

India's Maritime Domain Awareness Effort in the Indo-Pacific Region



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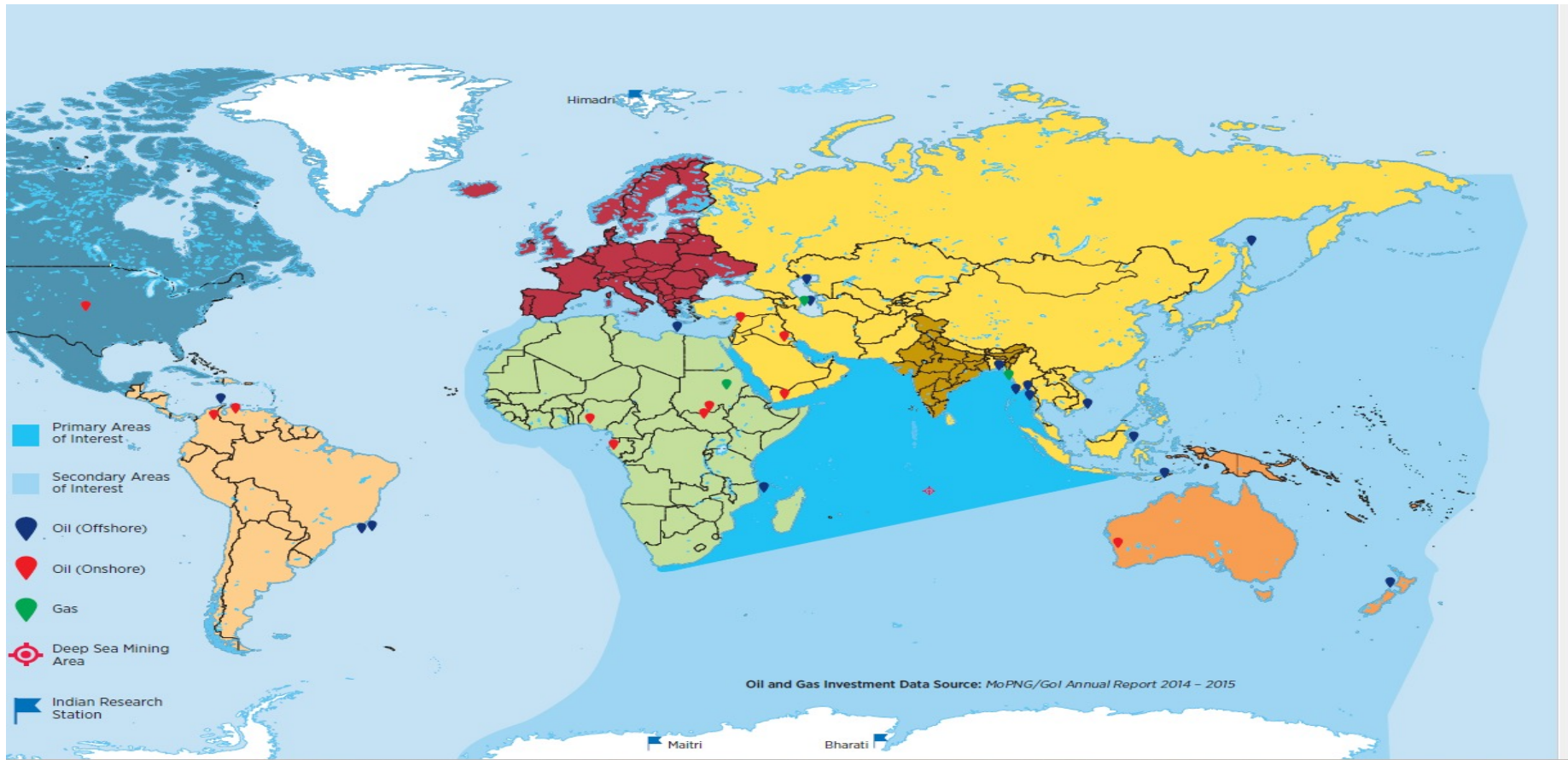
MV Pavit ran aground at Juhu Beach - 31 July 2011

