

Middle East Maritime Disruption and African Trade Resilience: A Chokepoint-to-Resilience Transmission Framework

Sixbert Sangwa^{1*}; Faiz Ibrahim Bello²; Angel Keza³; Nakundwa Niisha Onimbo⁴; Deng Reech Bul Deng⁵; Abraham Abot Panom Makuei⁶; Jeremiah Nyaboga Onyango⁷; Divine Pacifique Ishimwe⁸; Jabea Nsombi Msola⁹; Esther Kasyoka Peter¹⁰; Ahmed Rashid Gafar Elhassan¹¹; Kiiza Ivan Mugisha¹²; Arnaud Rutabana¹³; Ella Joeva Kaliza Mbanza¹⁴; Daniel Muhirwa¹⁵; Nuake Justice Junior Tsekpo¹⁶; Brave Alain Gahunda¹⁷; Mutinta Muleya¹⁸; Lisa Sheila Twahirwa Isimbi¹⁹; Bercy Samuel Inyamibwa²⁰; Benitha Teta Ngarambe²¹; Shania Teta Umwali²²; Hervine Ishimwe²³; Ingrid Augustine Melingui Nkogo²⁴; Nia Abigail Njeri Wangechi²⁵; Mary Arny Ishimwe²⁶; Diane Ntihabose²⁷; Evans Wekesa²⁹; Victoria Ishimwe³⁰; Tiana Hawi Ogol³¹; Florence Fumie Kayode³²; Olivier Ndayishimiye³³

Received: April 6, 2026
Revised: July 8, 2026
Accepted: August 13, 2026
Published online: September 10, 2026

Abstract

Maritime chokepoints have become critical sites where geopolitical conflict is converted into trade cost, delay, uncertainty and unequal supply-chain exposure. This article develops and substantiates a Chokepoint-to-Resilience Transmission Framework explaining how conflict-related disruption around the Red Sea, Gulf of Aden, Suez Canal, Bab el-Mandeb, Cape of Good Hope route and Strait of Hormuz creates African trade vulnerability or resilience. The study uses a pragmatic critical-realist design that combines a completed PRISMA 2020-guided systematised evidence map, documentary policy synthesis and descriptive analysis of verified institutional indicators. The evidence map identified 62 records, screened 53 after removing duplicates and included 25 scholarly and institutional sources. Verified institutional evidence shows that Suez-linked rerouting can add approximately 12 days to a Shanghai-Rotterdam voyage, approximate a 30% transit-time shock, reduce effective container capacity by about 9% and increase containership arrivals around the Cape of Good Hope by 328% by gross tonnage by early March 2024 relative to early December 2023. Across Djibouti, Kenya, Tanzania and Sudan, reported Suez-route exposure ranges from 10% to 34% of foreign trade by volume, with a mean of 22.5% and coefficient of variation of 52.4%. The article integrates supply-chain resilience, time-as-trade-barrier economics, maritime connectivity, global value chains, trade facilitation and geoeconomic risk into an Africa-focused framework. African trade resilience requires route-risk monitoring, port productivity, digital customs, corridor redundancy, supplier diversification, data systems and strategic regional integration.

Keywords: African trade resilience; maritime chokepoints; Red Sea crisis; Suez Canal; Strait of Hormuz; maritime disruption; supply-chain resilience; trade facilitation

ssangwa@alueducation.com

Department of International Business and Trade, African Leadership University, Kigali, Rwanda

© The Author(s) 2026. Published by Journal of Financial and Management Sciences. This article is published under the Creative Commons Attribution (CC BY 4.0) license. Anyone may reproduce, distribute, translate and create derivative works of this article (for both commercial and non-commercial purposes), subject to full attribution to the original publication and authors. The full terms of this license may be seen at <http://creativecommons.org/licences/by/4.0/legalcode>

1. Introduction

1.1 Background and context

International business research can no longer treat trade as the frictionless movement of goods across abstract markets. Trade is materially routed through ports, canals, straits, corridors, customs systems, contracts, vessels, insurers and political spaces. Maritime chokepoints such as the Suez Canal, Bab el-Mandeb, the Red Sea corridor, the Cape of Good Hope route and the Strait of Hormuz are therefore not merely geographical passages. They are strategic infrastructures through which security risk, transport economics, energy dependence, port capacity, insurance pricing and state power converge. For International Business and Trade, this matters because firms do not trade through neutral space. They trade through corridors whose reliability is shaped by conflict, regulatory capacity, commercial concentration, logistics infrastructure and the capacity of firms and states to absorb disruption.

This article uses the term Middle East conflict-related maritime disruption to refer to the connected set of shipping risks created by the Red Sea crisis and attacks affecting the Gulf of Aden, Bab el-Mandeb, Red Sea and Suez Canal corridor, together with wider regional escalation and Strait of Hormuz shipping and energy-market risk. The concept is intentionally narrower than the total politics of the Middle East. It refers to the trade-relevant mechanisms through which conflict and security risk alter routing, transit time, freight cost, insurance exposure, energy prices, port demand and trade reliability.

The Red Sea crisis since late 2023 makes this problem unusually visible. UN Trade and Development reported that attacks affecting the Gulf of Aden, Red Sea and Suez Canal redirected vessels across major Asia-Europe and Asia-Atlantic lanes toward the Cape of Good Hope, increasing voyage distance, operational cost and logistics pressure (Bacrot & Faure, 2024).

That assessment estimated that rerouting from Shanghai to Rotterdam could add about 12 sailing days, that diversion around Africa represented roughly a 30% increase in transit time and that the shock could reduce effective global container shipping capacity by about 9% (Bacrot & Faure, 2024). UNCTAD later reported that global trade reached about US\$35 trillion in 2025 but was expected to slow in 2026 because Middle East conflict and Strait of Hormuz shipping disruptions were likely to intensify trade-cost, energy-cost, inflation and geoeconomic pressures (UN Trade and Development, 2026).

These disruptions matter to Africa in two analytically distinct ways. First, African economies are exposed to external logistics shocks because many rely on long-distance maritime routes for imported fuel, fertilizer, food, intermediate goods, medicines, machinery and export access. Second, Africa is positioned inside the rerouting geography because the Cape of Good Hope becomes more important when Suez-linked passage becomes risky.

UNCTAD estimated that the Suez Canal accounts for around 10% of global seaborne trade by volume and 22% of containerized trade, while Europe accounts for approximately 26% of Africa's imports and 26% of Africa's exports by value (Bacrot & Faure, 2024). It also estimated that Suez-linked routes account for approximately 31% of Djibouti's foreign trade by volume, 15% of Kenya's, 10% of Tanzania's and 34% of Sudan's (Bacrot & Faure, 2024). These values do not prove causal impact, but they show that route dependence is uneven and therefore analytically researchable.

The same disruption is also ambiguous. It imposes costs through delay, insurance pressure, container scarcity, freight-rate volatility, energy exposure, fertilizer risk and port congestion, yet it may create short-term opportunities for ports along the Cape route.

UNCTAD reported that by early March 2024 vessel arrivals around the Cape of Good Hope increased sharply, including a 328% rise in containership arrivals by gross tonnage compared with early December 2023, while South African ports such as Durban and Cape Town faced both congestion and increased demand for bunkering and related services (Bacrot & Faure, 2024). This duality is central to the paper's contribution: one external shock can harm trade reliability while simultaneously increasing the strategic value of specific African ports.

Existing scholarship provides strong conceptual tools but has not yet fully integrated the current Middle East-linked maritime disruption into an Africa-focused trade-resilience framework. Supply-chain resilience literature explains how firms and systems anticipate, absorb, recover, adapt and transform after disruption (Christopher & Peck, 2004; Pettit et al., 2010; Wieland & Durach, 2021). Trade economics demonstrates that time itself is a trade barrier because delays raise inventory costs, weaken reliability and reduce competitiveness, especially for time-sensitive goods (Djankov et al., 2010; Hummels & Schaur, 2013). Maritime economics shows that liner shipping connectivity affects bilateral trade performance (Hoffmann et al., 2020). Global value chain theory explains why vulnerability is distributed unequally across firms, countries, sectors and governance positions (Gereffi et al., 2005). What remains underdeveloped is an integrated account of how conflict-driven chokepoint disruption is transmitted into African trade vulnerability or resilience through route dependence, port capacity, trade facilitation, sectoral exposure and managerial adaptation.

This article makes three contributions. First, it develops the Chokepoint-to-Resilience Transmission Framework, a mechanism-based model explaining how maritime security shocks become African trade vulnerability or resilience through route reallocation, time-cost pressure, exposure amplification and moderating institutional-managerial capacities.

Second, it provides a PRISMA-guided systematised evidence map that consolidates scholarly and institutional evidence on maritime chokepoints, trade costs, supply-chain resilience, trade facilitation, global value chains and African exposure. Third, it advances a policy-relevant interpretation of African trade resilience that is neither crisis sensationalism nor naive optimism: external shocks are unevenly damaging, but their final consequences are mediated by port connectivity, customs systems, corridor reliability, firm bargaining power and regional trade capacity.

