over 23,000 person-days of employment were generated, and more than 40,000 native trees planted along river banks. The success led to renewed water flow and strengthened biodiversity.
- Nine river restorations in Rampur: In regions such as Bilaspur and Shahabad, MGNREGA helped revive nine rivers, including the 75 km-long Nahal River. Nearly 1.5 lakh person-days of work were created through desilting and watershed management, leading to elevated groundwater levels and irrigation improvements.

Infrastructure & Local Markets

- Buxar, Bihar – Rural market built under MGNREGA: At Aathhar village, a 34 lakh rural market complex was constructed with 84 shops, composting units, electricity, CCTV,

and garden space. Women-run businesses now operate in grocery, tailoring, and beauty services, boosting rural commerce and female entrepreneurship.

- Jalpaiguri, West Bengal – All-weather roads and culverts: With tough terrain and tribal settlements, MGNREGA-funded roads, RCC culverts, and causeways enabled long-term mobility. The project created about 15,000 person-days, reducing isolation, improving access to schools and hospitals, and bolstering tourism potential.

Women Empowerment & Livelihoods

- Bokaro, Jharkhand – Mango orchard transforms tribal women's lives: In Kathal Tola village, tribal women used combined support from MGNREGA and state livelihood schemes to convert barren land into a mango orchard and vegetable plots. They now earn between Rs.45,000–55,000 annually and manage a Farmer Producer Company, improving income and decision-making status.
- Prayagraj, UP – Gender parity at work sites: In FY 2024–25, women contributed 46.7% of total workdays in the district, exceeding state norms. Over 850 women were appointed as 'mates' (supervisors), earning Rs. 325/day, which increased household income and enhanced leadership roles for rural women.

Large-scale Afforestation and Sustainable Forestry

Bihar –Human-gabion plantation strategy: the state adopted a model where four families maintained 200 saplings each under MGNREGA—earning employment for up to 100 days/year for five years. The project planted 50 million trees, benefiting one million families and boosting forest cover

Why These Examples Work

- Convergence with other schemes (livelihood, forestry, watershed) ensures broader impact and sustainability.
- Community participation, especially local women, improves ownership and design.
- Environmental asset-building (roads, forests, water bodies) supports long-term resilience.
- Institutional reforms (digital muster rolls, social audits) enhance transparency and trust. |

MGNREGA has shown its strength when integrated with environmental initiatives, gender-inclusive planning, institutional transparency, and community leadership. |

MGNREGA is a powerful tool for rural inclusion, offering employment, financial empowerment, gender equity, and infrastructure benefits. However, persistent challenges such as delayed

payments, digital exclusion, and underfunding are weakening its inclusive potential. Worker-led protests and parliamentary debates (e.g. proposals to raise the wage floor, extend guaranteed days, and reverse exclusionary digital policies) reflect the ongoing struggle to preserve the scheme's foundational values

Que. 4 (a) Why is concentration of industries very poor in North Eastern part of India? What steps have been taken by Government of India to address the issue?

Ans. 4 (a) North Eastern Region (NER) is a political and geographic grouping composed of eight states: Arunachal Pradesh, Assam, Manipur, Meghalaya, Mizoram, Nagaland, Sikkim, and Tripura . It covers around 5,300 km of international borders with Bangladesh, Myanmar, China, Bhutan, and Nepal. Linked to mainland India by the narrow Siliguri Corridor, also known as the "Chicken's Neck" (approximately 20-22 km wide)

Cultural, Strategic & Economic Significance

- The North East is one of the most ethnically and linguistically diverse regions in India, with around 200+ ethnic groups and 220+ languages/dialects
- Known for its breathtaking biodiversity, dense forests, rich wildlife, tea gardens, and mountainous terrain interspersed with valleys and plains
- Strategically important due to its proximity to Southeast Asia and role in India's Act East Policy, serving as a key gateway to ASEAN nations
- Economically emerging with sectors like tea, bamboo, hydropower, and organic agriculture — for instance, Sikkim is India's first fully organic state

Reasons for Poor Industrial Concentration in NER

1. Geographical Constraints

- The region is hilly, forested, and prone to natural disasters (e.g., floods, earthquakes).
- Limited flat land for industrial infrastructure.
- Difficult terrain raises transportation and logistic costs.

2. Poor Connectivity and Infrastructure

- Inadequate road, rail, and air connectivity within the region and with the rest of India.
- Limited access to ports, restricting trade and raw material movement.
- Power supply is often unreliable or underutilized despite hydropower potential.

3. Security and Insurgency Issues

- Presence of ethnic conflicts, militant groups, and political unrest discourage investment.
- Industries view the region as high-risk.

4. Low Urbanization and Market Size

- Sparse population and low urbanization offer a limited consumer base.
- Local demand is insufficient to sustain large-scale industries.

5. Lack of Skilled Labor and Industrial Ecosystem

- Limited availability of technical manpower and industrial training facilities.
- Absence of ancillary industries, logistics hubs, and research centers.

6. Land Acquisition Issues

- Tribal land ownership rules and customary land rights make land acquisition difficult for industrial projects.

Steps Taken by the Government of India

The Government has launched targeted policies, infrastructure programs, and incentives to promote industrial development in the North East:

1. North East Industrial Development Scheme (NEIDS) – 2017

- Offers financial incentives like capital investment subsidy, transport subsidy, GST reimbursement, and employment incentives.
- Focuses on micro, small, and medium enterprises (MSMEs) and environmentally sustainable industries.

2. Industrial Infrastructure Development

- Setting up of Integrated Infrastructure Development Centres (IIDCs) and Industrial Growth Centres (IGCs).
- Upgrading power, road, and telecom infrastructure under schemes like North East Road Sector Development Scheme (NERSDS) and Digital India.

3. Mission Purvodaya

- Aims to accelerate development in Eastern India, including NER, by focusing on steel, petroleum, and fertiliser industries.

4. Act East Policy

- Enhances trade and connectivity with Southeast Asia, positioning NER as a strategic gateway.
- Investment in border trade infrastructure, land customs stations, and transnational highways (e.g., India-Myanmar-Thailand Trilateral Highway).

5. Skill Development and Start-up Support

- Ministry of Skill Development and NEC initiatives to create Skilling Hubs and Entrepreneurship Centres.
- Promotion of Start-up India and Stand-Up India in the region.

6. Special Economic Zones (SEZs) and Industrial Corridors

- Establishment of SEZs in Mizoram, Tripura, and Assam to attract investors.
- Planning of inland waterways and logistics hubs to reduce transport bottlenecks.

Way Forward

The industrial backwardness of the North Eastern Region is due to structural constraints, but the region holds potential in ***hydropower, agro-processing, tourism, and border trade***. The Government of India's recent policies aim to integrate the region with national and global value chains. Effective implementation, improved governance, and peace-building efforts are crucial to unlock the industrial potential of the region.

Que. 4 (b) What are the components of Human Development Index (HDI) in India? Why do these components remained stagnant over the years ?

Ans. 4(b) Components of the Human Development Index (HDI)—particularly in the context of India—based on the latest UNDP methodology:

The HDI is a composite statistic that measures average performance in three fundamental dimensions of human development:

1. A long and healthy life

- Measured via life expectancy at birth

2. Access to knowledge (Education)

- Two sub-indicators:
- Mean years of schooling (average years of education for adults aged 25+)

- Expected years of schooling (years of education a child entering school is expected to receive)
- These are each normalized and then averaged for the Education Index

3. A decent standard of living (Income)

- Measured by Gross National Income (GNI) per capita in PPP dollars
- The Income Index uses a log transformation of GNI per capita to smooth disparities

According to the UNDP India report for 2022–23:

- HDI: India's HDI value is approximately 0.685 for 2023, ranking 130th among 193 countries
- Health: Life expectancy reached approximately 72 years in 2023
- Education: Expected years of schooling: approx. 13.0 years
- Mean years of schooling: approx. 6.9 years
- Income: GNI per capita estimated around USD 9,047 PPP in 2023

Why These Components Matter

- Health (Life expectancy) reflects access to healthcare, nutrition, sanitation, and disease control.
- Education (Mean & expected schooling) represents both existing human capital and future educational access.
- Income (GNI per capita PPP) indicates average economic well-being and material standards.

UNDP's geometric mean approach ensures balanced development across all three areas

Complementary Metrics

Because HDI doesn't capture inequalities or gender gaps, the Human Development Report also includes:

- Inequality-adjusted HDI (IHDI)
- Gender Development Index (GDI)
- Gender Inequality Index (GII)
- Multidimensional Poverty Index (MPI)
- The HDI offers a broader lens on human well-being than GDP alone, highlighting strengths and weaknesses in health, education, and income.

Despite improvements in some areas, India's HDI components have stagnated or grown slowly due to several interlinked factors:

1. Health-Related Challenges

- inadequate public health spending (less than 2% of GDP).
- Malnutrition, infant and maternal mortality, and limited access to healthcare in rural areas.
- Healthcare infrastructure gaps and regional disparities.
- Impact of pandemics like COVID-19 reversed recent health gains.

2. Education-Related Issues

- Low learning outcomes despite high enrollment (as shown by ASER reports).
- High dropout rates at secondary and higher education levels, especially among girls and marginalized groups.
- Lack of quality infrastructure, teachers, and digital divide in rural and remote areas.
- NEP 2020 is a positive step, but long-term impacts are still unfolding.

3. Income and Employment Inequality

- GNI per capita has grown slowly, and benefits are not equitably distributed.
- High levels of informal employment and underemployment keep incomes low.
- Jobless growth and rural distress limit improvements in standard of living.
- Gender and caste-based wage disparities persist.

4. Regional Disparities

- States like Kerala, Himachal Pradesh, and Tamil Nadu perform well on HDI, but Bihar, Jharkhand, and Uttar Pradesh lag significantly.
- Uneven development across regions skews national averages.

5. Policy Implementation Gaps

- Many welfare schemes (health, education, livelihoods) suffer from leakages, corruption, and poor delivery mechanisms.
- Lack of coordination between Centre and States affects policy outcomes.

While India has made gradual progress in HDI over the decades, the pace has been uneven and insufficient. Stagnation in health, education, and income indicators reflects deeper structural issues, governance challenges, and social inequalities. For real improvement, India needs

inclusive, well-funded, and efficiently implemented human development policies, focusing on quality over quantity.

