



## Geography: August – December 2024

### Navigating the Coal Transition

**Context:** Collapse of coal mining in Britain has lessons for India.

#### Coal Industry in the UK

- Once the backbone of the nation's economy, it began **shrinking in the mid-1950s** due to cheaper energy alternatives and the decline of heavy industries.
- Over a decade starting in the mid-1980s, the British government closed most coal mines causing almost 90% of the workforce losing their jobs.

#### Economic Impact of Mine Closures on Workers

- **Income:** Fell by 40% in the year following a mine closure and remained depressed by 20% up to 15 years later.
- **Lack of alternative employment:** Led to income drops reaching up to 90%.
- **Incomplete socio-economic recovery** for miners and their communities, even with government support.

#### Coal Industry in India

- The coal sector is a crucial component of the country's energy landscape meeting approximately **55% of India's** energy requirements.
- India's **coal reserves and production** are among the **largest** in the world.
- Coal India Ltd. has shut down approximately 130 mines since 2009, with around 300 mines closed overall due **depletion of coal reserves** and the **economic non-viability** of certain mines.
- The study underscores the need for ambitious transition plans to better support displaced workers in future transitions.

#### Socio-economic impact of mine closures in India

- **Economic Dependence:** Odisha, Jharkhand, and Chhattisgarh are heavily reliant on coal mining local economies; livelihoods dependent on the coal industry.
- **Impact on Workers:** Mine closures severely affect both formal and informal workers. However, the **informal workers**, who constitute a large portion of the workforce, face **increased economic insecurity** (Lack of protection and benefits).
- **Local Economic Disruption:** Disrupts local businesses and services, such as transport and retail operations, creating a **ripple effect** that impacts entire local economies closely tied to coal mining.
- **Community Disintegration:** Break up established communities, leading to social instability.
- **Increased Poverty:** Job losses often drive up poverty rates in affected areas.
- **Environmental Damage:** Abandoned mines can cause soil erosion and water contamination.
- **Health Issues:** Former miners and residents may face health problems from exposure to pollutants.

#### Lessons from Britain's Coal Decline: What India Can Learn

- **Ambitious Transition Plans:** Develop robust transition plans including severance packages, income support, and long-term assistance for displaced workers.



- **Re-skilling Programs:** Implement sector-specific training programs to help miners acquire new skills relevant to other industries.
- **Regional Economic Diversification:** Invest in economic diversification for coal-dependent regions to attract new businesses and create alternative job opportunities.
- **Targeted Support for Informal Workers:** Ensure that informal workers receive targeted support and assistance to mitigate their economic vulnerability.
- **Utilize Existing Welfare Schemes:** Make effective use of existing welfare schemes such as MGNREGS and PDS to support affected communities.
- **Detailed Planning and Data Collection:** Conduct detailed studies and collect comprehensive labor data to better understand and plan for the socio-economic impacts of mine closures.
- **Community Engagement:** Engage with local communities to tailor support and transition strategies to their specific needs and contexts.

## Ancient Drainage Systems

**Context:** Ancient cities have mastered drainage and water management by understanding local hydrology and monsoon patterns, a lesson modern cities like **Delhi** could benefit from.

### How Harappan Cities Avoided Floods

- **Raised City Planning:** Harappa was constructed with elevated areas to prevent flooding.
- **Efficient Water Management:** Dholavira featured advanced water storage and management systems.
- **Strategic Urban Layout** of Lothal to facilitate efficient water flow and drainage.
- **Use of Natural Terrain** by Rakhigarhi to direct water flow away from settlement areas.
- **Advanced Drainage Systems** of Mohenjo-Daro that effectively managed and channelled rainwater.

### Key Takeaways Against Urban Flooding

- **Develop Comprehensive Drainage Systems** to handle heavy rainfall and runoff.
- **Incorporate Elevated Design** to minimize the impact of floodwaters.
- **Implement Efficient Water Management** to manage excess rainwater and reduce flood risks.
- **Plan Strategic Urban Layout** for natural water flow to avoid water accumulation and flooding.
- **Utilize Natural Topography** for directing water away from critical areas and reducing flood vulnerability.

### Major Harappan sites and Rivers on which they were located

- ❖ Mohenjodaro - Indus River
- ❖ Rakhigarhi - Saraswati/Ghaggar-Hakra River
- ❖ Banawali - Saraswati/Ghaggar-Hakra River
- ❖ Dholavira - Mansar and Manhar seasonal streams, near Rann of Kachchh
- ❖ Lothal - Sabarmati River, near the Gulf of Khambhat
- ❖ Harappa - Ravi River
- ❖ Bhirrana - Ghaggar River



❖ **Lahuradewa** - Sarayu River, Upper Gangetic Plain

## Ballast Water Management

**Context:** Tamil Nadu has informed the **National Green Tribunal** that it has sought ₹160 crores from the **Kamarajar Port** to facilitate the removal of **charru mussels** that came with **ballast water**.

- Ballast water is **seawater** taken into a **ship's tanks** to **maintain stability** when the ship discharges cargo and rises in the water and is pumped out when the ship loads cargo and sinks deeper.
- In India, scientists have recorded nearly **30** invasive species coming from ship ballast water.

⇒ *The National Green Tribunal (NGT) is a **specialized body** established under the National Green Tribunal Act (2010) to handle environmental disputes and ensure the enforcement of environmental laws.*

## Global Regulations on Ballast Water

- **Ballast Water Management (BWM) Convention:** Enforced by the **International Maritime Organization (IMO)** in 2017 to prevent the spread of harmful aquatic organisms and pathogens via ballast water.

## India's Position

- **Current Status:** India has **not signed** the BWM Convention.
- **Implication:** Ships in Indian ports are **not obligated to follow BWM** regulations; **no formal checks or regulations** on ballast water discharge in Indian ports.
- **Legal Perspective:** **Ports are not liable;** vessel owners are held responsible if evidence of harm is found.

## Way Forward

- ✓ **India's Adoption of BWM Convention:** India should consider signing the Convention to ensure **international standards** are met and to protect its **marine ecosystems**.
- ✓ **Implement Regulatory Framework:** Develop and enforce **national regulations** for ballast water management as seen in **Australian ports**.
- ✓ **Strengthen Port Inspections:** Introduce rigorous checks and monitoring systems as seen in **New Zealand's ports**.
- ✓ **Promote Awareness:** Educate ship owners and operators about the impact of ballast on ecosystems.
- ✓ **Collaborate Internationally:** Engage with other countries and IMO to share best practices and strategies.

## Charru Mussel (*Mytella strigata*)

- It is an invasive species native to **South and Central America**; possibly Galapagos and Pacific Coast.
- It is invasive in the Philippines, Thailand, and India, including **Pulicat** and **Ashtamudi Lakes** and **disrupts ecosystems, hinders fishing,** and affects livelihoods.
- It thrives in **20°C-23°C**, tolerates 13°C-36°C, and cannot survive beyond 36°C.
- It appears in **black, brown, purple, or dark green** colors and spawns in **July-October** when larvae develop into bivalve veligers.



## Bonda Tribe

**Context** Bonda Tribe gets its first member to pursue an MBBS programme.

- Bonda tribe is a **Munda** ethnic group that lives in the isolated hill regions of the **Malkangiri district** of southwestern **Odisha**, near the junction of the three states of Odisha, **Chhattisgarh** & **Andhra Pradesh**.
- Also known as '**Remo**' (meaning "people" in the Bonda language), they are included in the list of the **75 Particularly Vulnerable Tribal Groups (PVTGs)** identified by the **Government of India**.
- They are one of the oldest and most primitive in mainland India and are the first forest settlers in India.

## Tribal Communities in Andhra Pradesh

**Context:** **Porja**, **Bagata**, and **Konda Dora** tribes in **Andhra Pradesh** suffer from **severe shortages of electricity and clean water**.

- These tribes have significantly contributed to the construction of the **Lower Sileru Hydro-Electric Project (LSP)** on the **Sileru River**.

### Bagata/ Bhakta Tribe

- Located in **Odisha** and **Andhra Pradesh**, these communities primarily engage in **farming**.
- They speak Oriya (dialect), Telugu, and Adivasi Oriya, and worship **Hindu deities** alongside **tribal gods**.
- **Dhimsa** is a popular dance by Bagata tribes. Their dances are collectively known as **Sankidi Kelbar**.

### Porja Tribe (Palanquin Bearers)

- Designated as a **Particularly Vulnerable Tribal Group (PVTG)**, they practice **Podu** (shifting cultivation).

### Konda Dora/ Pandava Dora Tribe

- They reside in the Konda Kamberu ranges of the **Eastern Ghats**, spanning Odisha and Andhra Pradesh.
- They originally spoke **Kubi/Konda** but now use a **mix of Telugu and Odia**.

## Tribal Communities in Mizoram

**Context:** Mizoram's ongoing efforts to amend its reservation rules are now uncertain due to the **Supreme Court** ruling which **upheld** the right of **states to sub-classify SCs and STs**.

- Months before the judgement, the Mizoram Government had put on hold the sub-classification of the State's ST quota in higher education and started working on amending the rule that provided for it.
- Nearly **95%** of **Mizoram** are STs, the **highest** percentage in India (2011 census).
- They comprises of Zo-ethnic tribes such as **Mizo (Lushai)**, **Hmar**, **Pawi**, **Lai**, **Mara**, **Gangte** and non-Zo-ethnic people such as **Chakma** tribes.
- Tribal festivals in Mizoram includes **Mim Kut**, **Pawl Kut** and **Chapchar Kut**.

⇒ Zo-ethnic people: An indigenous community along the frontier of India and Burma, having cultural similarities and a common ancestor called Zo.



## Cloudbursts

**Context:** The **cloudbursts in Himachal Pradesh** have resulted in significant casualties and extensive damage. An orange alert for severe weather is issued.

- A cloudburst is an **intense torrential rainfall** brought by a **thunderstorm** that lasts for a relatively **short duration** (a few minutes to a few hours).

## Glacial Lakes

**Context:** Rising moraine-dammed lakes in **Himachal Pradesh** and **Tibet** threaten **downstream life and infrastructure**.

- The shrinking of the **cryospheric cover** due to climate change leads to **rapid glacier reduction** in the Himalayas increasing unstable high-altitude glacial lakes.
- Glacial lakes in the **Satluj River** catchment nearly **doubled** from **562 in 2019** to **1,048 in 2023**.
- The **Upper Satluj basin** shows a higher concentration of glacial lakes, signaling greater climate impact in **high-altitude areas** compared to lower regions.

⇒ **Cryosphere** includes the components of the Earth System that are **frozen**, including snow cover, glaciers, ice sheets, ice shelves, icebergs, sea ice, lake ice, river ice, permafrost, seasonally frozen ground, and solid precipitation.

## Concerns

- Increased **water volume** and **glacier calving** heighten the risk of **avalanches** and **outbursts**.
- **Rapid glacier melt** and **reduced winter snowfall** would lead to **habitat destruction**.

## Landslides in India

**Context:** Landslides are sudden movements of rock, boulders, earth, or debris down a slope under the impact of gravity. In July 2024, the Wayanad district in Kerala experienced severe landslides, which resulted in hundreds of deaths, property damage, and displacement of residents.

## Types of Landslides

### Based on the materials involved

- **Rock slide:** Movement of **bedrock** down a slope, typically involving detached rock masses.
- **Debris slide:** Rapid downslope movement of **loose, unconsolidated material** like soil, rock fragments, organic matter, etc.
- **Soil slide:** Movement of **saturated, loose soil** that may involve a mix of soil and vegetation.
- **Loose mudslide:** Flow of **loosely bound mud** that becomes mobilised and moves downslope.

