CLAT 2026

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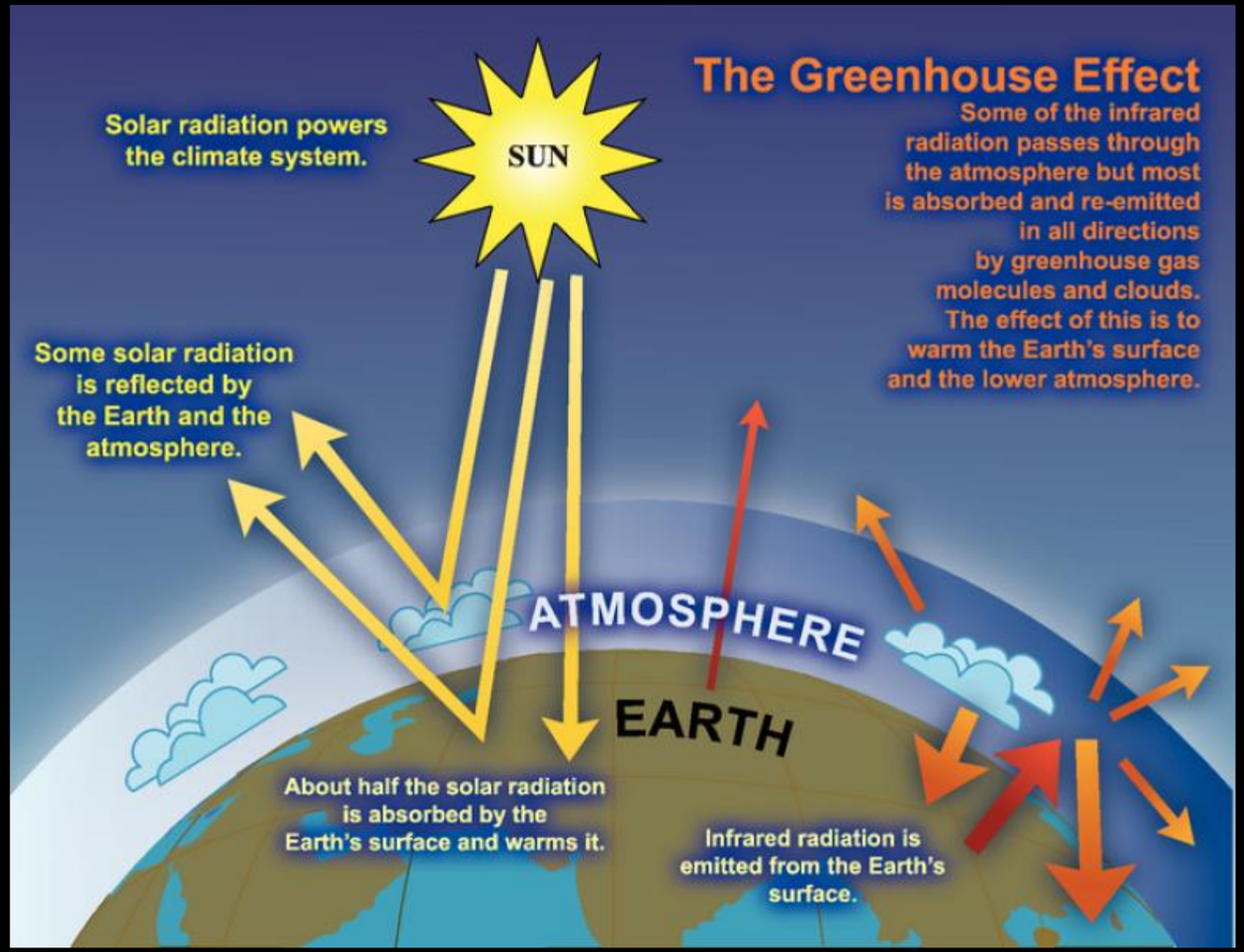
NON STOP 3HOUR+

MARATHON

CURRENT AFFAIRS & G.K

LIVE YouTube

Time : 7 PM Onwards in the evening Live



THE GREEN HOUSE EFFECT

The Greenhouse Effect: Introduction

- The Greenhouse Effect is a natural atmospheric process that warms the Earth's surface.
- Certain gases trap heat radiated from Earth and prevent it from escaping into space.
- Without it, Earth's average temperature would be –18°C, making life impossible.
- Problem arises when human activities intensify this natural effect → Global Warming.

How the Greenhouse Effect Works (Step-by-Step)

1	2	3
Sunlight reaches Earth as short-wave solar radiation.	Earth absorbs some of this energy ↠ warms the surface.	Earth re-emits heat as long-wave infrared radiation.

4	5
Greenhouse gases absorb & re-radiate this heat back to the surface.	The atmosphere acts like a "heat-trapping blanket", regulating temperature.

Natural vs Enhanced Greenhouse Effect

Natural Greenhouse Effect

- Occurs naturally
- Maintains stable climate
- Supports life, ecosystems, water cycle

Enhanced/Anthropogenic Greenhouse Effect

- Caused by human activities
- Excessive heat trapping
- Leads to global warming + climate change
- Faster temperature rise than any known natural cycle

Major Greenhouse Gases (GHGs)

1

Carbon Dioxide (CO_2)

- Contribution: ~76% of global emissions
- Sources: Fossil fuels, deforestation, cement industry
- Lifetime: Hundreds of years

2

Methane (CH_4)

- GWP: 28–34 times stronger than CO_2
- Sources: Livestock, paddy fields, landfills, oil & gas leaks
- Lifetime: 12 years

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Nitrous Oxide (N_2O)

- GWP: 265–298 times stronger
- Sources: Agriculture (fertilisers), biomass burning, industry

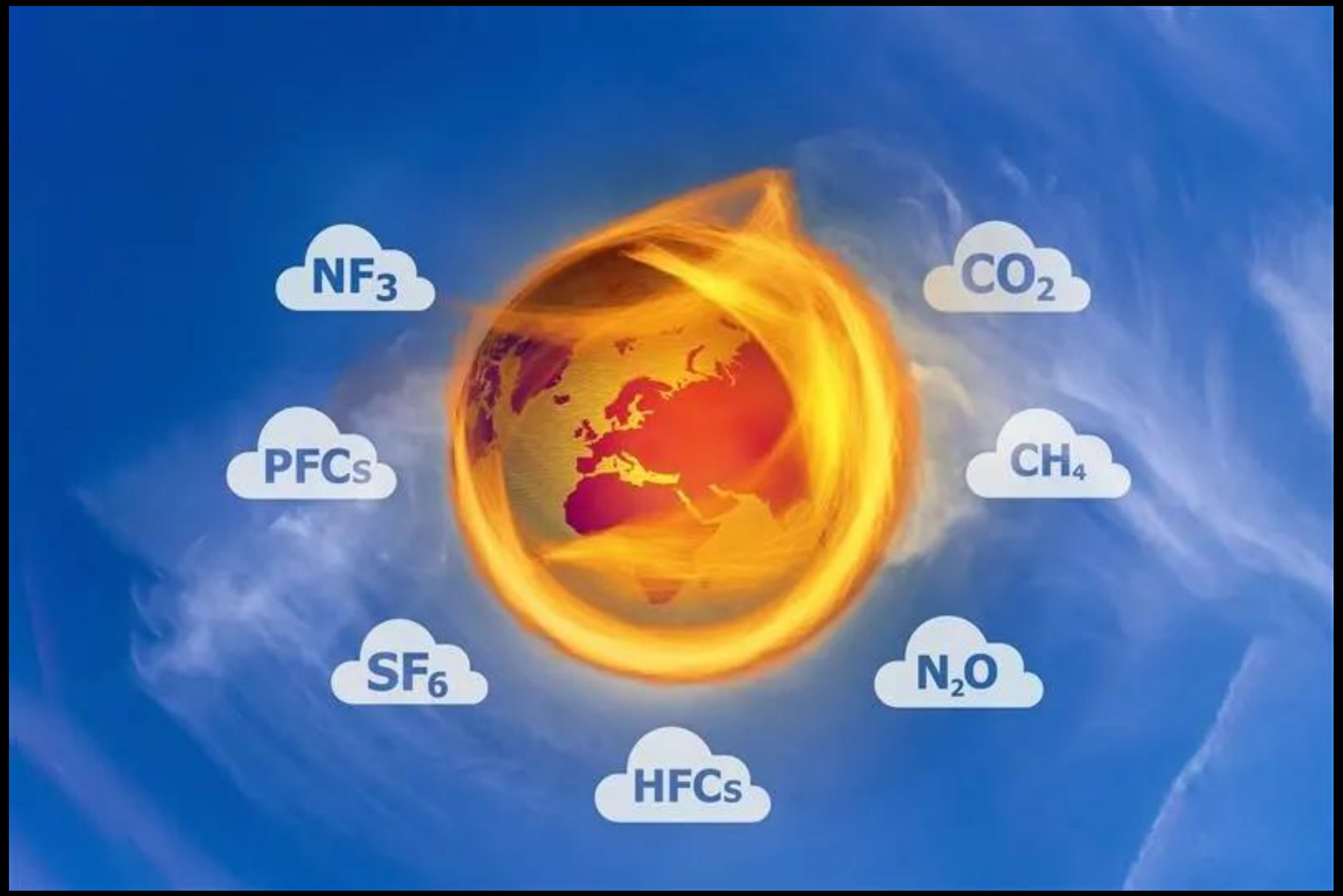
Fluorinated Gases (F-gases)

- Highest GWP (thousands of times stronger)
- Sources: Refrigeration, ACs, manufacturing

Water Vapour

- Natural GHG, but increases with warming → positive feedback

Fluorinated Gases (F-gases) – High Impact Greenhouse Gases



Fluorinated Gases (F-Gases)

(High-impact Greenhouse Gases used in industry, refrigeration, and electronics)

1. What Are F-Gases?

F-gases = Fluorinated Greenhouse Gases, which are synthetic (man-made) gases used mainly in:

- Refrigeration & air-conditioning
- Electronics manufacturing
- Fire suppression
- Industrial solvents
- Aerosols

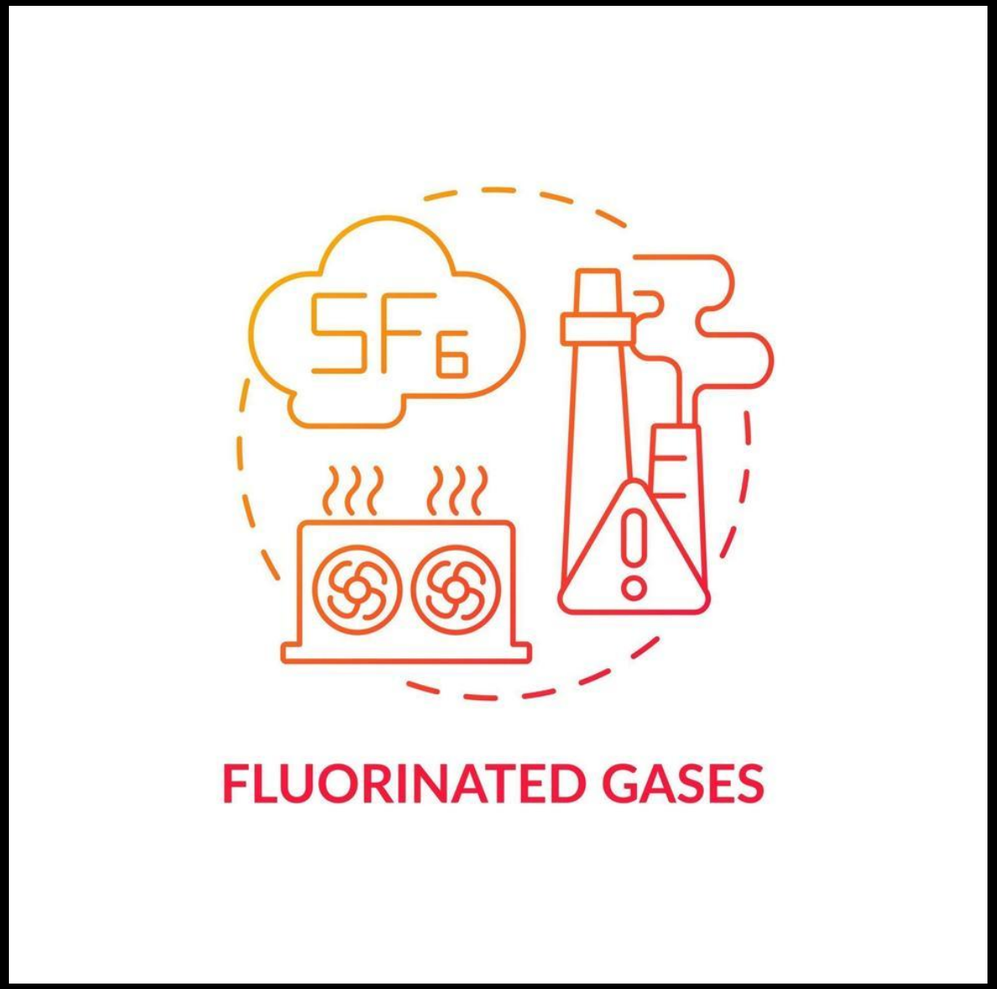
They are not naturally present in the atmosphere.

2. Types of F-Gases

F-gases include four major families:

1. HFCs — Hydrofluorocarbons

- Used in ACs, refrigerators, car ACs
- Replaced Ozone-destroying CFCs/HCFCs
- Strong greenhouse gases
- Controlled by Kigali Amendment (2016)



2. PFCs — Perfluorocarbons

- Used in aluminium production, semiconductor (chip) manufacturing
- Extremely long atmospheric lifetime (up to 50,000 years!)

3. SF_6 — Sulphur Hexafluoride

- Used in electrical equipment (switchgear), circuit breakers
- Most potent GHG known
- Global Warming Potential (GWP): ≈ 23,500 times CO_2

4. NF_3 — Nitrogen Trifluoride

- Used in LCD panels, solar PV manufacturing, semiconductors
- Very high GWP
- Increasing rapidly because of electronics boom

3. Why Are F-Gases Dangerous?

Extremely High Global Warming Potential (GWP)

Compared to CO_2 (GWP = 1):

1,430	23,500	17,200	7K–12K
HFC-134a	SF_6	NF_3	PFCs
GWP compared to CO_2	GWP compared to CO_2	GWP compared to CO_2	GWP compared to CO_2

Thus, even small emissions cause massive warming.

Very Long Atmospheric Lifetimes

- HFCs → decades
- PFCs → thousands of years
- SF_6 → 3,200 years
- NF_3 → ~740 years

Rapidly Increasing Due to Industrialisation

Driven by:

- Air-conditioning boom
- Refrigeration industry
- Semiconductor manufacturing
- Clean-room technology
- LED/LCD and photovoltaic panel production

4. How Are F-Gases Regulated?

a) Kyoto Protocol (1997)

First international treaty to control F-gases.

b) Kigali Amendment to Montreal Protocol (2016)

- Legally binding
- Phase-down of HFCs by 80–85% by 2047
- India's schedule:
  - Freeze in 2028
  - 85% reduction by 2047

c) EU F-Gas Regulations

Strictest rules in the world; aims to cut F-gas use by 2/3 by 2030.

5. Sources of F-Gas Emissions

- Leakage from ACs & refrigerators
- Disposal of old appliances
- Semiconductor manufacturing (PFCs & NF_3)
- Power sector equipment (SF_6 leaks)
- Aerosols & fire extinguishers
- Foam blowing industries

Why Greenhouse Gases Are Rising

- Fossil fuel burning (coal, oil, gas)
- Industrialisation & urbanisation
- Deforestation reduces CO_2 absorption
- Agriculture intensification (livestock, fertilisers)
- Waste mismanagement (landfills ↠ methane)
- Air travel & shipping emissions
- Energy-inefficient urban development

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Why the Greenhouse Effect is Now a Worry

1. Record-breaking Global Temperatures

- Last decade = warmest in recorded history
- 2023 & 2024 saw unprecedented heatwaves

2. Extreme Weather Events

- Intense rainfall, cloudbursts
- Forest fires
- Category-5 cyclones
- Marine heatwaves

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Climate Crisis Impacts

3. Melting Glaciers & Polar Ice

- Threat to Himalayas
- Sea-level rise → coastal flooding (including India)

4. Ocean Warming & Acidification

- Coral bleaching
- Loss of fisheries
- Collapse of marine ecosystems

Carbon Dioxide: The Dominant Culprit

- Energy sector contributes ~75% of CO_2 emissions
- Cement & steel industry huge emitters
- Transportation ↠ fast-rising carbon source
- CO_2 remains in atmosphere for centuries ↠ long-term warming lock-in

Methane: The Silent Danger

Much more powerful than CO_2

Shorter lifetime ↠ but rapid warming

Agriculture is the largest source in India

Leaks from natural gas pipelines = major global issue

Methane reduction is the fastest way to slow warming

International Concern (Treaties & Frameworks)

1 UNFCCC (1992)

Framework for tackling climate change

2 Kyoto Protocol (1997)

Legally binding emission reduction for developed countries

3 Paris Agreement (2015)

- Limit warming below 2°C, target 1.5°C
- Nationally Determined Contributions (NDCs)

4 IPCC Reports

Scientific basis showing urgent need to cut GHGs

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India's Position

India is the third-largest emitter, but with low per capita emissions

Major commitments:

- Net-zero target by 2070
- Reduce emission intensity by 45% by 2030
- Achieve 50% non-fossil electricity capacity by 2030

India focuses heavily on renewable energy expansion, electric mobility, green hydrogen & afforestation.

Green Credit Programme (GCP)

Green Credit Programme (GCP)

Full Name: Green Credit Programme (GCP)

Launched / Notified: Draft rules notified on 12 October 2023; officially launched during COP28 (1 December 2023).

Nodal Ministry: Ministry of Environment, Forest and Climate Change (MoEFCC)

- **Administrator:** Indian Council of Forestry Research and Education (ICFRE), Dehradun.

- **Objective:** To create a market-based mechanism to incentivise voluntary environmental actions (plantation, restoration, water conservation, sustainable agriculture, waste management, air pollution control, mangrove conservation, green buildings) by issuance of tradable "Green Credits".

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Key Features & Scope

Eligible Activities

Initially tree plantation and eco-restoration; gradually expanding to 8 sectors including: tree plantation, water management, sustainable agriculture, waste management, air pollution reduction, mangrove conservation, Ecomark & sustainable infrastructure.

Land Parcels

Minimum size requirement (e.g., 5 ha) of degraded land/areas under State Forest Departments for plantation & restoration.

Credit Issuance

Example methodology — One-tree = one Green Credit (subject to survival criteria & minimum density); in revised norms, credits would be granted after 5 years and minimum 40% canopy cover.

Trading Mechanism

Green Credits to be tradable on a domestic platform via a Green Credit Registry; can be used for environmental obligations (e.g., compensatory afforestation, CSR/ESG).

Institutional Framework & Implementation

01

Steering Committee

Inter-ministerial, headed by Environment Secretary overseeing GCP implementation.

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Administrator (ICFRE)

Develops guidelines, methodologies, maintains the registry, accredits agencies.

ćċ

State Forest Departments / Designated Agencies

Identify land parcels, implement afforestation/restoration, monitor survivals.

04

Registry & Platform

Digital portal for registration → verification → credit issuance → trading. (https://www.moefcc-gcp.in)

Funding, Use Cases & Linkages

Use Cases of Green Credits

Can be used by companies/industries for compensatory afforestation obligations under the Forest (Conservation) Act, 1980 (as amended), CSR/ESG obligations under Securities and Exchange Board of India (SEBI) reporting, voluntary environmental actions.

