

Analytical Review

MINE WARFARE IN THE STRAIT OF HORMUZ: OPERATIONAL TIMELINES, TECHNICAL REALITIES, AND STRATEGIC CONSEQUENCES – AN ANALYTICAL REVIEW

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Running title: Strait of Hormuz mining, naval disruption, and energy security risks

Abstract

This review examines Iran's potential to mine the Strait of Hormuz and the time required for clearance by the United States and its allies. Drawing on historical cases and current naval capabilities, it finds that Iran could disrupt shipping within days to a few weeks, especially in narrow chokepoints, while full mine clearance under conflict conditions could take months or longer. Factors such as mine types, naval tactics, and limited countermeasure assets would slow down operations, while nonmilitary effects like insurance withdrawal could further halt trade. The study highlights serious risks to global energy security, as the strait carries a major share of world oil transit.

Keywords: Strait of Hormuz, naval mining, Iran strategy, mine countermeasures, maritime security, energy supply, naval warfare, chokepoints

About author

Taha Nazir is a researcher, writer, and independent scholar based in Toronto, Canada. His work focuses on political analysis, international relations, and media discourse, with particular interest in South Asian geopolitics and global security dynamics. He has contributed to analytical writing and research commentary across various platforms, engaging with contemporary policy and governance issues.

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Data Source: Archives, Biographies, Databanks, Encyclopedias, Libraries, Metadata Registries, Reports, Repositories, arXiv, Crossref, OpenAI, Wikipedia, World Health Organization, Zenodo.

Conflict of Interest Statement: The author declares all potential conflicts of interest and affirms that any such interests have been appropriately disclosed in accordance with standard ethical guidelines.

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Peer Review Statement: This manuscript has not undergone external peer review, as it represents a structured synthesis and analysis of existing evidence. The methodological approach adheres to established standards to ensure rigor, transparency, and scientific validity.

Data Synthesis and Analysis

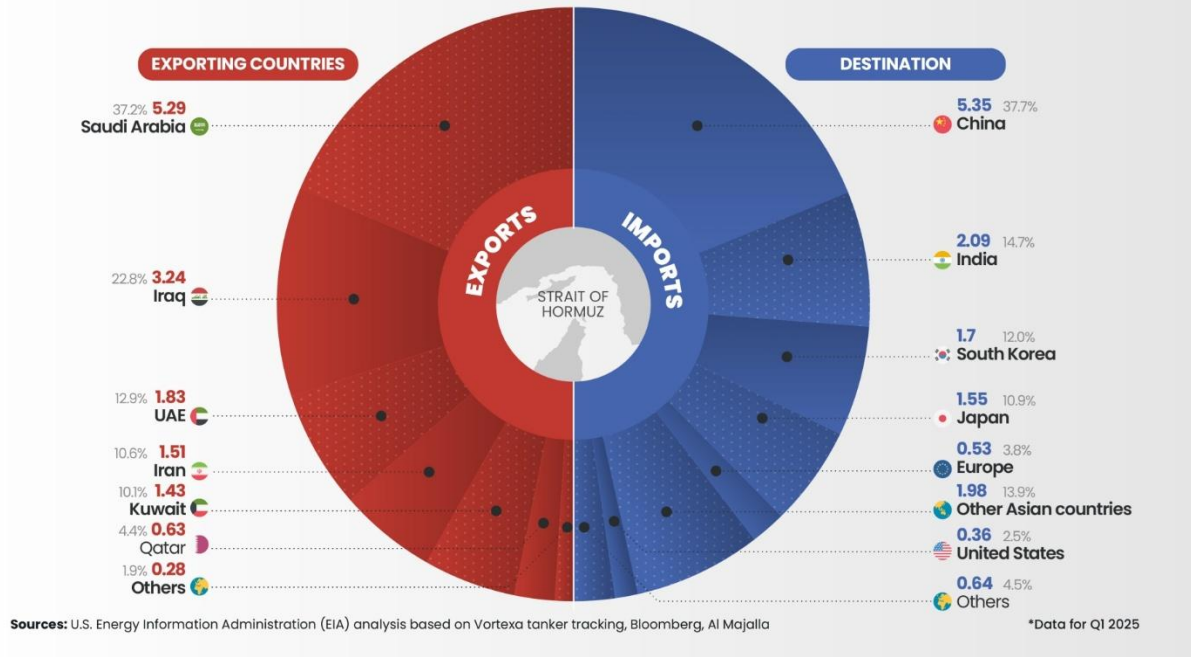
Data were synthesized using meta-analysis (fixed/random effects) with heterogeneity assessed by I^2 and Cochran's Q. Where pooling was not feasible, narrative and thematic syntheses were applied. Network meta-analysis and meta-regression were conducted where appropriate, in accordance with PRISMA and Cochrane guidelines.

