

SUMMARY OF DOWN TO EARTH

[16–30 APRIL, 2025]



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Subjective Questions for Practise

MCQs

Riverbed Mining in India

Context

- Riverbed mining in Uttarakhand, particularly in the Ganga River, has become a contentious issue, raising concerns over environmental, cultural, and economic impacts.

About Riverbed Mining

- It involves the extraction of materials like sand, gravel, and stones from riverbeds, that are essential for construction activities— roads, buildings, and urban infrastructure.

Impacts of Riverbed Mining

- **Erosion and Flood Risks:** Excessive mining weakens riverbanks, increasing the likelihood of floods and soil erosion.
 - The removal of sediments disrupts the natural flow of rivers, leading to unpredictable water levels.
- **Loss of Aquatic Biodiversity:** Riverbed mining threatens species like the Gangetic dolphin, which relies on sediment-rich waters for survival.
 - The destruction of habitats affects fish populations and other aquatic organisms.
- **Water Scarcity and Pollution:** Mining alters groundwater recharge patterns, leading to water shortages in nearby communities.
 - Increased turbidity and sedimentation degrade water quality, making it unsafe for consumption.
- **Groundwater Depletion:** Riverbed mining often lowers the water table by disturbing the aquifers.
 - The **Central Ground Water Board** has flagged unscientific sand mining as a threat to shallow aquifers, crucial for irrigation and drinking water in rural areas.
- **Impact on Communities:** Indigenous communities, especially in tribal belts, suffer land degradation and livelihood loss due to the disruption of river systems and contamination of water sources.

Policy Framework and Legal Developments

- **Sustainable Sand Mining Guidelines, 2016:** MoEFCC introduced these guidelines to regulate sand mining with an emphasis on scientific

assessment, decentralized monitoring, and transparency.

- **Enactment of Sand Mining Rules, 2023:** In response to persistent violations, the central government notified new Sand Mining Rules in 2023. These rules aim to:
 - Encourage real-time monitoring using drones and satellite imaging.
 - Strengthen the **District Survey Report (DSR)** mechanism.
 - Make the entire process digital — from bidding to transportation tracking.

Judicial Interventions

- **National Green Tribunal (NGT) Rulings (2024):** To stop mining activities that violated environmental clearance norms.
- **Supreme Court of India:** It has directed states to complete their **District Survey Reports** scientifically before issuing fresh mining leases. It also urged the use of technology for transparency.

Technological and Community Solutions

- **Digital Surveillance:** Several pilot states are now implementing GPS tracking of mining trucks, drone surveillance, and satellite audits to track and reduce illegal activities.
- **Community-Based Monitoring:** States like Kerala and Maharashtra are experimenting with involving local panchayats and civil society in reporting violations and regulating mining activities.

Policy Recommendations

- Strengthen **DSR Compliance** with involvement from independent scientific institutions.
- Mandate **Third-Party Environmental Audits** for riverbed mining operations.
- Incentivize Alternatives like **manufactured sand (M-sand)** to reduce riverbed dependency.
- **Institutional Capacity Building** for state pollution control boards and district administrations.

Informal Waste Pickers: Neglected Yet Indispensable

Context

- Despite their critical role in recycling and resource recovery, Informal waste pickers remain marginalized, facing social, economic, and occupational challenges.

About the Waste Pickers

- The **First World Conference of Waste Pickers**, held in **Colombia in 2008**, reached a provisional consensus to adopt the term **'waste picker' in English**, replacing the derogatory term 'scavenger'.
- Estimates suggest that the informal waste management sector employs between 12.5 million and 56 million people worldwide.
 - It accounts for nearly 1% of the population, or around 80 million people.

Role of Informal Waste Pickers

- **Resource Recovery:** Informal waste pickers collect and segregate recyclable materials, reducing the burden on landfills and mitigating pollution.
 - Their work contributes significantly to the recycling industry, supporting the circular economy.
- **Cost Reduction:** By recovering valuable materials, waste pickers reduce municipal waste management costs.
 - Their efforts subsidize urban sanitation services, making them an integral part of the waste value chain.
- **Environmental Impact:** Waste pickers play a vital role in reducing greenhouse gas emissions by diverting waste from landfills.
 - They help tackle the growing problem of plastic pollution, particularly in urban areas.

Challenges Faced by Waste Pickers

- **Lack of Recognition:** Waste pickers are often excluded from formal waste management systems, limiting their access to resources and opportunities.
 - Many cities outsource waste management to private companies, sidelining informal workers.
- **Occupational Hazards:** Waste pickers face health risks due to exposure to hazardous materials and unsanitary conditions.
 - They lack access to protective equipment and healthcare services.
- **Economic Vulnerability:** The informal nature of their work leaves waste pickers without job security or stable income.
 - Women, who form a significant portion of this workforce, are particularly vulnerable to exploitation.

Solid Waste Management Rules, 2016

- These were introduced by the MoEF&CC to replace the **earlier Municipal Solid Wastes (Management and Handling) Rules, 2000**.
- These rules aim to improve waste management practices across India, ensuring environmental sustainability and public health.

Key Features of the Rules

- **Applicability:** The rules apply to urban local bodies, census towns, industrial townships, railways, airports, ports, and other notified areas.
 - They cover all types of solid waste, excluding hazardous, biomedical, and e-waste, which are governed by separate rules.
- **Segregation at Source:** Waste generators must segregate waste into biodegradable, non-biodegradable, and domestic hazardous waste.
 - Segregation is mandatory for households, institutions, and commercial establishments.
- **Extended Producer Responsibility (EPR):** Producers of packaging materials are responsible for collecting and managing the waste generated by their products.
- **Decentralized Waste Management:** Local bodies are encouraged to adopt decentralized waste processing technologies, such as composting and bio-methanation.
- **Waste Processing and Disposal:** Emphasis is placed on recycling, composting, and waste-to-energy technologies.
 - Landfilling is restricted to non-recyclable and inert waste.
- **Involvement of Informal Sector:** The rules recognize the role of waste pickers and recyclers, encouraging their integration into formal waste management systems.

Way Forward

- **Integration into Formal Systems:** Cities should develop policies to integrate waste pickers into formal waste management systems without disrupting their autonomy.
 - Initiatives like **Pune's SWaCH Cooperative** and **Ambikapur's SAMCLAF** demonstrate the potential of community-driven approaches.

- **Social and Economic Support:** Providing waste pickers with access to healthcare, education, and financial services can improve their quality of life.
 - Ensuring fair wages and safe working conditions is essential for their empowerment.
- **Awareness and Advocacy:** Public awareness campaigns can highlight the contributions of waste pickers and reduce stigma.
 - Advocacy efforts can push for policy changes that recognize and support their work.

