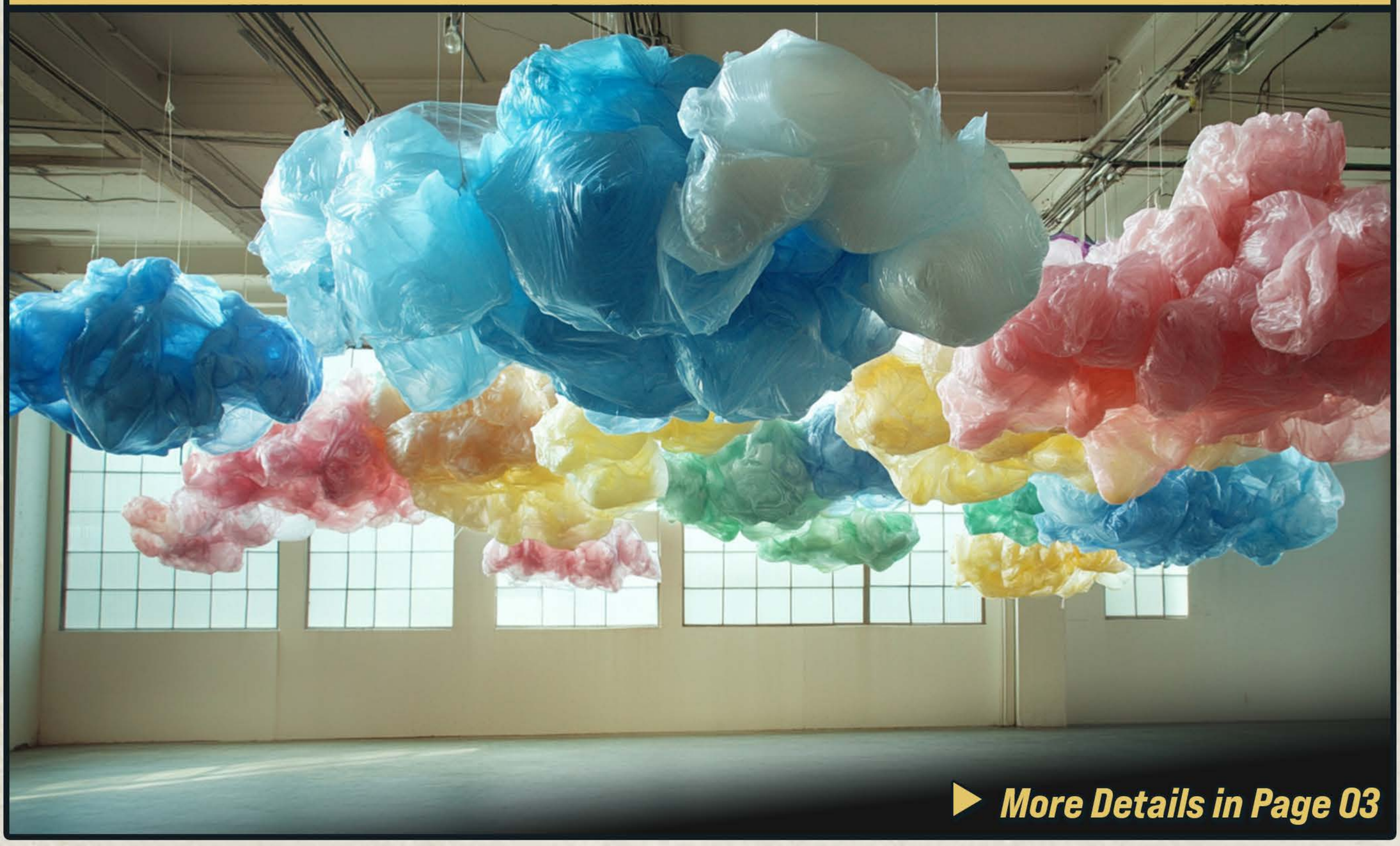
WEEKLY NEWS

November 17-23, 2024

Microplastics and Climate



▶ More Details in Page 03

‘An Eye on Methane’ Report

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HIGHLIGHTS

- ‘One Day One Genome’
- Climate Justice at CoP29

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First Fully Mechanical Qubits

Why in News?

- Swiss physicists have developed the first-ever **fully mechanical qubits,** which could address major limitations in current quantum computing systems.
- This breakthrough aims to overcome issues like **quantum error** and **shorter lifetimes** of virtual qubits made using electromagnetic methods.

Key Highlights

Mechanical Qubits

Mechanism: Unlike electromagnetic qubits, mechanical qubits operate using mechanical systems.

Significance:

Improved Stability: Reduces quantum errors that arise from the high sensitivity of traditional qubits.

Extended Lifetime: Addresses challenges of short operational periods seen in virtual qubits.

Quantum Errors

Quantum computers use **qubits (quantum bits)** to encode data, enabling them to perform complex computations.

However, these qubits are highly sensitive, leading to **calculation errors** (quantum errors).

As the size of quantum computers grows, these errors tend to worsen.

About Quantum Computers

Principles

Based on **Quantum Mechanics**, which describes the unique behavior of subatomic particles compared to macro-level physics.

Two core principles:

Superposition: Each qubit can represent both 0 and 1 simultaneously.

Entanglement: Correlation between qubits, where the state of one qubit depends on the state of another.

Wave-Particle Duality

Describes how quantum particles exhibit both **wave-like and particle-like properties,** termed **wave-particle duality.**

Initiatives for Quantum Computing in India

Major Programs

National Quantum Mission (2023): Aims to establish India as a global leader in quantum technologies.

Quantum Enabled Science and Technology (QUEST): Focuses on research to build quantum capabilities.

Research and Development

MeitY Quantum Computing Applications Lab (QCAL): Provides resources and tools for researchers.

Quantum Computer Simulator (QSim) Toolkit: Offers a virtual platform for exploring quantum computing.

Notable Achievements

Development of **quantum-backed green hydrogen production technology** at BHU, Varanasi.

Way Forward

- Continue research into **mechanical qubits** to enhance their feasibility for practical use.
- Strengthen international collaborations to leverage advancements in quantum computing.
- Scale up **India's quantum initiatives** by encouraging academic and industrial partnerships.
- Develop robust frameworks to mitigate quantum errors in larger quantum computing systems.

Microplastics and Climate: A New Concern

Why in News?

- New research reveals microplastics in the atmosphere may influence weather and climate.
- Microplastics act as ice-nucleating particles, impacting cloud formation and precipitation patterns.

