

Daily Current Affairs To The Point by Dhananjay Gautam

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GS Paper 3 – Science and Technology

Brain-Computer Interface (BCI): Restoring Movement for the Paralysed

Context: In a groundbreaking advancement, researchers at the **University of California** have developed a **new Brain-Computer Interface (BCI)** that allows people with **paralysis** to regain **movement** using robotic limbs—bridging brain signals directly to external devices.

What is a Brain-Computer Interface?

A Brain-Computer Interface (BCI) is a system that creates a direct

communication link between the **brain's electrical activity** and an **external device**—bypassing the body's damaged motor pathways.

- **Purpose**: To **assist**, **augment**, or **restore** sensory-motor and cognitive functions.
- In this breakthrough, the **BCI decodes signals** from the brain's **motor cortex** using **Artificial Intelligence (AI)** to control **robotic limbs**.

Types of Brain-Computer Interfaces:

1. Invasive BCI:

- Implanted directly into the brain tissue.
- Provides highly accurate signals.
- Used in severe cases like **paralysis** or **locked-in syndrome**.
- **Example**: *Neuralink's Blindsight*, which explores restoring vision and movement.

2. Partially Invasive BCI:

- Placed within the skull but outside the brain tissue, typically on the dura mater.
- Uses techniques like electrocorticography (ECoG) to record signals.
- Offers a **balance** between signal quality and risk.

3. Non-Invasive BCI:

- Requires **no surgery**; uses external sensors like **EEG electrodes**.
- More accessible and safer, but less precise.
- Ideal for general use in **assistive technologies** and **education**.

Applications of BCI Technology:

Medical & Rehabilitation:

- Assistive Devices: Let users control wheelchairs, robotic arms, or computers with their minds.
- Neurorehabilitation: Stimulates brain areas post-stroke to regain motor control.
- **Prosthetics**: Enables brain-operated **artificial limbs**.

Education & Training:

- Attention Monitoring: Helps track student engagement in classrooms.
- **Skill Learning**: Offers **real-time feedback** on brain activity during learning or simulations.

Industry & Automation:

Human-Robot Collaboration: Enhances efficiency and safety in automated environments.
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• Hands-Free Operation: Beneficial in hazardous jobs like mining or chemical processing.

Ethical and Practical Concerns:

1. Privacy Risks:

- Neural data may contain **sensitive thoughts**, emotions, or intentions.
- Raises fears of **data misuse** and **mental surveillance**.

2. Digital Divide:

• Advanced BCIs are **expensive** and **technically complex**, risking **exclusion** of marginalized groups.

3. Mental Autonomy:

• Long-term BCI use could alter **brain function** or affect a person's **sense of agency**, leading to questions about **identity and autonomy**.

The Way Ahead:

- Affordable Innovation: Focus on developing low-cost, scalable BCI systems for widespread adoption.
- Collaborative Ecosystem: Foster public-private partnerships and startup-driven solutions.
- Workforce Development: Establish education programs and certifications to train specialists in BCI design, ethics, and deployment.

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CHAMPION

GS Paper 3 – Economic Development



Enhancing Competitiveness of MSMEs in India

Context: The **NITI Aayog**, in partnership with the **Institute for Competitiveness** (IFC), has released a pivotal report aimed at strengthening the Micro, Small, and **Medium Enterprises (MSMEs)** sector in India—focusing on reforms to unlock its full potential.

About the Report:

- **Prepared By:** NITI Aayog & Institute for Competitiveness. •
- Objective: To drive systemic reforms in financing, skilling, innovation, and market access to enhance MSME competitiveness.
- **Sectoral Focus**: Textiles, Chemicals, Automotive, Food Processing, among others.
- The report outlines **policy interventions** to improve India's position in the global value chain through MSME transformation.

India's MSME Sector at a Glance:

- Home to **5.93 crore registered MSMEs**, employing over **25 crore people**. •
- In **2023–24**, MSME-related goods made up **45.73% of India's total exports**.
- Contribution to **Gross Value Added (GVA)** has steadily risen:
 - **27.3%** in 2020–21
 - **29.6%** in 2021–22
 - 30.1% in 2022-23 Freedom UPSC

Recent Policy Support:

- Union Budget 2025–26 includes:
 - Enhanced credit access
 - Support for first-time entrepreneurs 0
 - Promotion of labour-intensive industries
- **Revised Classification Criteria**:
 - **Investment limits** increased by **2.5x**,
 - **Turnover limits** doubled -Aimed at boosting **scale**, **technology adoption**, and **job creation**. 0

Challenges Identified in the Report:

Financing Gaps:

- MSME access to formal credit rose (2020–24):
 - Micro & Small: From 14% to 20% 0
 - Medium: From 4% to 9% 0
- Still, about 81% of credit demand remains unmet, with a funding gap of 80 lakh crore.
- CGTMSE (Credit Guarantee Fund) has scaled up but still falls short in addressing deep credit deficits.

