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Current Affairs - 04 November 2025

WHAT ARE HEAVY METALS?

Heavy Metals

80 Hg Heavy Metal	33 As Metalloid	28 Ni Metal	82 Pb Lead
24 Cr Chromium Metal	30 Zn Metal	29 Cu Metal	48 Cd Cadmium Metal

• The term 'heavy metal' refers to any **metallic chemical element** that has a **relatively high density** and is **toxic or poisonous at low concentrations**.

- Examples of heavy metals include **mercury (Hg), cadmium (Cd), arsenic (As), chromium (Cr), thallium (Tl), and lead (Pb)**.
- Heavy metals are **natural components of the Earth's crust**. They **cannot be degraded or destroyed**.
- To a small extent they **enter our bodies via food, drinking water, and air**.
- As **trace elements**, some heavy metals (e.g. copper, selenium, and zinc) are **essential to maintain the metabolism** of the human body.
- However, at **higher concentrations** they can lead to **poisoning**.
- **Heavy metal poisoning could result**, for instance, from **drinking-water contamination** (e.g. lead pipes), **high ambient air concentrations** near emission sources, or intake via the **food chain**.
- Heavy metals are dangerous because they **tend to bioaccumulate**.
 - Bioaccumulation means **an increase in the concentration of a chemical in a biological organism over time**, compared to the chemical's concentration in the environment.
 - **Compounds** accumulate in living things any time they are **taken up and stored faster than they are broken down** (metabolized) or excreted.
- **Heavy metals can enter a water supply** by industrial and consumer waste, or even from acidic rain breaking down soils and releasing heavy metals **into streams, lakes, rivers, and groundwater**.
- **Mercury, lead, and cadmium** are of **greatest concern** because of their **ability to travel long distances in the atmosphere**.



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MELATONIN



• Melatonin is a **naturally-occurring hormone in human beings** that controls sleep and wake cycles in our daily lives.

- Its levels **rise in the evening**, helping to promote sleep.
 - It is **secreted by the pineal gland** in human body.
 - Pineal gland releases the **most melatonin when there's darkness** and decreases melatonin production when you're exposed to light.
 - Melatonin can **also be made synthetically** in a lab and **sold as a dietary supplement**. It's called **exogenous melatonin**.
 - Those people **whose sleep is not optimal** and who travel frequently across time zones prefer melatonin supplements.
 - **Side Effects of Melatonin supplements:**
 - Overuse of melatonin may cause **headaches, hormonal changes**, or mood swings, disturbing the very rhythm and sleep cycle.
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MAGNITUDE 6.3 EARTHQUAKE STRIKES AFGHANISTAN



Recently, a 6.3-magnitude earthquake struck near **Mazar-e-Sharif** in northern **Afghanistan**, killing **at least 10 people** and injuring around **260**.

Geographical Location of Mazar-e-Sharif

- Mazar-e-Sharif, the capital of Balkh province, lies in northern Afghanistan, close to the **borders with Uzbekistan and Tajikistan**.
- It sits at an elevation of about 380 metres (1,250 ft) in a broad alluvial plain of the Amu Darya basin, making it a key urban and economic centre in the region.



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• Geophysical Characteristics

- Mazar-e-Sharif lies near the **boundary zone between the Eurasian and Indian tectonic plates**, an area of intense crustal compression caused by the northward movement of the Indian plate.
- This collision zone creates active fault lines running through northern and northeastern Afghanistan, where seismic stress accumulates and releases through frequent earthquakes.
- The recent quake near Mazar-e-Sharif is linked to **shallow crustal faults within this convergence zone**, where compressional forces **generate strike-slip and thrust faulting** — common mechanisms for strong tremors in the region.

Afghanistan's High Earthquake Risk

- Afghanistan, surrounded by rugged mountain ranges, is highly prone to earthquakes, which are its deadliest natural disasters.
- On average, around 560 people die each year, and annual damages exceed \$80 million.
- Since 1990, the country has experienced over 355 earthquakes with magnitudes above 5.0, underscoring its extreme seismic vulnerability.

Afghanistan Is Prone to Earthquakes



- Afghanistan lies at the junction of **three major tectonic plates** — the Eurasian, Indian, and Arabian plates.
- The northward movement of the Indian plate and its collision with the Eurasian plate, combined with pressure from the Arabian plate in the south, makes this one of the most seismically active regions on Earth.
- The constant pushing, twisting, and grinding of these plates generates frequent and powerful earthquakes across the region.
- **Most High-Risk Areas**
 - The **eastern and northeastern regions of Afghanistan** — along borders with Pakistan, Tajikistan, and Uzbekistan — are most vulnerable to major tremors.



