



Daily PIB Summary

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1. ROADS REIMAGINED: THE RISE OF INDIA'S ELECTRIC VEHICLES ECOSYSTEM



- I. India is building a comprehensive EV ecosystem by focusing on:
 - A. Electric vehicle manufacturing.
 - B. Charging infrastructure.
 - C. Advanced battery production.
 - D. Domestic value chains.
 - E. Research and innovation.
 - F. Public transport electrification.
- II. The transition supports:
 - A. Reduced oil imports.
 - B. Lower carbon emissions.
 - C. Cleaner urban air.
 - D. Green industrial growth.

BACKGROUND / CONTEXT

What are Electric Vehicles (EVs)?

- Electric Vehicles are automobiles powered fully or partially by electricity instead of conventional fossil fuels.

Types of EVs

- Battery Electric Vehicles (BEVs)** – Fully electric.
- Plug-in Hybrid Electric Vehicles (PHEVs)**.
- Hybrid Electric Vehicles (HEVs)**.
- Fuel Cell Electric Vehicles (FCEVs)**.

MAJOR GOVERNMENT INITIATIVES

PM E-DRIVE Scheme

Objectives

- Accelerate EV adoption.
- Support demand for electric vehicles.

- Expand charging infrastructure.
- Promote domestic manufacturing.
- Strengthen India's EV ecosystem.

PM e-Bus Sewa Scheme

Promotes:

- Electric buses in cities.
- Sustainable urban transport.
- Reduced vehicular emissions.

Production Linked Incentive (PLI) Scheme

Supports:

Automobile Sector

- Advanced automobile manufacturing.
- EV components.

Advanced Chemistry Cell (ACC) Batteries

- Domestic battery manufacturing.
- Reduced import dependence.

National Programme on Advanced Chemistry Cell (ACC) Battery Storage

Encourages:

- Gigafactories.
- Battery innovation.
- Energy storage technologies.

CHARGING INFRASTRUCTURE

Government initiatives support:

- Public charging stations.
- Fast charging networks.
- Highway charging corridors.
- Urban charging infrastructure.
- Battery swapping in selected segments.

BENEFITS OF EVs

Environmental

- Lower greenhouse gas emissions.
- Reduced urban air pollution.
- Improved public health.

Economic

- Lower fuel costs.
- Reduced oil imports.
- Employment generation.
- Growth of new manufacturing industries.

Energy Security

- Reduced dependence on imported crude oil.
- Greater use of renewable energy for mobility.

Industrial

- Promotes **Atmanirbhar Bharat**.
- Strengthens domestic manufacturing.
- Encourages innovation and startups.

CHALLENGES

- Limited charging infrastructure.
- High upfront vehicle cost.
- Battery recycling challenges.
- Critical mineral dependence.
- Consumer awareness.

WAY FORWARD

- Expand charging networks nationwide.
- Promote battery recycling and circular economy.
- Secure critical mineral supply chains.
- Increase domestic battery manufacturing.
- Encourage R&D in next-generation batteries.
- Integrate renewable energy with EV charging.

SIGNIFICANCE

Climate Action

Supports India's commitments towards:

- Net Zero emissions by **2070**.
- Reduced emission intensity.
- Sustainable transport.

Economic Growth

- Expands manufacturing.
- Creates green jobs.
- Attracts investment.

Urban Development

- Cleaner cities.
- Sustainable mobility.
- Improved air quality.

KEY HIGHLIGHTS

- **Major Theme:** Development of India's Electric Vehicle ecosystem.
- **Flagship Scheme:** PM E-DRIVE.
- **Public Transport Initiative:** PM e-Bus Sewa.
- **Manufacturing Support:** PLI Scheme for Automobiles and ACC Batteries.
- **Nodal Ministry:** Ministry of Heavy Industries.
- **Key Focus Areas:** EV manufacturing, charging infrastructure, batteries, and clean mobility.

