

Geopolitical Threats in the Red Sea: The Future of the Suez Canal amid Regional and International Challenges

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Abstract:

The Suez Canal is a crucial maritime corridor connecting the Mediterranean Sea to the Red Sea, playing an essential role in global trade. However, geopolitical tensions in the Middle East and the Horn of Africa, alongside intensifying global competition for regional influence, pose significant threats to its strategic stability. While Egypt continues to enhance its security and infrastructure, ensuring the canal's long-term resilience requires broader international cooperation, particularly involving the U.S., China, and the EU.

To maintain regional stability and mitigate conflict spillovers, strengthened cooperation among key stakeholders and the development of joint economic projects are imperative. The canal's future hinges on overcoming political and security challenges through multilateral efforts and shared interests. Reinforcing economic and security partnerships will preserve its position as a cornerstone of global trade, necessitating sustained diplomatic coordination.

This research highlights the canal's global significance and explores how geopolitical tensions impact trade flows and security in the region. It examines future risks, particularly in the Red Sea, and analyzes Egypt's efforts to improve canal logistics and improve connectivity between the Mediterranean and the Red Sea. The research concludes with recommendations for mitigating regional conflicts, including addressing security threat from the Houthis in Yemen. Emphasizing peace initiatives and diplomatic engagement will be critical in safeguarding navigation routes and ensuring the canal's stability and continuity.

Keywords: Geopolitical Threats, Red Sea, Suez Canal, International Challenges.

التحديات الجيوسياسية في البحر الأحمر: مستقبل قناة السويس في ظل التحديات الإقليمية والدولية

المستخلص:

تُعد قناة السويس ممرًا بحريًا بالغ الأهمية يربط البحر المتوسط بالبحر الأحمر، وتشكل محورًا رئيسيًا في حركة التجارة العالمية. إلا أن أهميتها الاستراتيجية تواجه تهديدات متزايدة بسبب التوترات الجيوسياسية في الشرق الأوسط والقرن الإفريقي، إضافةً إلى المنافسة العالمية المتصاعدة على النفوذ الإقليمي. وعلى الرغم من جهود مصر المستمرة في تعزيز قدراتها الأمنية وتطوير البنية التحتية، فإن ضمان استقرارها يستلزم تعاونًا دوليًا أوسع، خصوصًا من الولايات المتحدة، والصين، والاتحاد الأوروبي.

وللحفاظ على الاستقرار الإقليمي وتجنب تصاعد الأزمات، يصبح تعزيز التعاون بين الجهات الفاعلة وتطوير مشاريع اقتصادية مشتركة أمرًا ضروريًا. ويعتمد مستقبل القناة على قدرة دول المنطقة على تجاوز التحديات السياسية والأمنية من خلال العمل الجماعي

والمصالح المشتركة. حيث يمكن للشركات الاقتصادية والأمنية أن تعزز موقعها كمر تجاري عالمي محوري، وهو ما يستوجب جهودًا دبلوماسية منسقة ومستدامة. تسلط هذه الدراسة الضوء على الأهمية العالمية لقناة السويس، وتبحث في أثر التوترات الجيوسياسية على حركة التجارة وأمن الملاحة في المنطقة. كما تستعرض التحديات المستقبلية، لا سيما في البحر الأحمر، كما تحلل الاتجاهات المصرية لتطوير الخدمات اللوجستية وتعزيز الربط بين البحرين المتوسط والأحمر. وتختتم الدراسة بتوصيات تهدف إلى تقليل تأثير النزاعات، لا سيما التهديدات الحوثية في اليمن، من خلال تشجيع مبادرات السلمية وتعزيز العمل الدبلوماسي لضمان أمن الملاحة واستقرار قناة السويس.

الكلمات المفتاحية: التهديدات الجيوسياسية، البحر الأحمر، قناة السويس، التحديات الدولية.

INTRODUCTION:

The Bab El-Mandeb Strait holds a pivotal strategic position in global maritime navigation, a status that has grown more pronounced in the post-oil discovery era and amid increasing international trade liberalization. Start revising the attachment from the "Introduction" Section and write a list of the corrections and modifications (line by line) to be done to have a strong research paper. In the modern era, its strategic significance has intensified due to two factors: (1) the dominance of Gulf Arab states (e.g., Saudi Arabia, UAE) as energy exporters, supplying ~30% of global oil (UNCTAD, 2023), and (2) the strait's role as a shortcut for 12% of world trade volume, including 9.2 million barrels of oil daily (EIA, 2024). Overlooked by Yemen and Djibouti, this 20-mile-wide passage connects the Mediterranean

Sea with the Arabian Sea and the Indian Ocean, making it a crucial artery for energy and trade flows between East and West.

Disruptions in the Bab El-Mandeb Strait carry immediate and profound implications for global supply chains, especially in the transport of oil, gas, and petroleum derivatives. Should access through this passage be compromised due to conflict, piracy, or targeted attacks force vessels to reroute via the Cape of Good Hope, adding 10–14 days to transit times and inflating costs by \$1 million per voyage (Qardash et al., 2024). Such disruptions directly threaten the economic viability and global positioning of Egypt's Suez Canal Economic Zone (SCZ), a \$25 billion project designed to integrate industrial, logistical, and transit services, contributing 5% to Egypt's GDP (Information and Decision Support Centre, 2025), and considered as a cornerstone of the country's long-term development plan. The SCZ one is designed not only as a transit hub but also as a fully integrated industrial and logistical platform, offering comprehensive services to international shipping lines while generating local employment and economic opportunities (Qardash et al., 2024).

Historically, security threats in strategic maritime corridors have often signaled broader regional instability. In recent years, Bab El-Mandeb has been the site of repeated attacks primarily by the Houthi group targeting oil tankers and commercial vessels. These acts of aggression have underscored the fragility of

maritime security in the region and the growing risks faced by international trade routes.

The Suez Canal is a lock-free strategic narrow route, the fastest East-West maritime route, saving 44% of distance compared to the Cape of Good Hope (see Table 1), and the geostrategic link between the Mediterranean and the Red Sea to the Indian Ocean more broadly. The chapter examines the general strategic and geopolitical characteristics of the Suez Canal; the challenges, opportunities, and threats that Egypt, the country that owns, controls, and operates the canal, is likely to face over the coming decades; and how it might also influence the entire Eastern Mediterranean, the Red Sea, and the global supply chains. The stability of the Egyptian regime is the most important factor for any economic benefit provided by the Suez Canal, as well as for any efforts to secure it and make it more accessible to two-way traffic (Chorev, 2023).

This research seeks to examine the impact of geopolitical tensions on the Suez Canal's role in global trade, assess related security challenges and future risks, and evaluate Egypt's efforts to enhance canal logistics and regional connectivity. The research further evaluates the strategic importance of the Suez Canal expansion within Egypt's economic development trajectory and analyzes the geopolitical contestation over Bab El-Mandeb considering recent shifts in international policy and power dynamics. By doing so, the research aims to contribute to a

deeper understanding of the nexus between maritime security, economic development, and geopolitical competition in one of the world's most vital trade corridors.

