Prelims Exam Topics

SAMARTHAK MULTI-PURPOSE VESSEL

Context

Samarthak, the first indigenously designed and built **Multi-Purpose Vessel (MPV)** of the Indian Navy, has been formally delivered by **Larsen & Toubro (L&T)**.

About Samarthak

- **Type:** Lead ship of a new class of **Multi-Purpose Vessels**, designed for naval trials, training, logistics and support missions.
- **Builder:** Built by **L&T at Kattupalli shipyard, Tamil Nadu**.
- **Indigenous Content:** Over **75%**, supporting **Aatmanirbhar Bharat** in defence shipbuilding.

Key Features

- **Testing Platform:** Acts as a sea-based platform for testing and validating **indigenous radars, sonars, missiles and other weapons and sensors**.
- **Unmanned Systems:** Can deploy, control and recover **UAVs, USVs and UUVs** for surveillance and mine-countermeasure operations.
- **Towing & Logistics:** Equipped for **heavy lifting, towing and transfer of equipment** at sea.

SUBSEA CABLE INFRASTRUCTURE

Context

Visakhapatnam in Andhra Pradesh is emerging as India's **third major international subsea cable landing hub**, after **Mumbai and Chennai**, supported by growing data-centre investments.

About Subsea Cables

- **Nature:** Networks of **fibre-optic cables laid on the seabed** that carry the vast majority of international internet and data traffic.
- **Purpose:** Provide **high-capacity, low-latency and reliable international digital connectivity** between countries.

Major Indian Landing Hubs

- **Mumbai:** Major western gateway connecting India with **Europe, the Middle East and Africa**.
- **Chennai:** Major eastern gateway connecting India with **Southeast and East Asia**.

- **Visakhapatnam:** Emerging **third international landing hub** on India's east coast.

How Subsea Cables Work?

- **Light Transmission:** Digital data is converted into **light pulses** and transmitted through optical fibres.
- **Signal Boosting: Repeaters** placed along the cable route amplify signals over long distances.
- **Cable Landing Station:** Cables reach the shore at a **Cable Landing Station (CLS)**, where signals are processed and connected to terrestrial networks.
- **Data Distribution:** CLSs connect international cables with **data centres, cloud infrastructure and national fibre networks**.

Key Features

- **High Capacity:** Provides **much greater bandwidth and lower latency** than satellite-based international connectivity.
- **Protection:** Cables have protective layers and stronger armouring near coastal areas to reduce damage from external activity.
- **Route Diversity:** Multiple cable routes improve **network resilience** by allowing traffic to shift when one route is disrupted.
- **Strategic Infrastructure:** Increasingly important for **cloud computing, AI workloads and digital economies**.
- **Applications:** Supports **global internet services, cloud computing, AI data transfer, financial transactions, data-centre connectivity and secure government communications**.

SAFE DEFENCE FUND

Context

Italy has requested **€8 billion** under the European Union's **Security Action for Europe (SAFE)** defence financing programme.

About SAFE

- **Nature:** SAFE is an **EU joint borrowing instrument** created to strengthen Europe's defence capabilities.
- **Objective:** Supports rapid increases in **defence investment and common procurement** by EU Member States.

- **Financial Size:** Provides loans of up to **€150 billion**.

Participation

- **Loan Eligibility:** Only **EU Member States** can receive SAFE loans.
- **Common Procurement Partners:** EU acceding, candidate and potential candidate countries may participate.
- **Non-EU Partners:** Countries having **Security and Defence Partnerships with the EU** can also participate, including **India, Japan, Canada, Norway, South Korea and the UK**.

BUCKINGHAM CANAL

Context

The **Buckingham Canal** is again in focus as authorities consider restoring a **7.2-km central Chennai stretch** for navigation and urban water management.

About Buckingham Canal

- **Location:** Coastal canal running through **Andhra Pradesh and Tamil Nadu** along India's east coast.
- **Extent:** About **450 km** long, with roughly **250 km in Andhra Pradesh** and **200 km in Tamil Nadu**.
- **Historical Name:** Originally constructed as **Cochrane Canal** in **1806** and later renamed Buckingham Canal in **1878**.
- **Importance:** Historically served as a **cheap inland waterway** for transporting goods and passengers along the east coast.