Coral Bleaching

Context

- Scientists in Australia said that an unprecedented mass bleaching event has devastated the **Ningaloo Reef off Australia's western coast**, affecting the reef's surface and deeper layers and multiple coral species.

About

- **Coral reefs**, often referred to as the rainforests of the sea, are among the most biodiverse ecosystems on Earth.
- However, rising ocean temperatures and environmental stressors have triggered widespread coral bleaching, threatening marine life and coastal communities.
- The latest reports indicate that 84% of the world's coral reefs have been affected by bleaching, making it the most severe event in recorded history.

What is Coral Bleaching?

- It occurs when corals experience prolonged heat stress, causing them to expel the **zooxanthellae algae** that provide them with food and color.
- Without these algae, corals turn ghostly white and become vulnerable to disease and death.

Causes of Coral Bleaching

- **Climate Change:** Rising ocean temperatures due to greenhouse gas emissions.
- **Pollution:** Agricultural runoff and industrial waste degrade water quality.
- **Overfishing:** Disrupts marine ecosystems, making corals more susceptible to stress.

Impact on Marine Life

- Coral reefs support 25% of all marine species, including fish, mollusks, and crustaceans.
- Bleaching events disrupt food chains, leading to biodiversity loss.

Scale of the Crisis

- According to the **International Coral Reef Initiative**, the ongoing bleaching event has surpassed previous records, affecting reefs across the Pacific, Atlantic, and Indian Oceans.
- The Great Barrier Reef has suffered multiple bleaching events, with 44% coral loss in some areas.
- NOAA reports that 99.9% of coral reef areas in the Atlantic Ocean have experienced bleaching-level heat stress.

Myanmar Earthquake: Sagaing Fault

Context

- The **Sagaing fault in Myanmar**, responsible for the recent **Mandalay earthquake (magnitude 7.7)**, serves as a stark reminder of the destructive power of seismic activity.

About the Sagaing Fault

- The Sagaing fault, a **strike-slip fault system**, runs along the **tectonic boundary** between the Central Myanmar Lowlands and the Indo-Burman Range.
- It is influenced by the oblique convergence between the Indian and Eurasian plates.
- This convergence partitions strain into **perpendicular and parallel components**, with the fault absorbing much of the lateral movement.
- It runs 1,400 km from the Andaman Sea to the eastern Himalayan bend classified as a ridge-trench transform fault.
- Horizontal strike-slip motion dominates its activity, accommodating 50–55% of the region's plate motion.

Historical Earthquakes

- **1839:** Ava Earthquake
- **1927:** Yangon Earthquake
- **1946:** Sagaing Earthquake (Mandalay)

Geodynamic Context of the Sagaing Fault

- **Tectonic Boundary and Plate Movements:** The Sagaing fault forms the tectonic boundary between the Central Myanmar Lowlands and the Indo-Burman Range.
 - Oblique convergence of the Indian and Eurasian plates, rather than direct head-on collision, results in strain partitioning across the fault.
- The **Burma plate (or Burma sliver)**, a micro-tectonic block between the Indian plate and Sagaing fault, owes its origin to this strain partitioning.

South Asia's Seismic Vulnerability

- **Major Plate Boundaries:** The Himalayas, Shillong Plateau, Southern Indo-Burman Range, and Andaman-Nicobar subduction zone are active tectonic features resulting from the collision of the Indian and Eurasian Plates over 40 million years ago.
- **Ongoing Threats:** The Chittagong-Tripura fold belt remains active with moderate earthquakes, though its potential for generating great quakes is still unclear.

India's Vulnerability: Learning from Myanmar's Tragedy

- India's proximity to major tectonic features such as the **Himalayas, Indo-Burman Range, and Andaman-Nicobar subduction zone** places it among the most earthquake-prone countries in South Asia.
- **Risk Assessment:** Historical earthquakes in regions like **Kashmir, Assam, and Gujarat** underline the need for proactive measures.
 - Seismic zones in northeastern and northern India could experience similar devastation due to active fault lines and plate interactions.

Trump's Reciprocal Tariffs

Context

- Recently, US President Donald Trump unveiled his '**reciprocal tariffs**' policy, describing it as a '**declaration of economic independence**' and as a part of broader '**America First**' trade agenda.

About the Reciprocal Tariffs Policy

- **Key Features:** The tariffs aim to match or exceed the duties imposed by other countries on US goods.
 - India faces a 26% reciprocal tariff, resulting in an overall tariff burden of 36% on its exports to the US.
 - South Asian neighbors like Sri Lanka, Bangladesh, and Pakistan face even higher tariffs, with Sri Lanka's overall burden reaching 54%.
- **Additional Tariffs:** An ad valorem duty of 10% was imposed on imports from all trading partners.
 - Steel and aluminum imports from all countries face 25% tariffs, as announced earlier in March 2025.
- **Exemptions:** Trump spared Mexico and Canada from reciprocal tariffs, despite imposing additional import duties on their goods earlier.

Implications for the Global Economy

- **Economic Uncertainty:** The tariffs have disrupted global supply chains, affecting industries ranging from manufacturing to agriculture.
 - Stock markets worldwide have experienced significant volatility, reflecting fears of prolonged economic instability.
- **Impact on Trade Relations:** The policy risks triggering a global trade war, with countries like China and the EU announcing retaliatory tariffs.
 - India's agricultural sector, in particular, faces challenges as the US seeks to open its markets for American agri-businesses.
- **Historical Parallels:** Trump's tariffs echo the **Smoot-Hawley Tariff Act of 1930**, which deepened the economic crisis during the Great Depression and led to retaliatory measures by other nations.

Double Heatwave

Context

- Recently, the India Meteorological Department (IMD) warned of a '**double heatwave**' in the northwestern region during the summer, forecasting 10 to 12 heatwave days, **nearly double the usual five to six days**.
- IMD highlighted the potential for above-normal maximum and minimum temperatures across most

of India, except for some southern and northeastern regions.

About Heatwave

- It is a prolonged period of excessively high temperatures, often accompanied by dry conditions, which can have severe impacts on human health, agriculture, and infrastructure.
- According to the IMD, heatwaves in India are declared when temperatures exceed 40°C in plains and 30°C in hilly regions, with deviations of 4.5°C to 6.4°C above normal.

Heatwave Criteria in India (IMD)

- **Departure from Normal Temperature:**
 - **Heatwave:** When the temperature is 4.5°C to 6.4°C above normal.
 - **Severe Heatwave:** When the temperature exceeds 6.4°C above normal.
- **Absolute Maximum Temperature:**
 - **Heatwave:** When the actual maximum temperature reaches 45°C or more.
 - **Severe Heatwave:** When the temperature exceeds 47°C.
- For coastal regions, a heatwave is declared when the temperature is 37°C or more, with a departure of 4.5°C or higher.