1.2 Statement of the Problem

Although Middle East conflict-related maritime disruption has become one of the most significant contemporary risks to global trade, there remains insufficient Africa-focused conceptual and evidence-based understanding of how chokepoint disruption is transmitted into African trade vulnerability or resilience. Institutional evidence documents rerouting away from the Red Sea and Suez Canal toward the Cape of Good Hope, longer transit times, higher operational pressure, congestion at selected African ports and exposure of East African economies to Suez-linked trade routes (Bacrot & Faure, 2024; World Trade Organization, 2025).

UNCTAD's April 2026 update further identifies conflict in the Middle East and Strait of Hormuz disruptions as a short-term trade headwind through energy, logistics, inflation and geoeconomic channels (UN Trade and Development, 2026). However, the literature has not yet sufficiently connected these macro-level disruptions to African country and sector exposure, port and corridor readiness, trade facilitation implementation and firm-level adaptation strategies.

This gap matters because many African exporters and importers operate in thin-margin, infrastructure-constrained and time-sensitive supply chains where additional days, unreliable containers, higher insurance costs, fuel-price pressure and port congestion can reduce competitiveness, raise consumer prices and weaken food, energy and input security. If the problem is not examined systematically, firms and policymakers may continue to respond reactively to each crisis rather than building evidence-based resilience capabilities. This article addresses the gap by synthesising traceable evidence and developing a framework that explains how Red Sea, Suez Canal, Bab el-Mandeb, Cape of Good Hope and Strait of Hormuz-related disruption creates African trade exposure, and how that exposure can be moderated by institutions, infrastructure, regional coordination and managerial adaptation.

1.3 Research objectives

1.3.1 General objective

To develop and substantiate an integrated Chokepoint-to-Resilience Transmission Framework explaining how Middle East conflict-related maritime chokepoint disruptions create African trade vulnerability or resilience through route reallocation, time-cost pressure, exposure amplification and moderating institutional-managerial capacities.

1.3.2 Specific objectives

1. To describe the magnitude, timing and trade-logistics pattern of Red Sea, Suez Canal, Bab el-Mandeb, Cape of Good Hope and Strait of Hormuz-related disruptions using credible secondary evidence.
2. To synthesise how selected African economies, ports, corridors and sectors are exposed through route dependence, import dependence, export time-sensitivity, energy or fertilizer vulnerability and port or corridor capacity.
3. To integrate disruption-intensity indicators, exposure mechanisms and resilience capacities into a testable Africa-focused framework without claiming causal effects that are not supported by available data.

4. To derive theoretically grounded and evidence-informed managerial and policy implications for African trade resilience under persistent geopolitical uncertainty.

1.4 Research questions

The article is guided by three research questions that reflect its framework-based evidence-synthesis design:

RQ1. What were the magnitude, timing and trade-logistics patterns of Red Sea, Suez Canal, Bab el-Mandeb, Cape of Good Hope and Strait of Hormuz-related maritime disruptions from November 2023 to the evidence cut-off?

RQ2. Which selected African economies, ports, corridors and sectors appear most exposed to these disruptions, and through which mechanisms does exposure occur?

RQ3. How can disruption-intensity indicators, exposure mechanisms and resilience capacities be integrated into a testable framework for analysing African trade resilience under maritime chokepoint disruption?

Table 1. Alignment among research questions, objectives and evidence sources

Research question	Aligned objective	Evidence base	Analytical contribution
RQ1	Describe disruption magnitude, timing and logistics pattern	UNCTAD, WTO and institutional maritime evidence	Documents measurable disruption pressures without inferring untested causal effects
RQ2	Synthesise African exposure pathways	UNCTAD exposure estimates, port/corridor literature and documentary evidence	Explains heterogeneity by country, port, corridor and sector
RQ3	Develop a testable framework	Theoretical synthesis, operational definitions and evidence map	Distinguishes shock, mechanisms, moderators and outcomes for future empirical work

Note. The table aligns each research question with the article's objectives, evidence base and analytical contribution.

1.5 Framework propositions

Consistent with its framework-based evidence-synthesis design, this article advances four theoretical propositions rather than statistical hypotheses. The propositions synthesise the reviewed evidence by specifying how chokepoint disruption, route reallocation, exposure amplification, resilience capacity and distributional effects interact within the Chokepoint-to-Resilience Transmission Framework.

Table 2. Chokepoint-to-Resilience Transmission Framework propositions

Proposition	Mechanism	Expected empirical implication
P1	Chokepoint disruption induces route reallocation and transit-time pressure.	Higher disruption intensity should be associated with longer transit times, vessel diversion and schedule unreliability.
P2	Exposure amplification depends on route dependence, sectoral sensitivity and corridor dependence.	Countries and sectors with high Suez-route dependence, imported critical inputs or time-sensitive exports should show greater vulnerability.
P3	Resilience capacity moderates exposure.	Trade facilitation, port connectivity, logistics infrastructure and regional diversification should reduce the severity of observed vulnerability.
P4	Distributional effects are unequal.	Actors with stronger bargaining power, capital buffers and route alternatives should adapt more easily than small firms, land-linked economies and time-sensitive exporters.

Note. The propositions summarise the framework's mechanism-based logic and identify relationships that can be examined in subsequent empirical research.

1.6 Expected contributions

The theoretical contribution is a named Chokepoint-to-Resilience Transmission Framework that integrates supply-chain resilience, time-as-trade-barrier economics, maritime connectivity, global value chain governance, trade facilitation and geoeconomics into one Africa-focused account. The framework extends resilience theory beyond firm-level redundancy by examining how disruption travels through routes, ports, border systems, sectoral dependencies and regional corridors before becoming firm-level vulnerability or adaptation.

The methodological contribution lies in the article's transparent evidential boundaries. It combines peer-reviewed scholarship with authoritative institutional sources, reports verified descriptive indicators and documentary mechanisms, and reserves causal estimation for research designs with harmonised machine-readable data.

The practical contribution is a structured way for exporters, importers, freight forwarders, port users and trade-support institutions to translate geopolitical risk into operational decisions about route choice, supplier diversification, inventory buffers, insurance exposure, delivery commitments and customer communication. The policy contribution is to link trade resilience to port productivity, digital customs, corridor coordination, data systems, regional diversification and AfCFTA implementation.

1.7 Scope and delimitations

The study is delimited to maritime trade disruption associated with the Red Sea, Suez Canal, Bab el-Mandeb, Cape of Good Hope rerouting and Strait of Hormuz from November 2023 to 28 May 2026. It is not a military, diplomatic or theological analysis of the Middle East conflict. The unit of analysis is conceptual and comparative: countries, ports, corridors, sectors and trade-resilience mechanisms are examined through secondary evidence rather than through primary interviews or surveys. The article refers to selected African cases where traceable evidence exists, and avoids treating Africa as a uniform unit.

1.8 Operational definitions

Table 3. Operational definitions of key terms

Term	Operational meaning in this article
Maritime chokepoint	A narrow or strategically concentrated sea passage through which significant volumes of international trade move and where disruption can create wider cost, time and supply effects.
Trade resilience	The capacity of a trade system, port, corridor, sector, firm or economy to absorb, adapt to, recover from or transform after disruption while maintaining acceptable trade performance.
Disruption intensity	The observable severity of a shipping disturbance, captured through route diversion, reduced transits, added sailing time, freight pressure, port-call shifts, insurance risk or schedule unreliability.
Exposure amplification	The process through which route dependence, import dependence, time-sensitive exports, energy/fertilizer vulnerability, port congestion or corridor dependence magnify the effect of a maritime shock.
Resilience capacity	The moderating capability created by trade facilitation, port connectivity, logistics infrastructure, regional diversification, managerial flexibility and reliable trade data systems.

Note. Definitions are authors' operational definitions for this framework article, informed by supply-chain resilience, trade-cost, maritime connectivity and trade facilitation literatures.

2. Literature Review and Theoretical Framework

2.1 Search strategy and PRISMA overview

The review was conducted as a PRISMA 2020-guided systematised evidence map rather than a claim to exhaustive bibliometric coverage. This distinction is important. A systematic review normally seeks comprehensive coverage of a precisely bounded literature. A systematised evidence map uses transparent search, screening and synthesis procedures to organise the evidence base for a conceptual and policy-relevant article. This design matches the manuscript's contribution: it develops an integrated framework and synthesises traceable evidence rather than claiming to estimate causal effects.