Introduction:

The Strait of Hormuz constitutes one of the most strategically vital maritime chokepoints in the world. Roughly 21 million barrels of oil per day—approximately 21% of global seaborne petroleum—transit this narrow waterway between Iran (Bandar Abbas and Qeshm Island) and Oman (Musandam Peninsula). In any escalatory scenario involving Iran and the United States or its allies, naval mining remains a core component of Iran's anti-access/area-denial (A2/AD) strategy. This review provides a logically sequenced, evidence-based assessment of operational timelines for both mine laying and subsequent clearance, grounded in technical specifications, historical precedents, and current force structures.

Oil trade through the Strait of Hormuz

(Crude oil and condensate, million barrels per day*)



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Choke point: how the Iran war is stifling global energy markets | Al Majalla

Figure 1: Infographic illustrating daily oil trade volumes through the Strait of Hormuz (crude oil and condensate, million barrels per day) and primary exporting/importing nations (data: U.S. Energy Information Administration, Q1 2025).

Iran's Mine-Laying Capacity and Projected Timeline Iran maintains one of the world's largest naval mine stockpiles, estimated at 5,000–6,000 units. This inventory encompasses contact mines (e.g., K-8 and MD-500 series), advanced influence mines (acoustic, magnetic, and pressure-activated), and drifting mines capable of evading detection. The Islamic Revolutionary Guard Corps Navy (IRGC-N) employs a swarm-based doctrine utilising hundreds of small, high-speed fast attack craft (FACs) and dhows, each capable of deploying 2–3 mines per sortie.

The narrowest navigable channel in the Strait is only approximately 3.2 km wide. Deployment of even 500–1,000 mines in this confined sector—achievable within days using swarm tactics—would render commercial shipping operationally unviable. Historical precedent confirms the efficacy of limited mining: during the 1972 Operation Pocket Money, the United States laid only 36 mines to close North Vietnam's Haiphong Harbour; similarly, Iranian mining during the 1987–1988 Tanker War forced international convoys under Operation Earnest Will.

Under sustained coalition air and naval pressure, Iran could still achieve a militarily significant mine density in the critical chokepoint within **several days to a maximum of 2–3 weeks**.



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Figure 2: Iranian IRGC-N fast attack craft conducting high-speed operations in the Persian Gulf. These platforms form the backbone of Iran's rapid mine-laying swarm doctrine.

U.S. and Allied Mine-Clearance Operations: Timeline and Operational Constraints

Mine clearance under combat conditions is exponentially more demanding than laying operations. During the 1991 Gulf War (Operation Desert Storm), Iraqi forces emplaced approximately 1,300 mines off Kuwait. Coalition MCM forces required **more than two years** for complete clearance, even with post-hostilities access to Iraqi minefield charts. In one documented sub-operation, clearing 907 mines took 51 days under relatively permissive conditions.

Contemporary challenges are substantially greater:

- **Active Hostile Environment:** Clearance vessels and helicopters would face continuous threats from Iranian coastal anti-ship missiles (e.g., C-802 variants, Fateh-110), UAVs, and swarming FACs—conditions absent in 1991.
- **Asset Limitations:** The U.S. Navy has largely retired its Avenger-class MCM ships (e.g., USS Avenger, MCM-1; USS Warrior, MCM-10). Newer Littoral Combat Ships equipped with MCM modules remain operationally immature. European NATO contributions (Belgian/Dutch Tripartite-class, British Sandown-class) are numerically limited.
- **Mine Complexity:** Iran's mix includes drifting mines and sophisticated influence types, complicating detection in the Strait's variable currents.
- **Geographic Scale:** The broader Persian Gulf approaches encompass thousands of square kilometres, requiring systematic search patterns.