Double Heatwave

- A double heatwave refers to an extended period of extreme heat, where the number of heatwave days significantly exceeds the seasonal average. It is driven by:
 - **Climate Change:** Rising global temperatures contribute to prolonged heatwave conditions.
 - **High-Pressure Systems:** Persistent atmospheric pressure traps heat, preventing cooling.
 - **Urban Heat Islands:** Cities experience intensified heat due to concrete structures and reduced vegetation.

IMD's Heatwave Forecast for 2025

- According to the IMD's Seasonal Heat Outlook, most of India will experience above-normal maximum and minimum temperatures from March to May 2025.
- **Northwest India:** Expected to endure twice the usual number of heatwave days.

- **Delhi and Neighboring Regions:** Temperatures projected to rise by 1-2°C above normal.
- **Temporary Relief:** Northwesterly winds from Rajasthan may bring a 3-4°C drop in temperatures for a short period.

Impact of the Double Heatwave

- **Public Health Risks:**
 - Increased cases of heatstroke, dehydration, and respiratory illnesses.
 - Vulnerable populations, including the elderly and outdoor workers, face heightened risks.
- **Agricultural Challenges:**
 - Extreme heat can reduce crop yields, affecting food security.
 - Water scarcity may worsen, impacting irrigation and livestock.
- **Infrastructure Strain:**
 - Power grids may experience higher electricity demand, leading to outages.
 - Roads and railways could suffer heat-induced damage, affecting transportation.

Mitigation Strategies

- **Government Initiatives:**
 - IMD provides daily heatwave bulletins, extended forecasts, and impact-based warnings to help authorities and citizens prepare for extreme heat conditions.
 - Cities are encouraged to implement cooling shelters and water distribution points.
 - **Heat Index (Experimental):** Measures the combined effect of temperature and humidity.
 - **Interactive Maps:** Show real-time temperature trends and heatwave forecasts.
 - **NDMA Guidelines:** Offer preventive measures to mitigate heatwave impacts.
- **Community Awareness:**
 - Public campaigns promote hydration, avoiding outdoor activities, and wearing light clothing.
 - Schools and workplaces may adjust schedules to reduce heat exposure.
- **Long-Term Solutions:**
 - Expanding green spaces and urban cooling strategies can mitigate heat effects.
 - Investing in renewable energy reduces reliance on heat-sensitive power grids.

Glacier Loss in Hindu Kush Himalayas: United Nations (UN)

Context

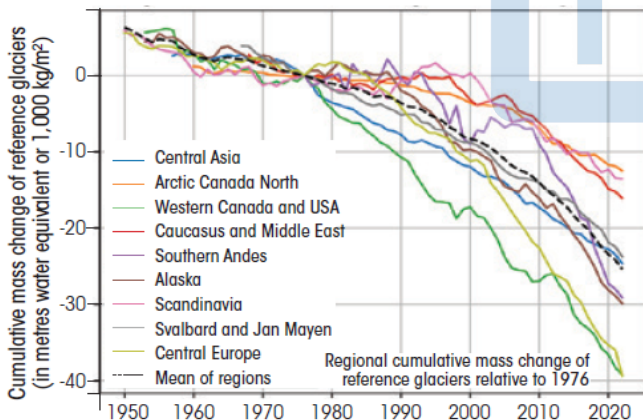
- According to a recent '**UN World Water Development Report 2025**', released on **World Glacier Day**, glaciers in the **Hindu Kush Himalayas (HKH)** are retreating 65% faster than they did a decade ago.

About the Hindu Kush Himalayas

- The 'Third Pole':** Spanning 3,500 kilometers across eight countries, the HKH region is often referred to as the 'Third Pole' due to its vast ice reserves.
 - It supports 240 million people directly and provides water to 1.65 billion people downstream through ten major river basins.
- Projected Glacier Loss:** If global temperatures rise by 1.5°C to 2°C, the region could lose 30–50% of its glacier volume by 2100.
 - Warming beyond 2°C could result in a 45% loss of glacier volume, threatening water availability for millions.

Rapid decline

Most of the world's glaciers are melting at an accelerated rate



Source: "UN World Water Development Report 2025"

Global Glacier Loss

- Worldwide Trends:** Glaciers globally are projected to lose 26–41% of their total mass by 2100, even under moderate warming scenarios.
 - The world has already lost 273 billion tonnes of ice annually since 2000, equivalent to the water intake of the global population for 30 years.

- Impact on Livelihoods:** Mountain communities, including those in the HKH, face increased risks of landslides, flash floods, and **Glacial Lake Outburst Floods (GLOFs)**.

- The retreat of glaciers disrupts hydrological systems, affecting agriculture, hydropower, and drinking water supplies.

Call to Action

- The UN report underscores the urgent need for global action to mitigate climate change and protect vulnerable glacier systems. It calls for:
 - Reducing greenhouse gas emissions to limit global warming.
 - Strengthening disaster preparedness in glacier-dependent regions.
 - Promoting sustainable water management to adapt to changing hydrological patterns.

AI Revolution and Its Societal Impact

Context

- Artificial Intelligence (AI) has become an integral part of modern life, transforming industries and reshaping societal norms.
- From graphic design to IT, AI's ability to perform cognitive tasks like reasoning, learning, and problem-solving has sparked both excitement and anxiety.