- **Strategic Importance:** Energy security, climate action, industrial growth, and sustainable transportation.

PRELIMS BOOSTER BOX

PM E-DRIVE

- I. Supports:
 - A. Electric vehicle adoption.
 - B. Charging infrastructure.
 - C. Domestic manufacturing.
 - D. Innovation.

PM e-Bus Sewa

- Promotes deployment of electric buses for sustainable public transport.

Production Linked Incentive (PLI) Scheme

Supports:

- Automobile manufacturing.
- Advanced Chemistry Cell (ACC) battery manufacturing.

Advanced Chemistry Cell (ACC)

- I. High-performance rechargeable batteries used in:
 - A. Electric vehicles.
 - B. Grid-scale energy storage.
 - C. Consumer electronics.

Battery Swapping

- Allows depleted batteries to be exchanged with fully charged batteries, reducing charging time.

Critical Minerals for EVs

Important minerals include:

- Lithium
- Cobalt
- Nickel
- Graphite
- Rare Earth Elements

National Electric Mobility Mission Plan (NEMMP) 2020

- Launched to promote electric mobility and reduce dependence on fossil fuels.

PadhAI-GENERATED UPSC MCQ

Consider the following statements regarding India's Electric Vehicle (EV) ecosystem:



1. The **PM E-DRIVE Scheme** aims to promote electric vehicle adoption and charging infrastructure.
2. The **Production Linked Incentive (PLI) Scheme** supports domestic manufacturing of Advanced Chemistry Cell (ACC) batteries.
3. **Battery swapping** allows users to replace a discharged battery with a fully charged one, reducing vehicle downtime.

Which of the statements given above is/are correct?

- (a) 1 and 2 only
(b) 2 and 3 only
(c) 1 and 3 only
(d) 1, 2 and 3

Answer: (d)

2. FOREST RIGHTS ACT (FRA), 2006



- I. The FRA, 2006 seeks to:
- A. Recognize the historical rights of forest-dwelling Scheduled Tribes (STs) and Other Traditional Forest Dwellers (OTFDs).
 - B. Correct the historical injustice caused by denial of forest rights.
 - C. Empower **Gram Sabhas** in forest governance.
 - D. Promote conservation through community participation.

BACKGROUND / CONTEXT

Historical Background

- During the colonial period and after Independence, large areas were declared **Reserved Forests** and **Protected Forests**,

restricting the customary rights of forest-dependent communities.

- The FRA was enacted to address this **historical injustice** by legally recognizing their traditional rights over forest land and resources.

LEGAL FRAMEWORK

Forest Rights Act, 2006

Official Name

The Scheduled Tribes and Other Traditional Forest Dwellers (Recognition of Forest Rights) Act, 2006

Implemented

- **1 January 2008**

Nodal Ministry

- **Ministry of Tribal Affairs**

OBJECTIVES

- Recognize individual and community forest rights.
- Strengthen livelihood security.
- Empower Gram Sabhas.
- Promote participatory forest governance.
- Conserve forests through community stewardship.

ELIGIBLE BENEFICIARIES

Scheduled Tribes (STs)

- Must primarily reside in and depend on forests for livelihood.

Other Traditional Forest Dwellers (OTFDs)

Must prove:

- Residence in forest areas for **at least three generations (75 years)** prior to **13 December 2005**.
- Dependence on forests for livelihood.

MAJOR RIGHTS RECOGNISED

Individual Forest Rights (IFR)

- Rights over forest land under occupation for habitation or self-cultivation (subject to the Act's limits and conditions).

Community Rights (CR)

Rights relating to:

- Grazing.
- Fishing.
- Water bodies.
- Minor Forest Produce (MFP).

- Traditional seasonal resource access.

Community Forest Resource (CFR) Rights

Gram Sabhas have the right to:

- Protect.
- Regenerate.
- Conserve.
- Manage community forest resources.