Linkages

Mission LiFE

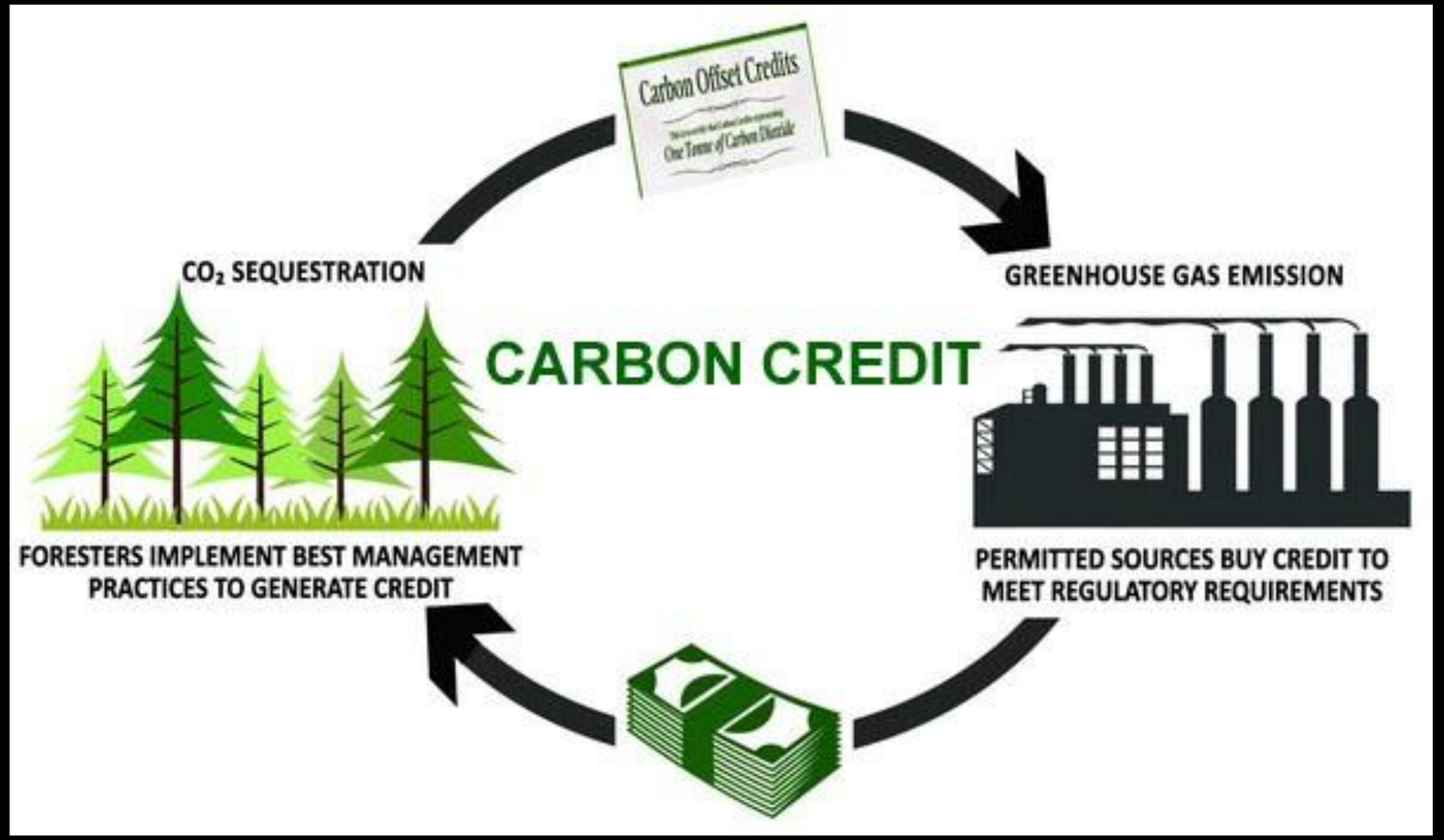
Lifestyle for Environment initiative by PM.

Sustainable Development Goals

SDG 13 (Climate Action), SDG 15 (Life on Land).

Latest Update (Aug 2025): Methodology revised to focus not only on tree count but canopy cover & 5-year survival for credits.

Carbon Credit Trading Scheme (CCTS)



Carbon Credit Trading Scheme (CCTS)

Full Name: Carbon Credit Trading Scheme (CCTS), 2023

Notified under: Energy Conservation (Amendment) Act, 2022 (Section 14AA).

Date of Notification: 28 June 2023 (by Ministry of Power).

Nodal Ministry: Ministry of Power (MoP).

Implementing Agency: Bureau of Energy Efficiency (BEE), New Delhi.

Regulatory Authority: Central Electricity Regulatory Commission (CERC).

Objective & Goal

Objective:

To establish a domestic market-based mechanism for the generation, trading, and use of carbon credits by industries, utilities, and sectors reducing greenhouse gas (GHG) emissions.

Goal: Support India's Net Zero by 2070 target and its NDC under the Paris Agreement.

Legal & Institutional Framework

Institution / Authority	Function
Ministry of Power (MoP)	Policy formulation, notification of eligible sectors, targets, and trading rules.
Bureau of Energy Efficiency (BEE)	Nodal agency managing accreditation, registry, verification, and credit issuance.
Central Electricity Regulatory Commission (CERC)	Regulates carbon market trading, transaction approval, dispute resolution.

Key Institutional Players

Institution / Authority	Function
Grid Controller of India Ltd. (Grid-India)	Market registry operator; maintains digital carbon credit registry.
Accredited Carbon Verifiers (ACVs)	Conduct monitoring, reporting, and verification (MRV) of projects.
Ministry of Environment, Forest & Climate Change (MoEFCC)	Coordinates alignment with UNFCCC and international mechanisms.

Mechanism of Carbon Credit Trading in India

Step-wise Process:

01

Project Identification

Industries implement carbon-saving projects (e.g., energy efficiency, renewable integration, green hydrogen, carbon capture).

02

Verification

BEE-accredited agencies verify reductions (in tCO_2e).

03

Certification

Verified reductions converted into Carbon Credit Certificates (CCCs).

04

Registry & Trading

Credits registered on Indian Carbon Market Registry (managed by Grid-India) and traded through designated power exchanges.

05

Compliance & Utilisation

Entities use credits to meet emission targets or trade them voluntarily.

Types of Markets & Trading Platforms

Types of Markets:

Compliance Market

Obligated entities under national emission caps.

Voluntary Market

Unregulated participants offset emissions voluntarily.

Trading Platforms:

Indian Energy Exchange (IEX) and Power Exchange India Limited (PEXIL).

Scope, Sectors & Key Data

1

Initial Sectors (2024–25):

Power, Cement, Steel, Fertilizer, Refinery, Transport, Building & Waste.

2

Unit Definition:

1 Carbon Credit = 1 tonne of CO_2 equivalent reduction (tCO_2e).

3

Registry Status (2025):

Pilot trading simulation completed; full rollout expected 2026.

4

Target:

Achieve 1 billion tCO_2e reductions by 2030 from registered projects.

International Linkages & Policy Alignment

Framework / Treaty	Relevance to CCTS 2023
UNFCCC (1992)	Provides global legal context for GHG emission reduction.
Kyoto Protocol (1997)	Introduced carbon trading via Clean Development Mechanism (CDM).
Paris Agreement (2015) – Article 6	Establishes international carbon market rules; India's scheme aligns with these.
India's NDCs (2022 Update)	Commit to reduce emission intensity by 45 % of 2005 levels by 2030 and achieve net zero by 2070.
ISA & IRENA Cooperation	Global clean-energy partnerships to help industries access green credits.

Conceptual Comparison – Green Credit vs. Carbon Credit

Parameter	Green Credit Programme (GCP)	Carbon Credit Mechanism
Origin / Launch	Introduced by MoEFCC, India – 2023 (notified Oct 2023).	Emerged under Kyoto Protocol (1997) and continued under Paris Agreement (2015).
Legal Basis (India)	Environment (Protection) Act, 1986 → Rule 16A (Green Credit Rules 2023).	Energy Conservation (Amendment) Act, 2022 → Carbon Credit Trading Scheme 2023 (MoP + BEE).
Nodal Ministry	Ministry of Environment, Forest & Climate Change (MoEFCC).	Ministry of Power (MoP); administered by Bureau of Energy Efficiency (BEE).

Comparison Continued

Parameter	Green Credit Programme (GCP)	Carbon Credit Mechanism
Objective	Incentivise voluntary environmental actions (tree plantation, water, waste, etc.).	Incentivise GHG emission reduction by tradable carbon units (1 ton CO_2 = 1 credit).
Administrator	ICFRE (Dehradun) – maintains Green Credit Registry & portal.	BEE (New Delhi) – designs compliance & voluntary carbon market framework.
Activity Scope	Broader environmental sectors: afforestation, water, waste, sustainable agri, etc.	Emission-specific: renewable energy, efficiency, carbon sequestration.
Credit Unit Basis	Activity-linked (e.g., tree survival, canopy cover, waste managed).	Quantitative GHG reduction measured in tCO_2e (ton of CO_2 equivalent).
Market Type	Domestic, voluntary, non-emission-based environmental credit market.	Domestic + international, emission-based compliance & voluntary markets.

Interlinkages & Institutions

Aspect	Green Credit (GCP)	Carbon Credit
Trading Platform	Green Credit Registry & Trading Platform under MoEFCC (operational 2024).	Indian Carbon Market (ICM) under BEE & CERC (notified 2023).
Verification & Validation	Done by ICFRE + Accredited Agencies – focus on survival, coverage, impact metrics.	Verified by Designated Operational Entities (DOEs) or Accredited Carbon Verifiers (ACVs).

Institutional Linkages Continued

Aspect	Green Credit (GCP)	Carbon Credit
International Linkage	Aligns with SDG 13 (Climate Action) & SDG 15 (Life on Land).	Linked to UNFCCC, Kyoto Protocol, Paris Agreement Article 6 (carbon trading framework).
Complementary National Missions	Mission LiFE (2022), National Afforestation Programme, Amrit Dharohar.	National Carbon Credit Trading Scheme (2023), Perform Achieve Trade (PAT) Mechanism.
Key Institutions	MoEFCC, ICFRE, State Forest Departments, CSR Entities.	MoP, BEE, CERC, DISCOMs, Renewable Energy Producers.
Output	"Green Credits" – multi-dimensional environmental improvement tokens.	"Carbon Credits" – certified GHG reduction units (tCO_2e).
Example of Usage	A corporate earns credits by restoring wetlands → can trade for CSR / ESG offsets.	A company reduces CO_2 emissions by 1 ton → can trade one carbon credit.

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Carbon Tax, CBAM & India's Response

Introduction: Why in News?

FTA Signing

On May 6, 2025, India and the UK signed a Free Trade Agreement (FTA) after 3 years of negotiation.

Major Hurdle

One major hurdle: UK's Carbon Border Adjustment Mechanism (CBAM) — a form of carbon tax on imports from countries like India.

India's Push

India pushed for a "rebalancing mechanism" to compensate Indian exporters hurt by CBAM and prevent future WTO disputes.

What is a Carbon Tax?

Definition

Defined by the World Bank as a direct tax on greenhouse gas (GHG) emissions, or on the carbon content of fossil fuels.

Carbon Pricing Systems

1. Carbon Tax
2. Emissions Trading System (ETS)

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Purpose:

Disincentivize fossil fuel use.

Promote cleaner production and consumption practices.

Raise revenue for green transitions.

What is the Carbon Border Adjustment Mechanism (CBAM)?

Origin

Introduced by the European Union in 2021.

UK Implementation

UK's own CBAM law is expected to take effect from January 2027.

Objective:

Environmental Standards

Maintain EU/UK domestic environmental standards by taxing imported goods based on their carbon footprint.

Avoid "carbon leakage": when companies relocate to countries with weaker climate laws to avoid carbon pricing.

Sectors Covered

- Aluminium
- Iron & Steel
- Cement
- Fertilisers
- Hydrogen (all high-emission sectors)

How it Works:

Emission Reporting

Exporters to the EU/UK must report embedded emissions.

Benchmark Comparison

Emissions are compared against EU/UK standards.

Border Taxation

Goods with emissions exceeding EU/UK benchmarks are taxed at the border.

Climate Justice principles

India's Objections:

Concern	Explanation
Violation of CBDR Principle	CBAM violates Common But Differentiated Responsibilities under UNFCCC and Paris Agreement, which acknowledge developing nations need policy space to grow.
Trade Protectionism	It's seen as a non-tariff trade barrier disguised as climate action.

Export Disruption and Cost Burden

Export Disruption

EU accounts for 15%+ of India's goods exports; key sectors like steel, cement, and aluminium will be disproportionately affected.

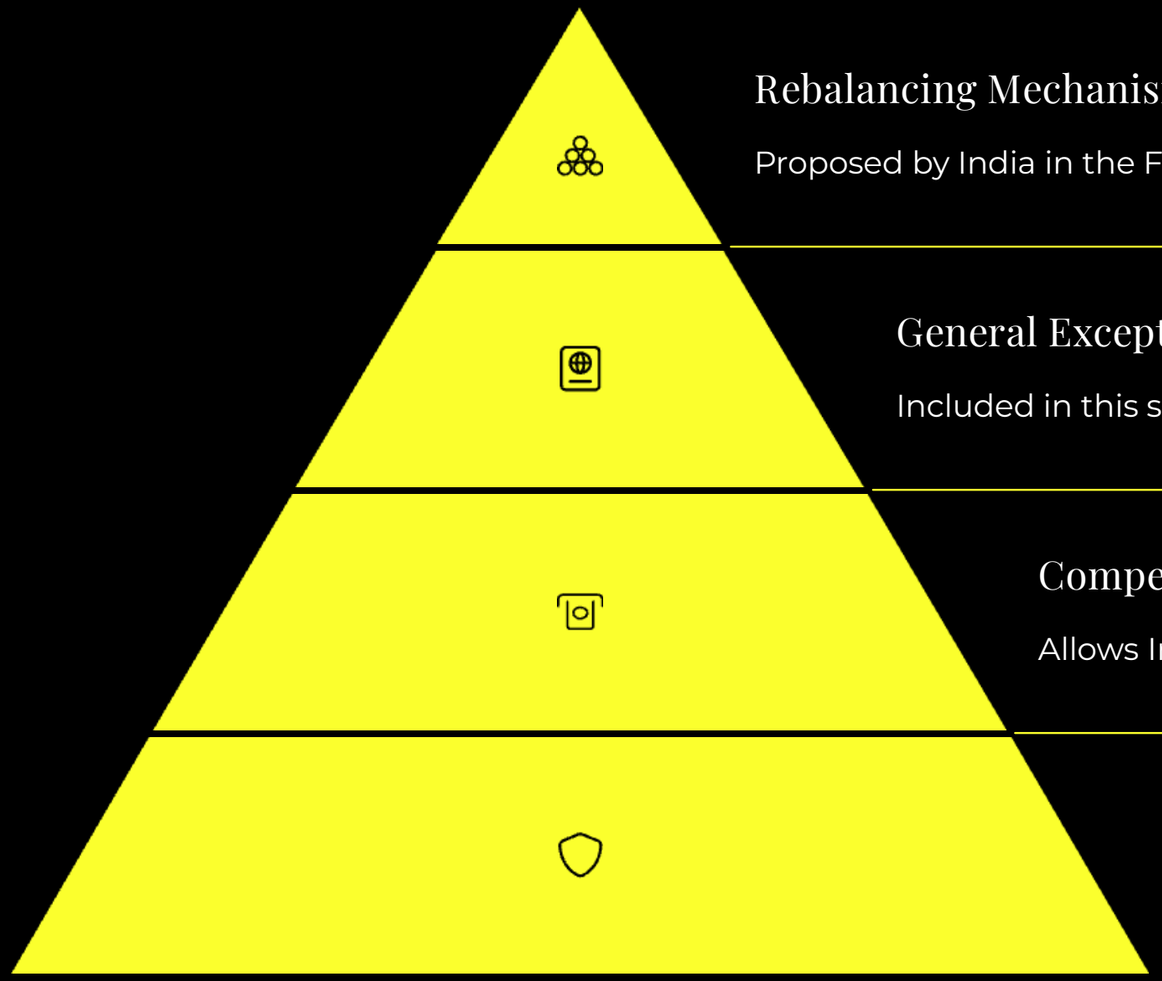
Cost Burden

Indian industries may lack technology/funds to meet EU/UK benchmarks, putting them at a disadvantage.

No Concessions

UK has refused to exempt or compensate Indian exporters under CBAM.

India's Counter-Response in the FTA



Rebalancing Mechanism

Proposed by India in the FTA

General Exceptions Chapter

Included in this section of the FTA

Compensation Claims

Allows India to claim for export losses due to CBAM

WTO Protection

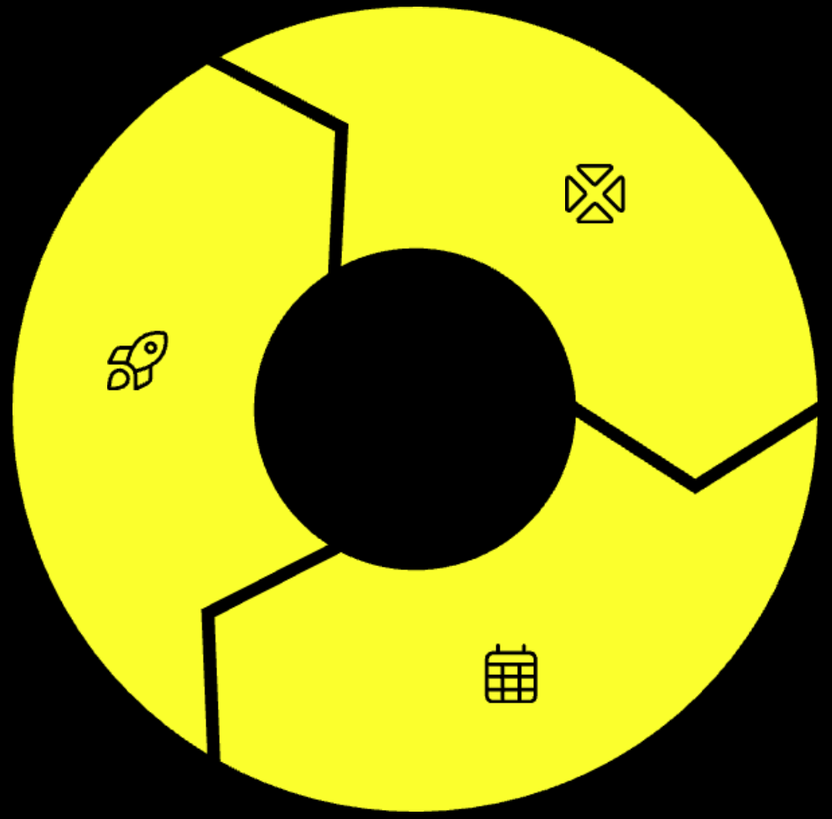
Prevents UK from challenging India at the WTO for retaliatory actions

General Exceptions (GATT Article XX): Allow trade rule violations for environment, public health, etc.

India's Carbon Credit Trading Scheme (CCTS)

Launch

India's domestic market mechanism to reduce emissions, launched in 2023



Alignment

Aligned with India's Paris Climate Agreement goals

Long-term Goal

Supporting India's net-zero target by 2070

Key Features:

Element	Description
CCTS	Framework for trading Carbon Credit Certificates (CCCs) in domestic carbon market
Compliance Mechanism	Mandatory for high-emission sectors (e.g., cement, steel, power) to meet emission intensity targets
Offset Mechanism	Voluntary for others to earn CCCs by reducing, avoiding, or removing emissions
Target Rules 2025	Draft GEI (Greenhouse Gas Emission Intensity) Target Rules notified on April 16, 2025 to regulate compliance

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Issuing of Certificates:

Meeting Targets

Entities meeting reduction targets → Earn CCCs

Exceeding Caps

Entities exceeding caps → Buy CCCs in market

Cost-Effective Decarbonization

Promotes cost-effective decarbonization

INDIA'S ACTION PLAN

The country is working to boost its domestic carbon credit market

1. India plans to develop the Indian Carb Market (ICM), with an objective to decarbonise the Indian economy by pricing GHG emissions through tradi of carbon credit certificates
2. The ICM is being created in compliance with Article 6.2 of the Paris Agreement
3. The Bureau of Energy Efficiency, unde the power ministry, along with the Ministry of Environment, Forest and Climate Change is working to develop a Carbon Credit Trading Scheme that expected to be notified in June 2023
4. Carbon Credit Certificates under the CCTS are expected to be available for trading by 2025

Globally Important Agricultural Heritage Systems (GIAHS)

Food and Agriculture Organization of the United Nations

Globally Important AGRICULTURAL HERITAGE Systems

GIAHS
Globally Important Agricultural Heritage Systems

About FAO (Food and Agriculture Organization)

Full Form: Food and Agriculture Organization of the United Nations

Established: 1945

Headquarters: Rome, Italy

Motto: Fiat Panis ("Let there be bread")

Members: 195 (194 countries + EU)

India's Membership: Founding member (since 1945)

Main Objectives:

- Eliminate hunger & ensure food security.
- Promote sustainable agriculture, fisheries & forestry.
- Support climate-resilient agri systems & biodiversity.