Que. 4 (c) Write down note on policy measures undertaken to improve female labour force participation rate in India.

Ans. 4 (c) Female Labour Force Participation Rate (FLFPR) is a key economic indicator that measures the proportion of women who are either working or actively seeking work compared to the total number of women in the working-age population. It's a measure of gender inclusion in the economy. Reflects social norms, education levels, economic conditions, and policy effectiveness.

- Female Labour Force = Number of women who are employed + Number of women who are unemployed but actively looking for work.
- Working-Age Female Population = usually women aged 15 years and above (can vary slightly by country or institution, e.g., ILO or national statistics).

A low FLFPR can indicate barriers like:

- Cultural and societal norms
- Lack of childcare support
- Gender discrimination
- Low job availability in female-friendly sectors

India has one of the **lowest female labour force participation rates** (FLFPR) among major economies, hovering around 20–25%, despite rising levels of female education. To address this concern, the government has undertaken several policy measures aimed at enhancing women's economic participation, ensuring gender equity, and providing supportive work environments.

1. Legislative and Regulatory Measures

- Maternity Benefit (Amendment) Act, 2017
  - Increased paid maternity leave from 12 to 26 weeks.
  - Mandated crèche facilities in establishments with 50+ employees.
- Equal Remuneration Act, 1976
  - Prohibits discrimination in wages and recruitment between men and women.
- Sexual Harassment of Women at Workplace Act, 2013
  - Provides legal protection and grievance redressal against workplace harassment.

2. Employment and Skill Development Initiatives

- Skill India Mission and PM Kaushal Vikas Yojana (PMKVY)Offers skill training tailored for women in non-traditional sectors.
- Stand-Up India and MUDRA Yojana Provides credit support to women entrepreneurs, especially from marginalized groups.
- Mahila E-Haat and Women Entrepreneurship Platform (WEP) Online platforms to support marketing, networking, and funding access for women.

3. Social and Infrastructure Support

- Beti Bachao Beti Padhao Promotes girls' education , indirectly improving their future employment prospects.
- Poshan Abhiyaan and ICDS Focus on child care and nutrition, helping reduce women's unpaid care burden.
- Expansion of crèche and child-care support under NREGA and urban policies.

4. Labour Market Reforms and Flexibility

- Encouragement of part-time, flexi-time, and remote work options post-COVID-19.
- Platform economy (e.g., gig work in delivery, services) offers new avenues for women.

5. Targeted Government Schemes

- National Rural Livelihood Mission (NRLM)Promotes self-help groups (SHGs) and micro-enterprises among rural women.
- Deen Dayal Upadhyaya Grameen Kaushalya Yojana (DDU-GKY) Trains rural youth, with a strong focus on female participation.

Improving female labour force participation in India requires a multi-pronged approach, combining legal protections, financial inclusion, skill development, and care infrastructure. While policy efforts have increased in recent years, effective implementation, social norm change, and public-private cooperation are crucial for sustainable progress.

Que. 5 (a) What is Apiculture? Specify the problems and prospects related to it.

Ans. 5 (a) Beekeeping or Apiculture is an absorbing hobby to some, and to others it is an industry for producing honey and wax. Since ancient times, honeybees have been kept in a crude manner in India. Bee-keeping, today is based upon improved methods using the principles of movable frame-hive, honey extractor and the smoker. Beekeeping is an ideal hobby because it involves outdoor work and does not require much time. It is both interesting and instructive.

Moreover, the returns in the form of money and mental satisfaction are highly gratifying. Beekeeping is an asset as honey bees help in increasing crop yields through pollination and gather nectar to produce honey and wax. It is a well considered view that the income derived by increased crop yield due to beekeeping is quite substantial.

Honey bees not only produce honey; they also pollinate the crops to get higher yield and a better quality of produce. A study has found that if the pollination is well-managed, crop yields increased by a significant median of about 24 percent and the efficient pollination of flowers also helps to protect the crops against pests. So beekeeping is the best Agri-Business in current situations, especially for the rural areas, where it can act as a secondary source of extra income. Beekeeping cannot be restricted to honey only, products such as royal jelly, bee wax, pollen, propolis and bee venom are also marketable at a good price and can help the farmers to enhance their revenue.

Beekeeping can be a profitable occupation in areas with good floral pasturage. Possibility for the development beekeeping in India is tremendous due to its diverse environment and inexhaustible floral resources obtained from natural vegetation and cultivated crops. According to recent statistics, about 50 million hectares of land is under the cultivation of oilseeds, pulses, orchards and other crops useful to bees and benefitted by bee pollination. In addition, there is about 60 million hectares of forest area with beekeeping potential. This vast area of agriculture and forest may easily sustain at least one crore bee colonies.

Several people in a village or group of villages may join, together and start a co-operative, generating work and income, since the manufacture of the basic beekeeping equipments such as hives, frames, smokers, extractors and containers, as well as the processing of honey and bee wax can be done locally.

India today has about eight lakh bee colonies. considering the modem beekeeping which arrived in India only three decades ago with the advent of the Khadi and Village Industries Commission (KVIC), today the number of bee colonies and beekeeper’s co- operatives increasing . It has made a spectacular achievement. Kerala, Tamil Nadu, West Bengal, Bihar, Orissa, Himachal Pradesh, Kashmir, Punjab, Meghalaya, Andaman and Nicobar islands are the important states in which beekeeping co-operatives are active.

Problems associated with beekeeping are:

- non-availability of honey boxes to the beekeepers,
- lack of honey marketing facilities and
- inadequate training in the management of apiary.

A viable proposition in this regard is to strengthen the beekeeping co-operatives and establish the bee industry as a whole and national beekeeping farms on forest land.

Selection of good apiary site

(i) Apiary ground should be clean & free from dry leaves etc. to avoid fire during summer (ii) Apiary site should be away from power station, brick kilns, highway and train tracks (iii) Site should be open & at dry place having shade (iv) Site should be easily accessible by road (v) Fresh running water should be easily available near the apiary (vi) It should have natural / artificial wind breaks (vii) Site should receive early morning and afternoon sunshine (viii) Area should be rich in bee flora (ix) There should not be other commercial apiary within 2-3 kilometers from the apiary site (x) There should not be any source of stagnant / dirty water, chemical industry/ sugar mill, etc., nearby the apiary

Selection of good quality bees

Beekeeping can be done by domesticating two species of honey bees viz; Apis cerena and Apis mellifera depending upon floral conditions and capability of investments. However, success in both the cases depends on quality of bees, particularly queen. Therefore, the following should be kept in mind to select the bee colonies:

(i) Buy disease free bee colonies from existing beekeepers after getting training on the subject. (ii) Select and multiply honey bee colonies only from disease resistant, high honey yielding, young, healthy and high egg laying capacity queen, etc. (iii) Keep colonies with good prolific queens (iv) Capture few bee colonies from their natural abodes in forests which may be used for further breeding/ multiplication to prevent inbreeding

Management of apiary

Placement of colonies in apiary (i) Hives should be as per specification of BIS/ISI and should be of locally available seasoned light weight wood. Unseasoned and heavy wood should be avoided (ii) Avoid nailing the bottom board with the brood chamber (iii) Restrict number of bee colonies in a apiary from 50-100 (iv) Keep row to row and box to box distance as10 and 3 feet, respectively (v) Avoid over- stocking of colonies in the apiary

Inspection of colonies (i) Adopt general colony and personal hygiene in the apiary like cleanliness in the beehives including cleaning the bottom board, top cover, etc. frequently (ii) Check the colonies periodically for any abnormalities or changes in behaviour of bees (iii) Inspect colonies on clear sunny days preferably at temperatures between 20 and 30°C (iv) Do not inspect colonies in cold, windy and cloudy days (v) Use smoker when needed to subdue the bees

(vi) Use protective dress and veil while inspecting colonies (vii) Handle colonies gently, avoid jerks (viii) Avoid crushing bees as it could lead to stinging (ix) Isolate the diseased colonies from healthy ones. (x) Handle diseased and healthy colonies separately

By-Products of a Honey Bee Farm Apart from honey, there are other commercially important by- products like royal jelly, bees wax, pollen, propolis and bee venom.

Royal Jelly It is a secretion from the hypopharyngeal glands of nurse-bees. Queen larva and the young workers feed on royal jelly. It is milky in color and contains proteins, lipids, carbohydrates, minerals like iron, Sulphur, copper and silicon. It increases the vitality and vigor in humans.

Beeswax is secreted as a liquid but solidifies when exposed to air. Scales are formed after solidification which is removed by the hive-bees for building the comb. Although the wax is white in color, the shade varies depending on the pollen pigments. It is chiefly used in the candle industry. Other major places where the bees wax is important are for making creams, ointments, capsules, deodorants, varnish, shoe polish, etc.

Honey– It is a viscous fluid produced from the flower nectar by the bees. Commercially it is the most important product of apiculturesince it is a whole food containing sugars, antibiotics, enzymes, acids and minerals. Since it has a high sugar content, it is a high energy source. It is a useful carrier for many ayurvedic and unani medicinal preparations. In severe cases of malnutrition, ulcers and impaired digestion, honey is recommended for regular consumption.

Propolis is the resin-like exudate collected by honey bees from the trees. It is used by them for sealing the cracks and crevices. It has an adhesive quality and hence mixed with Vaseline. It also has burn healing property and used for preparing ointments that treats cuts, wounds, etc.

Bee Venom It is an important secretion used by the worker bees as a defense mechanism. It contains active chemicals like histamine, hydrochloric acid, formic acid, calcium, Sulphur, apamine, etc. Commercially it is obtained through electric shock. T. Bee venom is injected into patients suffering from rheumatism. They cannot be cured by any other method. It also helps in curing neuralgia, endoarthritis, necrosis, etc.

Que. 5 (b) What are the benefits and challenges of Business Houses in India?

Ans.5 (b) A business is defined as an organization or enterprising entity engaged in commercial, industrial, or professional activities. Businesses can be for-profit entities or they can be non-profit organizations that operate to fulfill a charitable mission or further a social cause. Business Houses are a public or private structure business that forms a group of various companies dealing

in different segments. Business Houses are an important part of a nation's economy and a major contributor to the GDP of the country. The industrial scenario of many developing economies is identified by various business groups. In India, 90% of the businesses are family-owned. They have played a very crucial role in the development of the Indian economy.

