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Logistical parallels of maritime blockades: Hormuz and Ukrainian ports

Krystyna Hulyda

Abstract

The article examines maritime blockades as a factor in systemic supply chain disruption, comparing the Strait of Hormuz as a critical hub of global energy logistics with the 2022 blockade of Ukrainian ports as a case of losing the main agricultural export channel. From a logistics professional's perspective, a blockade is treated not only as a political or security event, but as an operational crisis requiring managerial response. The article argues that supply chain resilience depends on reserve capacity, route diversification, multimodal transport, tariff control, carrier management, digital monitoring, and rapid response to deviations. It proposes a time-based logistics response model covering preventive planning, stabilization during the first 30 days of crisis, and long-term adaptation.

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Keywords:

Maritime blockade;
Strait of Hormuz;
Ukrainian ports;
agricultural logistics;
supply chains;
crisis routing;
multimodal transportation;
logistical resilience.

Author correspondence:

Krystyna Hulyda,
Email: hulydalogistics@gmail.com

Introduction

Maritime transport remains one of the key foundations of world trade, as it is through ports, straits and maritime transport corridors that significant volumes of energy, food, raw materials and industrial goods pass (UNCTAD 2024). In stable conditions, such a logistics system is perceived as efficient and economically feasible: large consignments of goods can be moved over considerable distances at a relatively low cost. However, this efficiency often hides a deeper vulnerability - the dependence of global and national supply chains on a limited number of critical maritime nodes (Christopher and Peck 2004).

Maritime blockades reveal the transport and systemic vulnerability of supply chains. When a key port, strait or group of ports becomes inaccessible, the problem is not limited to the inability to send a ship. The entire logic of the movement of goods is disrupted: the manufacturer cannot sell products on time, warehouses and elevators accumulate excess volumes, carriers are forced to look for new routes, logistics costs increase, and customers face the risk of delays or non-fulfillment of contracts. A local transport problem quickly turns into a broader price, food or energy instability (UNCTAD 2024).

This pattern was especially pronounced after the blockade of Ukrainian seaports in 2022. Before the start of the full-scale war, Ukrainian agricultural exports relied heavily on the port infrastructure of the Black Sea (Yanovska, Król, and Pittman 2025). Seaports provided the scale, regularity, and relatively lower cost of grain and oilseed exports. When this channel was blocked, the agricultural sector was faced with the need to urgently rebuild all export logistics: from elevators and inland transportation to border crossings, alternative ports, documentary support and cost control. The blockade of Ukrainian agricultural exports also had a broader food dimension, since Ukraine plays an important role in global agricultural markets (FAO 2022).

In this article, the maritime blockade is assessed from the point of view of practical logistics - as an operational failure in the supply chain, requiring specific management decisions. The key question is not only the reasons for the loss of the maritime channel, but also how to maintain the movement of goods under new conditions. The blockade changes the route, transport model, carriers, delivery costs, document flow, contract execution terms and financial feasibility of delivery. Therefore, the solution to the problem should be based not on the expectation of the restoration of the previous port model, but on the formation of an alternative logistics architecture.

The parallel with the Strait of Hormuz allows us to expand the Ukrainian experience to the global level. The Strait of Hormuz is one of the most important maritime nodes of world energy logistics, since significant volumes of oil, petroleum products and liquefied natural gas pass through it. According to the U.S. Energy Information Administration, in 2024, about 20 million barrels of oil per day passed through the Strait of Hormuz, or approximately 20% of the world's consumption of liquid petroleum resources (EIA 2025).

At the same time, these two cases are not identical. The Strait of Hormuz is primarily associated with energy flows and global energy security, while the blockade of Ukrainian ports in 2022 directly affected agricultural exports and food security. For a correct comparison of these cases, the analysis criteria are further defined, which allow comparing not the political circumstances themselves, but the logistical consequences of dependence on critical maritime infrastructure.

The purpose of the article is to analyze maritime blockades as a source of systemic logistical failures using the example of the Strait of Hormuz and the blockade of Ukrainian ports in 2022, as well as to show possible approaches to overcoming such failures from the perspective of practical logistics. The central thesis is that bypassing the blockade cannot be reduced to finding a single alternative route. It is about building a crisis-resistant logistics model that combines backup routes, multimodal transportation, control of transport resources, cost management, digital monitoring and operational coordination of all participants in the supply chain.

METHODOLOGICAL PRINCIPLES OF THE STUDY

The study is based on a comparative approach that allows us to compare two situations that are different in nature due to a common feature - the dependence of supply chains on critical maritime infrastructure. The subject of comparison is not the political identity of the events, but the logistical consequences of excessive concentration of cargo flows within one maritime passage or group of ports.

Ukrainian ports in 2022 are considered as an example of an actual blockage of a port-dependent export system. This is a situation where the main channel for exporting agricultural products was lost, and the logistics system had to quickly shift to alternative cargo transportation routes. This example allows us to assess the practical consequences of the blockade: loss of throughput capacity, increased costs, overloading of land routes, complications in document flow, and the need for a new organization of transportation (Yanovska, Król, and Pittman 2025).