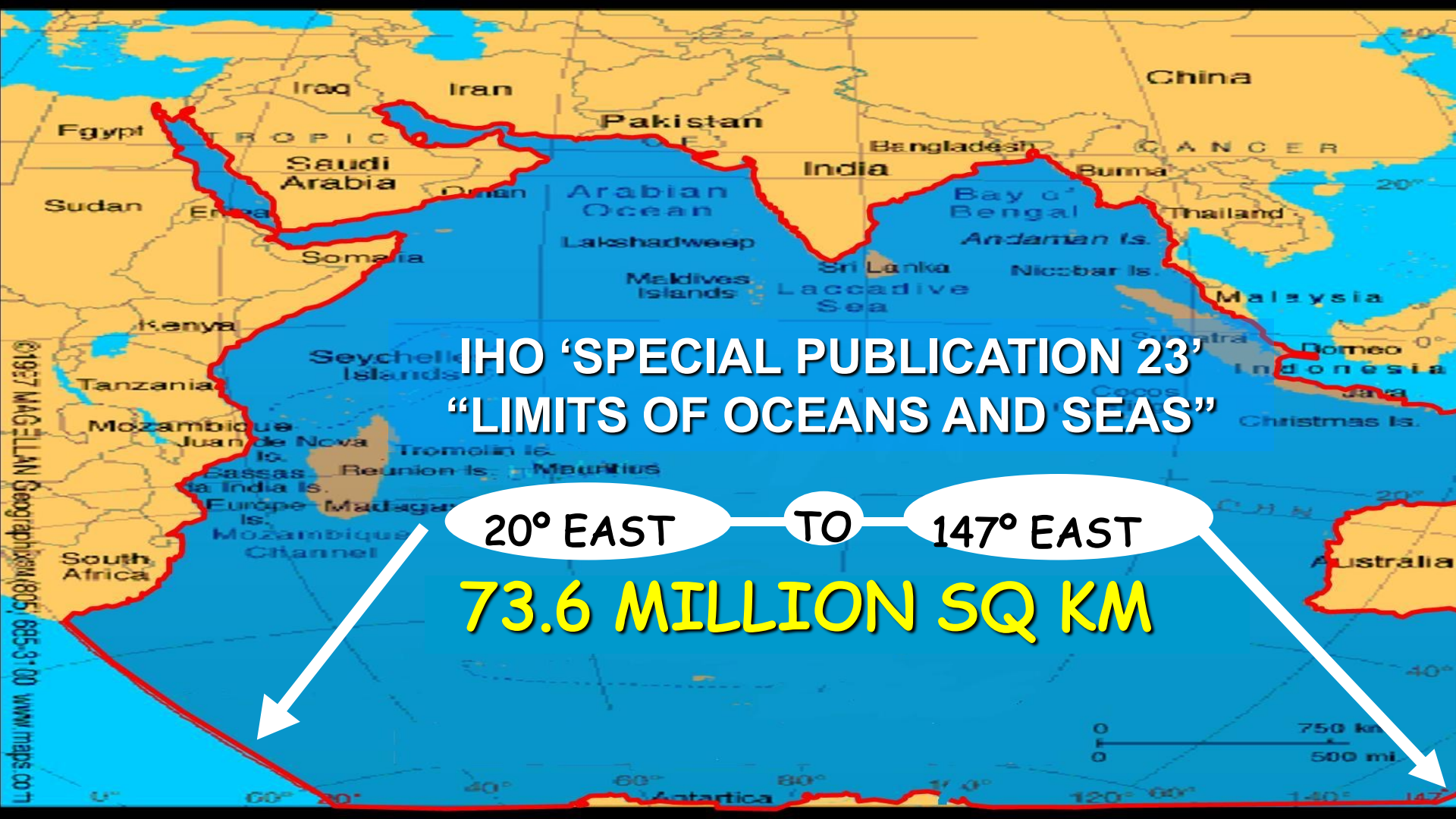
India's Strategic Geography

The Indo-Pacific Region



India: Areas Of Maritime Interest





**IHO 'SPECIAL PUBLICATION 23'
"LIMITS OF OCEANS AND SEAS"**

20° EAST TO 147° EAST

73.6 MILLION SQ KM

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750 km
500 mi

A satellite-style map of the Indian subcontinent and the surrounding Arabian Sea. The sea is highlighted in a darker blue. Yellow lines outline the coastline of the Arabian Sea. Several cities are marked with white stars and labeled: DLH (Delhi) in northern India, KOL (Kolkata) in eastern India, MBI (Mumbai) on the western coast, GOA (Goa) on the western coast, and KCH (Kochi) on the southern coast. The text 'Arabian Sea : 38,62,000 sq km' is overlaid in white on the sea.

