GS-3 Paper and Model answers

10 Markers (Answer in 150 words each)

- Distinguish between the **Human Development Index (HDI)** and **Inequality-adjusted Human Development Index (IHDI)** with special reference to India. Why is the IHDI considered a better indicator of inclusive growth?
- What are the challenges before the **Indian economy** when the world is moving away from free trade and multilateralism to protectionism and bilateralism? How can these challenges be met?
- Explain the factors influencing the decision of **farmers on the selection of high-value crops** in India.
- Elaborate the scope and significance of **supply chain management of agricultural commodities** in India.
- The fusion energy programme in India has steadily evolved over the past few decades. Mention **India's contributions to the International Thermonuclear Experimental Reactor (ITER)**. What will be the implications of the success of this project for the future of global energy?
- How can **India achieve energy independence through clean technology by 2047**? How can biotechnology play a crucial role in this endeavour?
- What is **Carbon Capture, Utilization and Storage (CCUS)**? What is the potential role of CCUS in tackling climate change?
- **Seawater intrusion** in the coastal aquifers is a major concern in India. What are the causes of seawater intrusion and the remedial measures to combat this hazard?
- **Terrorism** is a global scourge. How has it manifested in India? Elaborate with contemporary examples. What are the countermeasures adopted by the State?
- The Government of India recently stated that **Left Wing Extremism (LWE)** will be eliminated by 2026. What do you understand by LWE and how are people affected by it? What measures have been taken by the government to eliminate LWE?

15 Markers (Answer in 250 words each)

- Explain how the **Fiscal Health Index (FHI)** can be used as a tool for assessing the fiscal performance of states in India. In what way would it encourage the states to adopt prudent and sustainable fiscal policies?

- Discuss the **rationale of the Production Linked Incentive (PLI) scheme**. What are its achievements? In what way can the functioning and outcomes of the scheme be improved?
- Examine the factors responsible for **depleting groundwater in India**. What are the steps taken by the government to mitigate such depletion?
- Examine the scope of the **food processing industries in India**. Elaborate the measures taken by the government in this sector for generating employment opportunities.
- How does **nanotechnology** offer significant advancements in agriculture? How can this technology help to uplift the socio-economic status of farmers?
- India aims to become a **semiconductor manufacturing hub**. What are the challenges faced by the semiconductor industry in India? Mention the salient features of the **India Semiconductor Mission**.
- **Mining** is considered an environmental hazard. Why? Explain the remedial measures required to reduce the environmental hazard due to mining.
- Write a review on **India's climate commitments under the Paris Agreement (2015)** and mention how these have been strengthened in **COP26 (2021)**. How has the first Nationally Determined Contribution (NDC) been updated in 2022?
- What are the major challenges to **internal security and peace process in the North-Eastern States**? Map the various peace accords and agreements initiated by the government in the past decade.
- Why is **maritime security** vital to protect India's sea trade? Discuss maritime and coastal security challenges and the way forward.

Q1. Distinguish between HDI and IHDI; Why IHDI is better for inclusive growth?

Introduction

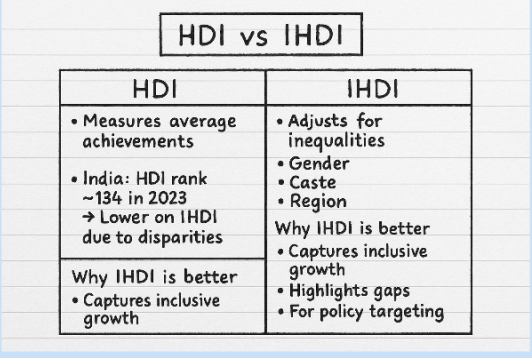
The Human Development Index (HDI) measures a nation's development based on life expectancy, education, and income. The Inequality-adjusted HDI (IHDI) discounts achievements by inequality levels, making it more reflective of real human welfare.

I. HDI vs IHDI

- **HDI:** Focuses on *average achievements* without accounting for distribution.
- **IHDI:** Adjusts for *inequalities* across gender, caste, and region.
- **India's Case:** High HDI rank (~134 in 2023) falls lower on IHDI due to wide disparities.

II. Why IHDI is better

- Captures **inclusive growth** rather than mere averages.
- Highlights gaps in *gender, caste, and regional equity*.
- Serves as a policy tool for targeted interventions (education in Bihar, health in tribal areas).



Conclusion

While HDI shows potential development, IHDI reveals actual lived realities, making it a better indicator of inclusivity.