The Strait of Hormuz is used as an example of the risk of a critical maritime passage. Unlike the Ukrainian case, here the analysis does not focus on the actual loss of the export channel, but on the impact of the probability of disruption of shipping on energy markets, insurance, freight, the behavior of trade participants and state planning (EIA 2025). Such a distinction allows us to compare both cases as different forms of logistical dependence: the actual loss of the port channel and the risk of destabilization of the strategic maritime passage.

The comparison is based on the following criteria: dependence on one maritime node or group of ports, the rate of capacity loss, the impact on global and regional markets, the possibility of reorienting cargo flows, the cost of bypass routes, the role of the state, the security environment and insurance, and the level of digital control of the supply chain.

These parameters show whether the supply chain is truly crisis-resistant (Pettit, Fiksel, and Croxton 2010).

From a logistical point of view, the greatest risk arises when the efficiency of the system is built on the concentration of flows in one maritime node. In stable conditions, such a model can be economically advantageous, as it provides large-scale transportation and lower cost. However, during a blockade, this advantage turns into a weakness: the loss of one channel forces an urgent restructuring of the entire system of goods movement (Christopher and Peck 2004).

1.1. Violation of the movement of goods

The first consequence of a maritime blockade is the discrepancy between the availability of goods and the possibility of their export. Products may continue to be available at warehouses, grain elevators, or production facilities; however, the conventional distribution channel through which they are transported to buyers becomes inoperative. In such a situation, the entire transport rhythm is disrupted: deadlines, carriers, documents, delivery costs and contract performance conditions change.

This is of particular importance for agricultural logistics. Grain and oilseed crops require continuous movement from the field to the elevator, and then to the export channel. If the port link fails, the pressure is transferred to the internal infrastructure: elevators accumulate products, motor transport and railways receive additional load, and border crossings operate at the limit of capacity (Yanovska, Król, and Pittman 2025).

In such conditions, the key indicator becomes the time for the restoration of logistics movement. It is not about a complete return to the previous model, but about the ability to quickly create a workable temporary scheme. The longer the system does not have a manageable alternative, the greater the financial losses, risks of non-fulfillment of contracts and pressure on the domestic market become.

Bypassing the blockade is not reduced to choosing another direction on the map. The alternative route must be operationally suitable: have available transport, transshipment points, issued documents, transparent cost and control of voyage execution. Without this, the flow of goods formally has a direction, but in fact remains unstable, expensive and difficult to manage.

Therefore, the disruption of goods movement during the blockade is manifested not only in the loss of the route. It destroys the transport rhythm, financial predictability of delivery, document flow and the ability to fulfill contractual obligations within the agreed deadlines.

1.2. Vulnerability of port-dependent systems

A port-dependent logistics system is effective under conditions of stable access to maritime infrastructure. It allows transporting large consignments of cargo at a lower cost and ensuring regularity of exports. However, in conditions of blockade, such concentration of flows becomes a source of risk: the loss of a port or maritime corridor disrupts the economics of the entire supply.

The main problem is limited reserve capacity. Alternative routes may exist, but they are not always able to quickly accept the volumes previously served by seaports. Road, rail, river and border routes can support some exports, but require additional coordination, transport, transshipment and documentary support (Yanovska, Król, and Pittman 2025).

Port dependence also creates a cost shock. When the main maritime channel becomes unavailable, delivery via alternative routes is often longer, more complicated and more expensive. As a result, the goods may remain suitable for export, but the delivery itself loses its economic attractiveness. USDA data on Ukrainian grain transportation confirm a significant change in transportation costs and routes after the outbreak of the war (USDA AMS 2023).

Therefore, port dependence becomes critical when alternative routes exist only formally, but do not have sufficient throughput capacity, tariff stability, and operational readiness.

1.3. Indicators of crisis resilience of supply chains

The resilience of a supply chain is determined by the system's ability to continue the movement of goods after the loss of the main route. In the scientific literature, the resilience of a supply chain is associated with the balance of vulnerabilities and capabilities of the system (Pettit, Fiksel, and Croxton 2010).

The first indicator is recovery time. It shows how quickly a system can transition from a complete halt or a sharp reduction in transport operations to a new operating scheme.

The second indicator is the reserve capacity. It determines what part of the cargo flow can be accepted by alternative routes without a critical deterioration in delivery times and costs.

The third indicator is the diversification of routes. The logistics system should be based not on a single transport corridor, but on several scenarios: main, reserve and emergency.

The fourth indicator is the ability to withstand a cost shock. The alternative route should be not only physically possible, but also economically justified.

The fifth indicator is the level of operational control. In crisis conditions, it is essential to have visibility of voyage status, transport availability, delays, tariffs, documentation, and risks at each stage of the route.

Thus, supply chain resilience is not about having a single backup route, but about the ability to quickly restore traffic, utilize spare capacity, control costs, and manage supply under uncertainty.