AI's Penetration Across Industries

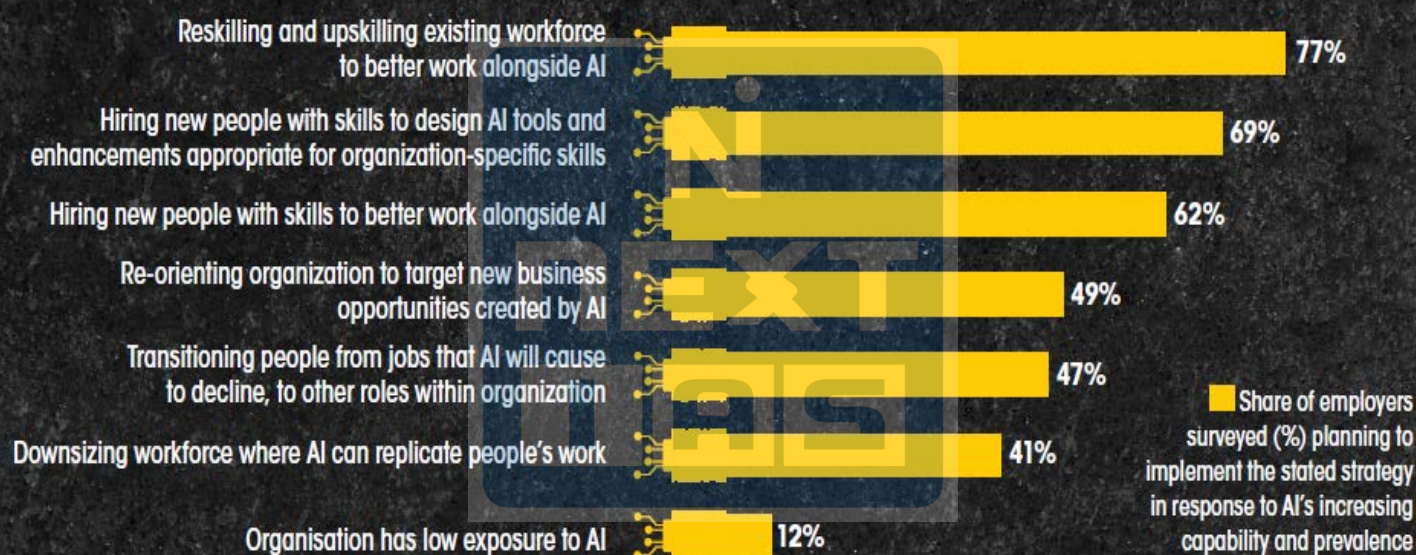
- Key Trends:**
 - From Ghibli art to search engines to weapon systems, the technology's penetration is nearly complete.
 - Trends show that organisations are rewiring to cope with the new reality.
 - Governments are using private players to gain AI supremacy, while allowing them a greater say in public policy.
 - India has entered the race late, but plans to develop its own model this year.
- According to the **World Economic Forum (WEF)**, two-fifths of the workers' existing skill sets will be transformed or become outdated over the 2025-2030 period.

- According to the **UN Conference on Trade and Development's (UNCTAD's) 'Technology and Innovation Report 2025'**, workers displaced from AI-impacted sectors may find jobs in other sectors with lower productivity, resulting in widening income inequality.
- **Graphic Design and IT:** AI tools now enable novices to create designs and write code, reducing the need for specialized professionals.

- It has led to job redundancies in sectors like graphic design and IT, where AI can produce first drafts or even finished products.
- **Generative AI Tools:** The launch of tools like ChatGPT, Microsoft Copilot, and Google Gemini has revolutionized content creation, programming, and customer service.
 - These tools can write stories, develop apps, and hold conversations in multiple languages, showcasing the endless possibilities of generative AI.

New-age workforce

Trends suggest a sharp spike in the demand for people with AI skills



Source: World Economic Forum, Future of Jobs Survey 2024

Challenges Posed by AI

- **Job Displacement:** Employees across sectors are anxious about the disruption caused by AI, which could replace roles in customer care, dispute resolution, and more.
- **Environmental Concerns:** AI's reliance on large data centers contributes to a significant carbon footprint, raising questions about sustainability.
 - Efforts to offset AI's environmental toll require widespread awareness and initiatives to use technology responsibly.

- **Legal and Ethical Issues:** Governments are grappling with the societal and legal challenges posed by AI, including its influence on public policy.

Related Key Terms

- **Algorithm:** A set of instructions used to perform tasks, such as calculations and data analysis, usually using a computer or another smart device.
- **Artificial Intelligence (AI):** AI, AI systems or AI technologies are products and services that are 'adaptable' and 'autonomous'.
 - The adaptability of AI refers to AI systems, after being trained, often developing the ability to perform new ways of finding patterns and

connections in data that are not directly envisioned by their human programmers.

- The autonomy of AI refers to some AI systems that can make decisions without the intent or ongoing control of a human.
- **AI Agents:** These are software systems that use AI to pursue goals and complete tasks on behalf of users.
 - They show reasoning, planning and memory and have a level of autonomy to make decisions, learn and adapt.
 - They can work with other agents to perform more complex workflows.
 - Example: China's Manus AI, OpenAI's Operator.
- **AI Assistant:** It is a software application that uses AI to perform tasks. It uses natural language processing and machine learning to understand requests and provide responses.
 - Unlike AI agents, which are proactive and work autonomously to achieve a specific goal by any means at their disposal, AI assistants perform tasks at request.
 - Example: Amazon's Alexa, Microsoft's Cortana, Apple's Siri.
- **Artificial General intelligence:** Also referred to as strong AI or broad AI, the terms refer to a theoretical form of AI that can achieve human-level or higher performance in most cognitive tasks.
- **AI Model:** It is a programme that has been trained on a set of data to recognise certain patterns or make decisions without further human interventions. Example: OpenAI's GPT.
- **Artificial Neural Network:** A computer structure inspired by the biological brain, consisting of a large set of interconnected computational units ('neurons').
 - Example: Google's search algorithm.
- **Chatbot:** It is a computer programme that simulates conversations with humans. Not all chatbots are equipped for that.
 - Chatbots with generative AI understand common language and complex queries and use empathy when answering questions.
 - Example: Microsoft's Copilot, X's Grok, OpenAI's ChatGPT.
- **Deep Learning:** A subset of machine learning that uses artificial neural networks to recognise patterns in data and provide a suitable output, for example, a prediction.
 - Deep learning is suitable for complex learning tasks such as voice and image recognition,

object detection and autonomous driving.

- **Deepfakes:** Pictures and video that are deliberately altered to generate misinformation and disinformation.
- **Foundational Models:** A machine learning model trained on a vast amount of data so that it can easily be adapted for a wide range of tasks, including being able to generate outputs (generative AI).
 - Example: Anthropic's Claude, OpenAI's GPT series.
- **Generative AI:** An AI model that generates text, images, audio, or video in response to user prompts.
 - It uses machine learning techniques to create new data that has similar characteristics to the data it was trained on.
 - Example: Amazon Q, ChatGPT.
- **General Purpose AI:** AI models that can be adapted to a wide range of applications (such as Foundation Models).
- **Large Language Models (LLM):** A type of foundation model, trained on vast amounts of text to carry out natural language processing tasks.
 - In training phases, LLMs learn parameters from factors such as the model size and training datasets.
 - Example: Google's Gemini, Meta's Llama, Anthropic's Claude.
- **Large Multimodal Models (LMMs):** Large Language Models (LLM): further evolve into LMMs capable of processing text, images, audio and video inputs. Example: OpenAI's Sora, Google's Gemini.
- **Machine Learning:** A type of AI that allows a system to learn and improve from examples without all its instructions being explicitly programmed.
 - Machine learning systems learn by finding patterns in training datasets.
- **Natural Language Processing:** It focuses on programming computer systems to understand and generate human speech and text.
 - Algorithms look for linguistic patterns in how sentences and paragraphs are constructed to create meaning.
- **Open Source:** It often means the underlying code used to run AI models is freely available for testing, scrutiny and improvement. Example: China's DeepSeek, Meta's Llama.