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Skilling and Human Capital:

• Many MSME workers lack formal training, hindering productivity, scalability, and quality standards.

Innovation & Technology Adoption:

- Low investment in R&D, product innovation, and quality certifications.
- Barriers include:
 - High costs
 - Weak internet and electricity infrastructure
 - Lack of awareness of state tech-support schemes

Policy Awareness Deficit: Existing MSME policies suffer from **low awareness** and **ineffective implementation**, especially at the **state and district levels**.

Recommendations & Way Forward:

1. Targeted Interventions:

• Focus on **cluster-based** MSME development tailored to regional strengths (e.g., textiles in Tamil Nadu, food processing in Bihar).

2. Strengthening Market Access:

- Training in digital marketing
- Partnerships with logistics and supply chain firms
- Creation of platforms for direct B2B and B2C linkages, especially in the Northeast and Eastern India

3. State-Level Reforms:

- Develop **adaptive policy frameworks** that:
 - Promote innovation
 - Enhance competitiveness
 - Support inclusive and green growth

4. Institutional Collaboration:

- Stronger coordination between:
 - Central and state governments
 - Financial institutions
 - Academic and research bodies
 - Private sector partners

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GS Paper 3 – Security

Terror Financing: A Global Security Threat

Context: India has intensified its crackdown on **terror financing**, urging global financial institutions such as the **IMF**, **World Bank**, and **ADB** to ensure that **developmental aid is not misused**—particularly in countries like **Pakistan**.

India also advocates for **Pakistan's re-listing on the FATF Grey List**, citing the need for **strict monitoring** of its financial ecosystem.



What is Terror Financing?

Terror financing refers to the **provision of funds**—from either **legitimate** or **illegitimate sources**—to support **terrorist individuals or organizations**. These funds are used to:

- Recruit operatives
- Procure weapons
- Plan and execute terror attacks
- Sustain organizational infrastructure

Major Sources of Terror Financing:

Source			Description
Hawala Trans	sactio	ns	Informal money transfer systems that evade formal banking channels, making funds hard to trace.
Fake Currenc	у		Counterfeit notes circulated to destabilize economies and fund illegal activities.
Drug Traffi <mark>ck</mark>	ing		Illicit narcotics trade is a major source of income for terror outfits.
Extortion Kidnappings		&	Hostage-taking and extortion from businesses/individuals for ransom.
Misused NGOs/Chariti	es		Front organizations collect donations under false pretenses and redirect them to terror groups.

Challenges in Combating Terror Financing:

- 1. Complex Financial Webs: Use of shell companies, front businesses, and underground networks.
- 2. Weak Global Coordination: Poor intelligence sharing and uneven enforcement.
- 3. Regulatory Gaps: Disparity in laws and enforcement levels across jurisdictions.
- 4. **Technology Misuse**: Cryptocurrencies and encrypted payment platforms offer **anonymity**, making tracing difficult.

India's Multi-Pronged Response:

Legislative Framework:

- Unlawful Activities (Prevention) Act (UAPA):
 - Allows designation of individuals/entities as **terrorists**.
 - Enables seizure of **assets and bank accounts**.
- Prevention of Money Laundering Act (PMLA):









• Targets financial crimes and enables **confiscation of laundered property**.

Institutional Mechanisms:

- **Financial Intelligence Unit (FIU-IND)**: Tracks suspicious transactions and shares intelligence with agencies.
- National Investigation Agency (NIA): Specializes in counter-terrorism investigations and financial linkages.

International Collaboration:

- Participation in the Financial Action Task Force (FATF)
- Hosting and joining platforms like **No Money for Terror (NMFT)** to build global consensus and enforcement mechanisms.

Technology Integration:

• **NATGRID (National Intelligence Grid)**: Integrates data from multiple sources for **real-time intelligence sharing**.

Data Analytics & AI tools to trace unusual transaction patterns and financial anomalies.

