



6 January, 2024

## PRITHvi Vlgyan (PRITHVI)

**Context:** The Cabinet has granted approval for the comprehensive scheme PRITHvi Vlgyan (PRITHVI) by the Ministry of Earth Sciences.

### ➤ Cabinet Approval and Overview:

- The Union Cabinet, chaired by Prime Minister Shri Narendra Modi, has approved the PRITHvi Vlgyan (PRITHVI) scheme.
- The implementation period is set from 2021 to 2026, with a total cost of Rs. 4,797 crore.

### ➤ Sub-schemes under PRITHVI:

- Atmosphere & Climate Research-Modelling Observing Systems & Services (ACROSS)
- Ocean Services, Modelling Application, Resources and Technology (O-SMART)
- Polar Science and Cryosphere Research (PACER)
- Seismology and Geosciences (SAGE)
- Research, Education, Training and Outreach (REACHOUT).

### ➤ Objectives of PRITHVI Scheme:

- Augmentation and sustenance of long-term observations of Earth's components.
- Development of modeling systems for understanding and predicting weather, ocean, and climate hazards.
- Exploration of polar and high seas regions.
- Development of technology for sustainable harnessing of oceanic resources.
- Translation of Earth system science knowledge into services for societal, environmental, and economic benefit.

### ➤ Mandate of Ministry of Earth Sciences (MoES):

- MoES is mandated to translate Science to Services for the Society.
- Provides services for weather, climate, ocean, coastal state, hydrology, seismology, and natural hazards.
- Aims to explore and harness marine living and non-living resources sustainably.
- Explores the three poles of the Earth (Arctic, Antarctic, and Himalayas).

### ➤ Services Provided by MoES:

- MoES delivers weather forecasts and warnings for natural disasters.
- Issues alerts for tsunamis and monitors earthquakes.
- The services are effectively utilized by agencies and state governments for saving lives and minimizing damages due to natural disasters.

### ➤ Institutes Involved in R&D and Operational Activities:

- Ten Institutes under MoES, including India Meteorological Department (IMD), National Centre for Medium Range Weather Forecasting (NCMRWF), and others.
- A fleet of oceanographic and coastal research vessels provides research support.

### ➤ Holistic Approach of PRITHVI Scheme:

- Earth System Sciences cover atmosphere, hydrosphere, geosphere, cryosphere, and biosphere.
- PRITHVI will holistically address all components, improving understanding and providing reliable services for the country.

- It involves integrated multi-disciplinary earth science research and innovative programs across MoES institutes.

### ➤ Inter-dependency and Integration:

- Components of the PRITHVI scheme are inter-dependent and carried out in an integrated manner.
- Aims to address grand challenges of weather, climate, ocean, cryosphere, seismological science, and resource exploration sustainably.

## Memorandum of Understanding between India and United States for International Development

**Context:** The Cabinet has approved the signing of an MoU between India and the United States (USAID/India) to support Indian Railways in achieving Net Zero Carbon Emission.

➤ **Objective of the MoU:** The MoU aims to support Indian Railways in achieving the Mission Net Zero Carbon Emission by 2030.

➤ **Platform for Interaction:** The MoU provides a platform for Indian Railways to interact and share the latest developments and knowledge in the railway sector.

➤ **Facilitated Areas:** Focus areas include utility modernization, advanced energy solutions, regional energy and market integration, private sector participation, training, and seminars/workshops on technology areas like Renewable Energy and energy efficiency.

➤ **Past Collaboration with USAID/India:** Previous collaboration included the deployment of rooftop solar across railway platforms.

### ➤ Key Activity Areas:

- Long-term energy planning for Indian Railways.
- Development of an Energy Efficiency Policy and Action Plan for Railway Buildings.
- Clean energy procurement planning for Indian Railways' net-zero vision.
- Technical support for regulatory and implementation barriers.
- Bid design and management support for large-scale renewable procurement.
- Support for promoting e-mobility.
- Collaborative hosting of events, conferences, and capacity-building programs.

➤ **Flexibility for Revision:** Participants can request revisions or amendments to the MoU, subject to approval.

➤ **Effective Period:** The MoU is effective from the signing date and expected to continue for five years or until the effective end of the South Asia Regional Energy Partnership (SAREP), whichever is shorter.

➤ **Impact:** The MoU supports Indian Railways in achieving Net Zero Carbon Emission by 2030, reducing dependence on imported fuels and promoting Renewable Energy technology.

### ➤ Expenditure and Funding:

- Technical assistance under the MoU is intended to be provided by USAID under the South Asia Regional Energy Partnership (SAREP) initiative.
- The MoU does not entail a financial commitment from Indian Railways.

