

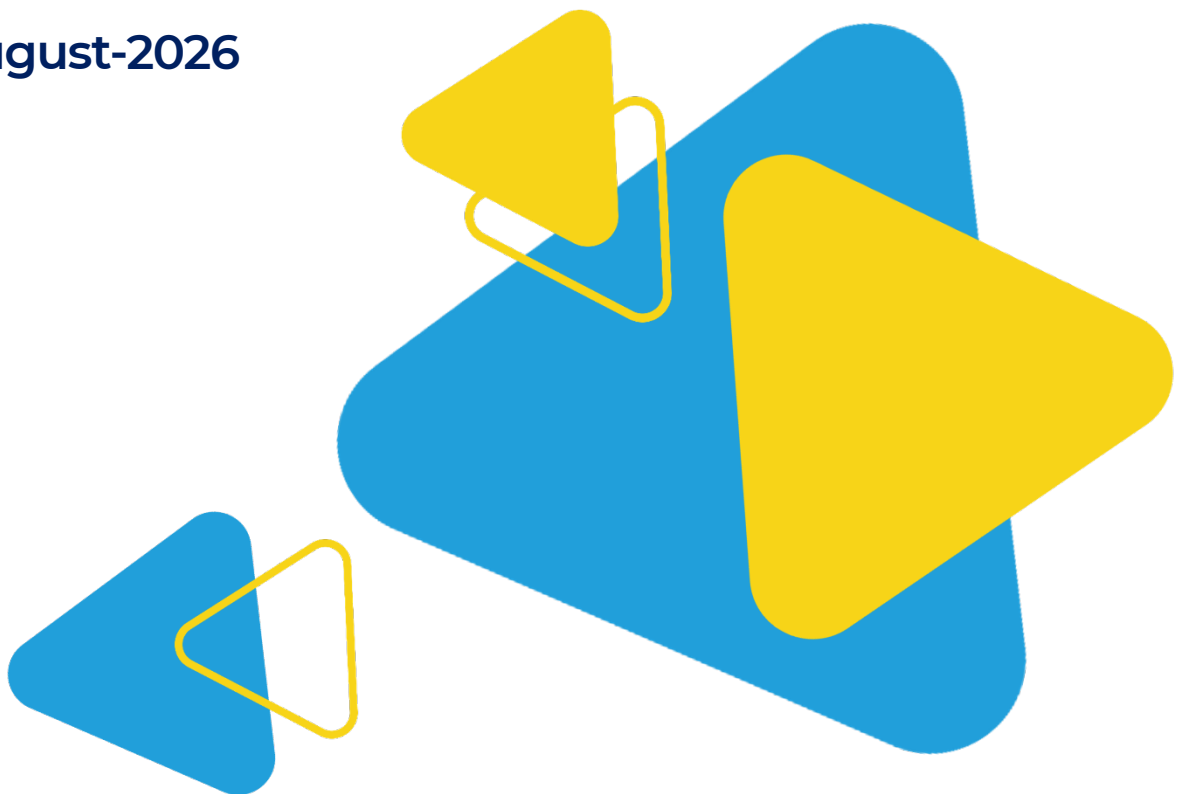


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Analytical Report

Strengthening the Resilience of Ukraine's Export Logistics

August-2026

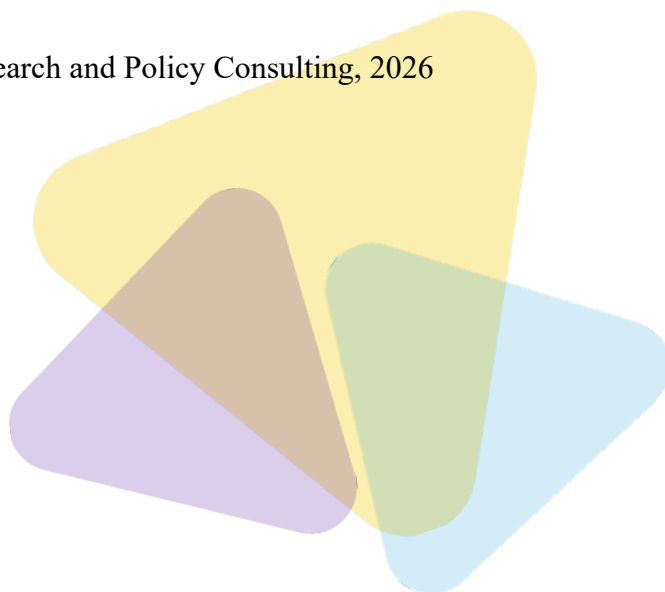


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Executive Summary

Under wartime conditions, Ukraine's export logistics system has preserved its core function of keeping goods moving to foreign markets, but it has done so by concentrating on a narrower, costlier, and less predictable set of routes than before 2022. This paper assesses the system's resilience against continuity, predictability, trade costs, adaptability, and route diversification criteria, combining the authors' assessment using foreign-trade, eCherha, Ukrzaliznytsia, and seaport statistics with interviews conducted with stakeholders working across maritime, rail, and road logistics.