Major Business Houses in India

Adani Group Adani Group is one of the well-known business houses in India. The company has its headquarters in Gujarat. It was founded in the year 1988 as a commodity trading business. It is an Indian multinational conglomerate working in diversified business sectors which includes resources, logistics, agribusiness and energy sectors. The subsidiaries of Adani Group are Adani Gas Limited, Adani Ports & SEZ Limited, Adani Power.

Aditya Birla Group Founded by Seth Shiv Narayan Birla in 1857, the Aditya Birla Group is one of the best business houses in India. The group has its headquarters in Worli, Mumbai. The group is active in sectors of viscose staple fibre, metals, cement (largest in India), viscose filament yarn, branded apparel, carbon black, chemicals, fertilisers, insulators, financial services, telecom, BPO and IT services.

Bharti Enterprises Bharti Enterprises was founded by Sunil Bharti Mittal in the year 1976. The company has its headquarters in New Delhi and is operational in 16 countries across Africa and Asia. The company has businesses in the field of telecommunications, agribusiness, financial services and manufacturing. It has its presence in many sectors but its largest revenue comes from the telecom industry.

Reliance Industries Ltd Reliance India Limited was founded by Dhirubhai Ambani in 1966 as Reliance Commercial Corporation. The company is now headed by Mukesh Ambani after his split with his brother, Anil Ambani. It is an Indian conglomerate holding company having headquarters in Mumbai. Reliance is the most profitable business house in India.. Reliance contributes almost 5% to the total revenues of the Government of India from customs and excise duty. The company is operational in the sectors of energy, petrochemicals, textiles, natural resources, retail, and telecommunications.

Tata Group Tata Group is a global enterprise established by Jamsetji Tata in 1868. Having its headquarters in india, it comprises of more than 100 companies operating independently. The Tata Group is operational in more than 100 countries across six continents in the world. Tata Sons is the primary investment holding company and promoter of Tata companies. The company has more than 695,000 employees working under it. Tata companies with significant scale include Tata Steel, Tata Motors, Tata Consultancy Services, Tata Power, Tata Chemicals, Tata Global Beverages, Tata Teleservices, Titan, Tata Communications and Indian Hotels.

Family businesses have always been an integral part of the economy and society in our country. Largely founded on the joint family principle of ownership and management, their contribution has always remained very high. The obvious importance of family business in India - the Indian economy is majorly driven by entrepreneurial capitalism.

Family businesses clearly have an enormous potential to create a winning brand provided they are able to efficiently organise and streamline their performance, and earn the trust of their customers and employees.

•The perks of being in a family business are the visibility and exposure that one gets into every aspect of running the company. You will have to be directly in touch with many stakeholders like vendors, landlords, government and customers. Another advantage is the constant knowledge transfer one can get from their predecessors and ancestors who have set up the business from scratch and understand its pulse.

•Another benefit of running a family business would be the ease in taking risky decisions. There is no conflict between your personal interests and organizational interests. But when you take a risky decision, you should have a strong logic behind it. Otherwise the existing system may not be able to cope with it.

•The key areas where family run firms continue to face unique challenges are Family Wealth Management, Managing Family Relationships and Professionalization.

•Indian family businesses enjoy various advantages due to their inherent characteristics and a social culture that supports their structures. However, these advantages can be destroyed if the family is not united.

•One of the popular myths about family businesses is that they are unable to adapt easily to increasing competition and technological progress. But as the new generation steps in, the family businesses subsequently have the advantage of entrepreneurial spirit and flexibility.

•Family-owned businesses are often perceived to be ideal because family members can be great team support and they form a loyal foundation for the company, they also tend to exhibit more dedication towards fulfilling a common goal. Most of the family run businesses are known for the ethics that they follow and it naturally creates a legacy for the coming generation to continue.

•When the family members have a common vision, well defined roles, open communication, and transparent systems of operations then the business can survive any test of time.

Indian family businesses have moved far ahead and now have a global presence. While the previous generations have laid the foundation of the business, the new generations have become

instrumental in strengthening the same and are capably forging ahead, bringing in impactful and positive changes not only at the company level but industry at large.

There is a huge need for innovative solutions, particularly those that alleviate poverty and benefit a large number of people. Given the scale of India and its resource constraints, low-cost, high-impact solutions are required. Technology startups play a crucial role in accomplishing this, because of their potential for scalability and exponential growth.

The flagship initiative, "Startup India", was initiated by the prime minister in 2016 "to build a strong ecosystem that is conducive for the growth of startup businesses, to drive sustainable economic growth and generate large scale employment opportunities.

In an increasingly uncertain and fast-moving business environment, large companies face pressures to innovate ever more rapidly. Their challenge is twofold: to innovate incrementally to grow their existing business, while understanding ongoing changes in their industry and making provisions for more radical innovations. The latter is proving to be difficult, and more large companies realise that they cannot simply rely on internally generated knowledge and on building everything themselves. As this 'closed innovation' paradigm loses its relevance, more companies turn towards open innovation approaches.

Que. 5 (c) Elaborate on locational characteristics of Petro refining industry in India

Ans.5 (c) The petrochemical refining industry in India plays a crucial role in the country's economy, providing essential raw materials for various industries, including automotive, textiles, and consumer goods. The locational characteristics of the petrochemical refining industry in India are influenced by several factors.

Proximity to Oil Fields

Crude Oil Sources: Refineries are often located near major oil fields to minimize transportation costs for crude oil. In India, significant oil fields are located in Assam (Assam-Arakan Basin) and Gujarat (Cambay Basin). Consequently, refineries in these regions, such as the Numaligarh Refinery in Assam and the Koyali Refinery in Gujarat, benefit from their proximity to the oil fields.

Coastal Locations

Access to Ports: Many refineries are located along the coast to facilitate the import of crude oil and the export of refined products. Coastal refineries benefit from easier access to international shipping routes and ports. Major coastal refineries include:

Jamnagar Refinery: Located in Gujarat, this is one of the largest refineries in the world, benefiting from proximity to the port of Kandla.

Mumbai Refinery: Located in Maharashtra, it has access to Mumbai port for imports and exports.

Infrastructure and Connectivity

Transport Links: Refineries are strategically located where they have good transportation links, including pipelines, roads, and railways, to ensure efficient distribution of crude oil and refined products. For instance:

Panipat Refinery: Located in Haryana, it is well-connected by road and rail, facilitating easy distribution of products to northern and central India.

Mathura Refinery: In Uttar Pradesh, it benefits from its proximity to major transportation networks for distributing products to northern regions.

Proximity to Industrial and Consumption Centers

Demand Centers: Refineries are often situated near major industrial hubs and large urban centers to cater to high demand for petroleum products. For example:

Haldia Refinery: Located in West Bengal, it serves the eastern and northeastern parts of India, which have significant industrial activity and population density.

Special Economic Zones (SEZs): Some refineries are located in SEZs, which offer various incentives such as tax breaks and infrastructure support. For example:

Jamnagar: The Jamnagar refinery benefits from the SEZ status, which supports its extensive operations.

Environmental and Social Considerations

Environmental Regulations: Refineries are increasingly situated in locations where environmental regulations can be effectively managed. The choice of location is influenced by the need to minimize environmental impact and ensure compliance with regulations.

Power Supply: The availability of reliable and cost-effective power is crucial for refinery operations. Refineries are often located in regions with stable power supply infrastructure. For instance:

Mangalore Refinery: Located in Karnataka, it benefits from the state's developed power infrastructure.

Major Refineries and Their Locations

- Jamnagar Refinery (Gujarat): Operated by Reliance Industries, it is one of the largest refineries in the world and is strategically located near the Kandla port.
- Koyali Refinery (Gujarat): Operated by Indian Oil Corporation (IOC), it is situated near the oil fields and has good access to transport infrastructure.
- Panipat Refinery (Haryana): Another IOC facility, it serves northern India with efficient transport links.
- Mumbai Refinery (Maharashtra): Operated by Bharat Petroleum Corporation Limited (BPCL), it benefits from proximity to Mumbai port.
- Mathura Refinery (Uttar Pradesh): Also operated by IOC, it caters to the northern and central regions.
- Haldia Refinery (West Bengal): Operated by IOC, it serves the eastern part of India and benefits from its coastal location.

The locational characteristics of the petrochemical refining industry in India are influenced by factors such as proximity to oil fields, coastal access, infrastructure, and government policies. Refineries are strategically positioned to optimize the transportation of crude oil, cater to regional demand, and benefit from economic incentives. These characteristics ensure the efficient operation and distribution of petroleum products across the country.

Que. 5 (d) What is left wing extremism? Outline the inclusion strategies mobilized in India.

Ans. 5 (d) The Maoist movement in India is among the longest and most lethal homegrown insurgencies that the world has seen. While the origin of Left-Wing Extremism (LWE) in the country goes back to the Telangana peasant rebellion (1946-51), the movement took the young republic by storm in 1967. On 25 May that year, peasants, landless labourers, and adivasis with their lathis, arrows and bows undertook daring raids of the granaries of a landlord at the Naxalbari village of West Bengal.

After many years of indifference, half-steps and ad hoc measures, both India's central and state governments have found their foothold against the Maoist insurgency that at its pinnacle may have seemed invincible. Once the insurgents began launching the most brazen attacks on the state (as illustrated in the Chhattisgarh killings of top political leaders of the Congress Party), the Centre and the affected states finally awoke to the challenge of putting an end to left-wing extremism. In a rare show of cooperative federalism—evident from institutional coordination and the implementation of joint mechanisms)—both Centre and states exhibited a clear common purpose in counterinsurgency. While there is no official COIN strategy adopted either by the

Centre or the Maoist-affected states (indeed, 'Operation Green Hunt' has remained an unofficial doctrine)—there is undeniable footprint of clear counterinsurgency principles in place.

The Law and Order Approach The law and order approach continues to be the key pillar of the Centre's counterinsurgency strategy.