Historical Development

- **Expansion:** The canal was gradually extended northwards from Chennai towards **Pulicat Lake and Dugarajapatnam**.
- **Navigation:** It was once linked with the **Krishna and Godavari canal systems**, creating a navigable network of about **650 km**.
- **Decline:** Navigation weakened with the expansion of **road and rail transport**, while pollution and encroachments further reduced its utility.

Importance for Chennai

- **Flood Management:** A properly maintained canal can act as an important **flood carrier during heavy rainfall**.

- **Navigation:** Sections have periodically been restored for **boat movement**, including a 14-km southern stretch between Thoraipakkam and Muttukadu.
- **National Waterway:** The **North and South Buckingham Canal** form part of **National Waterway 4**.

Challenges: Industrial and sewage pollution, encroachments, reduced canal width, infrastructure construction and declining navigability have degraded the waterway.

SALMONELLA

Context

Experts have highlighted the need for greater attention to **Salmonella infections in India**, which can range from mild gastroenteritis to serious bloodstream infections.

About Salmonella

- **Nature:** A group of bacteria that causes various infections in humans and animals.
- **Enteric Fever: Salmonella Typhi** causes typhoid fever, while **Salmonella Paratyphi** causes paratyphoid fever.

Sources & Transmission

- **Animal Reservoirs:** Commonly found in **poultry, pigs, cattle and pets**, as well as wild animals.
- **Food-Borne Spread:** Mainly transmitted through **contaminated food of animal origin**; contaminated vegetables can also transmit infection.
- **Faecal-Oral Route:** Can spread through **person-to-person contact** when hygiene and sanitation are poor.
- **Animal Contact:** Humans can become infected through direct contact with **infected animals**.

PM SVANIDHI (PRIME MINISTER STREET VENDOR'S ATMANIRBHAR NIDHI) SCHEME

Context

The **Ministry of Housing and Urban Affairs (MoHUA)** reported that **21.86 lakh loans worth ₹6,294 crore** were disbursed to street vendors under **PM SVANidhi** during the last 12 months.

About PM SVANidhi

- **Launch:** Launched in **2020** to support street vendors affected by the **COVID-19 pandemic**.

- **Type: Central Sector Scheme**.
- **Objective:** Provides **collateral-free working capital**, promotes business growth, financial inclusion and **digital payments**.
- **Implementation:** Jointly implemented by **MoHUA and Department of Financial Services (DFS)**.

Eligibility

- **Identified Vendors:** Vendors with a **Certificate of Vending/Identity Card** or those identified in ULB surveys.
- **Other Vendors:** Survey-excluded, new and peri-urban/rural vendors operating within ULB limits can qualify with a **Letter of Recommendation** from the ULB/Town Vending Committee.
- **State/UT Requirement:** States/UTs must have notified rules under the **Street Vendors (Protection of Livelihood and Regulation of Street Vending) Act, 2014**.

Key Benefits

- **Loan Tranches:** First tranche up to **₹15,000**, second up to **₹25,000** and third up to **₹50,000**.
- **Interest Subsidy:** Provides **7% interest subsidy** and higher loan eligibility for timely repayment.
- **Credit Guarantee:** Loans receive graded guarantee cover administered by **CGTMSE**.
- **Digital Incentive:** Vendors can receive up to **₹1,600 cashback** for digital retail and wholesale transactions.
- **Credit Card:** Vendors who repay the second tranche successfully, and those who have availed the third tranche, are eligible for a **₹30,000 credit card**.
- **Coverage:** Expanded progressively from statutory towns to **census towns and peri-urban areas**.

SREE NARAYANA GURU

Context

The **Prime Minister** recently paid tribute to **Sree Narayana Guru** on his birth anniversary.

About Sree Narayana Guru

- **Background:** A **saint, philosopher, spiritual leader and social reformer** from Kerala.
- **Social Reform:** Opposed the **caste system, untouchability and social inequality**, advocating social emancipation without creating an oppressor-oppressed divide.