The war has fundamentally reshaped the modal structure of Ukraine's exports. Road transport has become the primary channel for high-value, time-sensitive trade, increasing its share of export value from 22.3% in 2021 to 39.8% in 2025 despite carrying less than 10% of total export volume. Maritime routes remain the backbone of Ukraine's export system, handling nearly 70% of export tonnage but only 47–48% of value, well below the pre-war average of 62%. Rail has primarily been used to transport lower-value bulk goods.

Across key resilience dimensions, continuity remains relatively strong but highly concentrated. A handful of Polish road and rail crossings and three deep-sea ports handle most export flow, leaving the system vulnerable to disruptions at a few critical nodes. Predictability is weakest in maritime and road transport, where ongoing attacks on port infrastructure, lengthy border queues, and Poland's Register of International Road Transport (RMPD) monitoring regime continue to undermine planning.

Route diversification is particularly limited: land routes can absorb only about one-third of maritime grain throughput, the Danube has reverted to a secondary role since reopening the Ukrainian Sea Corridor, container traffic remains far below pre-war levels, and only a handful of western rail corridors operate effectively. A recurring asymmetry compounds these gaps: the shift onto land routes after a maritime shock completes within about two months, while recovery to maritime routes takes several months longer.

Interviews suggest the most significant constraints are institutional and regulatory rather than physical. Key challenges include state monopoly and ownership of ports and railways; the absence of a state modal-distribution policy and of a cross-modal tariff regulator; the Polish RMPD's regime and the EU's new 90/180 driver rule; war-related damage to rail infrastructure and disruption from air raids; low containerization rates; underutilized river transport; and the lack of market-safety institutions such as carrier and forwarder blacklists. These constraints are compounded by reduced wartime cargo volumes and a critical strategic vulnerability: the absence of a viable alternative to the maritime corridor, with Poland accounting for roughly half of Ukraine's international truck-crossing capacity.

To address these challenges, Ukraine must focus on improving border-crossing efficiency through better staffing, transparent performance data, and stronger process oversight rather than major infrastructure investment. Additional near-term measures include negotiating practical solutions with Poland on the RMPD regime and 90/180 rule, implementing e-queue priority for pre-cleared cargo, launching a joint risk-insurance fund

to bring container carriers back to Ukrainian ports, and maintaining EU trade-access arrangements.

Longer-term reforms should address structural weaknesses by reducing state monopolies distortions, advancing railway and interoperability reforms, creating a cross-modal tariff regulator, strengthening the multimodal transport framework, and better protecting maritime and rail infrastructure, where disruption has the greatest and most persistent impact.

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Introduction

Ukraine's export logistics system has become a critical determinant of the country's economic resilience, market access, and competitiveness under wartime conditions. Since Russia's full-scale invasion in 2022, exporters have faced disrupted maritime routes, attacks on transport infrastructure, border congestion, shifting regulations, rising security and insurance costs, and persistent uncertainty over the availability of export corridors. As a result, logistics increasingly determines whether Ukrainian goods can reach foreign markets on time and at competitive costs.

Disruptions can quickly translate into lost contracts, delivery delays, reduced margins, and weaker market positions, particularly in export-dependent sectors such as agriculture, metals, and food processing. Conversely, a logistics system capable of absorbing shocks, maintaining alternative routes, and restoring trade flows strengthens exporters' ability to preserve market access and remain competitive despite a highly volatile operating environment.

This paper focuses on the resilience of Ukraine's export logistics infrastructure and related institutional arrangements to ensure access to foreign markets, support export activity, and enhance the competitiveness of Ukrainian goods and services. It analyzes the resilience of logistics infrastructure, identifies key challenges and barriers affecting logistics systems, and proposes practical recommendations to strengthen long-term economic resilience.

The paper does not aim to provide a comprehensive technical audit of Ukraine's transport infrastructure or to cover the entire transport sector in equal detail. Instead, it focuses on the routes, nodes, procedures, and institutional factors most relevant to export logistics and market access. The analysis covers key export channels, including road border crossings, cross-border road freight, rail export logistics and rail interfaces, maritime and seaport logistics, Danube and river logistics, and intermodal links. It also examines the institutional and regulatory factors that shape the performance of these channels, including customs and border procedures, coordination among public authorities, infrastructure operators and market actors, infrastructure governance, and broader regulatory or geopolitical constraints.