FAO's Specialized Programmes include:

GIAHS

Globally Important Agricultural Heritage Systems

FAO-GEF

Biodiversity for Food and Agriculture

Global Soil Partnership

Sustainable soil management worldwide

World Food Day

Observance (Oct 16 every year)

What is GIAHS? (Definition & Vision)

Definition (FAO, 2002):

> "GIAHS are remarkable land use systems and landscapes rich in biological diversity, evolving from the co-adaptation of a community with its environment and its needs and aspirations for sustainable development."

To recognize and conserve living, evolving agricultural systems that:

- Sustain food & livelihood security
- Preserve agrobiodiversity
- Uphold traditional knowledge
- Maintain ecosystem resilience & cultural heritage

Launched by: FAO in 2002 at the World Summit on Sustainable Development (WSSD), Johannesburg.

Objectives of GIAHS Programme

01

Conservation

Safeguard traditional agricultural knowledge, practices, and biodiversity.

02

Sustainability

Promote long-term food security and ecosystem stability.

03

Livelihoods

Support indigenous and local farming communities.

04

Cultural Heritage

Protect intangible agricultural traditions and rituals.

05

Resilience

Strengthen adaptation to climate change & natural disasters.

06

Awareness

Showcase agri-heritage to promote eco-tourism & education.

Criteria for Designation as GIAHS (FAO Guidelines)

A site must exhibit:

1. **Food & Livelihood Security**

   Reliable production system for local communities.

2. **Agrobiodiversity**

   Rich diversity of crops, animals, and microorganisms.

3. **Indigenous Knowledge Systems**

   Traditional resource management practices.

4. **Cultural Values**

   Unique traditions, festivals, governance, and social norms.

5. **Remarkable Landscapes**

   Harmony between people and environment.

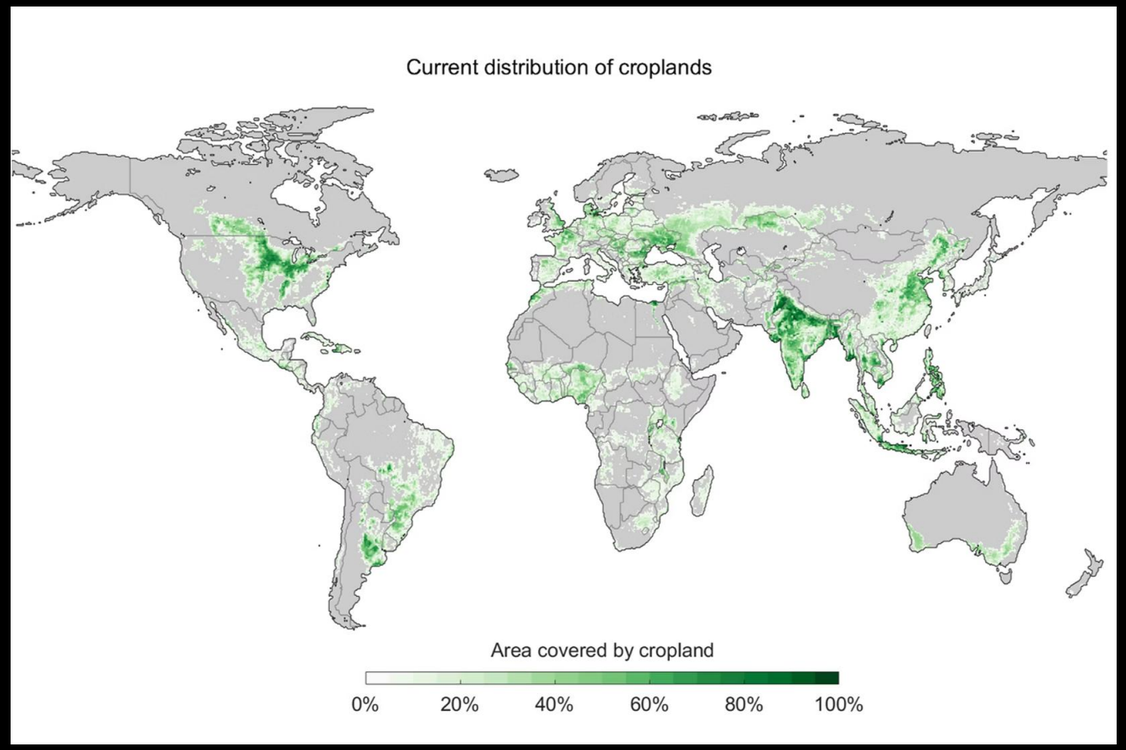
Global Status (as of 2025)

Key Statistics:

- **Recognized Sites:** 99 GIAHS sites across 29 countries (FAO, 2025).
- **Countries with multiple sites:** China, Japan, Korea, Peru, Italy, Spain.

Recent Additions:

- Tajikistan's Mountain Agropastoral System (Central Asia's first).
- Korea's Pine Tree Agroforestry & Bamboo-Fishery Systems.
- Portugal's Montado Agro-Silvo-Pastoral System.



Global Regions Involved: Asia-Pacific, Latin America, Africa, Mediterranean, Near East.

India's Recognized GIAHS Sites

Site	State / Region	Distinctive Features
Koraput Traditional Agricultural System	Odisha	79 indigenous rice varieties; tribal knowledge; shifting cultivation (podu); home gardens; integrated ecosystem.
Kuttanad Below Sea-Level Farming System	Kerala	Only system in the world practicing rice cultivation below mean sea level; integrates paddy, coconut, duck rearing, and aquaculture.
Saffron Heritage of Kashmir	Jammu & Kashmir	Ancient saffron cultivation (~2000 years old); grown at 1600–1800m; sustainable water harvesting (Karewa soils).

Nodal Institution for GIAHS in India:

- Indian Council of Agricultural Research (ICAR)
- Ministry of Agriculture & Farmers Welfare (coordinates nominations).

Core Features & Values of GIAHS

Agrobiodiversity

Unique local crop varieties (landraces).

Traditional Knowledge

Indigenous soil & water management, seed saving.

Cultural Practices

Rituals, songs, and community governance linked to agriculture.

Sustainability

Low external inputs, organic, closed-loop systems.

Ecosystem Services

Pollination, water regulation, nutrient recycling.

Adaptive Capacity

Evolved to withstand droughts, floods, or salinity.

Benefits of GIAHS Recognition

✓ Global Visibility & Funding

FAO support for conservation & capacity building.

✓ Livelihood Boost

Promotes eco-tourism, branding of traditional products.

✓ Biodiversity Conservation

In-situ preservation of crop varieties and genetic material.

✓ Cultural Revival

Restores respect for traditional farmers & women's knowledge.

✓ Policy Leverage

Helps integrate conservation with development schemes (e.g. MGNREGA, Paramparagat Krishi Vikas Yojana).

Linkages with Global Agendas

UN SDGs:

SDG 2

Zero Hunger

SDG 12

Responsible Consumption and Production

SDG 13

Climate Action

SDG 15

Life on Land

Indian Policy Support

National Mission on Sustainable Agriculture (NMSA)

Promotes resource-efficient, climate-resilient farming.

Paramparagat Krishi Vikas Yojana (PKVY)

Organic cluster development near heritage areas.

ICAR-NIASM & NBPGR

Document traditional varieties.

State Missions

Kerala (wetland preservation), J&K (saffron mission), Odisha (tribal seed banks).

GIAHS vs World Heritage Sites

Parameter	GIAHS	World Heritage Site (UNESCO)
Agency	FAO	UNESCO
Focus	Agricultural systems & living landscapes	Monuments, sites, or cultural/natural heritage
Nature	Dynamic, living, evolving	Mostly static / preserved
Community Role	Central (participatory)	Limited (often state-managed)

National Policy on Geothermal Energy 2025

A Step Towards Clean, Reliable, and Continuous Renewable Power

Presented by: Anurag Choubey | CLAT Gurukul

National Policy on Geothermal Energy

Highlights • (2025) • Use-Cases

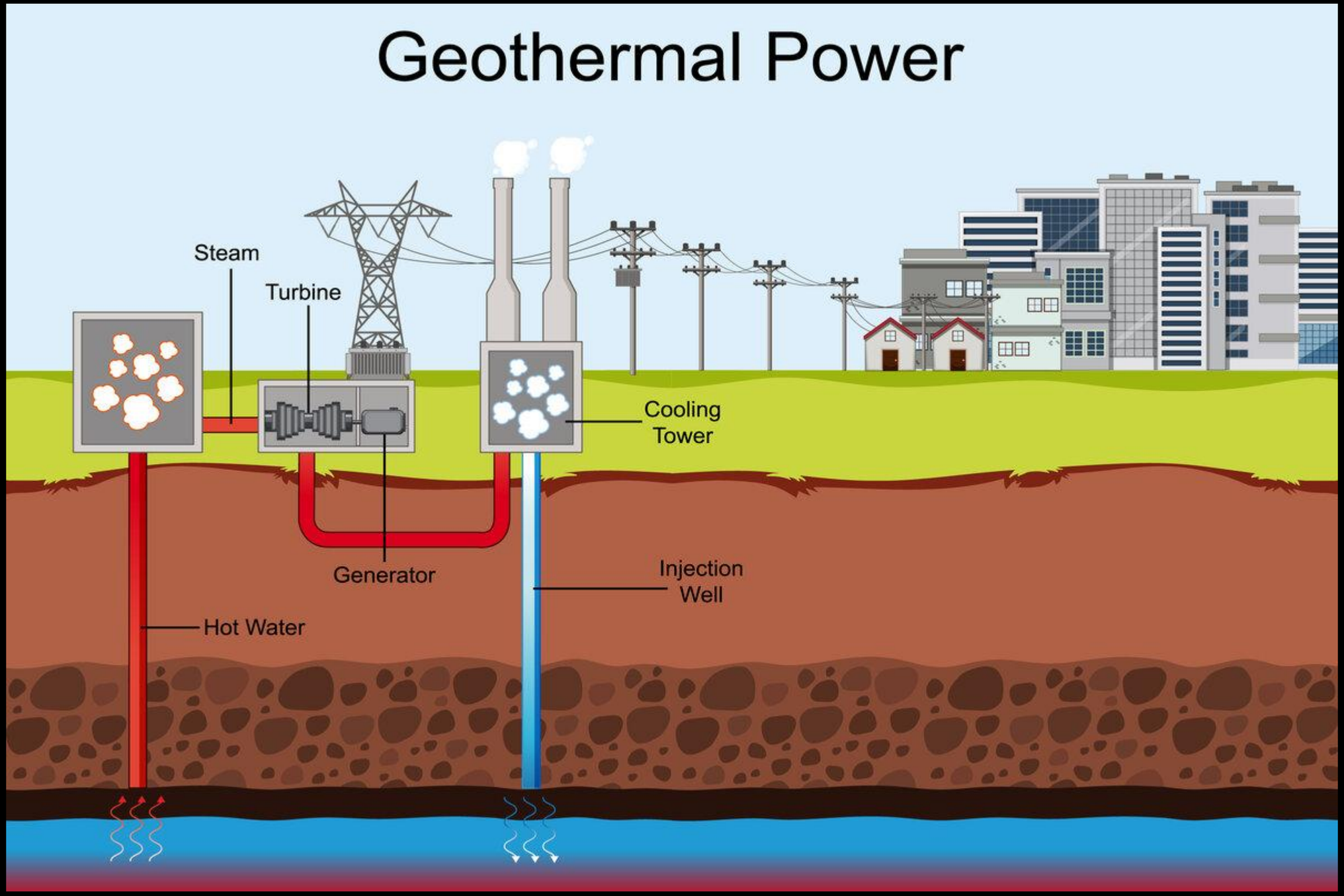
24x7
Baseload

Net Zero
2070

MNRE
Policy 2025

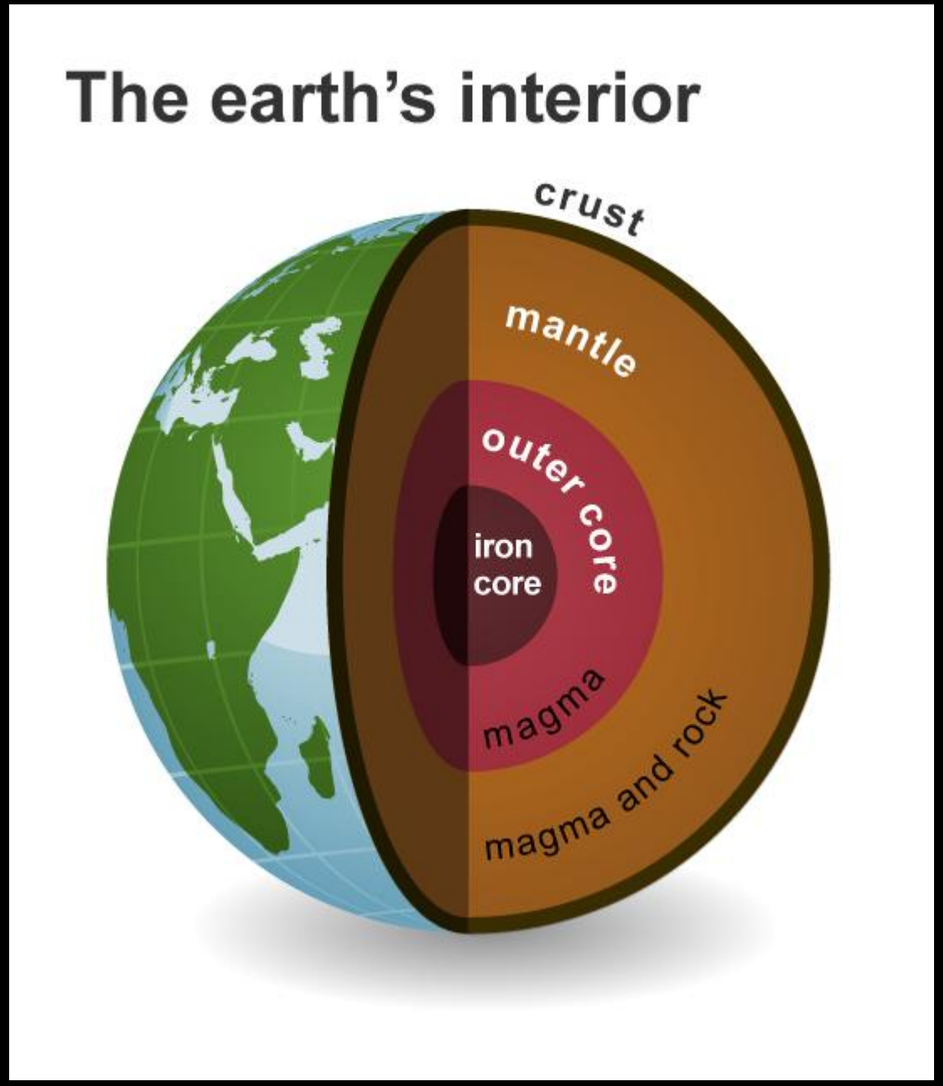
Highlgqrts • Sites • Use-Cases

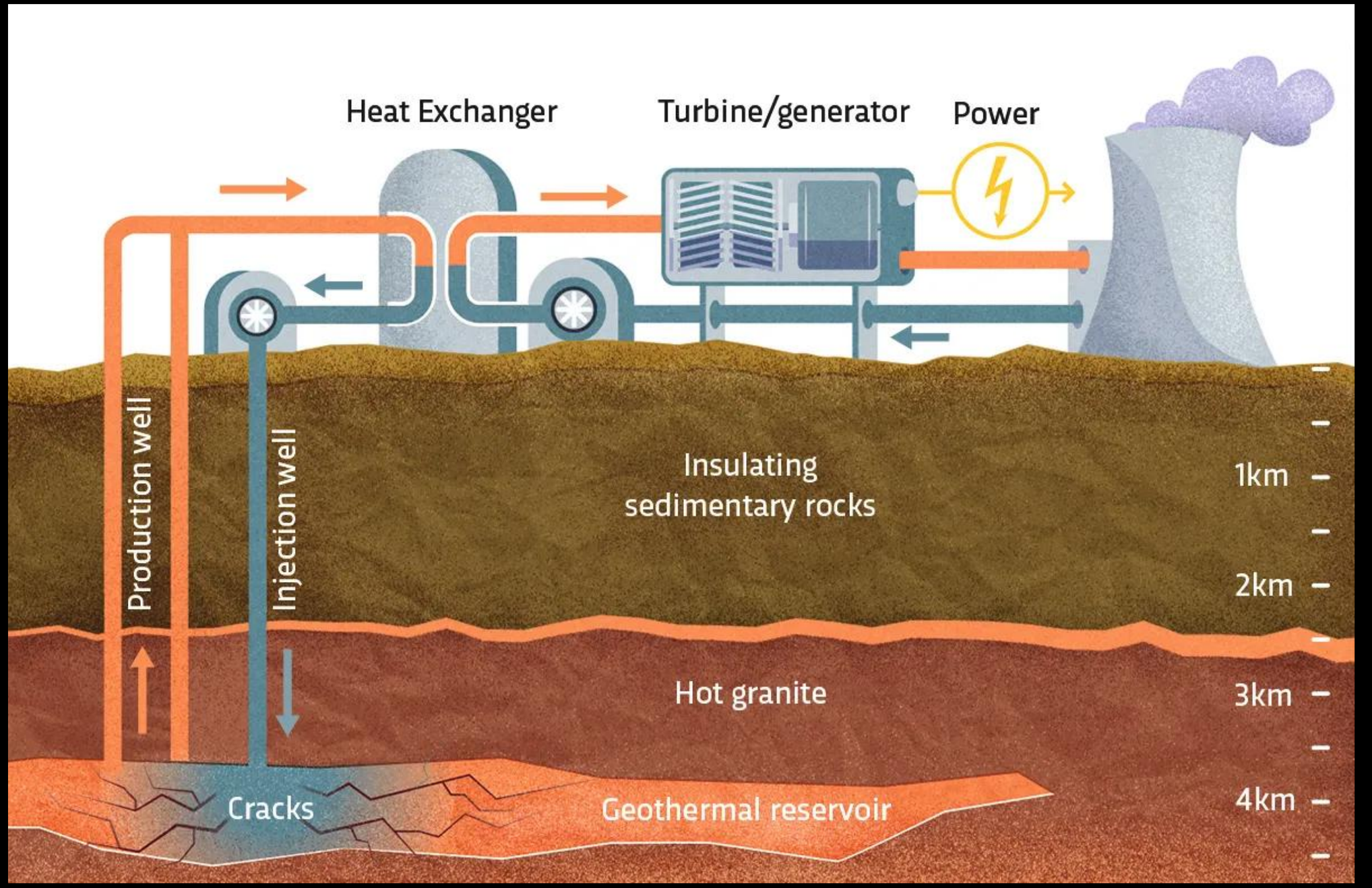
Geothermal Power



What is Geothermal Energy?

- Definition: heat from the Earth's interior, manifested via hot springs, geysers, subsurface heat gradient
- High-enthalpy versus low/medium enthalpy: high for power generation, low/medium for direct use (heating, cooling, agriculture, etc.)
- Characteristics: baseload, less intermittent, site specific





How It Works

Process:

01

Exploration

Identification through seismic & magneto-telluric surveys.

02

Drilling

Wells 1–3 km deep into geothermal reservoirs.

03

Production

Hot fluid/steam extracted.