Arabian Sea :
38,62,000 sq km

★ DLH

★ KOL

★ MBI

★ GOA

★ KCH

Non-detection of MV *Pavit*

An 'Arithmetical' Perspective.....

MV *Pavit* : Length: 90 metres; Beam: 12 metres

Highlights the challenges of surveillance in vast maritime areas



Area occupied MV *Pavit* (90 m x 12 m)

: **1080 sq m**

Seems **BIG.... HUGE**, in fact ! How did we miss it ?

1 Square-Kilometre = **1,000,000** [one MILLION square metres]

So MV *Pavit* [1080 square metres] is just : **0.1% of 1 sq km**

Area of the Arabian Sea


: **38,62,000 sq km**

So MV *Pavit* [1080 square metres] is just : **$2.79 \times 10^{-8} \%$**
[0.0000000279%] of the area of just the Arabian Sea alone

Seems **TINY INDEED....**

In fact ! How did we ever expect to find it?



A satellite map of the Arabian Sea region, showing the coastline of the Indian subcontinent and the surrounding waters. The map is overlaid with several text boxes. A yellow line highlights a portion of the Arabian Sea. Stars mark the locations of DLH, KOL, GOA, and KCH. The text boxes provide information about radar detection range, search requirements, the number of ships needed, radar operation requirements, and the area of the Arabian Sea.

Max Range at which a shipborne radar can detect a medium-sized ship: **22 nm (40 km)**

Assume a **10-day Continuous Search** by a given ship, proceeding at a speed of **16 knots (30 kmph)**

The number of radar-operating ships required daily to irradiate just the Arabian Sea alone: **46 ships!**

All radars **MUST** operate 24 x 7 x 365... No radar must ever fail... All must be manned by trained operators on a 24-hour basis.....

Arabian Sea :
38,62,000 sq km

Since it is not realistically feasible... **huge requirement exists for supplementing surveillance through space-based means**