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HIGH SEAS TREATY: CHALLENGES IN GLOBAL OCEAN GOVERNANCE

- The High Seas Treaty, also known as the **Biodiversity Beyond National Jurisdiction (BBNJ) Agreement**, represents a landmark effort in global marine conservation.
- Ratified by over 60 countries in September 2025, the treaty will enter into force in January 2026.
- It seeks to protect marine biodiversity in areas beyond national jurisdiction, the so-called high seas, by promoting sustainable use of ocean resources, addressing threats such as overfishing, pollution, and climate change, and ensuring equitable benefit-sharing of marine genetic resources (MGRs).
- While hailed as a major breakthrough under the United Nations Convention on the Law of the Sea (UNCLOS, 1982), the treaty faces significant implementation challenges, ranging from definitional ambiguities to geopolitical resistance by major powers.

Major Challenges in Implementation

- **Ambiguity Between “Common Heritage” and “Freedom of the Seas”**
 - The treaty attempts to balance two conflicting principles:
 - **Common Heritage of Humankind** - advocating for equitable sharing of ocean resources among all nations.
 - **Freedom of the High Seas** - guaranteeing states unrestricted navigation, research, and exploitation rights.
- **Governance of Marine Genetic Resources**
 - Before the treaty, there were no clear global norms on the extraction and commercialisation of MGRs.
 - This led to concerns about biopiracy, where developed nations and private corporations could exploit resources without compensating developing countries.
 - Although the treaty mandates monetary and non-monetary benefit-sharing, it lacks clarity on the mechanisms for calculating and distributing these benefits.



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- **Limited Participation from Major Powers**
 - Despite global support, the treaty faces a setback due to the absence of major maritime powers like the **United States, China, and Russia**, which have yet to ratify it. Their non-participation undermines the treaty's universality and weakens enforcement capacity.
- **Coordination with Existing International Bodies**
 - The treaty must align with existing institutions such as the **International Seabed Authority (ISA)** and **Regional Fisheries Management Organisations (RFMOs)** to prevent jurisdictional overlap.
 - Without coherent coordination, there is a risk of fragmented ocean governance and conflicting mandates.
- **Implementation and Monitoring Mechanisms**
 - Effective implementation will require regular monitoring, dynamic management of MPAs, and transparent data sharing among nations.
 - Developing countries also need technological and financial support to fulfil treaty obligations, particularly in research and enforcement.

Way Forward

- The High Seas Treaty marks a pivotal moment for ocean conservation under international law. Its success will depend on:
 - Finalising operational guidelines for benefit-sharing and environmental assessments.
 - Strengthening institutional cooperation between the BBNJ framework and existing global maritime bodies.
 - Encouraging universal ratification, especially by key maritime nations.
 - Linking ocean governance with broader climate and biodiversity frameworks to enhance global resilience.
 - By ensuring fair access and sustainable use of ocean resources, the treaty can bridge the gap between conservation and development, if backed by a genuine global commitment.
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INDIA'S IT DREAM IS AT A CROSSROADS

- For nearly three decades, India's Information Technology (IT) industry has stood as a **cornerstone of national economic progress** and a symbol of middle-class aspiration.
- Though it **employs only around 1% of the national workforce**, the sector contributes nearly 7% to India's GDP and has propelled millions into stable, global careers.
- **Companies like Infosys, Wipro, and Tata Consultancy Services (TCS) once represented assured success** for young engineers across the country.
- However, **recent large-scale layoffs, including TCS's unprecedented reduction of nearly 20,000 roles** in a single quarter, have **raised pressing questions** about the future of the industry.

Changing Landscape of the Global IT Industry

- **Changing Landscape of the Global IT Industry**
 - The forces transforming India's IT sector are global.
 - Major technology companies in the United States and Europe, such as Amazon and Meta, are also **restructuring and reducing headcount due to advances in automation** and uncertainty in global markets.
 - **The widespread deployment of Artificial Intelligence (AI)**, particularly generative and agentic AI systems, has automated routine functions such as coding, coordination, and reporting, functions that once formed the foundation of India's IT services model.
 - Simultaneously, **stricter U.S. immigration policies and rising visa costs have made it costly for Indian firms to send mid-level staff abroad**, pushing companies to localize talent in major international markets.
- **End of the Traditional Outsourcing Model**
 - India's IT success story was **built on the assembly line approach**: hiring large numbers of engineers, training them in basic coding skills, and deploying them in global projects.