04

Power Generation

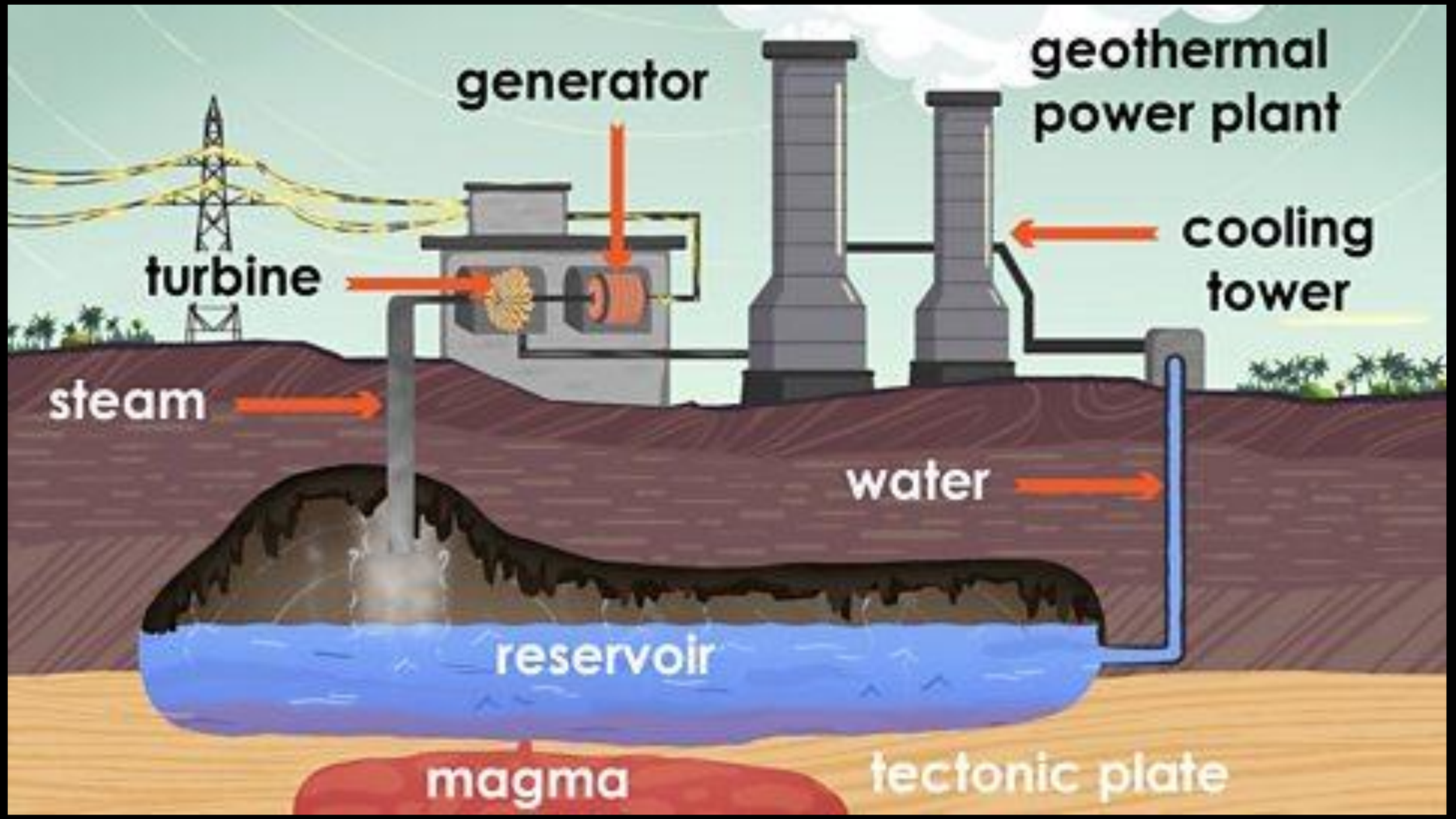
Drives turbines → electricity.

05

Reinjection

Used water reinjected to maintain pressure.

Key Fact: Reinjection prevents land subsidence & preserves reservoir.



Types of Geothermal Systems

Type	Temperature Range	Example	Typical Use
High Enthalpy	>150°C	Puga Valley, Ladakh	Electricity generation
Medium Enthalpy	90–150°C	Cambay Graben, Gujarat	Industrial heating
Low Enthalpy	<90°C	Manikaran, Himachal	Space heating, aquaculture

Types of Geothermal Power Plants

Dry Steam Plants

Use natural steam directly (e.g., The Geysers, California).

Flash Steam Plants

Use high-pressure water that flashes into steam.

Binary Cycle Plants

Use heat exchangers; operate at lower temperatures (more eco-friendly).

Fact: 70% of new geothermal plants globally are binary systems due to environmental safety.

Global Scenario (as of 2025)

Total Installed Capacity: ~17 GW worldwide.

Top 5 Countries:

- USA – 3.7 GW
- Indonesia – 2.4 GW
- Philippines – 1.9 GW
- Turkey – 1.7 GW
- New Zealand – 1 GW

Iceland: 90% of homes heated by geothermal.

Global Institutions: IRENA, IGA, World Bank Geothermal Fund.

Significance for India

- Provides baseload renewable power, unlike solar/wind.
- Reduces fossil fuel import dependency.
- Can provide heating solutions in Himalayan and cold regions.
- Suitable for hybrid integration with solar power.
- Supports Net Zero by 2070 & Energy Security goals.

National Policy on Geothermal Energy 2025

Launch: Ministry of New & Renewable Energy (2025).

Objective: Promote geothermal energy for power & direct-use.

FDI: 100% Foreign Direct Investment allowed.

Lease Tenure: 30 years (extendable by 10 years).

Pilot Projects: 5 sanctioned under Phase I (MNRE).

Repurposing: Abandoned oil & gas wells for geothermal use.

Fact: MNRE plans to develop India's first 25 MW geothermal plant by 2028.

Role of MNRE

Established: 1992

Mandate: Develop and promote renewable energy.

Key Divisions

Solar, Wind, Hydro, Bioenergy, New Technologies.

New Technologies Wing

Covers Geothermal, Ocean, and Hydrogen.

RE-RTD Programme (2023): Promotes R&D in geothermal technology.

Policy Alignment: National Action Plan on Climate Change (NAPCC).

Challenges in Geothermal Development

High Exploration Risk

Success rate <30% in initial drilling.

Geological Uncertainty

Requires precise thermal mapping.

High Capital Cost

$3–6 million per MW (vs $1 million for solar).

Limited Expertise

India lacks specialized drilling technology.

Environmental Impact

Risk of minor seismicity or gas emissions.

Global Best Practices

Iceland: 25% power from geothermal; district heating in Reykjavik.

Indonesia: State-backed Geothermal Fund lowers investor risk.

Kenya: Geothermal Development Corporation (GDC) model.

Japan: Binary systems in low-temperature zones (post-Fukushima energy shift).

Fact: Kenya generates over 40% of its power from geothermal.

Roadmap for India

- Complete Phase I (5 pilot projects) by 2027.
- Launch Phase II commercial operations (2028–2032).
- Develop National Geothermal Data Repository.
- Build domestic drilling and power plant expertise.
- Integrate geothermal with solar and wind hybrid systems.
- Collaborate with global agencies (IRENA, IGA, GDC).

Link to Climate Goals

→ Supports India's NDCs under the Paris Agreement.

→ Helps achieve Net Zero by 2070 target.

→ Contributes to Energy Security & Rural Electrification.

→ Promotes low-carbon industrialization.

→ Aligns with Mission LiFE (Lifestyle for Environment).

India's Geothermal Potential & Current Status

381 Thermal Areas

GSI has mapped ~381 thermally anomalous areas (hot springs) in India

10,600 MW Potential

Estimated potential: ~10,600 MW (≈ 10.6 GW)

Pilot Projects

Existing pilot / small projects: e.g. 20 kW pilot plant in Manuguru by SCCL (Telangana)

Singareni Collieries Company Limited (SCCL) is a coal mining company jointly owned by the governments of Telangana and India, and it has operations in areas like Manuguru.

Identified geothermal provinces: Himalayan, Naga-Lusai, Andaman & Nicobar, Son–Narmada–Tapi, Cambay Graben, etc.

Key Features of the National Policy on Geothermal Energy 2025

Dual Coverage

Covers both power generation (high enthalpy) and direct-use (low/medium enthalpy) applications

100% FDI

Allows 100% FDI in geothermal projects

Incentives

Tax holidays, import duty exemptions, concessional loans, viability gap funding, etc.

Lease Regime

Exploration + 30 years lease, extendable based on resource availability

Repurposing Wells

Encouragement to repurpose abandoned oil & gas wells for geothermal use

Institutional Support

Inter-ministerial coordination, data repository, centres of excellence, global partnerships

Pilot Projects & Implementation Steps

Phase I Initiatives

Five pilot / resource assessment projects approved by MNRE in Phase I

Example: Barmer, Rajasthan – utilizing abandoned oil fields for geothermal energy (Rs 15 crore pilot)

Phased expansion: start with pilots, assessments, then scale up

Development Focus

Development of geothermal resource data repository, mapping, improved exploration techniques

Linkage to Broader RE / Net Zero Goals

Complementary Energy

Geothermal as a complement to solar, wind, hydro

Base Load Support

Reduces variability in RE supply, strengthens base load

Net Zero 2070

Supports India's commitment to Net Zero by 2070

New Technologies

Fits into the "new technologies" vertical under MNRE (geothermal, ocean)

About MNRE & Related Programs

Role of Ministry of New & Renewable Energy (MNRE): nodal agency for RE, new technologies, policy, R&D, support schemes

New Technologies Stream

Under MNRE's "New Technologies" stream: geothermal and ocean energy are being nurtured

RE-RTD Programme

RE-RTD (Renewable Energy Research & Technology Development) programme: supports R&D across new RE technologies including geothermal

Other Schemes

Other MNRE schemes (for context): e.g. National Solar Mission, wind energy programmes, incentive / subsidy schemes

India's Context & Potential

381

Thermal Anomalies

Geological Survey of India (GSI) has located ~381 thermal anomalies / hot springs (temperatures ~35 °C to 89 °C)

10.6GW

Theoretical Potential

The estimate of ~10,600 MW (10.6 GW) is theoretical, and realization will depend heavily on resource confirmation and investment

20kW

Current Scale

Only very small scale (20 kW) geothermal pilot in India so far

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Policy Highlights & Innovations

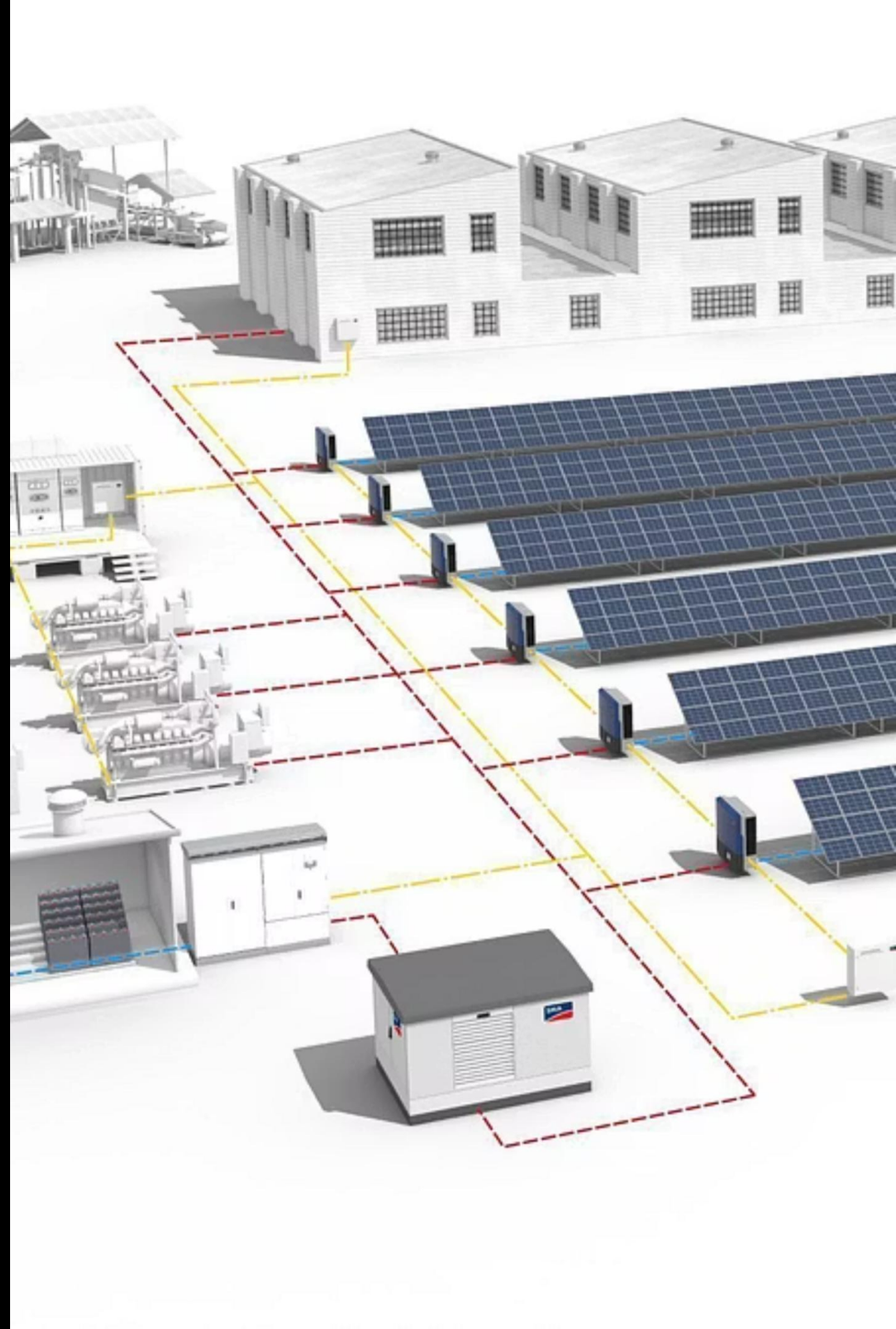
The policy is significant because it brings geothermal (which was relatively ignored) into the **mainstream RE policy portfolio**

Repurposing Oil & Gas Wells

The emphasis on repurposing oil & gas wells is clever: these wells already drilled (though not for power) can reduce exploration cost if suitable

Hybrid Energy Models

Hybrid energy models (e.g. geothermal + solar) are encouraged — this can smooth power supply and optimize resource use



Role of MNRE & Institutional Dimensions

- MNRE is the nodal ministry for renewable energy and new technologies like geothermal & ocean energy
- The RE-RTD programme under MNRE will be a key instrument to catalyze research and development in geothermal (and other emerging RE)
- Inter-ministerial coordination (e.g. with Oil & Gas, Mines, Environment, State governments) is essential, given overlap of geology, land, resource rights

National Red List Assessment (NRLA)

Initiative and Global Biodiversity Frameworks

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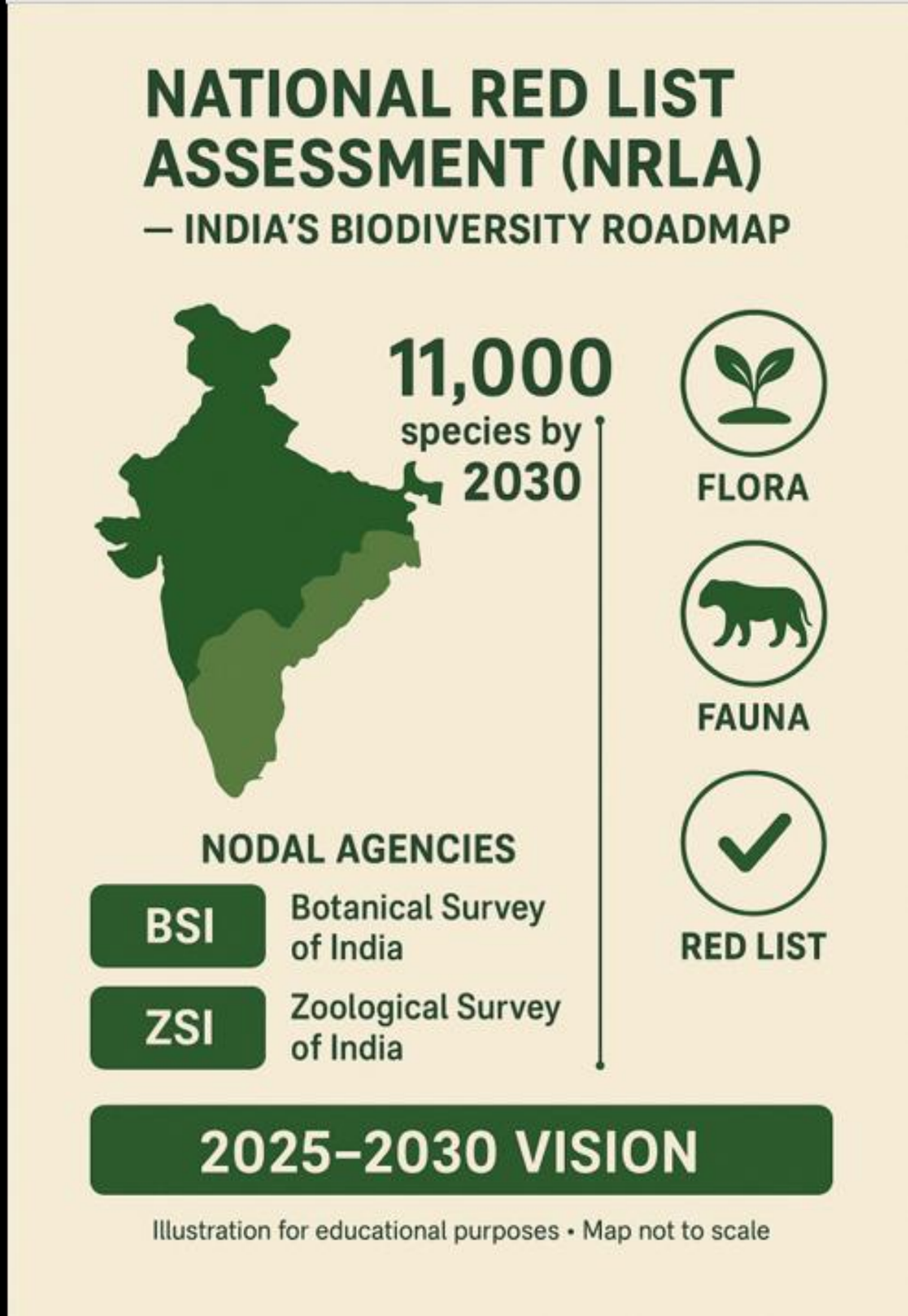
National Red List Assessment (NRLA)



What is NRLA?

Full Form

National Red List Assessment

Aim

Assess the conservation status of all Indian species scientifically using IUCN Red List criteria.

Nature

Nationally coordinated, transparent, participatory initiative.

Funding

₹95 crore (public funds).

Target Year

2030 (National Red Data Books publication).

Why NRLA is Needed

- **India:** 2.4% land area, 8% global biodiversity.
- Many species unassessed or outdated.
- Required for policy, conservation prioritization, and international commitments (CBD, GBF).
- Helps in data-driven species protection.

Key Objectives of NRLA

Objective	Explanation
National Red Data Books	Comprehensive lists of threatened flora & fauna by 2030.
Scientific Assessment	Use of IUCN Red List criteria.
Policy Integration	Supports WLPA 1972 & NBAP priorities.
Monitoring	Updates every 5 years.
Capacity Building	Develop skilled taxonomists and ecologists.

Lead Ministry & Institutional Framework

MoEFCC

Lead ministry; policy direction and coordination.

ZSI

Nodal for fauna.

BSI

Nodal for flora.

WTI

Partner via Centre for Species Survival (CSS: India).

IUCN-India

Technical validation and methodology alignment.

Methodology & Approach

- Based on IUCN Red List Categories & Criteria (population, range, habitat, survival trends).
- Categories: EX, CR, EN, VU, NT, LC, DD.
- Approach: Data-driven, peer-reviewed, and transparent.
- Output: India's National Red Data Books.

Process of Assessment

1

Identification

Identification of priority taxa.

2

Data Collection

Data collection (field, literature, museums).

3

Validation

Expert validation & workshops.

4

Categorization

Categorization under IUCN criteria.

5

Publication

Publication & periodic updates.

Global & National Linkages

CBD (1992)

Global biodiversity convention.

GBF (2022)

Halt extinction by 2030.

IUCN

International threat assessment system.

NBAP (India)

Domestic biodiversity action framework.