Modernisation of Police Forces The Centre soon realised that the Maoist insurgents were able to work vast swathes of territories largely because of lack of strong and effective policing. The government then sought to strengthen and improve the quality of policing in the Maoist-affected states, and Police Modernization Scheme. The Centre channeled substantial sums of funds to aid states in modernizing and upgrading their police forces in terms of acquiring modern weaponry, communication equipment, mobility, and infrastructure Recent studies have found that the tack of police modernization and improvement in intelligence-gathering indeed brought dividends for Indian states in their anti-Maoists campaigns.

Strengthening Intelligence Networks For a long time, poor intelligence infrastructure especially at the state level was a major bane in counterinsurgency. The Centre, in close consultation with states, then took certain critical steps to strengthen and upgrade the capabilities of intelligence agencies. This includes round-the-clock intelligence-sharing through Multi Agency Centre (MAC) at the Central level and through State Multi Agency Centre (SMAC) at the State level. Other noteworthy steps include the setting up of Joint Command and Control Centre at Maoist hotbeds such as Jagdalpur and Gaya, strengthening of technical and human intelligence, ensuring cooperation amongst the security forces, district police and intelligence agencies, providing thrust on generation of real-time intelligence and creation/ strengthening of State Intelligence Bureaus (SIBs) in the LWE affected States for which Central assistance is provided through the Special Infrastructure Scheme.

Aiding States in Security-Related Infrastructure One of the most critical components of the Centre's anti-Maoist strategy was the launching of the Security Related Expenditure (SRE) scheme. A brainchild of the UPA government, this scheme allowed state governments to reimburse 50 percent of their expenses on provisions like insurance scheme for police personnel, community policing, rehabilitation of surrendered Maoists, other security-related items not covered under the Police Modernization Scheme. Recently, the NDA raised the SRE reimbursement to up to 100 percent. SRE also now allows the advance release of funds to the Naxal-affected States.

Special Infrastructure Scheme To fill the critical infrastructure gaps that are not covered under existing government schemes, the Centre created the Special Infrastructure Scheme. These include requirements of mobility for the police and security forces by upgrading existing roads and rail tracks in inaccessible areas, and providing secure camping grounds and helipads at

strategic locations in remote and interior areas. Under the scheme, some 250 Fortified Police Stations were opened in LWE-affected states. The current central government has increased the number of stations to 400. In addition, in December 2016, the Union government approved road connectivity projects in 44 of the worst-affected districts and allocated a substantial sum of resources (INR 14025 crore) for setting up telephone infrastructure in those areas.[xcii] Further, the scheme provides funds for the creation of training infrastructure, weaponry, vehicles, and other related items for upgrade in LWE-affected states.

SAMADHAN The acronym stands for the following: S - Smart Leadership, A - Aggressive Strategy, M - Motivation and Training, A - Actionable Intelligence, D -Dashboard Based KPIs (Key Performance Indicators), and KRAs (Key Result Areas), H- Harnessing Technology, A - Action plan for each theatre and N- No access to Financing. This policy aims to re-energise the government's anti-Maoist initiatives, even as the elements are indeed the basic components of any effective counterinsurgency campaign.[xciii] The current government has also brought in systems and processes to enforce the use of unique identification numbers (Aadhaar) in smart guns, gelatine and other explosive materials. It has also expanded the ambits of existing provisions under the Explosives Act as well as the Prevention of Money Laundering Act 2017 to monitor the transportation of explosive substances and create obstacles for the flow of finances of the insurgents.

Development Programmes

The population-centric COIN aimed at winning hearts and minds amongst the local populations in Maoist-affected states came as an afterthought for successive governments at the Centre. However, since this did not end the insurgency which took newer avatars and spread even farther, the Centre finally initiated a series of development and good-governance measures to deny the insurgents the support of the affected populations.

The most significant steps taken by the Centre to address the longstanding grievances of adivasis are in terms of enacting few landmark legislations recognising the rights of adivasis to access forest resources and for self-governance .The passage of Forest Dwellers Act in 2006 despite stiff resistance from environmentalists and NGOs is a clear statement of the Centre's resolve to address the grievances of tribal populations living in the Naxal-affected areas.

As a follow up, the current NDA Government launched a new scheme Civic Action Program (CAP) providing financial grants for CAPFs to undertake various welfare activities in the LWE affected areas. This scheme aims to win the goodwill of the affected populations.

Another notable development scheme mainly to enhance connectivity in inaccessible Maoist affected regions is the Universal Services Obligation Fund (USOF). Further, to address issues of

education and employment in Maoist affect regions, the Ministry of Skill Development & Entrepreneurship (MoSDE) launched two new schemes, namely, 'Skill Development in 47 LWE affected districts' and 'Pradhan Mantri Kaushal Vikas Yojana (PMKVY)' for creating infrastructure and providing employment linked skill training to youth in affected areas.

Similarly, the NDA government has made major headway in providing electricity to villages in the LWE-affected districts under Deen Dayal Upadhyay Gram Jyoti Yojana (DDUGJY). The Centre under Rashtriya Madhyamik Shiksha Abhiyan (RMSA) has upgraded 1590 schools and 350 girl's hostels have been sanctioned in 35 most affected LWE districts. Besides, 08 Kendriya Vidyalayas and 05 Jawahar Navodaya Vidyalayas have also been sanctioned in the most affected LWE districts.

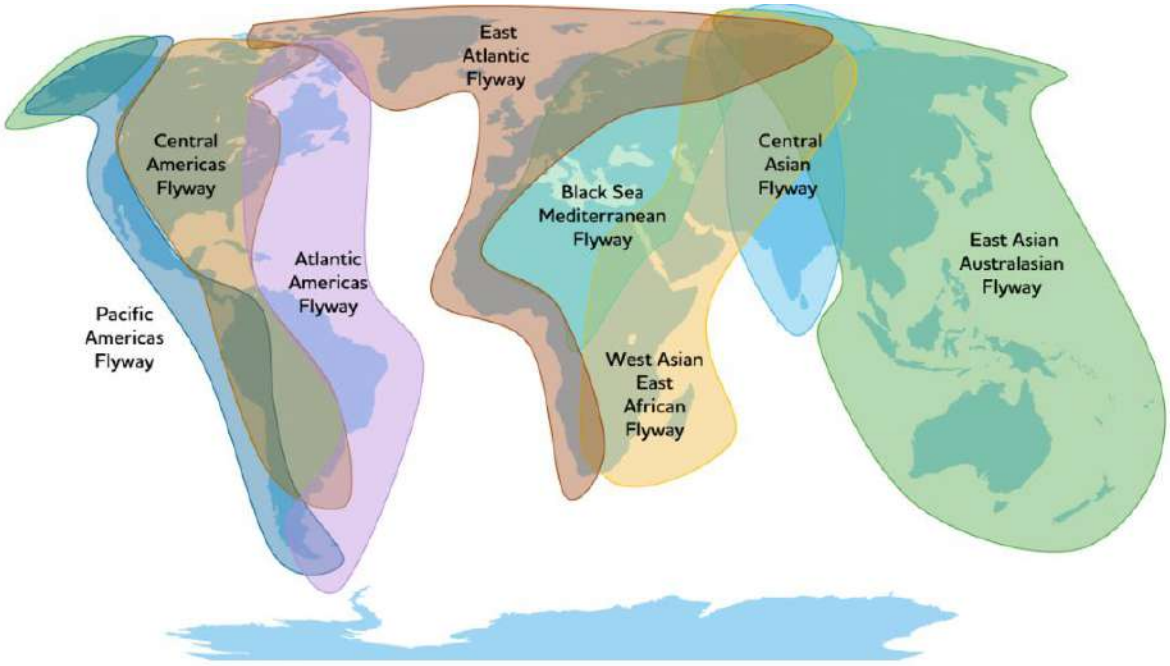
Que. 5 (e) What are the Flyways? Identify the Migratory Birds conservation in India.

Ans.5 (e) Flyways are established migratory routes used by bird species to travel between their breeding and wintering grounds. These routes are essential for the survival of migratory birds, as they provide critical pathways that link important habitats across different regions. Flyways are particularly significant for species that migrate long distances, often spanning continents.

East Asia-Australasia Flyway: This flyway stretches from the Arctic regions of Siberia and northern China through Southeast Asia and the islands of Oceania, including Australia and New Zealand. It is used by numerous migratory birds, such as the bar-tailed godwit and the great knot.

East Atlantic Flyway: Covering the western part of Europe, from the Arctic regions to southern Africa, this flyway includes migratory routes across the North Atlantic. It is used by species like the black-tailed godwit and the common eider.

African-Eurasian Flyway: This extensive flyway connects breeding grounds in Europe and Asia with wintering grounds in Africa. It includes the Mediterranean region, the Middle East, and the Sahel, and is used by birds like the European bee-eater and the peregrine falcon.



North American Flyway: This flyway encompasses migratory routes across North America, from the Arctic and sub-Arctic regions to Central America and the northern part of South America. It includes the Atlantic and Pacific coasts of North America and is used by species like the American woodcock and the northern pintail.

Central Asian Flyway: Extending from the Arctic and sub-Arctic regions of Eurasia through Central Asia to the Indian subcontinent and Southeast Asia, this flyway is vital for species such as the Siberian crane and the lesser flamingo.

Importance of Flyways

Habitat Connectivity: Flyways ensure that migratory birds can find suitable habitats along their migration routes. They link important breeding, stopover, and wintering sites, allowing birds to complete their life cycles.

Biodiversity: By supporting the movement of numerous bird species, flyways contribute to global biodiversity. They facilitate genetic exchange and population stability among bird species.

Conservation: Protecting flyways is crucial for bird conservation. Threats such as habitat loss, climate change, and pollution can impact these migratory routes. Conservation efforts often focus on preserving key stopover sites and breeding grounds along flyways.

Ecological Impact: Migratory birds play vital roles in various ecosystems, including seed dispersal, pest control, and serving as prey for other wildlife. Healthy flyways contribute to the balance and function of these ecosystems.

Conservation Challenges

Habitat Loss: Urbanization, agriculture, and industrial development can lead to the loss of crucial habitats along flyways.

Climate Change: Shifts in climate can alter the availability and quality of habitats, impacting migratory patterns and timing.

Pollution: Pesticides, plastics, and other pollutants can affect the health of migratory birds and their habitats.