- **Reinforcement Learning:** It is a method in AI training where models learn optimal decision-making strategies through cycles of actions and feedback, with human interaction playing a pivotal role in refining the learning process.
- **Transformers:** A transformer can read vast amounts of text, spot patterns in how words and phrases relate to each other, and make predictions about what word should come next.
 - Transformers have greatly improved natural language processing, computer vision, robotic capabilities and the ability of AI models to generate text.
 - Example: OpenAI's Chat GPT.
- **Bias:** In AI models, Bias refers to output errors caused by skewed training data.
- **Hallucinations:** Large Language Models (LLM), such as ChatGPT, are unable to identify if the phrases they generate make sense or are accurate.
 - It can lead to inaccurate results, also known as 'hallucination' effects, where LLMs generate plausible sounding but inaccurate text.

Globalised Food System: Disrupted by Tariffs

Context

- The interconnectedness of the world's food system faces disruption as nations impose tariffs, threatening the delicate balance of supply and demand.

About

- The world's food system is highly globalised, with more than 20% of food produced globally being traded across borders.
- From fruits to seafood, our daily food basket often includes items sourced from multiple countries.
- According to the UN FAO, global food trade was valued at \$2 trillion, a fourfold increase since 2000.

Role of Globalisation in Food Trade

- **A Multinational Food Basket:** By 2050, half of the world's population is expected to consume calories produced outside their own countries.
 - The WTO facilitated this globalisation by promoting free trade and fair tariffs.

- **Geography-Specific Commodities:** Countries export foods they are naturally suited to grow, while importing items to meet domestic demand.
 - It ensures year-round availability of diverse food products at affordable prices.

US and the Globalised Food System

- **A Food Importer:** Despite being the world's largest economy, the US imports 20% of its food supply and faces a \$42 billion agricultural trade deficit in 2025.
 - For decades, the US maintained an agricultural trade balance, but rising consumption of imported produce has shifted this dynamic.
- **Impact of Tariffs:** Recently, the US President announced tariffs on all nations trading with the US, aiming to make America self-sufficient.
 - These tariffs, including a 21% levy on cocoa from Côte d'Ivoire, will increase costs for American consumers and reduce imports of essential goods.

Case Study: Cote d'Ivoire's Cocoa Exports

- **A Cocoa Powerhouse:** Côte d'Ivoire produces two-thirds of the world's cocoa, with 4.7 million hectares under cultivation.
 - The US, with less than 1,500 hectares suitable for cocoa farming, relies heavily on imports from Cote d'Ivoire.
- **Tariff Impact:** The 21% tariff on cocoa will either reduce imports or force American consumers to pay higher prices.
 - It highlights the vulnerability of the US within the globalised food system.

AI's Environmental Footprint

Context

- In an era where Artificial Intelligence (AI) is hailed as a transformative force capable of solving critical challenges, its own environmental impact is coming under scrutiny.

AI's Dual Role in Sustainability

- **Optimizing Energy Grids:** AI is revolutionizing energy management by integrating renewable sources and optimizing resource use, as highlighted by World Economic Forum (WEF).

- Its applications in energy efficiency could reduce environmental harm.
- **Environmental Costs of AI:** Large-scale AI models, such as ChatGPT, rely on energy-intensive generative pre-trained transformer (GPT) models.
 - These models consume vast amounts of power throughout their lifecycle, spanning planning, development, training, deployment, and maintenance.

Data Centre Challenge

- **Electricity Consumption:** Data centres, the backbone of AI infrastructure, consumed 460 terawatt-hours (TWh) of electricity in 2022, accounting for 2% of global demand and 1% of CO2 emissions.
 - By 2026, electricity consumption could exceed 1,000 TWh, matching Japan's total demand, according to the IEA.
- **Limited Transparency:** Assessing AI's environmental cost is challenging due to opaque reporting of emissions by tech firms.
 - Emissions from AI lifecycle stages—such as server manufacturing—are often excluded from official data.

AI's Water Footprint

- **Water for Cooling Systems:** Data centres rely on water-intensive cooling systems to maintain optimal temperatures.
 - In 2023, Google withdrew 29 billion litres of water for its data centres, of which 23 billion litres were consumed on-site.
 - Meta's data centres used over 5.2 billion litres, marking a 50% increase since 2019, as per its sustainability report.
- **Water-Stressed Locations:** According to Planet Tracker, 41% of data centres are located in areas facing extreme water stress, with another 22% in highly stressed zones.
 - Countries like Indonesia, India, and Russia are particularly affected.

Misrepresentation of AI's Water Impact

- OpenAI's Sam Altman dismissed concerns about AI's water use, comparing it to a hamburger's lifecycle footprint.

- Experts like Shaolei Ren refute this, pointing out that AI's reported water use excludes significant processes such as rare earth metal mining for AI chips.

Initiatives:

- The International Energy Agency (IEA) has announced the creation of an Observatory on Energy, AI, and Data Centres.
 - It aims to compile global data on AI's electricity demand and track its applications in the energy sector.
- While the potential of AI to enhance efficiency is undeniable, its significant energy and water consumption reveal troubling contradictions.

Rework The Economics

Context

- India cannot afford an economy driven solely by GDP growth without considering the **Gross Nature Product (GNP)** — a measure that values natural resources and their role in livelihoods.

Case for Reworking Economics

- **Climate Change and Development:** India is highly vulnerable to the impacts of climate change, including extreme weather events and rising temperatures.
 - A development model that prioritizes green livelihoods and reduces local pollution can simultaneously address climate change and improve public health.
- **Avoiding the Western Model:** The Western approach of polluting first and cleaning up later is not financially viable for India.
 - India must adopt policies that integrate sustainability into development, avoiding the pitfalls of resource-intensive growth.
- **Redesigning Mobility:** Personal vehicles, even electric ones, contribute to congestion and pollution.
 - India has the opportunity to rethink mobility by focusing on public transportation and moving people, not cars.

Policy Recommendations

- **Invest in Natural Resources:** Policies should prioritize the sustainable use of natural resources to support livelihoods and reduce environmental degradation.
- **Promote Green Livelihoods:** Initiatives that create jobs in renewable energy, sustainable agriculture, and waste management can drive inclusive growth.
- **Integrate Climate Action with Development:** India's Nationally Determined Contributions (NDCs) should focus on co-benefits, ensuring that climate action supports development goals.