2. THE STRAIT OF HORMUZ AS AN EXAMPLE OF CRITICAL DEPENDENCE OF GLOBAL ENERGY LOGISTICS

The Strait of Hormuz is considered in this study as an example of the critical dependence of global energy logistics on a single maritime passage. Unlike Ukrainian ports in 2022, where a major export channel was effectively lost, in the case of the Strait of Hormuz, the key is the impact of the threat of disruption of shipping on prices, insurance, contracts and the behavior of market participants (EIA 2025).

The logistical vulnerability of the Strait of Hormuz lies in the high concentration of energy flows and the limited possibility of their rapid redirection. If traffic through this maritime passage becomes dangerous or unpredictable, the risk arises not only for individual vessels, but for the wider supply system of oil, petroleum products and liquefied natural gas. That is why the Strait of Hormuz is an example of a situation where a potential disruption of the route can affect the market even before the actual blockade.

2.1. The importance of the Strait of Hormuz

The Strait of Hormuz connects the Persian Gulf with the Gulf of Oman and the Arabian Sea. Its importance is determined primarily by the nature of the cargoes that pass through this route: oil, petroleum products and liquefied natural gas (EIA 2025). These are resources on the regularity of which the energy stability of many states depends.

According to the U.S. Energy Information Administration, in 2024 an average of about 20 million barrels of oil per day passed through the Strait of Hormuz, which corresponded to approximately 20% of the world's consumption of liquid petroleum resources (EIA 2025). In the first quarter of 2025, total oil flows through the strait remained close to the level of 2024 (EIA 2025). In addition, in 2024, about

a fifth of the world's trade in liquefied natural gas passed through the Strait of Hormuz, mainly from Qatar (EIA 2025).

The key logistical problem of the Strait of Hormuz is the mismatch between the scale of the main flow and the available backup capacity. Some exports can be redirected through pipelines in Saudi Arabia and the United Arab Emirates, but these capabilities are not able to fully replace the maritime route. The EIA estimates the available capacity of such bypass routes at approximately 2.6 million barrels per day (EIA 2025).

These data show that the Strait of Hormuz is not just an important maritime passage, but a critical node in global energy logistics. In stable conditions, the concentration of flows in this route ensures the scale of transportation. In crisis conditions, the same concentration becomes a source of systemic risk, since the world market does not have sufficient backup infrastructure to quickly and completely replace this channel.

Thus, the importance of the Strait of Hormuz lies in the combination of three factors: a high concentration of energy cargoes, limited bypass capabilities, and the dependence of importers on the regularity of supplies. For logistical analysis, this means that the efficiency of such a route cannot be assessed separately from its vulnerability.

2.2. Consequences of the threat of blockade

The threat of a blockade of the Strait of Hormuz affects the market even before the physical cessation of vessel traffic. Energy logistics participants build this risk into prices, insurance conditions, freight, contractual solutions and supply plans. Therefore, even without an actual blockade, the effect of pre-destabilization is formed (EIA 2025).

The first consequence is the price reaction. According to EIA, during the regional escalation in June 2025, despite the absence of a blockade of maritime traffic through the Strait of Hormuz, the price of Brent increased from $ 69 to $ 74 per barrel in one day (EIA 2025). This shows that the energy market reacts not only to the actual shortage of the resource, but also to the expectation of a possible disruption of supplies.

The second consequence is a change in insurance and transport conditions. When the risk to shipping increases, insurance becomes more expensive, voyage planning becomes more difficult, and some carriers may avoid the dangerous area. Even if shipping continues, logistics become more expensive, slower, and less predictable.

The third consequence is the need to re-route and re-contract. Companies are forced to assess what volumes can be re-routed, what timelines are realistic, what costs will be incurred if the route is changed, and whether alternative channels can accommodate the additional flow. In the case of the Strait of Hormuz, such re-routing is limited, as pipelines and other terminals can only partially mitigate the risk (EIA 2025).

The fourth consequence is the increased role of government planning. Since the Strait of Hormuz is related to energy security, the threat of its closure affects not only private companies but also government policy. Importing countries may review their inventories, sources of supply, terms of long-term contracts, and energy security measures (IEA n.d.).

From a practical logistics perspective, this case demonstrates the need for pre-calculated response scenarios. If critical cargo flows are concentrated in one maritime passage, the system must assess in advance what volumes can be redirected, through which channels, at what cost, in what time frame, and with what level of risk.

The Strait of Hormuz thus shows that dependence on a single strategic maritime passage creates the risk not only of physical blockage, but also of preliminary market destabilization. Even the threat of disruption can raise prices, change insurance conditions, complicate planning, and reveal a lack of spare capacity. That is why the logistical efficiency of a strategic route must be assessed together with its vulnerability.

3. UKRAINIAN AGRICULTURAL LOGISTICS AFTER THE BLOCKADE OF PORTS IN 2022: TRANSITION TO ALTERNATIVE ROUTES

The blockade of Ukrainian seaports in 2022 became a practical example of how a port-dependent export system loses its effectiveness in the event of a sudden closure of the main channel. If the Strait of Hormuz demonstrates the risk of possible destabilization of energy flows, then the case of Ukraine shows the consequences of an already implemented disruption: agricultural products remained physically available, but the usual way of their access to external markets was blocked (Yanovska, Król, and Pittman 2025).