Rights over Minor Forest Produce (MFP)

Includes ownership, collection, use, and disposal of products such as:

- Bamboo.
- Honey.
- Tendu leaves.
- Medicinal plants.
- Fruits.
- Resins.

Habitat Rights

Recognised for:

- Particularly Vulnerable Tribal Groups (PVTGs).
- Pre-agricultural communities.

ROLE OF GRAM SABHA

The **Gram Sabha** is the central authority under FRA.

Functions

- Initiates the claims process.
- Verifies claims.
- Protects community forest resources.
- Participates in conservation and management.

IMPLEMENTATION MECHANISM

Claims are processed through:

1. **Gram Sabha**
2. **Sub-Divisional Level Committee (SDLC)**
3. **District Level Committee (DLC)**

The **District Level Committee** is the final authority for approval of claims.

SIGNIFICANCE

Social Justice

- Corrects historical injustice.
- Protects tribal rights.

Livelihood Security

- Enhances income through forest resources.
- Supports sustainable livelihoods.

Forest Conservation

- Encourages community-led conservation.
- Strengthens participatory governance.

Constitutional Values

Supports:

- Social justice.
- Decentralization.
- Inclusive development.

CHALLENGES

- Delays in claim settlement.
- High rejection rates in some areas.
- Poor awareness.
- Documentation difficulties.
- Conflicts between conservation and development projects.
- Limited recognition of Community Forest Resource (CFR) rights.

WAY FORWARD

- Improve awareness among forest communities.
- Strengthen Gram Sabha capacity.
- Ensure transparent and timely claim processing.
- Promote recognition of Community Forest Resource rights.
- Integrate FRA with biodiversity conservation and sustainable livelihood programmes.

RELATED CONSTITUTIONAL & LEGAL PROVISIONS

- **Article 46** – Promotion of educational and economic interests of Scheduled Tribes and other weaker sections.
- **Fifth Schedule** – Administration of Scheduled Areas and Scheduled Tribes.
- **Panchayats (Extension to Scheduled Areas) Act, 1996 (PESA)** – Empowers Gram Sabhas in Scheduled Areas.
- **Biological Diversity Act, 2002** – Conservation and sustainable use of biodiversity.

KEY HIGHLIGHTS

- **Law:** Forest Rights Act (FRA), 2006.
- **Implemented:** 2008.
- **Nodal Ministry:** Ministry of Tribal Affairs.



- **Beneficiaries:** Scheduled Tribes (STs) and Other Traditional Forest Dwellers (OTFDs).
- **Core Principle:** Recognition of historical forest rights.
- **Central Institution:** Gram Sabha.
- **Major Rights:** Individual Forest Rights (IFR), Community Rights (CR), Community Forest Resource (CFR), Minor Forest Produce (MFP), Habitat Rights.
- **Strategic Importance:** Tribal welfare, forest conservation, and participatory governance.

PRELIMS BOOSTER BOX

Forest Rights Act (FRA), 2006

- Official Name: *The Scheduled Tribes and Other Traditional Forest Dwellers (Recognition of Forest Rights) Act, 2006*
- Implemented: **1 January 2008**
- Nodal Ministry: **Ministry of Tribal Affairs**

Key Rights

- Individual Forest Rights (IFR)
- Community Rights (CR)
- Community Forest Resource (CFR) Rights
- Rights over Minor Forest Produce (MFP)
- Habitat Rights for PVTGs

Minor Forest Produce (MFP)

Includes:

- Bamboo
- Honey
- Tendu leaves
- Medicinal plants
- Fruits
- Resins

PESA Act, 1996

- Extends Panchayati Raj to **Scheduled Areas**.
- Empowers **Gram Sabhas** in local governance and natural resource management.

Particularly Vulnerable Tribal Groups (PVTGs)

- Most vulnerable among Scheduled Tribes.
- Characterised by pre-agricultural technology, stagnant or declining population, low literacy, and subsistence economy.