Searches were recorded on 28 May 2026 in Google Scholar for the open scholarly search component, with DOI and bibliographic verification conducted through Crossref metadata, original publisher webpages and title-level publisher searches. Subscription-indexed database exporting from Scopus or Web of Science was not used for this systematised evidence map; this boundary is disclosed so that readers can replicate the search strategy within the same open-access search architecture. The scholarly searches used combinations of maritime chokepoints, Red Sea crisis, Suez Canal disruption, supply-chain resilience, geopolitical risk, trade costs, time delays, liner shipping connectivity, global value chains and African trade facilitation.

Institutional searches were conducted directly through the websites and search functions of UNCTAD, WTO, IMF PortWatch, UN Comtrade, the World Bank, the UN Global Survey on Digital and Sustainable Trade Facilitation and the Suez Canal Authority. Inclusion criteria required relevance to maritime disruption, chokepoints, geopolitical risk, supply-chain resilience, trade costs, port connectivity, trade facilitation or African trade vulnerability. Exclusion criteria removed duplicates, unsupported opinion pieces, military commentary without trade relevance, inaccessible records and sources with insufficient methodological transparency.

Table 4. PRISMA search strategy and record yield

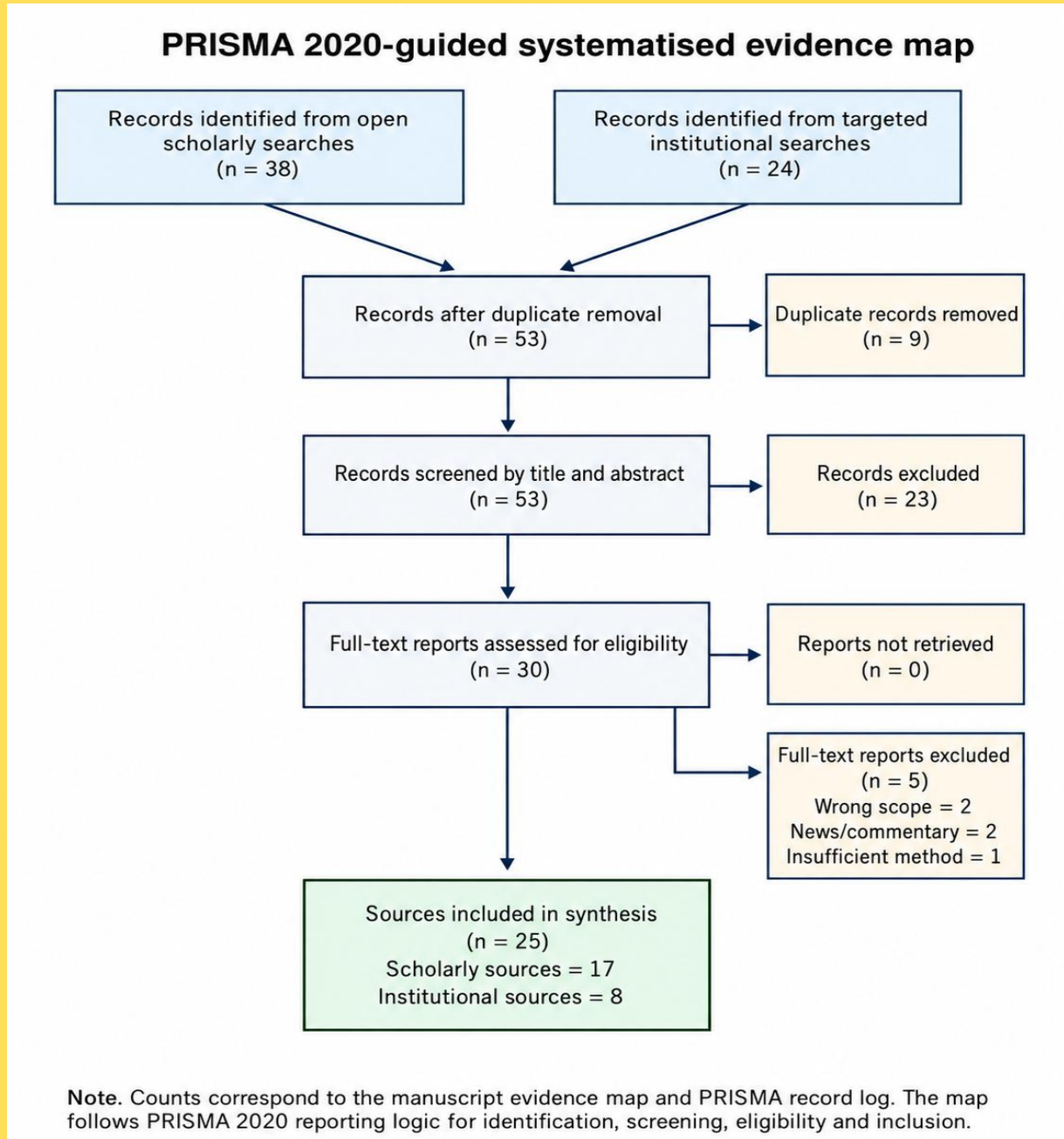
Search block	Search string or source family	Records identified	Records retained	Rationale
S1	"Red Sea crisis" AND shipping AND trade	6	3	Red Sea/Suez disruption and trade mechanism
S2	"Suez Canal" AND disruption AND Africa	5	3	Africa-specific routing exposure
S3	"maritime chokepoint" AND "supply chain resilience"	5	2	Chokepoint-resilience theory
S4	"geopolitical risk" AND maritime trade	5	2	Goeconomic risk
S5	"trade facilitation" AND "supply chain resilience" AND Africa	4	2	Trade facilitation as resilience moderator
S6	"liner shipping connectivity" AND trade flows AND Africa	3	1	Connectivity and African trade
S7	"time as a trade barrier" AND trade costs	4	2	Trade-time theory
S8	"global value chains" AND resilience AND geopolitical risk	3	1	GVC asymmetry and resilience
S9	"Strait of Hormuz" AND shipping disruption AND trade	3	1	Energy and chokepoint disruption
Institutional searches	UNCTAD, WTO, IMF PortWatch, UN Comtrade, World Bank, UN trade facilitation sources, Suez Canal Authority	24	8	Official evidence and data-source triangulation

Note. Full-text records assessed and inclusion/exclusion decisions are listed in Appendix A. The search was designed for a systematised evidence map, not an exhaustive bibliometric review.

Search platform specification. Search blocks S1-S9 in Table 4 were executed in Google Scholar and then checked through Crossref and publisher webpages where DOI, title or publication-status verification was required. The institutional search block was executed through targeted searches of UNCTAD, WTO, IMF PortWatch, UN Comtrade, World Bank, the UN Global Survey on Digital and Sustainable Trade Facilitation and the Suez Canal Authority websites.

The evidence map identified 62 records. After 9 duplicates were removed, 53 records were screened by title and abstract. Twenty-three records were excluded at screening; 30 full-text records were assessed; five were excluded at full-text stage; and 25 sources were included in the synthesis. Figure 1 reports this flow in PRISMA 2020 format.

Figure 1. PRISMA 2020 flow diagram for the systematised evidence map



Note. Counts correspond to the evidence-map log in Appendix A. The figure follows the reporting logic of Page et al. (2021).

Table 5. Evidence appraisal criteria

Criterion	Operational question	Use in screening and synthesis
Authority	Is the source produced by a peer-reviewed outlet, recognised institution, official data provider or clearly identifiable expert body?	Prioritised peer-reviewed scholarship and official institutional evidence; downgraded unsupported commentary.
Accuracy	Are claims supported by data, methods, citations, or transparent reporting?	Retained sources with traceable figures, identifiable methodology, DOI, stable URL or official publication status.
Relevance	Does the source address maritime disruption, trade costs, resilience, connectivity, trade facilitation, GVCs or African exposure?	Excluded military or news commentary without a clear trade or logistics mechanism.
Currency	Is the source temporally appropriate for a dynamic disruption?	Used current institutional evidence for Red Sea/Suez/Hormuz context and foundational literature for theory.
Purpose	Does the source inform analysis rather than simply advocate or sensationalise?	Separated institutional policy claims from peer-reviewed theoretical claims and avoided unverified causal language.

Note. The appraisal criteria were used to assess both peer-reviewed and institutional sources. Institutional sources were retained only where authority, relevance and traceability were sufficient.

2.2 Maritime chokepoints and geopolitical trade risk

Maritime chokepoints matter because they compress global interdependence into narrow corridors. A disruption at a chokepoint can affect shipping schedules, inventory cycles, commodity prices, energy availability, marine insurance and port congestion far from the original security event. This characteristic gives maritime trade a geoeconomic dimension: the geography of circulation becomes a channel of power and vulnerability. Geopolitical risk scholarship explains that political violence and uncertainty can depress investment, raise risk premiums and disrupt cross-border exchange (Caldara & Iacoviello, 2022). In maritime trade, these effects become operational through route deviation, security surcharges, waiting time, fuel costs and uncertainty around arrival reliability.