### Based on the movement of material

- **Fall:** Sudden free fall of rock or debris from a steep slope or cliff.
- **Topple:** Rotation of rock/soil blocks over a pivot point, causing them to fall forward.
- **Slide:** Downslope movement of a coherent mass along a defined slip surface.
- **Rotational slide:** Curved sliding motion of material along a concave slip surface, often involving a rotational component.



- **Translational slide:** Downslope movement of material along a planar or nearly planar slip surface.

### Based on the flow of material

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- **Debris flow:** Fast-moving mixture of **water, soil, and rock** that flows like a fluid down a slope.
- **Earth flow:** Slow, steady movement of **saturated, fine-grained soil/sediment** resembling a viscous fluid.
- **Mudflow:** Rapid, fluid movement of a **water-saturated mixture of mud, silt, and clay**.
- **Creep:** Slow, gradual downslope movement of soil and rock due to gravity, often imperceptible over short periods.

### Causes Behind Landslides

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#### Natural Factors

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- **Heavy Rainfall:** Heavy rain saturates the soil, reducing stability and triggering landslides. E.g., the **2018 Kerala floods** caused numerous landslides in the Western Ghats due to intense rainfall.
- **Earthquakes:** Seismic activity shakes the ground, destabilising slopes and causing landslides, such as the **2009 Kinnaur landslide**.
- **Snow Melting:** Rapid snowmelt increases water flow, weakening soil stability.
- **Undercutting of Slopes Due to Flooding:** Flooding erodes the base of slopes, making them unstable. E.g., landslides in the Western Ghats, exacerbated by flooding.

#### Anthropogenic Factors

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- **Excavation:** This removes soil and rock, destabilising slopes. For example, construction and excavation activities worsened the **2019 Munnar landslide in Kerala**.
- **Cutting of Hills and Trees:** Deforestation removes vegetation that stabilises soil, increasing landslide risk. For example, hill cutting and deforestation aggravated the **2018 Kodagu landslides in Karnataka**.
- **Overgrazing by Cattle:** Overgrazing destroys vegetation, leading to soil erosion and landslides. For example, overgrazing in the **Western Ghats** increases soil erosion, contributing to landslide risk.

### Impacts of Landslides

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- **Loss of life and property:** For instance, around 300 people lost their lives in Wayanad landslides.
- **Infrastructure damage:** Critical infrastructure like roads, bridges, power lines, etc. are destroyed.
- **Economic losses:** Disrupt livelihoods, trade, and tourism. The landslides in **Darjeeling, West Bengal**, have impacted the region's tea industry.
- **Environmental degradation:** Causes soil erosion, deforestation, and pollution of water bodies, leading to long-term environmental consequences.
- **Disaster relief and rehabilitation:** Government resources are diverted for rescue, relief, and rehabilitation efforts after landslides, impacting other development priorities.
- **Psychological impact:** Landslides can cause severe trauma and psychological distress among survivors and affected communities.

### The Worst Landslides in India

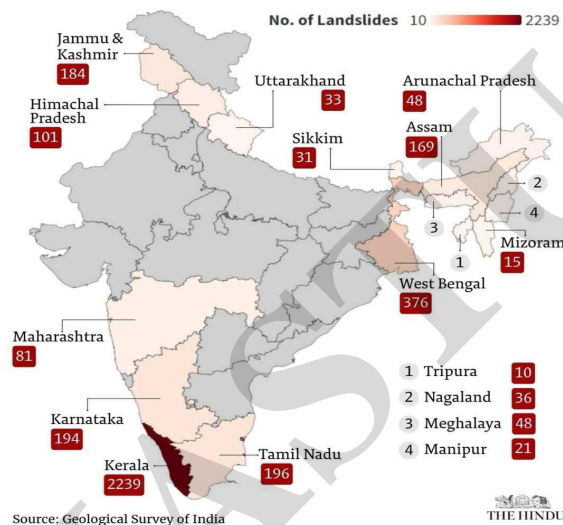
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- **Guwahati, Assam (1948):** Over 500 people lost their lives when an entire village was buried under a landslide triggered by heavy rains.
- **Darjeeling, West Bengal (1968):** A massive landslide caused by floods killed over 1000 people and divided a 60 km long highway into 91 parts.

- **Malin, Maharashtra (2014):** Heavy rainfall triggered a landslide that claimed the lives of around 151 people, with 100 others missing.
- **Mapla, Uttarakhand (1998):** A series of landslides over seven days wiped out an entire village, resulting in the death of over 380 people.
- **Kedarnath, Uttarakhand (2013):** Unprecedented rain and floods triggered massive landslides, leading to the death of over 5700 people and the destruction of thousands of villages.
- **Wayanad, Kerala (2024):** Recent landslides in the Wayanad district caused significant loss of life and property damage, highlighting the ongoing threat of landslides in India.

## States and districts with the Highest Incidence of Landslides in India

Of the 3,782 landslides happened between 2015-2022, Kerala is the most suffered state in the country with 2,239 incidents, according to a reply given in Lok Sabha by MoS (independent charge) Earth Science Dr. Jitendra Singh



- **Kerala:** Witnessed devastating landslides, particularly during the monsoon and topped the list with the highest number of landslides recorded from 2015-2022.
- **Maharashtra:** Certain regions, like the Western Ghats, are prone to landslides.

## Northeastern India

- **Mizoram:** Its unique geographical and geological conditions make it highly susceptible to landslides.
- **Tripura:** Susceptible to landslides due to its hilly terrain and heavy rainfall.
- **Nagaland:** Faces significant landslide challenges, especially during the monsoon season.
- **Arunachal Pradesh:** The state's mountainous landscape makes it prone to landslides.

## Himalayan Region

- **Uttarakhand:** Known for its mountainous terrain, Uttarakhand has experienced numerous landslides.
- **Himachal Pradesh:** Another Himalayan state facing landslide risks due to its geographical features.
- **Jammu and Kashmir:** The region's hilly topography contributes to frequent landslide occurrences.

## Landslides in Western Ghats

- The Western Ghats, a biodiversity hotspot, are also prone to landslides due to their unique geographical and climatic conditions.



## Causes of Increased Landslides in the Western Ghats

- **Deforestation and Land Use Change:** Large-scale conversion of forests into plantations, especially monoculture plantations like rubber and tea, has weakened the soil structure, making it susceptible to erosion and landslides.
- **Unsustainable Agriculture Practices:** Shifting cultivation and steep slope agriculture have led to soil erosion, loss of vegetation cover, and increased landslide vulnerability.
- **Climate Change and Extreme Weather Events:** Increased frequency and intensity of rainfall due to climate change have triggered landslides.
- **Unscientific Infrastructure Development:** Construction of roads, dams, and tunnels without proper **environmental impact assessment** has destabilised slopes and increased landslide risks.
- **Urbanization and Population Pressure:** Encroachment into hill slopes for residential and commercial purposes has led to the removal of vegetation and increased load on the slopes.
- **Mining and Quarrying Activities:** Illegal and unscientific mining and quarrying have weakened the rock structure and destabilised slopes.

## Comparison between landslides in the Western Ghats and the Himalayas

Factor	Western Ghat	Himalayas
<b>Topography</b>	Lower altitude, less steep slopes	Higher altitude, steeper slopes
<b>Geological formations</b>	Older, more stable rock formations (generally)	Younger, weaker rock formations
<b>Rainfall</b>	<b>High Rainfall:</b> Heavy monsoon rains contribute to frequent landslides.	<b>Variable Rainfall:</b> Heavy monsoon rains in foothills and significant snowfall in higher elevations.
<b>Landslide Frequency</b>	<b>High Frequency:</b> Frequent landslides during monsoon season; numerous events annually.	<b>Very High Frequency:</b> Frequent landslides year-round due to intense rainfall and seismic activity.
<b>Landslide Triggers</b>	<b>Monsoon Rains, Deforestation, Construction:</b> Heavy rains, human activities like deforestation and construction.	<b>Rainfall, Snowmelt, and Earthquakes:</b> Intense rainfall, snowmelt, and seismic activity are major triggers.
<b>Mitigation Measures</b>	<b>Afforestation, Drainage Systems, Land Use Planning:</b> Focus on vegetation and engineering solutions.	<b>Slope Stabilization, Early Warning Systems, Engineering Solutions:</b> Emphasis on monitoring and robust engineering practices.
<b>Notable Events</b>	<b>2018 Kerala Floods, 2019 Munnar Landslide:</b> Significant landslide events caused by heavy rains and human activities	<b>2013 Uttarakhand Floods, 2020 Chamoli Landslide:</b> Major landslide events influenced by heavy rainfall, snowmelt, and earthquakes.

### Measures Attempted to Conserve Western Ghats

- ❖ Madhav Gadgil Committee.
- ❖ Kasturirangan Committee.
- ❖ October 2018 notification
- ❖ Ecological Sensitivity Classification

- ❖ Protected Areas and Wildlife Sanctuaries
- ❖ Research and Monitoring
- ❖ Environmental Impact Assessment (EIA)

## Megaquake

**Context:** Japan to issue its **first-ever** megaquake advisory after a magnitude **7.1** earthquake recently struck near the **Nankai Trough**.

- A **megaquake** is a **large earthquake** with a magnitude of **8 or more** and occurs in subduction zones (where tectonic plates collide, and one plate is forced under another).
- It is capable of producing **intense shaking** and **massive tsunamis**.
- Scientists **can forecast** times of heightened risk but **cannot predict exact times** of occurrence as there is **no equipment**.

## Nankai Trough

- The Nankai Trough is an **underwater subduction zone** off **Japan's southwest Pacific coast**.
- It stretches from **Shizuoka**, just west of Tokyo, to the southern tip of **Kyushu Island**.
- It is nearly **900 km long** where the **Eurasian Plate** forces the **Philippine Sea Plate** into the mantle.
- This zone has experienced **destructive megaquakes**, roughly **every 100 to 150 years**, often in pairs.
- The most recent Nankai Trough megaquakes occurred as **twin events in 1944 and 1946**.



## River Nile

**Context:** Amidst civil war, Sudan has been struck with a deadly flood caused by river Nile due to heavy rainfalls causing displacement of thousands of people.

The Nile River is a major **north-flowing river** in {Prelims – In News} Tungabhadra River

**Context:** Karnataka issued a flood warning after a crest gate of the Tungabhadra reservoir (Pampa Sagar dam) got washed away. Remaining gates are opened to reduce the pressure on the broken gate.

- Tungabhadra is a tributary of Krishna river that flows through **Hampi**, the **capital of Vijayanagara Empire**.

- It is formed by the unification of the **Tunga** and the **Bhadra** originating from **Gangamula** in the Central Sahyadri (Western Ghats).
- **Tributaries:** Bhadra, Haridra, Vedavati, Tunga, Varda and Kumdavathi.
- The famous **Virupaksha temple** is on the banks of Tungabhadra.



### Tungabhadra Dam (Pampa Sagar Dam)

- The construction of the dam began in 1949 as a joint venture between the Kingdom of **Hyderabad** and the **Madras Presidency**.
- It was completed in 1953 to contribute to the irrigation of 6 chronically drought prone districts of Bellary, Koppal and Raichur in Karnataka and Anantapur, Cuddapah and Kurnool in Andhra Pradesh.

### Vladivostok

**Context** Indian companies face logistics constraints for transporting **copper concentrate** from **Mangolia**, the landlocked Central Asian country to India.

