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GS 1: ART & CULTURE, HISTORY, INDIAN SOCIETY AND GEOGRAPHY

1. How the polar Vortex caused a massive winter storm in the US

Context: The US and Canada were hit with a massive storm over the weekend, leading to mass school closures, dangerous road conditions, and power cuts. At least five people died in the storm, which impacted some 60 million dollars of damage in 30 US states and has sent temperatures plummeting across much of the continent. The cause of this extreme weather is the southward expansion of the polar vortex. Scientists are still researching the precise impact of climate change on the polar vortex, and if rising temperatures are making the low-pressure system buckle more frequently.

Key points

- **Overview:** A deadly blizzard (snowstorm) has gripped the United States & Canada, leading to multiple deaths and complete disruption of normal life.
- **Background:** Recently, a study was published in Science.org, revealing that the rapid warming of the Arctic might be allowing frigid air in the region to move southward more frequently than ever before. The study largely focused on something called the polar vortex, which is a mass of cold, low-pressure air that consistently hovers over the Arctic region.
- **Findings of the Study:** In the study published in the Science.org, the researchers found that the expansion of the polar vortex has been occurring more than twice as often in recent years and the reason for it is the rapidly warming Arctic. With the help of observational analysis and numerical modelling, the study came to the following conclusion-
 - The melting sea ice in Barents and Kara seas north of Russia and Scandinavia and increasing Siberian snowfall create larger and more energetic atmospheric waves.
- **Polar vortex:** It is a large low-pressure and cold air system that surrounds the Earth's poles. It always exists near the poles but becomes stronger in winter and weaker in summer. The term "vortex" refers to the counterclockwise flow of air, which keeps cold air confined near the poles.
 - *Tropospheric Polar Vortex* - Found in the lowest atmospheric layer (up to 10-15 km), where most weather events occur.
 - *Stratospheric Polar Vortex* - Found at higher altitudes (15-50 km), strongest during autumn and disappears in summer.
- **Key Features of the Polar Vortex:** *Northern Hemisphere Vortex* - Has two main centers, near Baffin Island, Canada. In northeastern Siberia.
Southern Hemisphere Vortex - Typically located around the South Pole. Stronger and more stable compared to the northern vortex, making it less likely to wobble.
- **Working of Polar vortex:** *Constant Spin* - The vortex spins counterclockwise around the North Pole throughout the year.
Seasonal Shifts - In summer months, the vortex sits at higher latitudes. In winter months, it shifts southward.
- **Causing extreme cold:** When the polar vortex weakens, cold Arctic air moves south, bringing freezing temperatures to regions like the US, Europe, and Asia.
 - *Role of the Jet Stream* - A strong polar vortex keeps the jet stream stable, trapping cold air in the north and keeping warm air in the south. When the polar vortex is strong, the polar jet stream locks bitterly cold, dry air in place over the Arctic. When strong, these winds essentially act as an unscalable wall that frigid air cannot breach.
 - *Impact of High-Pressure Systems* - A strong area of high pressure near the Arctic disturbs the polar vortex. High-pressure systems can disrupt the jet stream, pushing the cold air even farther south, leading to extreme cold in unusual areas.
- **Image of Global Warming on the Polar Vortex:** Global warming impacts the polar vortex, causing changes in weather patterns and leading to extreme cold events.
 - *More Extreme Cold Spells* - Even though global temperatures are rising, warming in the Arctic can lead to more cold weather in some regions, this happens because warmer temperatures in arctic makes the vortex unstable allowing cold air to move south.
 - *Faster Arctic Warming* - The Arctic is warming faster than the rest of the world, a phenomenon called Arctic amplification. This makes the polar vortex more likely to cause cold air outbreaks in lower latitudes.

GS 2: POLITY, GOVERNANCE, SOCIAL JUSTICE, INTERNATIONAL RELATIONS/INSTITUTIONS

2. Data Rules set to be rolled out by mid-2025

Context: The Government of India released the draft Digital Personal Data Protection Rules, 2025, under the Digital Data Protection Act, 2023, outlining provisions for data privacy, compliance, and processing mechanisms. The Bill seeks to provide for the protection of personal data and the privacy of individuals. The Members of Parliament from opposition parties objected to the introduction of the proposed law and called for it to be referred to a Parliamentary committee.