Putting Public Health Before Patent Rights

Context

- A recent ruling by the Delhi High Court emphasised the need to prioritize public health over patent rights in cases involving exorbitantly priced drugs.

About Risdiplam

- **Risdiplam**, a drug used to treat **Spinal Muscular Atrophy (SMA)**, a rare genetic disorder requiring lifelong treatment, with **no cure currently available**.
- **Risdiplam**, sold under the brand name **Evrysdi**, costs approximately ₹6 lakh per bottle, making it unaffordable for most patients.
- For a patient weighing over 20 kg, the annual cost of treatment exceeds ₹1.8 crore, creating a significant barrier to access.

High Court's Ruling

- **Public Health as a Priority:** Justice Mini Pushkarna dismissed a plea for an injunction, citing the predicament of SMA patients who cannot afford the drug.
 - It emphasized that public health considerations outweigh the financial interests of pharmaceutical companies in such cases.
- The court noted that the **Patient Assistance Program (PAP)** is often limited in scope and fails to meet the needs of the broader patient population.

Broader Implications

- **Access to Affordable Medicines:** The ruling underscores the importance of generic drugs in making life-saving treatments accessible to all.

- It sets a precedent for balancing patent rights with the right to health, particularly in cases involving rare diseases.
- **Challenges for Big Pharma:** While patents incentivize innovation, they often lead to monopolies that drive up drug prices.
 - The case highlights the need for a more equitable approach to intellectual property rights in the pharmaceutical sector.

Legal Aid for Protecting Elderly Rights: Kerala

Context

- Recently, the Kerala State Assembly passed the **Kerala State Elderly Commission Bill, 2025**, aimed at addressing the challenges faced by the growing elderly population.
 - It paves the way for the establishment of India's first Elderly Commission.

Need for an Elderly Commission

- **Rapidly Ageing Population:** Kerala's elderly population has grown significantly, constituting 12.6% of the state's population in 2025 and projected to reach 25% by 2030.
 - The feminization of aging, with more women living longer than men, has led to increased instances of widowed women facing financial insecurity.
- **Challenges Faced by Senior Citizens:** Many elderly individuals live in isolation due to the emigration of younger family members.
 - Issues such as declining health, loneliness, and financial instability are prevalent, necessitating immediate attention.

Key Features of the Elderly Commission

- **Legal Aid and Rights Protection:** The commission will provide legal assistance to senior citizens, addressing issues such as exploitation, abuse, and neglect.
 - It aims to uphold the dignity and rights of the elderly, ensuring their inclusion in society.
- **Inclusivity and Representation:** The commission will include at least one member from the SCs or STs and one woman member, reflecting the diverse needs of the elderly population.

- **Skill Bank for Seniors:** The commission plans to create a skill bank, enabling elderly individuals to showcase their talents and engage in gainful employment.
 - It seeks to harness the capabilities of healthier seniors for collective benefit.

Impact and Vision

- **Rehabilitation and Social Inclusion:** Providing support to the aged and infirm while promoting active participation in society.
- **Economic Empowerment:** Offering opportunities for seniors to contribute to the workforce and improve their financial independence.
- **Community Engagement:** Encouraging intergenerational solidarity and fostering a compassionate society.

India's Growing Market for Weight-Loss Drugs Amid Obesity Epidemic

Context

- India is witnessing a surge in demand for weight-loss drugs, driven by an alarming rise in obesity rates.

About

- According to a study published in 'The Lancet', nearly **one-third of India's population** is projected to be **obese by 2050**.
- Even conservative estimates from the National Family Health Survey (2019-21) reveal that 24% of women and 23% of men are overweight or obese.
- It has created a lucrative market for pharmaceutical companies offering solutions for diabetes and weight management.

Pharmaceutical Firms Enter the Market

- **Eli Lilly and Novo Nordisk:** Two major players, **US-based Eli Lilly** and Company and Danish drugmaker **Novo Nordisk**, are competing to roll out their blockbuster drugs in India.
 - These drugs address both diabetes and obesity, catering to the dual health challenges faced by many Indians.

- **Approval of Tirzepatide:** Recently, the Central Drugs Standard Control Organisation (CDSCO) approved Eli Lilly's drug Tirzepatide for Type 2 diabetes and weight management.

Bioluminescent Backwaters

Context

- Recently, the **bioluminescent backwaters** have appeared in Kochi (locally known as **Kavaru**).

Science Behind Kavaru (Bioluminescent Backwaters in Kochi)

- Bioluminescent Backwaters is a natural phenomenon, caused by microscopic organisms like Noctiluca Scintillans.
- Bioluminescence occurs when certain organisms **convert chemical energy into light**, producing a glow that is often blue but can appear red or brown depending on the species involved.
- In Kochi's backwaters, this phenomenon is triggered by **eutrophication** — an excess of nutrients like nitrates and phosphates in the water, often resulting from industrial waste, sewage, and agricultural runoff.
 - It threatens marine life, local livelihoods, and the sustainability of the region's ecosystems.

Ecological Concerns

- **Harmful Algal Blooms (HABs):** The bioluminescent blooms are often associated with HABs, which release toxins harmful to fish and shellfish.
 - These toxins disrupt marine ecosystems, leading to **hypoxia (oxygen depletion)** and biodiversity loss.
- **Impact on Fisheries:** Local fishers report declining catches due to the toxic effects of the blooms on aquatic life.
 - Contaminated seafood poses health risks, affecting both local consumption and export markets.
- **Water Quality Degradation:** Increased turbidity and sedimentation from the blooms compromise water quality, making it unsafe for human use.

Building the Largest Dam on Brahmaputra's Great Bend in China

Context

- China's bid to build the world's largest hydropower project on the Brahmaputra poses grave risks to the environment.

Project Overview

- **Scale and Purpose:** The dam is part of China's efforts to achieve carbon neutrality by 2060 through renewable energy sources.
 - It is expected to generate 60 gigawatts of electricity, surpassing the capacity of the Three Gorges Dam.
- **Location:** Situated on the Great Bend of the Brahmaputra River, the dam exploits the river's steep descent, ideal for hydropower generation.
 - The proximity to India's northeastern border has heightened geopolitical concerns.

Environmental Concerns

- **Impact on Ecosystems:** The dam threatens the fragile Himalayan ecosystem, home to diverse flora and fauna.
 - Altered water flow could disrupt aquatic habitats and biodiversity downstream.
- **Risk of Natural Disasters:** The region is prone to earthquakes and landslides, raising concerns about the dam's structural safety.
 - A catastrophic failure could have devastating consequences for downstream communities.