Key Findings

- **Role of Microplastics in Cloud Formation:**

  Microplastics serve as nuclei for ice crystals in clouds.

  Defects in water droplets caused by particles like dust, bacteria, or microplastics lead to freezing at warmer temperatures, altering cloud dynamics.

  Clouds form when water vapor condenses on tiny particles, creating water droplets or ice crystals.

- **Impact on Atmosphere and Climate:**

  Precipitation Patterns: Polluted environments with excess aerosol particles (e.g., microplastics) lead to smaller cloud droplets, resulting in less frequent rain and heavier rainfall during precipitation events.

  Global Warming: The ratio of liquid water to ice in clouds influences their warming or cooling effects.

  Other Impacts: Affects weather forecasting, climate modeling, and aviation safety due to changes in atmospheric ice crystal behavior.

Initiatives to Reduce Microplastics

- **Global Efforts:**

  Global Partnership on Plastic Pollution and Marine Litter.

  UN Environment Assembly's resolution for an International Legally Binding Agreement to end plastic pollution.

  IAEA's NUTEC Plastics initiative.

- ***Initiatives to Reduce Microplastics***

  ➪ **Indian Initiatives:**

  Ban on Single-Use Plastic.

  Implementation of Plastic Waste Management Rules, 2016.

  KVIC's Project REPLAN (Reducing Plastic from Nature).

- ***Way Forward***

  ➪ **Enhance research** on microplastics' atmospheric impact.

  ➪ **Strengthen global collaborations** for plastic pollution management.

  ➪ **Promote innovative waste reduction initiatives** and stricter enforcement of plastic bans.

  ➪ **Increase awareness** and adopt sustainable alternatives to plastics.

UNEP's Fourth 'An Eye on Methane' Report

Why in News?

- The **fourth edition of the report, An Eye on Methane: Invisible but not Unseen**, was published by the **United Nations Environment Programme's (UNEP) International Methane Emissions Observatory (IMEO).**
- Focuses on methane's impact on climate change and the global response to emissions.

Key Highlights

About IMEO

A core partner of the **Global Methane Pledge**, IMEO provides reliable data on methane emissions.

Data is sourced through:

Oil and Gas Methane Partnership 2.0 (OGMP 2.0) for industry reporting.

Methane Alert and Response System (MARS) for satellite-based monitoring.

Global methane science studies and national emissions inventories.

Findings from the Report

Impact on Global Warming: Methane emissions caused by humans account for approximately one-third of the planet's current warming.

Oil and Gas Sector: Members of OGMP 2.0 represent only **42% of global oil and gas production,** highlighting gaps in industry coverage.

Steel Supply Chain:

Methane emissions from metallurgical coal used in steel production contribute **10% of energy sector methane emissions.**

Mitigation is possible at **minimal costs.**

Poor Response to Emission Alerts: IMEO's **MARS alerts** for major methane leaks have seen substantive responses in only **1% of cases.**

About Methane

➪ **Characteristics:**

A potent greenhouse gas, **86 times stronger than CO_2 in the short term.**

A **Short-Lived Climate Pollutant (SLCP)** with an atmospheric lifespan of 1**2 years.**

➪ **Harmful Effects:** Contributes to toxic tropospheric ozone, leading to:

Respiratory problems.

Crop losses.

➪ **Sources of Emissions:**

Over **60%** of emissions stem from human activities, including:

Agriculture.

Fossil fuels.

Waste management.

Initiatives to Reduce Methane Emissions

➪ **Global Efforts**

Global Methane Pledge: Aimed at reducing global methane emissions by **30% by 2030.**

Climate and Clean Air Coalition (CCAC): Focused on short-lived climate pollutants.

Global Methane Alliance: Collaborative global methane reduction initiatives.

➪ **Indian Initiatives**

National Innovations in Climate Resilient Agriculture (NICRA): Enhancing climate resilience in agriculture.

National Livestock Mission: Sustainable livestock development to reduce methane.

Gobar-Dhan Scheme: Managing cattle waste and reducing emissions.

National Biogas and Organic Manure Programme: Promoting biogas as a clean energy source.

Way Forward

➪ **Enhanced Monitoring and Accountability:**

Expand OGMP 2.0 membership to cover a larger share of global production.

Strengthen enforcement of MARS alerts to ensure timely responses.

➪ **Global and Local Collaboration:**

Promote participation in initiatives like the Global Methane Pledge.

Enhance funding for methane reduction projects in developing countries.

➪ **Technology and Innovation:**

Invest in methane detection and reduction technologies.

Support research for cost-effective mitigation in industrial and agricultural sectors.

‘One Day One Genome’ Initiative: Advancing Microbial Genomics

Why in News?

- The **Department of Biotechnology (DBT)** and **Biotechnology Research and Innovation Council (BRIC)** launched the **‘One Day One Genome’ initiative.**
- Aims to enhance microbial genomics research and make genomic data accessible to researchers.

About Genome and Genome Sequencing

- **What is a Genome?**

  The complete set of genetic material (**DNA** or **RNA**) containing an organism’s hereditary information.

  Composed of unique sequences of **nucleotide bases.**

  DNA: Adenine (A), Cytosine (C), Guanine (G), Thymine (T).

  RNA: Adenine (A), Cytosine (C), Guanine (G), Uracil (U).

- **Genome Sequencing:** A process to determine the precise order of nucleotide bases in DNA/RNA.

Applications of Genome Sequencing (GS)

- **Disease Detection:** Helps identify rare disorders and preconditions like **cystic fibrosis** and **thalassemia**.
- **Pharmacogenomics:** Evaluates the safety and efficacy of drugs using individual genomic data.
- **Metagenomic Sequencing:** Explores genomes of multiple species in an environment, enabling:

  Rapid species identification.

  Environmental impact analysis.

- **Agriculture:**

  Identifies genetic markers for **disease resistance** and **drought tolerance** in crops.

  Reduces time for developing new crop varieties.

  Deciphers **host-pathogen relationships** in plants.

- **Microbial Sequencing:** Facilitates advancements in Biofuel development, Diagnostic tools, Vaccines, Environmental cleanup techniques.

Significance of Microbes

- **Environmental Role:** Participate in **biogeochemical cycles**, soil formation, and oxygen release (e.g., algae).
- **Human Health:** Aid in digestion, immunity, and mental health.
- **Household Products:** Involved in food and beverage production (e.g., **lactic acid bacteria** in food fermentation).
- **Industrial Applications:** Used in:

  Baking (e.g., baker's yeast for bread).

  Beverage production (e.g., beer).