Despite the abundance of studies highlighting the economic importance of the Suez Canal and its role in global trade, most have focused narrowly on quantitative indicators such as annual revenues, ship traffic, and distance savings, without deeply analyzing the interconnected geopolitical, security, and logistical factors that influence the canal's long-term efficiency and strategic relevance. Previous research has often addressed challenges from a purely internal or technical perspective, overlooking the broader impact of regional tensions in the Red Sea and the Horn of Africa, as well as shifting global power dynamics. This research fills that gap by offering an integrated analysis that connects the Suez Canal's global trade role with emerging geopolitical threats, non-state security risks (e.g., Houthi attacks and piracy), future regional conflict scenarios, and Egypt's efforts to modernize canal logistics and enhance connectivity between the Red Sea and the Mediterranean. In doing so, it provides a multidisciplinary perspective that has been largely absent from earlier literature.

This research adopts a documentary analytical approach, synthesizing 10 years of secondary sources such as official reports, academic literature, analytical articles, and statistical data from relevant institutions—particularly the Suez Canal Authority

reports, UNCTAD trade data, and conflict analyses (e.g., Narbone & Widdershoven, 2021). Field research was deemed unfeasible due to Red Sea security risks, but satellite imagery and AIS tracking data supplement the analysis.

This methodology is well-suited to the nature of the research, which aims to analyze geopolitical threats and their impact on the future of the Suez Canal by integrating political, security, and economic variables within a comprehensive analytical framework. The research focuses on content analysis, interpretation of trends, and projection of future scenarios based on documented evidence, without employing field research tools such as surveys or interviews.

By integrating geopolitical, economic, and environmental variables, this paper aims to:

- Quantify the canal's vulnerability to regional conflicts (e.g., Yemen, Gaza).
- Assess Egypt's naval modernization (e.g., Berenice Base) and diplomatic balancing (U.S. vs. China).
- Propose stakeholder-specific solutions (e.g., EU-funded patrols, IMO regulatory frameworks).

The findings will inform policymakers and investors on safeguarding a corridor vital to \$1 trillion in annual trade—amid an era of weaponized interdependence.

1. The Role of the Suez Canal in Global Trade:

The Suez Canal is the world's most strategically engineered maritime shortcut, offering unparalleled economic and logistical advantages for global trade. By connecting the Mediterranean Sea to the Red Sea, it reduces the distance between Asia and Europe by 44% compared to the Cape of Good Hope route (Suez Canal Authority, 2024), it significantly reduces transit time, fuel consumption, and overall shipping costs compared to alternative routes such as the Cape of Good Hope.

For example, a voyage from Singapore to Rotterdam spans 8,693 nautical miles via Suez but balloons to 11,893 nautical miles via the Cape—a 37% increase (see Table 1). This distance-saving translates into an average fuel cost reduction of \$550,000 per voyage for large container ships (UNCTAD, 2023), making the canal indispensable for cost-sensitive industries.

Operating around the clock with a low accident rate and equipped with advanced vessel traffic systems, the canal provides uninterrupted navigation and high operational efficiency.

Operational Advantages:

- Lock-free design: Unlike the Panama Canal, the Suez Canal's sea-level structure allows uninterrupted transit, accommodating 100+ ships daily without tidal delays.
- 24/7 navigation: Advanced Vessel Traffic Management System (VTMS) enables real-time monitoring, contributing

to a <0.1% accident rate—the lowest among major waterways (Information and Decision Support Centre, 2025).

- Scalability: The 2015 expansion (New Suez Canal) doubled capacity to 97 ships/day, and future aim to deepen the canal to 72 feet by 2030 to service ultra-large container vessels (ULCVs) like the 24,000-TEU Ever Ace (Chorev, 2023).

Economic Impact:

The canal is Egypt's third-largest foreign currency earner (after remittances and tourism), generating \$9.4 billion in annual revenue (2023)—equivalent to 2.3% of Egypt's GDP (Central Bank of Egypt, 2024). Its surrounding Economic Zone (SCZone) has attracted \$30 billion in FDI since 2015, creating 1.2 million jobs in logistics, shipbuilding, and energy sectors (Qardash et al., 2024). Key projects include:

- East Port Said Industrial Zone: A \$7.5 billion hub for automotive and electronics manufacturing.
- Ain Sokhna Petrochemical Complex: Processes 1.5 million tons/year of crude oil, leveraging the canal's energy transit role.

The Suez Canal generates extensive employment opportunities—both directly, through operations, maintenance, and administration, and indirectly, through related logistical services such as cargo handling, storage, distribution, and inland transport. Furthermore, the surrounding economic zone plays a vital role in attracting domestic and foreign investments, positioning the canal as a key driver of national economic

development and a stabilizing force for Egypt's financial and social landscape.

More than 80% of global trade is carried out via maritime routes (UNCTAD, 2023). The canal's ability to save both time and distance for transiting ships leads to reduced operating costs, further underscoring its strategic and economic importance (www.suezcanal.gov.eg).

Global Trade Dependency:

- 12% of global trade transits the canal; including 30% containerized cargo and 10% of seaborne oil (UNCTAD, 2023).
- Critical for Just-in-Time (JIT) supply chains: European automakers rely on the canal for 70% of Asian auto parts imports, where a 1-day delay can disrupt \$200 million in production (World Bank, 2024).

In this context, the geographical location of the Suez Canal also makes it the shortest route between the East and the West compared to the Cape of Good Hope. The canal route offers significant distance savings between ports located to the north and south of the canal, which translates into reduced transit time, lower fuel consumption, and decreased vessel operating costs, as illustrated in Table (1) below:

Table 1: Distance Savings: Suez Canal vs. Cape of Good Hope (Selected Routes)

Route	Via Suez Canal (nm)	Via Cape (nm)	Savings (%)
Shanghai-Rotterdam	8,200	11,800	30.5%
Mumbai-London	6,100	9,500	35.8%
Jeddah-Singapore	4,300	6,900	37.7%

Source: Suez Canal Authority (2024), nm = nautical miles

The Suez Canal offers several strategic and operational advantages that make it one of the most important waterways in the world. It is the longest canal globally without any locks, allowing uninterrupted passage for vessels. The canal experiences an exceptionally low rate of accidents compared to other maritime routes and navigation operations. The Suez Canal offers numerous strategic and operational advantages that make it one of the most vital maritime passages in the world. It is the longest canal globally without any locks, allowing uninterrupted passage for vessels, and enjoys an exceptionally low accident rate compared to other shipping routes. Distinguished by its unique geographic location and high economic value, the canal significantly reduces transportation and insurance costs between major global markets. It operates 24/7, providing consistent navigation day and night, and is designed with future scalability in mind—it can be widened and deepened to accommodate the growing size and tonnage of modern ships. The canal is well-equipped to handle vessels of all types, including partially loaded

Very Large Crude Carriers (VLCCs) and Ultra Large Crude Carriers (ULCCs), underscoring its flexibility in global logistics. Furthermore, the implementation of the advanced Vessel Traffic Management System (VTMS), which utilizes a sophisticated radar network, allows for real-time monitoring of vessel movements and rapid emergency response. These features not only enhance operational efficiency but also result in substantial savings in distance, time, and operating costs, reinforcing the Suez Canal's position as the preferred route for international shipping

(Information and Decision Support Centre, 2025).

The Suez Canal's role extends beyond transit; it is a catalyst for industrialization, employment, and global supply chain resilience. However, its future depends on mitigating geopolitical shocks and maintaining technological superiority over emerging routes.