Q2. Challenges to Indian Economy from Protectionism & Bilateralism

Introduction

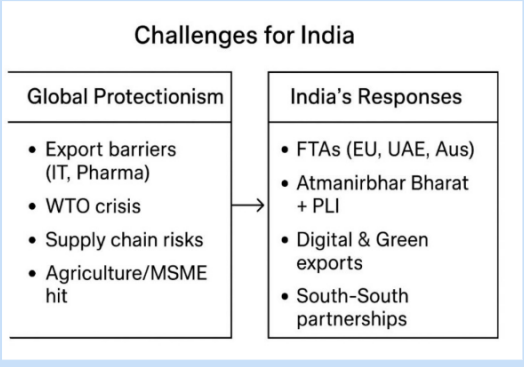
Global shift towards protectionism—trade wars, Brexit, US-China decoupling—threatens India's export-led growth and multilateral engagement at WTO.

I. Challenges

- **Export Dependence:** Barriers affect India's IT, pharma, and textile exports.
- **WTO Paralysis:** Dispute settlement body weakened, reducing India's recourse.
- **Supply Chain Disruptions:** "China+1" strategy raises competitiveness challenge.
- **Agriculture & MSMEs:** Face tariff hikes and non-tariff barriers abroad.

II. Strategies to Meet Challenges

- Diversify trade partners via FTAs (EU, UAE, Australia).
- Promote domestic competitiveness: *PLI schemes, Atmanirbhar Bharat*.
- Invest in digital trade, green technology exports.
- Strengthen South-South cooperation (Africa, ASEAN).



Conclusion

India must navigate protectionism through strategic FTAs, competitiveness enhancement, and leadership in new multilateral frameworks.

Q3. Factors Influencing Farmers' Choice of High-Value Crops

Introduction

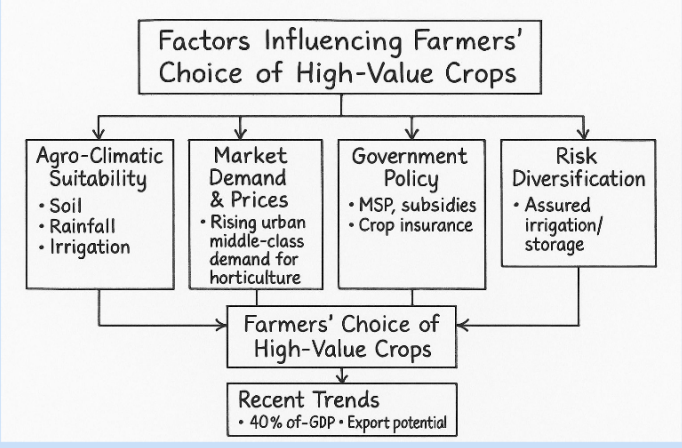
India's cropping patterns are influenced by ecological, economic, and policy factors, especially in adoption of high-value crops like fruits, vegetables, spices, and cotton.

I. Key Factors

- **Agro-Climatic Suitability:** Soil, rainfall, irrigation (e.g., grapes in Maharashtra, apples in Himachal).
- **Market Demand & Prices:** Rising urban middle-class demand for horticulture.
- **Government Policy:** MSP, subsidies, crop insurance.
- **Risk Diversification:** High-value crops preferred where assured irrigation/storage exists.

II. Recent Trends

- 40% of agricultural GDP now from high-value crops.
- Export potential: Basmati rice, spices, marine products.



Conclusion

Farmers' choice of high-value crops is a rational response to profitability, demand, and policy incentives, aligning with India's diversification towards agri-value chains.

Q4. Scope & Significance of Supply Chain Management (SCM) in Agriculture

Introduction

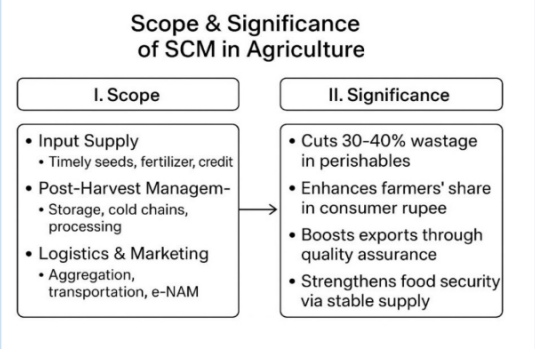
Efficient supply chain management (SCM) reduces wastage, enhances farmer incomes, and ensures consumer affordability.

I. Scope

- **Input Supply:** Timely seeds, fertilizers, credit.
- **Post-Harvest Management:** Storage, cold chains, processing.
- **Logistics & Marketing:** Aggregation, transportation, e-NAM platforms.