Human Activities: Activities like hunting, fishing, and land reclamation can disrupt migratory routes and breeding sites.

Efforts to protect and manage flyways are crucial for maintaining the health of migratory bird populations and ensuring the stability of global ecosystems.

Migratory bird conservation in India is crucial due to the country's role as a significant stopover and wintering ground for many migratory species. India's diverse habitats, including wetlands, forests, and grasslands, provide essential resources for migratory birds. Conservation efforts focus on protecting these habitats, mitigating threats, and ensuring safe migratory routes.

Protected Areas and Wetlands:

Wetland Protection: India has several important wetlands that serve as critical stopover sites and wintering grounds for migratory birds. Notable wetlands include the Keoladeo National Park (Bharatpur), the Chilika Lake, and the Sultanpur National Park. These areas are protected under national and international regulations to preserve their ecological integrity.

National Parks and Wildlife Sanctuaries: Many migratory birds use these protected areas for breeding, feeding, and resting. Examples include the Ranthambore National Park and the Kaziranga National Park.

International Agreements:

Ramsar Convention: India is a signatory to the Ramsar Convention on Wetlands, which aims to conserve wetlands of international importance. The convention helps in the protection of critical wetland habitats for migratory birds.

CMS (Convention on Migratory Species): India is a party to CMS, which promotes international cooperation for the conservation of migratory species. This includes various initiatives and agreements that focus on migratory birds.

Bird Life International: Collaborates with local organizations to protect important bird areas and promote bird-friendly practices.

Research and Monitoring:

Bird Surveys: Regular surveys and monitoring programs help track migratory bird populations, their movements, and habitat use. This data is crucial for assessing conservation needs and implementing effective measures.

Banding and Tracking: Techniques such as bird banding and satellite tracking are used to study migration patterns, flight paths, and stopover sites.

Challenges

Habitat Degradation: Urbanization, industrialization, and agricultural expansion lead to habitat loss and degradation, impacting migratory bird populations.

Pollution: Chemical pollution, plastic waste, and water contamination affect the health of migratory birds and their habitats.

Climate Change: Changes in climate patterns can alter migration timings, disrupt food availability, and impact breeding success.

Human-Wildlife Conflict: Conflicts with agriculture and fishing activities can lead to disturbances and harm to migratory birds.

Chilika Lake: The Chilika Lake has been recognized for its conservation success in supporting a large number of migratory birds, including the endangered Irrawaddy dolphin.

Keoladeo National Park: Known for its successful conservation of migratory waterfowl, particularly during the winter months when it hosts thousands of birds from across the globe.

Conservation of migratory birds in India requires continued effort and collaboration among government agencies, non-governmental organizations, local communities, and international partners. By addressing the threats and enhancing protective measures, India can help ensure the survival and well-being of these vital species.

Que. 6 (a) What is Production Linked Incentive (PLI) scheme? Critically examine its role towards employment generation in India.

Ans. 6 (a) The Production Linked Incentive (PLI) Scheme, launched by the Government of India in 2020, is a flagship initiative aimed at boosting domestic manufacturing, reducing import dependence, and making India a global manufacturing hub. The scheme offers financial incentives to companies based on incremental sales of goods manufactured in India over a base year. Initially rolled out for 3 sectors, it has now been expanded to 14 key sectors, including:

- Electronics and mobile manufacturing
- Pharmaceuticals and medical devices
- Automobiles and auto components
- Textiles, food processing, solar modules, etc.

Objectives of the PLI Scheme

- Promote domestic manufacturing and exports
- Attract foreign and domestic investments
- Enhance value addition in India's industrial output
- Generate large-scale employment opportunities
- Reduce trade deficits** in key sectors

Role in Employment Generation: A Critical Examination

Positive Contributions

1. Job Creation in Priority Sectors

- Sectors like electronics, textiles, food processing, and auto are labour-intensive, offering scope for mass employment, especially for low and semi-skilled workers.

2. Indirect Employment via Ancillary Industries

- Expansion in manufacturing boosts logistics, packaging, warehousing, and transport services, creating additional indirect job.

3. Formalization of Employment

- PLI-linked companies are often larger, formal-sector employers, contributing to social security and job stability.

4. Regional Development

- Clustering of industries in less-developed states (e.g., UP, Tamil Nadu, Andhra Pradesh) helps create regional employment hubs.

5. Women's Employment in Certain Sectors

- Sectors like textiles, electronics, and food processing tend to hire more women, improving female labour force participation.

Limitations and Challenges

1. Capital-Intensive Focus

- Sectors like semiconductors, solar modules, and automobiles are highly automated, with limited employment elasticity.

2. Skilled Labour Shortage

- Without adequate skilling, much of the potential employment may be filled by under-skilled or migrant labour, or go unutilized.

3. Uncertain Long-Term Job Impact

- Job creation may be short-term or project-based, and sustainability depends on global demand and competitiveness.

4. Urban-Rural Divide

- Most investments are concentrated in urban industrial corridors, leaving rural areas behind in employment benefits.

5. Implementation Bottlenecks

- Delays in fund disbursement, regulatory hurdles, and infrastructure gaps can reduce the full employment impact.

Way Forward

The PLI Scheme is a transformational policy tool to boost manufacturing competitiveness and attract investment. It has shown early signs of employment generation, especially in labour-intensive sectors. However, to maximize its employment potential, the government must complement PLI with robust skilling initiatives, ease of doing business, and balanced sectoral focus, ensuring that the jobs created are not only numerous but also sustainable and inclusive.

Que. 6 (b) What are major objectives of "Mission Antodaya"? How does program strengthen the process of participatory planning in India?

Ans. 6 (b) Mission Antyodaya is a convergence and accountability framework launched in the Union Budget 2017-18 by the Government of India. Its primary aim is to optimize the utilization of resources from approximately 26 ministries and departments, all focused on rural development, by making Gram Panchayats the central unit of planning and implementation

Objectives of the Mission

- Achieve poverty-free Gram Panchayats focusing on measurable improvements in rural livelihoods
- Facilitate convergent delivery of government schemes to target multi-dimensional deprivations such as lack of access to healthcare, education, sanitation, livelihood opportunities, and more
- Ensure resources are used effectively through targeted interventions at the household and Panchayat levels

Key Components

1. Annual Gram Panchayat Survey (Mission Antyodaya Survey)

Conducted in tandem with the People's Plan Campaign, this survey captures data across 21 development sectors defined under the Eleventh Schedule of the Indian Constitution. These include infrastructure, health and nutrition, water management, social security, governance, and more

2. Gap Reports and GP Rankings

Data from the survey generates GP-level rankings and gap reports which highlight service deficits. These tools inform planning and foster accountability

3. Gram Sabha Validation & Development Planning

Local Gram Sabhas validate survey findings and use them to craft the Gram Panchayat Development Plan (GPDP)—a community-driven, evidence-based roadmap for development, aligning central and state schemes with local priorities

Mission Antyodaya transforms rural development by placing Gram Panchayats at the heart of planning and resource convergence. Through an annual data-driven survey, it identifies local gaps, elevates accountability via rankings and gap reports, and ensures community-led GPDPs

are created and implemented with multi-scheme support. This strengthens local governance, service delivery, and socio-economic upliftment.

1. Convergence of Schemes

Bring together various central and state schemes under a common monitoring and evaluation framework at the Gram Panchayat level.

2 Ranking of Gram Panchayats

Assess and rank all GPs based on developmental gaps and strengths through a comprehensive survey of 29 key sectors (e.g., health, education, sanitation, livelihoods, infrastructure).

3. Saturation Approach to Development

Target saturation of basic needs such as drinking water, roads, housing, sanitation, and employment.

4. Data-Driven Planning

Create a baseline database on development indicators to identify priority areas and inform policy.

5. Inclusive and Sustainable Development

Focus on marginalized communities, ensuring that the benefits of development reach the poorest and most deprived households.

Mission Antyodaya Strengthens Participatory Planning

Mission Antyodaya actively promotes participatory planning, making Gram Panchayats central to decision-making in local development:

1. Community-Level Data Collection

Surveys are conducted at the village and GP level, involving **local elected representatives, functionaries, and community members.

This bottom-up approach helps identify actual felt needs rather than top-down assumptions.

2. Informed Gram Panchayat Development Plans (GPDPs)

The collected data feeds into Gram Panchayat Development Plans, ensuring planning is need-based, inclusive, and location-specific.

Helps GPs prioritize issues like sanitation, drinking water, housing, and livelihood generation.

3. Citizen Engagement

Encourages community participation through Gram Sabhas, where locals identify development priorities and hold officials accountable.

4. Evidence-Based Decision Making

Enables local bodies to prepare plans based on quantifiable data, leading to better resource allocation and scheme convergence.

5. Monitoring and Accountability

Real-time progress can be tracked using the Mission Antyodaya portal, promoting transparency and accountability

Mission Antyodaya is a strategic initiative aimed at eradicating rural poverty through converged planning, community participation, and data-based decision-making. By empowering Gram Panchayats and aligning developmental programs with local needs, it strengthens decentralized governance and moves India closer to achieving **inclusive and sustainable rural development.

Que. 6 (c) Critically analyze the growth of urban informal sector caused by migration. What are the corrective measures applied by Ministry of Housing and Urban Affairs?

Ans. 6 (c) The urban informal sector refers to all unregistered, small-scale economic activities in urban areas that are not regulated or protected by the government. These activities operate outside formal labor laws, taxation, and social security systems. Definition (based on ILO & NSSO) The urban informal sector includes enterprises (excluding agriculture) that:

- Are not registered under formal laws (like Factories Act or Companies Act),
- Operate with low capital and technology,
- Often have family labor or casual workers,
- Are not covered by formal contracts or protections.

Examples of Urban Informal Sector Jobs

- Street vendors (selling food, clothes, etc.)
- Rickshaw pullers or auto drivers
- Construction workers (casual or contract)
- Domestic workers (maids, cleaners)

- Small repair shops, tailors, cobblers
- Waste pickers and recyclers
- Home-based workers (e.g. women stitching garments)

Feature	Description
Unregistered	Not part of formal regulatory system
No job security	Workers often lack written contracts
Low wages	Paid less than formal sector jobs
No social security	No pensions, PF, or health insurance
High vulnerability	Prone to exploitation, no legal protection
Cash-based	Transactions often unrecorded

- A large share of urban employment in countries like India comes from this sector.
- It absorbs migrant labor from rural areas.
- Supports urban economy by providing cheap goods and services.
- Acts as a shock absorber during economic downturns, but workers remain highly vulnerable.