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- This **model offered efficiency and scale**, enabling the country to become the world's back-office powerhouse.
- However, **clients today are seeking more than manpower**, they want sophisticated solutions, faster delivery, and specialized expertise in cloud computing, cybersecurity, and AI-based platforms.
- **As a result, many mid-career professionals, especially those with legacy skills or managerial roles lacking technical depth**, find themselves vulnerable. The market now rewards agility, innovation, and deep technological capability rather than scale alone.

Skill Gaps and Workforce Challenges

- The **transition to AI-driven IT has exposed a broad skill gap** within the workforce.
- Technologies like SAP ECC, once considered indispensable, are increasingly supported by automation tools.
- **Young graduates entering the industry face competition** from both advanced automation and a global talent pool skilled in emerging technologies.
- **The days when mastering Java or .NET guaranteed career growth are gone**; the future belongs to those proficient in machine learning, data engineering, cybersecurity, and product-oriented problem solving.
- This **shift necessitates massive upskilling initiatives and academic reform** to bring engineering education in alignment with industry needs.

Conclusion

- **India's IT sector is transitioning from quantity-focused employment to quality-driven innovation**, from routine service delivery to advanced technology and product development.
 - **India stands at a pivotal juncture**, one where resilience, strategic reform, and continuous learning will determine whether the country retains its global technology leadership.
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ESTIC 2025 - BUILDING A FUTURE-READY INDIA THROUGH RESEARCH, INNOVATION, AND INCLUSIVITY

- Recently, the Indian PM addressed the **Emerging Science, Technology and Innovation Conclave (ESTIC) 2025** conclave at Bharat Mandapam, New Delhi.
- It aims to **shape India's science, technology, and innovation (STI) landscape** to align with the nation's goal of becoming a Viksit Bharat by 2047.
- The event **replaces the Indian Science Congress**, the oldest congregation of scientists in India (which had gone into oblivion, with its last session held in 2023), **marking a significant milestone in India's R&D journey**.

Key Highlights of the Prime Minister's Address:

- **Inspiration and national pride:**
 - **Congratulated India's women's cricket team** on winning the ICC Women's World Cup 2025, calling it an inspiration for millions.
 - **Celebrated the successful launch** of India's heaviest communication satellite (GSAT-7R/CMS-03), reflecting India's growing technological prowess.
- **21st century as the age of innovation:**
 - Described the century as one of "**exponential transformation**", emphasizing the need for global collaboration in emerging technologies.
 - Highlighted that the idea of ESTIC emerged from the need for international cooperation in STI.

Way Forward - Toward a Developed India through STI:

- **Foster collaboration** among government, academia, industry, and startups.
 - **Promote** ethical, inclusive, and sustainable innovation.
 - **Encourage** young scientific talent and enhance global partnerships in frontier technologies.
 - **Strengthen** the link between research, application, and social impact.
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NAGARJUNASAGAR-SRISAILAM TIGER RESERVE (NSTR)



- It is located in the Nallamala hill ranges (an offshoot of the Eastern Ghats) of Andhra Pradesh.
 - It is **one of the largest tiger reserves** in India, spreading over an area of **3,728 sq km**.
 - It hosts the **largest tiger population** in the Eastern Ghat landscape.
 - It is **named after** two major dams in the area, **Nagarjuna Sagar Dam and Srisailem Dam**.
 - Two wildlife sanctuaries, namely **Rajiv Gandhi Wildlife Sanctuary and Gundla Brahmeswaram Wildlife Sanctuary (GBM)**, constitute the NSTR.
 - The **river Krishna traverses through** this reserve for a linear distance of around 270 kilometers.
 - The reserve holds significant importance with **ancient temples** like the **Mallikarjuna Swamy Temple at Srisailem** and several **archaeological sites**, including **Buddhist relics** from the Nagarjuna Konda area.
 - **Topography:** It consists of **plateaus, ridges, gorges, and deep valleys**.
 - **Vegetation:** **Tropical dry deciduous forests** having an undergrowth of **bamboo and grass**.
 - **Flora:** The habitat has several endemics like **Andrographis nallamalayana, Eriolaena lushingtonii, Crotalaria madurensis Var, Dicliptera beddomei, and Premna hamiltonii**.
 - **Fauna:**
 - Top faunal species include **Tiger, Leopard, Wolf, Wild Dog** and Jackal.
 - The prey species are represented by Sambar, Chital, Chowsingha, Chinkara, Mouse Deer, Wild boar, and Porcupine.
 - The **river Krishna has Muggers, Otters and Turtles**.
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