Policy & Legal Integration

- Wildlife (Protection) Act, 1972 (Amended 2022) → Legal protection.
- Forest (Conservation) Act, 1980 → Restricts habitat loss.
- Biological Diversity Act, 2002 → Manages access and benefit sharing.
- Environment (Protection) Act, 1986 → Umbrella law.

India's Biodiversity Snapshot

45K	90K	28%	30%
Plant Species	Animal Species	Endemic Flora	Endemic Fauna
Approximately 45,000 plant species	Approximately 90,000 animal species	28% endemic flora	30% endemic fauna

8% of global species within 2.4% of Earth's area.

4 global biodiversity hotspots: Himalaya, Indo-Burma, Western Ghats, Sundaland.

International Relevance

Aligns with India's commitments under:

CBD

Convention on Biological Diversity

GBF

Kunming–Montreal Global Biodiversity Framework

International Treaties

CITES, Ramsar, CMS

Paris Agreement

UNFCCC

Strengthens India's global conservation reporting and credibility.

Significance for Policy & Research

Policy Prioritization

Identifies species for urgent conservation.

Legal Strength

Informs scheduling under WLPA.

Research Boost

New field surveys & databases.

Education

Capacity building in taxonomy & conservation.

Timeline (2024–2030) ⏳

2024
Initiative launched by MoEFCC.

2025–26
Pilot surveys & training.

2027–28
Compilation & validation.

2029
Peer review & digitization.

2030
Publication of Red Data Books.

Convention on Biological Diversity (CBD)

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Background & Structure

Key Facts

- Adopted: 1992, at the Rio Earth Summit (UNCED).
- Entered into Force: 29 December 1993.
- Headquarters: Montreal, Canada.

Protocols

1. Cartagena Protocol on Biosafety (2000).
2. Nagoya Protocol on Access and Benefit Sharing (2010).

Objective

1. Conservation of biological diversity.
2. Sustainable use of its components.
3. Fair and equitable sharing of benefits from genetic resources.

Institutional Framework

1. COP (Conference of the Parties) – supreme decision-making body.
2. Subsidiary Bodies: SBSTTA (Scientific, Technical & Technological Advice), SBI (Implementation).

Convention on Biological Diversity (CBD)

India's Role & NRLA Connection

- India's Membership: Ratified in 1994.
- National Focal Point: MoEFCC.
- Domestic Law: Biological Diversity Act, 2002; established National Biodiversity Authority (NBA).

Programmes

- National Biodiversity Action Plan (NBAP).
- People's Biodiversity Registers (PBRs).

NRLA Link

- NRLA provides national species data for CBD reporting (6th National Report).
- Supports monitoring under Aichi & post-2020 GBF targets.

Kunming–Montreal Global Biodiversity Framework (GBF)

Background & Structure

Overview

- Adopted: December 2022 (COP15, Montreal & Kunming).
- Purpose: Successor to Aichi Targets; global roadmap for biodiversity conservation (2022–2030).

Implementation

Key Implementation Bodies: CBD COP Bureau & Global Biodiversity Fund (2023).

Main Goals

- Halt biodiversity loss by 2030.
- Protect at least 30% of land & ocean ("30x30 target").
- Restore 30% of degraded ecosystems.
- Reduce extinction rates by 10×.

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Kunming–Montreal Global Biodiversity Framework (GBF)

India's Role & NRLA Connection

India's Commitment to GBF

India's Commitment: Endorsed GBF at COP15; supports 30x30 goal through protected areas expansion.

Focal Ministry: MoEFCC.

National Integration: NBAP & NRLA feed into GBF monitoring.

NRLA Link:

- NRLA provides metrics on extinction risk & species recovery trends.
- Directly relates to GBF Target 4 (reducing extinction rate).

International Union for Conservation of Nature (IUCN)

Background & Structure

Founded: 1948, Fontainebleau, France.

Headquarters: Gland, Switzerland.

Membership: 1,400+ members (governments, NGOs, scientific institutions).

Mission: Influence, encourage, and assist societies to conserve nature.

IUCN Major Functions

IUCN Red List

Maintains IUCN Red List of Threatened Species.

Conservation Reports

Publishes World Conservation Congress reports.

Global Frameworks

Develops global conservation frameworks.

International Union for Conservation of Nature (IUCN)

India's Role & NRLA Connection

Member Since: 1969.

National Office: IUCN-India, New Delhi.

Key Partnerships: Works with MoEFCC, WII, and ZSI.

NRLA Link:

- NRLA uses IUCN's methodology for national Red List assessments.
- Data exchange between IUCN Red List & National Red Data Books.

CITES

Convention on International Trade in Endangered Species

Background & Structure

CITES Overview

Adopted: 1973, Washington D.C.

Entered into Force: 1 July 1975.

Headquarters: Geneva, Switzerland.

Objective: To ensure that international trade in wild animals and plants does not threaten their survival.

Structure:

COP

Policy & regulatory decisions.

Secretariat

UNEP-administered (Geneva).

Appendices

- I: Prohibition on trade (most endangered).
- II: Regulated trade.
- III: Species protected in at least one country.

CITES (Convention on International Trade in Endangered Species)

India's Role & NRLA Connection

India's Membership: 1976.

Nodal Authority: MoEFCC.

Implementation: Through Wildlife (Protection) Act, 1972 (Schedules I–VI).

NRLA Link:

- NRLA data on species status informs CITES Appendix classification.
- Supports trade regulation & conservation planning.

Ramsar Convention on Wetlands

Background & Structure

Signed: 1971, Ramsar (Iran).

Entered into Force: 1975.

Headquarters: Gland, Switzerland.

Objective: Conservation & wise use of wetlands.

Ramsar Convention Structure

COPs every 3 years

Ramsar Secretariat hosted by IUCN

Maintains Ramsar Sites List

Principle: "Wise Use of Wetlands."

Ramsar Convention on Wetlands

India's Role & NRLA Connection

India's Membership: 1982.

Sites: 80+ Ramsar Sites (as of 2025).

Focal Point: MoEFCC.

NRLA Link:

- NRLA evaluates species within Ramsar Sites (migratory birds, amphibians).
- Assists in Ramsar reporting & site management.

Convention on Migratory Species

(CMS / Bonn Convention)

Background & Structure

CMS Overview

Adopted: 1979, Bonn, Germany.

Entered into Force: 1983.

Headquarters: Bonn, Germany.

Objective: Conserve migratory species across national borders.

Structure:

COP

(every 3 years)

Two appendices

(I – endangered; II – need cooperative action)

FAO

(Food and Agriculture Organization)

Background & Structure

Founded: 1945, Quebec City.

Headquarters: Rome, Italy.

Objective: Food security, sustainable agriculture, and natural resource management.

FAO (Food and Agriculture Organization)

India's Role & NRLA Connection

India's Membership: Founding member (1945).
Collaborations: Indian Council of Agricultural Research (ICAR), MoA.

FAO Structure

Structure:

- Conference, Council, and Technical Committees.
- Regional offices & UN partnerships.

NRLA Link:

- NRLA integrates agrobiodiversity assessments (crop wild relatives).
- FAO's biodiversity indicators used in species monitoring.

Global Environment Facility (GEF)

Background & Structure

Founded: 1991.

Headquarters: Washington D.C., USA.

Purpose: Fund projects addressing biodiversity, climate change, land degradation, chemicals, and international waters.

Partners: FAO, UNDP, UNEP, World Bank.

Global Environment Facility (GEF)

India's Role & NRLA Connection

India's Membership: Founding member.

National Focal Agency: MoEFCC.

Projects: India Biodiversity Programme, Green India Mission support.

NRLA Link:

- Provides funding for Red List capacity building.
- Integrates biodiversity indicators for grant justification.

UNFCCC

United Nations Framework Convention on Climate Change

UNFCCC Overview

Adopted:

1992 at the Rio Earth Summit (UNCED).

Entered into Force:

21 March 1994.

Headquarters / Secretariat:

Bonn, Germany.

Objective (Article 2): Stabilize greenhouse gas concentrations at a level that prevents dangerous human interference with the climate system.

Institutional Bodies:

- COP (Conference of the Parties) – annual decision-making meeting.
- SBSTA & SBI – scientific and implementation bodies.
- Secretariat: Coordinates global climate negotiations and reporting.

Key Protocols:

- Kyoto Protocol (1997) – binding emission targets.
- Paris Agreement (2015) – universal climate accord.

Financial Mechanisms:

- GCF (Green Climate Fund), Adaptation Fund, CTCN (Climate Tech Centre & Network).

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India's National Biodiversity Action Plan (NBAP)

Implementation & NRLA Connection

Implementation Tools & NRLA Link

Implementation Tools:

- State Biodiversity Boards.
- People's Biodiversity Registers (PBRs).

NRLA Link:

- Provides baseline species data for NBAP targets.
- Helps monitor biodiversity trends for national reporti

Paris Agreement & IPBES

Paris Agreement

Year: 2015

HQ: Paris

Focus Area: Climate adaptation

India's Role: Ratified 2016

NRLA Connection: Species adaptation link

IPBES

Year: 2012

HQ: Bonn

Focus Area: Biodiversity science-policy

India's Role: Member since 2012

NRLA Connection: Assessment data

NBAP

Year: 2008

HQ: New Delhi

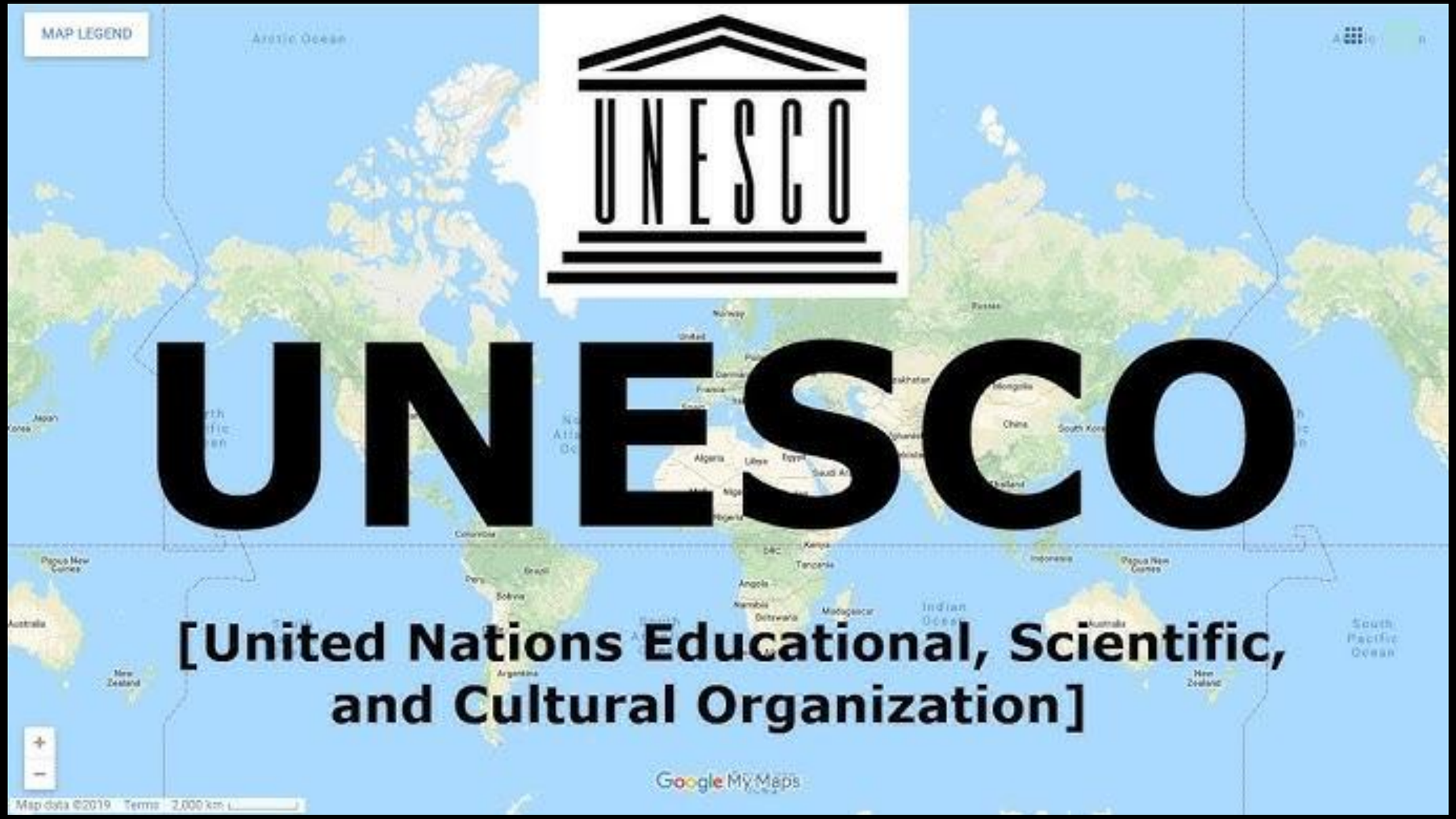
Focus Area: National biodiversity strategy

India's Role: Implemented by MoEFCC

NRLA Connection: NRLA baseline data

Seven New Natural Heritage Sites

India's 2025 Additions to UNESCO Tentative List



LIST OF 7 NEW INDIAN SITES ADDED TO UNESCO'S WORLD HERITAGE LIST

Understanding UNESCO and World Heritage

Full Form: United Nations Educational, Scientific and Cultural Organization

Founded: 16 November 1945

Headquarters: Paris, France

Director-General (2025): Audrey Azoulay

Member States: 194

Primary Goal: "To build peace in the minds of men and women through education, science, culture, and communication."

World Heritage Mandate (1972 Convention):

- Adopted: 16 November 1972 → Convention Concerning the Protection of the World Cultural and Natural Heritage
- Came into force: 1975
- Secretariat: UNESCO World Heritage Centre (Paris)

World Heritage Site (WHS) Concept 🏛️

Definition:

A site listed by UNESCO for its "Outstanding Universal Value" (OUV) to humanity under cultural, natural, or mixed categories.

Three Categories:

1. **Cultural Sites** – Monuments, buildings, archaeological sites.
2. **Natural Sites** – Geological formations, ecosystems, biodiversity habitats.
3. **Mixed Sites** – Combination of both (e.g., Khangchendzonga National Park).

Global WHS Statistics (2025)

Parameter	Details (as of 2025)
Total Sites	1,199 (across 168 countries)
Cultural	933
Natural	227
Mixed	39
Top Country	Italy (59 sites)
Followed by	China (57), Germany (53), France (52)
Regions	Europe–North America (≈47%), Asia–Pacific (≈26%)

Most Recent Additions: Geological and climate-linked natural sites globally.

India and UNESCO

Aspect	Detail
India's Ratification	14 November 1977
Total World Heritage Sites	42 (as of 2025)
Cultural Sites	35
Natural Sites	7
Mixed Sites	1 (Khangchendzonga National Park)
Tentative List (2025)	69 sites – 49 cultural + 17 natural + 3 mixed

Nodal Agency:

- Archaeological Survey of India (ASI) – cultural nominations
- Ministry of Environment, Forest & Climate Change (MoEFCC) – natural nominations

States with the Most World Heritage Sites

Rank	State/UT	Number of Sites	Examples
1	Maharashtra	6	Ajanta, Ellora, Elephanta, CST, Victorian Art Deco, Koyna (natural)
2	Karnataka	5	Hampi, Pattadakal, Western Ghats, etc.
3	Uttar Pradesh	4	Taj Mahal, Fatehpur Sikri, Agra Fort, etc.
4	Tamil Nadu	4	Great Chola Temples, Nilgiri Railways, etc.
—	Total 42 (India)	Cultural: 35	Natural: 7

Note: With the new 7 on Tentative List, Andhra Pradesh becomes a key emerging state in natural heritage nominations.

UNESCO Tentative List – Purpose and Process

Definition:

The Tentative List is a catalogue of properties a country believes deserve World Heritage status in the future.

Function:

- Prerequisite for formal nomination.
- Allows review by UNESCO experts.
- Helps States Parties prepare management & conservation plans.

India's Count (2025): 69 (49 Cultural + 17 Natural + 3 Mixed)

Significance:

- Marks the first phase of global recognition.
- Enhances funding eligibility and international collaboration.

India's Heritage Diplomacy under UNESCO

- India currently chairs the World Heritage Committee (2025 session).
- Advocates South–South cooperation in heritage conservation.
- Shift from Biodiversity → Geoheritage, reflecting Earth science leadership.
- Boosts soft power diplomacy and scientific credibility globally.

Overview – Seven New Natural Sites (2025)

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#	Site Name	State	Type	Key Feature
1	Deccan Traps	Maharashtra	Volcanic	66 My-old basalt formations
2	St. Mary's Island Cluster	Karnataka	Coastal / Geological	88 My-old rhyolitic lava columns
3	Meghalayan Age Caves	Meghalaya	Cave / Climate Archive	Record of 4,200-year mega drought
4	Naga Hill Ophiolite	Nagaland	Oceanic Crust	Ancient seafloor rocks
5	Tirumala Hills	Andhra Pradesh	Geological / Spiritual	Eparchaean Unconformity, natural arch
6	Erra Matti Dibbalu	Andhra Pradesh	Aeolian / Coastal	Red sand dunes
7	Varkala Cliffs	Kerala	Coastal Cliff	Mio-Pliocene Warkalli Formation

Site 1 – Deccan Traps at Panchgani & Mahabaleshwar, Maharashtra

Location: Satara District, Western Ghats (part of Koyna WLS)

Formation: ~66 million years ago (Cretaceous–Paleogene boundary)

Type: Volcanic flood basalt

Extent: ~500,000 sq km – one of the largest volcanic provinces on Earth

Scientific Value:

- Key to understanding mass extinction events (Chicxulub asteroid + volcanism).
- Shows layered basaltic columns, lava plateaus, and valleys.

Biodiversity Link: Western Ghats ecosystem overlay.

Threats: Quarrying, unregulated tourism, deforestation.

Site 2 – Geological Heritage of St. Mary's Island Cluster, Karnataka

Location: Udupi District, Arabian Sea, off Malpe Coast

Formation Age: ~88 million years (Late Cretaceous)

Feature: Hexagonal columnar rhyolitic lava — evidence of continental drift between India & Madagascar.

Scientific Relevance: Demonstrates separation of Indian and African plates.

Unique Aspect: Only known site in India for such columnar formations.

Tourism Potential: Model for eco-geotourism with regulated access.

Threats: Erosion, unregulated visitor footfall.

Site 3 – Meghalayan Age Caves, Meghalaya

Key Site: Mawmluh Cave near Sohra (Cherrapunji)

Significance:

- Global Boundary Stratotype Section and Point (GSSP) for the Meghalayan Age (Holocene Epoch).
- Stalagmites preserve a 4,200-year-old drought record, marking the start of Meghalayan Age.

Scientific Importance:

- Recognized by International Commission on Stratigraphy (ICS).
- Connects geology with climate science and anthropology.

Threats: Pollution, tourism impact, lack of site management.

Conservation Need: Strict research-based tourism regulation.

Site 4 – Naga Hill Ophiolite, Nagaland

Location: Kiphire District, SE Nagaland

Type: Ophiolite complex — remnant of ancient oceanic crust uplifted onto land.

Geological Importance:

- Rare exposure of mantle peridotites and gabbros.
- Explains plate tectonic evolution of the Indo-Burmese region.
- Part of Tethys Ocean closure story.

Biodiversity: 4 Key Biodiversity Areas; rich in orchids and hornbills.

Cultural Link: Local Naga community reverence for the landscape.

Threats: Mining, infrastructure.

Site 5 – Natural Heritage of Tirumala Hills, Andhra Pradesh

Location: Eastern Ghats, Tirupati region

Geological Features:

- Eparchaean Unconformity – time gap of 800 million years between two rock formations.
- Natural Arch (Silathoranam) – formed ~1.5 billion years ago.

Spiritual & Ecological Importance:

- Houses sacred shrines (Tirumala Temple).
- Rich biodiversity and forest cover.

Model of Management: Tirumala Tirupati Devasthanam (TTD) Trust's eco-governance.

UNESCO Significance: Combines spiritual and geological heritage.

Site 6 – Erra Matti Dibbalu (Red Sand Dunes), Andhra Pradesh 🏜️

Location: Near Visakhapatnam coast

Age: Estimated 2 million years (Late Pleistocene–Holocene transition).