Way Forward:

- Strengthen **cross-border coordination** to shut down terror funding routes.
- Enhance **financial literacy and awareness** among law enforcement and banking institutions.
- Develop robust regulation of cryptocurrencies and digital payment platforms.
- Promote **public-private partnerships** for proactive threat identification and counteraction.

FOGETHER WE SCALE HEIGHTS













GS Paper 1 – Geography



Place in News: Chile

Context: A powerful **7.4 magnitude earthquake** recently struck **southern Chile**, prompting a **tsunami alert** across coastal regions. Chile, located in the **Pacific Ring of Fire**, frequently experiences intense **seismic activity**, including **earthquakes**, **volcanic eruptions**, and **tsunamis**.

Political and Geographical Overview:

Location:

Chile lies along the **western edge of South America**, stretching over 4,300 km from **north to south**, making it one of the longest countries in the world.

Boundaries:

- North: Bordered by Peru and Bolivia
- East: Shares its longest border with Argentina
 - The Argentina-Chile border is the longest in South America and the third longest globally, after:
 - Canada–USA
 - Russia-Kazakhstan
- West: Flanked by the vast Pacific Ocean

Geographical Highlights:

- Andes Mountains dominate the eastern spine of the country.
- Atacama Desert in the north is the driest non-polar desert in the world, receiving less than 1 mm of rain per year in some areas.
- Sits on the **Pacific Ring of Fire**, making it prone to:
 - Volcanic eruptions
 - Earthquakes
 - Tsunamis
- Ojos del Salado:
 - o The highest active volcano on Earth, at 6,893 meters
 - o Also the **second-highest peak** in the Western Hemisphere

Economic Importance:

- Chile is the world's largest producer of copper, a vital metal for:
 - Electrical wiring
 - Electronics
 - Renewable energy infrastructure
- Located within the "Lithium Triangle" (with Bolivia and Argentina), containing:





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- Over 50% of the world's lithium reserves 0
- Crucial for electric vehicle batteries and clean energy tec 0

Did You Know?

- Chile was the first South American country to join the OECD (Organisation for Economic Co-• operation and Development).
- The Valparaíso region is home to the oldest stock exchange in Latin America.
- Chile's Naval Hydrographic and Oceanographic Service (SHOA) plays a key role in monitoring Pacific tsunami threats.

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Turbidity Currents in Submarine Canyons: A Deep-Sea Phenomenon

Context: Turbidity currents are **rapid**, **downslope flows of water** filled with **sediments**, making the water **denser** and less transparent. These currents behave similarly to **underwater avalanches**, often triggered by **geological disturbances** such as:

- Earthquakes
- Submarine landslides
- Slope failures and other geological events

These currents can travel great distances across the seafloor, shaping underwater landscapes and playing a vital role in oceanic processes.

Key Characteristics of Turbidity Currents:

Turbidity currents are an essential part of **deep-sea dynamics**. As the water's density increases due to suspended sediments, it becomes less transparent, often causing large-scale erosion of the seafloor. Key features include:

- Erosion and Canyon Formation: Turbidity currents actively carve out and enlarge submarine canyons, much like how rivers shape land canyons.
- Layered Sediment Deposition: These currents deposit sediments in graded layers, with coarser particles settling first, followed by finer sediments.
- **Shaping the Ocean Floor**: These flows contribute significantly to **deep-sea sedimentation**, sculpting the ocean's topography over time.

Submarine Can<mark>yons: Na</mark>ture's Underwater Valleys:

Submarine canyons are **narrow**, **steep-sided valleys** that form on the **continental slopes** and rise. They can extend from the **continental shelf** down into the deep ocean, often carved by the erosive force of turbidity currents. Key aspects of submarine canyons include:

- **Global Presence**: There are approximately **9,477 known submarine canyons** globally, covering almost **11%** of the continental slope regions.
- **Distinct Morphology**: Canyons on **active margins** (tectonically active zones) are generally **steeper and shorter**, while those on **passive margins** (less tectonically active regions) tend to have more gradual slopes.
- **Unstable Walls**: The walls of these canyons are often **nearly vertical**, and their susceptibility to collapse adds further sediment to turbidity currents, increasing their destructive power.

Types of Submarine Canyons:

Submarine canyons come in different forms, each unique in its formation and function:

• Bank Canyons: These are flat-topped elevations along the continental margins, created through both erosional and depositional processes. A prominent example is Dogger Bank in the North Sea.