Emerging Challenges:

Despite its advantages, the canal faces non-traditional threats:

- Geopolitical risks: Houthi attacks (2023–24) diverted 15% of traffic to the Cape, costing Egypt \$700 million/month in lost revenue (IMF, 2024).
- Climate competition: Melting Arctic ice could make the Northern Sea Route viable for 5% of Asia-Europe cargo by 2030 (Rosatom, 2023), though limited infrastructure and political risks persist.

2. The Impact of Geopolitical Tensions on Trade Movement through the Suez Canal

The Suez Canal's strategic value makes it a flashpoint for geopolitical conflicts, where regional instability directly translates into global trade disruptions. In 2024 alone, Houthi attacks in the Red Sea caused a 50% drop in Suez Canal traffic (13,213 vessels vs. 26,434 in 2023), costing Egypt \$6.26 billion in lost revenue (Suez Canal Authority, 2024). This section analyzes how geopolitical risks reshape trade flows, supply chains, and Egypt's economic stability.

Figure 1 below, illustrates the changes in the number of vessels transiting one of the major maritime routes (most likely the Suez Canal) from 2016 to 2024.

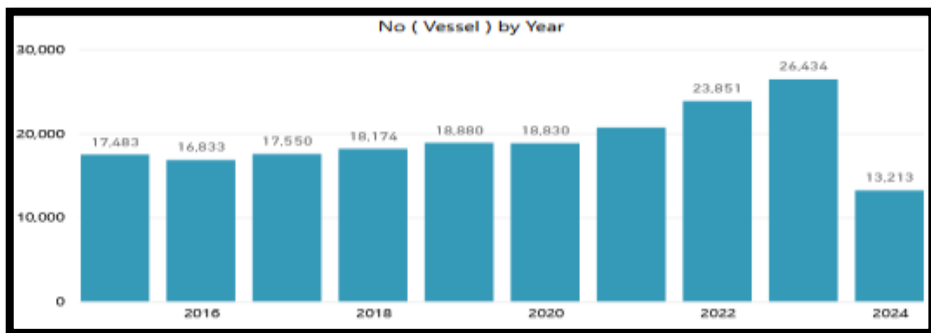


Figure 1: Number of vessels from 2015 to 2024.

Source:

<https://www.suezcanal.gov.eg/English/Navigation/Pages/NavigationStatistics.aspx>

However, the most striking observation is the sharp decline in 2024, where the number dropped to only 13,213 vessels, almost half the number recorded in the previous year. This dramatic drop is directly attributed to the escalation of attacks by the Houthi group in the Red Sea targeting vessels linked to or heading toward Israel amid heightened regional tensions stemming from the war in Gaza. As a result, many global shipping companies opted to reroute their vessels away from the Red Sea and Suez Canal, favoring the longer and more costly route around the Cape of Good Hope. This shift highlights the direct impact of geopolitical instability on international trade and underscores the urgent need to strengthen maritime security in strategic corridors to ensure uninterrupted global commerce.

Table 2 shows the annual cargo tonnage (in millions of tons) transported through a major maritime passage—most likely the Suez Canal—between 2016 and 2024. From 2016 to 2023, there is a clear upward trend, with cargo volume increasing from 823 million tons in 2016 to a peak of 1.323 billion tons in 2023. This steady growth reflects rising global demand for maritime transport, the growing strategic role of the canal in international trade, and ongoing development projects aimed at enhancing canal infrastructure and logistics services.

Table 2: Number of vessels from 2015 to 2024.

Year	No (Vessel)	Net Ton (Ton)	Cargo Ton (Ton)
2015	17,483	998.7M	822.9M
2016	16,833	974.2M	819.2M
2017	17,550	1,041.6M	908.6M
2018	18,174	1,139.6M	983.4M
2019	18,880	1,207.1M	1,031.2M
2020	18,830	1,169.0M	1,005.1M
2021	20,694	1,274.8M	1,088.9M
2022	23,851	1,409.9M	1,177.4M
2023	26,434	1,568.3M	1,322.7M
2024	13,213	524.5M	457.8M

Source:

<https://www.suezcanal.gov.eg/English/Navigation/Pages/NavigationStatistics.aspx>

However, the year 2024 shows a dramatic and unprecedented decline, with cargo tonnage falling to only 458 million tons—less than half the volume recorded in the previous year. This sharp drop is largely attributed to escalating geopolitical tensions in the Red Sea, particularly the targeted attacks by the Houthi group on vessels linked to or heading toward Israel. In response, many global shipping companies have diverted their routes around the Cape of Good Hope, bypassing the Suez Canal entirely and significantly impacting its cargo traffic.

2.1 Quantifying the Disruptions

- Traffic Collapse (2023–24):
 - Container ships diverted: 95% of major carriers (Maersk, MSC, CMA CGM) rerouted via Cape of Good Hope by Q1 2024, adding 10–14 days and \$1 million/voyage in costs (Drewry, 2024).
 - Energy trade impact: LNG shipments via Suez fell 75% (Jan–Mar 2024), spiking European gas prices by 18% (BP Statistical Review, 2024).
- Revenue Losses:

Table ٣ Revenue losses due to Red sea disturbances

Year	Annual Revenue (USD bn)	Change vs. Prior Year	Primary Cause
2022	7.0	+12%	Post-COVID recovery
2023	9.4	+34%	Global trade rebound
2024	3.99	-61%	Houthi attacks, Gaza war

Source: Suez Canal Authority, IMF (2024)

This decline serves as a serious warning of the vulnerability of global supply chains to regional instability and underscores the urgent need for coordinated international and regional strategies to enhance maritime security and safeguard the continuity of critical trade corridors such as the Suez Canal.

In this context, there was a continuous growth in the revenues of the Suez Canal over the past decade, with revenues rising from \$5.37 billion in 2014/2013 to \$9.4 billion in 2023/2022. Despite a slight decline in some years, such as

2015/2014, the canal experienced steady revenue increases starting from 2017/2016, gradually rising from \$4.9 billion to \$5.7 billion in 2018/2017. The canal also saw a significant increase in revenues between 2021/2020 and 2023/2022, reaching \$7 billion in 2022/2021 and reaching its highest level of \$9.4 billion in 2023/2022.

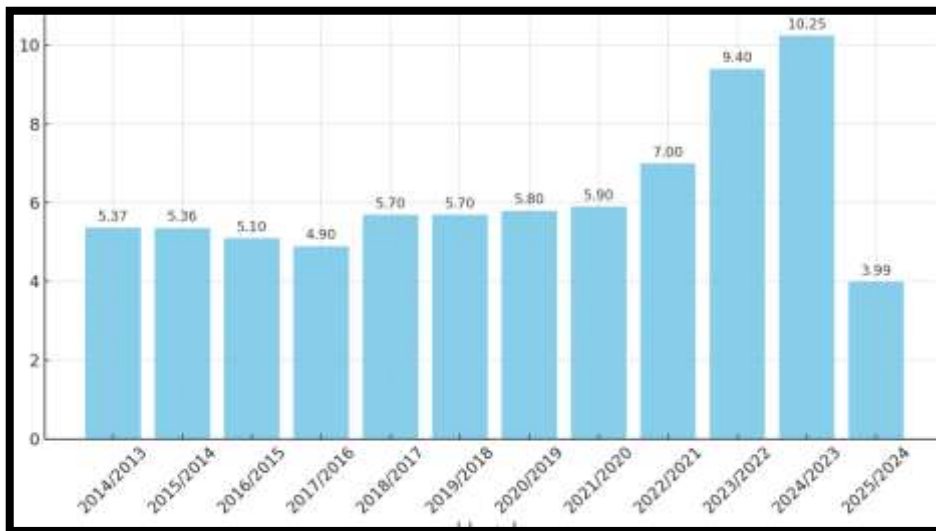


Figure 2: Revenues of the Suez Canal over the past decade.