According to NSSO data, a majority of urban workers in India are in informal employment—even within formal enterprises. Urban informal employment includes informal workers in both informal and formal sector enterprises (like contract workers in factories).

1. Push-Pull Dynamics of Migration

- Rural distress, agricultural stagnation, and lack of jobs push people out of villages.
- Urban areas pull migrants with the promise of better livelihood, but often fail to provide formal employment due to limited capacity.

2. Expansion of Informal Sector

Migrants lacking formal education, skills, or documentation find work in informal jobs such as:

- Street vending
- Construction labor
- Domestic work

- Waste picking
- Transport services (rickshaw pulling, delivery)

3. Issues with Informal Urban Work

- No job security, social security, or legal protection.
- Low and irregular wages with poor working conditions.
- Involvement in informal housing (slums) and lack of access to clean water, sanitation, and healthcare.
- High vulnerability during shocks like COVID-19—millions of migrants were stranded without income or shelter.

4. Urban Informal Sector: A Double-Edged Sword

- While it absorbs surplus labor and supports city economies, it perpetuates poverty and exploitation if unregulated.
- It also limits tax revenues and complicates urban planning.

Corrective Measures by the Ministry of Housing and Urban Affairs (MoHUA)

MoHUA has implemented several targeted policies and schemes to improve the lives and livelihoods of urban informal workers and migrants:

1. PM SVANidhi (2020 – Ongoing)

- Pradhan Mantri Street Vendor's AtmaNirbhar Nidhi offers collateral-free microcredit (Rs.10,000) to street vendors.
- Encourages digital transactions , improves access to formal finance, and builds a credit history for informal workers.

2. Affordable Rental Housing Complexes (ARHCs)

- Aimed at providing affordable housing for migrant workers and urban poor near their workplaces.
- Uses public-private partnerships and conversion of government-funded vacant housing into rental units.

3. PMAY–Urban (Pradhan Mantri Awas Yojana – Urban)

- Aims to provide "Housing for All" with basic amenities by 2022.
- Supports construction of affordable housing for economically weaker sections (EWS) and low-income groups (LIG).

4. Deendayal Antyodaya Yojana – National Urban Livelihoods Mission (DAY-NULM)

- Focuses on skill development, self-employment, and financial inclusion of urban poor, including migrants.
- Promotes formation of Self-Help Groups (SHGs) and access to credit.

5. Smart Cities Mission and AMRUT

- Indirectly supports informal sector workers by improving urban infrastructure, transport, and housing, leading to better working environments.

Way Forward

The urban informal sector has grown rapidly due to rural-to-urban migration, offering survival-level employment but often under exploitative conditions. While it plays a critical economic role, its unregulated nature poses challenges for urban governance, worker welfare, and inclusive development. The Ministry of Housing and Urban Affairs has introduced several progressive schemes—like PM SVANidhi and ARHCs—that aim to integrate informal workers into the formal urban framework, but effective implementation, coordination with states, and scaling up remain key challenges going forward.

Que. 7 (a) Examine the relationship between farm size and productivity in Indian agriculture. What are the measures undertaken to improve agricultural productivity in country?

Ans.7 (a) Farm size refers to the area of agricultural land operated by a single farm household. In India, farm size is typically measured in hectares and has been shrinking over time due to population pressure , inheritance laws , and land fragmentation .

Classification of Farm Sizes (India - based on landholding):

- Marginal Less than 1 hectare
- Small 1 to 2 hectares
- Semi-medium 2 to 4 hectares
- Medium 4 to 10 hectares
- Large More than 10 hectares

Reasons for Small Farm Size in India:

- Population growth → Land subdivided across generations.
- Inheritance laws → Equal division among heirs.

- Urbanization→ Shrinking rural land availability.
- Low consolidation→ Little land pooling or cooperative farming.

Implications of Small Farm Size:

Positive	Negative
Intensive cultivation	Low economies of scale
Family labor use	Limited access to technology & credit
Local food security	Low productivity & profitability
Suitability for certain crops	Difficult to mechanize

Relationship Between Farm Size and Productivity in Indian Agriculture

1. Inverse Relationship: Small Farms, Higher Productivity

- Traditionally, Indian agriculture has shown an inverse relationship between farm size and productivity:
- Small and marginal farmers (owning <2 hectares) often achieve higher output per hectare than large farmers.

Reasons include:

- Intensive use of family labour(low cost and more attentive to plots).
- Multiple cropping and inter cropping on small plots.
- Greater attention to land management and less fallow land.

2. Limits of the Inverse Relationship

However, this pattern does not always hold under modern farming:

Small farms face constraints like:

- Lack of access to technology, irrigation, and credit.
- Limited ability to benefit from mechanization.
- Poor bargaining power in input/output markets.

Larger farms may benefit from:

- Economies of scale.
- Better access to capital-intensive inputs, high-yielding varieties, and storage.

Thus, while productivity per hectare may be high on small farms in traditional settings, modern productivity is increasingly linked to technology, infrastructure, and policy support, not just farm size.

Measures Undertaken to Improve Agricultural Productivity in India

The Government of India and state governments have implemented several schemes and reforms to improve agricultural productivity:

1. Technological and Input Support

- Soil Health Card Scheme: Promotes balanced fertilizer use based on soil testing.
- Pradhan Mantri Krishi Sinchai Yojana (PMKSY): Focus on "Har Khet Ko Pani" and micro-irrigation to improve water use efficiency.
- Sub-Mission on Agricultural Mechanization: Promotes access to modern farm machinery, especially for small and marginal farmers.

2. Seed and Crop Improvements

- National Mission on Oilseeds and Oil Palm, and National Food Security Mission: Promote high-yielding seed varieties and sustainable intensification.
- Research and Extension Services via ICAR and Krishi Vigyan Kendras (KVKs): Disseminate modern techniques to farmers.

3. Institutional Reforms

- e-NAM (National Agriculture Market): Improves price discovery and reduces market distortions.
- FPO (Farmer Producer Organizations): Encourages group farming, improving access to inputs, credit, and markets.
- PM-KISAN: Direct income support improves liquidity for timely input purchase.

4. Digitization and Smart Agriculture

- Digital Agriculture Mission: Promotes use of AI, drones, sensors, and data platforms for precision farming.
- Kisan Drones Scheme: Facilitates spraying of fertilizers and pesticides efficiently.

5. Climate-Resilient and Sustainable Farming

- Paramparagat Krishi Vikas Yojana (PKVY) and Zero Budget Natural Farming (ZBNF): Encourage organic and low-input sustainable agriculture.

- National Innovations in Climate Resilient Agriculture (NICRA): Supports adaptation to climate shocks.

Way Forward

While small farms have historically shown higher productivity per unit area, modern agricultural productivity in India is increasingly determined by access to technology, irrigation, credit, and market linkages, rather than just farm size. Government initiatives are now geared toward technological upgradation, institutional support, and sustainability, aiming to make both small and large farms more productive and resilient. To further boost productivity, the focus must be on land consolidation, digital infrastructure, and inclusive policy support across all regions.

Que.7 (b) What are industrial policy reforms related to manufacturing sector? Discuss their impacts on MSMEs.

Ans. 7 (b) Since the 1991 economic reforms, India has introduced a series of industrial policy changes aimed at liberalization, privatization, and globalization of the manufacturing sector. Key reforms include:

1. Deregulation and De-licensing

- Most manufacturing sectors were removed from compulsory industrial licensing (except for hazardous or strategic items).
- Enabled greater private participation and ease of doing business.

2. Foreign Direct Investment (FDI) Liberalization

- Automatic route for 100% FDI in most manufacturing sub-sectors (e.g., electronics, auto, textiles).
- Helped attract global manufacturers and promote technology transfer.

3. GST Implementation (2017)

- Replaced multiple state and central taxes with a unified tax regime.
- Reduced tax-related barriers to inter-state trade, improving manufacturing efficiency.

4. "Make in India" Initiative (2014)

- Aimed to increase manufacturing's share in GDP to 25% and promote job creation .
- Focused on ease of doing business , FDI promotion, and infrastructure improvement.

5. Production Linked Incentive (PLI) Scheme

- Offers financial incentives based on incremental production and sales.
- Targeted 14 key sectors including electronics, pharmaceuticals, textiles, autos, and solar modules.

6. National Industrial Corridor Development Programme

- Developing 11 industrial corridors to improve infrastructure and logistics connectivity for manufacturing zones.

7. Labour Law Reforms

- Consolidation of 29 labour laws into 4 Labour Codes for simplified compliance and greater flexibility in hiring.

Impact of These Reforms on MSMEs

Micro, Small, and Medium Enterprises (MSMEs) are a crucial part of India's manufacturing ecosystem, but they face both opportunities and challenges from these reforms.

Positive Impacts

1. Easier Market Access and Formalization

- GST and e-market platforms like GeM (Government e-Marketplace) have improved market integration and formal participation.

2. Technology Adoption and Upgradation

- FDI-led competition and PLI incentives have encouraged MSMEs to modernize to remain competitive.

3. Credit and Financing Support

- Reforms have been complemented with schemes like:
- Emergency Credit Line Guarantee Scheme (ECLGS)
- MUDRA loans
- Credit Guarantee Fund for Micro and Small Enterprises (CGTMSE)

4. Cluster Development

- Industrial corridors and MSME cluster development programs have improved access to shared infrastructure and logistics.

5. Ease of Doing Business

- Simplified registration (Udyam), online compliance, and de-licensing have reduced regulatory burdens.

Challenges and Negative Impacts

1. Unequal Benefits from PLI and FDI

- PLI and global supply chain integration mostly benefit larger firms; MSMEs are often excluded due to size and investment criteria.

2. Increased Competition

- Liberalization and FDI inflows expose MSMEs to global and large domestic players, eroding market share if not competitive.

3. Compliance Burden under GST

- Small firms struggle with digital literacy, timely filing, and working capital management under GST.