  Biofuel production (e.g., yeast).

  Sewage treatment.

Way Forward

- **Strengthening Research:**

  Promote accessibility and sharing of microbial genomic data among researchers.

  Expand collaborations for cross-disciplinary innovation.
- **Technological Advancements:** Develop cost-effective and faster sequencing technologies.
- **Focus Areas:** Enhance applications in agriculture, healthcare, and environmental management.
- **Public Awareness:** Educate the public on the importance of microbial genomics in everyday life.

Indian Coast Guard and Coastal Security

Why in News?

- The **Parliamentary Standing Committee on Defence** reviewed the **Indian Coast Guard's (ICG)** role in ensuring coastal security.
- Focused on ICG's operational capabilities, strategic initiatives, and preparedness for addressing coastal security challenges.

Security Concerns of the Coast

Major Threats

Terrorist Infiltration via Sea: Potential for sea-based attacks, such as the **2008 Mumbai attacks.**

Maritime Trafficking: Smuggling of gold, luxury items, drugs, and illegal trade via maritime routes.

Industrial & Strategic Vulnerabilities:

Numerous **Special Economic Zones (SEZs)** along the coast.

Critical infrastructure, including **oil refineries, offshore platforms, and 13 major ports** handling 90% of maritime trade.

Damage to Strategic Installations:

Naval commands: Vishakhapatnam, Mumbai, Kochi, and Port Blair.

Nuclear power plants: Tarapur, Kudankulam, and Kalpakkam.

Additional Challenges

Poor coordination among agencies.

Illegal fishing and marine pollution.

Vulnerability to natural disasters.

Steps Taken to Strengthen Coastal Security

Organizational Initiatives

NCSMCS:

National Committee for Strengthening Maritime and Coastal Security.

Acts as a forum to review maritime and coastal security.

National Command, Control, Communications, and Intelligence (NC3I): Enhances surveillance and intelligence-sharing.

Maritime Domain Awareness (MDA): Strengthened through the **Coastal Surveillance Network (CSN),** including radars, sensors, and the **Automatic Identification System (AIS).**

Procedural Initiatives

SAGAR Initiative: India's vision for ensuring secure and sustainable seas.

Sea Vigil Exercise: A comprehensive coastal security drill.

Coastal Security Scheme: Focuses on improving infrastructure and coordination.

Indian Coast Guard: An Overview

Legislation and Headquarters

Established under the **Coast Guard Act of 1978.**

Headquarters located in **Delhi**.

Objectives

Safeguard India's **11,098 km coastline.**

Secure vital maritime trade routes.

Key Functions

Protecting offshore installations and ensuring maritime safety.

Assisting fishermen and enforcing maritime laws.

Preserving the marine environment and preventing pollution.

Supporting **anti-smuggling operations.**

Ministry: Operates under the **Ministry of Defence.**

Way Forward

Enhanced Interagency Coordination: Improve collaboration among agencies involved in coastal security.

Technology Upgrades: Strengthen surveillance systems, including drones and advanced radars.

Public Awareness: Engage local fishing communities to act as informants for potential threats.

Policy Revisions: Regular updates to ensure comprehensive coastal security frameworks.

Climate Justice at CoP29

Why in News?

- At the **Second Annual High-Level Ministerial Round Table on Just Transition** during CoP29, India emphasized the importance of **climate justice** and **equitable global action** for addressing climate change.

Understanding Just Transitions

- **Definition:** Ensuring no one is left behind during the shift to low-carbon and environmentally sustainable economies and societies.
- **Significance:**

  Aims for social inclusion and equity.

  Focuses on balancing economic, environmental, and social considerations.

Need for Just Transitions

- **Climate Change Mitigation:** Essential for reducing global warming by transitioning to low-carbon energy.
- **Global Commitments:** Supports India's **Nationally Determined Contributions (NDCs)** and the **Panchamrita Pledge.**
- **Energy Security:** Reduces dependence on fossil fuel imports, enhancing resilience.

Challenges in Achieving Just Transitions

- **Global-Level Challenges**

  Estimating Costs: No established method to calculate the costs of a just energy transition.

  Intellectual Property (IP) Issues: Green technology access hindered by patent restrictions.

- **Ethical and Domestic Issues**

  Equity and Responsibility: Balancing **environmental justice** with economic growth.

  Economic Vulnerabilities: Transition may increase financial strain on developing countries.

  Limited Resources: Insufficient domestic financial support for large-scale transitions.

- ***Challenges in Achieving Just Transitions***

  - **Initiatives for Just Transition in India**

    Production-Linked Incentive (PLI) Scheme: Encourages the manufacturing of high-efficiency solar PV modules.

    Sovereign Green Bonds: Funds projects to reduce carbon intensity.

    National Clean Energy Fund (NCEF): Supports clean energy ventures through a coal cess.

    Green Term Ahead Market (GTAM): Facilitates renewable energy trading through exchanges.

- ***Way Forward***

  - **International Actions**

    Unrestricted Technology Transfer: Promote access to green technologies.

    Equitable Climate Finance: Developed nations to provide fair funding for climate action.

    Strengthened Cooperation: Build trust among nations to enhance collective action.

  - **Domestic Actions**

    National Just Transition Body: Establish an independent body to monitor and guide just transition efforts.

    Financial Mechanisms: Develop innovative domestic funding sources for green initiatives.

    Public Awareness: Engage communities to support inclusive and equitable transition policies.

Guru Ghasidas-Tamor Pingla: India's 56th Tiger Reserve

Why in News?

➪ The **Chhattisgarh government** has notified the **Guru Ghasidas National Park** and **Tamor Pingla Wildlife Sanctuary** as India's **56th Tiger Reserve (TR)** on the advice of the **National Tiger Conservation Authority (NTCA).**

Key Highlights

➪ **Tiger Reserves in Chhattisgarh**

Chhattisgarh now has **four TRs:**

1. **Indravati TR**
2. **Udanti-Sitanadi TR**
3. **Achanakmar TR**
4. **Guru Ghasidas-Tamor Pingla TR**

➪ **National Significance**

Guru Ghasidas-Tamor Pingla TR is now **India's third-largest TR**, following:

1. **Nagarjunasagar-Srisailam TR (Andhra Pradesh)**
2. **Manas TR (Assam)**

About Tiger Reserves

➪ **Legal Framework:** TRs are notified by **state governments** under the **Wildlife (Protection) Act, 1972**, based on NTCA recommendations.

➪ **Zoning of Tiger Reserves**

Core/Critical Areas:

Must remain **inviolate** for tiger conservation.

