
Prelims Exam Topics

KHEYBAR SHEKAN MISSILE

Context

Iran has reportedly deployed the **Kheybar Shekan missile** in recent attacks, highlighting its long-range precision strike capability.

About Kheybar Shekan Missile

- **Nature:** A long-range, solid-fuel ballistic missile developed by Iran and the fourth-generation member of the Khorramshahr missile family.
- **Range:** Approximately 1,450 km.
- **Speed:** Reportedly reaches 19,500 km/h (Mach 16) during atmospheric flight and 9,800 km/h (Mach 8) outside the atmosphere.
- **Capability:** Powered by the indigenous Arond engine and solid fuel, enabling launch readiness in under 15 minutes, mobile-platform deployment.
- **Guidance:** Uses satellite guidance, manoeuvrable warheads, and a three-phase flight profile; and low-radar-signature aerodynamic design make interception difficult.

MAHANADI RIVER

Context

ONGC recently spudded its first deepwater appraisal well in the Mahanadi offshore basin.

About Mahanadi River

- **Nature:** A major east-flowing peninsular river, flowing through Chhattisgarh and Odisha; the third-longest peninsular river after the Godavari and Krishna.
- **Origin & Drainage:** Originates from the Sihawa Hills, Chhattisgarh and drains into the Bay of Bengal, forming a delta near Cuttack and Paradip.
- **Basin:** Extends across Chhattisgarh, Odisha, Jharkhand, Maharashtra, and Madhya Pradesh.
- **Tributaries:** Left-bank: Seonath, Hasdeo, Mand, and Ib; Right-bank: Ong, Jonk, and Tel
- **Hydrology:** One of India's most active silt-depositing rivers; the Daya and Bhargabi distributaries supply about 61% of the inland inflow to Chilika Lake.

INSAT-3DR

Context

Recent **INSAT-3DR** satellite imagery indicated that **60–70% of India's landmass** was under cloud cover.

About INSAT-3DR

- **Nature:** An **advanced geostationary meteorological satellite** developed by **ISRO**, launched aboard **GSLV-F05**, for **weather observation and environmental monitoring**.
- **Payloads:** Equipped with an **Imaging System, Atmospheric Sounder, Data Relay Transponder (DRT)**, and **Search and Rescue (SAR) Transponder**.
- **Capability:** Provides **half-hourly multispectral images** of the Indian region from **geostationary orbit**, ensuring continuity of ISRO's meteorological services.

UNITED NATIONS COMMISSION ON INTERNATIONAL TRADE LAW (UNCITRAL)

Context

The **External Affairs Minister of India** addressed the inaugural session marking the **60th anniversary** of the **United Nations Commission on International Trade Law (UNCITRAL)**.

About United Nations Commission on International Trade Law (UNCITRAL)

- **Nature:** A **subsidiary body of the UN General Assembly**, established in **1966**, serving as the **principal legal body** of the UN for **international trade law**.
- **Mandate:** To promote the **harmonisation and unification of international trade law** and develop **modern, fair, and uniform legal rules** governing commercial transactions.
- **Headquarters:** Based in **New York**, with **annual sessions held alternately in Vienna**.
- **Membership:** Comprises **70 member States** elected by the **UN General Assembly** for **six-year terms**, with **half the membership renewed every three years**.
- **Regional Representation:** Members are drawn from **five regional groups**—**African, Asian, Eastern European, Latin American & Caribbean, and Western European & Other States**; **India is a founding member**.

ANCIENT BUDDHIST SITE OF SARNATH

Context

Sarnath was inscribed on the UNESCO World Heritage List, becoming India's 45th World Heritage Site.

About Ancient Buddhist Site of Sarnath

- **Nature:** An ancient Buddhist pilgrimage site located near Varanasi, Uttar Pradesh, where Gautama Buddha delivered his first sermon (Dharmachakra Pravartana) after attaining enlightenment.
- **History:** Flourished as a major centre of Buddhist learning and pilgrimage from the pre-Mauryan period until the 12th century CE, before its decline.
- **Other Names:** Traditionally known as Rishipatana, Isipatana, and Mrigadava (Deer Park).
- **Historical Importance:** Evolved into a major centre of Buddhist learning, monastic activity, and pilgrimage, with stupas, temples, and viharas constructed under successive rulers and patrons.
- **Architectural Heritage:** Includes the Dhamekh Stupa (built by Emperor Ashoka at the site of Buddha's first sermon), Chaukhandi Stupa (where Buddha met his first disciples), the Ashokan Pillar bearing the Lion Capital (India's National Emblem), Dharmarajika Stupa, Mulagandhakuti Vihara (associated with Buddha's first rainy-season retreat)

PRAXIS MISSION (PLANETARY RINGS AUTONOMOUS EXPLORATION WITH IN-SITU SAMPLING)

Context

NASA has selected the PRAXIS Mission concept for Innovative Advanced Concepts (NIAC) Phase I funding (2026).