The paper addresses the following research questions:

1. Which vulnerabilities in Ukraine's export logistics system most seriously threaten continuity, predictability, and cost-efficient access to foreign markets?
2. Which operational bottlenecks in road, rail, maritime, Danube, border-crossing, and intermodal logistics most directly affect the reliability and flexibility of export flows?
3. How do institutional and regulatory factors, including customs and border procedures, coordination mechanisms, infrastructure governance, and regulatory uncertainty, shape the resilience of export logistics?
4. How do logistics constraints affect exporters in practice, especially in terms of market access, delivery reliability, trade costs, and route diversification?

5. Which resilience gaps and risks are most critical for Ukraine's long-term export sustainability and competitiveness?
6. Which policy, coordination, procedural, or market-oriented measures could realistically strengthen export logistics resilience in the short- and medium-term under current wartime and institutional constraints?

By answering these questions, the paper seeks to identify where Ukraine's export logistics system is vulnerable, which constraints matter most for exporters, and which interventions are likely to produce practical improvements. The purpose is to support policy discussion on how Ukraine can preserve and strengthen its export connectivity amid ongoing disruption.

Analytical Framework and Methodology

Definition of export logistics resilience

Export logistics resilience is defined here as the capacity of Ukraine's export logistics system to maintain, restore, and adapt the movement of goods to foreign markets amid wartime, economic, regulatory, and geopolitical disruptions, while preserving market access, delivery reliability, reasonable trade costs, and the possibility of route diversification.

Resilience is commonly understood as a system's capacity to prepare for, absorb, recover from, and adapt to shocks (OECD),¹ and in supply chain² and transport work as the ability to restore normal operations after disruption while maintaining freight mobility.³ However, that standard shock-and-recovery framing is insufficient here, because Ukraine's system operates under prolonged war, recurring infrastructure attacks, shifting trade routes, and evolving market access constraints. In this context, resilience cannot be reduced to a return to the pre-disruption state. For an export-oriented economy, resilience must also be assessed in terms of trade outcomes. As the World Bank stresses,⁴ reliability matters to traders as much as speed, since unpredictable clearance disrupts contracts and raises costs.⁵

¹ Resilience Strategies And Approaches To Contain Systemic Threats. OECD, SG/NAEC(2019)5 <https://one.oecd.org/document/SG/NAEC%282019%295/en/pdf>

² Keys to resilient supply chains. Increasing supply chain resilience: OECD policy toolkit. <https://www.oecd.org/content/dam/oecd/en/topics/policy-issues/global-value-and-supply-chains/Resilient-Supply-Chains-Brochure-2024.pdf>

³ Structuring a Definition of Resilience for the Freight Transportation System. Chilan Ta, Anne V. Goodchild, and Kelly Pitera. Transportation Research Record: Journal of the Transportation Research Board, No. 2097, Transportation Research Board of the National Academies, Washington, D.C., 2009, pp. 19–25. <https://www.urbanfreightlab.com/wp-content/uploads/2023/04/Structuring-a-Definition-of-Resilience-Freight.pdf>

⁴ Logistics Performance Indicators 2.0. <https://lpi.worldbank.org/en/home>

⁵ Why smarter logistics are essential for trade, growth, and jobs. Christina Wiederer, Matias Herrera Dappe, Daria Ulybina. April 23, 2026. <https://blogs.worldbank.org/en/trade/why-smarter-logistics-are-essential-for-trade--growth--and-jobs>

Accordingly, this paper treats export logistics resilience as both an operational and economic concept rather than solely an infrastructure one. It assesses resilience across two dimensions: the **operational** functioning of key routes and nodes (road crossings, rail interfaces, seaports, Danube ports, and intermodal links), and the **institutional and regulatory** arrangements (customs procedures, coordination, capacity management, and policy predictability) that shape how these assets perform under stress.

Resilience is assessed through five criteria:

1. **Continuity:** keeping export flows moving during disruption, even through reduced, rerouted, or temporary arrangements.
2. **Predictability:** the ability to plan shipments with reasonable confidence over timing, procedures, waiting times, and route access.
3. **Trade costs:** the extent to which disruption, delay, rerouting, or regulatory barriers raise the cost of reaching foreign markets.
4. **Adaptability:** the capacity of authorities, operators, and exporters to adjust procedures, routes, modes, and coordination as conditions change.
5. **Route diversification:** the availability and practical usability of alternative channels, so exporters are not excessively dependent on a single route, mode, crossing, or port.