Rights of **Scheduled Tribes and forest dwellers** are protected under the **Forest Rights Act, 2006.**

Buffer/Peripheral Areas:

Focus on **human-wildlife coexistence.**

Recognizes **local rights** through **Gram Sabha.**

- ***Location and Landscape***
  - ➪ **Geography:** Located on the **Chota Nagpur plateau** and partly on the **Baghelkhand plateau.**
  - ➪ **Rivers:** Major rivers include **Hasdeo Gopad** and **Baranga.**
  - ➪ **Fauna:** Home to species like Leopards, hyenas, jackals, wolves, and sloth bears.
  - ➪ **Landscape Approach**

    Part of a **contiguous network** with:

    Sanjay Dubri TR (Madhya Pradesh)

    Bandhavgarh TR (Madhya Pradesh)

    Palamau TR (Jharkhand)

- ***Landscape Approach to Tiger Conservation***
  - ➪ **Concept:** Treats protected areas as a **network of interconnected populations** through corridors to sustain tiger populations.
  - ➪ **Significance**

    Ensures:

    Habitat connectivity

    Gene flow

    Reduction of **inbreeding depression**

    Avoidance of tiger **translocations**

- ***Way Forward***
  - ➪ **Strengthen habitat connectivity** between tiger reserves.
  - ➪ Enhance **community participation** in conservation efforts.
  - ➪ Develop effective **corridor management** to protect tiger populations.
  - ➪ Promote **sustainable tourism** to generate awareness and funds for conservation.

India-Italy Joint Strategic Action Plan 2025-2029

Why in News?

- India and Italy unveiled a **five-year Joint Strategic Action Plan (2025-2029)** during a bilateral meeting on the sidelines of the **G20 Summit in Brazil.**
- The plan outlines collaboration in key sectors such as **defense, energy, connectivity, and science and technology.**

Key Highlights

- **Economic Cooperation**

  Emphasis on increasing **trade and investment** in sectors like:

  Green technologies

  Pharmaceuticals

  Food processing through the **Joint Commission for Economic Cooperation** and **Working Group on Food Processing.**

- **Connectivity**

  Collaboration on the **India-Middle East-Europe Economic Corridor (IMEEC)** to enhance connectivity and trade links between **India, Middle East, and Europe.**

- **Science and Technology**

  Expansion of cooperation in **critical technologies,** including:

  Artificial intelligence

  Digitalization

  Implementation of th**e** 2025-27 Executive Programme for Scientific and Technological Cooperation.

  Launch of **Indo-Italian Innovation and Incubation Exchange Programme** to foster **academic and industrial collaboration.**

- **Energy Transition**

  Agreement on organizing **Tech Summits** and strengthening global alliances such as:

  Global Biofuels Alliance

  International Solar Alliance.

Key Highlights

Defense Cooperation

Annual **Joint Defence Consultative (JDC) meetings** and **Joint Staff Talks (JST)** to improve defense coordination.

Discussion on creating a **Defence Industrial Roadmap** to bolster cooperation in defense manufacturing.

India-Italy Relations

Political

Diplomatic relations were established in **1947**.

Economic

Italy is India's **4th largest trading partner in the EU.**

Bilateral trade in **2022-23** reached **$14.253 billion**, with a balance of trade favoring India.

The **Indian diaspora** in Italy is approximately **2 lakhs.**

Migration and Mobility

The **Migration and Mobility Partnership Agreement (2023)** facilitates **safe and legal migration** between the two nations.

Way Forward

- **Deepen Bilateral Trade:** Promote joint ventures in emerging technologies and sustainable energy.
- **Enhance Defense Collaboration:** Develop a robust **Defence Industrial Roadmap** for manufacturing and technology transfer.
- **Leverage Connectivity:** Utilize IMEEC to boost strategic trade and enhance connectivity.
- **Strengthen Diaspora Engagement:** Foster greater participation of the Indian community in bilateral economic and cultural initiatives.
- **Promote Technological Innovation:** Scale up academic and industrial exchanges to accelerate advancements in AI and digitalization.

Rio de Janeiro Declaration

Why in News?

- The **G20 Summit 2024,** held in **Rio de Janeiro**, concluded with the adoption of the **Rio de Janeiro Declaration**, addressing global challenges and promoting inclusive growth.
- Theme: **"Building a Just World and a Sustainable Planet."**

Key Highlights of the Rio de Janeiro Declaration

Social Inclusion and Fight Against Hunger and Poverty

Global Alliance Against Hunger and Poverty:

Launched to eradicate hunger and poverty.

Focus on cash transfer programs and expanding school meals in vulnerable regions.

Global Coalition for Local and Regional Production, Innovation, and Equitable Access: Aims to enhance access to vaccines, diagnostics, and health technologies for neglected diseases and vulnerable populations.

Sustainable Development, Energy Transitions, and Climate Action

Task Force on Global Mobilization Against Climate Change:

Created to identify and address structural barriers to private capital flows for climate action.

Focus on developing countries' climate financing needs.

Reform of Global Governance Institutions

UN Security Council Reform: Pledged to align with 21st-century realities for inclusivity, effectiveness, and accountability.

G20 Roadmap for Multilateral Development Banks (MDBs): Aims to create better, larger, and more effective MDBs for global development.

About the Global Alliance Against Hunger and Poverty

- **Aim:** To accelerate efforts toward eradicating hunger and poverty globally.
- **Membership:** Includes **148 members** (82 countries, African Union, European Union, etc.); India is a member.
- **Goals:**

Reach **500 million people** with cash transfer programs in low- and lower-middle-income countries by **2030**.

Provide high-quality school meals to an additional **150 million children** in vulnerable nations.

- ***Way Forward***

  - **Global Actions**

    Strengthen international cooperation for inclusive and equitable global growth.

    Mobilize private and public capital to address structural barriers in climate financing.

    Promote reforms in global governance for better representation and accountability.

  - **India's Role**

    Leverage its G20 membership to lead initiatives on poverty alleviation, hunger eradication, and climate action.

    Enhance participation in programs under the **Global Alliance Against Hunger and Poverty** and climate financing mechanisms.

COP29: Methane and Climate Resilience

Why in News?

➪ The **COP29 Presidency** introduced two major initiatives:

Reducing Methane from Organic Waste Declaration

Baku Harmoniya Climate Initiative for Farmers

Reducing Methane from Organic Waste Declaration

➪ **Key Highlights**

Objective: Reduce methane emissions from organic waste by integrating sectoral targets in future Nationally Determined Contributions (NDCs).