Composition: Red lateritic sand dunes shaped by wind and water.

Scientific Value:

- Evidence of sea-level fluctuations and paleoclimatic transitions.
- Record of India's coastal geomorphology evolution.

Threats: Urbanization, illegal sand mining, coastal projects.

Protection Proposal: Geoheritage status under upcoming Geoheritage Bill.

Site 7 – Varkala Cliffs, Kerala

Location: Thiruvananthapuram District (Arabian Sea coast)

Feature: Continuous lateritic cliff line called the Warkalli Formation (Mio-Pliocene age).

Scientific Value:

- Evidence of tectonic uplift and tropical weathering.
- Contains fossilized shells and iron-rich nodules.
- Natural water-harvesting aquifers.

Biodiversity: Coastal vegetation and endemic plant species.

Tourism Potential: Wellness and geotourism destination; requires regulation.

Threats: Erosion, urban encroachment, waste pollution.

Policy and Conservation Dimensions

Key Legal Frameworks:

- Ancient Monuments and Archaeological Sites and Remains Act, 1958
- Environment (Protection) Act, 1986
- Coastal Regulation Zone (CRZ) Rules, 2019
- Proposed Geoheritage Bill, 2024 – to protect sites of geological significance.

Managing Institutions:

- MoEFCC, Ministry of Culture, ASI, Geological Survey of India (GSI), State Departments.
- UNESCO World Heritage Committee – final decision body.

India's Heritage Landscape Summary

Category	Sites	Key Examples
Cultural	35	Taj Mahal, Hampi, Ajanta–Ellora, Jaipur City
Natural	7	Kaziranga, Western Ghats, Great Himalayan NP
Mixed	1	Khangchendzonga NP
Tentative (Natural)	17	Includes 7 new geological nominations
Top State (Total)	Maharashtra (6)	Cultural + Natural mix

Old vs. New Focus

Phase	Dominant Theme	Example
Pre-2020	Cultural & architectural	Jaipur, Ahmedabad
2021–2023	Biodiversity & ecozones	Western Ghats, Great Himalayan NP
2025 Onward	Geological heritage	7 new natural sites

Interpretation: India's heritage diplomacy now integrates Earth Science and Ecology — aligning with SDG 15 ("Life on Land").

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ENVIRONMENT & CLIMATE CHANGE

Introduction

- The period of 1970s experienced an ascend globally in industrialisation leading to degradation of the environment at a very high pace.
- The need was felt for a combined effort towards environment conservation from all over the world.

Contd…

- The result of these combined efforts was The United Nations Conference on the Human Environment i.e. The Stockholm Conference, 1972.
- In India, the Bhopal Gas Tragedy of 1984 called for urgent legislation in the field of environment.
- In this background the Parliament passed the Environment Protection Act, 1986 and the Environment Protection Rules, 1986.

Environment Protection Act, 1986

- The Act came into force on Nov. 19, 1986 and extends to the whole of India.
- The Act was passed to provide for the protection and improvement of environment and for matters connected there with.

Contd...

- The Act gives certain powers to the Central Government to take measures for the purpose of protecting and improving the quality of the environment and to prevent environmental pollution.
- The Act is an "umbrella" legislation designed to provide a framework for Central Government coordination of the activities of various central and state authorities established under previous laws, such as the Water Act and the Air Act.

Some Interesting stats about India

- 2.4% of the world's land area

- 16.7% of the world's human population
- 18% livestock

- It contributes about 8% of the known global biodiversity

Government's Plans, Policies & Initiatives

1. The Government of India enacted the Wild Life (Protection) Act 1972 deriving powers from Article 48A and 51A (g).

- The Wild Life (Protection) Act was passed by Parliament using the provisions of Article 252 of the Indian Constitution and guided by Article 48A and 51A (g)

- It was the first legislation to include a comprehensive list of endangered wildlife species and to prohibit the hunting of wild animals.

Policies Contd...

- Article 48A is part of the Directive Principles of State Policy, and states that the state should protect and improve the environment, including forests and wildlife.

- Article 51A (g) states that it is the fundamental duty of every citizen of India to protect and improve the natural environment, including forests, lakes, rivers, and wildlife.

Objective

Effectively protecting the wildlife of this country and to control poaching, smuggling and illegal trade in wildlife and its derivatives

a. The act extends to the whole of India

b. Jammu and Kashmir (J&K) does not have its own wildlife act anymore.

c. The Jammu and Kashmir Wildlife (Protection) Act, 1978 was repealed after the Jammu & Kashmir Reorganization Act, 2019 was passed by Parliament.

d. It has 6 Schedules to provide degrees of Protection

Policies **Contd...**

2. A National Board for Wildlife (NBWL), chaired by the Prime Minister of India provides for a policy framework for wildlife conservation in the country.

3. The National Wildlife Action Plan (2002-2016) was adopted in 2002, emphasizing the people's participation and their support for wildlife conservation.

Policies Contd...

4. The Indian Constitution entails the subject of forests and wildlife in the Concurrent list thus laying the responsibility of wildlife conservation on both the Centre and the State.

5. Specialized projects: To save the endangered species of animals, specialised projects are being implemented with international cooperation (WWF, UNDP, UNEP, IUCN) as well as on a stand-alone basis e.g.

a) Project Tiger 1973

b) Operation Crocodile 1975

c) Project Rhinoceros 1987

d) Project Snow Leopard 2009

e) Project Elephant 1988

International organization working for environment

⇒**WWF, World Wide Fund for Nature**, was founded in 1961 and its headquarters are in **Gland, Switzerland**

⇒**International Union for Conservation of Nature, (IUCN)**, was founded in 1948 and its headquarters are in **Gland, Switzerland**

⇒**United Nations Environment Programme (UNEP)**, was founded in 1972 and is headquartered in Nairobi, Kenya.

⇒**United Nations Development Programme (UNEP)**, was founded in 1965 and is headquartered in New York City, the USA.

Policies Contd...

6. The Protected Areas of India:

- Protected areas are those in which human occupation or at least the exploitation of resources is limited.
- These are defined according to the categorization guidelines for protected areas by the International Union for Conservation of Nature (IUCN).

Policies Contd...

- There are several kinds of protected areas, which vary by level of protection depending on the enabling laws of each country or the regulations of the international organizations involved.

- There are 4 categories of the Protected Areas in India viz,

a) National Parks

b) Sanctuaries

c) Conservation Reserves

d) Community Reserves

Differences between a National Park, Wildlife Sanctuary, Tiger Reserve, and Biosphere Reserve

1. National Park

- Purpose: Primarily for the protection of flora and fauna and overall biodiversity. Human activities like grazing or collection of forest products are strictly prohibited.

- National parks in India are IUCN category II protected areas

Nation park Contd...

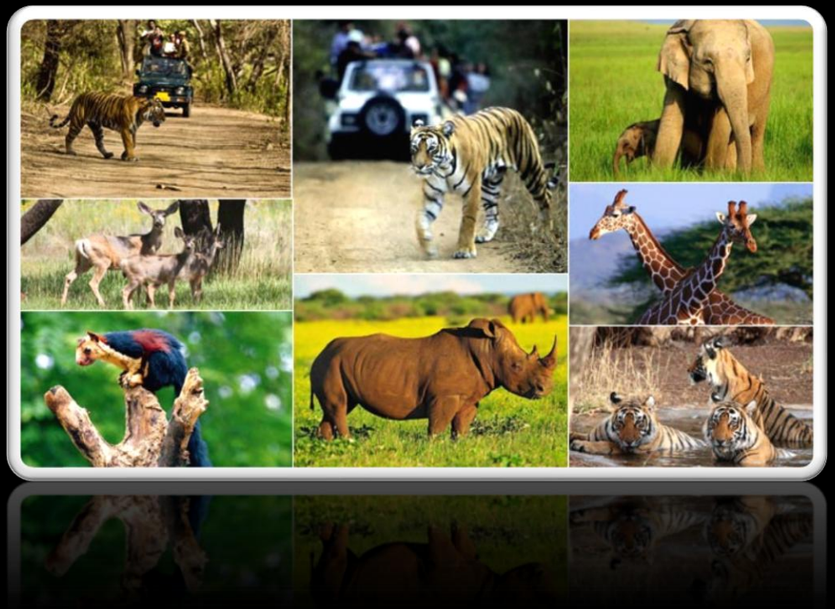
- Regulations: No human activities or commercial exploitation allowed.
- Objective: Conservation of ecosystems.
- Examples in India: Jim Corbett National Park (Uttarakhand), Kaziranga National Park (Assam), Sundarbans National Park (West Bengal).

National park Contd...

- India's first national park was established in 1936 as Hailey National Park, now known as Jim Corbett National Park, Uttarakhand.

- There are 104 existing national parks in India covering an area of 40501.13 km², which is 1.23% of the geographical area of the country (National Wildlife Database, May 2019).

2. Wildlife Sanctuary



- Purpose: Protection of specific species of wildlife, though human activities like grazing and regulated resource collection are sometimes permitted.

- Any area other than area comprised with any reserve forest or the territorial waters can be notified by the State Government to constitute as a sanctuary if such area is of adequate ecological, faunal, floral, geomorphological, natural or zoological significance.

Widlife Sanctuary Contd...

- The difference between a Sanctuary and a National Park mainly lies in the vesting of rights of people living inside
- Regulations: Certain human activities allowed under specific conditions.

Wildlife sanctuary Contd...

- Objective: Protection of particular species.
- Examples in India: Bharatpur Bird Sanctuary (Rajasthan), Periyar Wildlife Sanctuary (Kerala), Mudumalai Wildlife Sanctuary (Tamil Nadu).

3. Conservation Reserves and Community Reserves

- Purpose: To protect areas of India which typically act as buffer zones to or connectors and migration corridors between established national parks, wildlife sanctuaries and reserved and protected forests of India.
- Regulations: Focused protection of tigers, usually stricter regulations, similar to national parks.

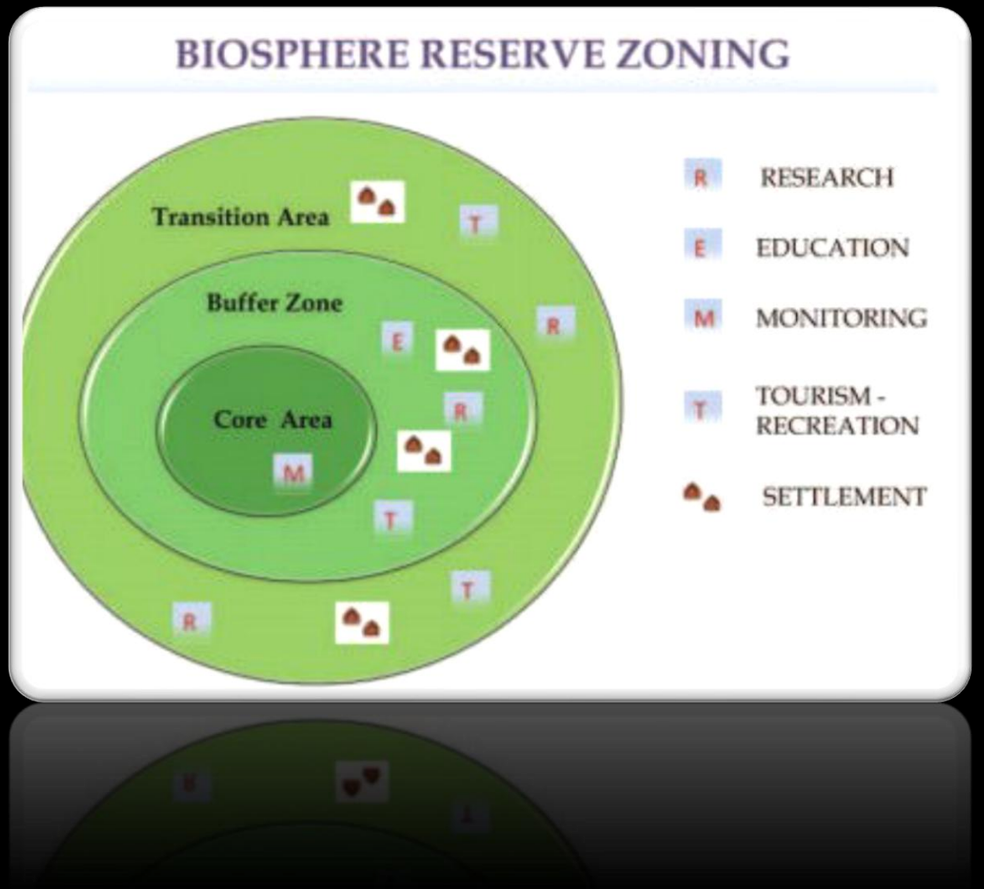
Conservation Reserves and Community Reserves Contd...

- Objective: Increase tiger population and preserve their habitat.
- Examples in India: Ranthambore Tiger Reserve (Rajasthan), Bandipur Tiger Reserve (Karnataka), Kanha Tiger Reserve (Madhya Pradesh).

4. Biosphere Reserve

- **Purpose:** Conservation of biodiversity with emphasis on sustainable development and fostering research and education.

- **Regulations:** Zones with varying levels of protection: core zone (no human interference), buffer zone (limited activities), and transition zone (sustainable practices allowed).



Biosphere Reserve Contd...

- Objective: Protection of entire ecosystems and support of sustainable living for humans.

Examples in India: Nilgiri Biosphere Reserve (Tamil Nadu), Sunderban Biosphere Reserve (West Bengal), Nanda Devi Biosphere Reserve (Uttarakhand).

5. Wetlands, Ramsar Convention, Montreux Record

- In simple words: Wetlands are areas where water is the primary factor controlling the environment and the associated plant and animal life

- Where? They occur where the water table is at or near the surface of the land, or where the land is covered by water

Wetlands, Ramsar Convention, Montreux Record Contd...

- Most widespread definition: Lands transitional between terrestrial and aquatic eco-systems where the water table is usually at or near the surface or the land is covered by shallow water

- Ramsar Convention on Wetlands: Wetlands are areas of marsh, fen or water, whether natural or artificial, permanent or temporary, with water that is static or flowing, fresh, brackish or salt, including areas of marine water, the depth of which at low tide does not exceed six metres.

Wetlands, Ramsar Convention, Montreux Record Contd...

⇒The Ramsar Convention on Wetlands was signed in Ramsar, Iran, in 1971

⇒Ramsar is a city on the shores of Caspian sea

⇒It is an intergovernmental treaty which provides the framework for national action and international cooperation for the conservation and wise use of wetlands and their resources

Wetlands, Ramsar Convention, Montreux Record Contd...

⇒There are presently 158 Contracting Parties to the Convention, with 1758 wetland sites, totalling 161 million hectares, designated for inclusion in the Ramsar List of Wetlands of International Importance

⇒Montreux Record is a register of wetland sites on Ramsar List where changes in ecological character have occurred, are occurring, or are likely to occur as a result of technological developments, pollution or other human interference

Wetlands, Ramsar Convention, Montreux Record Contd...

⇒Ramsar Convention is the only global environment treaty dealing with a particular ecosystem

⇒It is maintained as part of the Ramsar List

⇒It was determined that the Montreux Record should be employed to identify priority sites for positive national and international conservation attention

Wetlands, Ramsar Convention, Montreux Record Contd...

⇒Sites may be added to and removed from the Record only with the approval of the Contracting Parties in which they lie

⇒Ramasar sites in Bihar

- Kanwar Lake: Bihar's first Ramsar site, designated in 2020, is in Begusarai District

Wetlands, Ramsar Convention, Montreux Record Contd...

- Nagi Bird Sanctuary: A man-made wetland in the Jamui district that was designated as a Ramsar site in 2024

- Nakti Bird Sanctuary: A man-made wetland in the Jamui district that was designated as a Ramsar site in 2024

Forest Coverage in India

Protected Areas of India (July, 2019)

	No.	Total Area (km^2)	Coverage % of Country
National Parks (NPs)	104	40501.13	1.23
Wildlife Sanctuaries (WLSs)	551	119775.80	3.64
Conservation Reserves (CRs)	88	4356.49	0.13
Community Reserves	127	525.22	0.02
Protected Areas (PAs)	**870**	**165158.54**	**5.02**

UNESCO-Recognized National Parks in India

1. Kaziranga National Park (Assam)
   - Recognized in: 1985
   - Famous for: One-horned rhinoceros, tigers, elephants, wild water buffalo, and swamp deer.

2. Keoladeo National Park (Bharatpur Bird Sanctuary) (Rajasthan)
   - Recognized in: 1985
   - Famous for: Migratory birds, including the Siberian crane.

UNESCO **Contd…**

3. Manas National Park (Assam)
   - Recognized in: 1985
   - Famous for: Bengal tiger, pygmy hog, Indian elephant, and the Assam roofed turtle.

4. Sundarbans National Park (West Bengal)
   - Recognized in: 1987
   - Famous for: Royal Bengal tigers and the world's largest mangrove forest.

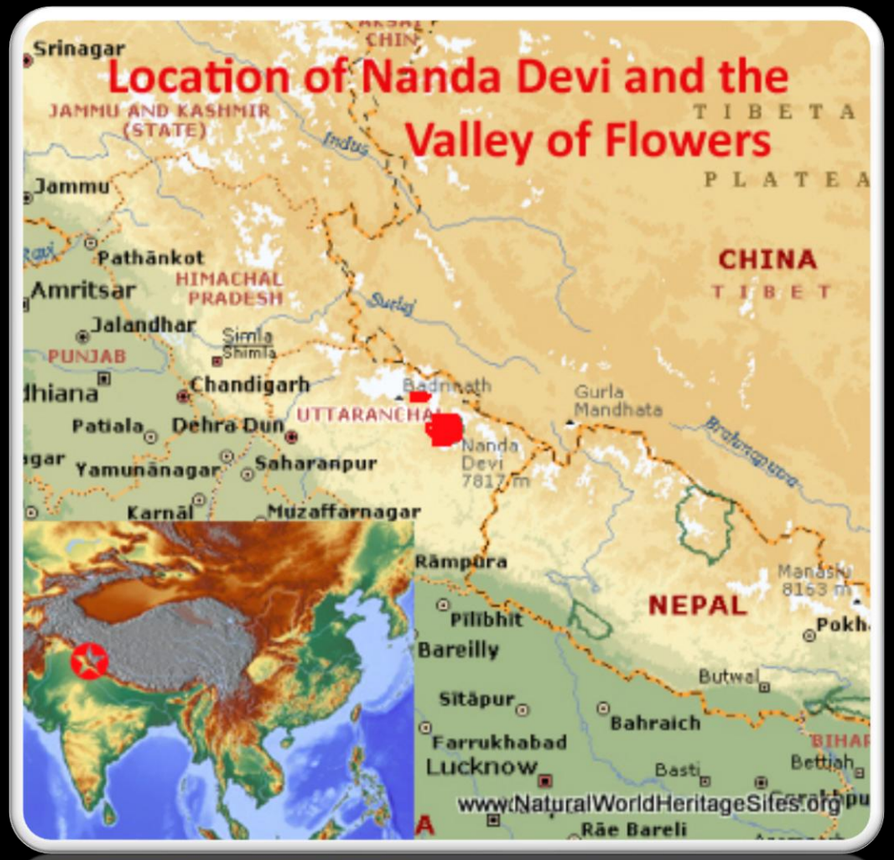
UNESCO Contd...

5. Nanda Devi and Valley of Flowers National Parks (Uttarakhand)

- Recognized in: 1988 (Nanda Devi), 2005 (Valley of Flowers)
- Famous for: Unique high-altitude flora and fauna, including snow leopards and Asiatic black bears.

6. Great Himalayan National Park (Himachal Pradesh)

- Recognized in: 2014
- Famous for: Rich biodiversity of alpine meadows and forests with species like the snow leopard, Himalayan tahr, and musk deer.



UNESCO-Recognized Wildlife Sanctuaries in India

1. Manas Wildlife Sanctuary (Assam)
    - Part of Manas National Park, this wildlife sanctuary is recognized for its outstanding universal value as a habitat for rare and endangered species such as the golden langur, pygmy hog, and Indian elephant.