PadhAI-GENERATED UPSC MCQ

Consider the following statements regarding the Forest Rights Act (FRA), 2006:

1. The Act recognises both **Individual Forest Rights** and **Community Forest Resource Rights**.
2. The **Ministry of Tribal Affairs** is the nodal ministry for implementation of the Act.
3. The **Gram Sabha** plays a central role in initiating and verifying claims under the Act.

Which of the statements given above is/are correct?

- (a) 1 and 2 only
- (b) 2 and 3 only
- (c) 1 and 3 only
- (d) 1, 2 and 3

Answer: (d)

3. PARLIAMENT QUESTION: GAGANYAAN MISSION AND BHARATIYA ANTARIKSH STATION



- **Gaganyaan** is India's first human spaceflight mission, led by **ISRO**.
- The mission aims to demonstrate India's capability to safely send astronauts into **Low Earth Orbit (LEO)** and return them to Earth.
- Building on Gaganyaan, India plans to establish the **Bharatiya Antariksh Station (BAS)**, a modular space station that will support

long-duration scientific research and strengthen India's human spaceflight programme.

BACKGROUND / CONTEXT

Gaganyaan Mission

Objective

To demonstrate India's capability to:

- Launch a crew into space.
- Sustain astronauts in orbit for a short-duration mission.
- Safely recover the crew after re-entry.

Mission Profile

- **Crew:** Up to **three astronauts**.
- **Orbit:** Low Earth Orbit (LEO), around **400 km** above Earth.
- **Duration:** Approximately **3 days**.
- **Launch Vehicle:** **LVM3** (Launch Vehicle Mark-3).

MAJOR COMPONENTS OF GAGANYAAN

Human-Rated LVM3

- Modified version of ISRO's heavy-lift launcher.
- Enhanced reliability and safety for crewed missions.

Crew Module

Designed to:

- Accommodate astronauts.
- Provide life support.
- Ensure safe re-entry and splashdown.

Service Module

Provides:

- Power.
- Propulsion.
- Thermal control.
- Mission support functions.

Crew Escape System

- Enables rapid separation of the crew module during launch emergencies.
- Ensures astronaut safety.

PRECURSOR MISSIONS

Before the crewed flight, ISRO is undertaking:

- Uncrewed Gaganyaan missions.
- Crew Escape System tests.
- Recovery demonstrations.

- Human-rating validation.

BHARATIYA ANTARIKSH STATION (BAS)

Vision

- India plans to establish its own **space station** by **2035**.

Objectives

- Conduct long-duration human missions.
- Perform microgravity research.
- Test advanced space technologies.
- Strengthen India's independent space capabilities.

Key Features

- Modular design.
- Indigenous development.
- Support scientific experiments.
- Platform for international collaboration.

FUTURE ROADMAP

India's long-term space vision includes:

- Operational **Bharatiya Antariksh Station** by **2035**.
- An **Indian astronaut landing on the Moon** by **2040**, as announced by the Government.
- Expansion of human space exploration capabilities.

SIGNIFICANCE

Scientific

- Advances space science.
- Enables microgravity experiments.
- Supports biomedical and material science research.

Technological

- Promotes indigenous technologies.
- Strengthens aerospace manufacturing.
- Enhances innovation.

Strategic

- Positions India among nations with independent human spaceflight capability.
- Strengthens national security and strategic autonomy in space.

Economic

- Boosts the space economy.
- Encourages private sector participation.
- Generates high-skilled employment.

CHALLENGES

- Human-rating of launch systems.
- Crew safety.
- Long-duration life support.
- Space medicine.
- High costs.
- Advanced orbital infrastructure.

WAY FORWARD

- Successfully complete uncrewed missions.
- Strengthen public-private partnerships.
- Invest in reusable technologies.
- Expand astronaut training.
- Promote international collaboration while strengthening indigenous capabilities.