- The possible routes are by rail to Chian's **Tiajin port** or a combined road and rail route to **Vladivostok**.
- **Vladivostok** is a **port city** on the **Pacific Ocean** shore of the **Russian Far East**.
- It is located around **Zolotoy Rog** ("Golden Horn Bay") on the western side of **Muravyov-Amursky peninsula** that separates Amur and Ussuri bays on the **Sea of Japan**.
- It is the **end point of the Trans-Siberian Railway**, and is the **first free seaport** of the **Far East**.

### Yellow Sea

- Also known as **North Sea**, it is a marginal sea of the **Western Pacific Ocean** located between **mainland China** and the **Korean Peninsula**, and can be considered the **northwestern part of the East China Sea**.
- It is separated from the **Sea of Japan** by the boundary from the southern end of **Haenam Peninsula** to **Jeju Island** in **South Korea**.

- The innermost bay of the **northwestern** Yellow Sea is called the **Bohai Sea**, into which flow the **Yellow River**, the **Hai River** and the **Liao River**.
- The **northeastern extension** of the Yellow Sea is called the **Korea Bay**, into which flow the **Yalu River**, the **Chongchon River** and the **Taedong River**.

## Danube river

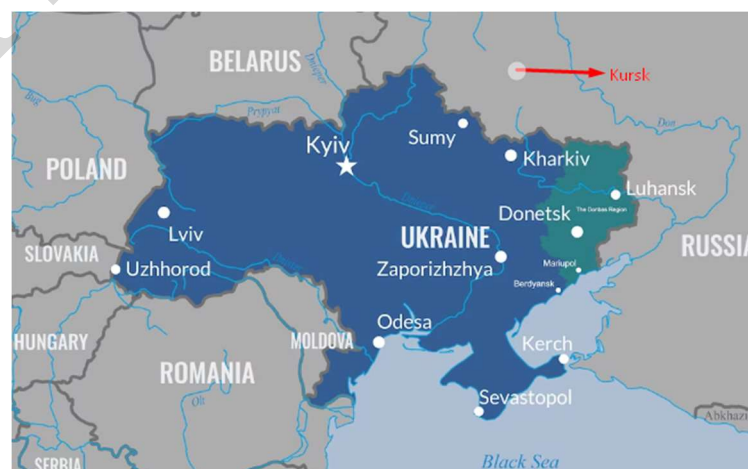
**Context:** Poaching and trafficking are threatening the survival of Sturgeon Fish in **Danube river**.

- It is **2nd-largest river in Europe** after Russia's Volga.
- It flows from **Black Forest** in Germany to the **Black Sea**.
- It passes through four capital cities (Vienna, Bratislava, Budapest, and Belgrade) and **ten countries**.
- It is **connected to the North Sea** via the **Rhine-Main-Danube Canal**.
- **Sturgeon Fish** is found in freshwaters and saltwaters of Eurasia and North America.



## Kursk Oblast

**Context:** Ukrainian troops have advanced around 30 km into the Russian territory of the **Kursk region** and Russia has declared a “**federal-level**” **emergency** in the region.



- **Kursk** is one of the oldest cities in Russia lying along the **upper Seym River** in **Moscow** and is home to large nuclear power stations.
- It is located in the fertile **Black Earth territory** and has a moderate continental climate.
- It contributes to two major drainage areas: the **Dnieper River** and the **Don River**.
- The **Kursk Magnetic Anomaly** has one of the richest iron ore deposits in the world.

### Dnieper River

- Dnieper (or Dnipro) river is a major **transboundary** river in Eastern Europe flowing through Russia, Belarus and Ukraine and is emptied into the Black Sea.
- Historically, it was an important barrier dividing Ukraine into right and left banks.

### Don River

- It flows through the Central Russia and drains into the Sea of Azov.

### Seym River

- The Seym is a west-flowing river in Russia and Ukraine and is the largest tributary of the river **Desna**.

## Lake Gatun

**Context:** The Panama Canal, an important shipping lane around the world, faces an existential threat due to fall in the level of **Lake Gatun**, an artificial water reservoir vital to the operation of the canal system.

- **Lake Gatun** was formed by damming the **Chagres River** and its smaller affluents at Gatun.
- The lake's main function is to hold sufficient water in the **Gaillard Cut** to the south for canal passage and for use in the canal's locks during dry spells. **Guacha Island** is present in the centre of the lake.
- **Panama Canal** is a crucial shipping route that connects Atlantic and Pacific Oceans through the **Isthmus of Panama** in Central America.





## China's Monopoly in Strategic Minerals

**Context:** China restricted the export of antimony in the name of 'national security'.

### Antimony

Antimony is a **semi-metal**. In its elemental form, it is a silvery white, brittle, fusible, crystalline solid that exhibits **poor electrical** and **heat conductivity** properties and **vaporises at low temperatures**.

Antimony is **not an abundant** element but is found in small quantities in over 100 mineral species.

China produces **88%** of the world's antimony.

### Uses of Antimony

Antimony is used in the electronics industry to make **semiconductor devices**, such as infrared detectors and diodes and in **plastic production** as a heat stabiliser in PVC.

It is used in **solar panels** to improve the stability of the solar performance of the glass upon exposure to UV radiations.

A lead-antimony alloy is used in **batteries**. Other uses of antimony alloys include **type metal (in printing presses), bullets and cable sheathing**.

Antimony compounds are used to make **flame-retardant materials**, paints, enamels, glass & pottery.

## China's Monopoly in Strategic Minerals

China controls **60% of rare earth production, 60% of critical minerals production** and **80% of the processing** worldwide.

It is the top source for **five out of 12 critical minerals** and the **second or third** top source for an additional three: **Fluorspar, Gallium, and Scandium**.

It dominates every supply chain segment — upstream, midstream, and downstream, covering mining, extraction, refining and processing. Thus, China's decision has profound implications for global security.

**India**, too, remains **vulnerable** due to its **strategic dependence on China**. It is heavily dependent on the imports of critical minerals such as lithium, nickel, cobalt and copper, which resulted in an import cost of around ₹34,000 crore in FY23.

### Use of monopoly to weaponise the critical mineral supply chain

Critical minerals **export controls** have become a part of China's foreign policy objectives. It has been using mineral resources as a political tool to leverage its status as a mineral power.

#### Some instances of export controls by China:

It has increased restrictions on its critical minerals exports nine times between 2009 and 2020.

In 2023, it announced curbs on the export of **gallium** and **germanium** (used in solar cells and computer chips) to the **Netherlands** due to the latter's restriction on supply of semiconductor equipment.

In 2023, it curbed the export of synthetic **graphite material** and **natural flake graphite** (used in EV batteries, fuel cells, and nuclear reactors), following the US export curb on advanced computing and semiconductor products to China.

It restricted the export of **rare earth processing technologies** in making **rare earth magnets** used in EVs and technologies used to extract and separate critical minerals.

### Implications of China's monopoly

**Impacts green energy transition:** China's near monopoly in minerals like lithium, cobalt, and rare earths, crucial for EVs and solar panels, **slows down the global energy transition**. Any disruption to China's supply could delay the production of clean energy technologies.



**Economic and security dependencies:** A targeted **supply-chain disruption** could cripple the production of consumer products and **weapons systems** (fighter jets, missile systems, and satellites).

**Global price volatility:** China's control over strategic mineral supply allows it to influence global prices, leading to price volatility, especially during geopolitical tensions or supply chain disruptions. E.g. Production slowdowns and export delays during covid-19 pandemic led to spikes in prices of rare earth metals.

**Resource diplomacy:** China's mineral monopoly forces countries to form strategic alliances and engage in resource diplomacy to secure access to alternative supplies.

### Way ahead

**Diversification of mineral sourcing** by developing mining projects in other regions and implementing new mineral mining technologies.

Technological innovation and **recycling of critical minerals** could reduce demand by 20% to 40%, while **material substitution** could alleviate strains on supply and reduce costs.

**Strategic stockpiling** could act as a buffer against sudden supply chain disruptions.

## Saora Tribals Granted Habitat Rights

**Context:** **Odisha** has achieved a significant milestone by granting habitat rights to the **Saora tribals** of Gajapati district, making it the **only state** in India to **extend such rights** to the **highest number** of Particularly Vulnerable Tribal Groups (PVTGs).

The status empowers the tribes to **protect** and **preserve natural entities, sacred sites, and places of religious and spiritual importance** within their habitat.

**Section 2(h)** of the **Forests Rights Act (FRA)** defines **habitat** as an area comprising the **customary habitat** and other habitats in **reserved** and **protected forests** of primitive tribal groups, pre-agricultural communities, and other forest-dwelling scheduled tribes.

The **granting of habitat rights** is conducted under **section 3(1)(e)** of **Forests Rights Act (FRA) 2006**.

### About Saora (Savara) Tribes

Predominantly found in **Bihar, Orissa, Andhra Pradesh, Madhya Pradesh, Maharashtra, West Bengal**.

Historically, they appear in **Hindu mythology** and scriptures. In **Orissa**, they are associated with the cult of **Lord Jagannath**.

They belong to the **proto-Austroloid race**, common among tribes of Central and Southern India.

**Language:** '**Sora**,' an ancient **Mundari dialect** with local variation.

**Occupation:** **Shifting and terrace cultivation**. They also practice **hunting**, fishing, wage labour, forest collection, and animal husbandry, supported by **traditional labour cooperatives** called **Ansir**

## A Rare August Cyclone: 'Asna'

**Context:** The **North Indian Ocean**, vital for summer monsoon moisture, is paradoxically the **least active cyclone region** despite warm tropical oceans.

A unique cyclone season here is shaped by factors that **both promote** and **suppress cyclogenesis**, influenced by **global warming**.



## Cyclone Asna

The rare August cyclone, 'Asna', is noteworthy for its **land-born origin**, developing from a strong depression over land before transitioning onto the Arabian Sea.

This is the **first North Indian Ocean cyclone** in **August since 1981**, highlighting its unusual nature.

The **low-pressure system** that became 'Asna' grew rapidly over land, **fed by excess soil moisture** from heavy rainfall. The depression's unusual size and strength allowed it to reach the **warm northern Arabian Sea** and it provided the energy for the depression to intensify into a cyclone.

The Arabian Sea warming, linked to the northward shift of the **low-level jet**, has led to its formation.

*Typically, low-pressure systems originate in the **Bay of Bengal** and traverse the **monsoon zone**.*

## Two Cyclone Seasons

During the monsoon, **strong southwesterly winds**, or the **low-level jets**, cool the Arabian Sea by mixing cold subsurface waters with surface waters.

In contrast, the Bay of Bengal's **strong convective activity** generates many low-pressure systems, but these rarely develop into cyclones due to **vertical wind shear**, dissipating their energy.

Thus, the North Indian Ocean experiences two distinct cyclone seasons - **pre-monsoon** and **post-monsoon** - due to the influence of **monsoonal winds** and **sea surface temperatures**.

The **Arabian Sea** is **less prone** to cyclones due to **cooler temperatures**, **stronger wind shear**, and **lower convective activity** than the **Bay of Bengal**.

Despite a slight increase in cyclone numbers since 2010, the Arabian Sea has been notably calm recently.

Also, the **northeast monsoon** and **dry continental air** cool the **Arabian Sea post-monsoon**, further inhibiting cyclone development.

## Unusual Indian Ocean

The **Indian Ocean** is notable for its monsoonal circulation and seasonal wind reversals north of the equator. It's also unique due to '**oceanic tunnels**' connecting it to the Pacific and Southern Oceans.