The Red Sea and Suez cases are especially consequential because they connect Asia, Europe, the Mediterranean and Africa. Bab el-Mandeb is not just a regional security concern. It is part of a global containerized trade system whose efficiency depends on predictable passage. The Strait of Hormuz adds an energy dimension because it is central to global oil and liquefied natural gas flows. For African economies, the combined risk is therefore not only import delay. It includes fuel price exposure, fertilizer vulnerability, higher manufacturing input costs and increased uncertainty for export sectors that must meet contractual delivery windows.

2.3 Red Sea, Suez, Bab el-Mandeb, Cape of Good Hope and Hormuz disruption literature

Institutional evidence shows that the Red Sea disruption changed routing behaviour on major lanes. UNCTAD reported that shipping lines redirected vessels around the Cape of Good Hope, increasing distance and time, and that the Shanghai-Rotterdam route could gain around 12 sailing days (Bacrot & Faure, 2024). The same report describes the diversion as a supply shock equivalent to roughly a 30% increase in transit time and around a 9% reduction in effective global container shipping capacity. Maritime-economics scholarship similarly interprets the Red Sea crisis as a disruption to vessel operations, shipping networks and maritime supply chains rather than as a narrowly local security event (Notteboom et al., 2024).

S. Sangwa et al.

WTO also recognises conflict-related disruption in Red Sea and Suez shipments as a factor affecting trade conditions (World Trade Organization, 2025).

The Cape of Good Hope rerouting creates a paradox for Africa. The same disruption that raises costs and delays for some trade flows can raise traffic and service demand for selected ports. UNCTAD's reported 328% increase in containership arrivals by gross tonnage around the Cape of Good Hope by early March 2024 illustrates this paradox (Bacrot & Faure, 2024). A sophisticated analysis must therefore avoid the simple narrative that Africa is only a passive victim of external shocks. Africa is exposed, but exposure is differentiated by geography, sector, port capacity and policy readiness.

2.4 African trade vulnerability and route dependence

African trade vulnerability is partly structural. Many economies depend on imported fuel, fertilizer, medicines, machinery, food and intermediate goods. Several export sectors are time-sensitive, including horticulture, fresh produce, tea, coffee, seafood and certain manufactured inputs linked to global value chains. Land-linked economies are exposed through corridor dependence, where a maritime delay can become an inland logistics delay through congested ports, customs backlogs, trucking availability, storage costs and exchange-rate pressure.

Route dependence is measurable but not homogeneous. UNCTAD's exposure estimates for Djibouti, Kenya, Tanzania and Sudan indicate that Suez-linked trade can represent a large share of foreign trade by volume (Bacrot & Faure, 2024). Sudan and Djibouti appear more exposed than Kenya and Tanzania in the cited estimates. Such heterogeneity justifies a purposive, theory-driven comparative logic rather than a continent-wide generalisation that ignores data availability and route-specific exposure.

2.5 Supply-chain resilience theory

Supply-chain resilience theory provides the manuscript's primary conceptual foundation. Christopher and Peck (2004) frame resilience as the ability of supply chains to recover from disturbance, emphasising visibility, velocity, flexibility, collaboration and risk awareness. Pettit et al. (2010) conceptualise resilience as the balance between vulnerabilities and capabilities, while Kamalahmadi and Parast (2016) show that the literature treats resilience as an enterprise and supply-chain capability built through preparedness, response, recovery, flexibility, redundancy, collaboration and learning.

Wieland and Durach (2021) deepen the discussion by distinguishing engineering and social-ecological perspectives on resilience. Ivanov and Dolgui (2020) extend resilience toward viability, arguing that intertwined supply networks require capacities that go beyond simple recovery to sustained functioning under severe disruption.

Applied to African trade, resilience is not simply whether goods eventually arrive. It concerns whether firms, ports, corridors and governments can maintain acceptable trade performance under stress. This includes alternative routing, inventory strategy, supplier diversification, port productivity, digital customs, reliable trade information, financial buffers and regional corridor coordination. The framework therefore treats resilience as four related capacities: absorption, adaptation, recovery and transformation.

2.6 Trade costs and time as a trade barrier

Trade economics has long recognised that costs are not limited to tariffs. Anderson and van Wincoop (2004) show that trade costs are central to international exchange, while Limão and Venables (2001), Francois and Manchin (2013), and Portugal-Perez and Wilson (2012) demonstrate the importance of infrastructure, institutions and trade facilitation for trade performance.

Djankov et al. (2010) show that time delays reduce trade, while Hummels and Schaur (2013) estimate that time costs behave like an ad valorem tariff equivalent. In the Red Sea and Suez context, delay is not merely administrative. It is geopolitical. A rerouted vessel creates extra distance, fuel use, crew time, schedule disruption, equipment imbalance and contractual uncertainty.

2.7 Maritime connectivity, ports and trade facilitation

Maritime connectivity shapes market access. Hoffmann et al. (2020) show that liner shipping bilateral connectivity affects bilateral trade flows, including evidence involving South Africa and Namibia. Port infrastructure and logistics performance similarly influence trade outcomes because ports are not passive nodes. They process, delay, price and sometimes absorb disruption. Notteboom and Rodrigue's (2005) port-regionalisation thesis is especially relevant because chokepoint disruption is transmitted not only through seaports but also through inland corridors, logistics zones and hinterland distribution systems. Notteboom, Pallis and Rodrigue (2021) further show that container shipping and ports respond to systemic disruption through network reconfiguration, capacity stress, operational adaptation and uneven resilience. When rerouting raises calls around the Cape, ports with stronger capacity may capture service opportunities, while congested ports may translate opportunity into bottleneck.

Trade facilitation provides the institutional side of resilience. Digital customs, risk management, agency coordination, pre-arrival processing, transparent rules and reliable border procedures reduce the amount of avoidable friction added to unavoidable external shocks. The manuscript therefore treats trade facilitation as a moderator: it cannot prevent Middle East conflict, but it can shape how deeply that conflict damages African trade performance.

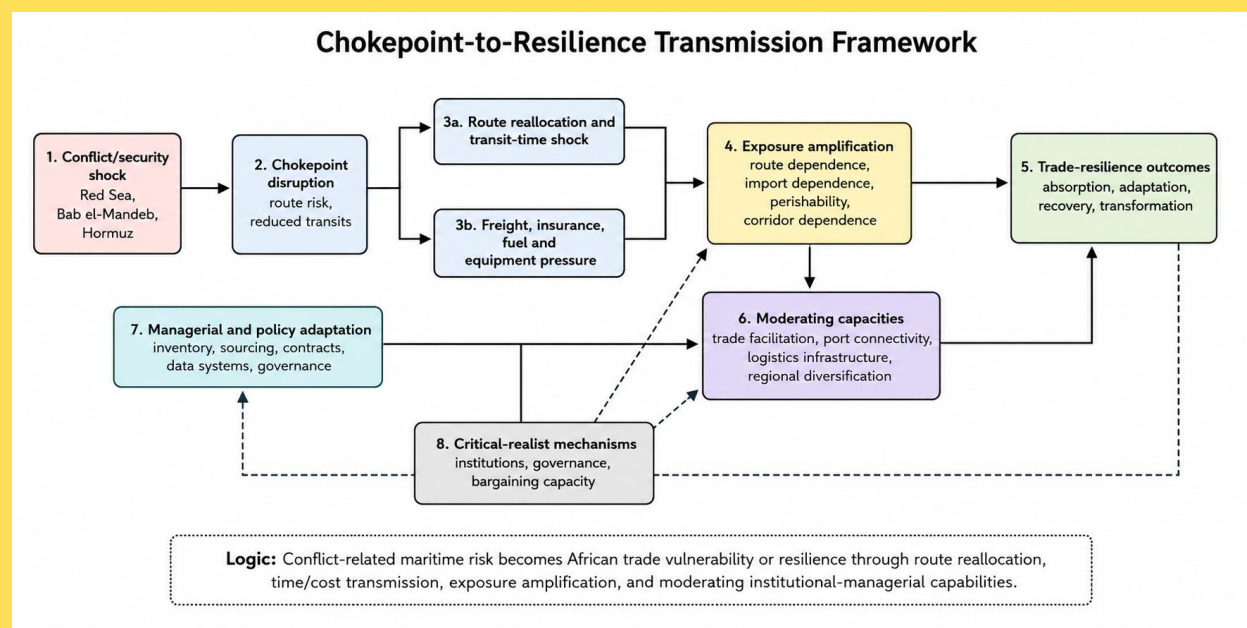
2.8 Global value chains and asymmetric vulnerability

Global value chain theory helps explain why trade shocks are unequal. Gereffi et al. (2005) show that production networks are governed through relationships that allocate power, value, information and risk unevenly. African firms in lower-margin or less powerful positions may have limited ability to pass freight increases to buyers or negotiate delivery flexibility. This matters because supply-chain resilience is not only technical. It is also political-economic. Firms with bargaining power can diversify routes, carry inventory, renegotiate contracts and absorb insurance premiums. Smaller firms may simply experience cost compression and lost reliability.