RELATED INITIATIVES

Indian National Space Promotion and Authorization Center (IN-SPACe)

- Facilitates private sector participation in India's space sector.

NewSpace India Limited (NSIL)

- Commercial arm of ISRO responsible for commercialisation of space technologies.

Indian Space Policy, 2023

Encourages:

- Private investment.
- Innovation.
- Commercial space activities.
- International competitiveness.

KEY HIGHLIGHTS

- **Mission:** Gaganyaan.
- **Agency:** Indian Space Research Organisation (ISRO).
- **Launch Vehicle:** LVM3.
- **Crew Capacity:** Up to 3 astronauts.
- **Orbit:** Low Earth Orbit (~400 km).
- **Future Space Station:** Bharatiya Antariksh Station (BAS).
- **Target for BAS:** 2035.
- **Long-Term Goal:** Indian astronaut on the Moon by 2040.
- **Strategic Importance:** Human spaceflight, scientific research, indigenous technology, and global space leadership.

PRELIMS BOOSTER BOX

Gaganyaan Mission

- India's first human spaceflight mission.
- Implemented by **ISRO**.
- Uses the **LVM3** launch vehicle.

Low Earth Orbit (LEO)

- Altitude: Approximately **160–2,000 km** above Earth.
- Gaganyaan mission planned at around **400 km**.

Bharatiya Antariksh Station (BAS)

- Proposed indigenous modular space station.
- Target operational year: **2035**.

IN-SPACe

- **Indian National Space Promotion and Authorization Center.**
- Regulates and promotes private participation in the space sector.

NSIL

- **NewSpace India Limited.**
- Commercial arm of ISRO.

Indian Space Policy, 2023

- Defines roles of ISRO, IN-SPACe, NSIL, and the private sector.
- Encourages commercialisation and innovation in space activities.

PadhAI-GENERATED UPSC MCQ

Consider the following statements regarding India's human spaceflight programme:

1. **Gaganyaan** aims to demonstrate India's capability to send astronauts into **Low Earth Orbit** and safely return them to Earth.
2. The **LVM3** serves as the launch vehicle for the Gaganyaan mission.
3. The proposed **Bharatiya Antariksh Station** is planned to be operational by **2035**.

Which of the statements given above is/are correct?

- (a) 1 and 2 only
- (b) 2 and 3 only
- (c) 1 and 3 only
- (d) 1, 2 and 3

Answer: (d)

4. GOVERNMENT NOTIFIES INVENTORY-BASED CROSS-BORDER E-COMMERCE EXPORT FRAMEWORK UNDER FOREIGN TRADE POLICY 2023



The framework aims to:

- Promote India's cross-border e-commerce exports.
- Enable inventory-based export operations under a regulated mechanism.
- Improve global market access for Indian manufacturers and MSMEs.
- Ensure transparency, traceability, and export compliance.
- Prevent diversion of export inventory into the domestic market.

BACKGROUND / CONTEXT

Foreign Trade Policy (FTP) 2023

The **Foreign Trade Policy 2023** seeks to:

- Boost India's merchandise and services exports.
- Promote ease of doing business.
- Digitise export processes.
- Support MSMEs and e-commerce exporters.
- Move towards the long-term goal of making India a major global export hub.

Cross-border e-commerce is one of the identified growth drivers under the policy.

WHAT IS INVENTORY-BASED CROSS-BORDER E-COMMERCE?

- Unlike the traditional marketplace model, the notified framework allows a designated **Exporter-on-Record (EoR)** entity to procure goods from Indian sellers and hold inventory **exclusively for export** through online channels.
- The inventory **cannot be sold in the domestic market**.

KEY FEATURES OF THE NEW FRAMEWORK

Exporter-on-Record (EoR)

- The inventory-holding entity must register as an **Exporter-on-Record** with DGFT.
- It must disclose ownership and shareholding details where required.