II. Significance

- Cuts **30–40% wastage** in perishables.
- Enhances farmers' share in consumer rupee.
- Boosts exports through quality assurance.
- Strengthens food security via stable supply.



Examples: Amul's dairy model, ITC's e-Choupal, PM Kisan Sampada Yojana.

Conclusion

SCM is critical to transforming agriculture from subsistence to agribusiness, ensuring both profitability and sustainability.

Q5. Fusion Energy Programme & ITER Project

Introduction

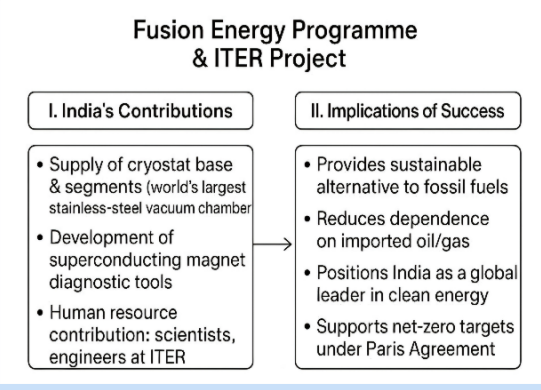
Fusion energy mimics the Sun's process, offering clean, limitless energy. India is a key partner in the International Thermonuclear Experimental Reactor (ITER) project in France.

I. India's Contributions

- Supply of **cryostat base & segments** (world's largest stainless-steel vacuum chamber).
- Development of superconducting magnets, diagnostic tools.
- Human resource contribution: scientists, engineers at ITER.

II. Implications of Success

- Provides sustainable alternative to fossil fuels.
- Reduces dependence on imported oil/gas.
- Positions India as a global leader in clean energy.
- Supports *net-zero targets* under Paris Agreement.



Conclusion

ITER can be a game-changer for India's energy security, ushering a future of sustainable, abundant, and carbon-free energy.

Q6. Energy Independence by 2047 & Role of Biotechnology

Introduction

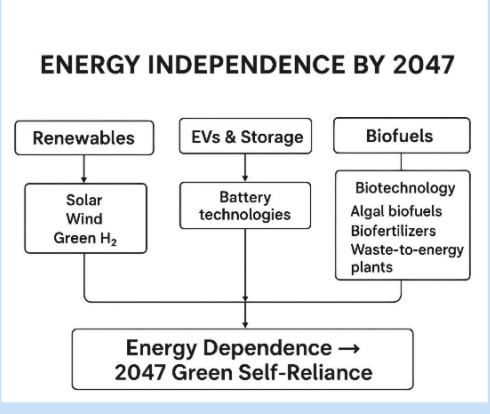
India aims to achieve energy independence by 2047, coinciding with its centenary of independence, primarily through clean technologies and green fuels.

I. Pathways to Energy Independence

- **Renewables:** Solar, wind, and green hydrogen expansion.
- **EVs & Storage:** Battery technologies reducing oil imports.
- **Biofuels:** Ethanol blending target of 20% by 2025.

II. Role of Biotechnology

- **Bioenergy:** Algal biofuels, waste-to-energy plants.
- **Bioremediation:** Reducing emissions from fossil fuels.



- **Bio-fertilizers & bio-crops:** Reducing agri-energy input demand.

Conclusion

Biotechnology, combined with clean energy, can enable India to move from energy dependence to green self-reliance by 2047.

Q7. Carbon Capture, Utilization, and Storage (CCUS)

Introduction

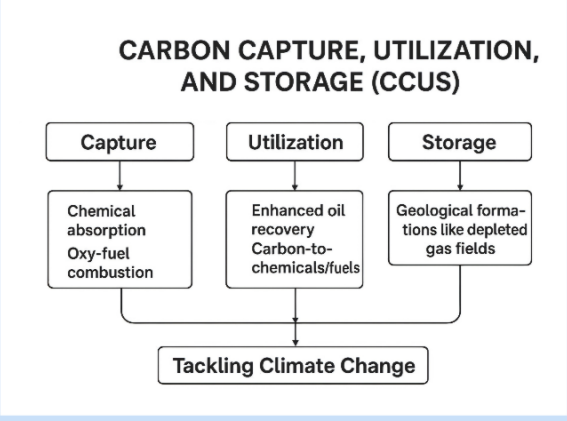
CCUS is a set of technologies that capture CO_2 from industrial and power plants, transport it, and either utilize it or store it underground.

I. Components

- **Capture:** Chemical absorption, oxy-fuel combustion.
- **Utilization:** Enhanced oil recovery, carbon-to-chemicals/fuels.
- **Storage:** Geological formations like depleted gas fields.