The **Pacific tunnel** brings warm water to the upper layers (top 500 metres), while the **Southern Ocean tunnel** brings cooler waters below 1 km.

During pre-monsoon season, the Arabian Sea heats up quickly as the Sun shifts to the Northern Hemisphere. Bay of Bengal, already warmer than the Arabian Sea, heats up further, triggering atmospheric convection and rainfall. These conditions influence **cyclogenesis**.

## Climate Change and the Indian Ocean

**Increased heat** from the Pacific and Southern Oceans, combined with atmospheric changes, is rapidly warming the North Indian Ocean, affecting monsoons, **cyclogenesis**, and **cyclone numbers**.

The rapid warming is impacting **global ocean dynamics**, influencing heat uptake by the Pacific and deep water circulation in the North Atlantic, making it a key player in global climate change and cyclone activity.

## Role of Arctic Sea Ice in Indian Monsoon

**Context:** A Ministry of Earth Sciences study found that seasonal changes in the Arctic sea ice affect the Indian summer monsoon rainfall (ISMR).

**Less sea ice** in the **central Arctic** leads to **lower rain** in **western** and **peninsular India** but **more rain** in **central** and **northern India**.

**Less sea ice** in the **Barents-Kara Sea** region **delays** and makes the **monsoon more unpredictable**. It also leads to heavy rain in northeastern India, leaving central and northwest regions drier.

**Role of climate change:** Global warming, which accelerates the reduction of Arctic sea ice, is exacerbating the ISMR's variability and unpredictability.



## Pallikaranai Marsh

**Context:** A bathymetric study in Pallikaranai marshland aims to enhance ecological functions and prevent encroachments, guided by National Green Tribunal.

### Pallikaranai Marsh

It is a **freshwater** marsh near **Chennai** adjacent to the **Bay of Bengal**.

**Notable species:** Russell's viper, glossy ibis, and Pheasant-tailed jacana.

In **April 2022**, Pallikaranai Marsh was designated a **Ramsar site**. It has **65 wetlands** that enhance biodiversity, with **Okkiyam Madavu** and **Kovalam Creek** serving as key **outlets to the Bay of Bengal**.

*Bathymetry studies **underwater depth and topography**, measuring water body depths to create detailed seafloor maps. It uses techniques like **sonar, LIDAR**, and traditional depth sounding to measure the time for sound waves or light pulses to reach the seafloor and return.*

## Pokrovsk

**Context:** The Russian Army is advancing in **Pokrovsk** to conquer the whole **Donetsk region**.

Dubbed as "**gateway to Donetsk**" by Russia, control over the city would allow Moscow to **disrupt Ukrainian supply lines** along the eastern front and boost its campaign to capture the city of **Chasiv Yar**, which sits on higher ground, offering potential control of a wider area.

**Pokrovsk**, part of **Donetsk**, lies on a key road used by the Ukrainian military to supply other embattled Ukrainian-held outposts, such as the towns of **Chasiv Yar** and **Kostiantynivka** in the Donetsk region.

It has emerged as a coking coal producer and a vital logistical hub.



Credits: [TH](#)

## Amazon Rainforest

**Context:** About **40%** of **Amazon rainforest** has **not** been granted **special government protection**.

**Only 61%** of the peak carbon areas in the Amazon are **protected** as **indigenous reserves** or **other protected lands**, but the **rest** generally have **no official designation**.

**Only 51%** of peak carbon areas in **Brazil**, **Suriname**, and **French Guiana** are labelled for **preservation**.

### Amazon

Spread over parts of Bolivia, **Brazil (60%)**, Colombia, Ecuador, Guyana, Peru, Suriname & Venezuela.

The **Amazon River**, which runs through it, flows more than 6,500 km. It's the **world's second longest river** after the **Nile**, responsible for around **15% of the planet's total river discharge** into the oceans.

It encompasses the **single largest remaining tropical rainforest** in the world and houses at least **10%** of the **world's known biodiversity**.





## Significance of Amazon

The Amazon rainforest is called the '**lungs of the Earth**' because it 'breathes in' CO<sub>2</sub> and 'exhales' oxygen on a massive scale. It contained 71.5 Bn tonnes of carbon (~**double the global CO<sub>2</sub> emissions** for 2022).

The Amazon's canopy cover helps **regulate temperature and humidity** and is intricately linked to regional climate patterns through **hydrological cycles** that depend on the forests.

It contributes about \$8.2 billion annually to Brazil's economy from products, including rubber and timber.

## Shale Gas in Jharkhand

**Context:** According to a recent study, the **eastern South Karanpura** coalfield in **Jharkhand's Ramgarh** district shows promising potential for shale gas generation.

Scientists employed **Rock-Eval pyrolysis** to assess the potential of rock samples.

*Rock-Eval pyrolysis is a laboratory technique to evaluate sedimentary rocks' hydrocarbon content and thermal maturity, particularly for petroleum exploration.*

## Government Policies and Pilot Projects Regarding Shale Gas in India

**HELP Policy (2016):** The **Hydrocarbon Exploration and Licensing Policy** provides a unified license for exploring all hydrocarbons, including shale gas, to attract investment and enhance exploration.

**ONGC Projects:** ONGC has initiated pilot projects in the **Cambay** and **Damodar Valley Basin** to assess shale gas viability.

**Other Efforts:** Shale gas exploration is underway in the **Krishna-Godavari** and **Cauvery basins**.

## Significance of Shale Gas for India

**Energy Security:** Developing domestic shale gas reserves could help reduce India's heavy reliance on imported oil and gas, enhancing energy independence.

**Economic Growth:** Shale gas exploration can create jobs in the energy sector, stimulate technological advancements, and boost infrastructure development.

**Cleaner Energy Transition:** Natural gas, including shale gas, burns **cleaner than coal**, helping India transition to cleaner energy and reduce greenhouse gas emissions.

**Diversification of Energy Sources:** Shale gas could diversify India's energy mix, reducing its dependence on coal and imported oil.

**Global Competitiveness:** Shale gas development, similar to the **U.S. shale boom**, could enhance India's position in the global energy market.

## Challenges for Shale Gas Development in India

**Geological Complexities:** India's shale formations are more complex and often found at deeper levels, making extraction more difficult than in the U.S.

**Water Scarcity:** The regions rich in shale gas often face water scarcity, complicating the fracking process, which requires large amounts of water.

**Environmental and Regulatory Issues:** Concerns over groundwater contamination and seismic activity remain, and India's regulatory framework around shale gas exploration is still evolving.

**Finite Resource:** Shale gas is still a finite fossil fuel, and reliance on it may delay a broader transition to renewable energy sources.



**High Infrastructure Costs:** Significant investments in infrastructure, such as drilling rigs and pipelines, are needed, which could drive up energy production costs.

**Public Health Concerns:** Communities near fracking sites report health issues such as respiratory problems and skin rashes linked to the chemicals used in fracking.

## State of Global Water Resources Report

**Context:** The State of Global Water Resources Report by World Meteorological Organization (WMO) highlighted that 2023 was the **driest year for global rivers**.

### Contributing factors

**Growing water demand:** The report showed a growing trend in agricultural and industrial demand further strained river systems, exacerbating low water levels.

**Rising trend in dry areas:** The report showed a rising trend in dry areas over time, with 2023 being the driest year in the last three decades, followed by 2021 and 2015. **Example:** In **Argentina**, this caused a **3% loss in GDP**, and the **water levels** in the **Amazon** and **Lake Titicaca** reached record lows.

**Transition from La Niña to El Niño:** The transition from La Niña (2022-2023) to El Niño (2023) appears to have been a key climatic driver in this record-breaking dry and warm situation.

**Glacier Impact:** 2023 was the **second consecutive year** in which “glaciers suffered the **largest mass loss** ever registered in **50 years**.

**Groundwater Levels:** In 2023, average groundwater levels were much below average in 19% of monitored wells. **Example:** Western and Southern Australia were regions where average groundwater levels were below or much below average in many wells.

**Below-average inflows:** Rising trends in the construction of dams and reservoirs reduce the average river inflows. For example, the **Murray-Darling River** in **Australia** and the **Mackenzie River** in **North America** recorded below-average inflows.

### Role of Climate Change

**Soil Moisture:** Due to excess heat, soil moisture in 2023 was predominantly below or much below average across large areas globally throughout the year. Almost all of North America, South America, North Africa, and West Asia experienced much below-average soil moisture levels.

**Water Scarcity:** According to **UN Water**, 3.6 billion people face inadequate access to water for at least one month every year, which is expected to rise to more than five billion by 2050.

**Glacial Retreat:** As glaciers retreat due to rising temperatures, initial increases in river flow can occur, but long-term reductions are likely as glaciers diminish, impacting water supply downstream.

**Altered Precipitation Patterns:** Climate change leads to shifts in rainfall distribution, with some regions experiencing increased rainfall and others facing droughts. **Example:** Erratic Monsoon in India.

### Way forward

**Education and Awareness:** For example, in **California**, the “**Save Our Water**” campaign successfully raised awareness about the importance of water conservation and contributed to a 25% reduction in urban water use during the 2014–2016 drought.

**Efficient Water Use:** Cities like **Seattle** have promoted the **adoption of low-flow fixtures**, such as toilets and showerheads. The city’s “**Water Smart**” program offers rebates for these installations.

**Rainwater Harvesting:** For Example, **Rajasthan** has implemented extensive **rainwater harvesting systems** for residential and commercial buildings, providing water for irrigation and non-potable uses.

**Wastewater Recycling:** Singapore has invested heavily in its **NEWater program**, which treats and reuses wastewater for industrial and potable uses.

**Sustainable Agriculture Practices:** Israel is an example where **drip irrigation technology** has transformed agriculture in arid regions, allowing farmers to optimise water use.

**Conservation Policies:** For example, the **EU's Water Framework Directive** promotes sustainable water use across member states and encourages integrated water management.

**Community Engagement:** For example, the **"One Water"** initiative in various **U.S.** cities engages local communities in water conservation efforts, such as tree planting and watershed cleanups.

**Habitat Restoration:** For example, the **U.S. Army Corps of Engineers** estimates that **restored wetlands** can retain up to 3.5 million acre-feet of water, significantly benefiting regional water supply.

**Integrated watershed management:** For example, the **World Bank's watershed management** projects in Karnataka are leading examples of integrated watershed management in arid zones.

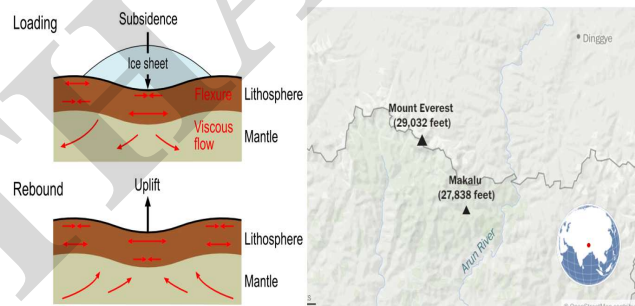
## Increase in height of Mount Everest

**Context:** Mount Everest has **gained** roughly 49-164 feet (15-50 meters) in **height** due to a change in the regional river system.

**Reason for increase in height:** **Isostatic rebound**, where the **land rises** when the **weight of the surface diminishes** due to the **removal of heavy material** like rock or ice.

Here, the merger of the rivers, with the **Kosi subjugating the Arun** as the rivers **changed course** over time – resulted in **accelerated erosion** that has carried off huge amounts of rock and soil, **reducing the weight** of the region near Everest. As a result, the land rose.