Procurement from Indian Sellers

- Goods must be sourced from **Indian manufacturers or sellers**.
- Sellers remain responsible for declaring the correct origin of goods.

Confirmed Export Orders

- Inventory procurement is permitted **only against confirmed export orders**.
- Speculative inventory build-up is not permitted.

Digital Traceability

The framework requires:

- Separate identification of export inventory.
- Digital record-keeping.
- Complete traceability across the supply chain.

No Domestic Sale

- Export inventory cannot be diverted into India's domestic market.
- This protects domestic retail regulations while supporting exports.

OBJECTIVES

- Increase India's e-commerce exports.
- Improve global market access for MSMEs.
- Enhance logistics efficiency.
- Encourage digital trade.
- Generate employment.
- Promote **'Made in India'** products internationally.

SIGNIFICANCE

For MSMEs

- Easier access to overseas consumers.
- Lower market-entry barriers.
- Better participation in global value chains.

For Exports

- Higher export competitiveness.
- Diversification of export channels.
- Growth in direct-to-consumer (D2C) exports.

For Manufacturing

- Encourages production of export-oriented goods.
- Supports the **Make in India** initiative.

For Digital Economy

- Strengthens India's digital commerce ecosystem.
- Encourages innovation in logistics and fulfilment.

CHALLENGES

- Ensuring regulatory compliance.
- Digital tracking of inventory.
- Efficient customs and logistics.
- Preventing misuse of the export-only framework.
- Meeting international product standards.

WAY FORWARD

- Expand digital export infrastructure.
- Strengthen customs facilitation.
- Enhance logistics and warehousing.
- Build MSME capacity for global e-commerce.
- Integrate with initiatives such as **Districts as Export Hubs** and **One District One Product (ODOP)**.

KEY HIGHLIGHTS

- **Framework:** Inventory-based Cross-border E-Commerce Export Framework.
- **Policy:** Foreign Trade Policy (FTP) 2023.
- **Implementing Agency:** Directorate General of Foreign Trade (DGFT).
- **Core Mechanism:** Exporter-on-Record (EoR).
- **Key Safeguards:** Confirmed export orders, digital traceability, no domestic diversion of export inventory.

- **Major Beneficiaries:** MSMEs, manufacturers, artisans, exporters.
- **Strategic Importance:** Export promotion, digital trade, manufacturing growth, and employment generation.

PRELIMS BOOSTER BOX

Foreign Trade Policy (FTP) 2023

- Released by the **Directorate General of Foreign Trade (DGFT)** under the **Ministry of Commerce and Industry**.
- Focuses on:
 - Export promotion.
 - Ease of doing business.
 - Digitalisation.
 - Districts as Export Hubs.

Directorate General of Foreign Trade (DGFT)

- Functions under the **Department of Commerce, Ministry of Commerce and Industry**.
- Responsible for implementing India's Foreign Trade Policy.

Exporter-on-Record (EoR)

- Entity responsible for export compliance, customs documentation, and shipment under the notified framework.

Cross-border E-Commerce

- Online sale of goods across international borders directly to consumers or businesses.

Related Initiatives

- **One District One Product (ODOP)**
- **Districts as Export Hubs**
- **Trade Connect ePlatform**
- **Export Promotion Mission**

PadhAI-GENERATED UPSC MCQ

Consider the following statements regarding the **Inventory-based Cross-border E-Commerce Export Framework notified under the Foreign Trade Policy (FTP) 2023**:

- The framework permits designated entities to hold inventory **exclusively for export**.
- Export inventory procured under the framework can be sold in the domestic market if export demand declines.