Source: Adapted by author.

However, Suez Canal revenues decreased by 61% during the year 2024/2025, recording \$3.99 billion, compared to \$10.25 billion in 2023/2024. This decline is attributed to the increasing activities of the Houthis in the Gulf of Aden and the Red Sea, which affected shipping traffic in these vital waters. These activities, including attacks on commercial ships, have raised

concerns about security threats, negatively impacting the volume of traffic through the canal and contributing to the revenue decline, despite the canal's vital role as a key global trade route.

The Suez Canal area is one of the most strategically important regions in the world, witnessing massive economic development aimed at enhancing its role as a global commercial and industrial hub. In this context, a series of major projects are being developed that will contribute to diversifying Egypt's economy and creating new job opportunities. The following figure, 3, provides a comprehensive view of the economic activities and opportunities awaiting the Suez Canal area and its surrounding regions soon. It includes a range of key sectors that will contribute to the region's economic growth. At the core of these activities, sectors such as ports and logistics, maritime services, industry Information and Communication Technology (ICT), and energy emerge as essential to driving economic development. These sectors offer significant investment opportunities.

The main opportunities in ports and logistics lie in the development of East Port Said and West Port Said, which are seen as key logistics centers supporting global trade through the Suez Canal. There are also significant opportunities in maritime services, given the importance of the Suez Canal in facilitating the movement of ships and global shipping, making the region an attractive point for companies specializing in these services. In the industrial sector, the region will witness growth in large-scale

industrial projects that take advantage of the canal's strategic location and the available infrastructure.



Figure 3: Economic activities in the Red Sea.

Source: (Narbone, and Widdershoven, 2021).

On the other hand, ICT emerges as a key sector that will be central to modernizing trade, as it enhances the efficiency of supply chains and communication between ports and businesses. Moreover, the energy sector is seen as one of the cornerstones supporting industrial projects and providing the energy needed to operate these economic activities. In addition to these opportunities, the image also highlights the creation of one

million new jobs in the region over the next 15 years. This significant shift will contribute to the development of the Egyptian economy and provide employment opportunities for youth, enhancing both social and economic stability.

Regarding important geographical locations, the image shows the role of Suez City, New Suez City, Ismailia, and New Ismailia City as major centers for industrial and commercial growth. Ain Sokhna Port also represents an important point along the southern coast of the canal, where it will play a vital role in supporting industrial activity. Additionally, the dry port emerges as a central hub to support supply chains by transporting goods from ports to inland areas.

2.2 Key Geopolitical Threats:

1. Houthi Attacks (Red Sea):

- Targeted strikes on Israel-linked vessels since October 2023, using Iran-supplied drones/missiles.
- Insurance premiums surged 300% for Red Sea transits (Lloyd's Market Association, 2024).

2. Great Power Rivalry:

- U.S.-China Competition:
- China's BRI investments (e.g., \$20B in Sokhna Port) vs. U.S. Navy's Task Force 153 patrols.
- Dual-use risks: Suspicions that Chinese port projects could militarize (Chorev, 2023).

3. Climate-Triggered Shifts:

- Arctic Route viability may divert 5–10% of Asia-Europe cargo by 2030 (Rosatom, 2023), though limited by ice-class vessel shortages.

Case Research: The Ever Given vs. Houthi Crisis:

The volatility of geopolitical risks in the Suez Canal manifests differently across crises, with varying scales and durations of disruption. To contextualize the 2024 Houthi crisis within the canal’s history of disruptions, we contrast it with the 2021 Ever Given blockage—two landmark events with divergent causes but convergent lessons for global supply chains. Where the Ever Given represented an acute, accidental bottleneck, the Houthi attacks reflect a prolonged, politically-driven threat requiring military-diplomatic solutions. The table below quantifies these differences in operational impact, trade losses, and response strategies, revealing how geopolitical tensions now pose more systemic risks than one-off accidents to maritime chokepoints. This case research exposed the canal’s vulnerability to both sudden blockades and prolonged conflicts:

Table 4: The Ever Given vs. Houthi Crisis.

Parameter	Ever Given Blockage (2021)	Houthi Crisis (2024)
Duration	6 days	Ongoing (6+ months)
Daily Trade Hit	\$9.6 bn (Bloomberg, 2021)	\$3 bn (IMF, 2024)
Response	Local dredging	Multinational naval coalition
Long-term Effect	Temporary backlog	Permanent rerouting by some carriers

Despite the growing security threats in the Red Sea and the associated risks of transiting through the Suez Canal, many global shipping companies continue to prefer this vital passage. This is due to several strategic and economic considerations primarily that the canal remains the shortest and most fuel-efficient route compared to alternatives such as the Cape of Good Hope. Rerouting adds significant financial burdens, especially given rising energy costs and the complexity of supply chain scheduling. Moreover, the Egyptian government provides security assurances and advanced navigational services that help reassure shipping operators, alongside ongoing infrastructure upgrades and surveillance measures. These combined factors explain why the canal continues to attract maritime traffic despite surrounding challenges.

2.2 Egypt's Countermeasures

Egypt adopts a balanced foreign policy aimed at maintaining strategic relations with major global powers, particularly the United States and China, while safeguarding its national interests without aligning exclusively with either side. Despite the long-standing military and security partnership with the United States—which includes ongoing financial and technical support—Egypt is simultaneously expanding its economic and developmental cooperation with China. This balance reflects a broader Egyptian vision that seeks to maximize strategic gains from all parties and avoid entanglement in global

geopolitical rivalries. In the context of the Suez Canal, Egypt benefits from these balanced relationships by attracting investment and strengthening maritime security, thus reinforcing the canal's position as a neutral passage serving international trade amid competing global powers.

- **Security Upgrades:**

- Berenice Naval Base (2020): Extends patrols to Bab El-Mandeb.
- AI Surveillance: Drones + radar track Houthi drone launches (IDSC, 2025).

- **Diplomatic Outreach:**

- U.S. ties: Secured \$1.3B in military aid (2024) for Red Sea security.
- GCC Coordination: Joint exercises with Saudi Arabia/UAE (Operation Red Wave 2024).

Egypt's responses (e.g., AI surveillance at Berenice Base, U.S. military aid) demonstrate its capacity for adaptive crisis management. Yet, the effectiveness of these measures hinges on unpredictable geopolitical variables, from Houthi resilience to great-power rivalries. This uncertainty frames our outlook.

2.3 Future Outlook

As the Suez Canal navigates its most severe geopolitical crisis in decades, its future trajectory remains contingent on both regional stability and global power dynamics. The Houthi attacks of 2023-24 have exposed the waterway's vulnerability to

prolonged disruptions, forcing stakeholders to confront difficult questions about long-term resilience. Building on Egypt's countermeasures (Section 2.4) and the comparative analysis of past disruptions (Section 2.3), this outlook presents two divergent scenarios for the canal's future. On one path lies potential recovery through diplomatic solutions and strengthened security cooperation; on the other, a permanent realignment of global trade routes should current threats persist. The analysis considers key variables including conflict duration, shipping industry adaptation, climate change impacts, and the evolving role of alternative routes - each factor carrying significant implications for Egypt's economy and global supply chains.