UNESCO-Recognized Biosphere Reserves in India

1. Nilgiri Biosphere Reserve (Tamil Nadu, Kerala, Karnataka)
   - Recognized as part of UNESCO's World Network of Biosphere Reserves in 2000.
   - Famous for: Evergreen forests, grasslands, and species like the Asian elephant and Bengal tiger.

2. Sundarbans Biosphere Reserve (West Bengal)
   - Recognized as a World Heritage Site in 1987 and also part of UNESCO's Biosphere Reserve network.
   - Famous for: Mangrove ecosystem and the Royal Bengal tiger.

UNESCO Contd...

3. Nanda Devi Biosphere Reserve (Uttarakhand)
   - Recognized as part of UNESCO's World Network of Biosphere Reserves in 2004.
   - Famous for: The towering Nanda Devi peak, rich biodiversity, and endangered species like the snow leopard.

4. Gulf of Mannar Biosphere Reserve (Tamil Nadu)
   - Recognized as part of UNESCO's World Network of Biosphere Reserves in 2001.
   - Famous for: Marine biodiversity, coral reefs, and seagrass beds.

Policies Contd...

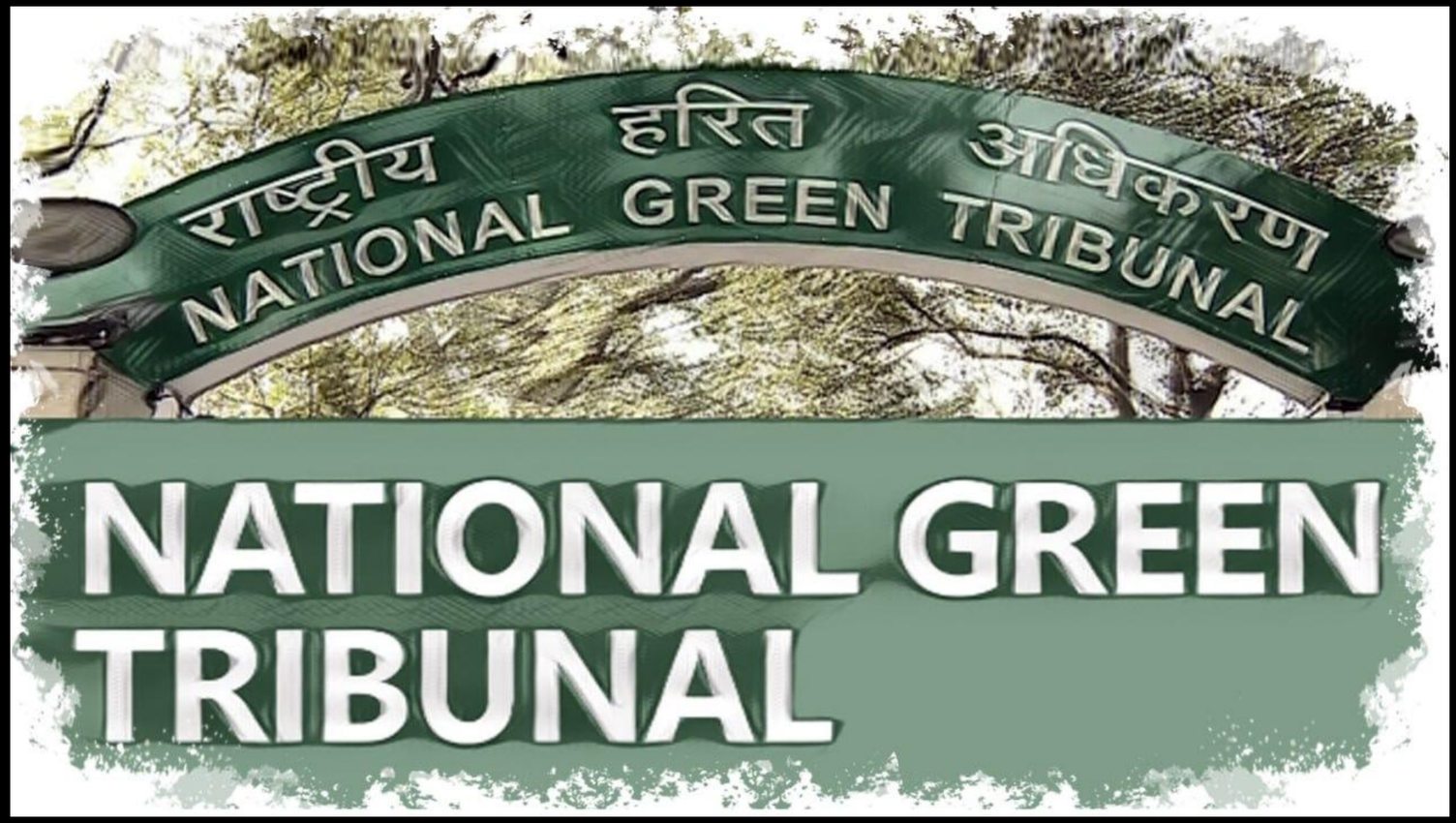
5. Great Nicobar Biosphere Reserve (Andaman and Nicobar Islands)
   - Recognized as part of UNESCO's World Network of Biosphere Reserves in 2013.
   - Famous for: Tropical rainforests and species like saltwater crocodiles and leatherback turtles.

6. Pachmarhi Biosphere Reserve (Madhya Pradesh)
   - Recognized as part of UNESCO's World Network of Biosphere Reserves in 2009.
   - Famous for: Teak forests, medicinal plants, and rich tribal culture.

7. Achanakmar-Amarkantak Biosphere Reserve (Chhattisgarh, Madhya Pradesh)
   - Recognized as part of UNESCO's World Network of Biosphere Reserves in 2012.
   - Famous for: Rich biodiversity and medicinal plant diversity in the transition zone between the Vindhya and Satpura mountain ranges.


BIOSPHERE RESERVES IN INDIA
Jammu and Kashmir
Cold desert
Himachal Pradesh
Nanada Devi
Chandigarh
Punjab
Uttarakhand
Haryana
Delhi
Rajasthan
Uttar Pradesh
Dihang-Dibang
khangchendzonga
Arunachal Pradesh
Sikkim
Dibru-Saikhowa
Manas
Assam
Nagaland
Bihar
Meghalaya
Runn of Kutch
Panna
Nokrek
Manipur
Jharkhand
Tripura
Achanakmar-Amarkantak
Madhya Pradesh
West Bengal
Mizoram
Gujarat
Pachmarhi
Chhattisgarh
Simlipal
Sunderban
Daman and Diu
Orissa
Dadra and Nagar Haveli
Maharashtra
Telangana
BIOSPHERE RESERVES IN INDIA
Goa
Andhra Pradesh
Seshachalam
Karnataka
Nilgiri
Pondicherry
Tamil Nadu
Kerala
Andaman and Nicobar Islands
Lakshadweep
Agasthyamalai
Gulf of Mannar
Great Nicobar

NATIONAL GREEN TRIBUNAL (NGT)



WHY IN THE NEWS?

Suo Motu Cognizance

The NGT has recently taken **suo motu cognizance** of several environmental violations—such as illegal sand mining, river pollution, and air quality issues.

Environmental Norms

It has also directed states to implement strict environmental norms under the **Water (Prevention and Control of Pollution) Act** and the **Air Act**.

Ongoing Debates

Ongoing debates about **expanding the tribunal's jurisdiction** and ensuring better **compliance and enforcement** have kept it in focus.

WHAT IS THE NGT?

The **National Green Tribunal (NGT)** is a **specialized body** equipped with the necessary expertise to handle environmental disputes involving multi-disciplinary issues.

Established

18 October 2010

Headquarters

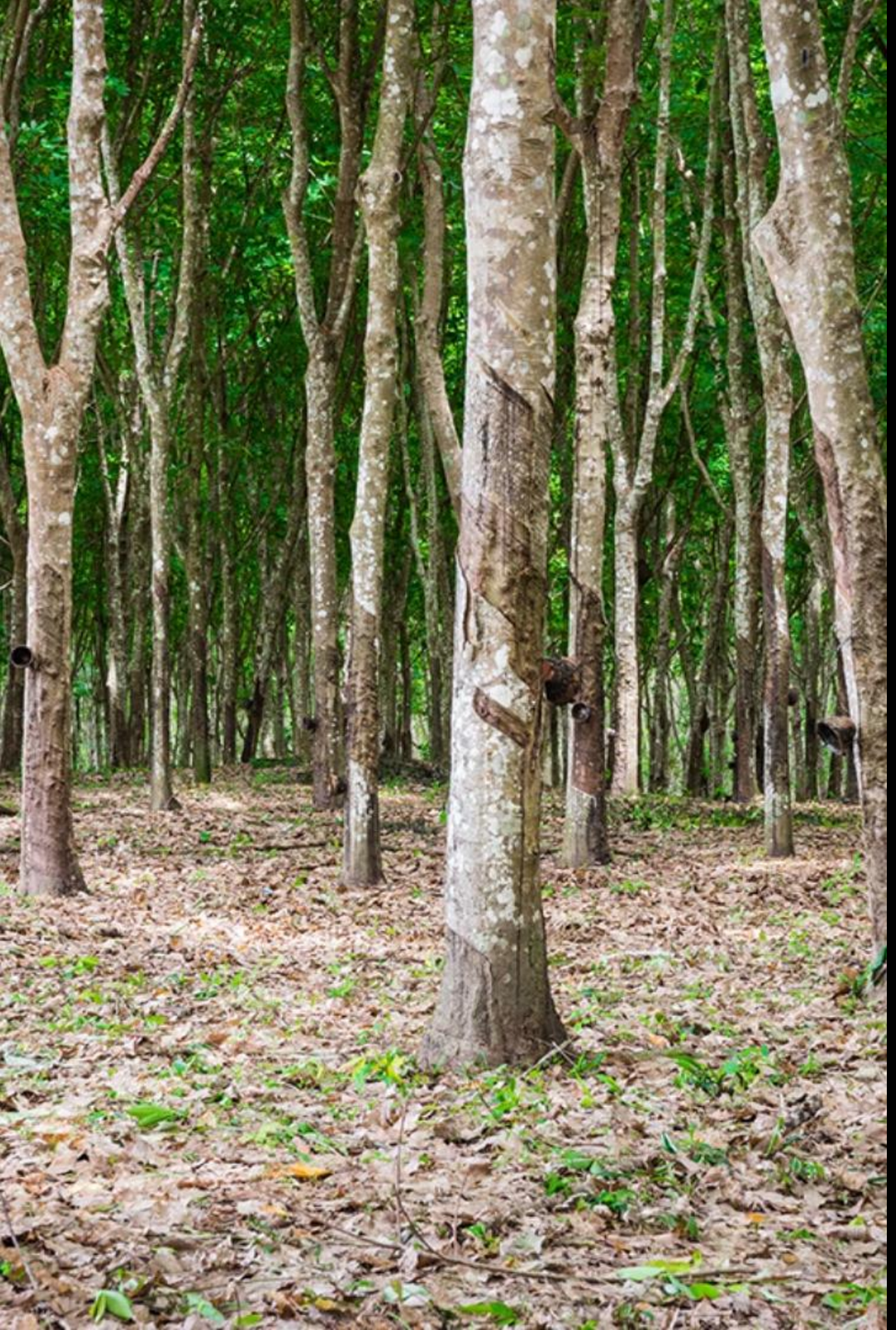
New Delhi (with regional benches in Bhopal, Pune, Kolkata, and Chennai)

Established Under

National Green Tribunal Act, 2010

Jurisdiction

India (can also apply international environmental laws to which India is a signatory)



Main Objective

To ensure **expeditious and effective disposal** of cases relating to environmental protection, forest conservation, and enforcement of legal rights related to the environment.

Environmental Protection

Safeguarding natural resources and ecosystems

Forest Conservation

Preserving forest cover and biodiversity

Legal Rights

Enforcing environmental rights of citizens

Powers & Functions

1. **Adjudicates civil cases** under:

Water Act

Water (Prevention & Control of Pollution) Act, 1974

Air Act

Air (Prevention & Control of Pollution) Act, 1981

Environment Act

Environment (Protection) Act, 1986

Biodiversity Act

Biological Diversity Act, 2002

Forest Act

Forest (Conservation) Act, 1980

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Additional Powers

Penalties and Compensation

Can impose **penalties and compensation** for environmental damage.

Suo Motu Action

Can **suo motu** take up matters (on its own).

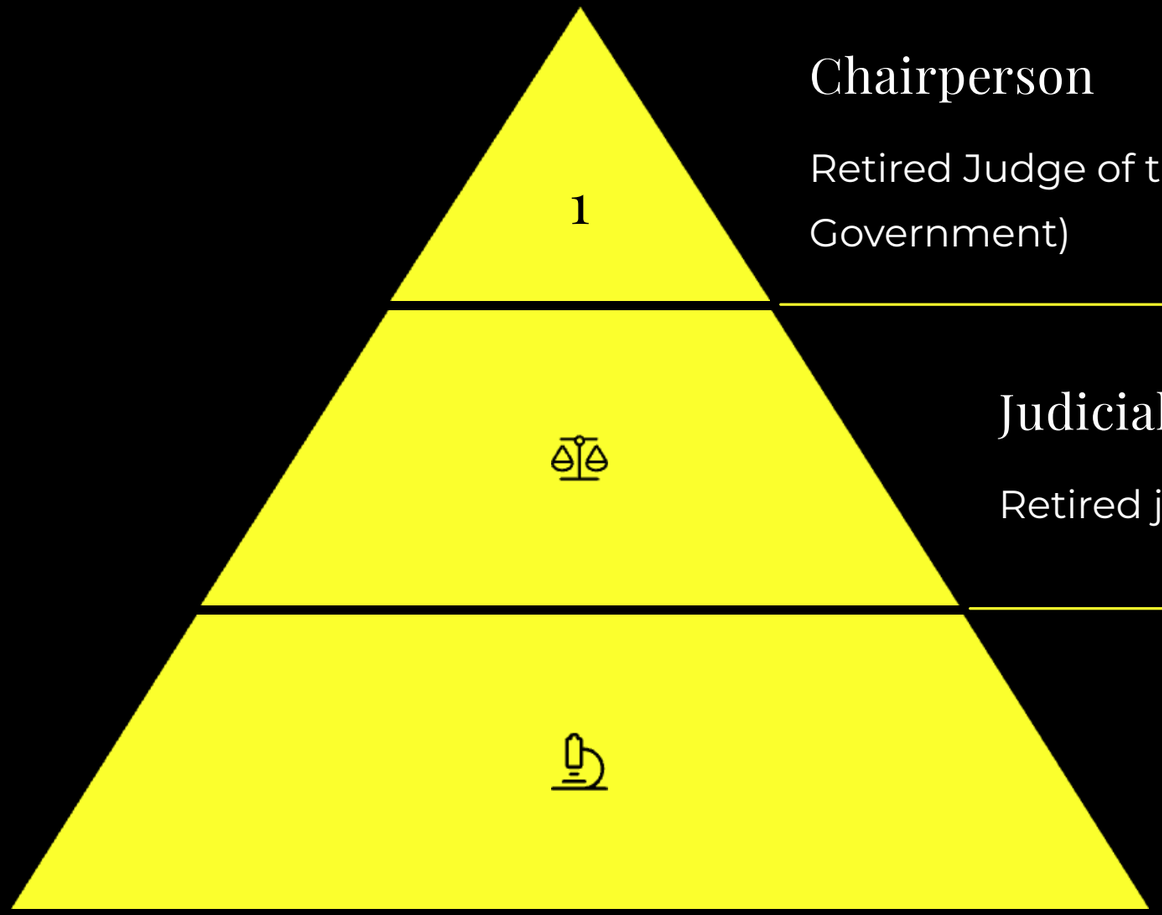
Binding Decisions

Issues **binding decisions**, enforceable by law.

Guiding Principles

Works on the **principles of natural justice**, **polluter pays**, and **sustainable development**.

COMPOSITION OF NGT



Chairperson

Retired Judge of the Supreme Court (appointed by the Central Government)

Judicial Members

Retired judges of the High Courts

Expert Members

Professionals with scientific, technical, or legal experience in environmental matters

HISTORICAL BACKGROUND

Bhopal Gas Tragedy (1984)

Bhopal Gas Tragedy (1984) exposed India's lack of speedy environmental justice mechanisms.

Need for Dedicated Court

The need for a **dedicated environmental court** was felt after years of delayed litigation in regular courts.

Recommendations

The **Law Commission of India**, **SC judgments**, and **international obligations** (like the Rio Declaration 1992) strengthened the case.

NGT Act (2010)

Based on recommendations, Parliament passed the **NGT Act in 2010**, making India the **third country** in the world (after Australia and New Zealand) to establish a specialized green court.

SIGNIFICANCE OF NGT

Area	Contribution
Environmental Justice	Speeds up disposal of cases related to pollution, forest degradation, wildlife protection
Accountability	Brings corporations and government bodies to task
Public Awareness	Encourages citizen activism via Public Interest Litigation (PIL)
Implementation	Improves enforcement of existing environmental laws
Specialization	Ensures informed, science-based decisions with expert members

RECENT NGT INTERVENTIONS (2023–2024)

1 **Solid Waste Management**

Fined states for **non-compliance with Solid Waste Management Rules**.

2 **Sand Mining**

Banned **illegal sand mining** in several districts.

3 **Forest Ecosystems**

Ordered restoration of **damaged forest ecosystems** due to developmental activities.

4 **River Pollution**

Took note of **industrial pollution** in rivers like Yamuna and Mahanadi.

MINISTRY OF ENVIRONMENT, FOREST AND CLIMATE CHANGE (MoEFCC)

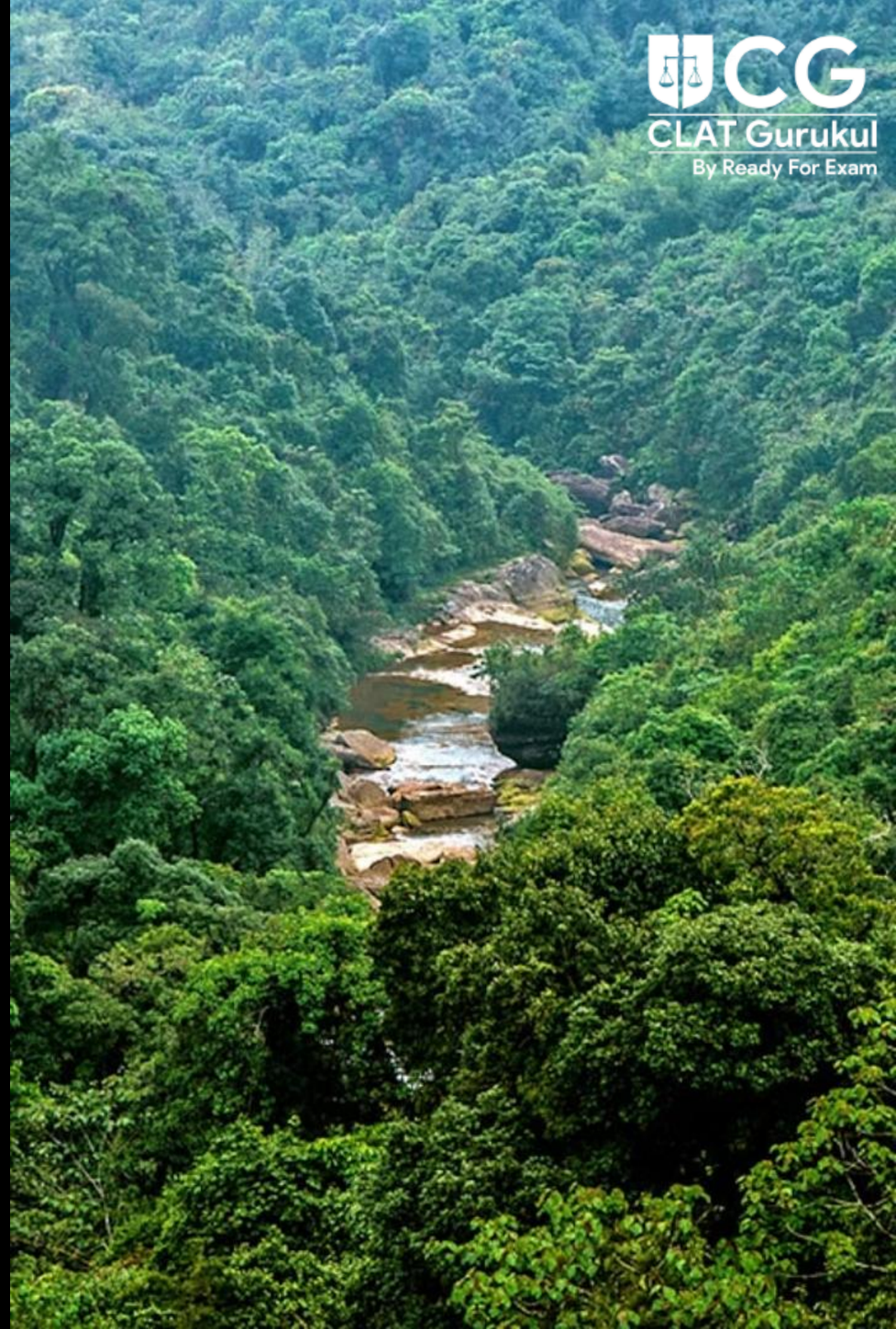
What is MoEFCC?