2.9 The Chokepoint-to-Resilience Transmission Framework

The Chokepoint-to-Resilience Transmission Framework links conflict-related maritime disruption to African trade-resilience outcomes through four mechanisms. First, chokepoint disruption changes route choice and transit time. Second, route changes produce freight-cost, insurance, fuel, equipment and scheduling pressure. Third, African exposure is amplified by route dependence, import dependence, export time-sensitivity, energy and fertilizer vulnerability, port congestion and corridor dependence. Fourth, resilience outcomes are moderated by trade facilitation, port connectivity, logistics infrastructure, regional diversification and managerial adaptation. Figure 2 visualises the model.

Figure 2. Chokepoint-to-Resilience Transmission Framework



Note. Authors' synthesis based on supply-chain resilience, trade-cost, maritime connectivity, trade facilitation, global value chain and geoeconomic risk literatures. The model separates shocks, pathways, mechanisms, moderators and outcomes.

2.10 Literature gap and theoretical contribution

The literature contains strong work on supply-chain resilience, time costs, maritime connectivity and global value chains, but it tends to treat these domains separately. The current disruption requires integration. A conflict in one region becomes an African trade problem through a chain of mechanisms: security risk becomes route change; route change becomes time and cost; time and cost interact with sectoral dependence; and exposure becomes resilience or vulnerability depending on institutional and managerial capacity. The theoretical contribution is therefore an integrated geoeconomic trade-resilience framework for analysing conflict-driven maritime disruption in Africa.

3. Methodology

3.1 Research philosophy and paradigm

The study adopts a pragmatic critical-realist orientation. Ontologically, the disruption has objective traces: vessel movements, port calls, freight-rate proxies, transit times, trade values and route changes exist independently of the researcher's interpretation. Epistemologically, however, these traces do not explain themselves. Their meaning is mediated by institutions, power relations, port governance, firm capacity, infrastructure, sectoral dependence and policy choice. A purely positivist design would risk reducing the phenomenon to traffic counts and coefficients. A purely interpretivist design would risk underplaying measurable logistics disruption. Pragmatic critical realism is therefore appropriate because it permits measurement while asking deeper causal questions about mechanisms and unequal capacities.

3.2 Research design

The study adopts a conceptual and evidence-informed framework design supported by a PRISMA-guided systematised evidence map and documentary policy synthesis. The analysis reports completed evidence mapping, source appraisal, documentary synthesis and descriptive extraction of verified institutional indicators. It does not estimate causal effects, regression models or panel relationships.

3.3 Data sources and evidence base

Data sources were selected on credibility, relevance, transparency and replicability. Priority sources included UNCTAD reports and statistics, IMF PortWatch, WTO trade outlooks and statistics, UN Comtrade, World Bank indicators, the UN Global Survey on Digital and Sustainable Trade Facilitation, the Suez Canal Authority and peer-reviewed literature on resilience, trade costs, ports, maritime connectivity, global value chains and geopolitical risk. Table 6 summarises the principal secondary-data sources and their methodological roles.

Table 6. Primary secondary-data sources and methodological role

Source	Owner	Variables or indicators	Use in article	Limitation
UNCTAD reports/statistics	UN Trade and Development	Rerouting, Suez exposure, global trade updates	Context and verified institutional indicators	Some values are report-based rather than downloadable panel data
IMF PortWatch	IMF and partners	Port calls, maritime trade flow estimates, chokepoints	Data-source architecture for future longitudinal analysis	Live extraction and harmonisation required for econometric testing
WTO trade outlook/statistics	World Trade Organization	Global trade conditions and Red Sea/Suez disruption context	Triangulation of trade context	Aggregate, not always Africa-port specific
UN Comtrade	United Nations	Country-commodity trade values	Trade-flow outcome source for future testing	Reporting lags and mirror-data issues
World Bank LPI 2.0	World Bank	Logistics speed, connectivity and reliability	Moderator of resilience capacity	May not align monthly with disruption timing
UN Global Survey on Digital and	UN Regional Commission	Trade facilitation implementation measures	Institutional capacity moderator	Biennial survey periodicity

Sustainable Trade Facilitation	ns and UNCTAD			
Suez Canal Authority	Suez Canal Authority	Canal transits, tonnage and navigation statistics	Route-specific exposure context	Access frequency and variable definitions require verification

Note. The table distinguishes sources used as verified evidence in this article from data portals suitable for future econometric testing.

3.4 Case logic and exposure pathways

The population of interest is African economies, ports, corridors and sectors potentially affected by Red Sea, Suez, Bab el-Mandeb, Cape of Good Hope and Hormuz-related disruption. Cases are not treated as a random sample. They are selected conceptually because they represent distinct exposure pathways: direct route exposure, canal-revenue exposure, port-service opportunity, corridor dependence and energy or input vulnerability. Table 7 presents this purposive logic and makes the limits of each case explicit.

Table 7. Purposive case logic for secondary-data analysis

Case	Exposure pathway	Reason for inclusion	Key variables	Expected limitation
Egypt/Suez Canal	Direct chokepoint and canal-revenue exposure	Central route node linking Red Sea, Mediterranean and global trade	Canal transit, revenue, route diversion	Official data frequency may vary
Djibouti	High Suez-route exposure	UNCTAD reports 31% of foreign trade by volume through Suez	Suez dependence, port/corridor flows	Small economy and transshipment complexity
Kenya	East African route exposure and time-sensitive exports	UNCTAD reports 15% exposure; horticulture and tea relevance	Trade values, transit exposure, sector mix	Separating maritime shock from domestic factors
Tanzania	East African route exposure	UNCTAD reports 10% exposure; regional corridor relevance	Suez exposure, port/corridor data	Exposure may be less direct
Sudan	High Suez exposure and conflict vulnerability	UNCTAD reports 34% exposure	Route dependence, import vulnerability	Domestic conflict confounding
South Africa	Cape route opportunity and congestion risk	Cape rerouting increases vessel demand around South African ports	Port calls, congestion, bunkering demand	Port-specific data access and multiple congestion causes

Rwanda	Land-linked corridor dependence	Maritime shock transmitted via regional corridors	Import dependence, corridor time, trade facilitation	No direct seaport; indirect attribution
--------	---------------------------------	---	--	---

Note. Cases are selected by theoretical relevance and data availability rather than random sampling. The table does not claim continental representativeness.

3.5 Variable and construct operationalisation

The constructs are operationalised to clarify the theoretical model and the evidential scope of the synthesis. Table 8 distinguishes disruption intensity, exposure amplification, resilience capacity and trade-resilience outcomes by linking each construct to observable indicators, expected directionality and relevant data sources.

Table 8. Construct operationalisation for the Chokeypoint-to-Resilience Transmission Framework

Construct	Operational indicators	Expected direction	Potential source	Analytical note
Disruption intensity	Reduced transits, route diversion, added days, port-call shifts, war-risk or insurance pressure	Higher values indicate stronger disruption	PortWatch, UNCTAD, Suez Canal Authority, shipping reports	Use multiple measures for robustness
Exposure amplification	Suez dependence, import dependence, time-sensitive exports, energy/fertilizer vulnerability, corridor dependence	Higher values indicate greater vulnerability	UNCTAD, UN Comtrade, WDI, port/corridor reports	Requires sector classification
Resilience capacity	Trade facilitation score, LSCI, LPI, port performance, corridor alternatives, data systems	Higher values expected to reduce vulnerability	UN Trade Facilitation Survey, UNCTADstat, World Bank, port authorities	May be lagged or infrequently updated
Trade-resilience outcomes	Continuity of trade flows, lower delay/cost sensitivity, recovery speed, adaptation, transformation	Negative outcomes expected during high disruption when resilience capacity is weak	Freight indexes, PortWatch, UN Comtrade, port data	Causal claims require controls

Note. The table identifies observable indicators that anchor the framework and clarify the evidential scope of the synthesis.

3.6 Evidence extraction and synthesis

Raw values from official reports were extracted without alteration and recorded in the evidence audit. For each figure used in the article, the source, reported value, interpretation and limitation were recorded. Documentary synthesis coded sources using mechanism-oriented categories drawn from the conceptual framework: route diversion, transit-time pressure, freight or insurance pressure, port congestion, energy or fertilizer exposure, trade facilitation, corridor resilience, regional diversification and managerial adaptation. This mechanism-based synthesis is appropriate for critical realist analysis because it seeks to explain how observable events become uneven outcomes through deeper structures and capabilities.