- **Core Message: "One Caste, One Religion, One God for Mankind"**, promoting equality and human unity.

Major Contributions

- **Aruvippuram Movement (1888):** Consecrated a **Shiva idol at Aruvippuram**, challenging caste-based restrictions on temple worship.
- **SNDP Yogam (1903):** Helped establish the **Sri Narayana Guru Dharma Paripalana Yogam**, which worked for Ezhava access to **education, government employment and political representation**.
- **Vaikom Satyagraha:** Associated with the movement against **untouchability and caste-based discrimination** in Kerala.
- **Sivagiri Foundation (1924):** Promoted **cleanliness, education, devotion, agriculture, handicrafts and trade**.
- **Sivagiri Pilgrimage:** Initiated by his followers to promote **purity, education and organisation**.
- **Works:** *Advaita Deepika, Atmavilasam, Daiva Dasakam* and *Brahmavidya Panchakam*.

JAVELIN MISSILE SYSTEM

Context

India has signed an agreement to acquire the **Javelin anti-tank missile system** from the **United States**.

About Javelin

- **Type:** A **man-portable anti-tank guided missile (ATGM)** developed by the **Javelin Joint Venture of Raytheon and Lockheed Martin**.
- **Range:** Standard effective range is about **2.5 km**.
- **Targets:** Designed mainly against **armoured vehicles**, and can also engage **bunkers, fortifications and helicopters**.
- **Deployment:** Can be **shoulder-fired** by one person or launched from a **remote ground platform**.

Fire-and-Forget System

- **Target Acquisition:** Operator detects and locks the target using the missile system's **infrared sight**.
- **Guidance:** Target information is transferred to the **onboard guidance system** of the missile.

- **Autonomous Flight:** After launch, the missile tracks the target **without continuous operator guidance**, allowing the operator to relocate or take cover.

Soft Launch Mechanism

- **Initial Motor:** A low-thrust motor ejects the missile from the launch tube.
- **Flight Motor:** After the missile moves to a safe distance, the main motor ignites and propels it towards the target.
- **Advantage:** Reduces **recoil and launch signature** and allows firing from **confined spaces**.

Attack Modes

- **Direct Attack:** Missile travels directly towards the target; useful against **bunkers and helicopters**.
- **Top Attack:** Missile rises before diving onto the target from above, exploiting the **weaker roof armour of tanks**.

BARRIER LAKES

Context

A **barrier lake in Tibet** recently began overflowing and breaching, creating fresh **flood risks for Nepal and downstream regions**.

About Barrier Lakes

- **Nature:** A temporary lake formed when a **landslide, rock avalanche, debris flow or glacial collapse blocks a river channel**.
- **Other Names:** Also called a **landslide dam** or **quake lake**.
- **Formation:** Common in mountainous regions where unstable slopes can suddenly obstruct river valleys.

How Do They Form?

- **Slope Failure: Earthquakes, intense rainfall, cloudbursts or glacial collapse** dislodge rock, soil, ice and debris.
- **River Blockage:** The debris blocks a **narrow river valley or channel**, acting as a natural dam.
- **Water Accumulation:** Water backs up behind the barrier, forming a **lake or reservoir**.

Key Features

- **Unstable Barrier:** Made of **loosely packed rocks, soil, gravel, mud and sometimes ice**, unlike engineered dams.

- **Sudden Failure:** Water may breach the barrier through **overtopping or seepage**, causing rapid collapse.
- **Variable Lifespan:** May persist from **hours to months or even decades**, depending on inflow and barrier stability.
- **Dual Hazard:** Can cause **upstream inundation** and, after failure, a sudden **landslide-dam outburst flood downstream**.

Mains Exam Topics

HIMALAYAN DISASTER MANAGEMENT

Context

The recent **flash floods in Nepal** highlight how disasters originating in the Himalayan region can rapidly cross national borders and affect downstream populations, infrastructure and river systems. This underscores the need for **joint early-warning systems, real-time data sharing, coordinated rescue operations and basin-level disaster management among** Himalayan countries.