Expert assessments from the U.S. Office of Naval Intelligence and the International Institute for Strategic Studies indicate that full clearance and safe re-opening could require **several months to potentially two years or longer**, depending on Iranian resistance and initial mine density.





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Figure 3: U.S. Navy Avenger-class mine countermeasures ship (MCM) conducting operations. These vessels represent the backbone of legacy U.S. mine-clearance capability, many of which have been retired or repurposed.

Table 1: Comparative Operational Timelines for Mine Warfare in the Strait of Hormuz

Phase	Estimated Timeline	Primary Determining Factors
Iranian Mine Deployment	Several days to 2–3 weeks	5,000–6,000 mine inventory; IRGC-N swarm tactics with fast attack craft; 3.2 km narrow channel; resilience under coalition strikes
U.S./Allied Mine Clearance	Several months to 2+ years	Active combat environment; limited dedicated MCM assets (Avenger-class/LCS); advanced/drift mine types; geographic scale; 1991 Gulf War precedent (2+ years)

Psychological, Economic, and Non-Kinetic Effects

The mere threat or confirmation of mining triggers immediate systemic disruption. Maritime insurers typically suspend coverage, shipping companies reroute via the Cape of Good Hope (adding 10–14 days and millions in fuel costs), and global oil markets experience volatility. During the 1987–1988 Tanker War, Iranian mining alone caused insurance rates to surge and

forced multinational convoys. Similar dynamics were observed in the 2019 tanker attacks near Fujairah and the 2021 Suez Canal blockage, demonstrating how psychological effects often precede and exceed physical impacts.

Conclusion

Iran possesses both the quantitative inventory and doctrinal capability to disrupt maritime traffic through the Strait of Hormuz within days to weeks via naval mining. Restoration of safe navigation under combat conditions, however, represents a protracted, high-risk endeavour likely spanning many months to several years. These timelines are shaped by technical specifications, historical lessons from the 1991 Gulf War and 1987–1988 Tanker War, and Iran's asymmetric A2/AD advantages in a confined littoral environment.

For global energy security—particularly for major importers such as China (37% of its oil via Hormuz), India, Japan, South Korea, and Europe—the implications are profound. Strategic planning must therefore treat naval mine warfare in the Hormuz chokepoint as a high-probability, high-impact contingency, necessitating sustained investment in MCM capabilities, alternative routing resilience, and diplomatic de-escalation mechanisms.



Ethical Statement

This is a research-based manuscript prepared and structured in a scientific narrative review format. Modern AI-assisted tools were used to access current and authentic information from digital archives, bibliographic databanks, online libraries, research articles, academic repositories, and encyclopedias.

Preprint Notice

This manuscript is shared as a non-peer-reviewed preprint on platforms such as Zenodo, SSRN, and Research Square to support scholarly discussion. The content is research-based and developed using publicly available and verifiable sources. Readers are encouraged to interpret the material as preliminary and subject to revision.

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Literature Search and Information Management

Literature retrieval was conducted using a structured and reproducible search strategy in accordance with PRISMA-S reporting standards. Search strategies were independently evaluated using the PRESS framework to ensure methodological quality, accuracy, and completeness. Grey literature was systematically identified using the CADTH *Grey Matters* framework to enhance coverage of unpublished, non-indexed, and policy-relevant sources, thereby minimizing publication bias and improving evidence comprehensiveness.

Risk of Bias and Evidence Quality

Risk of bias was assessed using validated, design-specific tools (RoB 2, ROBINS-I, QUADAS-2/3, AMSTAR 2, Newcastle–Ottawa Scale, and CASP). The certainty of evidence and strength of recommendations were evaluated using the GRADE framework, ensuring a standardized and reproducible assessment across study designs.

Review Typology and Reporting

Review designs were classified into standard categories (scoping, umbrella, rapid, qualitative, and mixed-methods), with reporting aligned to established guidelines (PRISMA-ScR, PRIOR, PRISMA-RR, ENTREQ, and PRISMA/MMAT) to ensure methodological rigor and transparency.



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