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GS Paper 3 - Environment and Ecology



- Shoal Canyons: Shallow regions with accumulated sediments, typically found at depths of less than 10 meters during low tide. These are often hazardous to navigation.
- Reef Canyons: Composed of calcareous skeletons from corals and algae, these reefs are biodiversity hotspots, particularly in the Pacific Ocean. They are commonly found associated with guyots and seamounts.

Microplastic Transport and Submarine Canyons:

A recent study published in ACS Environmental Science & Technology highlighted a groundbreaking discovery: turbidity currents are now transporting microplastics into the deep sea, particularly through submarine canyons. This occurs even in regions that aren't directly fed by rivers, such as the Whittard Canyon off the coast of Ireland. This finding underscores the growing environmental concerns of plastic pollution in deep-sea ecosystems and the role of submarine canyons as conduits for this pollution to reach even the most remote ocean depths.

Fun Fact: Submarine Canyons and Ecosystem Diversity

While submarine canyons are primarily known for their geological role, they are also critical ecosystem **hotspots**. The deep, nutrient-rich waters flowing through these canyons support diverse species of fish, invertebrates, and even whale populations that feed on abundant plankton and nutrients. Thus, submarine canyons serve not only as geologically dynamic structures but also as **biodiversity reservoirs** in the deep ocean.

In conclusion, **turbidity currents** and **submarine canyons** are key players in shaping the seafloor and influencing oceanic processes. They drive sedimentation, transport pollutants, and support marine ecosystems, making them critical to understanding the complex dynamics of our oceans.

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GS Paper 3 – Environment and Ecology

Climate Change and the Shrinking Caspian Sea: A Looming Environmental Crisis

Context: The **Caspian Sea**, the world's **largest enclosed inland water body**, is now at the frontline of climate change impacts. Once a vast expanse sustaining economies, biodiversity, and regional geopolitics, this **tectonic lake** is rapidly shrinking—primarily due to **climate-driven evaporation**.



Alarming Water Level Declines:

Even with efforts to curb global warming, scientists project that the Caspian Sea will **drop by 5–10 meters** by the end of the century. If temperatures rise unchecked, this decline could reach up to **21 meters** by **2100**. The consequences of such a dramatic fall are profound and far-reaching.

Biodiversity on the Brink:

The shrinking waters place endemic and endangered species at risk:

- **Caspian Seal** (*Endangered* IUCN): The only marine mammal native to the region.
- Beluga Sturgeon (*Critically Endangered*): Known for producing prized caviar, this ancient fish faces habitat destruction.

As salinity increases and shorelines recede, these species lose critical breeding and feeding grounds, accelerating their decline.

Economic and Industrial Fallout:

The Caspian region's economy—heavily reliant on **ports and hydrocarbon industries**—faces significant disruption:

- **Ports at Risk**: Major transport hubs like **Baku**, **Anzali**, **Aktau**, **Turkmenbashi**, and **Lagan** may become **inland relics**, severed from the sea.
- Volga River Threat: As the Caspian's only maritime connection to the outside world, a decline in the Volga's viability could isolate the region's shipping network.
- **Oil and Gas Production**: Key offshore fields such as **Kashagan (Kazakhstan)** and **Filanovsky (Russia)** are at risk of being **stranded**, jeopardizing **energy exports** and national revenues.

Public Health and Environmental Disaster:

As the seabed dries:

- **Toxic Dust Storms** may emerge, **releasing pollutants and salt** into the air—reminiscent of the **Aral Sea catastrophe**.
- **Communities** near the coast face increased risks of **respiratory illnesses**, soil degradation, and water insecurity.

Geopolitical and Environmental Significance:

The Caspian Sea is bordered by **five countries—Russia, Azerbaijan, Iran, Turkmenistan**, and **Kazakhstan**—and is fed primarily by three rivers: the **Volga**, **Ural**, and **Terek**.

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- It serves as a **critical geopolitical hub**, providing transit routes, energy corridors, and biodiversity resources.
- The retreat of its shoreline could fuel territorial disputes, impact fisheries, and strain regional cooperation.

Did You Know?

- The Caspian Sea is not a sea, but a lake—formed in a tectonic depression, isolated from the world's • oceans for millions of years.
- It's a key wintering area for migratory birds, supporting one of the most unique brackish ecosystems in the world.

Conclusion: A Call for Urgent Action

The fate of the Caspian Sea is a stark reminder of how climate change transcends land, sea, and borders. Protecting this unique water body requires coordinated international action, adaptive water policies, and serious climate commitments—before it becomes another ecological tragedy in the pages of history.

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