What are the major challenges in managing disasters in the Himalayan region?

- **Extreme Inaccessibility of High-Altitude Zones:** Many hazards originate in remote and high-altitude areas that are extremely difficult to access, monitor or equip with ground-based observation systems.
  - **e.g.,** The **2026 mudslide at Gyirong Port** was linked to a glacier collapse in the high Himalayas of Nepal, highlighting the difficulty of monitoring hazards in inaccessible terrain.
- **Ineffective Early-Warning Systems:** Existing systems may provide insufficient lead time for extremely rapid hazards such as debris flows, avalanches and flash floods.
  - **e.g.,** A debris flow travelling at around **50 metres per second** can leave downstream communities with only minutes to evacuate, making conventional warning systems inadequate.
- **Climate-Induced Uncertainty:** Early-warning systems often rely heavily on historical patterns, while climate change is increasing the frequency and intensity of **extreme and unprecedented events**.
  - **e.g.,** Infrastructure designed around historical flood levels may be inadequate when rainfall, glacier instability or cloudburst intensity exceeds past experience.
- **Underestimation of Cascading Risks:** Himalayan hazards rarely operate in isolation, as one event can trigger multiple secondary disasters across interconnected natural and infrastructure systems.
  - **e.g.,** An **avalanche or slope failure** can trigger landslides, debris flows, dam failure and downstream flooding, magnifying the overall impact.

- **Fragmented Disaster Governance:** Disaster management responsibilities are divided across multiple agencies and administrative levels, creating coordination gaps, procedural delays and unclear accountability.
    - **e.g.,** Field-level response may require coordination among the **NDMA, SDMAs, Border Roads Organisation, Central Water Commission, Geological Survey of India, Armed Forces and district administrations**, complicating rapid decision-making during sudden disasters.
- **Limited Cross-Border Collaboration:** Himalayan disasters often cross national boundaries, but mechanisms for timely and operational sharing of hazard information remain inadequate.

How has unplanned development increased disaster vulnerability in the Himalayas?

- **Slope Destabilisation:** Road cutting, tunnelling and hill excavation weaken fragile slopes and increase landslide risk.
    - **e.g.,** In **Himachal Pradesh during the 2023 monsoon**, the State's landslide inventory identified **road widening, excavation and overburden** among factors associated with landslide occurrence, highlighting the risks of construction on unstable slopes.
- **Settlement in Hazard Zones:** Construction along unstable slopes and river valleys increases exposure to floods, landslides and debris flows.
    - **e.g.,** The **Joshimath subsidence crisis of 2023** highlighted concerns over **rapid construction, over-concretisation and development pressure** in a geologically fragile area, increasing the vulnerability of buildings and infrastructure.
- **Drainage Disruption:** Roads and buildings alter natural drainage and concentrate runoff, increasing erosion and local flooding.
    - **e.g.,** In the **2013 Kedarnath disaster**, intense rainfall and flash floods caused severe damage to settlements, roads and bridges concentrated along the **Mandakini valley**, demonstrating the high exposure created by development in narrow mountain valleys.
- **Loss of Natural Buffers:** Deforestation and concretisation reduce vegetation cover and increase runoff, erosion and slope instability.
    - **e.g.,** Rapid urban expansion around **Shimla** has involved extensive slope modification, construction and reduction of natural drainage spaces, increasing the vulnerability of built-up areas to **landslides and intense rainfall**.

- **Critical Infrastructure Exposure:** Dams, roads, bridges and hydropower projects located along narrow valleys face cascading losses from floods, GLOFs and landslides.
    - **e.g.,** The **2023 South Lhonak GLOF in Sikkim** damaged bridges, roads and hydropower infrastructure along the **Teesta basin**, demonstrating how concentration of critical assets in hazard-prone valleys can multiply disaster losses.

Why do Himalayan disasters require cooperation among neighbouring countries?