II. Role in Tackling Climate Change

- Reduces emissions from hard-to-abate sectors (steel, cement).
- Supports India's Net Zero 2070 target.
- Enables negative emissions when paired with bioenergy (BECCS).



Conclusion

CCUS is not a silver bullet but a vital complement to renewable expansion in decarbonisation strategy.

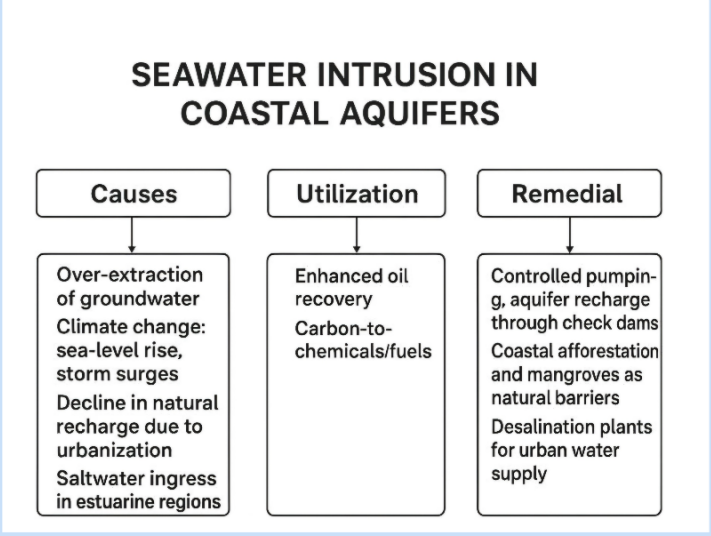
Q8. Seawater Intrusion in Coastal Aquifers

Introduction

Seawater intrusion occurs when saline water encroaches into freshwater aquifers, a major concern in India's 7,500 km coastline.

I. Causes

- Over-extraction of groundwater (agriculture, urban).
- Climate change: sea-level rise, storm surges.
- Decline in natural recharge due to urbanisation.
- Saltwater ingress in estuarine regions.



II. Remedial Measures

- Controlled pumping, aquifer recharge through check dams.
- Coastal afforestation and mangroves as natural barriers.
- Desalination plants for urban water supply.
- Integrated coastal zone management (ICZM).

Conclusion

Addressing seawater intrusion is vital for water security, agriculture, and sustaining coastal livelihoods.

Q9. Terrorism in India: Manifestation & Countermeasures

Introduction

Terrorism in India has varied manifestations—cross-border militancy, left-wing extremism, and urban terror.

I. Manifestations

- **Cross-border:** J&K militancy (Pulwama 2019).
- **Religious extremism:** 2008 Mumbai attacks.
- **Insurgency:** Northeast ethnic militias.
- **Urban Naxalism:** Maoist influence in tribal belts.

II. State Countermeasures

- Legal: UAPA, NIA Act, AFSPA in disturbed areas.
- Institutional: NIA, Multi-Agency Centre, NATGRID.
- Operational: Surgical strikes, counter-insurgency ops.
- Developmental: Civic action programs in Maoist areas.

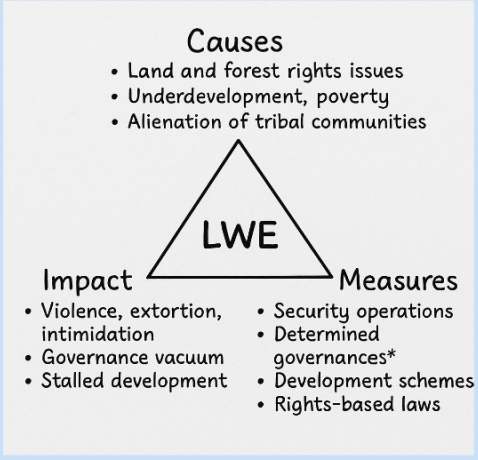
Conclusion

India's strategy combines **hard power (security)** with **soft power (development)** to address root causes of terrorism.

Q10. Left Wing Extremism (LWE) in India

Introduction

Left Wing Extremism, or Naxalism, is an armed insurgency based on Maoist ideology aiming to overthrow the state through people's war.



I. Impact on People

- Violence, extortion, and displacement in "Red Corridor" states (Jharkhand, Chhattisgarh, Odisha).
- Loss of governance, stalled development projects.
- Human rights violations against tribal communities.

II. Government Measures

- **Security:** Operation Green Hunt, fortified police stations.
- **Development:** Aspirational Districts Programme, road & telecom projects.
- **Governance:** PESA, FRA to empower tribals.
- **Rehabilitation:** Surrender-cum-rehabilitation schemes.