For agricultural logistics, this situation was particularly difficult. Grain and oilseeds cannot remain in the chain for a long time without movement, since their accumulation creates pressure on elevators, storage facilities, internal transportation, financial calculations and the future production cycle. Therefore, after the loss of the port channel, the main task was to create temporary routes capable of supporting at least part of the cargo flow.

3.1. Loss of the main export channel

Before the start of the full-scale war, Ukrainian agricultural exports relied heavily on Black Sea ports. Logist.FM's industry material on the Agro Region experience cites data that in the pre-war period, 95% of seaborne grain exports passed through the ports of Odesa, Pivdennyi, Chornomorsk, and Mykolaiv, while Mariupol and Berdyansk provided the remaining 5% (Logist.FM 2023). An academic study of Ukrainian grain export logistics also indicates that in peacetime, over 90% of Ukrainian grain exports passed through Black Sea ports (Yanovska, Król, and Pittman 2025).

After the blockade of seaports, this model ceased to function as a guaranteed export channel. The problem was not only that ships could not leave with cargo. The entire chain was disrupted: producers could not export products as planned, elevators accumulated residues, railways and motor transport received additional load, and border crossings worked at the limit of capacity. In such conditions, the port ceased to be the final point of domestic logistics and the starting point of international deliveries (OECD 2022).

The loss of the main export channel changed the economics of agricultural exports. The maritime route was not only familiar, but also the most suitable for large consignments of grain. The transition to land and river routes meant a greater number of operations, additional transshipment, longer terms, more complex document management and higher delivery costs. The war in Ukraine changed shipping models and increased transportation distances for certain commodity flows, in particular grain (UNCTAD 2023b).

The problem of recovery time was particularly acute. In the event of a blockade, agricultural logistics does not have a long period for adaptation, since the new crop needs storage space, and export contracts need to be fulfilled. The longer the products do not move, the greater the pressure on warehouses, working capital and the domestic market.

The Black Sea Grain Initiative, concluded in July 2022, partially restored the export of Ukrainian grain via the Black Sea (UNCTAD n.d.). UNCTAD notes that in the first four months of the initiative, it provided 60% of Ukraine's exports of corn, wheat and barley (UNCTAD 2023a). The same report notes that exports for January–November 2022 remained 22% lower than in 2021 (UNCTAD 2023a).

Thus, the blockade of Ukrainian ports revealed the limits of the pre-war export model built around the Black Sea port infrastructure. The continued preservation of agricultural exports required not the search for a single equivalent substitute for the maritime channel, but the rapid redistribution of cargo flows across land, river, and multimodal routes.

3.2. Formation of temporary logistical solutions

In practice, the reorientation meant the rapid creation of several temporary traffic channels, each of which compensated for only part of the lost port capacity. Cargo was directed to the western and southwestern borders, Danube ports, rail crossings, border terminals and European logistics hubs. The European Commission launched the EU–Ukraine Solidarity Lanes in May 2022 as a system of alternative logistics routes for Ukrainian exports and trade with the EU (European Commission 2026).

Such solutions were temporary in nature, since none of these directions could immediately completely replace seaports. Road transport provided flexibility, but was more expensive and less suitable for mass volumes. Railways could handle larger consignments, but faced the limitations of border infrastructure, differences in track gauge and the need for transhipment. The Danube ports became an important additional route, but also required increased capacity, coordination, and new operational procedures (World Bank 2025).

In the Ukrainian case, bypassing the blockade was not a single route. It was a combination of several partially effective channels, each of which covered only part of the need. This combination allowed the movement of products to be maintained, albeit at higher cost, longer lead times, and greater administrative complexity.

Temporary solutions required a rapid restructuring of the internal organization of transportation. It was necessary to separately plan delivery from the fields to the elevators, movement from the elevators to border or river nodes, further reloading, paperwork, and interaction with buyers. In such a system, each stage became an independent risk point.

A separate challenge was cost. A Logist.FM report on Agro Region shows that logistics expenses as a share of product cost rose from 3% in 2020 to 5% in 2021 and reached 14% in 2022 (Logist.FM 2023). USDA data on Ukrainian grain transportation also confirm that the war significantly changed the transportation costs and routes of Ukrainian grain exports (USDA AMS 2023). The USDA report for 2024 states that logistics costs for the export of Ukrainian wheat and corn decreased compared to 2022, but remained higher than the pre-war level (USDA AMS 2024).

Therefore, temporary logistics solutions had to be evaluated not only according to the principle of "can it be delivered", but also according to the principle of "does such delivery make economic sense". In crisis conditions, a route does not need to be optimal, but manageable: with available transport, transparent pricing, predictable timelines, proper documentation, and the ability to monitor execution.

Ukrainian agricultural logistics in 2022 actually moved from a port model to an anti-crisis multi-channel system. It was based on road transportation, railway routes, the Danube route, border crossings and partial use of maritime exports after the launch of the grain corridor. This system was more expensive and complex, but it made it possible to maintain the movement of agricultural products in the face of the loss of the main channel.