➪ **Significance:**

Organic waste is the **third-largest source** of anthropogenic methane emissions, following agriculture and fossil fuels.

Focuses on launching policies and roadmaps for methane reduction in the organic waste sector.

➪ **Collaborative Effort:** Developed with the **UNEP-convened Climate and Clean Air Coalition (CCAC).**

CCAC: Established in **2012**, it works on reducing **short-lived climate pollutants (SLCPs),** including methane, black carbon, HFCs, and tropospheric ozone.

➪ **Signatories:** 35 countries, representing **47% of global methane emissions** from organic waste. **India is not a signatory.**

Baku Harmoniya Climate Initiative for Farmers

➪ **Key Highlights**

Launched by: COP29 Azerbaijan Presidency in collaboration with the **UN Food and Agriculture Organization (FAO).**

Aim:

Help farmers access programs for climate-resilient agrifood systems transformation.

Empower **women and youth** in farming communities.

Catalyze investments in climate-resilient agriculture.

Hosting: Part of the **Food and Agriculture for Sustainable Transformation (FAST) Partnership**, established at COP27 in 2022.

FAST Partnership: Multi-stakeholder platform enhancing climate finance for agrifood systems to support vulnerable populations.

- ***Way Forward***

  - **Global Level**

    Promote collaborative frameworks like CCAC and FAST to address climate challenges.

    Encourage countries, including India, to join methane reduction initiatives to combat global warming.

    Strengthen financial mechanisms for climate-resilient agriculture through multilateral efforts.

  - **India's Role**

    Leverage existing programs like **Gobar-Dhan Scheme** and **National Livestock Mission** to align with methane reduction goals.

    Focus on empowering women and youth in agrifood systems through national climate-resilient strategies.

    Collaborate with platforms like FAST to mobilize investments in sustainable agriculture.

Cloud Seeding

Why in News?

- **Delhi's Initiative:** The Delhi Government has sought the Centre's permission to implement cloud seeding as a measure to address deteriorating air quality in the city.

About Cloud Seeding

- **Definition:** A weather modification technique to enhance precipitation (artificial rain).
- **Process:**

  Chemicals like silver iodide, potassium iodide, and dry ice are dispersed into the atmosphere using airplanes or helicopters.

  These chemicals attract water vapour, serving as nuclei to form rain clouds.

- **Types:**

  Hygroscopic Cloud Seeding: Enhances droplet merging in liquid clouds.

  Glaciogenic Cloud Seeding: Promotes ice formation in super-cooled clouds.

Cloud Seeding and Climate Change

- **Arguments in Favor**

  Weather Regulation: Helps manage water vapour, reducing damage from hailstorms and increasing snowfall during winters.

  Water Supply: Enhances precipitation in arid areas, improving livability and community support.

  Air Pollution Control: Disperses pollutants like dust, smoke, and smog; mitigates wildfires.

  Agricultural Benefits: Provides essential moisture for crops in dry conditions.

- **Arguments Against**

  Limited Research: Insufficient evidence to prove effectiveness against pollution, especially in Delhi's scenario.

  Moisture Dependency: Requires moisture-laden clouds; not all clouds are suitable for seeding.

  Chemical Impacts: Silver iodide, the primary agent, may cause iodine poisoning and harm aquatic and terrestrial life.

  High Costs: Estimated cost is around ₹1 lakh per square kilometre, raising concerns about economic feasibility.

- ***Way Forward***
  - **Research and Development:** More studies to evaluate the effectiveness and long-term impacts of cloud seeding.
  - **Nature-Based Solutions:** Green infrastructure, urban vegetation, and other natural methods to reduce pollution.
  - **Construction-Based Interventions:** Adoption of technologies like carbon capture and storage, and bio-based building materials to address pollution sustainably

Chennai-Vladivostok Eastern Maritime Corridor

Why in News?

- **Launch of the Chennai-Vladivostok Eastern Maritime Corridor (EMC)**, aimed at enhancing maritime connectivity between **India and Russia.**
- Announced by the **Union Minister of Ports, Shipping & Waterways.**
- The corridor is operational and will strengthen economic and trade relations between the two countries.

About the Eastern Maritime Corridor (EMC)

- **Envisioned in 2019** during the **Eastern Economic Forum** held in **Vladivostok, Russia.**
- Connects **Chennai (India)** to **Vladivostok (Russia)** through **Northeast Asia.**
- **Total Distance:** Approx. **10,300 km**, passing through:

  Sea of Japan

  South China Sea

  Malacca Strait
- Aims to improve trade and connectivity by establishing a reliable sea route.

Significance of the EMC

- **Reduced Logistics Costs:**

  Shortens transportation time by **16 days.**

  Cuts down distance by **40%** compared to the current trade route via the **Suez Canal.**

  Current route between **Mumbai and St. Petersburg** via Suez takes around **40 days** covering **16,066 km.**
- **Boost to India's Maritime Sector:**

  India's maritime sector handles **95% by volume** and **70% by value** of the country's trade.

  Aligns with **India's Maritime Vision 2030**, which involves over **150 initiatives** across the maritime sector.

- ***Significance of the EMC***
  - **Strategic Geopolitical Advantage:**

    The corridor addresses the growing **dominance of China** in the South China Sea.

    Vladivostok's proximity to the **Russia-China border** enhances India's access to the region.
  - **Strengthens India's Act Far East Policy:** Opens access to **Russian resources** and enhances India's presence in the **Pacific trade network.**

- ***Other Key Maritime Corridors***
  - **India-Middle East-Europe Economic Corridor (IMEEC):** Launched at the **G20 Leaders' Summit (2023)** to integrate **Asia, Europe**, and the **Middle East.**
  - **International North-South Transport Corridor (INSTC):** Proposed in **2000**, linking Russia's **Baltic Sea** coast to India's western ports via **Iran**.