**Isostatic rebound** is **propelling the mountain upwards** by about 0.16mm to 0.53mm a year (10% of Everest's annual uplift rate), with its neighbouring peaks, **Lhotse** and **Makalu**, the world's fourth and fifth highest peaks, respectively.



## Mount Everest

Also known as **Chomolungma** (Tibet) and **Sagarmatha** (Nepal), it is the **world's highest mountain** with an elevation of 8,848 meters (29,029 feet).

Although Mount Everest is the highest mountain on earth above sea level, the **world's tallest mountain** is **Mauna Kea**, an **extinct volcano** in **Hawaii**. The majority part of it resides below sea level.

It is located in the Mahalangur Himal sub-range of the Himalayas, on border between Nepal and Tibet.

It was **first recognised** in **1841** by **Sir George Everest** and was called **Peak 15**. The name Mount Everest was then introduced in **1865** in honour of Sir George Everest, **director of the Survey of India**.

The first successful summit of Mount Everest was recorded in 1953 by **Sir Edmund Hillary** (New Zealand). He was accompanied by **Tenzing Norgay** – a Sherpa from Nepal.



## Poleward shift of atmospheric rivers

**Context:** Atmospheric rivers are shifting poleward. Atmospheric instability of the jet stream allows them to curve poleward in different ways. Atmospheric rivers are commonly seen in the **extratropics**, a region between 30 and 50 degrees latitudes in both hemispheres.

*Atmospheric rivers share a similar origin — moisture supply from the tropics. No two atmospheric rivers are exactly alike.*

### Reason for poleward shift of atmospheric rivers

**Cooling in eastern tropical Pacific:** During **La Niña**, cooler sea surface temperatures in the eastern tropical Pacific **strengthen** the **Walker circulation** in western Pacific, **expanding tropical rainfall belt**.

This, along with altered **atmospheric eddy patterns**, creates **high-pressure anomalies** and wind patterns that steer atmospheric rivers farther **poleward**.

### Impact of poleward shift of atmospheric rivers

In the **subtropics**, it could lead to **longer droughts** and **less water**. Regions like California and southern Brazil, which rely on these rivers for rainfall, may face water shortages.

In **higher latitudes**, it could lead to **more extreme rainfall, flooding** and **landslides** in places such as the US Pacific Northwest, Europe and even in polar regions.

In the **Arctic**, it could **speed up sea ice melting**, adding to **global warming**.

## Jog Waterfall, Karnataka

**Context:** The **Karnataka** Government discussed plans to increase tourist footfall at Jog Falls.

It is also known as **Gerusoppe Falls**, located on the **Sharavati River** in the **Western Ghats**. With a drop of **253 meters** (830 feet), it is the **second-highest plunge waterfall** in India.

### Projects on Jog falls

**Linganamakki Dam:** Built in **1964**, this dam is located **upstream of Jog Falls** and regulates the water flow to the falls.

**Sharavathi Hydroelectric Project:** One of the largest **hydroelectric projects** in Karnataka, it harnesses the power of the Sharavathi River.

**Gerusoppa Hydroelectric Project:** This project, also known as the **Sharavathi Tailrace Project**, is situated **downstream from Jog Falls**. It taps into the residual water from the Sharavathi River.

### Sharavathi River

**Origin and flow:** **Ambuthirtha** in the **Western Ghats**.

Flows westward into **Arabian Sea** at **Honnavar**.

Home to the rare and endemic freshwater fish species ***Batasio sharavatiensis***.

## Roopkund Glacial lake

**Context:** Roopkund Lake (Uttarakhand) is being impacted by climate change.

**Location:** At the base of Mt. Trishul in the Garhwal Himalayas, part of the Nanda Devi National Park.

It is also known as the “Lake of Skeletons” due to the skeletal remains of an estimated 600-800 people found here.

Some of these skeletons date back to around 1200 years. According to genetic research, these people were descended from various ethnic groups, including **Mediterraneans**.

### Garhwal Himalaya

Part of the **Himalayan Sivalik**, the outermost hills of the Himalayas, Western part of Kumaon Himalaya

Located in **Himachal Pradesh** and **Uttarakhand**.

**Major Peaks:** Nanda Devi, Kamet, Mana Peak, Mukut Parvat.

## Barberton Greenstone Belt

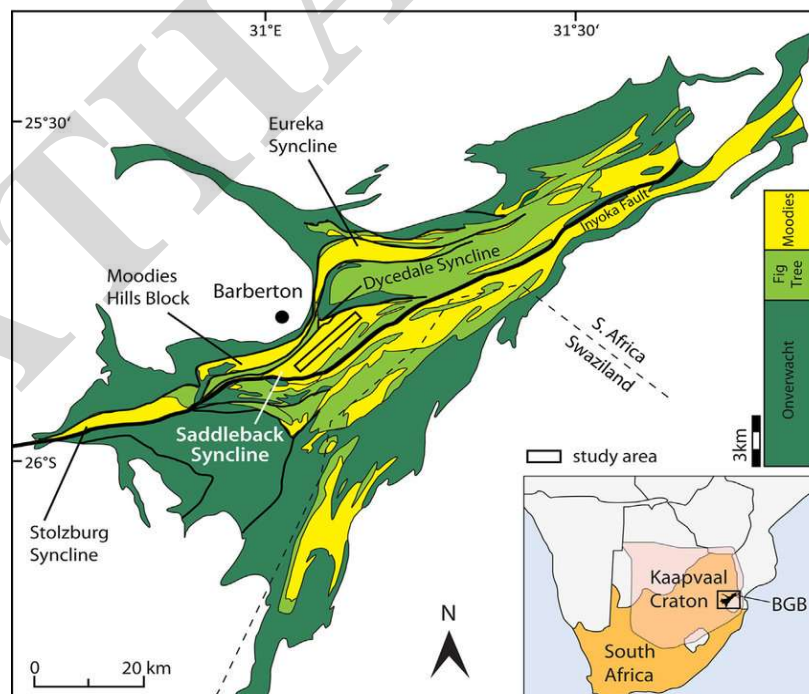
**Context:** Researchers have assessed the effects of an ancient **meteorite** impact in **Barberton Greenstone Belt** that acted as a **giant fertiliser bomb** for life on Earth.

The meteorite delivered a large amount of **phosphorous**, a nutrient for microbes crucial for the molecules central to storing and conveying genetic information.

It also mixed **iron-rich deep waters** into **shallower waters**, creating an environment ideal for microbes.

### Barberton Greenstone Belt (BGB)

It is located in Kaapvaal craton of southeastern **Africa**.



It is a rugged mountain terrain of substantially untransformed **Archaean rocks**.

It contains the best-preserved, oldest (the lowermost volcanic rocks are almost 3.5 billion years old), and most diverse sequence of **volcanic** and **sedimentary rocks** on Earth **unaffected by subduction** (and metamorphism) and erosion.

**Makhonjwa Mountains** make up 40% of the Barberton belt. **Komati River** flows through the belt.

BGB's outcrops were added to **UNESCO's World Heritage Sites**.

## Sahara desert witnesses first flood in 50 years

**Context:** Recently, A rare deluge of rainfall has left lagoons of water amid the palm trees and sand dunes of the Sahara desert. NASA satellites showed water rushing in to fill **Lake Iriqui**, a famous lake bed between **Zagora** and **Tata** that had been **dry for 50 years**.

### Sahara Desert

**Size:** It is the world's **largest hot desert** and the **third-largest desert overall**, smaller only than the deserts of **Antarctica** and the **northern Arctic**.

**Location:** It is located in North Africa and **touches 11 countries:** Algeria, Chad, Egypt, Libya, Mali, Mauritania, Morocco, Niger, Sudan, Tunisia, and Western Sahara.

**Hottest landscape:** In 1922, **Al Azizia** (Libya) in the Sahara recorded the highest temperature, **57.7 °C**.

**Drainage:** Several rivers discharge into **Lake Chad** in the **southern Sahara**; the **Niger** rises in **Fouta Djallon** region of Guinea and flows through southwestern Sahara before turning southward to the sea.

**Tribes:** Various nomadic groups, **Bedouins** and **Tuaregs** are prominent. The oasis in the Sahara and the **Nile Valley** in **Egypt** support **settled populations**.

## Chagos Islands

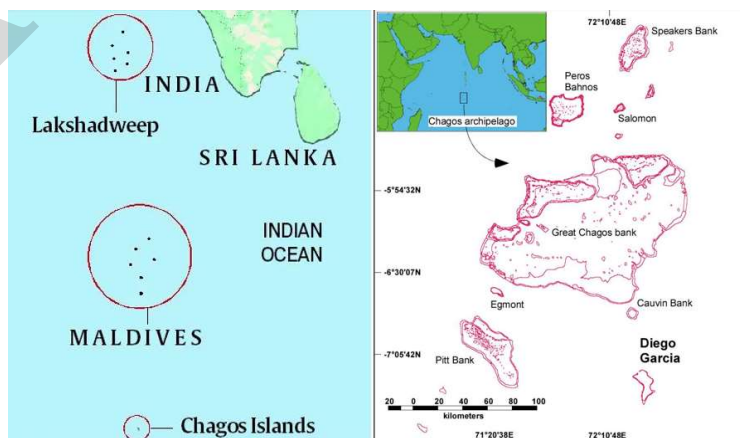
**Context:** The **U.K.** will **restore sovereignty** of the **Chagos Islands** to **Mauritius** but **retains Diego Garcia** **airbase**.

The Chagos archipelago is a group of **seven atolls** in the Indian Ocean, comprising at least 60 islands about 500 km south of the **Maldives** and more than 2000 km northeast of **Mauritius**.

Chagos Islands are the **southernmost archipelago** of the **Chagos–Laccadive Ridge**, a long submarine mountain range in the Indian Ocean.

**Key Islands:** **Salomon Islands**, **Diego Garcia**, **Nelsons Island**, etc.

The **Great Chagos Bank** is the **largest atoll** in the world.



## History of sovereignty dispute over the Archipelago

The islands were initially uninhabited but were claimed by the **British** in the late **18th century** after passing through **French** control. The islands were used for **coconut plantations**, and workers were brought in, many of them descendants of slaves from Africa and laborers from India.

Britain (controlled the Chagos Islands since **1814**) separated the islands from Mauritius in **1965**, three years before Mauritius gained independence, to establish the **British Indian Ocean Territory**.

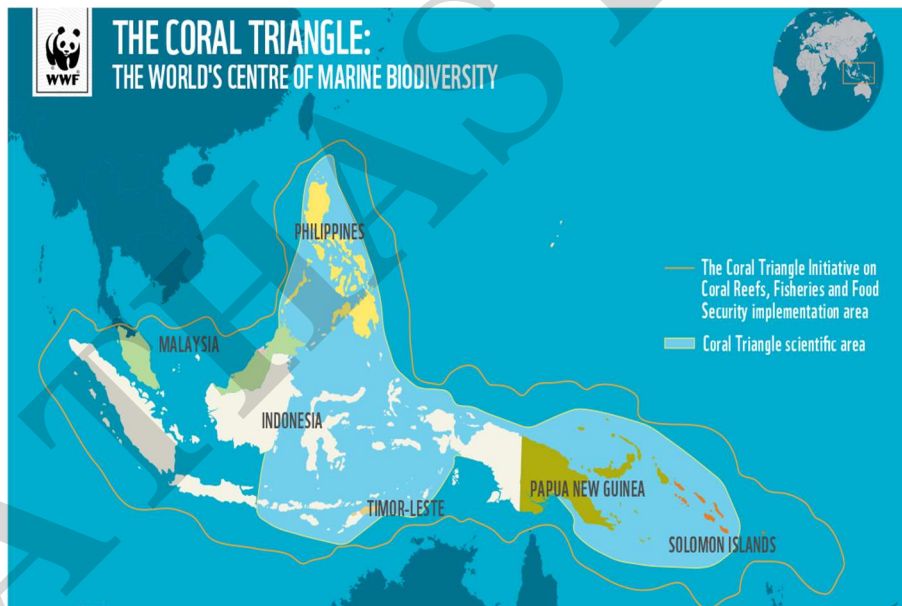
In the early 1970s, nearly 2,000 residents were forcibly relocated to Mauritius and the Seychelles to make way for an airbase on **Diego Garcia**, the largest island, which was leased to the United States in 1966. It became a **fully operational military base** in **1986**.