## Face to Face Centres

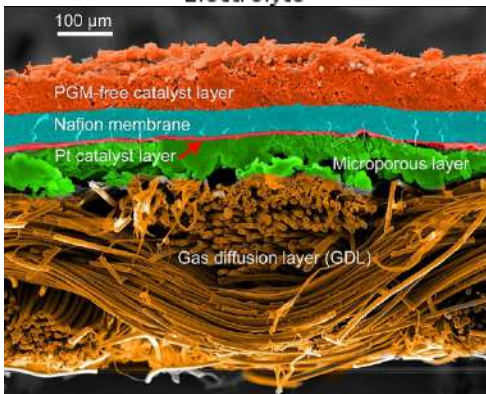
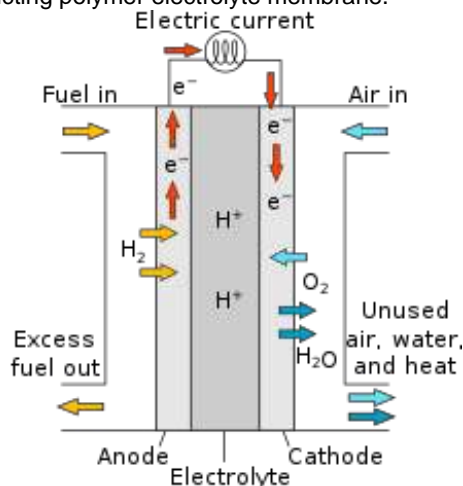


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## Proton-exchange membrane fuel cells (PEMFC)

**Context:** ISRO successfully tested a 100 W Proton-exchange membrane fuel cells (PEMFC) Power System on its orbital platform, POEM3, launched via PSLV-C58 on January 1, 2024.

- Proton-Exchange Membrane Fuel Cells (PEMFC) are designed for various applications, including transport and stationary uses.
- They operate at lower temperature/pressure ranges, typically between 50 to 100 °C.
- A distinctive feature is the use of a specialized proton-conducting polymer electrolyte membrane.



- **Contrast with PEM Electrolysis:**
  - PEMFCs generate electricity, functioning in opposition to PEM electrolysis, which consumes electricity.
  - They are considered a leading candidate to replace the aging alkaline fuel-cell technology used in the Space Shuttle.
- **Construction - Membrane Electrode Assemblies (MEA):**
  - The structure of PEMFC involves Membrane Electrode Assemblies (MEA), consisting of electrodes, electrolyte, catalyst, and gas diffusion layers.
  - Catalyst, carbon, and electrode ink are applied to the solid electrolyte, with carbon paper serving as electrodes.
  - The triple phase boundary (TPB) within the MEA is crucial for facilitating cell reactions.

- **Operating Temperatures:** PEMFCs operate optimally at temperatures above 100 °C, facilitating the conversion of water byproducts into steam and reducing water management challenges.
- **Electrochemical Reactions:**
  - At the anode, hydrogen undergoes oxidation (HOR), splitting into protons and electrons.
  - Protons permeate through the membrane to the cathode, while electrons travel to create the current output.
  - Oxygen reacts at the cathode, forming water molecules (ORR).
- **Polymer Electrolyte Membrane:**
  - The polymer electrolyte membrane conducts hydrogen ions (protons) while preventing the conduction of electrons, avoiding a "short circuit."
  - It is resistant to gas crossover and can withstand the harsh environments at both the cathode and anode.
- **Strengths:**
  - PEMFCs offer easy sealing with a thin polymeric membrane.
  - Their low operating temperature allows for cold starts, even at temperatures as low as -20°C.
  - They exhibit a light mass and high power density, making them suitable for transport applications.
- **Weaknesses:**
  - Effective water management is crucial for optimal performance.
  - The platinum catalyst used in PEMFCs is vulnerable to carbon monoxide poisoning.
  - Operating temperature is limited by the characteristics of the membrane.
- **Efficiency:**
  - The maximal theoretical efficiency of PEMFCs is approximately 83% at 298 K.
  - The practical efficiency typically ranges from 50-60%, influenced by factors such as activation losses, ohmic losses, and mass transport losses.