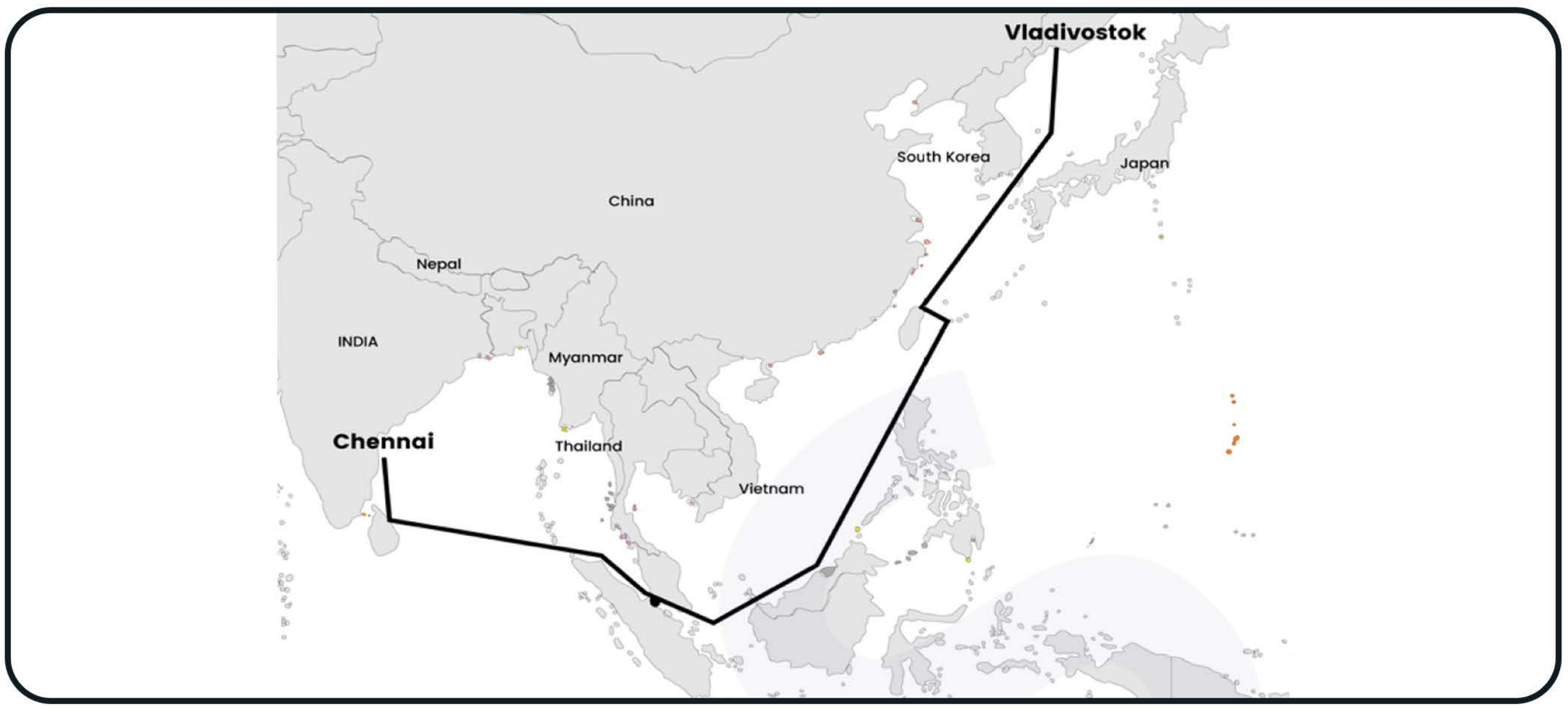
- ***Way Forward***
  - **Expand Connectivity:**

    Further strengthen India's maritime ties with Russia and other countries in the Pacific region.

    Integrate the EMC with **other global trade networks** to enhance economic influence.
  - **Infrastructure Development:**

    Invest in port and logistics infrastructure to streamline operations along the corridor.

    Focus on sustainable and efficient maritime practices to ensure long-term success.
  - **Leverage Strategic Partnerships:** Explore opportunities for **joint ventures** with Russian and regional partners to maximize benefits from the corridor.
  - **Geopolitical Implications:** Enhance India's role in counterbalancing China's influence in the South China Sea and surrounding regions.



2nd India-CARICOM Summit

Why in News?

- **2nd India-CARICOM Summit** concluded in **Guyana**.
- **India** proposed **seven key pillars** to enhance the relationship between **India** and the **Caribbean Community (CARICOM).**
- **First-ever India-CARICOM Summit** was held in 2019.

Seven Key Pillars for Strengthening Ties (Acronym: C-A-R-I-C-O-M)

C	A	R	I	C	O	M
Capacity Building	*Agriculture and Food Security*	*Renewable Energy and Climate Change*	*Innovation*	*Cricket and Culture*	*Ocean Economy and Maritime Security*	*Medicines and Healthcare*

About CARICOM

- **Established in 1973** to promote economic integration and cooperation in the **Caribbean**.

  Comprises **21 countries:**
- **15 Member States** (e.g., Antigua and Barbuda, Bahamas, Barbados).
- **6 Associate Members** (e.g., Belize).