Conclusion

With declining violent incidents (down by >70% in last decade), elimination by 2026 is achievable through sustained security and inclusive development.

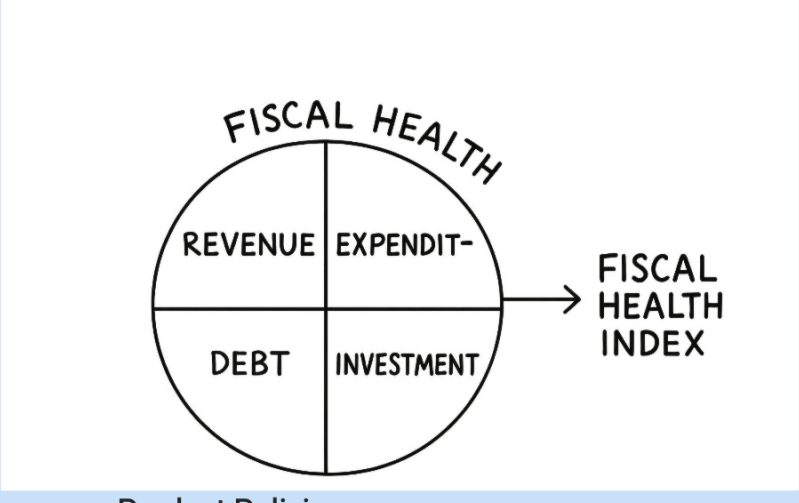
Q11. Fiscal Health Index (FHI) & States' Fiscal Performance

Introduction

The Fiscal Health Index (FHI) is a composite tool that measures the financial sustainability of states across revenue, expenditure, debt and investment indicators. It serves as a benchmark for prudent fiscal management.

I. FHI as an Assessment Tool

- Evaluates **revenue mobilisation** through tax buoyancy and non-tax sources.
- Assesses **quality of expenditure**, distinguishing capital from revenue spending.
- Captures **debt sustainability** via debt-to-GSDP and interest payment ratios.



II. How FHI Encourages Prudent Policies

- Creates **inter-state competition** in fiscal discipline.
- **Links central transfers** to responsible fiscal performance.
- Promotes **transparency and accountability** in public finance.

III. Broader Impact on Governance

- Strengthens **public investment in infrastructure**.
- Improves **creditworthiness** of states for borrowing.
- Aligns state budgets with **long-term development goals**.

Conclusion

FHI is not merely an index but a fiscal compass, guiding states towards sustainability while balancing growth with responsibility.

Q12. Production Linked Incentive (PLI) Scheme

Introduction

The Production Linked Incentive (PLI) scheme incentivises incremental sales in manufacturing, aiming to boost domestic production, exports and employment.

I. Rationale of the Scheme

- Reduce **import dependence** in critical sectors like electronics, APIs.

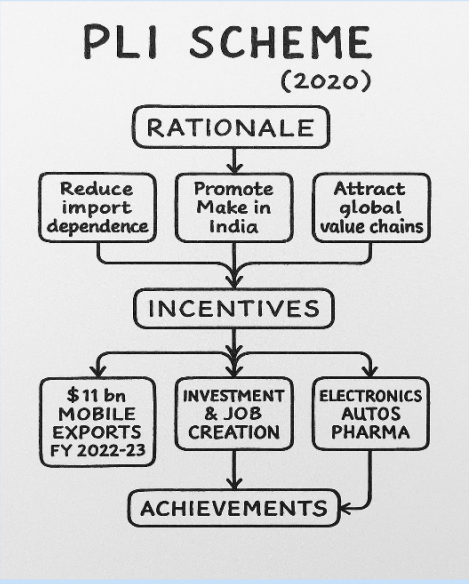
- Integrate India into **global value chains** shifting from China.
- Promote **Make in India and Atmanirbhar Bharat** vision.

II. Achievements So Far

- Mobile exports crossed **$11 billion in 2023**.
- Attracted investments in **electronics, pharma, auto components**.
- Created **direct and indirect employment opportunities**.

III. Scope for Improvement

- Simplify **compliance norms** and ensure quick disbursement.
- Expand to **MSMEs and sunrise sectors** (EVs, green hydrogen).
- Link incentives with **R&D, skill-building and innovation**.



Conclusion

PLI has catalysed manufacturing growth, but long-term competitiveness rests on innovation, not subsidies alone.