A non-binding UN General Assembly resolution in 2019 called on Britain to relinquish control of the islands, citing the forced eviction of the population as **unlawful**. Despite this, the UK extended the lease for Diego Garcia until 2036 in 2016.

## Coral Triangle

**Context:** Experts recommend the **Coral Triangle** be classified as a **Particularly Sensitive Sea Area** to protect it from harmful maritime activities.

Often referred to as the '**Amazon of the seas**', it is a huge marine area in **Southeast Asia**. It includes countries like Indonesia, Papua New Guinea, Singapore, Philippines, Timor-Leste & Solomon Islands.



It encompasses portions of 2 biogeographic regions: the **Indonesian-Philippines Region** and the **Far Southwestern Pacific Region**.

It has **76%** of all known coral species worldwide and **37%** of the **world's total coral reef fish**.

## About Particularly Sensitive Sea Area (PSSAs)

These are **internationally recognised**, highly sensitive, and highly protected locations because of their ecological, socioeconomic or scientific significance.

The **International Maritime Organization (IMO)** stressed the guidelines for designating those areas

## Azores Island

**Context:** Azores island created the **largest marine protected area** in the **North Atlantic**.

### About Azores Island

The Autonomous Region of the Azores is a **Portuguese** archipelago of **volcanic origin** made up of nine islands in the **North Atlantic Ocean**.



It is located at the **seismically active Azores Triple Junction** plate boundary where the **North American Plate**, **Eurasian Plate** and **African Plate** meet.

The archipelago, alongside Madeira, Cape Verde, and the Canary Islands, is part of **Macaronesia**.

The islands lie in a **northwest-southeast direction** and are divided into three groups: **northwest**, **central** and **eastern**. **Mount Pico**, located on Pico Island, is the **highest point** on the archipelago

## Little Prespa Lake

**Context:** Little Prespa Lake in **Europe** has been transformed into swamps or **dried up**.

### About Little Prespa Lake

**Location:** It is situated on the **border between Greece and Albania**.

It consists of two lakes:

**Great Prespa Lake** (shared by **Albania, Greece, and North Macedonia**).

**Small Prespa Lake** (Mostly in **Greece** with a small tip in **Albania**).

One of the **oldest tectonic lakes** in Europe and the **highest tectonic lake** on the **Balkan Peninsula**. The region features rocks from the **oldest Palaeozoic** formations to sediments from the young **Neogene era**.

It is home to the world's **largest breeding colony** of the **Dalmatian pelican**.

The lake is part of the Prespa National Park and is designated as a Ramsar Wetland.



## Lake Erie

**Context:** Water infected with **Microcystin** in **Lake Erie** can be harmful.

### About Lake Erie

**Location:** One of **North America's Great Lakes**, situated on the **border** between the **U.S.** and **Canada**.

**Size:** It is the **fourth-largest** among the **five Great Lakes**.

**Major Tributaries:** The main contributing rivers include the **Detroit, Huron, and Raisin** rivers.

**Outflow:** **Niagara River** serves as its eastern discharge point.

**Shallow Depth:** Warms and cools more rapidly than other Great Lakes.

**Economic Role:** Commercial fishing, tourism, and shipping; Major ports include **Cleveland** and **Toledo**.

**Ecological Threats:** Faces pollution, invasive species, and algal blooms, posing risks to water quality.



### What is Microcystin?

It is a **toxin** produced by certain **freshwater cyanobacteria**, commonly known as **blue-green algae**.

These toxins can pose significant health risks to humans and animals, primarily affecting the liver.

It is produced in large quantities during algal blooms, contaminating the water. There are over 250 types of microcystins, with **microcystin-LR** being the most common and toxic variant.

## Siddi Community

**Context:** The film **Rhythm of Dammam**, which highlights the marginalised **Siddi community** in India, is being screened at the 55th **International Film Festival of India (IFFI)** in Goa.

The Siddis are **descendants of African slaves** brought to India by the Portuguese in the **late 17th century**. They arrived during the trans-Indian Ocean slave trade.

**Location:** Most Siddis live along India's **western coast**, particularly in Gujarat, Maharashtra & Karnataka.

**Status as a Scheduled Tribe:** In 2003, the Indian government recognised Siddis as a Scheduled Tribe. They are also part of the centre's list of Particularly Vulnerable Tribal Groups (PVTGs).



**Family Life:** Mostly follow nuclear family system, where parents & children live together. Extended families are also common in their community.

**Rich Cultural Traditions:** The Siddis are known for their folk music and dances, such as Dhamal and Rasda, with men performing the Dhamal dance.

### International Film Festival of India (IFFI)

Established in **1952**; it is held **annually** in Goa.

Since 2004, IFFI has moved to its **permanent venue** in **Goa**, where it is jointly organised each year by the National Film Development Corporation of India Ltd. (NFDC), the Ministry of Information and Broadcasting, in collaboration with the State Government of Goa and the Indian Film Industry.

It aims to provide a platform for filmmakers worldwide to showcase their excellence in **film art**, contribute to the understanding and appreciation of film cultures of different nations in the context of their social and cultural ethos, and promote friendship and cooperation among people worldwide.

It is the **only film festival in South Asia** accredited by the **International Federation of Film Producers and Associations (FIAPF)** as a Competitive Feature Film Festival.

### DANA (Cold Drop)

**Context: Valencia** (eastern **Spain**) received a year's worth of rainfall within just 8 hours, which can be attributed to an event known locally as "**Depresión Aislada en Niveles Altos**" (**DANA**).

#### About DANA

**Depresión Aislada en Niveles Altos (DANA)** is commonly referred to in English as the "**cold drop**." Spanish meteorologists coined the term to describe this weather phenomenon specifically.

It forms when a **mass of cold air** descends over the **warm waters** of the **Mediterranean Sea**, leading to rapid atmospheric instability.

**Polar Jet Stream Influence:** The phenomenon involves the polar jet stream, which acts as a boundary between polar and tropical air. Occasionally, a pocket of cold air detaches and moves over the Mediterranean, triggering DANA.

**Period:** It typically occurs in the autumn and spring months in the western Mediterranean region.

**Note:** This should not be confused with **Cyclone DANA**, a tropical cyclone that impacted the states of West Bengal and Odisha in India.

### "Bhu-Neer" Portal

**Context:** The **Ministry of Jal Shakti** launched the "**Bhu-Neer**" portal during the concluding ceremony of **India Water Week 2024**.

Developed by **Central Ground Water Authority (CGWA)** under the **Ministry of Jal Shakti**, in collaboration with National Informatics Centre (NIC), to improve groundwater regulation across India.

#### Features of "Bhu-Neer"

**PAN-Based Single ID System:** This feature allows users to use their **PAN (Permanent Account Number)** as a single identification system for all groundwater-related activities.



**NOC with QR Code:** The portal issues **No Objection Certificates (NOCs)** with **QR codes**, ensuring easy verification and authenticity.

**Centralised Database:** Provides comprehensive details on the legal framework governing groundwater extraction, regulations at both state and national levels, and access to critical information on groundwater compliance, policies, and sustainable practices.

**Ease of Doing Business:** Makes groundwater regulation seamless & faceless.

## **Current State of Water in India**

**Water Scarcity:** India, with **18%** of the world's population, has only **4% of its freshwater resources**, making it one of the most water-stressed countries globally. As of 2024, this imbalance highlights the nation's severe water scarcity issues.

**Groundwater Depletion:** Groundwater accounts for **80%** of the drinking water supply and two-thirds of the irrigation needs in India. Over-extraction of groundwater has led to severe depletion, especially in agricultural states like Punjab, where the water table is drastically falling.

**Water Pollution:** Approximately **70%** of India's water is contaminated, with nearly half of the country's rivers unsafe for drinking or irrigation. India ranks **120<sup>th</sup> out of 122 countries** on the **Global Water Quality Index 2024**, indicating poor water quality.

**Rural Water Access:** Around 163 million Indians lack access to safe drinking water. Around 600 million people in India face high-to-extreme water stress, with many rural areas still dependent on unsafe water.

**Climate Vulnerability:** Climate change has exacerbated droughts and floods, further impacting water availability in India. By 2030, India's water supply is projected to meet only half of the country's demand.

## **Factors Contributing to the Water Crisis in India**

**Rapid Population Growth and Urbanization:** The increasing population and rapid urbanisation have led to a heightened demand for water, straining the existing water resources and infrastructure.

**Inefficient Agricultural Practices:** Agriculture consumes about **80%** of India's freshwater. The dependency on water-intensive crops and inefficient irrigation methods leads to unsustainable water usage.

**Pollution of Water Bodies:** Industrial waste, untreated sewage, and agricultural runoff have heavily polluted rivers, lakes, and groundwater, reducing the availability of safe, potable water.

**Depleting Groundwater Reserves:** Excessive groundwater extraction, especially for agricultural purposes, has caused significant **groundwater depletion** in states like **Punjab, Haryana, and Rajasthan**.

**Climate Change:** Irregular rainfall patterns, frequent droughts & changing monsoon cycles due to climate change have disrupted water availability, worsening the crisis in drought-prone & semi-arid regions.

**Over-Reliance on Monsoons:** India's heavy reliance on monsoon rainfall to replenish water resources makes country vulnerable to monsoon variability, impacting agricultural production and water availability.

**Unequal Distribution and Access:** **Regional disparities** in water availability result in some areas facing acute shortages while others have abundant resources. This unequal distribution leads to limited access to water, particularly in rural and marginalised communities.

**Weak Governance and Policy Implementation:** Inconsistent & fragmented water policies, poor governance, & weak enforcement of regulations hinder effective water management and conservation efforts.

## **Government Initiatives Related to Water Management in India**

Atal Bhujal Yojana

Jal Jeevan Mission (JJM)

Pradhan Mantri Krishi Sinchayee Yojana  
Jal Shakti Abhiyan- Catch the Rain Campaign  
National Mission for Clean Ganga (NMCG)

### India Water Week 2024

**Aim:** It focuses on addressing critical challenges in water management and fostering innovation in water-related technologies and practices.