Significance of CARICOM for India

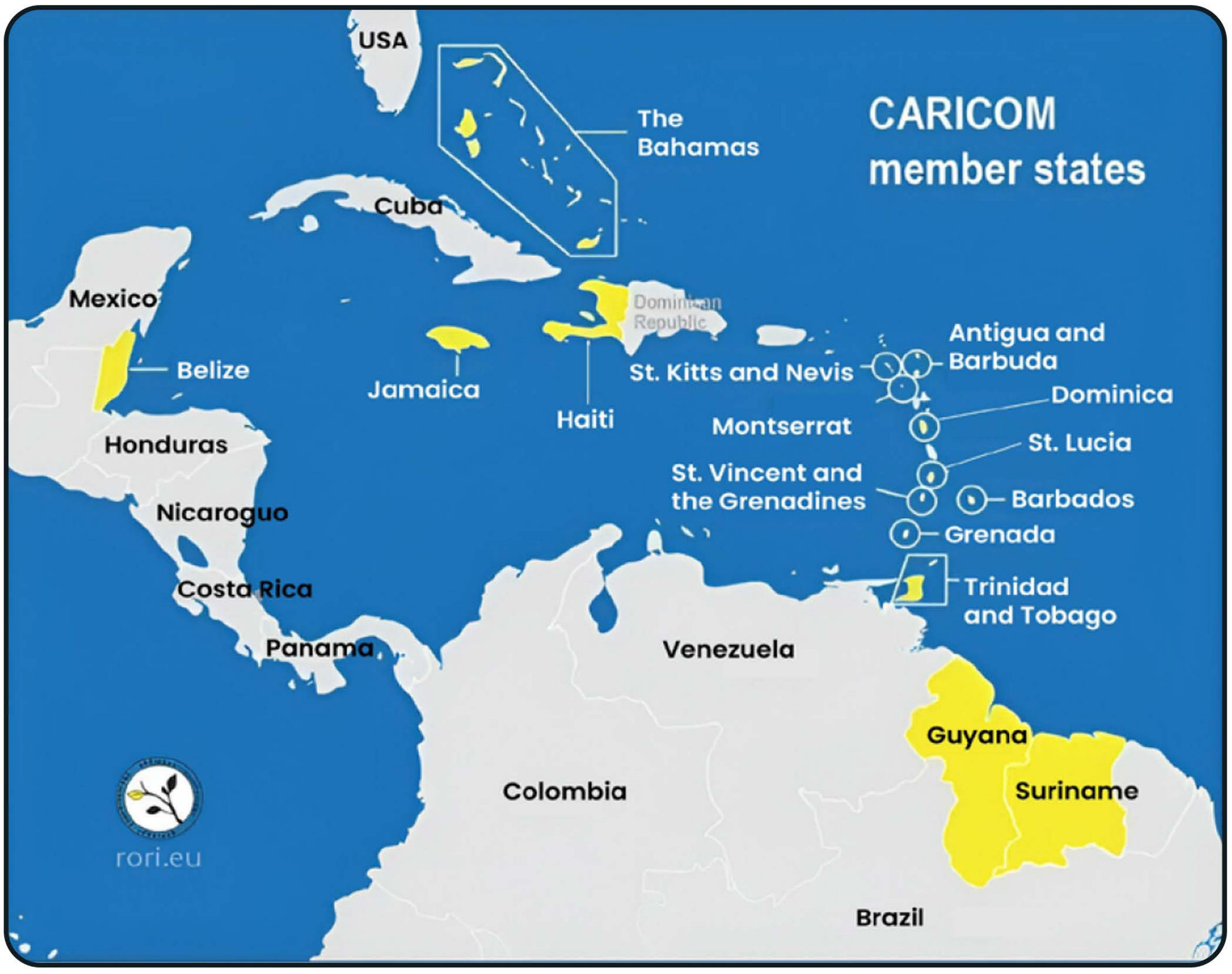
- **Partnership in Multilateral Forums:** Many CARICOM nations, such as **Antigua and Barbuda,** support India's bid for **permanent membership in the UN Security Council.**
- **South-South Cooperation:** CARICOM countries participated in India's **3rd Voice of Global South Summit (2024).**
- **Defence Exports:** Example: **HAL (Hindustan Aeronautics Limited)** recently delivered **two Dornier 228 aircraft** to **Guyana**.
- **Climate Action and Energy Security:** Example: **Suriname** joined the **International Solar Alliance (ISA)**, fostering energy collaboration.
- **Additional Points:**

  CARICOM serves as a **gateway to Latin America** for India.

  Cooperation in **disaster resilience** through initiatives like the **Coalition for Disaster Resilient Infrastructure.**

  CARICOM is home to a significant **Indian Diaspora**, especially in **Trinidad** and **Tobago**.

- ***Way Forward***
  - **Enhanced Bilateral Cooperation:** Continue expanding ties across key sectors like **renewable energy, agriculture, and climate action.**
  - **Focus on Trade and Technology:** Strengthen **trade relations** and **technological collaboration** with CARICOM countries.
  - **Increased Multilateral Engagement:** Leverage CARICOM's support for **India's international initiatives,** including climate change and global governance reforms.
  - **Community Outreach:** Foster closer cultural and educational exchanges, capitalizing on the Indian diaspora's presence in the region



Russia Updates Its Nuclear Doctrine

Why in News?

- Russia's President has approved a revised **Nuclear Doctrine (ND)**, replacing the 2020 version.
- The new doctrine emphasizes the role of nuclear weapons in deterring threats and expands scenarios for their potential use.

Key Features of Russia's Revised ND

- **Expanded Definition of Nuclear Attack:**

  Treats aggression by a non-nuclear state, supported by a nuclear state, as a **joint attack** warranting nuclear retaliation.

  Targets countries allowing their territories to be used for aggression against Russia.

- **Lowering Nuclear Response Threshold:**

  Extends from defending Russia's existence to **protecting sovereignty and territorial integrity.**

  Belarus placed under Russia's **nuclear umbrella.**

- **New Risks Triggering Nuclear Response:**

  Expansion of **military coalitions** and large-scale exercises near Russian borders.

  Deployment of enemy military infrastructure closer to Russia's borders.

Potential Impacts of the Revised Doctrine

- **Increased Risk of Escalation:** Greater likelihood of **Tactical Nuclear Warfare** due to lowered response thresholds.
- **Weakening Non-Proliferation Efforts:** Could make it harder to persuade other nations to abandon nuclear programs.
- **Heightened Geopolitical Tensions:** Expanded definition of "extreme circumstances" may deepen **distrust** between Russia and the US.

Way Forward

- **Global Dialogue:** Encourage discussions on limiting nuclear doctrines to prevent misinterpretation and escalation.
- **Strengthen Non-Proliferation Mechanisms:** Reinforce frameworks like the NPT and IAEA safeguards.
- **De-escalatory Measures:** Promote confidence-building measures between global powers to reduce nuclear risks.

WHO Report on Climate Change and Health at CoP-29

Why in News?

- **World Health Organization (WHO)** released its report on **Climate Change and Health at CoP-29.**
- The report emphasizes **health** as a key argument for **climate action** across **people, place, and planet.**

Impact of Climate Change on Health

- **Direct Impact:**

  Noncommunicable Diseases (NCDs): Climate change and **air pollution** are responsible for **85%** of NCD-related deaths.

  Heat Stress: People experienced **50 additional days** of heat-related health threats in **2023** due to climate change.

  Maternal and Reproductive Health: Increased risks of **preterm birth, low birth weight, maternal death, and decreased fertility.**

- **Indirect Impact:**

  Poverty and Marginalization: Climate change exacerbates **poverty** and **marginalization**.

  Food and Water Security: Threats to **food** and **water** security.

  Rise in Conflicts and Migration: Climate change leads to **conflict** and migration pressures.

  Internal Displacement: In **2023, 20.3 million people** were displaced due to **weather-related disasters.**

Key Recommendations

- **One Health Approach:** Adopt a **One Health** framework to address the interconnectedness of **human, animal,** and **ecosystem** health.
- **Transition to Circular Economy:** Shift from **extractive economic systems** to a **circular economy** model for sustainability.
- **Climate Finance:** Ensure that the **New Collective Quantified Goal (NCQG)** on climate finance and **Loss and Damage Fund** arrangements are **fully funded.**
- **Integrating Health into Climate Action:** Incorporate **health considerations** into **national climate action** plans, including **Nationally Determined Contributions (NDCs)** and **National Action Plans (NAPs).**

- ***Initiatives Taken***
  - **National Programme on Climate Change and Human Health** (Ministry of Health & Family Welfare).
  - **The Network on Climate Change and Health** (Department of Science & Technology program).