3.7 Reliability, validity, trustworthiness and robustness

Credibility is strengthened through source triangulation, transparent search and screening records, explicit inclusion and exclusion criteria, consistent operational definitions and cautious causal language. Construct validity is strengthened by distinguishing indicators from constructs. For example, a freight index is not the same as total logistics cost, and a port-call increase is not automatically evidence of improved port performance. Robustness is addressed conceptually by identifying alternative disruption measures, alternative exposure indicators and alternative explanations, including global demand shifts, energy price changes, domestic conflict, exchange-rate pressures, seasonal trade variation and port-specific governance failures.

3.8 Ethical considerations

The study uses secondary, non-human-subject data and therefore does not require informed consent from research participants. Ethical responsibility nevertheless remains. Researchers must represent data accurately, cite sources properly, avoid plagiarism, avoid invented statistics, disclose limitations and ensure that authorship reflects actual contribution and consent. The large co-authorship model requires transparent contribution statements, final approval by all listed authors and accountability for the integrity of the work.

S. Sangwa et al.

4. Evidence Synthesis and Framework Findings

4.1 PRISMA evidence-map results

The evidence map identified 38 records through open scholarly searches and 24 records through targeted institutional searches, for a total of 62 records. After removing 9 duplicates, 53 records were screened by title and abstract. Twenty-three were excluded at screening. Thirty full-text reports were assessed for eligibility, none were unavailable and five were excluded after full-text assessment. The final synthesis included 25 sources, consisting of 17 scholarly studies and 8 institutional sources. Appendix A provides the record status summary and full-text decision log.

4.2 Maritime disruption pattern and verified institutional indicators

Verified institutional evidence indicates a disruption pattern characterised by route deviation, longer transit time, reduced effective container capacity, port pressure around the Cape route and uncertainty around energy-linked chokepoints. Table 9 reports the main verified indicators used in the evidence synthesis. These indicators are sufficient to establish measurable exposure pathways and plausible resilience pressures, but they are not treated as causal estimates of trade-flow loss.

Table 9. Reviewed secondary-data evidence extracted from official reports

Reviewed secondary-data point	Reported value	Source	Interpretive relevance
Suez Canal share of global seaborne trade by volume	10%	Bacrot & Faure (2024)	Shows systemic relevance of Suez route
Suez Canal share of containerized trade flows	22%	Bacrot & Faure (2024)	Shows high container-shipping relevance
Shanghai-Rotterdam rerouting via the Cape	About 12 additional sailing days	Bacrot & Faure (2024)	Converts maritime insecurity into time-as-trade-barrier effects
Diversion around Africa	About 30% transit-time increase and 9% effective capacity reduction	Bacrot & Faure (2024)	Explains schedule and capacity pressure beyond direct attack zones
Cape of Good Hope containership arrivals by gross tonnage	328% increase by early March 2024 relative to early December 2023	Bacrot & Faure (2024)	Shows alternative-route pressure and port-service opportunity
Global trade in 2025	About US\$35 trillion, up about US\$2.5 trillion from 2024	UN Trade and Development (2026)	Macro baseline for 2026 slowdown risk
Middle East/Hormuz disruptions	Identified as the current primary global trade headwind	UN Trade and Development (2026)	Connects chokepoint disruption to macro trade outlook
Red Sea/Suez shipments	Disrupted by regional conflict	World Trade Organization (2025)	Triangulates institutional recognition of disruption

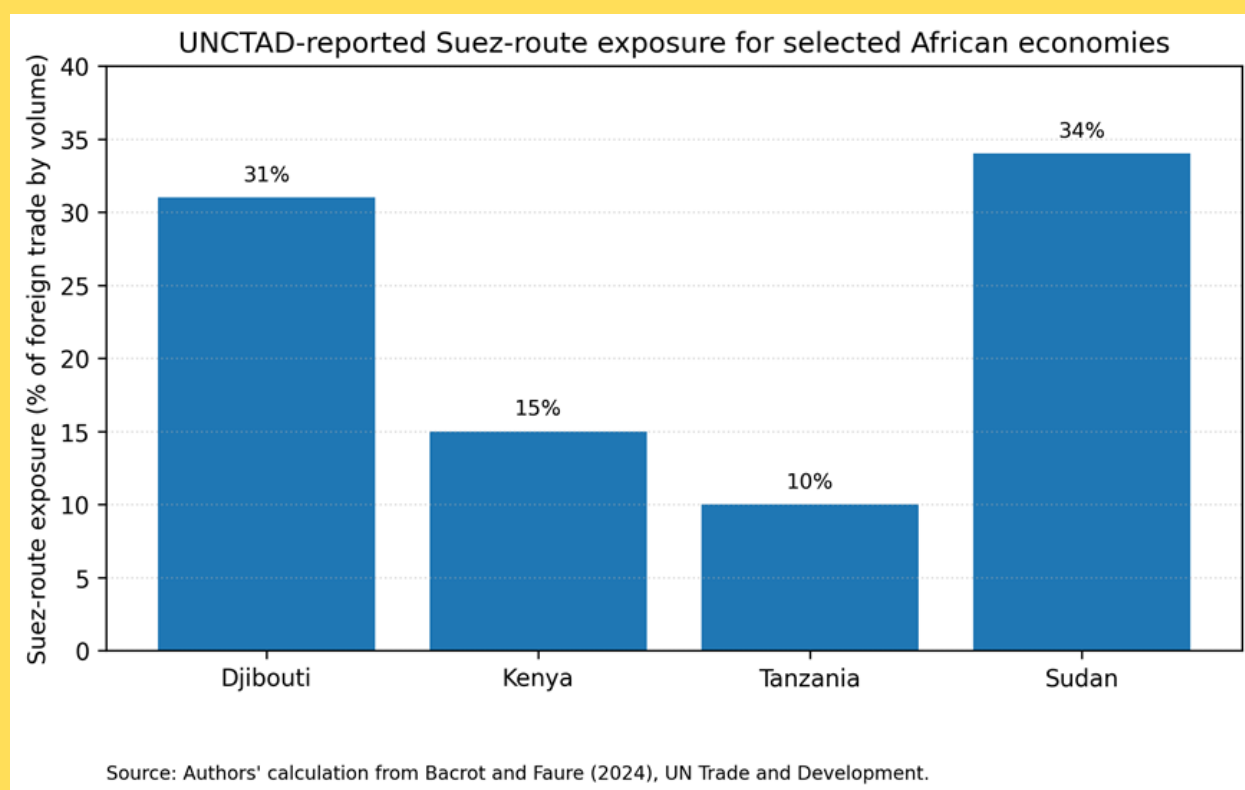
Note. Values are taken from cited official sources and listed as reported institutional indicators. They are not inferred from proprietary data.

4.3 African exposure heterogeneity

Exposure is uneven across African economies. UNCTAD's Suez-route exposure estimates for Djibouti, Kenya, Tanzania and Sudan range from 10% to 34% of foreign trade by volume (Bacrot & Faure, 2024). Figure 3 visualises the four country estimates. Table 10 reports descriptive statistics calculated from these values.

The mean is 22.50%, the median is 23.00%, the sample standard deviation is 11.79 percentage points, the range is 24 percentage points and the coefficient of variation is 52.4%. These descriptive statistics demonstrate heterogeneity. They do not establish causal impact, but they justify comparing highly exposed economies with moderately exposed economies and Cape-route ports.

Figure 3. UNCTAD-reported Suez-route exposure for selected African economies



Note. Authors' chart calculated from the UNCTAD estimates reported by Bacrot and Faure (2024). Values represent the share of each country's foreign trade by volume channelled through the Suez Canal.

Table 10. Descriptive statistics from UNCTAD Suez-route exposure estimates

Statistic	Value
N	4 countries
Mean Suez-route exposure	22.50%
Median Suez-route exposure	23.00%
Sample standard deviation	11.79 percentage points
Minimum	10%
Maximum	34%
Range	24 percentage points
Coefficient of variation	52.4%

Note. Authors' calculations from four country-level UNCTAD estimates: Djibouti 31%, Kenya 15%, Tanzania 10% and Sudan 34% (Bacrot & Faure, 2024).

4.4 Documentary policy synthesis

Documentary evidence points to five recurrent resilience priorities. Table 11 summarises these priorities and their managerial or policy implications. The synthesis is not a substitute for econometric estimation. It explains how authoritative institutions frame the mechanisms through which maritime disruption becomes trade vulnerability, port opportunity or resilience pressure.

Table 11. Documentary policy synthesis

Theme	Finding	Managerial or policy implication
Route diversification	Rerouting via the Cape reduces immediate security exposure but raises time, fuel, schedule and congestion costs.	Firms should compare route risk, delivery commitments, insurance terms and inventory buffers rather than simply choosing the shortest route.
Port readiness	Cape-route pressure can create short-term port-service demand but also congestion and reputational risk.	Port authorities should strengthen berth planning, bunkering coordination, digital port-call systems and hinterland links.
Trade facilitation	Volatile schedules increase the value of customs speed, digital documentation and border-agency coordination.	Governments should treat trade facilitation as resilience infrastructure, not only as administrative reform.
Energy and fertilizer channels	Hormuz and regional conflict risks may affect trade indirectly through fuel, fertilizer and inflationary channels.	Policy analysis should integrate maritime risk with food security, agriculture and industrial input planning.
Regional diversification	Land-linked and corridor-dependent economies are exposed through ports they do not control.	AfCFTA and corridor institutions should strengthen alternative corridors, data sharing and regional contingency planning.