4. Delayed Payments

- Despite reforms, MSMEs often face payment delays from large buyers and government agencies, affecting liquidity.

5. Lack of Skilled Labour and Technology

- Many MSMEs lack access to advanced skills and R\&D, limiting their ability to adopt new technologies.

Way Forward

Industrial policy reforms in the manufacturing sector have created a more open, competitive, and growth-oriented environment, with targeted incentives and infrastructure support. While these reforms offer significant opportunities for MSMEs—especially in modernization and formalization—there are persistent structural challenges such as limited access to credit, technology, and skilled manpower. Addressing these gaps through targeted MSME-centric policies, skilling, and financial support is essential to ensure that MSMEs can fully participate in and contribute to India's manufacturing-led growth.

Que.7 (c) Bring out the main features of Foreign Trade Policy 2023. How it is effective in controlling trade based money laundering?

Ans.7 (c) India's Foreign Trade Policy is a set of guidelines and strategies formulated by the Ministry of Commerce and Industry to promote and regulate exports and imports of goods and services. It aims to boost international trade , enhance export competitiveness , and contribute to economic growth and employment generation .

Key Features:

Aspect	Description
Issued by	**Directorate General of Foreign Trade (DGFT), Ministry of Commerce**
Legal Basis	**Foreign Trade (Development & Regulation) Act, 1992**
Duration	**Typically 5 years (but can be extended or revised)**
Objectives	**Boost exports, reduce trade deficit, ease of doing business, integrate with global value chains**

Foreign Trade Policy 2023

Unlike previous five-year plans, FTP 2023 is a dynamic and flexible policy without an end date – it will be updated as needed based on global and domestic conditions.

Major Highlights of FTP 2023:

Area	Key Features
Digital focus	Fully paperless and online approval processes via DGFT
E-commerce exports	Support for warehousing and export hubs for small businesses and sellers
One District, One Product (ODOP)	Promote district-level exports for local products
Towns of Export Excellence	Expanded to more towns to boost infrastructure and support services

Amnesty scheme	One-time settlement scheme for defaulting advance authorization holders
Internationalization of Rupee	Supports trade in Indian Rupees, especially with countries like Russia
No end-date	Flexible, responsive to global trade dynamics
Sector-specific push	Support for apparel, electronics, pharma, and agri exports

Export Promotion Schemes under FTP:

- RoDTEP (Remission of Duties and Taxes on Export Products) Refunds embedded taxes not covered by GST
- RoSCTL (for garments and made-ups) Similar to RoDTEP, but for textile sector
- Advance Authorization Duty-free import of inputs for export production
- Export Promotion Capital Goods (EPCG) Allows duty-free import of capital goods for export production
- SEZs and EOUs Special zones and units with tax benefits to promote exports

Objectives of India's Foreign Trade Policy:

1. Increase India’s share in global trade

2. Make Indian exports globally competitive

3. Diversify export base (products and markets)

4. Promote ease of doing business for exporters

5. Boost employment and value addition in trade sectors

Effectiveness in Controlling Trade-Based Money Laundering (TBML)

Trade-Based Money Laundering involves disguising illicit funds through under- or over-invoicing, multiple invoicing, or misrepresentation of trade documents. FTP 2023 introduces several features to help curb TBML:

1. End-to-End Digitization

- Elimination of paper trails reduces scope for document tampering or fake invoices.
- E-verification of supporting documents (like shipping bills, bank remittances) strengthens scrutiny.

2. Data Integration with Banks and Customs

- Interlinking of DGFT systems with Customs (ICEGATE), Banks (EDI), GSTN, etc., allows real-time cross-verification of trade transactions.
- Helps detect anomalies like over-invoicing of exports or under-invoicing of imports.

3. Incentive Rationalization

- Transition from MEIS/SEIS to RoDTEP and RoSCTL reduces incentive misuse through phantom exports.

4. Rupee Trade and Reduced Hawala Risk

- Promoting NR-based trade under regulated channels like Special Vostro Accounts reduces informal currency movement.

5. Tracking via Unique Identifiers

- Exporters and importers are tracked via IEC (Import-Export Code) and PAN-linked identifiers, allowing greater transparency.

6. Tightened Scrutiny for High-Risk Sectors

- Specific attention to gems & jewellery, electronics, and e-commerce exports, which have higher TBML risks.

Foreign Trade Policy 2023 represents a modern, technology-driven, and flexible trade regime aimed at enhancing export performance and compliance. While the policy does not explicitly focus on money laundering, its digitalization, inter-agency integration, and real-time monitoring systems indirectly create strong deterrents to Trade-Based Money Laundering (TBML). However, continued vigilance, customs intelligence coordination, and capacity building of enforcement agencies are essential to make these reforms fully effective.

Que. 8. (a) Explain the main pillars of the Indian model of inclusive growth. What are the social welfare measures undertaken to achieve inclusivity.

Ans.8. (a) Inclusive growth in India refers to broad-based, equitable, and sustainable economic development that ensures opportunities and benefits reach all sections of society, especially the marginalized.

Poverty Reduction

- Focus on lifting people above the poverty line through targeted welfare schemes and rural employment programs (e.g., MGNREGA).
- Promoting asset creation and access to income-generating opportunities.

2. Employment Generation

- Special emphasis on labour-intensive sectors(e.g., textiles, MSMEs, construction).
- Schemes like Start-Up India, Skill India, and Make in India aim to enhance job opportunities, particularly for youth and rural populations.

3. Agricultural and Rural Development

- Programs like PM-KISAN, PM-AASHA, PMFBY, and e-NAM support farmers through income support, crop insurance, and market access.
- Infrastructure development (rural roads, irrigation, power) through PMGSY, BharatNet etc.

4. Education and Skill Development

- Focus on universal access to education (SSA, NEP 2020) and quality improvement
- Vocational training and digital literacy through Skill India Mission, PMKVY, and Digital India.

5. Health and Nutrition

- Government initiatives like Ayushman Bharat, Jan Arogya Yojana, and POSHAN Abhiyaan target universal health coverage and nutritional security.
- Strengthening of public health infrastructure through Health and Wellness Centres.

6. Financial Inclusion

- Access to banking and credit through Jan Dhan Yojana, Aadhaar-enabled DBT, MUDRA loans, and PM-SVANidhi for street vendors.
- Ensures direct delivery of subsidies and welfare benefits to beneficiaries.

7. Gender and Social Equity

- Empowerment of women through Beti Bachao Beti Padhao, PM Ujjwala Yojana, and Self-Help Groups (SHGs) under NRLM.
- Affirmative action in education, employment, and political participation for SCs, STs, and minorities.

8. Infrastructure and Connectivity

- Development of roads, digital connectivity, electricity, and housing under PMAY, Saubhagya, and UDAN.
- Reduces regional disparities and integrates rural and backward areas into the growth process.

Social Welfare Measures to Achieve Inclusivity

The government has adopted several flagship welfare schemes that directly aim to uplift disadvantaged sections:

1. Mahatma Gandhi National Rural Employment Guarantee Act (MGNREGA)

- Guarantees 100 days of wage employment to rural households.
- Focuses on asset creation, water conservation, and empowerment of women and SC/STs

2. Public Distribution System (PDS) and NFSA

- Ensures food security through subsidized food grains to over 80 crore people under the National Food Security Act.

3. Pradhan Mantri Awas Yojana (PMAY)

- Provides housing for all, with subsidies for urban and rural poor.
- Encourages women ownership of houses.

4. Ayushman Bharat – PM Jan Arogya Yojana

- Offers free health insurance of Rs 5 lakh per family per year for secondary and tertiary care.

5. PM Ujjwala Yojana

- Provides free LPG connections to poor women to reduce indoor pollution and improve health.

6. National Social Assistance Programme (NSAP)

- Direct cash transfers to elderly, widows, and disabled persons below the poverty line.

7. Samagra Shiksha Abhiyan

- Integrates school education from pre-primary to Class 12, ensuring access and equity in education.

8. Stand-Up India and MUDRA Yojana

- Promote entrepreneurship among women, SC/STs, and micro enterprises by providing collateral-free loans.

India's model of inclusive growth is based on a multi-dimensional approach involving employment, education, health, rural development, and financial inclusion. Through a robust set of social welfare schemes, the government aims to reduce inequality, empower disadvantaged groups, and ensure that economic growth leads to social justice and human development. The success of inclusive growth depends not only on economic policies but also on effective implementation, transparency, and active community participation.

Que. 8 (b) In light of NISAR, discuss the role and prospects of Space Technologies in developments in India

Ans. 8 (b) In the past 50 years, Indian Space has seen many successful milestones, demonstrating excelling Indian technology and widespread utilization of space services in different areas of the national economy. Present capabilities and capacities of Indian Space are mainly in the unitary capabilities of the national space agency—this has enabled the nation to significantly achieve about 10–12 high-quality missions every year. Meeting future domestic needs and benefiting by access to a large global market of space will require a quantum jump in capabilities and capacities to be served.

Another important development is the aspirational growth of the Indian economy and the people. With a gross domestic product (GDP) growth hovering around 7%–8% and a few trillion dollar economy, the nation has launched important developmental initiatives—Digital India, Make in

India, Smart City, Swach Bharat, National Education Mission, and National Skill Mission programs. Thus, demands for diverse applications of space technology are inevitable, integrating across geographical, sectoral, and temporal domains of the country. In an earlier suo-moto study, we have outlined the future 10–20 years of policy perspectives for Indian Space development and also outlined the perspectives of how a national space ecosystem would emerge, evolving from the present national space agency into a public–private–academia triad.

NISAR stands for NASA-ISRO Synthetic Aperture Radar. It is a collaborative Earth-observation mission between. It is designed to provide high-resolution, all-weather, day-and-night radar imaging of the Earth's surface to monitor environmental changes, natural disasters, and ecosystem dynamics.

NISAR uses two radar frequencies:

- L-band (24 cm wavelength) – provided by NASA
- S-band (10 cm wavelength) – provided by ISRO

This allows penetration into forest canopies, ice, soil, and surface structures, making it ideal for tracking minute changes on Earth's surface.