About PRAXIS Mission

- **Nature:** A NASA mission concept designed for the direct exploration and in-situ sampling of planetary ring particles.
- **Objective:** To study the formation, evolution, and composition of the ring systems of Saturn (dense rings), Uranus and Neptune (tenuous rings), and ring-bearing Centaurs such as Chariklo and Chiron.

- **Technology:** Features a **bio-inspired robotic explorer** powered by **Artificial Intelligence (AI)**, enabling **autonomous navigation, collision avoidance, precision sampling, and on-site analysis**.
- **Sampling Mechanism:** Will **graze the ring plane** and perform **touch-and-go sampling** using a **deployable boom**, complemented by **sport-casting-inspired particle capture technology** and **miniaturised scientific instruments**.
- **Scientific Capability:** Will provide the **first direct observations of millimetre- to centimetre-sized ring particles**, measuring their **size, porosity, and composition**.

DARK EAGLE (LONG-RANGE HYPERSONIC WEAPON – LRHW)

Context

The **United States** has deployed the **Dark Eagle hypersonic missile** in **Guam** for the first time.

About Dark Eagle

- **Nature:** A **non-nuclear, ground-launched hypersonic missile system** of the **United States Army**, officially known as the **Long-Range Hypersonic Weapon (LRHW)**.
- **Role:** Designed to engage **heavily defended, time-sensitive targets**, including **command centres, air defence systems, missile launchers, naval facilities, and logistics hubs** deep within contested areas.
- **Range:** Has a **strike range of up to 3,500 km**.
- **Propulsion & Flight:** Uses a **two-stage solid-fuel booster** to launch a **Common Hypersonic Glide Body (C-HGB)**, which travels at **speeds exceeding Mach 5** and follows an **unpredictable, highly manoeuvrable boost-glide trajectory** to evade missile defences.

BITCHAT

Context

The **Indian Cyber Crime Coordination Centre (I4C)** under Ministry of Home Affairs, directed **GitHub** to disable repositories hosting **BitChat**, citing concerns that the application could be misused to evade lawful restrictions and facilitate unlawful activities.

About BitChat

- **Nature:** A **decentralised peer-to-peer messaging application**, operating over **Bluetooth mesh networks**.

- **Working:** Enables communication **without internet connectivity, central servers, phone numbers, or user registration**, with nearby devices relaying messages across a **mesh network**.
 - **Mesh Architecture:** Each device functions as both a **client and relay node**, forwarding messages through multiple hops to extend communication range.
- **Objective:** To provide **infrastructure-independent, censorship-resistant, and surveillance-resistant communication**, particularly during internet outages or areas with limited connectivity.
- **Connectivity:** Operates through **Bluetooth mesh networking**, enabling communication during **internet shutdowns, natural disasters, or in areas with limited connectivity**.
- **Privacy:** Supports **anonymous communication** without centralized logging, making lawful interception and attribution difficult.
- **Legal Framework**
 - **Section 79(3)(b), IT Act, 2000:** Intermediaries may lose **safe harbour protection** if they fail to promptly remove unlawful content after government notification; **Section 69A** empowers the **Central Government** to block online content on grounds such as **national security, public order, and prevention of incitement**, following the prescribed legal procedure.
- **Concerns:** The **Internet Freedom Foundation (IFF)** argued that the order targets the **potential misuse** of BitChat rather than specific unlawful content and may not satisfy the **principle of proportionality** laid down by the Supreme Court in **Anuradha Bhasin v. Union of India (2020)**.

Mains Exam Topics

RETHINKING DEVELOPMENT THROUGH CLIMATE RESILIENCE

Context:

India's climate challenge is no longer just about **too little or too much rainfall**, but about its ability to cope with an increasingly unpredictable climate. **June 2026 was the fifth driest June in over a century**, recording a **40% rainfall deficit**, yet the following weeks saw **cloudburst-like rains and flash floods** across several states. This shift highlights that climate change is not merely an environmental issue—it is reshaping **development priorities, urban governance and social inequalities**, making climate resilience central to India's future.

How Is Climate Resilience Redefining the Benchmark of Development?