4. AUTHOR'S METHODOLOGY FOR BUILDING A CRISIS-RESISTANT SUPPLY CHAIN

A crisis-resistant supply chain should be designed as a system of interconnected cargo movement scenarios, not as a single backup route. In stable conditions, logistics is often focused on the minimum cost and the shortest delivery time. During a blockade, this is not enough: the main thing is to maintain controlled cargo movement even when the main maritime channel is unavailable or under threat (Ivanov and Dolgui 2020). The proposed methodology is based on three elements: backup routes and

logistics nodes, multimodal transportation organization, and risk sharing between routes, carriers, and ports. This approach makes it possible to reduce dependence on a single transport corridor and maintain supplies even if the main channel is lost (McKinnon 2014).

4.1. Backup routes and logistics hubs

The first element of a crisis-resistant supply chain is a backup route map. It should include the main, backup and emergency scenarios of cargo movement. For agricultural logistics, such scenarios can be railway crossings, road corridors, river ports, border terminals and alternative maritime ports.

The backup route should not be formal, but operationally suitable. For it, the throughput capacity, estimated cost, delivery times, transshipment points and main restrictions should be determined in advance. If the route is started to be created only after the blockade, the system loses time, and the cargo flow accumulates in internal nodes.

Logistics nodes are of particular importance: elevators, warehouses, railway stations, transshipment areas, border terminals and river ports. In the crisis model, they perform a stabilizing function: they accept cargo, give time for decision-making and create the possibility of further redirection.

4.2. Multimodal organization of cargo movement

The second element of the methodology is multimodal transportation organization, i.e. the combination of several modes of transport within one delivery chain. In the event of a blockade, one mode of transport is rarely able to completely replace a maritime channel, so the system should combine road, rail, river and, if possible, maritime transport.

The advantage of the multimodal model is flexibility. If one direction is overloaded or becomes more expensive, part of the cargo can be sent to another channel. If the port is unavailable, the cargo can temporarily accumulate in a reserve node until a suitable route appears.

For agricultural logistics, such a model is especially important, since grain cargoes require rhythmic movement and sufficient throughput capacity. After the blockade of Ukrainian Black Sea ports, the European Commission launched the EU–Ukraine Solidarity Lanes precisely as a system of alternative routes for Ukrainian exports (European Commission 2026).

4.3. Risk allocation between routes, carriers and ports

The third element of the methodology is risk sharing. In crisis logistics, it is dangerous to concentrate cargo traffic on one route, one port, one mode of transport or one carrier. Such concentration may be convenient in stable conditions, but during a blockade it creates additional dependence.

Risk sharing between routes means that cargo must be moved in several directions. Part of the flow can go by rail, part by road, part by river or alternative port nodes. Such a model may be more expensive than one optimal route, but it reduces the risk of a complete stoppage of supplies.

Risk sharing between carriers involves working with several groups of transport partners. The practical experience of Agro Region, described in the Logist.FM material, shows the importance of own and hired transport in reducing dependence on the external transport market (Logist.FM 2023).

The managerial meaning of this method is to move from a linear port-dependent model to a distributed logistics system. It is based on backup routes, intermediate nodes, different modes of transport, and predefined rules for switching between scenarios.

5. TOOLS FOR CONTROLLING LOGISTICAL CONTINUITY DURING A BLOCKADE

After the loss of the main maritime channel, it is not enough to have backup routes and alternative nodes. It is necessary to ensure their daily operation: find transport, agree on a tariff, control the voyage, issue documents, track delays and change the decision if the route ceases to be effective.

In crisis conditions, logistics moves from a planned mode to a mode of constant operational control. Queues at the borders, the availability of carriers, the cost of fuel, insurance conditions, terminal congestion and the throughput capacity of individual directions change. Therefore, maintaining route manageability becomes a key task.

5.1. Management of carriers, tariffs and voyage operations

The first level of daily control is the management of carriers. During the blockade, the demand for transport increases faster than its actual availability. This creates the risk of a shortage of vehicles, a sharp increase in tariffs, unstable quality of voyage performance and dependence on random market offers.

Operationally, this means dividing carriers by reliability, directions of work, type of transport, tariff behavior and quality of performance of previous voyages. In crisis conditions, it is important to know not only who can provide transport, but also who performs voyages without disruptions, meets deadlines and works correctly with documents.

The second element is tariff control. The tariff during the blockade depends on queues, transport shortages, fuel prices, route risks, insurance and the situation at the borders. Therefore, each route must be evaluated in comparison with others. If one route becomes more expensive faster, the cargo flow must be partially redirected. USDA data on Ukrainian grain transportation confirm a significant change in transport costs after the war began (USDA AMS 2023).

The third element is voyage execution monitoring. The logistics team needs to see the time of loading, departure, downtime, checkpoints, arrival at the terminal, and completion of unloading. Based on this data, a rating of carriers is formed by timeliness, cost, document quality, and number of deviations.

5.2. Digital monitoring and document control

The second level of operational management is digital monitoring of cargo movements. During a blockade, the logistics team cannot rely only on telephone messages or manual information updates. The more complex the route, the higher the risk of losing control over the cargo, terms and costs.