Challenges to India's Maritime Security

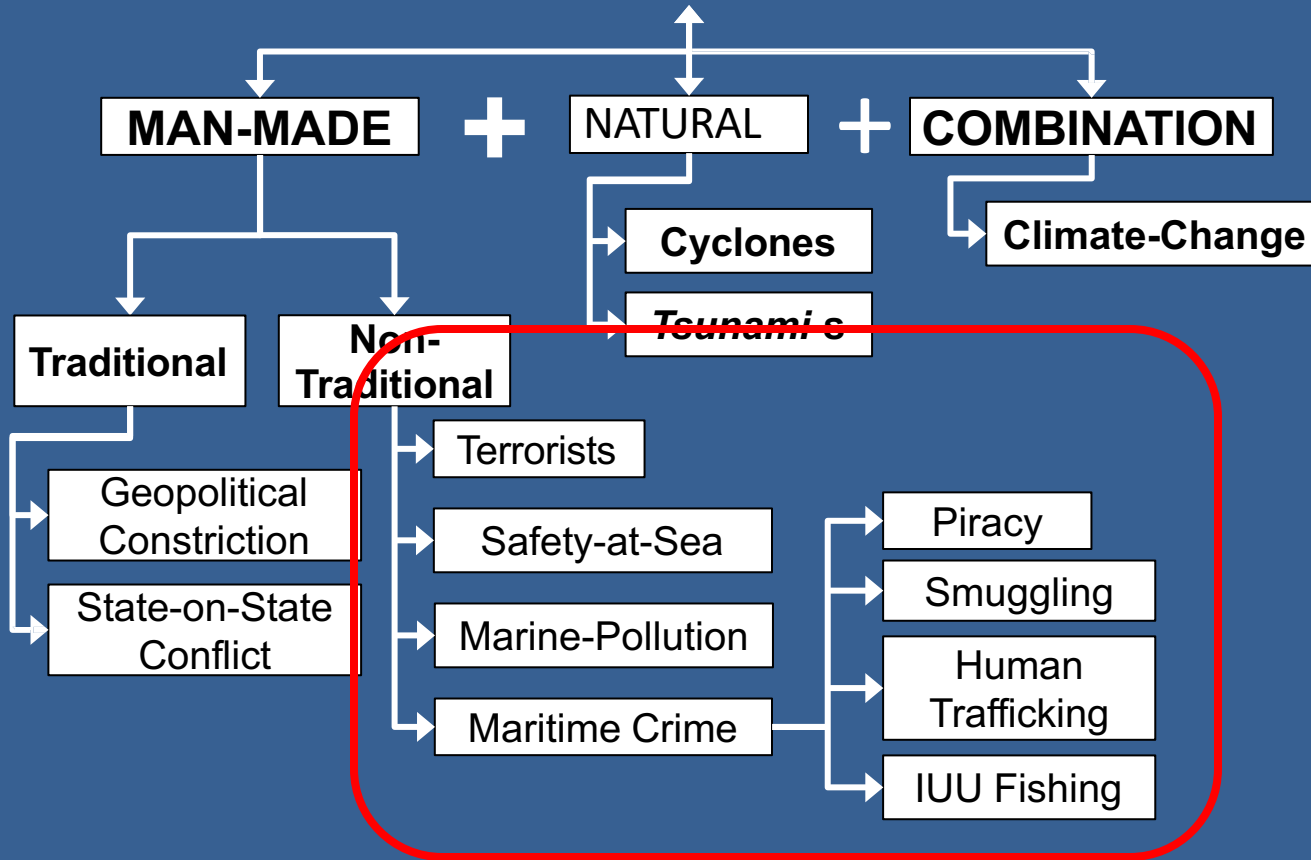
➤ Traditional

- ✓ Pak Maritime Doctrine – Offensive Approach
- ✓ China Proactive maritime Presence in IOR – Scenario
- ✓ Collusive Pak-China Nexus in IOR

➤ Non-traditional - From and at the Seas

- ✓ State supported acts of non-State rogue elements
- ✓ Man-made maritime security challenges
- ✓ natural calamities and disasters

Threats Arising 'In-', 'From-', or 'Through' the Sea



Monitoring Threats through MDA

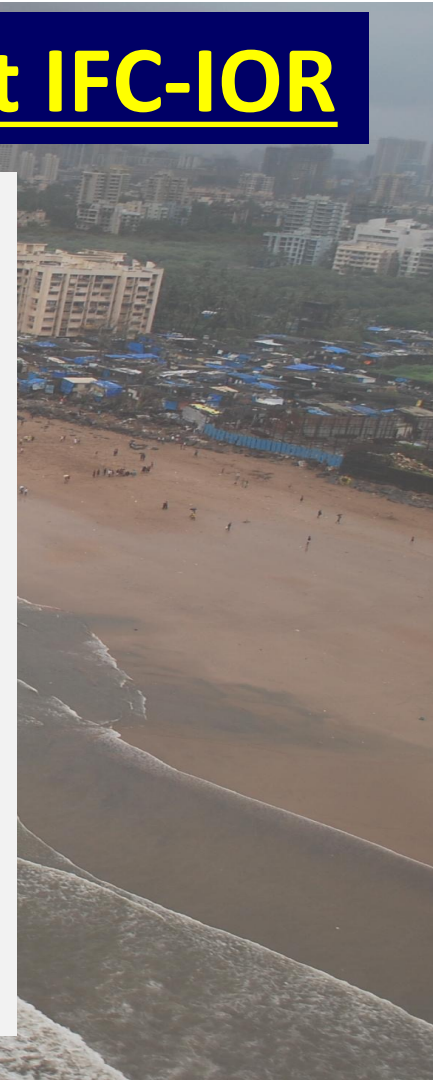
- **Satellite-based surveillance technologies**
- **Maritime reconnaissance and AEW aircraft**
- **Long range UAVs - ship-borne and shore-based**
- **Joint and single service identification systems with ability to discern between friend and foe**
- **Sub-surface surveillance including mobile and static systems - deployable from ships/submarines/aircraft**
- **Robust networking infrastructure to provide high-speed large-bandwidth connectivity for multi-media data sharing**
- **Effective cyber-space monitoring capability to safeguard own information**