Q13. Groundwater Depletion in India

Introduction

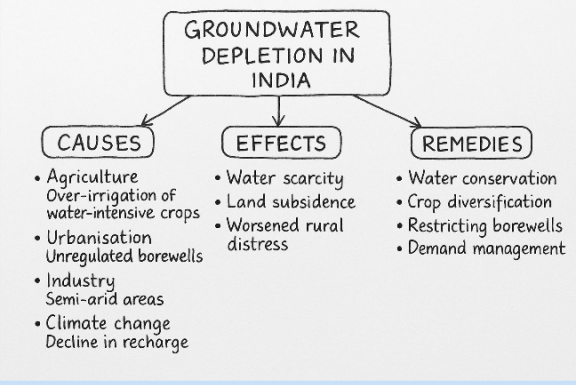
India, the largest extractor of groundwater globally, faces unsustainable depletion threatening agriculture, urban supply and ecology.

I. Causes of Groundwater Depletion

- **Agriculture:** Free electricity encourages overuse for water-intensive crops.
- **Urbanisation:** Over-extraction through unregulated borewells.
- **Industry & Climate:** Industrial demand and erratic monsoons reducing recharge.

II. Government Measures

- **Atal Bhujal Yojana:** Community-led water budgeting.
- **Jal Shakti Abhiyan:** Rainwater harvesting, watershed development.
- **PMKSY:** Promotion of drip and sprinkler irrigation.



III. Challenges Ahead

- Weak **enforcement of groundwater laws**.

- Farmers' **reluctance to shift to less water-intensive crops**.
- Need for **behavioural change and local governance reforms**.

Conclusion

Groundwater depletion is a silent crisis. Only a combination of technology, policy and social awareness can ensure sustainability.

Q14. Food Processing Industries (FPI) in India

Introduction

Food processing is a sunrise sector that reduces wastage, adds value and generates rural employment, crucial for doubling farmers' income.

I. Scope and Significance

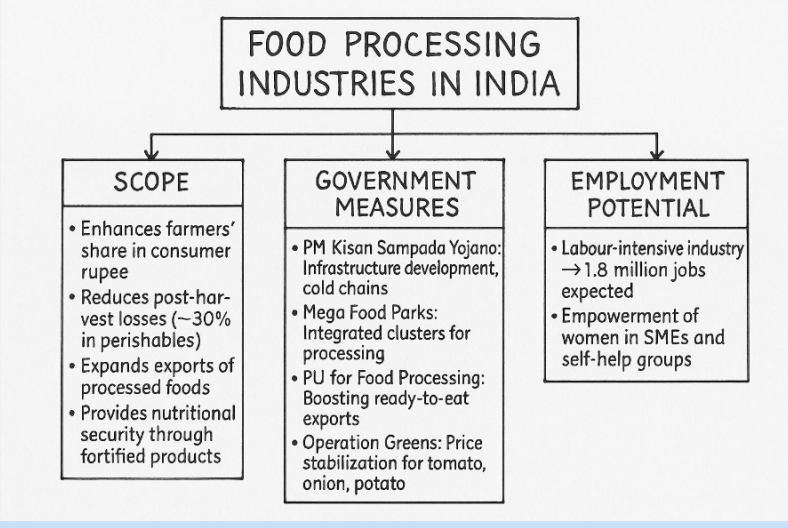
- Reduces **post-harvest losses** (30–35%).
- Enhances **farmers' income** by improving value realisation.
- Expands **exports of processed foods**.

II. Government Initiatives

- **PM Kisan Sampada Yojana:** Infrastructure and cold chains.
- **Mega Food Parks:** Cluster-based processing hubs.
- **PLI for Food Processing:** Incentives for global competitiveness.

III. Employment and Inclusive Growth

- Labour-intensive → generates **millions of jobs**.
- Strengthens **women-led enterprises** and SHGs.
- Supports **nutrition security** through fortified products.



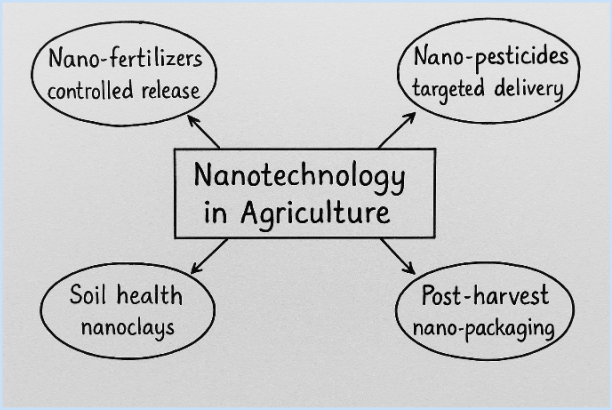
Conclusion

FPI is a strategic sector linking agriculture with industry, promoting inclusive growth and positioning India as an agri-export hub.