Key points

- **Overview:** The Union government is aiming at finalising and notifying the Digital Personal Data Protection Rules, currently in a draft state, by the middle of the year.
- **Parental consent for children's data:** *Verification required* - social media and online platforms must obtain verifiable parental consent before children create accounts.
Identity validation - Parents' age and identity must be validated through government-issued identity proof.
- **Role and responsibilities of data fiduciaries:** Entities collecting and processing personal data are categorised as "Data Fiduciaries." Significant Data Fiduciaries (SDFs) are those processing high volumes or sensitive data, impacting national sovereignty, security, or public order.
 - *Data retention* - Data can only be retained for the duration of consent and must be deleted afterward.
 - *Security measures* - Fiduciaries must ensure encryption, access control, and monitoring for unauthorised access.
- **Data localisation:** *Reintroduction* - Localisation mandates restrict transferring certain personal and traffic data outside India.
Oversight - A government-formed committee will determine the categories of data restricted from cross-border transfer.
- **Safeguards for government data processing:** Government agencies must process citizen data lawfully, with specific safeguards outlined to address concerns over exemptions for national security and public order.
- **Industry and Expert Reactions:** *Ambiguity in security standards* - Experts have raised concerns about the lack of detailed guidance on security practices, potentially leading to varied interpretations.
Data localisation controversy - Global tech giants like Meta and Google have expressed concerns over the implications of data localisation on service delivery.
- **Penalties and Enforcement:** *Fines* - Non-compliance with safeguards or failure to prevent data breaches can attract penalties of up to Rs 250 crore.
Consent manager violations - Repeat violations by consent managers may lead to suspension or cancellation of their registration.
- **Conclusion:** The draft Digital Personal Data Protection Rules, 2025, aim to strengthen India's data privacy framework while addressing challenges for businesses and individuals. The reintroduction of data localisation and emphasis on consent management mark significant developments, but clarity on implementation and compliance mechanisms remains crucial.

GS 2: POLITY, GOVERNANCE, SOCIAL JUSTICE, INTERNATIONAL RELATIONS/INSTITUTIONS

3. India hands over defence equipment and stores to the Maldives

Context: The visit by Ghassan Maumoon is crucial since this is the first Defence Minister-level meeting after Indian defence personnel, managing and maintaining aviation platforms gifted by India, were withdrawn from the Maldives last year. According to the sources, the two sides also discussed extending the lease of aviation platforms expiring this year – two Advanced Light Helicopters (ALH), which are being used by the Maldives for medical evacuation purposes. They also discussed the frequent docking of foreign vessels in Maldivian maritime territory and the implications of permissions granted to the vessels by foreign agencies, including the Chinese.

Key points

- **Overview:** Defence Ministers Rajnath Singh and Mohamed Ghassan Maumoon met in New Delhi on Wednesday as the two countries moved to restore ties after a hiatus that spread rancour in the two capitals.
- **Defence tie-ups:** A technical agreement on sharing 'White Shipping Information' between the Indian Navy and the Maldives National Defence Force was also signed, enabling the exchange of prior information on the movement of commercial, non-military vessels.
- **Defence and Security:** Security remains a critical aspect of India-Maldives relations. India's military presence in the Maldives has been a contentious issue, with calls for the replacement of Indian troops with technical personnel. It aims to address Maldivian concerns while maintaining security cooperation. The strategic location of the Maldives in the Indian Ocean makes it a vital partner for India in ensuring regional stability and countering external influences, particularly from China.
- **Joint exercises:** India and the Maldives regularly conduct joint exercises, including the bilateral exercises "Ekuverin" and "Ekatha", and the trilateral exercise "Dosti".
- **China's growing influence in the Maldives:** *Geopolitical Competition* - The Maldives' strategic location in the Indian Ocean makes it a key player in the geopolitical rivalry between India and China. China's increasing presence in the Maldives, through infrastructure projects and financial aid, challenges India's traditional influence in the region.
Security Concerns - China's involvement in the Maldives extends to security cooperation, which can be seen as a counterbalance to India's military presence. It creates tension, as India views the Maldives as part of its strategic sphere of influence and is wary of Chinese military activities in the region.
- **Conclusion:** The turnaround in Maldives-India relations is a testament to the power of subtle diplomacy over muscular posturing. It underscores the importance of sensitive and nuanced engagement in international relations. As Prime Minister Modi aptly put it, India remains the 'first responder' for the Maldives in times of need, reaffirming the deep-rooted ties between the two nations.

Q. How has India's role as a first responder in the Maldives strengthened the bilateral relationship between the two countries? How crucial is the Maldives-India relationship to the stability and security of the Indian Ocean region? (মালদ্বীপত প্রথম সঁহাৰি দিয়া হিচাপে ভাৰতৰ ভূমিকাই দুয়োখন দেশৰ মাজত দ্বিপাক্ষিক সম্পৰ্ক কেনেদৰে শক্তিশালী কৰিছে? ভাৰত মহাসাগৰ অঞ্চলৰ সুস্থিৰতা আৰু নিৰাপত্তাৰ বাবে মালদ্বীপ-ভাৰতৰ সম্পৰ্ক কিমান গুৰুত্বপূৰ্ণ?)

4. Coal mine tragedy

Context: In a shocking incident that lays bare the thriving illegal coal mining syndicate in Assam, around 15 workers were trapped inside a 340-feet-deep quarry in Dima Hasao district on Monday. The body of one worker has been retrieved and given the depth of water that inundated the mine, chances of survival of the trapped miners are remote. Accidental deaths in illegally operated mines are nothing new, with fatalities occurring with alarming frequency. It is only when major accidents occur that things come into the public domain. Workers in illegal mines extract coal under the most hazardous conditions and without any protective measures. The thriving syndicate of illegal coal mining has also been a major factor behind biodiversity loss and severe damage to waterbodies, cropland and human health.