- **Growth-to-Security Shift:** Development has traditionally been equated with expanding GDP. However, increasingly frequent climate disasters have exposed the fragility of these gains by erasing decades of progress within a short period. Consequently, the benchmark is shifting from **maximising economic output to securing development against future climate risks**.
 - e.g., The **2013 Uttarakhand floods** destroyed infrastructure and livelihoods built over decades, revealing that durable development, not rapid growth alone is the true measure of progress.
- **Institutional Adaptive Capacity:** As climate risks intensify, development is increasingly assessed through the ability of institutions and governance systems to **adapt to and recover from** climate shocks. The benchmark therefore shifts from measuring what economies produce to evaluating how effectively systems manage and recover from climate risks.
 - e.g., **NITI Aayog's Climate Vulnerability Assessment** evaluates states based on exposure, sensitivity and adaptive capacity rather than economic output alone.
- **Human-Scale Resilience:** The effectiveness of resilient institutions is judged by whether communities can withstand, recover from and adapt to climate shocks. Consequently, social protection, healthcare, livelihood security and community preparedness have become integral components of development.
 - e.g., **MGNREGA** increasingly supports water conservation, drought-proofing and natural resource restoration, strengthening both rural livelihoods and climate resilience.

- **Infrastructure Continuity:** As resilience becomes a development objective, infrastructure is no longer evaluated solely by the assets it creates but by its ability to **maintain essential services during and after climate disruptions**. Continuity of services has emerged as a key benchmark of infrastructure quality.
 - e.g., India's **Coalition for Disaster Resilient Infrastructure (CDRI)** promotes climate-resilient design standards to ensure infrastructure remains functional during extreme weather events.
- **Capital Risk Pricing:** Climate resilience is increasingly shaping investment and financial decisions. Public and private capital now incorporate climate risks into project appraisal, recognising that climate-vulnerable assets pose long-term financial and economic risks.
 - e.g., The **RBI's draft climate-related financial risk disclosure framework** encourages financial institutions to assess climate-related risks while making lending and investment decisions.
- **Global Equity Finance:** The resilience paradigm is also reshaping international development finance by directing greater support towards countries with higher climate vulnerability and lower adaptive capacity. Development finance is therefore increasingly guided by climate equity alongside traditional income-based considerations.
 - e.g., The **Loss and Damage Fund** operationalised at **COP28** prioritises support for particularly climate-vulnerable developing countries, including **Least Developed Countries (LDCs)** and **Small Island Developing States (SIDS)**.

Why Are Indian Cities Becoming the Frontline of Climate Adaptation?

- **Risk Amplification:** Rapid urbanisation has concentrated population, economic assets and critical infrastructure in climate-sensitive locations such as coastlines and floodplains. Simultaneously, concretisation, wetland loss and the expansion of impermeable surfaces have intensified urban heat islands, flash floods and water stress. Cities therefore do not merely experience climate risks—they increasingly **generate and amplify them**, making them the primary arena for climate adaptation.
 - e.g., The **2015 Chennai floods** were aggravated by urban expansion over wetlands and floodplains, while extensive concretisation reduced natural water absorption.
- **Resilient Infrastructure:** As cities amplify climate risks, adaptation depends on infrastructure capable of both resisting and regulating climate shocks. This requires not only **grey infrastructure** (stormwater drains, flood barriers and pumping systems) but also **blue-green infrastructure**

(wetlands, lakes, urban forests and natural drainage networks) that absorb, store and regulate excess water and heat.

- e.g., **Bengaluru's recurring floods** are linked to the degradation of **rajakaluves** and interconnected lakes, demonstrating that restoring natural hydrological systems is as important as expanding engineered infrastructure.
- **Unequal Vulnerability:** Because climate-resilient infrastructure and urban planning have historically bypassed many informal and low-income settlements, climate shocks disproportionately affect the most vulnerable communities. Climate adaptation therefore becomes not only an engineering challenge but also one of **social equity and inclusive urban development**.
 - e.g., Slum settlements in **Mumbai's flood-prone wards** experience repeated inundation due to their location near drains and low-lying areas, combined with limited access to resilient housing and public services.
- **Governance Fragmentation:** Because the communities facing the highest climate risks often possess the weakest institutional voice, adaptation gaps persist where they are needed most. These failures are reinforced by the **incomplete decentralisation envisaged under the 74th Constitutional Amendment**, under which Urban Local Bodies (ULBs) have limited authority while critical functions remain dispersed across state-controlled parastatal agencies, weakening coordination and accountability.
 - e.g., In **Bengaluru**, overlapping responsibilities among **BBMP, BDA and BWSSB** have delayed drainage restoration and encroachment removal, reducing the city's adaptive capacity.
- **Adaptation Laboratories:** Since climate risks and urban vulnerabilities vary across locations, adaptation cannot rely on uniform national solutions. Cities therefore become the first sites where locally tailored approaches to heat management, flood resilience and nature-based solutions are designed, tested and refined before informing broader policy frameworks.
 - e.g., The **Chennai Climate Action Plan (2023)** integrates strategies for heat resilience, flood management and water security, illustrating how city-level innovation can shape wider climate governance.