Delhi EV Policy 2.0

Context

- The Delhi government has unveiled its ambitious **Electric Vehicle (EV) Policy 2.0**, building on the success of its earlier initiative to promote sustainable and eco-friendly transportation.

Key Features of Delhi EV Policy 2.0

- **Increased EV Adoption Targets:** The policy sets a target of achieving 95% EV penetration in new vehicle registrations by 2027.
 - It emphasizes the adoption of EVs across all categories, including two-wheelers, three-wheelers, and commercial vehicles.
- **Subsidies and Incentives:** Women EV buyers are proposed to receive a subsidy of up to ₹36,000 to encourage adoption.

- Additional incentives are provided for fleet operators and businesses transitioning to EVs.

- **Charging Infrastructure Expansion:** The policy focuses on setting up battery collection units and expanding the network of public charging stations.
 - It aims to ensure that EV users have access to charging facilities within a 3 km radius across the city.
- **Job Creation:** The implementation of EV Policy 2.0 is expected to generate over 20,000 jobs, particularly in the manufacturing, maintenance, and charging infrastructure sectors.

Environmental and Economic Impact

- **Reduction in Emissions:** By promoting EVs, the policy aims to significantly reduce vehicular pollution, a major contributor to Delhi's air quality issues.
- **Boost to Green Economy:** The policy supports the growth of the EV ecosystem, including battery manufacturing and recycling industries.
 - It aligns with India's broader goals of achieving net-zero carbon emissions by 2070.

Challenges and Way Forward

- **Infrastructure Development:** Ensuring the availability of adequate charging stations and battery-swapping facilities remains a critical challenge.
- **Affordability and Awareness:** While subsidies help, the high upfront cost of EVs may deter some buyers.
 - Awareness campaigns can address misconceptions and promote adoption.
- **Sustained Policy Support:** Continuous monitoring and updates to the policy will be essential to address emerging challenges and maintain momentum.

Indian Softshell Turtles (Nilssonia Gangetica)

Context

- Due to indiscriminate dumping of garbage, discharge of industrial effluents and excessive sand mining in Chambal river impact the Indian softshell turtles (Nilssonia Gangetica).

- The Chambal is home to various turtle species, 80% of the country's gharials, smooth-coated otters, dolphins and over 290 species of migratory and resident birds.

About the Indian Softshell Turtles aka Ganges Softshell Turtle (*Nilssonina Gangetica*)

- It is a freshwater species native to South Asia. It is found in rivers like the Ganges, Brahmaputra, and Indus.
- These turtles feed on fish, amphibians, carrion, and aquatic plants, contributing to the health of river ecosystems.
 - Their scavenging behavior helps control pollution in water bodies.
- They are sensitive to environmental changes, their presence reflects the health of aquatic habitats.

Threats

- **Habitat Loss:** Riverbed mining and dam construction disrupt their natural habitats.
- **Pollution:** Industrial waste and agricultural runoff degrade water quality.
- **Exploitation:** The turtles are hunted for their meat and calipee, primarily for export to East Asia.

Conservation Status

- **IUCN Red List:** Endangered
- **Wildlife Protection Act, 1972:** Schedule I

Conservation Efforts

- **Turtle Sanctuaries:** Initiatives like the **Ganga Action Plan** have established turtle breeding facilities to restore populations.
- **Community Engagement:** Local communities are being involved in conservation programs to reduce exploitation and promote sustainable practices.

Discovery of Six New Species Under Antarctic Seafloor

Context

- Recently, scientists confirmed the discovery of **six new species** thriving under the **Antarctic seafloor** in the **Bellingshausen Sea**.
- This groundbreaking revelation followed the break-off of an iceberg from the **George VI Ice Shelf**, part of the Antarctic Peninsula ice sheet.

Key Findings

- **Large Corals and Sponges:** These structures serve as habitats for diverse marine life.
- **Icefish:** Unique species adapted to the frigid waters.
- **Giant Sea Spiders:** Magnificent arthropods thriving in the extreme cold.
- **Octopus:** Resilient mollusks contributing to the intricate food web.

Significance of the Discovery

- **Biodiversity Insights:** The six new species highlight the adaptability of life in extreme environments.
 - This discovery sheds light on previously unknown ecological processes and interactions.
- **Impact of Iceberg Break-offs:** Iceberg calving events often expose untouched areas, allowing scientists to study ecosystems shielded by layers of ice for centuries. Conservation Implications.
- **Understanding Antarctic biodiversity:** It is crucial for global conservation efforts, particularly as climate change accelerates ice shelf melt and threatens delicate ecosystems.

Commission on Genetic Resources for Food and Agriculture (CGRFA 20)

Context

- Recently, the global leaders convened in Rome for the 20th Regular Session of the Commission on Genetic Resources for Food and Agriculture (CGRFA 20).

Key Discussions and Outcomes

- **Biodiversity Conservation:** Delegates reviewed progress on conserving plant, animal, aquatic, and forest genetic resources.
 - Discussions extended to microorganisms and invertebrates, emphasizing their role in sustainable agriculture and food systems.
- **Access and Benefit-Sharing:** The session addressed decisions from the **COP16** under the **Convention on Biological Diversity (CBD)**, focusing on equitable

access to genetic resources and benefit-sharing mechanisms.

- **Recognition of Indigenous Contributions:** The role of indigenous peoples and local communities in biodiversity conservation was widely acknowledged, highlighting their traditional knowledge and sustainable practices.

FAO Reports

- **The Second Report on the State of the World's Forest Genetic Resources:** Highlighted a global tree seed shortage, with many countries struggling to meet reforestation targets due to a lack of high-quality seeds.
- **The Third Report on the State of the World's Plant Genetic Resources for Food and Agriculture:** Revealed that 60% of global crop production relies on just nine crops, with 6% diversity in farmers' varieties and landraces under threat globally.

Challenges and Implications

- **Threats to Genetic Diversity:** Over-reliance on a limited number of crops and tree species increases vulnerability to climate change, pests, and diseases.
 - The loss of genetic diversity poses significant risks to global food security and ecosystem resilience.
- **Reforestation and Climate Goals:** The tree seed shortage could hinder global efforts to combat deforestation and achieve climate targets.
 - Strengthening seed banks and promoting sustainable forestry practices are critical to addressing this challenge.
- **Data and Capacity Gaps:** Delegates noted difficulties in collecting and managing high-quality data on genetic resources, emphasizing the need for capacity-building and infrastructure development.

Way Forward

- **Global Collaboration:** Strengthening international cooperation is essential to conserve genetic resources and ensure equitable access and benefit-sharing.
- **Policy Implementation:** Countries must align their national policies with global frameworks, such as the Kunming-Montreal Global Biodiversity Framework, to achieve sustainable outcomes.