Digital monitoring should cover the location of transport, downtime, deviations from the route, passing key points, loading and unloading status. For road transportation, satellite-based tracking of trip execution is particularly important; for rail and combined routes, regular updates of the status of the wagon, terminal and overloading. Ukrainian scientific research on logistics under martial law also emphasizes the role of digital solutions in maintaining the controllability of transportation (Vasyltsiv 2023).

A separate element is document control. An error in a customs, transport, phytosanitary or contract document can stop the cargo in the same way as a lack of transport or a closed route. Therefore, a list of documents, responsible persons, preparation deadlines and inspection points should be determined for each route.

A good practice is to have a single dashboard that combines both voyage and document status. Such a tool enables not only the tracking of a shipment’s location, but also an assessment of whether it is ready for the next stage of movement.

5.3. Deviation control: delays, tariffs, capacity, insurance

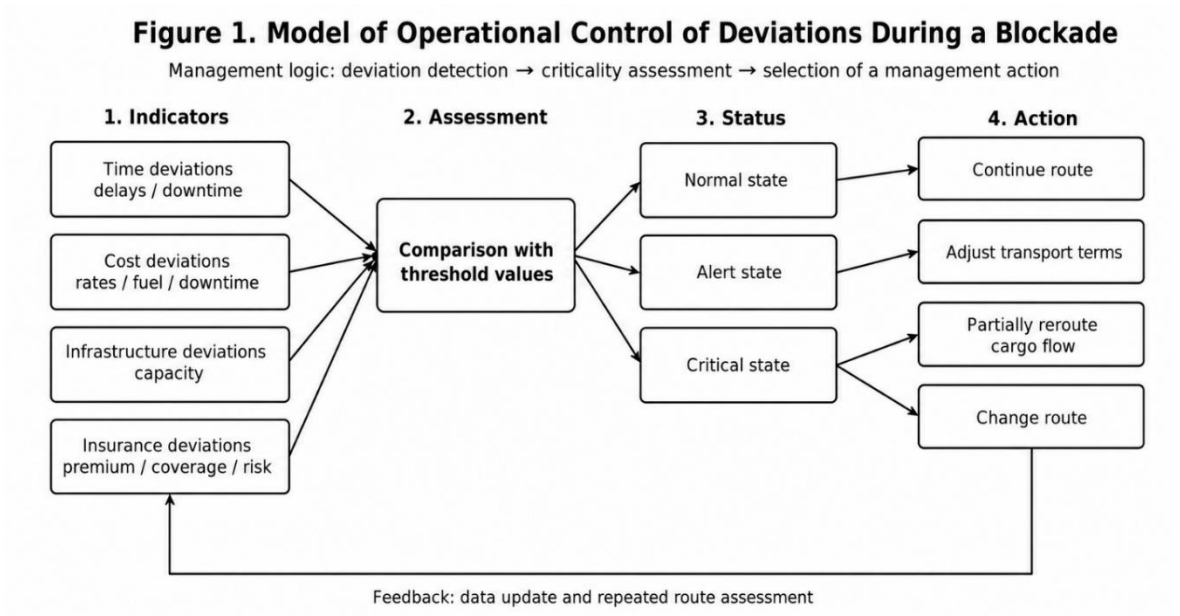
The third level of daily management is deviation control. In crisis conditions, delays, queues, tariff changes, transport shortages, terminal restrictions or new insurance conditions are part of the working environment. Therefore, it is important not only to record deviations, but also to have rules for responding.

The main types of deviations are time delays, tariff changes, capacity reduction and changes in insurance conditions. Threshold values should be set for each route: permissible delay time, maximum tariff, minimum capacity, acceptable insurance risk and risk of contract non-fulfillment.

Insurance in war conditions becomes a separate factor in the logistical suitability of the route. The Ministry of Economy of Ukraine noted that the mechanism for insuring ships against war risks was to reduce the cost of grain transportation insurance by approximately 2.5 percentage points of the insurance rate (Ministry of Economy of Ukraine 2023). Marsh McLennan also reported on the expansion of the Unity mechanism for insuring war risks of ships heading to or from Ukrainian ports (Marsh McLennan 2024).

To effectively control deviations, a system of management decisions is needed: to extend the route, adjust the transportation conditions, partially redirect the cargo, or replace the route. At this level the crisis-resistant model moves from design to practical operation.

Figure 1. Model of Operational Control of Deviations During a Blockade



6. PARALLELS BETWEEN THE STRAIT OF HORMUZ AND UKRAINIAN PORTS

The comparison of the Strait of Hormuz and Ukrainian ports in 2022 is analytically significant not because these situations are identical, but because they demonstrate a common logistical pattern: excessive concentration of critical cargo traffic in one maritime node creates systemic vulnerability. The Strait of Hormuz concentrates a significant amount of energy flows (EIA 2025). Ukrainian Black Sea ports were a key channel for Ukrainian grain exports until 2022 (Yanovska, Król, and Pittman 2025).