- **Transboundary River Systems:** Major Himalayan rivers cross several national boundaries, allowing hazards generated upstream to rapidly affect downstream countries.
    - **e.g.,** A **GLOF, rock-ice avalanche or slope failure** in the upper reaches of the Indus, Ganga or Brahmaputra basin can develop into a debris flow or flash flood in downstream areas of India or Bangladesh.
- **Shared Cryosphere Systems:** Glaciers and glacial lakes located in one country can create disaster risks for communities in downstream countries.
    - **e.g.,** Glacial lakes in **Tibet or Nepal** can pose GLOF risks to downstream regions such as **Sikkim, Uttarakhand and Himachal Pradesh**, while foreign jurisdictions limit India's ability to directly install monitoring infrastructure there.
- **Cross-Border Information Gaps:** Downstream countries depend on upstream observations for effective forecasting, making restricted access to hydrological and cryospheric information a major vulnerability.
    - **e.g.,** Inadequate sharing of **hydrological data from upstream river systems** can reduce India's lead time for flood warnings.
- **Shared Seismic and Geological System:** The Himalayan seismic belt extends across **Pakistan, India, Nepal, Bhutan and China**, making earthquakes and associated hazards inherently regional.
    - **e.g.,** The **2015 Nepal earthquake** generated widespread ground shaking and co-seismic landslides that disrupted transport corridors, river channels and cross-border connectivity.
- **Transnational Weather Systems:** Western Disturbances and the Indian Summer Monsoon influence weather across multiple Himalayan countries, making isolated forecasting less effective.
    - **e.g.,** Extreme precipitation caused by the interaction of **Western Disturbances and monsoonal systems** can affect Pakistan, India, Nepal and neighbouring regions, requiring wider atmospheric data sharing.

- **Limitations of Bilateral Agreements:** Existing bilateral arrangements often focus on specific rivers, seasons or data categories and may not provide continuous crisis-time coordination.
    - **e.g.,** Hydrological data-sharing arrangements between **India and China** and between **India and Nepal** may not provide comprehensive, automated and sub-hourly information during rapidly evolving disasters.

Way Forward

- **Establish a Himalayan Disaster Management Framework:** Create a dedicated regional mechanism for coordinated disaster risk reduction, environmental protection and emergency response across the Hindu Kush Himalayan region.
    - **e.g.,** A framework inspired by the **Alpine Convention** or the **International Commission for the Protection of the Rhine (ICPR)** could establish common standards and institutional coordination.
- **Treat Critical Hazard Data as a Humanitarian Resource:** Hydro-meteorological, seismic and glacial information required for life-saving warnings should be shared as a regional public good rather than being excessively restricted.
- **Strengthen Real-Time Data Sharing:** Replace limited seasonal arrangements with **year-round, automated and near-real-time telemetry** covering rivers, glaciers, glacial lakes and weather conditions.
- **Develop a Regional Early-Warning System:** Integrate **satellites, weather radars, river sensors, seismic networks and glacier-monitoring systems** into a common warning architecture.
- **Promote Joint Cryosphere Monitoring:** Use remote sensing and ground-based technologies to jointly monitor glacier retreat, glacial lake expansion and potential GLOF sites.
- **Adopt Basin-Level Cooperation:** Manage Himalayan rivers as interconnected systems rather than as isolated national stretches, with cooperation on forecasting, reservoir operations and disaster response.
- **Conduct Joint Disaster Response Exercises:** Regular multinational exercises can improve interoperability among civil protection, armed forces and local authorities in difficult mountain terrain.
    - **e.g.,** Joint drills involving **India's NDRF, Nepal's disaster-management agencies and counterparts in Bhutan and Bangladesh** can focus on debris-flow rescue, rope operations and high-altitude evacuation.

- **Strengthen Existing Regional Platforms:** Build regional disaster-management cooperation through institutions that already possess Himalayan expertise, networks and technical capacity.
    - **e.g., ICIMOD** and its **Hindu Kush Himalayan Disaster Risk Reduction (DRR) Hub** can provide an institutional platform for regional knowledge-sharing, risk assessment and coordinated disaster-risk reduction.