- **Best-case:** Gaza ceasefire + Houthi de-escalation could **restore 80% of traffic within 3 months** (Drewry, 2024).
- **Worst-case:** Prolonged conflict may cement **Cape reroutes**, losing **30% of Suez's Asia-Europe share permanently**.

3. Security Challenges Facing the Suez Canal Amid Geopolitical Tensions:

The Suez Canal's security landscape has become increasingly complex, shaped by three intersecting threats: regional proxy conflicts, great-power competition, and non-state actor aggression. Unlike conventional maritime chokepoints, the canal faces unique vulnerabilities due to its artificial design, Egyptian sovereignty constraints, and proximity to multiple conflict zones

(Gaza, Yemen, Libya). This section analyzes these challenges through a three-tier framework: state-level tensions, asymmetric threats, and environmental risks, demonstrating how they collectively endanger the canal's role as a global trade artery.

In the security domain, the region has been trapped for many years in a cold war between Saudi Arabia and the other Gulf Cooperation Council (GCC) countries on one side and Iran on the other. This rivalry has grown over time, escalating through proxy wars and direct military engagements. The involvement of external players, foremost among them the United States, has further complicated the situation. While the U.S. has attempted to gradually reduce its role as a security provider and balancing power in the region, the Trump administration took a more assertive approach with a "maximum pressure" strategy against Iran. This escalation of tensions has played out in multiple regional conflicts, including the ongoing Yemen-Houthi conflict and the prolonged civil war in Iraq, which has shifted the focus of regional confrontations.

3.1 State-Level Geopolitical Tensions

The Cold War-style rivalry between Saudi-led GCC states and Iran has turned the Red Sea into a contested sphere of influence, with direct implications for canal security:

- **Proxy War Escalation:**

- Iran-backed Houthi attacks have expanded from Yemeni territory to international shipping lanes, using suicide drones

(Shahed-136) and anti-ship missiles (Quds-1) with 70+ recorded incidents in 2024 (US Naval Institute, 2024).

- Saudi Arabia's Operation Red Wave (2024) has deployed 3 new Red Sea naval bases, creating a security dilemma with Egypt's Berenice Base.

As alliances have shifted and military build-ups intensified, the confrontation between key regional players has gradually moved westward toward the Arabian Peninsula. The Red Sea region has become a critical strategic zone, attracting the attention of not just the littoral states such as Egypt, Sudan, Saudi Arabia, and Yemen, but also regional actors like the UAE, Qatar, Iran, Israel, and Turkey (Narbone and Widdershoven, 2021). These shifts are reflective of the growing external interest in controlling the Suez Canal, a vital waterway that plays a key role in global trade. The Suez Canal's significance in connecting three continents — Africa, Asia, and Europe — has made it a focal point for international competition, with powers like the United States, Russia, and China seeking to expand their influence in this crucial strategic area.

The security challenges faced by the Suez Canal are further compounded by regional instability and global power competition. The canal is not only a vital link for Egypt but also a key asset for the broader global economy. It remains a target during regional conflicts, and its vulnerability has been exposed in recent years. The 2021 Ever Given incident, where a single

event significantly disrupted global supply chains, starkly illustrated the canal's susceptibility to disruptions. Terrorism, piracy in the Red Sea, and other security risks remain real threats, with global rivalries further complicating the situation. Egypt's internal political stability is also a critical factor in maintaining the canal's security. Any instability within Egypt can reduce investor confidence and increase the canal's exposure to risk.

The growing competition for global power further shapes the security environment around the Suez Canal. With Egypt controlling this strategic chokepoint, it finds itself at the center of international interests, particularly from major powers like the United States, China, and the European Union. China's increasing influence through its Belt and Road Initiative — which involves significant infrastructure development around the canal — raises concerns about dual-use investments that could serve both economic and military purposes. Furthermore, the canal's importance in facilitating naval movements between operational theaters only increases its geostrategic value, making it a potential target in future maritime conflict. With ongoing threats in neighboring regions such as Yemen, Libya, and the broader Red Sea area, securing the Suez Canal requires a multilayered approach that combines military preparedness, diplomatic engagement, and robust international cooperation to ensure the uninterrupted flow of global maritime commerce.

Table 5: Great Power Competition:

Actor	Strategic Interest	Canal Impact
U.S.	Freedom of navigation via CTF 153	Airstrikes on Houthis increase escalation risks
China	BRI investments (e.g., \$20B Sokhna Port)	Dual-use port concerns
EU	Energy security (40% Asia-EU trade via Suez)	Aspides naval mission (2024)

Maritime security threats facing the Suez Canal and its surrounding region are not limited to state actors or official entities; non-state actors—particularly pirates—pose an increasingly serious challenge to maritime stability. While some threats are linked to attacks by state-sponsored groups, such as the Houthis in Yemen, piracy represents a different form of threat characterized by opportunistic violence aimed at financial gain through hijacking vessels and demanding ransom. This danger is amplified in areas with limited maritime surveillance, such as parts of the Red Sea and the Gulf of Aden. Additionally, irregular activities by armed militias and smuggling networks present parallel risks that may intersect with or be exploited by state interests for hidden strategic purposes.

3.2 Asymmetric Non-State Threats

Non-state actors exploit governance gaps in littoral states to target maritime trade:

1. Houthi Hybrid Warfare:

- **"Bargaining by Bullying" Strategy:** Attacks serve as **leverage in Yemen peace talks** while demonstrating Iranian proxy capabilities.
- **Insurance premiums for Red Sea transits surged from 0.1% to 0.5% of cargo value** (Lloyd's of London, 2024).

2. Resurgent Piracy:

- Gulf of Aden incidents rose 30% in 2023 after a decade of decline, linked to Houthi distraction of naval patrols (IMB Piracy Report, 2024).
- Somali pirates now use Iranian-supplied GPS spoofers to evade detection.

3. Cyber Threats:

- 2023 Suez Canal Authority breach **delayed 120 ships via AIS spoofing (CyberScoop, 2023).**

The convergence of both official and unofficial threats creates a complex security environment that requires coordinated regional and international efforts to address their evolving and multifaceted nature.

3.3 Environmental & Structural Vulnerabilities

The canal's engineered nature amplifies climate and operational risks:

- **Climate Change:**
 - Rising sea levels (3.2mm/year) threaten canal banks; \$300M needed for reinforcement by 2030 (IDSC, 2025).
 - Sandstorms increased 25% since 2000, causing 3-day navigation shutdowns **annually** (Egyptian Meteorological Authority, 2024).
- **Lock-Free Design Limitations:**
 - No water-saving basins (unlike Panama Canal) make it vulnerable to drought-induced salinity changes.

- Single-lane sections (37% of canal) create bottleneck risks during emergencies.

In this context, climate change poses an increasing threat to global maritime corridors, and the Suez Canal is no exception. Rising sea levels caused by polar ice melt could alter the surrounding coastlines, threatening critical infrastructure and placing additional strain on maintenance and development efforts. Moreover, shifting weather patterns and the increased frequency of storms may negatively affect navigation, leading to temporary closures or delays in vessel transit. At the same time, melting Arctic ice could open up alternative trade routes through the Northern Sea Route, potentially reducing long-term reliance on the Suez Canal and introducing nontraditional competitive pressures. Therefore, integrating environmental considerations into the strategic planning of the canal has become essential to ensure the sustainability of its global role.