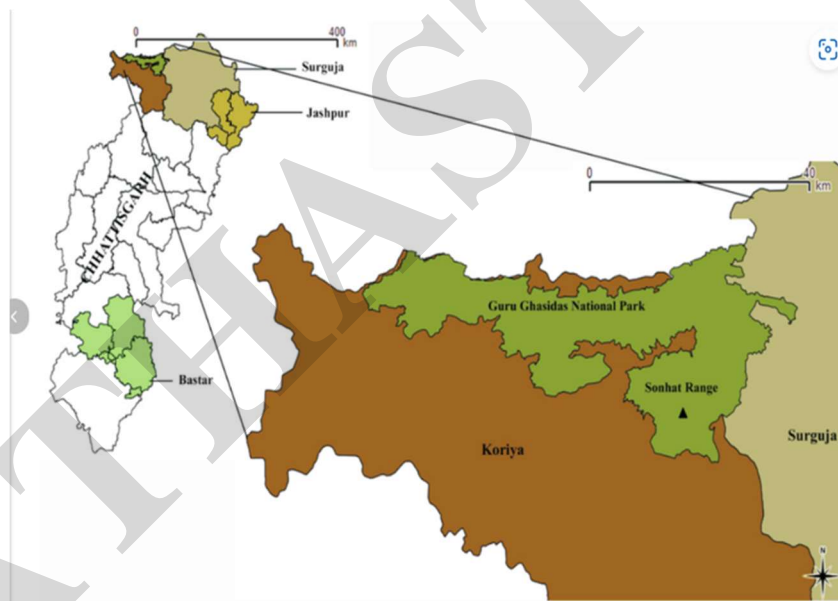
**Theme:** 'Partnerships and Cooperation for Inclusive Water Development and Management'.

**Participants:** Countries such as Denmark, Israel, Australia, and Singapore showcased their innovations and experiences in water management. Notably, China and Bangladesh did not participate in the International Water Week events held in India.

### Guru Ghasidas-Tamor Pingla Tiger Reserve

**Context:** Chhattisgarh government notified Guru Ghasidas-Tamor Pingla as India's 56<sup>th</sup> tiger reserve.

*Tiger Reserves are notified by State govt. under the Wildlife (Protection) Act, 1972 on advice of NTCA.*



It is the **fourth** tiger reserve in **Chhattisgarh** after Achanakmar, Indravati, and Udanti Sitanadi. It is nestled in the **Chota Nagpur plateau** and partly in **Baghelkhand plateau**.

It's the **3rd largest** Tiger Reserve after **Nagarjunasagar-Srisailem Tiger Reserve** in **Andhra Pradesh** and **Manas Tiger Reserve** in **Assam**.

It is spread across **four districts**, Manendragarh-Chirmiri-Bharatpur (MCB), Korea, Surajpur, and Balrampur in the northern tribal Surguja region of Chhattisgarh.

It is connected to the **Bandhavgarh Tiger Reserve** in **Madhya Pradesh** to the West and **Palamau Tiger Reserve** in Jharkhand to the East.

It is contiguous to **Sanjay Dubri Tiger Reserve** in Madhya Pradesh.



## Hindon River

**Context:** The **Hindon River** has become highly polluted due to industrial effluents and inadequate sewage treatment facilities, making its water toxic and impacting the health of local communities in UP.

### About Hindon River

The Hindon River is a **tributary** of the Yamuna River and primarily relies on rainfall.

**Source:** Originates from the **lower Shivalik ranges** in Saharanpur District, **Uttar Pradesh**.

**Flow:** Travels across the **industrial belt** of Western Uttar Pradesh for approximately 400 kilometres before merging with the Yamuna River in Noida.

**Main Tributaries:** **Kali (West) River** and the **Krishni River**.

**Pollution Issue:** Urban, agricultural, and industrial wastes are released into the river without adequate treatment. It is one of the most polluted sections of the Ganga basin.

**2015 CPCB Report:** The Central Pollution Control Board declared the Hindon a 'dead river' in 2015 due to its severe pollution levels, rendering it '**unfit**' even for bathing in several sections.

### Central Pollution Control Board (CPCB)

It is a **statutory body** established under the **Water (Prevention and Control of Pollution) Act, 1974**.

It was later empowered with responsibilities under **Air (Prevention and Control of Pollution) Act, 1981**.

CPCB provides technical services to the **Ministry of Environment and Forests** in line with the Environment (Protection) Act, 1986.

### Principal Functions

**Water Pollution:** Promotes the cleanliness of streams and wells across various states by preventing, controlling, and reducing water pollution.

**Air Pollution:** Enhances air quality and works towards preventing, controlling, and reducing air pollution.

**Advisory Role:** Advises the Central govt on air and water pollution control and abatement matters.

## Mt. Lewotobi Laki Laki

**Context:** The eruption of **Mount Lewotobi Laki-Laki** in **Indonesia** set off earthquakes, leading to fatalities, extensive property destruction, and mass evacuations in the affected region.

**Twin Peaks:** Part of the Lewotobi **twin volcanic complex**, including Lewotobi Laki-Laki (Male) and Lewotobi Perempuan (Female) stratovolcanoes.

**Geological Importance:** Positioned within the "**Ring of Fire**," an area of vigorous tectonic activity.

**Historical Names:** Historically known as Lobetabi, Lovotivo, and Loby Toby.

## Solomon Islands

**Context:** A team of scientists discovered the **world's largest coral colony** in the Solomon Islands, which is estimated to be around **300 years old**.

## About Solomon Islands

It is located in the **southwestern Pacific Ocean**, forming two parallel chains of volcanic islands and coral atolls. Predominantly **mountainous terrain** with extensive forests, along with some large plains.

**Nearest neighbours:** **Vanuatu** to the southeast and **Papua New Guinea** to the west.

**Comprises nearly 1,000 islands:** Six main large islands and over 900 smaller islands.

**Independence:** It was a **British** protectorate until independence as a republic in **1978**.

**Economy:** Fisheries, timber, and exports such as copra and palm oil. Mining, especially of **gold** and **nickel**, contributes more to the economy.



**Culture and Society:** Rich in diverse cultures with over 70 distinct languages spoken (**English is the official Language**). Predominantly **Melanesian population** with Polynesian and Micronesian minorities.

**Political Structure:** It is a **constitutional monarchy** with a parliamentary system.

## Al-Jawf Region

**Context:** The **Al-Jawf region** in **Saudi Arabia** witnessed a **historic winter** phenomenon, with snowfall blanketing the desert for the **first time** in recorded history.

It is one of the **most fertile regions** in Saudi Arabia. Human presence here dates to the **Stone Age**.

The region is renowned for its **olive cultivation**, boasting the world's largest modern olive farm, a record noted in the **Guinness Book**. The region is one of the **coldest regions** in Saudi Arabia during winter.

## Oilfields Regulation Bill

**Context:** Rajya Sabha passed the **Oilfields (Regulation and Development) Amendment Bill 2024** to streamline **oil and gas exploration** in India.

### Need for the Bill

**Energy Demand:** Reduces the gap between domestic production and consumption of oil and gas.

**Ease of Doing Business (EoDB):** Encourages investments by modernising the legal framework.



**Policy Stability:** Attracts domestic and international stakeholders by offering regulatory clarity.

### Key Features of the Bill

**Broadened Definition of Mineral Oils:** Includes hydrocarbons, coal bed methane and shale gas/oil.

**Delinking Petroleum and Mining Operations:** Separates the regulatory frameworks for EoDB.

**Decriminalisation of Offences:** Removes imprisonment provisions; introduces enhanced penalties for non-compliance.

**Simplified Dispute Resolution:** Establishes an expedited mechanism for penalties and appeals.

### Key Issues Raised

**Lack of Parliamentary Scrutiny:** The opposition demands that the bill be sent to a standing/ select committee for detailed review.

**Fear of Centralisation:** Concerns over reduced state control over resources & increased central authority.

**Impact on Arbitration Provisions:** Changes could discourage foreign investors, raising investment risks.

**Priority for Public Enterprises:** Emphasis on prioritising public sector entities over private companies.

### Benefits and Potential Impact

**Investment Opportunities:** Attracts both domestic & international players, enhancing economic activity.

**Infrastructure Sharing:** Promotes **efficient use** of existing resources.

**Business-Friendly Environment:** Simplifies compliance and reduces regulatory hurdles.

### Way Forward

**Balanced Federal Approach:** Ensure equitable resource benefit-sharing between the centre & states.

**Support for Public Enterprises:** Prioritize entities like ONGC for key exploration projects.

**Stakeholder Engagement:** Continue consultations to address concerns and improve transparency.

## CWC 2024 Report on Water Availability

**Context:** The Central Water Commission (CWC) released its **2024 study**, estimating **India's average annual water availability** from 1985-2023 at 2,115.95 billion cubic meters (BCM).

### Comparison with Previous Estimates

**1901–1903 Estimate** was the earliest calculation at **1,443.2 BCM**.

**2019 Assessment:** Water availability estimated at 1,999.2 BCM (1985–2015).

**Improved Accuracy in 2024 Assessment:** Includes **Bhutan's Brahmaputra** contribution and **Nepal's full Ganga** contribution, enhancing precision.

### Key Findings of the Assessment

#### Current Status

Per capita water availability at 1,486 cubic meters in 2021

**2024 Projection** shows that 1,513 cubic meters of water is **still below the water stress threshold**.

### Water Scarcity Analysis conducted by Falkenmark Indicator which states:

**Water stress:** <1,700 cubic meters per capita.

**Water scarcity:** <1,000 cubic meters per capita.

**Absolute scarcity:** <500 cubic meters per capita.

### Average Distribution of Water Availability

**Top Ranking Basins:** Brahmaputra (592.32 BCM), Ganga (581.75 BCM), Godavari (129.17 BCM).

**Bottom Ranking Basins:** Sabarmati (9.87 BCM), Pennar (10.42 BCM), Mahi (13.03 BCM).

**Total Water Availability across India:** 2,115.95 BCM.

(Quantities in BCM are just for reference and are not to be remembered.)

### Water Availability Assessment

Essential for **planning** sustainable water resource management, it is the process of evaluating the **quantity, quality** and **distribution** of water resources within a **specific region** over a **defined period**.

It involves analysing natural water sources, precipitation patterns, evapotranspiration, land use, and soil data to determine the amount of water available for consumption and agricultural, industrial, and environmental needs.

### Challenges in Utilizable Water

In 2019, only 690 BCM out of 1,999.2 BCM water availability was **utilisable** surface water.

**Smaller basins** like Sabarmati and Pennar have **higher water usability** than larger basins.

**Brahmaputra basin** has the **minimum proportion of utilisable water** resources.

## Ken – Betwa River Linking Project

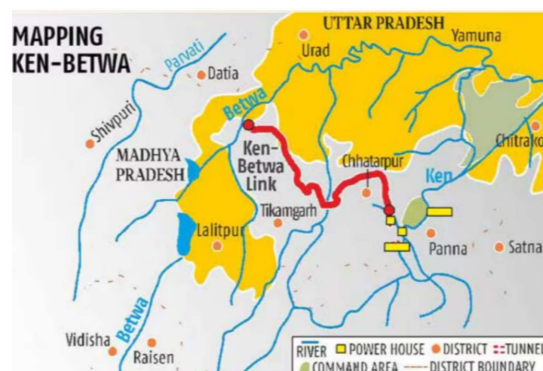
**Context:** PM laid the foundation for the **Ken – Betwa River Linking Project (KBLP)**.

### Project Overview

**Objective:** Transfer water from the Ken River to the Betwa River via a 221-km canal with a 2-km tunnel.

**Key Components:** Includes **Daudhan Dam** (73.8 m high) in **Madhya Pradesh**, tunnels, the Ken-Betwa Link Canal and powerhouses.

**Timeline:** Expected completion by 2032.





## Benefits

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**Irrigation:** Annual irrigation for 10.62 lakh hectares (8.11 lakh ha in MP and 2.51 lakh ha in UP).

**Drinking Water:** Supply to 62 lakh people in water-scarce regions.

**Power Generation:** 103 MW hydropower and 27 MW solar power generation.

The project aims to address **drought and water scarcity**, fostering **regional development**.