The **MoEFCC** is the **nodal ministry** in the Government of India for planning, promoting, coordinating, and overseeing environmental and forestry programmes.

Role with NGT

The MoEFCC provides administrative support to the NGT and implements many of the policies and regulations that the NGT enforces through its judicial decisions.

It serves as the primary government body responsible for environmental protection in India, working in tandem with the NGT's judicial oversight.



Key Functions of MoEFCC

Policy Implementation

Implements **environmental policies**, laws, and regulations

International Compliance

Implements **international environmental conventions** (UNFCCC, CBD, CITES, etc.)

Pollution Control

Supervises **Pollution Control Boards** (CPCB & SPCBs)

Climate Action

Oversees **climate change adaptation/mitigation**

Conservation

Manages **national parks**, **biodiversity**, **wetlands**, and **forests**

RELATED LAWS

Environment Protection Act, 1986

Umbrella legislation that provides a framework for environmental protection and regulation of industrial activities.

Wildlife Protection Act, 1972

Provides for the protection of wild animals, birds, and plants, and matters connected therewith.

Forest Conservation Act, 1980

Restricts the use of forest land for non-forest purposes and prevents deforestation.

Biological Diversity Act, 2002

Provides for conservation of biological diversity, sustainable use of its components, and fair sharing of benefits.

International Agreements

Paris Agreement (2015)

Global climate change mitigation framework

Rio Declaration (1992)

Principles for sustainable development

3

Stockholm Convention (1972)

Elimination of persistent organic pollutants

4

Convention on Biological Diversity

Conservation and sustainable use of biodiversity

CONCLUSION

The National Green Tribunal stands as a landmark institution in India's environmental governance framework, serving as the crucial bridge between aggressive development and ecological sustainability. By providing expedited justice for environmental violations, NGT has transformed how India addresses its ecological challenges.

Working in tandem with the Ministry of Environment, Forest and Climate Change, the NGT has cultivated a new era of environmental accountability. Its specialized expertise and dedicated focus have reshaped India's approach to balancing economic ambitions with ecological responsibility.

As India navigates the complex challenges of climate change and sustainable development, the NGT's role becomes increasingly vital. The tribunal's continued effectiveness will ultimately depend on collaborative efforts between government bodies, civil society organizations, corporate entities, and informed citizens committed to preserving India's environmental heritage.

14

Years of Impact

Transforming environmental justice since 2010

20,000+

Cases Adjudicated

Ranging from river pollution to forest conservation

95%

Implementation Rate

High compliance with tribunal directives

Integrated Forum on Climate Change and Trade (IFCCT)

Introduction & Background

Integrated Forum on Climate Change and Trade (IFCCT)

Name: Integrated Forum on Climate Change and Trade (IFCCT)

Proposed by André Aranha Corrêa do Lago (COP30 President-Designate, Brazil) at the World Trade Organization (WTO) Public Forum, September 2025.

Motivation: Climate and trade policy have long been treated in silos; the forum is intended to bridge that gap.

Context: At the intersection of the Paris Agreement climate regime and the WTO trade regime, emergent trade-measures (e.g., carbon border adjustment, deforestation-linked import bans) are creating tensions.

Key Objectives & Scope

Main objective: Provide a "neutral space" for governments, trade-experts and climate-policy makers to explore how trade and climate can be aligned.

Scope includes:

Climate Policies Impact

How climate policies (carbon pricing, border-measures) impact trade competitiveness

Trade-Restrictive Measures

Addressing "trade-restrictive unilateral measures" tied to climate

Green Transition

Designing trade mechanisms that support the green transition (technology transfer, environmental goods)

Fairness & Equity

Ensuring fairness for developing countries in trade/climate interplay

No binding outcomes: The forum's value is 'ideas generation, trust-building', rather than strictly legal obligations.

Why This Matters (Climate-Trade Nexus)

Trade & climate are linked but historically governed separately.

Example tensions:

- EU's Carbon Border Adjustment Mechanism (CBAM) and deforestation-imports ban vs manufacturing exporters.
- Supply chain realignments due to climate regulation imposing different burdens.

Developing Nations

For developing nations, climate measures tied to trade can challenge competitiveness, development & equity.

COP30 Timing

The forum is timely ahead of COP30 (Belém, Brazil, Nov 2025) as a flagship action to integrate trade into climate discussions.

Expected Structure & Topics

Timeline: Launch at COP30, then recurring meetings (annually or biennially) across trade + climate ministers & experts.

Working Groups & Deliverables

Working Groups/Tracks may include:

01

Trade Measures Interface

Trade measures and climate policy interface

02

Energy Transition

Energy transition and clean-trade flows

03

Technology & Goods

Technology & environmental goods trade

04

Developing Countries

Impacts on developing countries & trade-finance for climate

Key deliverables (likely): Policy-recommendation papers, multi-stakeholder dialogues, capacity building modules.

Linkages: Integrates with WTO, UNFCCC, trade-climate-finance fora

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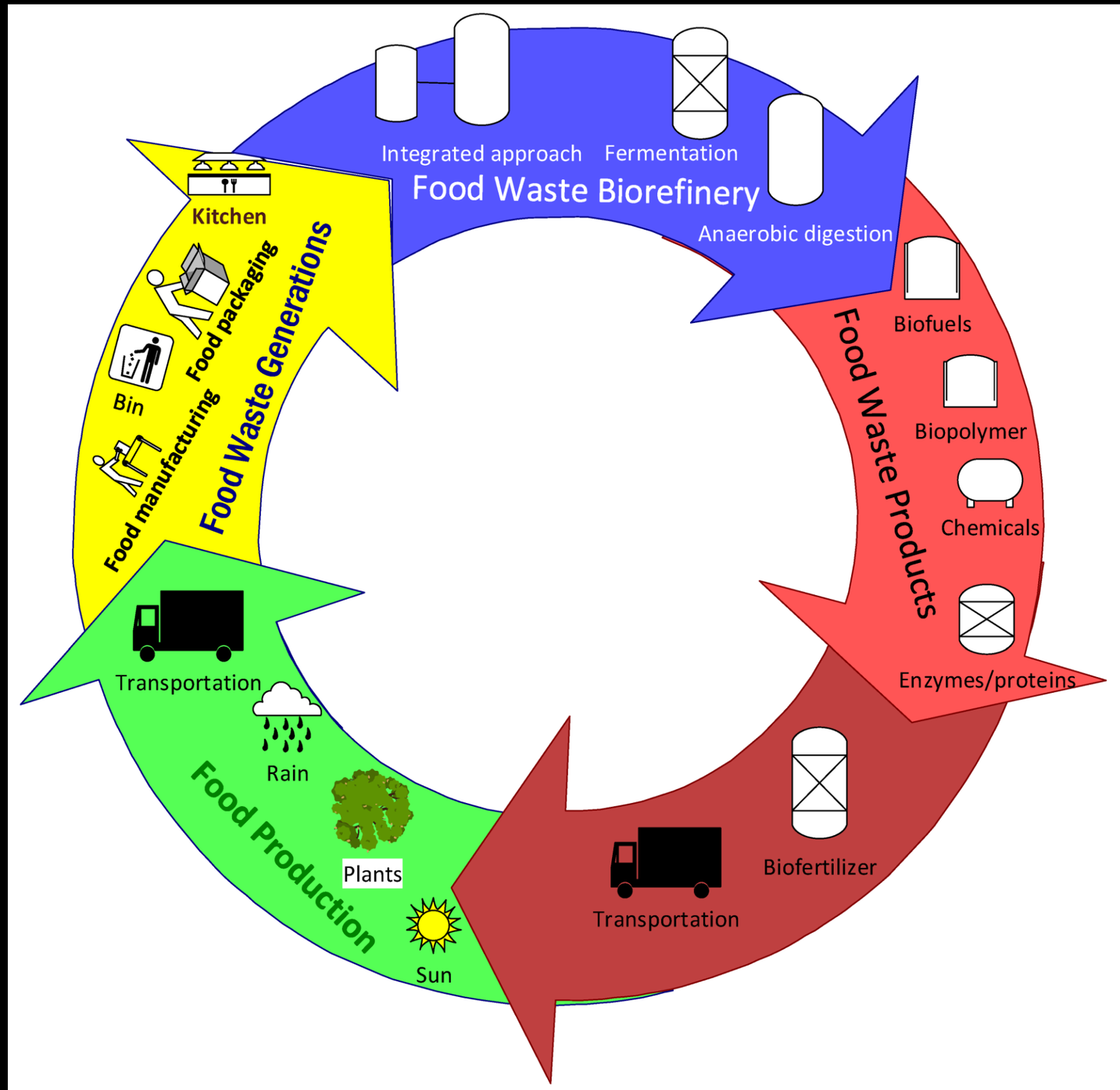
Overview of the Food Waste Breakthrough (FWB) Initiative



Food Waste Breakthrough (FWB) Initiative

Full name: Food Waste Breakthrough (FWB) Initiative.

Launched by: United Nations Environment Programme (UNEP) and partners.

Launch date: 13 November 2025, at COP30 in Belém, Brazil.

Aim:

Halve Food Waste

Halve global food waste by 2030.

Reduce Methane

Reduce methane emissions by up to 7% by 2030.

Context: Food waste contributes significantly to greenhouse-gas emissions (~10% global GHGs; up to 14% of methane).

Structure, Key Partners & Funding

Three core pillars of the initiative:

1. Capacity Building & Advocacy
2. Data & Policy
3. Finance & Implementation.

Country Champions: Brazil, Japan, United Kingdom.

City / Sub-national Champions include: Amman, Bangkok, California, Curitiba, Dar es Salaam, Florianópolis, Hanam City, Kisumu, Mexico City, Milan, Paris, Rio de Janeiro.

Private Sector & Funding

Private-sector contributors: Carrefour, Citibank, Google, Hilton, Rabobank, Winnow.

Funding:

$3M

GEF Commitment

Global Environment Facility (GEF) committed US$3 million for the first 4-year global project.

$5M

Challenge Fund

Additional US$5 million challenge fund being developed to support 20-25 community-led innovations across Latin America & Caribbean, Asia, Africa, Middle East.

Why It Matters: Relevance & Impacts

Food waste is more than a moral issue — it's a major climate, economic & food-security issue.

1 Billion Tonnes

Over 1 billion tonnes of food wasted annually.

$1 Trillion Loss

Annual financial loss of about US$1 trillion.

14% Methane

Methane: food waste in landfills contributes up to 14% of global methane emissions, and methane is ~84 times stronger than CO_2 over 20 years.

By halving food waste:

- You reduce pressure on landfills, lower methane emissions.
- Improve food security (redirect surplus food to needy).
- Support climate targets (mitigate warming).

Link to UN Sustainable Development Goals (SDGs):

1

SDG 2

Zero Hunger

2

SDG 12

Responsible Consumption & Production

3

SDG 13

Climate Action

How the Initiative Works & What It Requires

Data & Policy

Member states, cities must establish data-tracking for food loss/waste, integrate into national climate/action plans.

Capacity Building

Training for stakeholders (governments, businesses, civil society) on best practices for food recovery, waste prevention, circular-economy models.

Finance & Implementation

Investing in infrastructure (cold chains, redistribution networks, landfill diversion), supporting innovations (behaviour change, waste-to-value tech).

Targeted Actions for Cities / Regions

Waste Prevention

Waste prevention in supply chains.

Food Banks

Diverting edible surplus to food banks.

Methane Capture

Landfill methane capture.

Waste Audits

Food-waste audits.

Country Platform for Climate and Nature Finance

Introduction & Background

Name: Country Platform for Climate and Nature Finance (CPCNF)

Announced during COP 30 (Belém, Brazil) at a ministerial event, 17 November 2025.

Purpose: A country-driven mechanism to translate climate and nature priorities into investment-oriented programs, instead of fragmented project-based approaches.

It aligns stakeholders, financing flows and policies with national climate & nature agendas.

Key Features & Membership

The Platform is coordinated with major global finance mechanisms — e.g., Green Climate Fund (GCF) (~US$19 billion commitments).

Member countries (13 listed initially): India, Cambodia, Colombia, Kazakhstan, Lesotho, Mongolia, Nigeria, Oman, Panama, Rwanda, Dominican Republic, Togo, South Africa; plus regional alliance – the African Islands States Climate Commission (AISCC).

With these plus existing platforms (Brazil, Caribbean regional platform) total number of country-platforms becomes 16.

Why It Matters & Strategic Relevance

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The Problem

Climate finance today is often project-by-project, leading to fragmentation, inefficiency and misalignment with national priorities.

The Solution

A country platform model aims at pooling investments, aligning finance with national strategy, and linking nature & climate in one architecture.

For countries like India:

Offers improved access to global funds, better alignment with national climate targets, and supports blended finance (public + private).

For the global system:

Helps ensure that nature finance (biodiversity, ecosystems) gets equal focus with climate mitigation/adaptation finance.

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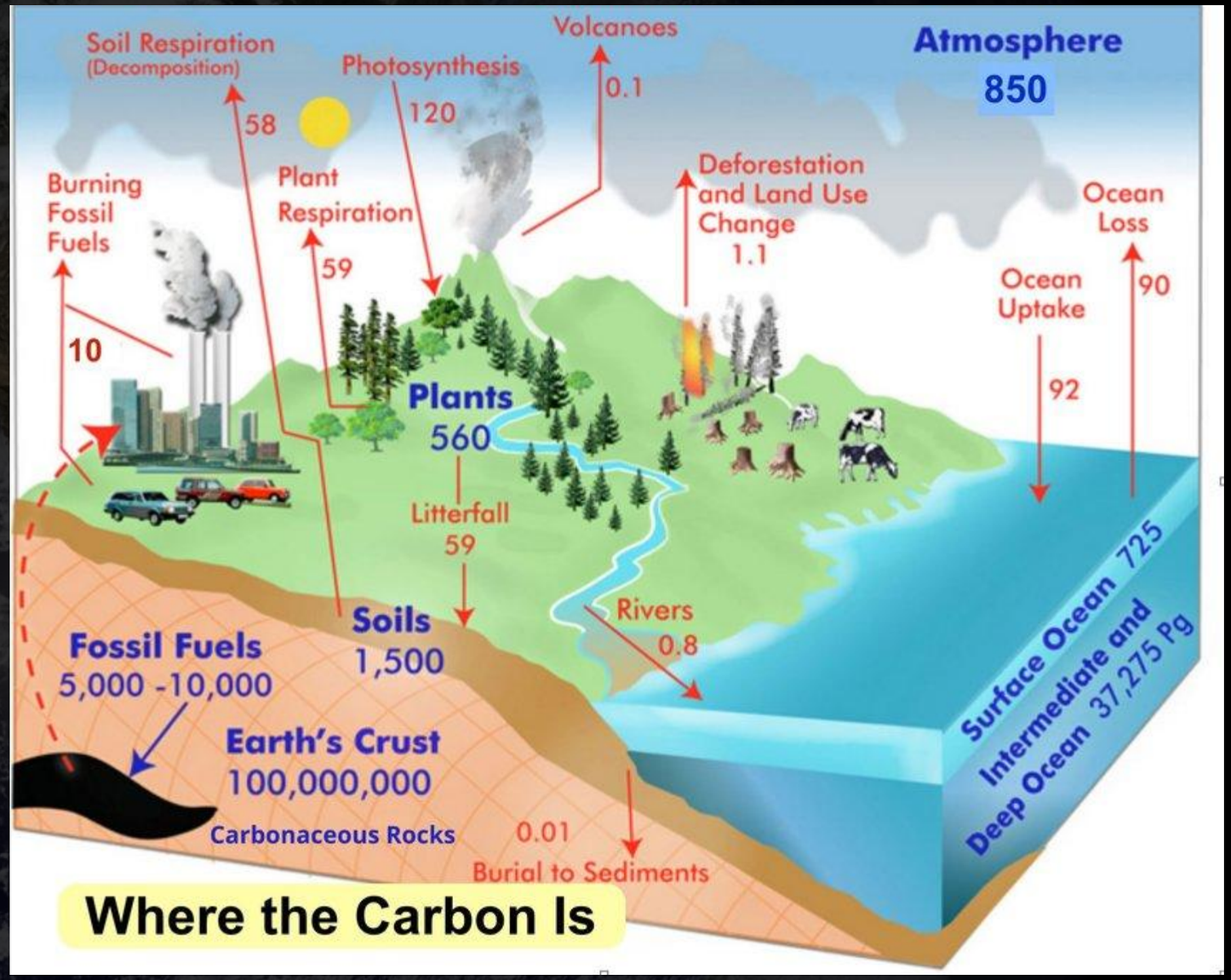
Global Carbon Budget



Introduction to Global Carbon Budget

The Global Carbon Budget represents the net amount of CO_2 emitted into the atmosphere after accounting for sources (fossil fuels, land-use change) and sinks (oceans, land biosphere).

The 2025 edition is produced by the **Global Carbon Project (GCP)** in association with multiple research institutes.

It's critical because it shows how emissions compare to pathways consistent with the Paris Agreement targets of limiting warming to 1.5 °C or well below 2 °C.

Trends & What the Numbers Show

1

Emissions Growth

- Fossil-fuel & industry emissions have grown nearly ~2–3% per year over last decade.
- Land-use-change emissions have stabilised and slightly declined.
- The carbon-intensity of the economy is dropping slowly, but not fast enough.

2

The Challenge

- Despite improved sink performance, the sheer volume of emissions overwhelms them → atmospheric CO_2 continues rising.
- The budget shows pathways: to limit warming to 1.5 °C, remaining carbon budget is estimated at ~300–400 $GtCO_2$ from 2025 onward.

At current rates (≈22 $GtCO_2$/year net), that budget would be exhausted in **~14-18 years**.

Causes & Drivers

Economic Growth + Energy Demand

Especially in Asia-Pacific, Africa.

Fossil Fuel Dependence

Coal still dominant in many countries.

Transport & Industrial Emissions

Heavy industries (cement, steel) hard to decarbonise.

Land-Use Change

Deforestation in tropics adds to emissions; while reforestation gains are less.

Slow Transition to Renewables / Energy Efficiency

While renewables are growing, emissions from fossil fuels still high.

Why It's a Worry (Exam-Relevant Points)

Climate Impact

CO_2 accumulation fosters global warming, sea-level rise, extreme weather.

Limited Budget

A "budget" for 1.5 °C means very limited remaining emissions — implying rapid decarbonisation needed.

Regional Vulnerability

Some regions (Small Island States, Coastal areas) will face irreversible damage if budget overshot.

Technology Requirements

The longer emissions remain high, the more carbon removal or negative-emissions technologies will be required — costly & uncertain.

India's Position

For countries like India: despite lower per-capita emissions, budget pressure means early action is beneficial both for climate and development.

India's Context & Relevance

India's annual CO_2 emissions (≈3 $GtCO_2$) are 7-8% of global fossil-fuel emissions, but per-capita much lower (2-3 t CO_2/person vs global ~8-10 t).

India's growth path intersects with the global budget:

The Challenge

Need for energy-intensive growth → challenge.

The Opportunity

But also opportunity: leapfrog to low-carbon technology, renewables, green hydrogen.

By understanding the global budget constraints, India can align its policies (e.g., renewable expansion, energy efficiency) to preserve development momentum while staying within safe climate space.

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Thank You!

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