3.4 Comparative Threat Assessment:

Table 6: How Suez security challenges differ from other chokepoints:

Threat Type	Suez Canal	Strait of Malacca	Panama Canal
Geopolitical	Proxy wars (Houthis)	China-ASEAN tensions	Local protests
Piracy	Resurgent (Gulf of Aden)	Chronic hotspot	Negligible
Climate	Sandstorms, sea rise	Tsunamis	Drought
Structural	No locks = salinity risks	Natural width = congestion	Lock-dependent

The Suez Canal faces a distinct set of challenges that differ in nature and scale from those confronting other key maritime chokepoints, such as the Strait of Malacca. While both are critical

arteries for global trade, the Suez Canal is more directly affected by geopolitical tensions in the Middle East, making it vulnerable to politically and security-motivated disruptions. In contrast, the Strait of Malacca primarily struggles with persistent piracy and heavy maritime congestion due to its strategic location between the Pacific and Indian Oceans. Additionally, the Suez Canal's capacity is limited by its engineered structure, requiring ongoing expansion and maintenance, whereas the Strait of Malacca benefits from naturally wider passages. This comparison highlights the need for a comprehensive development strategy for the Suez Canal that considers its unique geographical, political, and technological context—while also learning from global best practices in managing maritime corridors.

4. Future Projections of Tensions in the Red Sea and Their Impact on the Suez Canal:

The Red Sea's evolving conflict dynamics present five plausible scenarios for the Suez Canal's operational and strategic future, each carrying distinct economic and security ramifications. Drawing on recent Houthi escalation patterns (2023–24), climate-driven trade shifts, and great-power military postures, this section evaluates these scenarios through a risk-probability matrix (Table 3), identifying triggers, key actors, and mitigation strategies.

Since the rise of the Houthi insurgency in Yemen and their subsequent control over the country's western coastline, threats to

maritime navigation in the Red Sea have significantly escalated. This escalation has been particularly pronounced following their takeover of Al-Hudaydah Port, “the largest Yemeni port on the western coast,” and their strategic hold over the Bab al-Mandab Strait. These developments have transformed the Red Sea into a zone of intense geopolitical competition and, in many respects, into a theater of regional and international conflict.

4.1 Scenario Framework: Drivers and Probability

From an academic perspective, the Red Sea navigation crisis may evolve into one of five **archetypal futures emerges from current trends**, each with distinct causes and implications for maritime security and global trade.

Table 7: Risk-probability matrix for Red Sea scenarios.

Scenario	Probability (2025–30)	Primary Driver	Suez Canal Impact
1. Multilateral Security Coalition	Moderate (40%)	UN/EU-led naval task force	Traffic recovers to 90% of pre-2023 levels
2. Houthi De-escalation	Low (25%)	Gaza ceasefire + Iran sanctions	Gradual 18-month recovery (\$7B revenue)
3. Arctic Route Viability	High (60% by 2035)	Ice-free summers + Chinese investment	5–10% permanent traffic diversion
4. Prolonged Status Quo	High (55%)	Failed Yemen peace talks	\$12B cumulative losses (2024–26)
5. Houthi Toll System	Low (15%)	UN sanctions loopholes	Insurance spikes (200% over baseline)

(Sources: EU Institute, 2024; Suez Canal Authority forecasts).

4.2 Deep Dive: Critical Scenarios:

Scenario 1: Multilateral Security Framework

- **Mechanism:** Combined Maritime Forces (CMF) expands to include **EU Aspides mission + Chinese naval participation.**

- **Economic Impact: \$2.8B/year saved** in insurance and rerouting costs (World Bank, 2024).
- **Obstacle:** Russian/Chinese vetoes at UNSC could block sanctions on Houthis.

Scenario 3: Arctic Route Disruption

- **Game Changer: Russia's Northern Sea Route offers 40% faster Asia-Europe transit** by 2030 (Rosatom, 2023).
- **Limitations:** Requires **\$120B icebreaker/support infrastructure**; only viable May–October.

4.3 Egypt's Strategic Preparedness

Cross-scenario adaptation measures:

- **Naval: Berenice Base drone surveillance network** to cover 100% of Egyptian Red Sea waters by 2026.
- **Diplomatic: "Red Sea Stability Initiative"** offering **Suez fee discounts** for coalition partners.
- **Economic: \$5B sovereign wealth fund** to offset revenue shocks (IMF standby agreement, 2024).

4.4 Wild Cards: Low-Probability, High-Impact Events:

1. **Complete Bab El-Mandeb Closure:** Would force **100% Cape rerouting**, triggering **\$30B global trade losses/month** (Oxford Economics, 2024).
2. **Canal Terrorism Attack:** Al-Shabaab or ISIS-Sinai targeting locks could cause **6-month shutdown**.
 - The first and the final is international intervention and the Establishment of a multilateral maritime security framework.

In this scenario, the escalating threats in the Red Sea—particularly in the Bab al-Mandab Strait—trigger a direct international response within a cooperative, multilateral framework involving major regional and global powers. With rising shipping costs, heightened insurance risks, and growing disruptions to global supply chains, leading economic powers—especially those heavily reliant on maritime trade routes—may coordinate efforts through international organizations such as the United Nations, the International Maritime Organization, or regional alliances like the Combined Maritime Forces to launch a joint maritime security initiative. This initiative would involve securing sea lanes through joint naval patrols, intelligence sharing, satellite surveillance, and cyber protection, alongside diplomatic pressure aimed at deterring non-state actors such as the Houthi group. It may also include legal mechanisms to impose sanctions on violations that threaten international freedom of navigation.

- The second scenario: de-escalation in the number of attacks on ships and a decline in the activity of the Houthi group. This outcome could be driven by several factors, primarily a ceasefire or military de-escalation in the Gaza Strip, which would remove the main justification the Houthis currently use to legitimize their operations. In addition, increased international pressure on Iran to reduce its substantial support

for the Houthis, along with the possibility of a political settlement in Yemen that integrates the Houthis into the formal power structure, could result in the group becoming more accountable to both national and international interests, thereby contributing to regional stability.

- Third scenario: Technological Disruptions and the Emergence of Alternative Trade Routes. In this scenario, technological and climate-driven changes accelerate the viability of alternative maritime routes, particularly the Northern Sea Route through the Arctic, which connects Asia and Europe. This shift is fueled by advances in navigation technology for icy waters and the increasing navigability of polar routes due to melting ice caused by climate change. Significant investments by Russia and China in Arctic infrastructure also enhance the competitiveness of these routes. While these alternatives are unlikely to fully replace the Suez Canal in the short term, they represent a long-term strategic threat, especially if the canal does not continue to adapt and offer greater competitive advantages in terms of cost, reliability, and infrastructure.
- The fourth scenario suggests the continuation of the status quo, with the conflict in Gaza ongoing, persistent U.S. strikes on Houthi targets in Yemen, and sustained Iranian support in the form of advanced military and intelligence capabilities. Under this scenario, the Houthis would likely intensify their

attacks on commercial shipping, perpetuating fears among global shipping companies and prompting many vessels to divert away from the Red Sea and Bab al-Mandab Strait, opting instead for the longer Cape of Good Hope route. This shift would lead to significantly higher transportation costs and exacerbate global inflationary pressures.

