3. Red Sea Cable Disruption – S & T

Recent disruptions in submarine communication cables in the Red Sea, highlights India's urgent need to strengthen its Underwater Domain Awareness (UDA), the ability to monitor, detect, and assess activities beneath oceans and seas.

Why UDA is Critical for India

1. National Security & Regional Stability - China's "Underwater Great Wall" project, with seabed sensors and unmanned vehicles, expands its Indo-Pacific surveillance dominance. Growing Chinese submarine activity in the Indian Ocean Region (IOR) poses a direct challenge to India's strategic security calculus.
2. Protection of Critical Infrastructure - Around 95–97% of international data traffic, including financial transactions, cloud services, and defence communications, travels through undersea fibre-optic cables. India's subsea cables are highly vulnerable to sabotage, espionage, accidents, and natural disasters.
3. Maritime Strategy - India's maritime domain includes 11,098.81 km of coastline, 1,382 islands, and a 2.37 million sq. km EEZ. Securing chokepoints (like Malacca Strait), sea lanes of communication (SLOCs), and littoral waters demands advanced subsea situational awareness.
4. Economic Security - The Blue Economy, with ambitions in offshore energy, seabed mining, and undersea pipelines, requires protection from both natural hazards (tsunamis, earthquakes) and man-made threats (sabotage, cyber-physical attacks).

India's Undersea Cable Technological Deficiencies

No Defined Legal Protection - India lacks legal mechanisms or Cable Protection Zones (as Australia has under UNCLOS), leaving subsea cables exposed in territorial waters and EEZ.
Lack of Cable Repair Ships - India has no indigenous subsea cable repair fleet; currently depends on foreign vessels, delaying restoration when cables are cut.
Monitoring Gaps - Limited real-time undersea surveillance infrastructure for tracking disruptions in subsea cable networks.
Operational Deficiency - No indigenous systems for rapid maintenance, reducing resilience against disruptions.

Initiatives Taken by India

1. Deep Ocean Mission (DOM)
Budget - ₹4,077 crore.
Samudrayaan Project - Development of *Matsya-6000* submersible capable of diving to **6,000 metres**; first crewed mission planned for 2027. Trials of underwater hydrophones (communication up to 5.5 km depth) mark advances in deep-sea engineering.
2. Strategic Partnerships
Australia - Cooperation on advanced towed-array acoustic systems for undersea surveillance.
United States - Collaboration under the Autonomous Systems Industry Alliance (ASIA) on unmanned underwater systems and autonomous surveillance technologies.
3. Indigenous Maritime Infrastructure - INS Nistar (with 80% indigenous content) commissioned for undersea operations, blending research, exploration, and defence needs under Atmanirbhar Bharat.
4. Resource Security & Energy Exploration - National Deep Water Exploration Mission (Samudra Manthan) launched for offshore oil, gas, and mineral exploration within India's EEZ, aligning economic and strategic security priorities.

Submarine Cables

Definition - Submarine cables are fiber optic cables laid on the ocean floor that connect continents and countries through landing points, forming the backbone of international digital connectivity.
India's Role - India hosts 17 international submarine cables with 14 landing stations, mainly concentrated in Mumbai and Chennai.
As of **end-2022** -

1. **Lit Capacity** - 138.606 Tbps (ready to be used).

2. Activated Capacity - 111.111 Tbps (currently in operation).

This places India as a strategic digital hub in the Indo-Pacific region.

Global Importance - Carry over 99% of international data exchange (internet, phone calls, financial transactions, e-commerce, defence communications). More efficient and secure compared to satellite communication, which carries less than 1% of global internet traffic. Vital for global financial markets, e-governance, social media, and cloud services.

Fiber-Optic Cable

Definition - A networking cable that transmits data as light pulses through thin strands of glass or plastic called optical fibers.

Working Principle - Uses Total Internal Reflection (TIR), where light continuously bounces inside the core without escaping, ensuring long-distance transmission with minimal signal loss.

Main Elements of Fiber-Optic Cables

1. **Core** - Central thin strand of glass or plastic. Light pulses carrying data travel through this part.
2. **Cladding** - Surrounds the core with a lower refractive index. Ensures light remains trapped in the core via repeated reflection.
3. **Buffer Coating** - Protective outer plastic layer. Shields the delicate fiber strands from moisture, damage, and external stress.
4. **Detector (Receiver end)** - Converts light pulses back into electrical signals that devices (computers, routers, servers) can interpret.

Submarine Cable Resilience and Global Governance

1. International Advisory Body for Submarine Cable Resilience

Launched by - International Telecommunication Union (ITU) and International Cable Protection Committee (ICPC).

Purpose - Strengthen the resilience and security of submarine cable systems.

Provide strategic guidance to address -

1. Rising global internet traffic.
2. Aging cable infrastructure (most cables last ~25 years).
3. Environmental threats (seabed earthquakes, tsunamis, undersea landslides).
4. Geopolitical risks (sabotage, surveillance, cyber-attacks).

2. International Cable Protection Committee (ICPC)

Founded - 1958.

Role - A global platform bringing together governments, telecom companies, and cable operators.

Functions - Share technical, legal, and environmental best practices. Coordinate emergency response for cable damages. Advocate for UNCLOS-based cable protection measures, such as prohibiting trawling or dredging in cable zones.

Strategic Significance of Submarine Cables for India

Digital Sovereignty - As a rising digital economy, safeguarding submarine cables is critical to India's financial markets, defence data, and IT services exports.

Economic Role - Supports India's $250+ billion IT-BPM industry, fintech operations, and international digital trade.

Geopolitical Leverage - With cable landing points in Mumbai, Chennai, and Kochi, India is positioned as a gateway for Asia–Europe and Asia–Africa internet connectivity.

Security Vulnerabilities - Currently lacks Cable Protection Zones (like Australia) under UNCLOS frameworks. Relies on foreign-owned repair ships, delaying responses to sabotage/accidents. Limited real-time undersea monitoring infrastructure for cable surveillance.

Way Forward for India

Legal Framework - Introduce Indian Cable Protection Zones under domestic maritime law in line with UNCLOS.
Indigenous Capabilities - Build Indian-owned cable repair and maintenance ships.
Undersea Monitoring Network - Deploy hydrophone arrays, acoustic sensors, and AI-based predictive analytics for real-time detection of disruptions.
Strategic Alliances - Collaborate with partners like the Quad, EU, and Australia to safeguard global subsea cable routes in the Indo-Pacific.
Blue Economy Integration - Link cable protection with deep-ocean exploration, offshore energy, and seabed mining to ensure holistic maritime domain awareness.

Way Ahead

Build Subsea Cable Protection Fleet - Establish Indian-owned cable repair ships and dedicated subsea maintenance fleet to reduce reliance on foreign entities.
Invest in Real-Time Surveillance - Deploy acoustic sensor grids, seabed hydrophone arrays, and satellite-linked sensors for round-the-clock monitoring.
Boost Technological Capabilities - Fast-track indigenous Unmanned Underwater Vehicles (UUVs) and Air Independent Propulsion (AIP) for extended submarine operations. Develop advanced sonar technologies for deep-sea detection.
Adopt AI & Predictive Tools - Use AI-driven sonar analytics, predictive modelling, and machine learning to enhance situational awareness across the IOR.
Legal and Regulatory Measures - Create Cable Protection Zones under Indian maritime law, aligned with UNCLOS, to safeguard undersea infrastructure.
Source - https - //www.orfonline.org/expert-speak/addressing-india-s-undersea-technological-deficiencies