Note. The synthesis is based on documentary coding of official institutional evidence and the mechanisms developed in the literature review.

4.5 Findings by research question

Table 12 summarises the evidence-based answer to each research question. The article distinguishes established descriptive evidence from framework propositions requiring future statistical testing. This distinction preserves the article's evidential boundary by separating verified descriptive evidence from framework propositions that require subsequent inferential testing.

Table 12. Summary of findings by research question

Research question	Evidence-based answer
RQ1	The reviewed evidence shows route diversion from Red Sea-Suez lanes toward the Cape of Good Hope, longer voyages, effective capacity pressure and wider energy/trade-cost risks connected to Middle East and Hormuz uncertainty.
RQ2	African exposure is uneven. Djibouti, Kenya, Tanzania and Sudan show different levels of Suez-route exposure, while South Africa faces alternative-route port-service opportunities and congestion risks. Land-linked economies may be indirectly exposed through regional corridors.
RQ3	The Chokepoint-to-Resilience Transmission Framework integrates disruption intensity, exposure amplification and moderating resilience capacities into a testable model. It specifies mechanisms that future studies can examine using PortWatch, freight-rate, port-authority, UN Comtrade and trade facilitation datasets.

Note. The table separates verified descriptive evidence from mechanisms that require future inferential testing.

5. Discussion

5.1 Interpretation of findings

The central interpretation is that Middle East conflict-related maritime disruption should be understood as a trade-resilience problem rather than as a distant geopolitical event. The transmission pathway is not mysterious: insecurity changes routes; route changes alter time, cost, reliability and insurance; these pressures interact with African exposure; and the final consequences depend on institutional and managerial capacity. This interpretation moves the debate beyond dramatic headlines toward measurable mechanisms.

5.2 Theoretical implications

The study extends supply-chain resilience theory by shifting the unit of analysis from the firm to the route-port-corridor-policy system. It extends time-as-trade-barrier theory by showing that delay can be geopolitically produced, not merely administratively produced. It extends global value chain analysis by emphasising that vulnerability depends on governance position and bargaining capacity. It extends trade facilitation theory by treating customs and corridor reforms as resilience capabilities rather than only efficiency reforms. The Chokepoint-to-Resilience Transmission Framework gives these extensions a common mechanism-based structure.

5.3 Comparison with prior literature

The findings are consistent with Christopher and Peck's (2004) emphasis on visibility and flexibility, Pettit et al.'s (2010) vulnerability-capability balance, and Wieland and Durach's (2021) argument that resilience can be viewed through multiple lenses. They also align with Djankov et al. (2010) and Hummels and Schaur (2013) by treating time as a real trade cost. The African contribution lies in integrating these literatures through the concrete geography of Red Sea, Suez, Bab el-Mandeb, Cape and Hormuz-linked disruption.

5.4 African trade-resilience mechanisms

African resilience mechanisms operate at several levels. Firms can diversify suppliers, revise contracts, improve demand forecasting, build targeted inventory buffers and strengthen freight-forwarding intelligence. Ports can improve berth productivity, yard management, digital documentation and congestion monitoring. Governments can support trade facilitation, alternative corridors, corridor observatories and transparent trade data systems. Regional institutions can strengthen interoperability, corridor governance and real-time information sharing. These mechanisms matter because resilience is not located in one actor. It is distributed across the trade system.

5.5 Managerial implications

Managers should treat geopolitical risk as an operational planning variable rather than an external news item. Exporters should map route dependence, assess customer delivery terms, renegotiate force majeure and insurance clauses, and consider inventory buffers where financially feasible. Importers should classify inputs by criticality, lead-time sensitivity and supplier substitutability. Freight forwarders should develop scenario-based route advice. Firms handling perishable exports should quantify the economic value of each additional day in transit and compare it with the cost of alternative routing or modal options.

5.6 Policy implications

Policy responses should not wait for crisis moments. Trade facilitation, port productivity, digital customs, risk-based inspection, corridor governance and data transparency are resilience investments. African governments and regional institutions should build route-risk dashboards, strengthen port-community systems, coordinate alternative corridors and integrate maritime disruption into food security, energy security and industrial policy planning. Such measures do not eliminate external shocks, but they reduce how deeply those shocks damage trade performance.

5.7 Implications for AfCFTA and regional corridor planning

The AfCFTA can contribute to resilience if it is implemented as more than tariff liberalisation. Intra-African trade requires functioning corridors, harmonised documentation, efficient borders, reliable port-hinterland links and trusted data systems. Maritime disruption shows why regional diversification matters. When external sea routes are stressed, regional sourcing and cross-border corridor efficiency can reduce vulnerability, but only if firms can rely on predictable procedures and infrastructure.

5.8 Critical reflection on inequality, dependency and geoeconomic power

A critical reading of the evidence shows that disruption is not socially neutral. Actors with capital, alternative suppliers, inventory capacity, insurance access and bargaining power can adapt more easily. Smaller firms, land-linked economies and time-sensitive exporters bear disproportionate burdens. A shipping line may recover costs through surcharges, while a small exporter may lose a delivery window. A port may gain calls but suffer congestion. A land-linked importer may face higher input prices without any direct role in the maritime event. This is why resilience cannot be reduced to managerial flexibility. It is also a question of development, infrastructure, institutional capacity and the unequal position of African economies within global trade systems.

5.9 Alternative explanations and evidential boundaries

The framework must be read alongside alternative explanations. Trade-flow changes during 2023-2026 may also reflect global demand shifts, commodity-price movements, exchange-rate pressures, domestic conflict, seasonal agricultural cycles, policy changes, port-specific governance failures and inventory decisions made before the disruption. The article therefore uses cautious language: it identifies exposure pathways, descriptive indicators and plausible mechanisms rather than claiming that maritime disruption alone caused observed trade outcomes. This evidential discipline strengthens, rather than weakens, the manuscript because it makes the model testable.

6. Conclusion

6.1 Summary

This article examined Middle East conflict-related maritime disruption as an African trade-resilience problem. Maritime chokepoints function as trade-risk transmission points when route concentration, conflict risk, trade-cost pressure, exposure amplification and unequal adaptive capacity combine. Verified evidence shows that Red Sea/Suez disruption lengthened voyages, reduced effective container capacity, shifted vessels toward the Cape of Good Hope and created heterogeneous African exposure through route dependence, port congestion, import costs and time-sensitive export vulnerability.

6.2 Contributions

The study contributes the Chokepoint-to-Resilience Transmission Framework, which integrates supply-chain resilience, trade-cost theory, maritime connectivity, trade facilitation, global value chain governance and geoeconomic analysis. It also contributes methodologically by demonstrating a transparent secondary-data framework article that uses traceable evidence, PRISMA records, data audit logic and cautious reporting. Its practical contribution is to translate maritime geopolitics into route-risk monitoring, port readiness, trade facilitation, corridor coordination and firm-level adaptation.

6.3 Recommendations

- African firms should develop route-risk dashboards and quantify the cost of delay by product category and customer contract.
- Port authorities should publish timely congestion, berth, dwell-time and bunkering indicators to support market decision-making.
- Trade ministries should integrate maritime disruption risk into trade facilitation, food security, industrial policy and AfCFTA implementation plans.
- Regional economic communities should strengthen corridor redundancy, cross-border

digital documentation and border-agency coordination.

- Researchers should replicate the evidence map in subscription databases where available and execute future statistical testing with updated machine-readable data.

6.4 Limitations

The manuscript is limited by data latency, uneven port-level reporting, difficulty attributing trade-flow changes exclusively to maritime disruption and limited public access to some proprietary freight-rate and insurance-risk indicators. These limitations define the evidential boundary. The article therefore distinguishes verified descriptive evidence from propositions requiring future inferential testing.

6.5 Future research

Future research should extract weekly or monthly PortWatch indicators, port authority data, freight-rate indexes, UN Comtrade commodity flows, LPI 2.0 indicators and trade facilitation scores to estimate pre-post changes, correlations and fixed-effects panel models. Qualitative extensions could examine firm-level adaptation through interviews, but such primary data would require ethics approval and a different design. Comparative studies could also examine whether African ports receiving diverted Cape traffic experience durable gains in connectivity or only temporary pressure without strategic upgrading.