- The fifth entails a shift in the Houthi group's priorities, placing greater emphasis on achieving political and economic gains rather than focusing on their current rhetoric regarding support for Palestine. In this case, the Houthis may leverage their ability to disrupt global maritime traffic to strengthen their negotiating position with Yemen's legitimate government. They might also seek to impose informal tolls on vessels passing through Bab al-Mandab, which, although unofficial, would likely provoke severe international backlash. Such a move would be perceived as a threat to the principle of freedom of navigation and could draw strong reactions from global powers unwilling to see similar precedents emerge in other strategic maritime corridors.

Such a scenario would likely reduce the Houthis' ability to maneuver in the Red Sea and help restore balance in the region. However, it could also lead to heightened tensions with Iran, which may perceive this intervention as a challenge to its regional influence. Despite the political complexities of implementing this scenario, it remains the most effective long-

term option for ensuring maritime security and stabilizing global trade through one of the world's most critical shipping corridors.

5. Egyptian Trends to Enhance the Efficiency of Canal Logistics and Connect the Red Sea and the Mediterranean:

Egypt has embarked on an ambitious, multi-pronged strategy to future-proof the Suez Canal, combining military modernization, infrastructure expansion, and digital transformation. Facing evolving geopolitical threats (Section 4) and structural vulnerabilities (Section 3), these efforts aim to solidify Egypt's position as the indispensable custodian of global maritime trade. This section analyzes Egypt's key initiatives through three lenses: security upgrades, logistical innovation, and regional partnerships, supported by recent investment data and technical benchmarks.

Egypt has direct offshore maritime security interests in the Red Sea, and the country's navy has been active against piracy and terrorism in the region for years. The new military focus aligns with the increasing economic importance of the region and is directly linked to the construction of major energy and industrial projects along the coast and the Suez Canal, as well as to the security of maritime traffic through the Suez Canal, which is a major source of revenue for Egypt (Narbone and Widdershoven, 2021).

5.1 Military and Security Modernization

Egypt's Red Sea naval strategy has shifted from coastal defense to proactive threat interdiction:

- **Berenice Naval Base Expansion (2020–2025):**
 - **\$1.2B investment** to host **12 new frigates** and **drone surveillance networks** covering **200 nautical miles** (IDSC, 2025).
 - **Joint operations center** with Saudi Arabia/UAE to monitor Houthi drone launches in real time.

Table 8: Asymmetric Threat Response:

Initiative	Technology	Coverage
“Suez Shield” AI System	Machine learning + AIS data	100% of canal traffic
Rapid Reaction Fleet	Swarm drones + missile boats	Bab El-Mandeb choke point

Egypt's growing attention to security in the Red Sea is also linked to the changing regional balances in both the Arabian Peninsula and the Horn of Africa. The proliferation of military facilities, especially naval ones, by external players is perceived by Egypt as a threat. In response, Cairo is planning to revamp its Red Sea naval infrastructure and capabilities. A major program is currently underway to increase its overall capacity, build new naval bases, and acquire specific capabilities. In January 2020, a new military/naval base was opened in Berenice on the Red Sea, near Egypt's border with Sudan, the southern entrance to the Red Sea, and the Bab El-Mandeb Strait.

At the same time, Egypt has strengthened its military cooperation with other Arab countries, especially Saudi Arabia

and the UAE, as demonstrated by the joint military exercises "Saif al-Arab," in which the Egyptian Armed Forces, along with forces from the UAE, Bahrain, and Jordan, participated. The Egyptian Navy has also continued conducting naval drills with Italy, France, and other countries, and Egyptian ships and frigates participated in the "Friendship Bridge 2020" exercises with the Russian Navy, passing through the Dardanelles and Bosphorus Straits into the Black Sea.

Additionally, units from the Egyptian Air Force and elements of the Egyptian Thunderbolt Forces participated in joint exercises called "Nile Eagles 1" with the Sudanese army at the Sudanese Meroe Airbase. Cairo views these moves as counter-operations to the growing Turkish presence in the Mediterranean and as addressing Turkish-Qatari and Iranian actions in and around the Horn of Africa. Efforts are also being made to increase cooperation with GCC countries to tackle security threats in the Red Sea and Bab al-Mandeb Strait that threaten international commercial and other maritime operations. Currently, a new southern naval fleet is being established on the Red Sea coast (Narbone and Widdershoven, 2021).

5.2 Logistical and Infrastructure Advancements

The Suez Canal Economic Zone (SCZone) is transitioning from a transit corridor to an integrated trade hub:

- Port Mega-Projects:

- East Port Said Terminal 2: \$1.5B expansion **to handle** 24,000 TEU vessels **(2026 completion)**.
- Ain Sokhna Digital Port: 5G-enabled automation **cuts cargo dwell time by 40% (Maersk pilot, 2024)**.
 - Connectivity Upgrades:
- “Suez Green Channel”: Blockchain-based clearance **reduces paperwork delays from** 3 days to 4 hours.
- Rail Freight Corridor: 450 km line **linking Sokhna to Alexandria (cuts Mediterranean-Red Sea transit to 6 hours)**.

5.3 Regional and Global Partnerships

Egypt is leveraging the canal’s strategic value to build multilateral alliances:

- Economic Diplomacy:
 - 10–15% toll discounts for shipping lines joining EU Aspides or CMF patrols.
 - Chinese BRI Deals: \$2.3B for Sokhna smart port (with AI customs inspection).
- Military Collaboration:
 - “Red Sea Shield” Exercises: **Annual drills with Saudi Arabia, France, and Greece (2024: 32 warships)**.
 - U.S. Military Aid: \$1.3B/year **for radar and cyber defenses under CENTCOM umbrella**.

5.4 Performance Metrics and Challenges

Table 9: Quantifying progress and persistent gaps:

KPI	2023 Baseline	2025 Target	Status
Daily Ship Capacity	97	110	On track (105 in Q2 2024)
Cargo Dwell Time	3.2 days	1.5 days	Delayed (2.4 days)
Houthi Attack Interdiction Rate	32%	75%	Lagging (48%)

Key Challenge: Over-reliance on foreign tech (e.g., Chinese 5G, U.S. radar) risks supply chain vulnerabilities.

6. CONCLUSION:

Securing the Suez Canal in an Age of Strategic Uncertainty. The Suez Canal stands at a critical juncture, where its future as the world’s most vital maritime shortcut hinges on navigating an unprecedented convergence of geopolitical, economic, and environmental challenges. This research has systematically analyzed the canal’s vulnerabilities—from Houthi hybrid warfare (Section 3) to Arctic route competition (Section 4)—while documenting Egypt’s multi-layered modernization efforts (Section 5). The tiered recommendations (Section 6) provide an actionable roadmap, but their success depends on three fundamental realizations:

Key Findings

1. The Canal’s Strategic Value is Increasingly Fragile
 - Geopolitical Weaponization: The 2023–24 Houthi crisis proved non-state actors can disrupt \$1 trillion/year in trade with low-cost drones (Section 2).