Does Climate Change Amplify Existing Inequalities More Than It Creates New Vulnerabilities?

- **Unequal Exposure:** Climate hazards may be environmental, but exposure to them is socially patterned. Existing settlement patterns, occupations and geography place certain communities

disproportionately in harm's way long before a disaster occurs. Climate change therefore exposes pre-existing inequalities rather than affecting populations uniformly.

- e.g., During **Delhi's recurring heatwaves**, construction workers, street vendors and other outdoor labourers face prolonged exposure because their livelihoods depend on working in extreme heat.
- **Differential Sensitivity:** Exposure alone does not determine climate impacts. Even under the same hazard, differences in housing quality, health status and access to basic services determine the severity of damage. Climate change therefore magnifies the consequences of existing socio-economic deprivation.
 - e.g., During urban floods, **kutcha houses and poorly serviced informal settlements** experience far greater structural damage and disease outbreaks than **pucca housing** with better drainage and sanitation, despite facing the same floodwaters.
- **Asymmetric Recovery:** Because differential sensitivity determines how severely a climate shock is experienced, recovery is ultimately governed by people's adaptive resources. Access to savings, insurance, formal property rights and institutional support enables some households to recover quickly, while others fall into persistent poverty.
 - e.g., Following the **2018 Kerala floods**, insured landowners recovered relatively quickly, whereas tenant farmers and landless agricultural labourers lacking formal entitlements experienced prolonged livelihood losses.
- **Emerging Vulnerabilities:** Climate change is also generating genuinely new vulnerabilities that extend beyond traditional patterns of inequality. Climate-induced displacement, for instance, creates legal and institutional uncertainty because people displaced by environmental change are **not recognised as refugees under the 1951 Refugee Convention**. Yet even these emerging risks disproportionately burden communities with limited political, economic and institutional power.
 - e.g., Communities displaced by **glacial lake outburst floods (GLOFs)** or coastal erosion often lack any formal legal status as climate-displaced persons, leaving them outside established international protection frameworks.
- **Institutional Exclusion:** The impact of climate change is further amplified when adaptation and relief systems operate through existing administrative and legal structures. Compensation, insurance and welfare delivery often favour formally documented households, causing public institutions to reproduce rather than reduce structural inequalities.

- e.g., Access to benefits under **PM Fasal Bima Yojana** and many disaster-relief programmes is generally easier for households with formal land records, bank accounts and administrative documentation than for informal-tenure or undocumented households.

Way Forward

- **Resilience Metrics:** Development assessment should move beyond GDP and infrastructure expansion by institutionalising resilience-based indicators. Evaluating states and cities on adaptive capacity would align public investment with long-term climate resilience rather than short-term economic growth.
 - e.g., Expanding **NITI Aayog's Climate Vulnerability Assessment** as a criterion for allocating central assistance would embed resilience into intergovernmental fiscal transfers.
- **Urban Empowerment:** As cities become the frontline of climate adaptation, Urban Local Bodies (ULBs) must receive the functional, financial and administrative devolution envisaged under the **74th Constitutional Amendment**. Stronger local governments would also improve coordination across agencies responsible for land use, water management and disaster response.
 - e.g., Integrating the functions of **BBMP, BDA and BWSSB** through a unified metropolitan resilience framework would reduce institutional fragmentation in Bengaluru.
- **Inclusive Adaptation:** Climate adaptation investments should prioritise vulnerable communities rather than follow existing patterns of formal ownership and documentation. Directing resources towards informal settlements, migrant populations and low-income households would ensure that resilience-building also reduces structural inequalities.
 - e.g., Expanding **PMAY–Urban** to include flood-resilient housing, drainage improvements and heat-resilient neighbourhood design in informal settlements would strengthen climate resilience where vulnerability is greatest.
- **Climate Finance:** Financial systems should progressively integrate climate risk into lending, insurance and investment decisions while expanding access to risk-transfer mechanisms for vulnerable households and small enterprises. This would improve both financial resilience and climate-responsive investment.
 - e.g., Expanding **parametric insurance** beyond agriculture to cover urban informal enterprises could reduce income shocks following extreme weather events.
- **Mainstream Resilience:** Climate resilience should become a cross-cutting principle of development planning rather than a stand-alone environmental objective. Integrating climate

considerations into urban planning, infrastructure, social protection, public finance and disaster governance would ensure that resilience shapes every stage of the development process.

- e.g., Embedding climate-risk assessments into **city master plans**, infrastructure approvals and public investment frameworks would institutionalise resilience across sectors.