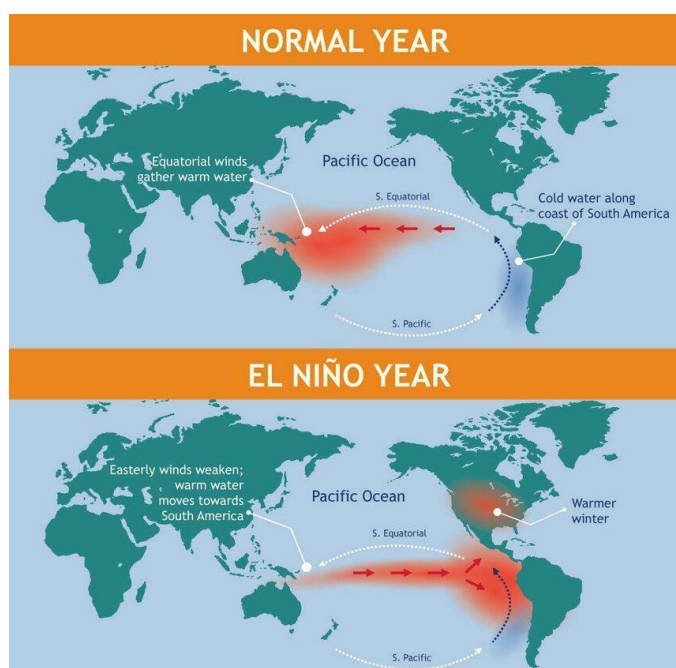
3. The **Directorate General of Foreign Trade (DGFT)** is responsible for implementing the framework.

Which of the statements given above is/are correct?

- (a) 1 and 2 only
(b) 2 and 3 only
(c) 1 and 3 only
(d) 1, 2 and 3

Answer: (c)

5. EARTH SCIENCES MINISTER DR. JITENDRA SINGH EXPLAINS EL NIÑO AND ITS MONSOON IMPACT IN LOK SABHA REPLY



- **El Niño** is a natural climate phenomenon characterised by **warmer-than-normal sea surface temperatures** in the **central and eastern equatorial Pacific Ocean**.
- It influences global weather patterns, including India's southwest monsoon.
- Although El Niño is generally associated with **below-normal monsoon rainfall**, its impact is **not deterministic**, as several other climatic factors also affect the monsoon.

BACKGROUND / CONTEXT

What is El Niño?

El Niño is the **warm phase** of the **El Niño–Southern Oscillation (ENSO)**.

It occurs when:

- Sea surface temperatures (SSTs) become **warmer than normal** in the central and eastern equatorial Pacific.
- Trade winds weaken.
- Atmospheric circulation patterns shift.

ENSO (El Niño–Southern Oscillation)

ENSO has three phases:

1. **El Niño** – Warm phase.
2. **La Niña** – Cool phase.
3. **Neutral** – Neither warm nor cool phase.

HOW DOES EL NIÑO AFFECT THE INDIAN MONSOON?

Normally:

- Warm waters in the western Pacific promote strong convection.
- Moisture-laden winds strengthen the southwest monsoon.

During El Niño:

- Warm waters shift eastward.
- Convection weakens over the Indian Ocean region.
- Monsoon circulation may weaken.
- Rainfall over India can be below normal.

However, the relationship is **not one-to-one**, and India has experienced normal monsoons during some El Niño years due to the influence of other climate systems.

OTHER FACTORS INFLUENCING THE MONSOON

Indian Ocean Dipole (IOD)

- Difference in sea surface temperatures between the western and eastern Indian Ocean.
- A **positive IOD** can offset the adverse effects of El Niño.

Madden–Julian Oscillation (MJO)

- Eastward-moving pulse of clouds and rainfall in the tropics.
- Influences active and break phases of the monsoon.

Eurasian Snow Cover

- Affects land–sea temperature contrast.
- Influences monsoon circulation.

Arabian Sea & Bay of Bengal Conditions

- Sea surface temperatures.
- Moisture availability.
- Cyclonic activity.

ROLE OF IMD

India Meteorological Department (IMD)

The IMD is responsible for:

- Monsoon forecasting.
- Weather observations.
- Climate monitoring.
- Early warning services.