- **Support for Indigenous Communities:** Recognizing and integrating indigenous knowledge into conservation strategies can enhance biodiversity preservation efforts.

Bt Cotton Seed

Context

- The recent decision by the Union Ministry of Agriculture and Farmers Welfare to increase the price of **Bt Cotton Seeds (Bollgard II-BG-II)** has sparked widespread debate among experts and farmers.

About the Bt Cotton Seeds

- These are **genetically modified seeds** introduced in India in 2002 to combat the American bollworm, a major pest affecting cotton crops.
- These were developed using **Bacillus Thuringiensis (Bt)**, a soil bacterium, these seeds produce a protein toxic to specific pests, reducing the need for chemical pesticides.
- Bt cotton is India's first genetically modified crop and is widely cultivated, covering 96% of cotton farms in the country.

Price Hike and Its Implications

- **Details of the Price Increase:** The price of a 475-gram packet of BG-II seeds has been set at ₹901, up by ₹37 from the previous year.
 - Farmers typically prefer BG-II seeds for their pest resistance, but the rising costs are adding to their financial burden.
- **Impact on Farmers:** The price hike comes at a time when cotton yields have dropped from 510.82 kg/ha in 2014-15 to 436.99 kg/ha in 2024-25.
 - Farmers are also grappling with increased pesticide usage and higher cultivation costs due to recurring pest attacks.

Challenges with Bt Cotton

- **Pest Resistance:** Over time, pests like the pink bollworm have developed resistance to Bt cotton, leading to recurring infestations.
- **Declining Yields:** Cotton yields have dropped steadily, from 510.82 kg/ha in 2014-15 to 436.99 kg/ha in 2024-25, raising concerns about the long-term efficacy of Bt seeds.

- Climate change, with erratic rainfall and temperature shifts, has further exacerbated the problem.
- **Lack of Performance Review:** Experts argue that the government has failed to assess the performance of Bt cotton seeds before approving price hikes.
 - Issues such as low-quality cotton formation, black fungus, and other crop diseases remain unaddressed.

Policy Reforms

- The **Cotton Seed Price (Control) Order, 2015**, which removed state governments' power to regulate seed prices, needs to be revisited.
- Strengthening research and development in pest-resistant and climate-resilient seed varieties is crucial.

Karnataka to Establish Gig Workers' Welfare Board

Context

- Recently, the **Karnataka** government announced its plan to establish a **Gig Workers' Welfare Board** aimed at improving the working conditions of gig and platform-based workers.

Key Features of the Plan

- **Establishment of Welfare Board:** The Gig Workers' Welfare Board will act as a dedicated body to oversee the implementation of welfare measures for gig and platform-based workers.
 - It aims to address issues related to wages, occupational hazards, and access to benefits like health insurance and pensions.
- **Introduction of a Cess:** A 5% cess will be levied on companies employing gig workers to fund welfare schemes.
 - The revenue generated will be used to create a safety net for workers, ensuring their social and economic well-being.
- **Legislative Backing:** The government plans to introduce a Bill in the state cabinet to formalize the establishment of the Welfare Board and its operational framework.

Gig workers in India

- They represent a growing segment of the workforce, engaged in flexible, platform-based jobs such as ride-hailing, food delivery, and e-commerce services.
- According to **NITI Aayog (2022)**, India had over 10 million gig workers, a number projected to rise to 23.5 million by 2030.
- These workers operate outside traditional employer-employee relationships, earning income through short-term contracts or freelance arrangements.

Challenges Faced by Gig Workers

- **Lack of Social Security:** Gig workers are not entitled to benefits like health insurance, pensions, or paid leave, leaving them vulnerable to financial instability.
- **Low Pay and Long Hours:** Many gig workers report earning less than ₹15,000 per month, with some working over 12–14 hours a day.
- **Unsafe Working Conditions:** Delivery workers face risks such as road accidents and health issues due to long hours and poor infrastructure.

Subjective Questions for Practise

1. What are the environmental and social consequences of unregulated riverbed mining in India, and how can sustainable practices be implemented to mitigate its impact?
2. Examine the causes and consequences of coral bleaching. How does climate change contribute to this phenomenon, and what strategies can be implemented to protect and restore coral reef ecosystems?
3. Examine the phenomenon of double heatwaves and their increasing frequency. What are the environmental, health, and socio-economic impacts of consecutive heatwaves?
4. Discuss the factors contributing to glacier loss in the Hindu Kush Himalayas and analyze its impact on water security, agriculture, and regional ecosystems.
5. Analyze how the imposition of tariffs by major economies disrupts the globalised food system. What are the potential consequences for food security, trade relations, and consumer costs, especially for food-import dependent nations?

MCQs

1. With reference to the Sand Mining Rules, 2023, consider the following statements:
 1. These encourage real-time monitoring using drones and satellite imaging.
 2. These strengthen the District Survey Report (DSR) mechanism.
 Which of the statements given above is/are correct?
 - (a) 1 only
 - (b) 2 only
 - (c) Both 1 and 2
 - (d) Neither 1 nor 2
2. With reference to the 'Solid Waste Management Rules, 2016', consider the following statements:
 1. These were introduced to replace the Municipal Solid Wastes (Management and Handling) Rules, 2000.
 2. They cover all types of solid waste, including hazardous, biomedical, and e-waste.
 Which of the statements given above is/are correct?
 - (a) 1 only
 - (b) 2 only
 - (c) Both 1 and 2
 - (d) Neither 1 nor 2
3. Which one of the following international organisations is responsible for publishing the 'Technology and Innovation Report 2025'?
 - (a) UN Conference on Trade and Development (UNCTAD)
 - (b) World Bank

- (c) United Nations Framework Convention on Climate Change (UNFCCC)
 - (d) World Intellectual Property Organization (WIPO)
4. Terms like *Risdiplam* and *Evrysdi* are sometimes appeared in the news, primarily in the context of:
 - (a) Sickle Cell Disease
 - (b) Spinal Muscular Atrophy
 - (c) Huntington Disease
 - (d) Multiple Sclerosis
5. Which one of the following Indian states recently passed the provision related to Legal Aid for Protecting Elderly Rights?
 - (a) Karnataka
 - (b) Rajasthan
 - (c) Punjab
 - (d) Kerala
6. Which one of the following Indian states recently announced its plan to establish a Gig Workers' Welfare Board?
 - (a) Gujarat
 - (b) Maharashtra
 - (c) Karnataka
 - (d) Uttar Pradesh

Answer Key: _____

1. (c), 2. (a), 3. (a), 4. (b), 5. (d), 6. (c)