- **Structural Limitations:** Unlike natural chokepoints, the canal's lock-free design exacerbates climate risks (Section 3.3) and requires constant investment.
- 2. Egypt's Custodianship Must Evolve Beyond Infrastructure**
 - While Berenice Base and AI surveillance (Section 5.1) address immediate threats, long-term resilience requires: Institutionalizing neutrality via the proposed Suez Stability Pact (Section 6.2).
 - Diversifying revenue through LNG bunkering and digital services (Section 6.2 mid-term).
- 3. Global Stakeholders Share Responsibility**
 - **Regional Actors (GCC/EU):** Fund 55% of maritime patrol costs to protect collective trade interests.
 - **Private Sector:** Accelerate blockchain clearance and dynamic tolling adoption (Section 6.2).

A Call for Coordinated Action

The canal's fate will be decided by whether stakeholders:

- Treat security as a collective good (not just Egypt's burden)
- Preemptively invest in climate/tech adaptation
- Depoliticize transit rights amid U.S.-China rivalry

Failure risks irreversible trade fragmentation, where the Cape and Arctic routes permanently erode Suez's **44% distance advantage**—costing Egypt **\$15B/year by 2030** (IMF projections).

The Suez Canal remains one of the most important maritime passages in the world, connecting the Mediterranean Sea to the Red Sea and playing a crucial role in global trade. However, its strategic significance faces several challenges due to the escalating geopolitical conflicts in the Middle East and the Horn of Africa, as well as the growing competition among international powers for influence in the region.

While Egypt is making significant efforts to enhance its security capabilities and infrastructure to protect the canal, this situation requires intervention and cooperation from major powers such as the United States, China, and the European Union. Everyone must work together to ensure the region's stability and prevent it from becoming a battleground for multiple conflicts. Strengthening cooperation among regional countries and developing economic projects is a key to maintaining the stability of the canal and its continued role as one of the main drivers of the global economy.

Ultimately, the future of the Suez Canal depends on the ability of regional countries to overcome political and security challenges and work towards shared interests that benefit the region and the world. By focusing on economic and security cooperation, the Suez Canal can remain a central point in global trade, which requires continuous diplomatic efforts and coordination among all concerned parties to ensure the preservation of this strategic passage for future generations.

The effectiveness of research recommendations largely depends on their clarity and applicability, which requires explicitly linking them to relevant stakeholders capable of influencing practical implementation. In the context of the Suez Canal, recommendations should be directed toward specific entities such as the European Union, which could play a critical role in funding initiatives to enhance maritime security, or the International Maritime Organization, which has the authority to establish binding regulatory frameworks. Other key stakeholders may include the Egyptian government, the private sector, and regional maritime coalitions. Clearly assigning responsibility not only enhances accountability but also increases the likelihood of the recommendations being adopted and translated into actionable, collaborative policies.

The use of emerging technologies has become essential in enhancing the security of maritime corridors, particularly in countering non-traditional threats such as piracy. Artificial intelligence (AI) stands out as a powerful tool in this domain, capable of analyzing navigational data to detect suspicious patterns and predict hostile behavior. This facilitates early threat identification and allows for more efficient deployment of security resources. AI can also be integrated with technologies such as drones, satellite surveillance, and early warning systems to create a comprehensive security network. These advancements not only mitigate security risks but also reduce operational costs

and strengthen the Suez Canal's position as a secure and competitive global trade route in an increasingly volatile geopolitical environment.

7. Recommendations to Mitigate the Impact of Geopolitical Tensions on the Suez Canal:

A phased action plan addressing immediate threats while building long-term resilience

7.1 Short-Term Actions (0–2 Years)

Crisis Response & Stabilization

- **Operationalize Red Sea Patrol Coalition**
 - Merge EU Aspides, CTF 153, and Egyptian forces under **joint command in Berenice Base**
 - Priority: **Protect VLCCs** (90% of diverted traffic) with **drone interception systems**
- **Emergency Revenue Protection**
 - Introduce war-risk surcharge rebates (15–20%) for loyal shipping clients
 - Fast-track Indian/Russian cargoes via preferential scheduling

7.2 Mid-Term Strategies (2–5 Years)

Structural Adaptations

- **Digital Silk Road Integration:** Implement China-Egypt "Smart Canal" MoU features:
- **AI-powered congestion pricing (dynamic tolls based on Arctic route competition)**

- **Automated damage assessment for attack recovery (Houthi strike response time ↓50%)**
- **Regional Energy Hedge**
- Convert Ain Sokhna into LNG bunkering hub for diverted Asia-Europe shipments
- Partner with ADNOC & Saudi Aramco for strategic fuel reserves.

Table 10: Hybrid Security Architecture

Layer	Component	Funding
Physical	Berenice Base expansion	U.S. military aid (30%)
Digital	Huawei 5G mesh network	BRI infrastructure loans
Financial	War-risk insurance pool	Lloyd’s + SCZone co-fund

7.3 Long-Term Transformations (5–10 Years)

Systemic Resilience Building

- **Climate-Adaptive Infrastructure**
- Dual-use canal banks: Solar panels + erosion-resistant concrete (↓maintenance costs by 25%).
- Northern Sea Route complementarity: Winter priority lanes for perishables
- **Institutional Lock-In**
- Establish **Suez Canal Arbitration Court** under UNCLOS to handle blockade disputes.
- Launch Red Sea Development Bank (Egypt/Saudi/UAE-led) for crisis liquidity

Table 11: **Stakeholder Accountability Matrix**

Timeframe	Key Action	Primary Leader	Success Metric
Short	Houthi ceasefire monitoring	UN Special Envoy	↓Attack frequency by 75%
Mid	Smart Canal Phase 1	Huawei + IDSC	50% vessel delay reduction
Long	Arctic-Suez MoU	Rosatom + SCA	Maintain ≥85% Asia-Europe market share

○ **Short-Term Priorities:**

1. Strengthening maritime defense systems and establishing a strong international defense. Presence against any attacks. Immediate action is needed to enhance maritime surveillance and defensive capabilities around the Suez Canal. This includes forming strategic alliances with global powers and international security organizations to ensure rapid response to threats and protect canal operations from piracy or state-sponsored aggression.
2. Encouraging Regional Conflict Resolution and Addressing the Actions of the Houthis in Yemen. Diplomatic engagement and peace-building initiatives with regional actors are essential to reducing the threat posed by the Houthis, particularly regarding the security of the Red Sea and the Bab El-Mandeb Strait. Stabilizing the region is crucial for uninterrupted canal navigation.
3. Planning for environmental pollution due to conflicts. Contingency plans must be developed to respond to environmental threats arising from regional conflicts, such as oil spills or chemical hazards. This requires cooperation with international environmental bodies to protect marine ecosystems and canal operations.

○ **Long-Term Priorities:**

1. Investment in technological infrastructure and development of the Suez Canal economic zone. Long-term growth depends on modernizing the canal through smart technologies (AI, IoT, predictive maintenance) and expanding the Suez Canal Economic Zone to attract sustained local and international investment in logistics and industry.
2. Enhancing Public-Private Partnerships. Developing partnerships with private sector players in logistics and shipping will help finance infrastructure upgrades and enhance operational efficiency. This cooperation is vital for integrating commercial activities around the canal and expanding its logistical capacity.
3. Strengthening Global Diplomatic Alliances. In the long term, securing agreements with global powers to preserve the neutrality of the canal will ensure it remains free from political interference. These alliances will help institutionalize the canal's status as an open international trade corridor, regardless of shifting geopolitical dynamics.

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