Declarations

Author contributions. Sixbert Sangwa conceptualised the study, designed the methodological framework, supervised the collaborative evidence-mapping process, coordinated manuscript development, wrote the original draft, integrated revisions and serves as the corresponding author. The co-authors contributed to topic refinement, search-string testing, source identification, evidence discussion, PRISMA record checking, data-audit review, formative critique and manuscript review within the supervised course-based research process. Authorship is limited to contributors who made identifiable intellectual or documentary contributions, reviewed the final manuscript, approved its submission and accepted accountability for the integrity of the work.

Conflict of interest. The authors declare that they have no known financial or non-financial conflicts of interest in relation to this manuscript.

Funding. This research received no external funding.

Data availability. This study uses publicly available secondary sources. The accompanying workbook contains the PRISMA records, search log, data audit, variable operationalisation, and extracted evidence values. Additional machine-readable datasets generated through subsequent extraction and cleaning are available through the associated OSF project: <https://doi.org/10.17605/OSF.IO/VXTRM>, under a Creative Commons Attribution 4.0 International licence, subject to the licensing conditions of the original data sources.

Ethics statement. This study relied exclusively on secondary, non-human-subject data and did not involve direct interaction with research participants. Formal ethics approval and informed consent were therefore not required. The authors nevertheless observed ethical obligations concerning accurate data representation, proper citation, avoidance of fabricated statistics, respect for dataset licences, and transparent authorship attribution.

AI use statement. The authors used ChatGPT (GPT-5.5 Thinking, July 2026 web interface) only during the revision stage for language polishing, formatting consistency, readability checks and Word-document tracked-change preparation. The tool was not used to screen records independently, extract data, fabricate statistics, generate unsupported citations, conduct statistical analysis or replace authorial interpretation. All AI-assisted wording and formatting suggestions were reviewed, revised and verified by Sixbert Sangwa and the co-authors, who remain fully responsible for the accuracy, analysis, interpretation, citations and integrity of the manuscript.

Acknowledgements. The authors acknowledge the course-based discussions and formative review process that contributed to the development of this manuscript.

References

- Anderson, J. E., & van Wincoop, E. (2004). Trade costs. *Journal of Economic Literature*, 42(3), 691-751. <https://doi.org/10.1257/0022051042177649>
- Bacrot, C., & Faure, M.-A. (2024, April 17). Red Sea crisis and implications for trade facilitation in Africa. UN Trade and Development. <https://unctad.org/news/red-sea-crisis-and-implications-trade-facilitation-africa>
- Caldara, D., & Iacoviello, M. (2022). Measuring geopolitical risk. *American Economic Review*, 112(4), 1194-1225. <https://doi.org/10.1257/aer.20191823>
- Christopher, M., & Peck, H. (2004). Building the resilient supply chain. *International Journal of Logistics Management*, 15(2), 1-14. <https://doi.org/10.1108/09574090410700275>
- Djankov, S., Freund, C., & Pham, C. S. (2010). Trading on time. *The Review of Economics and Statistics*, 92(1), 166-173. <https://doi.org/10.1162/rest.2009.11498>
- Murungu, E., Ndahimana, S., Ruhanya, P., Ssempe, M., Ekosse, E., & Sangwa, S. (2025). *Reorienting global value chains under AfCFTA: The role of SEZs and emerging technologies in boosting value-added trade and firm upgrading*. *Science and Education*, 6(8), 99–123. <https://doi.org/10.2139/ssrn.5409564>
- Francois, J., & Manchin, M. (2013). Institutions, infrastructure, and trade. *World Development*, 46, 165-175. <https://doi.org/10.1016/j.worlddev.2013.02.009>
- Gereffi, G., Humphrey, J., & Sturgeon, T. (2005). The governance of global value chains. *Review of International Political Economy*, 12(1), 78-104. <https://doi.org/10.1080/09692290500049805>
- Hoffmann, J., Saeed, N., & Sødal, S. (2020). Liner shipping bilateral connectivity and its impact on South Africa's bilateral trade flows. *Maritime Economics & Logistics*, 22, 473-499. <https://doi.org/10.1057/s41278-019-00124-8>
- Hummels, D. L., & Schaur, G. (2013). Time as a trade barrier. *American Economic Review*, 103(7), 2935-2959. <https://doi.org/10.1257/aer.103.7.2935>
- International Monetary Fund and partners. (2026). PortWatch. Retrieved May 28, 2026, from <https://portwatch.imf.org/>

- Ivanov, D., & Dolgui, A. (2020). Viability of intertwined supply networks: Extending the supply chain resilience angles towards survivability. *International Journal of Production Research*, 58(10), 2904-2915. <https://doi.org/10.1080/00207543.2020.1750727>
- Kamalahmadi, M., & Parast, M. M. (2016). A review of the literature on the principles of enterprise and supply chain resilience. *International Journal of Production Economics*, 171, 116-133. <https://doi.org/10.1016/j.ijpe.2015.10.023>
- Limão, N., & Venables, A. J. (2001). Infrastructure, geographical disadvantage, transport costs, and trade. *The World Bank Economic Review*, 15(3), 451-479. <https://doi.org/10.1093/wber/15.3.451>
- Notteboom, T. E., Haralambides, H., & Cullinane, K. (2024). The Red Sea crisis: Ramifications for vessel operations, shipping networks, and maritime supply chains. *Maritime Economics & Logistics*, 26(1), 1-20. <https://doi.org/10.1057/s41278-024-00287-z>
- Notteboom, T. E., & Rodrigue, J.-P. (2005). Port regionalization: Towards a new phase in port development. *Maritime Policy & Management*, 32(3), 297-313. <https://doi.org/10.1080/03088830500139885>
- Notteboom, T., Pallis, T., & Rodrigue, J.-P. (2021). Disruptions and resilience in global container shipping and ports: The COVID-19 pandemic versus the 2008-2009 financial crisis. *Maritime Economics & Logistics*, 23, 179-210. <https://doi.org/10.1057/s41278-020-00180-5>
- Page, M. J., McKenzie, J. E., Bossuyt, P. M., Boutron, I., Hoffmann, T. C., Mulrow, C. D., Shamseer, L., Tetzlaff, J. M., Akl, E. A., Brennan, S. E., Chou, R., Glanville, J., Grimshaw, J. M., Hróbjartsson, A., Lalu, M. M., Li, T., Loder, E. W., Mayo-Wilson, E., McDonald, S., ... Moher, D. (2021). The PRISMA 2020 statement: An updated guideline for reporting systematic reviews. *BMJ*, 372, Article n71. <https://doi.org/10.1136/bmj.n71>
- Pettit, T. J., Fiksel, J., & Croxton, K. L. (2010). Ensuring supply chain resilience: Development of a conceptual framework. *Journal of Business Logistics*, 31(1), 1-21. <https://doi.org/10.1002/j.2158-1592.2010.tb00125.x>
- Portugal-Perez, A., & Wilson, J. S. (2012). Export performance and trade facilitation reform: Hard and soft infrastructure. *World Development*, 40(7), 1295-1307. <https://doi.org/10.1016/j.worlddev.2011.10.021>

Suez Canal Authority. (2026). Navigation and Suez Canal information. Retrieved May 28, 2026, from <https://www.suezcanal.gov.eg/>

UN Regional Commissions & UN Trade and Development. (2025). UN Global Survey on Digital and Sustainable Trade Facilitation. Retrieved May 28, 2026, from <https://www.untfsurvey.org/>

UN Trade and Development. (2026). Global trade update: April 2026. https://unctad.org/system/files/official-document/ditcinf2026d4_en.pdf

United Nations Statistics Division. (2026). UN Comtrade. Retrieved May 28, 2026, from <https://comtradeplus.un.org/>

Wieland, A., & Durach, C. F. (2021). Two perspectives on supply chain resilience. *Journal of Business Logistics*, 42(3), 315-322. <https://doi.org/10.1111/jbl.12271>

World Bank. (2025). Logistics Performance Indicators 2.0. Retrieved May 28, 2026, from <https://lpi.worldbank.org/>

World Trade Organization. (2025). Global trade outlook and statistics 2025. https://www.wto.org/english/res_e/booksp_e/trade_outlook25_e.pdf

Appendix A. PRISMA record status summary and full-text decision log

Table A1. PRISMA record status summary

PRISMA stage	Count	Traceability location
Records identified from open scholarly searches	38	Search-strategy table and record log
Records identified from institutional searches	24	Search-strategy table and record log
Duplicate records removed	9	Duplicate status in evidence-map log
Records screened	53	Title/abstract screening log
Records excluded at title/abstract	23	Screening exclusion rows
Full texts assessed for eligibility	30	Table A2
Reports excluded after full-text assessment	5	Table A2, excluded rows
Studies/reports included in synthesis	25	Table A2, included rows

Note. The table provides transparent PRISMA counts used in Figure 1.

The full full-text eligibility decision log is supplied as Supplementary File 1 so that the main article remains readable while retaining full PRISMA traceability. The supplementary log lists all 30 full-text records assessed, including the 25 included sources and 5 full-text exclusions with reasons.