Objectives and Applications:

- Climate change -Monitor melting glaciers, rising sea levels, and deforestation
- Earthquakes and landslides -Detect ground deformation for early warnings
- Agriculture - Crop monitoring, soil moisture estimation
- Disaster management -Mapping floods, oil spills, wildfires, etc.
- Urban planning -Detect land subsidence and infrastructure changes
- EcosystemsTrack -changes in wetlands, forests, and biodiversity

Importance of NISAR:

- First satellite with dual-frequency SAR globally.
- Will generate about 85 terabytes of data per day.
- Enhances India's capability in space-based earth observation.
- Example of high-impact US-India space collaboration.

India's space programme has emerged as the most cost-effective one in the world. ISRO has formal agreements with 33 countries and three multinational bodies to help with its space projects, and has about 30 spacecrafts placed in different orbital paths. Besides, it has launched as many as 51 satellites for 20 countries to date and is rapidly emerging as the world's launch pad.

ISRO has a constellation of ten earth observation satellites, nine communication satellites, one meteorological satellite, and one scientific satellite to its name. As a leader in the development of cutting-edge technologies and interplanetary exploratory missions, it is planning several more operational missions and making its mark in areas like satellite navigation.

Space Industry in India

Ever since India sent a spacecraft to Mars in 2014, India has earned its place in the top-ranking space-faring nations (which include the US, Europe, Russia, China and Japan). The space sector in India can broadly be categorized into upstream and downstream industries. Upstream industries include manufacturing of satellites, their parts and subsystems, and launch vehicles. Downstream industries include satellite-based services, such as satellite TV, communications, imagery etc.

In India, right now, only government entities have a hold over the space sector. The commercial industries merely supply parts and components or manufacture subsystems for the satellites. Some of them use government's space infrastructure to provide services to their consumers. In advanced space-faring nations, many of these blocks have already been deregulated and privatized to create a value chain and make a major contribution to the economy. Now that the government is promoting private investments in the space sector thoughts its 'Make in India' program, there are high chances that a private space industry ecosystem may come up in India too.

It is believed that the rise of the space industry in India can help in the following ways:

- Adding an edge to India's foreign policy as our space capabilities can be a part of our initiatives to foster new relationships,
- Avoiding the outflow of tax-payer's money to foreign hands from where we procure turnkey products and services,
- Creating more opportunities for foreign direct investments (FDI), as well as new jobs for highly-skilled labour market,
- Empowering India's defense system by equipping it with space technology, and allowing armed forces to procure defense products and services indigenously, and
- Reversing the brain-drain from India.Tiny Startups set out to revolutionize the Space Sector of India Indian space SME industry is valued at just $48 million but is expected to expand at a quick pace.

Some of the space-related Indian startups that are already making a mark in the market are:

- A small satellite developer Dhruva Space joined hands with a German company called the Berlin Space Technologies last year to establish India's first factory to manufacture satellites for non- telecom commercial applications such as disaster management, vehicle and flight

tracking, predictive analytics and imaging. It aims to manufacture 10 to 12 satellites every year.

- Team India, an aerospace startup, won $1 million prize in the Google Lunar XPrize competition in the 'Landing Milestone' category.
- Earth2Orbit is India's first private space startup that offers earth observation products and launch facilitation services to different companies.

India has the benefit of having experience in design-oriented manufacturing, aerospace, and embedded software - which places it in a good position to emerge as a global hub of private space industries. Some of the fields in which private space companies may make their niche are:

- Automated Identification of Ships (AIS)
- Women's Safety
- Nature Resource Management
- Tele-Medicine
- Tele-Education
- Remote Sensing for Flood Management

Challenges of Indian Space Industry Space efforts of India are not without its problems. While the US is pushing to expand cooperation with India's space sector, the private US space companies have been opposing the use of low-cost ISRO launch vehicles for putting American satellites into orbits. According to them, it would be difficult for them to compete against ISRO as it is subsidised by the Indian government.

Debris from an Indian satellite falling back to earth from orbit landed in a Japanese fishing village, and triggered an international dispute. India would have to pay for the damages as determined by the 1972 Convention on International Liability for Damage Caused by Space Objects. The absence of the national space law and policy means that India finds it hard to determine the quantum of damages it has to pay.

In the last two years, India's spaceship reached planet Mars, a mini space shuttle has been launched successfully, and ISRO kickstarted the classic swadeshi satellite based navigation system. By the end of this year, ISRO is going to launch a unique South Asia Satellite (as conceived by Prime Minister Narendra Modi himself) which is a friendly communications satellite for the South Asian neighbours. India has also launched its first state observatory - AstroSAT.

ISRO's NAVIC (Navigation with Indian Constellation) has seven satellites in orbit which provides day and night coverage of the navigation signals throughout the Indian region. ISRO missions and space technology have several other applications too, such as communication,

broadcasting, meteorology, oceanography, survey of natural resources, monitoring environment, and predicting disasters.

There has been a major shift in India's defence policy too and control of space has been highlighted as one of the critical areas of security after air, land and sea. Now that the Indian space programme is maturing, most top-tier colleges (IITs) are involved in cutting-edge research along with DRDO, HAL and ISRO. As more companies establish and expand their engineering centres in India, opportunities in the space industry will definitely increase.

Looking ahead into such a national ecosystem, we now visualize critical developments that will bring impacting and paradigm shifts to holistic Indian Space through the triad—game changers. With about 100–150 possible missions in the coming 10–20 years—encompassing earth observation, satellite communications, positioning, space science, planetary missions, operational and advanced launch access missions, and the initiation of a human spaceflight program—the critical shifts would be not just technological advancements but also organizational restructuring from emerging newer organizational arrangements, industrialization and emergence of private space industry, deeper penetration of space services in Indian society, increasing global presence of Indian players, and a vibrant cooperative and collaboration at the international level. What will drive these game changers? Cost efficiency will be one key driver amply demonstrated in many sectors for global markets; this will impact global space markets and bring a leveling effect across global markets. Indian skills and human resources will be another driver, with Indian scientists, engineers, and managers playing a major role in the national and global space. Third will be Indian innovation—the ability to improvise and innovate with simple low-cost, but effective, solutions. These three drivers will bring a new economic model that balances systems, costs, and performance.

Ques. 8 (c) What is the major pipeline networks in India? Examine its role in regional development.

Ans. 8 (c) Pipelines plays a crucial role in regional development by facilitating the efficient and reliable transportation of oil, natural gas, and refined products. Their impact extends across economic, social, and environmental dimensions.

Economic Growth and Investment

Boosting Local Economies: Pipelines create job opportunities during their construction and operational phases. Local businesses often benefit from the increased demand for goods and services related to pipeline construction and maintenance.

Attracting Investments: The presence of pipeline infrastructure can attract investment in industries such as energy, petrochemicals, and manufacturing. Companies are more likely to invest in regions with reliable access to energy resources.

Stimulating Industrial Growth: Pipelines enable the efficient transportation of raw materials and energy, which supports the development of local industries and boosts industrial productivity.

Energy Security and Reliability

Stable Energy Supply: Pipelines provide a reliable and continuous supply of energy resources, which is essential for powering homes, industries, and businesses. This stability supports economic activities and regional development.

Diversification of Energy Sources: Pipelines allow for the diversification of energy sources by connecting regions with different resource endowments. This helps to reduce dependency on a single source and enhances regional energy security.

Infrastructure Development

Enhanced Connectivity: Pipelines improve connectivity between regions by linking energy-producing areas with consumption centers. This connectivity can also support broader infrastructure development, including transportation and communication networks.

Economic Corridors: Pipelines often become part of larger economic corridors that stimulate development along their routes. They can drive the construction of associated infrastructure, such as roads, storage facilities, and industrial zones.

Regional Integration and Trade

Regional Integration: Pipelines facilitate the integration of regional economies by connecting areas with complementary resource endowments. For example, pipelines can link oil-producing regions with areas that have high energy demand, fostering economic cooperation and trade.

Cross-Border Trade: In some cases, pipelines cross national borders, promoting international trade and economic cooperation between neighboring countries. This can lead to stronger regional alliances and shared economic benefits.

Social Benefits

Improved Access to Energy: Pipelines improve access to energy in remote or underserved regions, contributing to improved living standards and quality of life. Reliable energy access supports education, healthcare, and other essential services.

Community Development: Pipeline projects often include community development initiatives, such as building schools, healthcare facilities, and infrastructure, benefiting local populations.

Environmental and Technological Advancements

Environmentally Friendly Transport: Pipelines are generally considered a more environmentally friendly mode of transportation compared to road or rail for moving large quantities of oil and gas. They reduce the risk of spills and accidents associated with other transportation methods.

Technological Innovation: The development and operation of pipelines drive technological advancements in areas such as leak detection, monitoring systems, and energy efficiency. These innovations can have broader applications and benefits for other sectors.

Regional Resilience

Economic Resilience: By diversifying energy sources and supply routes, pipelines contribute to the economic resilience of regions. They help mitigate the impact of supply disruptions or fluctuations in global energy markets.

Disaster Response: Pipelines can enhance regional resilience to natural disasters by providing a stable supply of energy resources for emergency response and recovery efforts.

India has developed an extensive network of pipelines for transporting oil, natural gas, and refined products across the country. These pipelines play a crucial role in meeting the energy needs of the nation and facilitating economic growth. Here's an overview of the major pipeline networks in India:

Challenges and Future Developments

Infrastructure Development: Expanding and upgrading pipeline infrastructure to meet growing demand and ensure efficiency.

Safety and Maintenance: Ensuring pipeline safety, regular maintenance, and addressing any issues related to leaks or accidents.

Environmental Impact: Managing the environmental impact of pipeline construction and operation, including habitat disruption and pollution.

Regulatory Framework: Navigating regulatory challenges and ensuring compliance with safety and environmental standards.

In summary, India's major pipeline networks play a vital role in transporting oil, natural gas, and refined products across the country, supporting economic growth and energy security. Ongoing and planned projects aim to enhance infrastructure, improve efficiency, and expand coverage to meet the growing demands of the Indian economy.

NOTE: PLEASE BE INFORMED THAT THIS IS THE DETAILED AND ENRICHED CONTENT TO THE ASKED QUESTIONS. IN ORDER TO PROVIDE YOU WITH ALL ASPECTS OF INFORMATION AND ILLUSTRATIONS WE HAVE NOT ADHERED TO WORD LIMIT.