Q15. Nanotechnology in Agriculture

Introduction

Nanotechnology applies nanoscale innovations to farming, enhancing efficiency, productivity and sustainability.



I. Scientific Advancements

- **Nano-fertilizers** improve nutrient-use efficiency.
- **Nano-pesticides** reduce chemical residues.
- **Nano-packaging** enhances shelf life of perishables.

II. Socio-Economic Benefits for Farmers

- Cuts **input costs** for smallholders.
- Improves **yield and quality**, boosting incomes.
- Generates **new employment** in agri-nano industries.

III. Challenges & Way Forward

- **High R&D cost** and regulatory gaps.
- Risk of **environmental toxicity** if unchecked.
- Need for **scaling-up through public–private partnerships**.

Conclusion

Nanotechnology can transform Indian agriculture into climate-smart and farmer-friendly, aiding socio-economic upliftment and Viksit Bharat @2047 vision.

Q16. India's Semiconductor Manufacturing Hub & India Semiconductor Mission

Introduction

Semiconductors are the backbone of digital and strategic industries. India, aiming to become a global hub, launched the **India Semiconductor Mission (ISM), 2021** with ₹76,000 crore incentive outlay.

I. Challenges Faced by Industry

- **Capital Intensive:** High investment (fab requires $8–10 bn) with long gestation.
- **Technological Gaps:** Lack of advanced lithography and R&D ecosystem.
- **Supply Chain Dependence:** Reliance on Taiwan, South Korea for core equipment.
- **Skilled Workforce Deficit:** Shortage of semiconductor design & fab engineers.

II. Salient Features of ISM

- **Incentive Schemes:** 50% support for fabs, ATMP/OSAT units.
- **Design Linked Incentive (DLI):** Promotes indigenous chip design start-ups.
- **Collaborations:** Ties with global players (Foxconn, Vedanta).
- **Capacity Building:** Focus on R&D, talent creation and trusted electronics.

III. Strategic Significance

- Reduces import dependence (~$20 bn annually).
- Supports national security in defence & telecom.
- Positions India in global value chains amidst US-China chip rivalry.

Conclusion

Semiconductors are India's "oil of the digital age." Success of ISM depends on global partnerships, R&D and scaling talent.

Q17. Mining as an Environmental Hazard

Introduction

Mining is vital for economic growth but often leaves behind ecological scars, making it an environmental hazard.

I. Why Mining is Hazardous

- **Deforestation & Biodiversity Loss:** Open-pit mining clears forests.
- **Air & Water Pollution:** Particulate matter, acid mine drainage.
- **Soil Degradation:** Land subsidence and fertility loss.
- **Displacement:** Affects indigenous and tribal populations.

II. Remedial Measures

- **Strict Compliance:** Enforce EC norms, EIA-based clearance.
- **Sustainable Mining Practices:** Eco-friendly technologies, mine closure plans.
- **Rehabilitation:** Afforestation, reclamation of mined land.
- **Community Participation:** Implementation of PESA, DMF funds for locals.

III. Policy Framework

- **MMDR Act amendments (2015):** Transparent auctions.
- **National Mineral Policy (2019):** Sustainable mining focus.
- **SC rulings (Goa, Karnataka):** Curb on illegal mining.

Conclusion

Mining should shift from exploitative extraction to sustainable resource stewardship to balance economy with ecology.

Q18. India's Climate Commitments under Paris Agreement

Introduction

India, the 3rd largest emitter but with per capita emissions below global average, has progressively enhanced climate ambition under **Paris Agreement (2015)**.

I. Paris Agreement (2015) & COP26 (2021)

- **Paris Pledge:** Reduce emission intensity by 33–35% by 2030.
- **COP26 Updates:** Net Zero by 2070; 50% electricity from renewables by 2030; 1 bn tonnes CO_2 reduction.
- **Equity Principle:** Emphasis on climate justice and CBDR-RC.

II. NDCs Updated in 2022

- **Emission Intensity Reduction:** Enhanced to 45% of 2005 levels.
- **Non-Fossil Capacity:** Target raised to 50% of installed capacity.
- **Carbon Sink:** Expanded afforestation targets.

III. Significance

- Boosts India's global climate leadership (ISA, CDRI).
- Aligns with energy transition goals.
- Strengthens domestic green economy, jobs in RE sector.

Conclusion

India's updated NDCs strike a balance between growth and sustainability, reaffirming its role as a responsible climate leader.