From a practical logistics perspective, these cases should be compared in terms of how the system reacts to the loss or threat of loss of the main route. The key factors are the capacity of alternatives, the speed of cargo reorientation, the cost of bypass routes, the role of insurance, state participation, and the ability of logistics teams to maintain control over cargo movement.

Table 1. Comparison of logistics risks of the Strait of Hormuz and Ukrainian ports in 2022

Criterion	**Strait of Hormuz**	**Ukrainian ports in 2022**	**Analytical conclusion**
Dependency type	Energy, global	Agrarian, export-national with a global food effect	Critical cargo traffic is concentrated in limited maritime infrastructure
Nature of risk	The threat of blocking a strategic maritime passage	Actual blockade of ports and loss of main export channel	Hormuz demonstrates the risk of possible loss of the route, Ukrainian ports - the consequences of the realized loss
Primary product	Oil, gas, energy resources	Grain, oilseeds, agricultural products	Different commodities create different types of instability: energy or food
Alternative routes	Limited pipelines and other maritime routes	Railway, road transport, Danube ports, EU ports	Alternatives exist, but are not always able to completely replace the main channel
Cost effect	Rising price expectations, insurance and transportation costs	Rising logistics costs and congestion on land routes	The blockade or its threat quickly moves into the financial sphere
The role of the state and insurance	Energy security, reserves, shipping insurance	Export policy, war risk insurance, support for alternative corridors	In times of crisis, logistics goes beyond private management
Operational response	Planning for backup scenarios in advance	Urgent formation of temporary routes	Crisis resilience depends on the system's readiness for the loss of the main channel

6.1. Common logistical risks

The first common risk is the concentration of cargo traffic. In both cases, efficiency under normal conditions was based on the stable operation of one critical route. In a crisis, such concentration turns into vulnerability.

The second risk is insufficient reserve capacity. Alternative routes may exist, but their presence does not mean the ability to quickly accept the previous volume of cargo. For the Strait of Hormuz, this is

the limitation of the bypass energy infrastructure (EIA 2025). For Ukrainian ports, it is the limited ability of railways, road transport, Danube ports and European routes to completely replace the Black Sea port system (World Bank 2025).

The third risk is the transition of the transport problem into a financial one. When the main route becomes inaccessible or risky, logistics becomes more expensive due to longer routes, overloading, transport shortages, insurance, downtime and uncertainty of deadlines. In the Ukrainian case, this was manifested in the increase in the cost of agricultural logistics and the decrease in the commercial attractiveness of individual deliveries (Logist.FM 2023).

The fourth risk is the need for data management. In crisis conditions, it is important to know the actual status of the route: capacity, fare, delay risk, insurance conditions, transport availability, and document readiness. Without such control, alternative routes remain formal, not truly manageable.

6.2. Key differences

The first difference is the nature of the risk. The Strait of Hormuz is an example of a potential disruption of a strategic maritime passage, while Ukrainian ports in 2022 are an example of an actual blockage of a major export channel.

The second difference concerns the commodity nature of the flows. The Strait of Hormuz is associated with energy resources, so its risks are reflected in energy prices, energy security and state planning (IEA n.d.). Ukrainian ports were critical for agricultural production, so the consequences of their blockade were manifested through food security, grain storage, internal agricultural logistics and the financial stability of producers (FAO 2022).

The third difference is the type of alternatives. For the Strait of Hormuz, the alternatives are mainly of an infrastructure and energy nature: pipelines, other terminals, strategic reserves, changing sources of supply. For Ukrainian agricultural logistics, the alternatives were more operational: road routes, railway crossings, Danube ports, warehouses, grain elevators, border terminals and European ports (European Commission 2026).

The fourth difference is the level of managerial influence of an individual company. In the case of the Strait of Hormuz, an individual market participant has limited influence on the route itself. In the case of Ukrainian agricultural logistics, the company had more room for operational decisions: choosing carriers, changing routes, using its own fleet and distributing cargo between grain elevators, railways, road transport and river routes (Logist.FM 2023).

The analytical value of the comparison lies in identifying a common mechanism: the sustainability of the supply chain depends not only on the efficiency of the main route, but also on the system’s ability to quickly distribute flows, control costs and make operational decisions in conditions of uncertainty.

7. TIME MODEL OF LOGISTIC RESPONSE TO A MARITIME BLOCKADE

The temporal logistics response model divides blockade management into three horizons: crisis preparation, actions in the first 30 days after the loss of a maritime channel, and long-term adaptation of the system. This approach shows not only what should be in a crisis-resistant supply chain, but also when these solutions should be applied.

Before a blockade, the main task is to prepare scenarios and resources. In the first 30 days, stabilize cargo movement and restore minimum throughput capacity. In the long term, transform temporary solutions into a new logistics system that is less dependent on a single maritime channel.

7.1. Preventive planning before a blockade occurs

Preventive planning begins with identifying critical points in the supply chain: elevators, domestic routes, railway stations, road corridors, border crossings, ports, transshipment terminals and document flow. Each point should be assessed for capacity, cost, risk of delays and the possibility of rapid replacement (McKinnon 2014).