## Regions Benefiting

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**Bundelkhand Region:** Affected areas in Uttar Pradesh and Madhya Pradesh.

**Madhya Pradesh:** Panna, Tikamgarh, Chhatarpur, Sagar, Damoh, Datia, Vidisha, Shivpuri, Raisen.

**Uttar Pradesh:** Banda, Mahoba, Jhansi, Lalitpur.

## Controversies and Criticism

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**Environmental Clearance:** The project has faced scrutiny over its approval **inside the Panna Tiger Reserve**, violating precedents of such infrastructure in protected areas.

**Economic Viability:** SC's Central Empowered Committee (CEC) raised questions about the economic feasibility and wildlife clearance.

**Unresolved Hydrological Concerns:** Experts demand a thorough review of the hydrological data to assess potential long-term effects.

## Environmental Concerns

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**Deforestation:** 98 sq km of Panna National Park submerged, resulting in the felling of 2-3 million trees.

**Wildlife Threats:** Potential harm to the **tiger reintroduction program**, Ken Gharial Sanctuary population and vulture nesting sites.

**Hydrological Impact:** The IIT-Bombay study predicts a 12% reduction in September rainfall due to the project's effect on land-atmosphere interaction.

**Data Transparency:** Experts demand transparency in the hydrological data of the Ken River.

## Social Impacts

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**Displacement:** Thousands of families in the **Chhatarpur** and **Panna districts** will be displaced due to submergence and land acquisition.

**Compensation Issues:** Protests over inadequate compensation & minimal benefits, esp. in Panna district.

## Way Forward

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**Sustainable Implementation:** Ensure the preservation of biodiversity and consider alternative irrigation measures to mitigate environmental impact.

**Community Welfare:** Address compensation issues and ensure that displaced families receive fair rehabilitation benefits.

**Transparency:** Make hydrological data publicly available for independent review and monitor the environmental impact on protected areas.



## Hydrothermal Vents

**Context:** Indian oceanographers have captured the image of an active hydrothermal vent located 4,500 metres below the surface of the **Indian Ocean**.

This site holds potential for mineral exploration as part of the **Deep Ocean Mission**.

**Hydrothermal vents** are **underwater springs** located primarily **near tectonic plates**. These vents occur where **cold water**, about 2 degrees Celsius, **meets magma** in a **tectonically active region**.

The cold water **trickles through cracks** and fissures in the ocean crust and mixes with magma, **getting heated up**. This heated water can reach temperatures up to 370 degrees Celsius.

The super hot water emerges as **plumes**, rich in minerals and gases, through chimneys and vents.

### Significance

**Rich Mineral Deposit:** Deposits from hydrothermal venting are rich in copper, zinc, gold, silver, platinum, iron, cobalt, nickel, and other economically beneficial minerals and metals.

**Ecosystem Insights:** The unique **chemosynthetic organisms** (produce their own food through chemosynthesis, i.e., using chemical energy) in these areas help us better understand life in harsh environments.

**Economic Potential:** The long-lasting activity spans, spanning hundreds to thousands of years, make them highly valuable for ongoing exploration.

### National Centre for Polar and Ocean Research (NCPOR)

It plays a leading role in deep ocean surveys and exploration, including hydrothermal minerals and geoscientific surveys, especially in polar and Southern Ocean regions.

**Ice core samples:** It stores the samples from Antarctica and the Himalayas.

**Research stations:** It operates the Indian Antarctic Research Bases "**Maitri**" and "**Bharati**" and the Indian Arctic base "**Himadri**".

**Oceanic research vessel:** It manages the **ORV Sagar Kanya**, India's flagship oceanographic study vessel.

## Slowing Domestic Migration in India

**Context:** The Economic Advisory Council to the Prime Minister (**EAC-PM**) released a **report** titled "**400 Million Dreams!**" revealing a significant **reduction in domestic migration** in India.

### Key Findings

**Decline in Domestic Migration:** Decreased by **11.78%**, from 45.57 crore in 2011 to **40.20 crore** in 2023.

**Migration Rate:** Reduced from 37.64% in 2011 to **28.88%** in **2023**, indicating a slowdown.

**Rising States:** West Bengal, **Rajasthan** and **Karnataka** have seen an increase in migrant arrivals.

**Declining States:** **Maharashtra & AP** have experienced a reduction in their share of migrants.

**Top Districts:** Mumbai, Bengaluru, **Howrah**, Central Delhi, and Hyderabad attract migrants most.

**Peak Periods:** Migration peaks from April to June, with secondary peaks in November and December, likely due to festivals and family events.

**Pandemic Impact:** Post-pandemic migration during peak months (e.g., May 2023) was 6.67% lower than in 2012, indicating a permanent shift in migration trends.



## Reasons for Slowdown in Migration

**Economic Growth in Smaller Cities:** Improved infrastructure, healthcare, education and job opportunities in smaller cities have reduced the need for migration to major urban centres.

**Better Local Services:** Enhanced local economies and services like connectivity and education in traditional migration source areas have decreased the dependence on larger cities.

**Government Schemes:** Pradhan Mantri Mudra Yojana (PMMY), Pradhan Mantri Gram Sadak Yojana (PMGSY), Ayushman Bharat and Digital India are driving local economic growth.

## Implications of Reduced Migration

**Labour Shortages:** Key industries relying on migrant workers may face workforce shortages.

**Higher Costs:** Labour shortages could drive up wages and production costs.

**Boost to Local Economies:** Local economies may grow as workers stay in their home regions, aiding rural and semi-urban development.

**Demand for Local Services:** Greater need for education, healthcare & infrastructure in rural areas.

**Urbanisation Slowdown:** Reduced migration may slow urbanisation, affecting city economies.

**Pressure on Rural Resources:** Overburdening may lead to unsustainable agricultural practices.

## Government Initiatives Supporting Migration and Economic Growth

**PM Street Vendor's AtmaNirbhar Nidhi (PM SVANidhi):** Providing financial support to street vendors.

**PM Shram Yogi Maan-Dhan Yojana (PMSYM):** Offering pension schemes for informal sector workers.

**One Nation One Ration Card (ONORC):** Ensuring food security for migrants nationwide.

**Mera Ration App:** Facilitating access to public distribution systems for migrants.

## Way Forward

**Focus on Infrastructure Development:** Continued rural and semi-urban infrastructure improvements will further reduce migration and enhance local economies.

**Policy Reforms:** Policies addressing labour shortages in key industries & support local economic growth.

**Tracking Migration Trends:** Greater emphasis on regular tracking and analysis of migration data to develop accurate migration-related policies.

## Cyclone Fengal

**Context:** Cyclone Fengal made **landfall** over Puducherry. **Cyclone Fengal** has formed due to a **weather disturbance** that has intensified into a deep depression in the **southwest Bay of Bengal**.

The name "**Fengal**" was proposed by **Saudi Arabia** and is of **Arabic origin**.

## Cyclone Naming Process

**WMO (World Meteorological Organisation)** divided the world's Oceans into Basins and assigned the responsibility of naming the Cyclones to the respective regional bodies.

Worldwide, **six regional specialised meteorological centres (RSMCs)** and five regional tropical Cyclone Warning Centres (TCWCs) are mandated to issue advisories and name tropical cyclones.



The **India Meteorological Department (RSMC New Delhi)** names tropical cyclones formed over the **Bay of Bengal** and the **Arabian Sea**.

## Landfall of Cyclone

**Context: Cyclone Fengal** made **landfall** over Puducherry. It is the second cyclone to impact India's east coast two months after **Cyclone Dana**.

### What is Landfall?

**Landfall** is the event of a tropical cyclone moving from over water to onto land. According to the **Indian Meteorological Department (IMD)**, a cyclone makes landfall when its centre, or eye, crosses the coast.

When the storm makes landfall, its outer bands may have already reached the coast, bringing strong winds, heavy rain, and a storm surge.

*A landfall should not be confused with a **direct hit**. A direct hit occurs when the core of high winds (eyewall) comes ashore, but the storm's centre may remain offshore.*

### Duration of Landfall

**Time Frame:** Landfalls can last several hours, depending on the cyclone's wind speed and size.

**Post-Landfall Intensity:** Cyclones **lose intensity after landfall** due to **reduced moisture supply** and **increased surface friction**. While landfall marks a cyclone's most devastating phase, it also signals the beginning of its weakening.

## Daylight Saving Time in US

**Context:** The US President wants to end daylight saving time in the U.S.

**Daylight saving time (DST)** or summer time is the practice of **advancing clocks by one hour** during summer months in the **US**. In DST, evening time is increased by sacrificing the morning hours.

Typically, users in regions with **summer time** (some countries in the **extreme north** and **south**) adjust clocks forward one hour close to the **start of spring** and **backwards in the autumn** to standard time.

DST aims to improve energy efficiency by reducing the need for artificial lighting, making it relevant to climate change and energy overconsumption. It is considered an **environmentally sustainable** concept.

### History and Adoption of Daylight Saving Time (DST)

The practice was first suggested in a whimsical essay by **Benjamin Franklin** in 1784. Australia, Great Britain, Germany, and the US adopted summer Daylight Saving Time during **World War I** to conserve fuel by reducing the need for artificial lighting.

**Current Practice:** Today, DST is practised in around 70 countries, including the European Union.

**India's case:** India **does not** observe DST, primarily because countries near the Equator do not experience variations in daylight hours between seasons.

### Problems with Daylight Saving Time

**Operational and Communication Issues:** It can cause problems for businesses, travel, and communication as coordinating activities across regions with different time observances becomes more complex.



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# DAYLIGHT SAVING TIME

**Daylight saving time (DST)** or summer time is the practice of **advancing clocks by one hour during summer months**. In DST, evening time is increased by sacrificing the morning hours.

## PRACTICE


Regions with **summer time** adjust clocks forward by one hour **in spring** and **backward in autumn**, mainly in the **extreme north** and **south**.



## SIGNIFICANCE

- Reduces artificial lighting, saving energy.
- Supports climate change mitigation efforts.
- **Environmentally sustainable**

## History and Adoption of Daylight Saving Time (DST)

Origins	Adoption	Current Practice	India's case
<p>First suggested by <b>Benjamin Franklin</b> in 1784 in a whimsical essay.</p> 	<p>Introduced during <b>World War I</b> by Australia, Great Britain, Germany, and the US to conserve fuel.</p> 	<p>Today, DST is practiced in <b>around 70 countries</b>, including the European Union.</p> 	<p>India <b>does not</b> observe DST due to minimal daylight variation near the Equator.</p>  <p>© PMF IAS</p>

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## Problems with Daylight Saving Time

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Can disrupt people's sleep patterns and **circadian rhythms**.

**Increased risks** of sleep disorders, cognitive issues, and heart-related conditions.

Not adopted universally → confusion and inconsistencies across different zones.

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In some regions, time changes can **increase energy** use due to greater reliance on heating and cooling systems.

Challenges for businesses, travel, and communication across regions with different time observances.

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**Health Consequences:** These disruptions can lead to negative health effects, including increased risk of sleep disorders, reduced cognitive function, and higher incidence of heart attacks and strokes.

**Sleep Disturbance:** The time change can disrupt people's sleep patterns and **circadian rhythms**.

**Possible Surge in Energy Demand:** In certain regions, time change can actually lead to increased energy consumption due to greater reliance on heating & cooling systems during extended daylight hours.

**Time Zone Disparities:** Not adopted universally → confusion and inconsistencies across different zones.