## 2023 warmest on record

**Context:** 2023 is the hottest year on record, surpassing preindustrial levels by 1.48 degrees Celsius.

- **Record-High Global Temperatures in 2023:**
  - The year 2023 has been confirmed as the warmest on record, exceeding preindustrial levels by a significant margin of 1.48 degrees Celsius.
  - Copernicus, part of the European Union's space program, provided data supporting this temperature increase.
- **Global Mean Temperature for January to November 2023:**
  - Copernicus reported that the global mean temperature for the first eleven months of 2023 was 1.46°C above the pre-industrial average of 1850-1900.
  - This surpassed the eleven-month average for 2016, the previously recorded warmest calendar year.
- **Influence of El Nino:**
  - Records were established during a moderately strong El Nino, a climate pattern featuring warmer Equatorial Pacific temperatures.

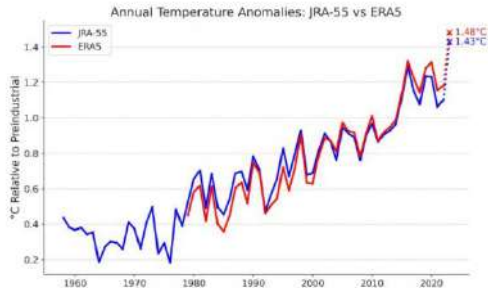
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- Researchers noted that the temperature records surpassed expectations even for El Nino's influence.



➤ **Prediction and Persistence of High Temperatures:**

- The National Oceanic and Atmospheric Administration predicted a 54% chance of this El Nino event becoming historically strong.
- Despite El Nino's expected decline, researchers anticipate continued record temperatures due to Earth's unprecedented energy imbalance.

➤ **Exceeding 1.5°C Ceiling:**

- By May 2024, researchers predict a 12-month running-mean global temperature of 1.6-1.7°C relative to 1880-1920, surpassing the 1.5°C ceiling.
- Warming is attributed not only to El Nino but also to Earth's increased absorption of sunlight.

➤ **Occurrence of Brief Breaches:**

- In June 2023, global mean temperature briefly exceeded the 1.5°C limit.

- On November 17, 2023, preliminary analysis indicated a breach of 2°C warming, with temperatures 2.06°C above pre-industrial levels.

➤ **Warmest November on Record:**

- November 17, 2023, was reported as the warmest on record, with a global temperature 1.17°C above the 1991-2020 average.
- November 2023 overall was about 1.75°C warmer than the November average for 1850-1900.

➤ **Increased Frequency of High Temperatures:**

- The 2023 State of Climate Report highlighted 38 days with global average temperatures above 1.5°C by September 12, 2023.
- This trend began in late 2022, with temperatures reaching 1.32°C above the pre-industrial era from November 2022 to April 2023.

➤ **Paris Agreement Goals and Future Projections:**

- The State of Climate Report raises concerns about exceeding the goals of the Paris Agreement, with potential long-term impacts.
- Projections suggest a likelihood of continued high temperatures, with a 66% chance of annual averages exceeding 1.5°C for 2023-2027.

➤ **Overall Climate Context:**

- In 2015, the Paris Agreement aimed to limit global average temperature increase, aspiring to stay "well below 2°C above preindustrial levels" and limiting the increase to 1.5°C.
- The observed temperature trends underscore the urgency of addressing climate change and its potential consequences.

## NEWS IN BETWEEN THE LINES

### Van Vihar National Park



Recently, India's oldest, 36-year-old male sloth bear named Bablu died due to multi-organ failure at a Van National Park in Bhopal.

**About Van Vihar National Park:**

- Van Vihar National Park is a **national park and zoo** at Bhopal in **Madhya Pradesh**.
- It is located on the banks of **Bhopal's Upper Lake**, also known as the "**Bada Talab**" which is **Ramsar Site** and one of the two lakes of Bhoj Wetland.
- It has a **rescue center for wild animals**, a conservation breeding center, a butterfly park and a wild cafe and **breeding center for sloth bears**.
- **Flora:** It houses at least 700 species of plants, including Amaltas, **Safed Babul**, **Reunjha**, **Landia** and **Saja**.
- **Fauna:** It hosts a variety of herbivores and carnivores namely, **white tiger**, leopard, **sloth bear**, chital, sambhar, blackbuck, blue bull, **chousingha**, common langur, **rhesus monkey**, porcupine, etc.

### Palaeolithic Quartzite Tools



Recently, the floods in the Mulugu district of Telangana has led to a fresh discovery of palaeolithic quartzite tools.

**About:**

- The new discovery of the tools or hand axes adds to **understanding about human habitations in Telangana and central India**.
- The **stone axe measuring 15.5cm in length, 1 1cm in width** and 5.5cm in thickness was also found, belongs to the **Lower Palaeolithic period** and is about 30 lakh years ago.
- These tools were **identified on the basis of chipping style**.

**Other Discoveries:**

- In **1863**, the **East India Company's Geological Survey** team found a palaeolithic site at Attirampakkam near **Madras** (present-day Chennai) with **bifacial hand-axes** made of stone by early humans.