The next step is a scenario map. For each main route, backup and emergency options should be identified. For each of them, it is necessary to determine in advance the transport, transshipment nodes, documents, responsible persons, estimated cost and the limit of the allowable delivery time.

Preventive readiness also requires a contractual and information base: preliminary agreements with carriers, backup terminals and forwarders, as well as tools for tracking transport, tariffs, queues, balances at elevators, documents and voyage execution.

7.2. Response algorithm in the first 30 days of the crisis

The first 30 days after the maritime channel is blocked are a period of stabilization. The system can no longer operate according to the old scheme, but it does not yet have a fully developed alternative model. The main task is to quickly move from uncertainty to controlled cargo movement.

In the first 72 hours, it is necessary to record the actual state of the chain: cargo in transit, residues in elevators or warehouses, urgent contracts, available carriers and open routes. During the first week, the cargo flow is distributed between available directions. In the second week, carriers and tariffs are stabilized. In the third, the economics of the routes are checked. By the end of the month, a temporary working model should be formed.

Table 2. Response algorithm in the first 30 days after the blockade

Period	**Main task**	**Key actions**	**Expected result**
0–3 days	Situation assessment	Inventory of cargo, routes, contracts, carriers and risks	A complete picture of the current state of the chain
4–7 days	Launching temporary directions	Distribution of cargo between available routes, determination of priority batches	Restoring minimal product movement
8–14 days	Transportation stabilization	Carrier selection, tariff control, and daily monitoring of transport operations	Reducing chaos and disruption
15–21 days	Checking the economy of routes	Analysis of the full cost of delivery, terms and risks	Avoiding overly expensive or unstable scenarios
22–30 days	Formation of a temporal model	Fixing work routes, nodes, tariff limits and switching rules	Managed crisis logistics system

Such an algorithm does not eliminate all the consequences of the blockade, but it reduces uncertainty and brings the supply chain into a state of control.

7.3. Long-term adaptation of the logistics system

After the first stage of stabilization, temporary solutions should be evaluated and partially transformed into permanent elements of the logistics system. If a company or industry returns to the previous port-dependent model without taking into account the experience of the blockade, it retains the same vulnerability.

Long-term adaptation should include a multi-channel export structure, investments in reserve nodes, the development of transport flexibility, digital control, revision of contract terms and regular testing of crisis scenarios. Of particular importance is the combination of own transport resources, contract carriers and the reserve transportation market, which is confirmed by the practical experience of Agro Region (Logist.FM 2023).

In the long term, the main result should be the transition from reactive to adaptive logistics. The reactive system begins to operate only after the loss of the route. The adaptive system has prepared scenarios, up-to-date data, proven partners, and a mechanism for quickly switching between channels.

CONCLUSIONS

The analysis shows that single-channel logistics is a strategic risk for supply chains. Dependence on a single port, strait, or transport route can provide high efficiency in stable conditions, but during a blockade, such a model quickly loses its stability. The Strait of Hormuz demonstrates the vulnerability of global energy logistics due to the concentration of significant amounts of energy resources in a single maritime passage (EIA 2025). Ukrainian ports in 2022 showed another dimension of the same problem: the actual loss of the main export channel forced agricultural logistics to urgently switch to alternative routes (Yanovska, Król, and Pittman 2025).

Crisis resilience of the supply chain requires additional costs, but its absence is much more expensive. Backup routes, additional warehouse and transshipment capacities, preliminary agreements with several carriers, digital voyage monitoring, and document control may seem redundant in peacetime. However, in crisis conditions, these elements determine whether the system is able to continue the movement of goods. If alternative routes are not prepared in advance, businesses lose time, face sharp increases in tariffs, transport shortages, border delays and the risk of non-fulfillment of contracts (Christopher and Peck 2004).

Multimodality in such conditions is not an additional option, but a condition for the survival of the supply chain. The Ukrainian experience of 2022 has shown that no alternative channel alone can fully replace seaports. At the same time, the combination of railways, road transport, river ports, border crossings and ports of neighboring countries allows partially compensating for the loss of the main maritime route. It is the combination of several transport scenarios that creates the minimum necessary throughput capacity and makes it possible to support exports even in difficult security conditions (European Commission 2026).

For strategic goods, logistics becomes a security issue. In the case of the Strait of Hormuz, it is about energy security, since the risk of blocking this maritime passage affects prices, insurance, oil and gas supplies and state planning (IEA n.d.). In the case of Ukraine, it is about food security, as the blockade of ports has limited the export of grain and agricultural products, which has had consequences not only for the Ukrainian economy, but also for food-importing countries (FAO 2022).

The general conclusion is that a modern supply chain should not be built around a single most efficient route, but as a system of prepared alternatives. Sustainable logistics involves reserve capacity, multimodal transportation, risk sharing between routes and carriers, digital control, financial

assessment of each scenario and readiness for a rapid transition from planned mode to crisis management. The blockade cannot be completely neutralized by logistical tools alone, but a properly designed system allows you to reduce losses, maintain controllability and support the movement of critical goods even with the loss of the main maritime channel.

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