Information Fusion Centre- IOR (IFC-IOR)

- **IFC-IOR established at Gurgaon on 22 Dec 18**
- **A collaborative MDA architecture for regional maritime safety and security**
- **To mainly address non-traditional threats – Piracy, Armed Robbery, Human & Contraband Trafficking, IUU Fishing, Arms Running, Poaching, Terrorism**
- **Working level linkages established with more than 50 nations and multinational/ maritime security centres**
- **Hosts International Liaison Officers (ILOs) from 12 partner nations**
- **Publishes Monthly Maritime Security Updates, Half Yearly Overview and Annual Reports**
- **Monthly weather forecasts and weather warnings also published**


Information/Technologies Fusion at IFC-IOR

- **Info of vessels at Sea – From National AIS Chain**
- **Space-based AIS Data from *Resource-sat* Satellites**
- **Data from Coastal Radars**
- **Long Range information and Tracking (LRIT)**
- **Info from ‘White Shipping Agreement’ Partners**
- **Maritime Security Information System (MSSIS)**
- **Info from IMO departments and organisations**
- **Info from Indian Ports association wrt ISPS code**



MDA Collaboration with other Stakeholders

- **Information Fusion Centre, Singapore**
- **Regional Centre for Operational Coordination (RCOC), Seychelles**
- **Regional Maritime Information Fusion Centre (RMIFC), Madagascar**
- **Great plans to engender comprehensive information sharing under the Indo-Pacific Maritime Domain Awareness (IPMDA) protocol, agreed between the QUAD group of countries**

A satellite map of the Indian Ocean region, showing the Indian Peninsula, the Arabian Sea, and the Bay of Bengal. The map is overlaid with several semi-transparent text boxes. A yellow box at the bottom contains a question. A white box in the lower-left contains the area of the Arabian Sea. Red and black text boxes provide context and requirements for surveillance. The map includes labels for cities: DLH, KOL, JES, GOA, and KCH.

That still leaves the challenge of ensuring that no dark ship comes in undetected through maritime area adjoining the Indian Peninsula

So information from, ships' radars, and various sensors of surveillance aircraft and UAVs is required

But we have seen that this will just not be adequate and sustainable, given the vastness of area in question

So getting information from Space-based surveillance – Electro-optic as well as Radar – systems becomes a must

**Arabian Sea :
38,62,000 sq km**

But, do we have sufficient number of remote sensing and data relay satellites to cover at least our 'Primary areas of maritime interest'?

Indian Maritime Space assets Requirement

<u>Domain</u>	<u>Existing Assets</u>	<u>Requirement</u>
Communication	GSAT-7 Rukmini	01 for redundancy
Remote Sensing and Surveillance (SBS)	<p><u>Sun-Synchronous Orbit</u></p> <ul style="list-style-type: none"> ➤ CARTOSAT 2A & 2B ➤ CARTOSAT 2 series Addl. ➤ CARTOSAT-3 ➤ EROS-B ➤ RISAT-2, 2B, 2BR SAR <p><u>GEO</u></p> <ul style="list-style-type: none"> ➤ INSAT-3A, 3D, 3DR ➤ KALPANA 	<p>SBS-2 – 8 EO Satellites – 4 SAR Satellites</p> <p>SBS-3 – ?? (Conceptualisation Stage)</p>
Space-based AIS	<ul style="list-style-type: none"> ➤ RESOURCESAT-2 ➤ RESOURCESAT-2A 	
PNT	<ul style="list-style-type: none"> ➤ IRNSS (NavIC) ➤ GAGAN 	More satellites in Stage 2 to cover Indo-Pacific Region
Wide Ocean-Area ELINT Satellites	-	At least 1 constellation of 4 satellites for early detection

**That's where huge opportunities lie for our
Space Industry, whether ISRO-backed NSIL,
or private players, or even start-ups.**