**Palaeolithic Age:**

- The Paleolithic Age, also known as the old stone age or early stone age, is a **prehistoric era** that lasted from around 2.5 million years ago to **10,000 BCE**.
- It is **characterized by the use of stone tools by early human** ancestors for cutting wood and killing animals for food.

## Face to Face Centres





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## Panchayat Se Parliament Tak



Recently, the Lok Sabha Speaker Om Birla inaugurated 'Panchayat Se Parliament Tak' programme for women representatives in New Delhi.

### About Panchayat Se Parliament Tak:

- 'Panchayat Se Parliament Tak' (from Panchayat to Parliament) is an initiative which was **organised by the National Commission for Women (NCW)** in collaboration with the Institute of Constitutional and Parliament Studies.
- Its aim is to **empowering women leaders from local to national levels**.
- This programme will **bring women to leadership roles in the decision-making process**.
- **The Nari Shakti Vandan Act** marks a historic milestone in India's journey towards **women's empowerment** and will reserve **one-third** of the total seats in the Lok Sabha and State Legislatures for women.

## Chilika Lake



Recently, on National Birds Day in 2024, Chilika lake witnessed a remarkable sight as it hosted over a million birds belonging to 184 different species.

### About Chilika Lake:

- Chilika Lake is located on the east coast of India in **Odisha**, at the mouth of the **Daya River**, which flows into the Bay of Bengal.
- It is the **largest brackish water lagoon in Asia and the second largest coastal lagoon in the world**.
- It was designated the first Indian wetland of international importance under the **Ramsar Convention in 1981**.
- The lake is home to a number of **threatened species of plants and animals**, including Amur Falcons, Bar-headed Geese, Black-necked cranes, Marine turtles, Dugongs, and Humpback Whales.

### The Nalabana Island:

- The Nalabana island also known as **Nalabana Bird Sanctuary** located in the heart of Chilika lake is a protected area and popular destination for thousands of migratory winged guests and regional bird species.
- It was declared a bird sanctuary under the **Wildlife Protection Act in 1972**.
- The island **disappears during monsoon season** due to inundation, only to emerge again post-monsoon.

## Place in News

### Arabian Sea

Recently, in a positive end to a hijacking attempt in the North Arabian Sea, Indian Navy MARCOS (Marine Commandos) secured and safely evacuated all 21 crew members, including 15 Indians, from merchant vessel Lila Norfolk.



### About Arabian Sea:

**Location:** Arabian Sea is the **northwestern part of the Indian Ocean** situated between the Indian subcontinent & the Arabian Peninsula.

**Boundaries:** The Arabian Sea is bounded by **Pakistan, Iran** and the **Gulf of Oman** (North), the **Gulf of Aden**, the **Guardafui Channel** and the **Arabian Peninsula** (West), the **Laccadive Sea** and the **Somali Sea** (Southeast) and **India** (East).

### Features:

- The Arabian Sea is **rich in natural gas and oil**, and is a key energy source for the region.
- It is an **important area for naval operations** and is home to several naval bases, including those of India, Iran and the United States.
- It is a major **transit hub for goods and people travelling between Asia, the Middle East and Africa**.

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## Place in News

### Lebnon

Recently, the International Organization for Migration (IOM) reported that the sustained conflict along the Lebanon-Israel border has displaced over 76,000 people within nearly three months.



**Lebnon (Capital: Bairut)**

**Location:** Lebnon is a small country in Western Asia located on the eastern shore of the Mediterranean Sea.

**Boundaries:** Lebnon shares its border with Syria (North and East), Mediterranean Sea (West) and Israel (South).

**Physical Features:**

- The Litani River also known as the Leontes originated in the Beqaa Valley, is a major water source in southern Lebnon.
- Qurnat as Sawda is the highest peak located in Lebnon.
- Lebnon has a moderate Mediterranean climate.

## POINTS TO PONDER

- Which international agreements recognize Geographical Indications (GIs) as part of Intellectual Property Rights (IPRs)? - **Paris Convention and TRIPS Agreement**
- Which former Army Chief authored the book "Of Some Consequence: A Soldier Remembers"? - **Gen K Sundarji**
- Which script was used in the bilingual inscription recently discovered in Goa from the Kadamba period? - **Kannada and Sanskrit**
- For how long is the 'Workation' visa initially valid in South Korea? - **1 year**
- What is Rejupave, the technology utilized by the Border Road Organisation for road construction in high-altitude conditions? - **A liquid bio-based asphalt modifier cum rejuvenating agent**

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