Key points

- **Overview:** An investigation into the accident is underway, as the mine is under prima facie, given that illegal mining, including rat-hole mining, has been going on under the very eyes of the government authorities for years.
- **Illegal Coal Mining in India:** Illegal coal mining has led to multiple fatalities, including recent incidents in Gujarat, Jharkhand, and West Bengal, highlighting its prevalence and dangers. There are 10 workers who have died in illegal mining incidents in Gujarat alone this year, showcasing the ongoing risks associated with this activity. Illegal mining is often conducted in abandoned mines or shallow coal seams, particularly in remote areas, where monitoring and enforcement of regulations are weak.
- **Legal Frameworks Governing Coal Mining in India:** *Coal Mines (Nationalisation) Act, 1973* - This act nationalized coal mining in India, regulating who can mine coal and under what conditions. *Mines and Minerals (Development and Regulation) Act, 1957 (MMDR Act)* - This central legislation governs the mining sector, detailing processes for acquiring mining licenses and regulating mining activities. It empowers state governments to frame rules to prevent illegal mining.
- **Factors responsible for Illegal Coal Mining:** *High Demand for Coal* - With coal accounting for 55% of India's energy needs, the high demand often exceeds legal supply leading to illegal mining activities. *Weak Regulatory Enforcement* - Inadequate monitoring and enforcement of mining regulations in remote areas allow illegal mining operations to flourish. *Political Patronage* - Allegations of political leaders' involvement in illegal mining operations complicate efforts to curb these activities, as seen in various states. *Poverty and Unemployment* - Many coal-rich areas are home to impoverished populations who resort to illegal mining as a source of livelihood due to limited job opportunities.
- **Risks Workers Face:** *Lack of Safety Equipment* - Workers often operate without helmets, masks, or other protective gear, significantly increasing their risk of injury or death. *Hazardous Working Conditions* - Illegal mines are typically unregulated, lacking proper structural support, making them vulnerable to cave-ins, landslides, and explosions. *Toxic Gas Exposure* - Miners are at risk of asphyxiation from inhaling toxic gases like carbon monoxide, as evidenced by recent fatalities in Gujarat.
- **Conclusion:** Need to implement advanced surveillance technologies, such as drones and satellite imaging, to monitor and detect illegal mining activities in real-time. This can improve the efficiency of enforcement agencies in identifying and responding to illegal operations swiftly.

5. River interlinking, the fount of environmental disaster

Context: On December 25, 2024, Prime Minister Narendra Modi laid the foundation stone for the Ken-Betwa River Link Project, which aims to solve the water scarcity in the Bundelkhand region that covers parts of Uttar Pradesh and Madhya Pradesh. The project also includes the construction of a dam located within the Panna Tiger Reserve, raising concerns about its submergence. Upon completion, this project will link the supposed water surplus Ken River with the Betwa in drought-stricken Bundelkhand which had a 58% forest cover in 1938.

Key points

- **Overview:** River Interlinking projects (RIP) is to ensure greater equity in the distribution of water by enhancing the availability of water in drought prone and rain-fed areas. It is also known as the National Perspective Plan (NPP).
- **National Perspective Plan (NPP):** It was prepared by the then Ministry of Irrigation (now Ministry of Jal Shakti) in 1980.
Objective - Water resources development through inter-basin transfer of water, for transferring water from water surplus basins to water-deficit basins.
- **Significance of the River Interlinking Projects:**
Reducing Regional Imbalance - India depends on monsoon rains that are erratic as well as regionally imbalanced. The interlinking of rivers will reduce the amount of surplus rain and river water which flows into the sea.
Irrigation for Agriculture - Interlinking can provide a solution to the rain-fed irrigation problems of Indian agriculture through the transfer of surplus water to deficit regions.
Reducing Water Distress - This can help in mitigating the effect of drought and floods to a certain extent.
- **Ecological and environmental issues:** There are knowledge gaps between the claimed benefits and potential threats from environment and ecological impact. Feasibility of flood control and drought protection is under question because almost all rivers own very less water than required in lean season and lean season of almost all rivers is similar due to monsoon nature of India.
- **Socio-Economic Issues:** The need of massive storage capacities will cause displacement of vulnerable (Tribals, villagers, etc.), poor river and ground water quality and fertile land and forest submergence. India has yet to rehabilitate approx. 50% of people displaced due to previous water storage facilities.
- **Technological Developments:** Cost of power generation by solar power projects would be below Rs. 1.0 per Kwh in a few years. India has yet to manage its water leakage problem in cities and rural areas, the leakage situation in river and canal linking via tunnel and pipe will make the situation worse.
- **Conclusion:** To mitigate the increasing demand of water and minimise the effects of flood and drought we must focus on the small-small, decentralised water conservation program to fulfil local needs instead of mega projects.