It uses:

- Dynamical climate models.
- Statistical models.
- Ocean–atmosphere observations.
- Satellite and Doppler weather radar data.

SIGNIFICANCE

Agriculture

- Nearly half of India's net sown area still depends substantially on rainfall.
- Monsoon performance affects:
 - Food production.
 - Rural livelihoods.
 - Agricultural incomes.

Water Resources

Influences:

- Reservoir storage.
- Groundwater recharge.
- River flows.

Economy

Affects:

- Inflation.
- Food prices.
- Rural demand.
- Overall economic growth.

Disaster Management

Poor or erratic monsoons can lead to:

- Droughts.
- Floods.

- Heatwaves.
- Crop losses.

GOVERNMENT INITIATIVES

Monsoon Mission

Improves:

- Seasonal forecasting.
- High-resolution climate modelling.
- Weather prediction capability.

Pradhan Mantri Krishi Sinchayee Yojana (PMKSY)

Enhances:

- Irrigation coverage.
- Water-use efficiency.
- Climate-resilient agriculture.

National Mission for Sustainable Agriculture (NMSA)

Promotes:

- Climate-resilient farming.
- Water conservation.
- Crop diversification.

CHALLENGES

- Increasing climate variability.
- Extreme rainfall events.
- Forecast uncertainty.
- Changing ENSO–monsoon relationship.
- Rising temperatures due to climate change.

WAY FORWARD

- Improve seasonal forecasting accuracy.
- Strengthen climate-resilient agriculture.
- Expand irrigation infrastructure.
- Enhance weather advisory services for farmers.
- Invest in climate research and observation systems.

KEY HIGHLIGHTS

- **Phenomenon:** El Niño.
- **Climate System:** ENSO (El Niño–Southern Oscillation).
- **Primary Effect:** Warmer central and eastern equatorial Pacific Ocean.
- **Impact on India:** Can weaken the southwest monsoon, but the outcome depends on multiple climate drivers.



- **Key Institutions:** Ministry of Earth Sciences (MoES), India Meteorological Department (IMD).
- **Related Factors:** Indian Ocean Dipole (IOD), Madden–Julian Oscillation (MJO), Eurasian snow cover.
- **Strategic Importance:** Agriculture, water security, disaster management, and economic stability.

PRELIMS BOOSTER BOX

El Niño

- Warm phase of the **El Niño–Southern Oscillation (ENSO)**.
- Characterised by **warmer-than-normal sea surface temperatures** in the **central and eastern equatorial Pacific Ocean**.

La Niña

- Cool phase of ENSO.
- Often associated with **better-than-normal monsoon rainfall** over India, though not invariably.

Indian Ocean Dipole (IOD)

- Difference in sea surface temperatures between the western and eastern Indian Ocean.
- A **positive IOD** can partially compensate for El Niño's adverse impact on the Indian monsoon.

Madden–Julian Oscillation (MJO)

- Eastward-moving tropical atmospheric disturbance affecting rainfall and monsoon activity.

India Meteorological Department (IMD)

- Established: **1875**
- Ministry: **Ministry of Earth Sciences (MoES)**.
- Responsible for weather forecasting, cyclone warnings, and monsoon prediction.

Monsoon Mission

- Government programme to improve monsoon forecasting through advanced climate models and observational systems.

PadhAI-GENERATED UPSC MCQ

Consider the following statements regarding El Niño and the Indian Monsoon:

1. **El Niño** is characterised by warmer-than-normal sea surface temperatures in the central and eastern equatorial Pacific Ocean.
2. A **positive Indian Ocean Dipole (IOD)** can reduce or offset the adverse impact of El Niño on the Indian monsoon.
3. The **India Meteorological Department (IMD)** functions under the **Ministry of Earth Sciences**.

Which of the statements given above is/are correct?

- (a) 1 and 2 only
- (b) 2 and 3 only
- (c) 1 and 3 only
- (d) 1, 2 and 3

Answer: (d)