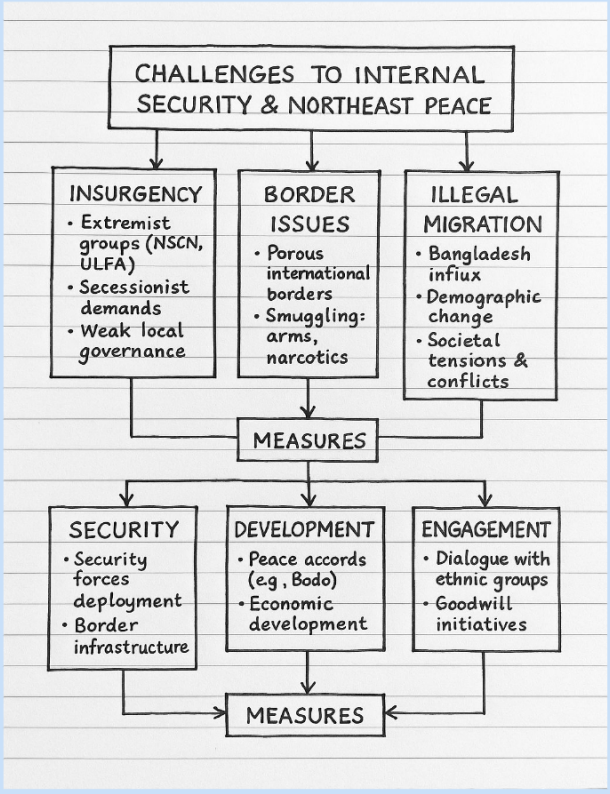
Q19. Internal Security & Peace Process in North-East

Introduction

North-East India has been plagued by insurgency, ethnic conflict and underdevelopment, making peace processes vital for stability.

I. Major Challenges

- **Ethnic Insurgencies:** ULFA (Assam), NSCN (Nagaland).
- **Cross-Border Issues:** Porous borders with Myanmar, Bangladesh.
- **Socio-Economic Gaps:** Alienation due to underdevelopment.
- **Illegal Migration & Demography:** Source of tension.



II. Peace Accords & Government Initiatives

- **Naga Peace Accord (2015):** Framework agreement with NSCN(IM).
- **Bodo Accord (2020):** Greater autonomy for Bodoland Territorial Region.
- **Bru-Reang Agreement (2020):** Resettlement in Tripura.
- **AFSPA Dilution:** Withdrawn from many districts.

III. Outcomes & Way Forward

- Reduction in insurgency violence by 80% (MHA data).
- Greater political participation & integration.
- Need for **inclusive development, cross-border cooperation and trust-building**.

Conclusion

Peace in the North-East lies in blending security measures with dialogue, autonomy and development-led integration.

Q20. Why is maritime security vital to protect India's sea trade? Discuss maritime and coastal security challenges and the way forward.

Introduction

India's maritime security is vital as 95% of its trade by volume and 70% by value is seaborne. With a 7,500 km+ coastline, 12 major ports, and its strategic location in the Indian Ocean—through which a large share of global oil trade passes—India's sea trade is deeply tied to national security and economic stability.

I. Importance of Maritime Security for India's Sea Trade

- **Trade lifeline:** Ensures uninterrupted movement of crude oil, LNG, and exports.
- **Strategic location:** Secures Sea Lanes of Communication (SLOCs) like the Strait of Hormuz and Malacca.
- **Blue economy:** Fisheries, offshore energy, and shipping contribute significantly to GDP.
- **Geopolitical influence:** Protects India's role as net security provider in Indian Ocean Region.

II. Maritime & Coastal Security Challenges

- **Terrorism & piracy:** 26/11 Mumbai attack revealed coastal vulnerabilities; piracy in Gulf of Aden.
- **Smuggling & illegal fishing:** Narco-terrorism, arms smuggling, depletion of fish stocks.
- **China's naval expansion:** String of Pearls strategy, presence in Gwadar & Hambantota ports.
- **Weak infrastructure:** Poor coastal radar coverage, fragmented jurisdiction between Navy, Coast

Guard, state marine police.

- **Climate risks:** Rising sea levels, cyclones, affecting ports and coastal communities.

III. Way Forward

- **Integrated Maritime Security:** Strengthen NC3I (National Command, Control, Communications, and Intelligence) network.
- **Capacity building:** Modernisation of Navy, Coast Guard, port security.
- **Regional cooperation:** SAGAR (Security and Growth for All in the Region), QUAD, Indo-Pacific initiatives.
- **Community participation:** Training fishermen as “eyes and ears” of coastal security.
- **Blue economy focus:** Sustainable exploitation with security synergy.

Conclusion

Maritime security is the backbone of India’s trade and strategic autonomy. A robust, integrated, and forward-looking maritime strategy will secure India’s sea trade and reinforce its emergence as a leading power in the Indo-Pacific.