- ***Way Forward***
  - **Strengthened Climate-Health Integration:** Ensure that health considerations are integrated into **climate action** frameworks at national and international levels.
  - **Investment in Climate Resilience:** Increase investment in **climate-resilient healthcare systems and health infrastructure.**
  - **International Collaboration:** Foster **global partnerships** to address the health impacts of climate change, particularly in vulnerable communities.
  - **Public Awareness and Education:** Enhance **public awareness** on the interconnections between **climate change** and **health** and encourage **behavioral changes** for better health outcomes.

Global Nitrous Oxide (N2O) Assessment Report by CCAC and FAO

Why in News?

- The **Climate and Clean Air Coalition (CCAC)** and **FAO** launched the **Global Nitrous Oxide (N2O) Assessment Report at UN COP29 in Baku, Azerbaijan.**

  This is the first **international report** focused solely on **N2O emissions** in over a decade.

Key Findings of the Report

- **Impact on Global Warming:** If N2O emissions continue at the current rate (currently contributing 0.1°C to global warming), limiting global warming to 1.5°C becomes unfeasible.
- **Increase in N2O Emissions:**

  40% increase in **anthropogenic N2O emissions** since **1980**.

  Around **75% of N2O emissions** originate from the **agricultural use of synthetic fertilizers** and **manure**.
- **Ozone Depletion:** N2O is a leading **ozone-depleting substance**, contributing to **harmful UV radiation**, which increases risks of:

  Cataracts (0.2-0.8% increase).

  Skin cancer (2-10% increase).

Measures to Abate N2O Emissions

- **Agriculture:** Use of **enhanced-efficiency fertilizers, nitrification inhibitors,** and **slow-release formulations.**
- **Industry: Thermal destruction** or **catalytic processes** can achieve **90-99% efficiency** in treating emissions from **adipic acid** and **nitric acid** production.
- **Fossil Fuel Reduction:** Transition to **renewable energy sources** in **transportation** and **energy production.**
- **Manure Management:** Techniques like **balancing nutrient inputs** in animal feed, **reducing grazing intensity**, and **anaerobic digestion** of manure.
- **Multilateral Options:** Use of **Gothenburg Protocol targets** for **ammonia** and **nitrogen oxides** under the **Convention on Long Range Transboundary Air Pollution.**

- ***About N2O***

  - **Properties:**

    N2O, commonly known as **'laughing gas'**, is a **long-lived greenhouse gas.**

    It is about **270 times more powerful** than **CO2** and has an **atmospheric lifetime** of **114 years.**

    Inorganic, colorless, odorless, soluble in water, and its vapors are heavier than air.

  - **Sources:**

    Natural: Microbial activity in soils and oceans.

    Anthropogenic: Fertilizers, wastewater, etc.

- ***About CCAC***

  - **Establishment:** Founded in **2012** and convened under the **UNEP**.
  - **Membership:** Over **160 governments**, intergovernmental organizations, and **NGOs**.
  - **India's Participation:** India joined the CCAC in **2019**.
  - **Mission:** Focuses on reducing **short-lived climate pollutants** that contribute to both **climate change** and **air pollution.**

- ***Way Forward***

  - **Stronger Global Efforts:** Intensify global initiatives to curb N2O emissions, particularly from **agriculture** and **industry**.
  - **Adoption of Sustainable Practices:** Promote **sustainable farming techniques** and **circular economy** models to reduce dependency on harmful fertilizers and enhance **manure management.**
  - **Increased International Cooperation:** Build stronger **multilateral frameworks** and partnerships to address N2O emissions and other pollutants.
  - **Enhanced Monitoring and Enforcement:** Strengthen monitoring and **policy enforcement** mechanisms to track N2O emissions globally and ensure that targets for emission reductions are met.

India-Maldives Pact for Cross-Border Transactions in Local Currencies

Why in News?

- **India** and **Maldives** have signed a **Memorandum of Understanding (MoU)** between the **Reserve Bank of India (RBI)** and the **Maldives Monetary Authority (MMA).**
- The agreement aims to promote the use of **local currencies** (Indian Rupee and Maldivian Rufiyaa) for **cross-border transactions.**

Significance of the Agreement

- **Reducing Dollar Dependency:** India has been working to reduce reliance on the US dollar in international trade by promoting the use of local currencies.
- **Strengthening Bilateral Relations:** The MoU enhances **economic cooperation** between India and the Maldives, especially in the financial sector.

About the Internationalisation of the Rupee

- **Definition:** Currency internationalisation involves expanding a national currency's role to function globally as a **unit of account, medium of exchange, and store of value.**
- **Goal for India:** To **promote the rupee** for **foreign trade** and **current account transactions,** reducing dependence on foreign currencies, particularly the dollar.

Significance of Rupee Internationalisation

- **Risk Reduction:** Enables **domestic firms** to invoice and settle international trade in **local currencies,** mitigating **exchange rate risks.**
- **Broader Financial Access:** Facilitates **international market access** for domestic entities, lowering **capital costs** and providing expanded financing options.
- **Reserve Management:** Reduces the need for **large foreign exchange reserves,** leading to lower associated costs and **external vulnerabilities.**

Challenges in Internationalising the Rupee

- **Currency Fluctuations:** Initial stages of internationalisation may experience significant **fluctuations** in the value of the rupee.
- **Monetary Control Conflicts: Triffin's Dilemma** may arise, where global currency supply obligations conflict with **domestic monetary policy needs.**
- **Exposure to External Shocks:** Increased exposure to international financial **shocks** due to unrestricted cross-border capital flows.

Steps Taken Toward Rupee Internationalisation

- **RBI Initiatives:** The **RBI** has allowed **invoicing and payments** for international trade in **Indian Rupees.** Introduction of the **Special Rupee Vostro Account** system to facilitate the rupee's use in international transactions.
- **Currency Swap Agreements:** India has signed **currency swap agreements** with countries like **Japan, Sri Lanka**, and **Bhutan** to promote the rupee in cross-border transactions.

Way Forward

- **Expanding Currency Agreements:** India should continue to build partnerships with more countries to increase the use of the rupee for **international trade.**
- **Strengthening Financial Infrastructure:** Develop more robust **financial mechanisms** and **platforms** to support the use of the rupee in cross-border transactions.
- **Building Confidence:** Efforts to stabilize the rupee's value and reduce volatility will be key to encouraging its wider use globally.

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