This approach deliberately avoids equating resilience with physical reconstruction alone: a route may be physically available yet commercially unusable due to cost, unpredictable delays, or poor coordination, while a low-capacity route can still add resilience as a reliable fallback. The core question is whether the system preserves market access and competitiveness under stress.

Methods and evidence base

Export logistics resilience cannot be assessed solely from infrastructure data. It depends on the interaction between physical capacity, operational performance, border and customs procedures, regulatory constraints, market behavior, and the ability of exporters and logistics providers to adapt when routes or conditions change. Therefore, this paper uses a mixed-methods consisting of four main components: desk research, structured data review stakeholder interviews, and policy analysis.

The desk research for this paper included review of policy documents, government strategies, donor and international organization reports, sectoral studies, relevant legislation and regulations, and previous analytical work on Ukraine's transport, trade, customs, and logistics systems. This review supported the identification of the main known bottlenecks, policy commitments, institutional constraints, and reform processes affecting export logistics resilience.

The structured analysis incorporated available quantitative indicators for export flows, transport performance, border crossings, route use, logistics costs, and disruptions. This included foreign trade statistics; transport volumes by mode, port, and railway; border-crossing data; customs-related indicators; queue and waiting-time data; and sectoral

information from public authorities, infrastructure operators, business associations, and market sources. Quantitative evidence was used not only to describe trends, but also to identify where disruptions, bottlenecks, or route shifts have had the greatest practical relevance for exporters.

The semi-structured stakeholder interviews were conducted with selected public- and private-sector stakeholders and experts. These consultations were used to test and refine findings from desk research, identify bottlenecks not fully visible in public data, assess the practical consequences of operational and regulatory constraints, and sharpen policy recommendations. Stakeholder consultations were particularly important for understanding issues such as predictability, informal costs, coordination failures, route substitution, and the actual feasibility of proposed solutions.

Finally, the paper applies comparative and policy analysis to synthesize the evidence and identify priority resilience gaps. After defining export logistics resilience and its assessment criteria, it examines the performance of key export routes and nodes alongside the institutional and regulatory factors that shape them. The analysis compares constraints according to their impact on market access, delivery reliability, trade costs, adaptability, and route diversification, allowing it to distinguish between secondary challenges and binding constraints on export resilience. The resulting recommendations emerge directly from this assessment rather than as a standalone list of reforms.

Data limitations and caveats

The analysis was subject to several important data limitations. These limitations did not prevent an evidence-based assessment, but they required caution in interpreting the findings and prioritizing resilience gaps.

First, wartime conditions have affected the availability, completeness, and regularity of official data. Some transport, infrastructure, customs, border-crossing, and operational indicators are unavailable, delayed, aggregated, or no longer published in the same format as before the full-scale invasion. In some cases, data gaps reflect security considerations. As a result, the paper cannot provide a fully comprehensive statistical picture of all logistics routes, nodes, and disruptions.

Second, available data is uneven across transport modes and logistics segments. Maritime, Danube, rail, road, border-crossing, and intermodal logistics are covered by different institutions, data systems, and reporting practices. Some indicators measure cargo volumes, others measure waiting times, capacity, infrastructure use, or administrative performance. These indicators are not always directly comparable. Therefore, the analysis does not treat all modes as statistically equivalent but interprets each data source in relation to the specific operational question it can reasonably answer.

The freight market is, in a senior stakeholder's assessment, not actually counted. Internal road freight movement has virtually no comprehensive statistical basis (cargo types, directions, and origin/destination are nearly absent), leaving customs data as effectively the only systemic source, and only for the export-import segment. The implication is that

evidence-based modal-redistribution policy cannot be built without first constructing a measurable foundation: one cannot establish which cargoes travel by road rather than rail, over what distance, and why, in the absence of a full transport matrix.

Third, some key aspects of export logistics resilience are difficult to quantify. Predictability, coordination quality, informal delays, flexibility in route choice, the commercial attractiveness of alternative routes, and the practical impact of regulatory uncertainty are often only partially reflected in official data. For this reason, stakeholder interviews are used as a necessary source of evidence for dimensions that are poorly captured by statistics.

Fourth, logistics costs are affected by multiple overlapping factors, including security risks, fuel prices, insurance costs, seasonal export patterns, transport supply and demand, border procedures, infrastructure constraints, and regulatory requirements. This makes it difficult to attribute cost increases to a single cause. The paper, therefore, focuses on identifying the main mechanisms by which logistics constraints affect exporters' costs and competitiveness.

Finally, the situation in Ukraine's export logistics system remains highly dynamic. Security risks, border procedures, EU regulatory decisions, infrastructure damage, route availability, and market behavior can change quickly. The paper, therefore, presents findings as an assessment of resilience under current wartime and regulatory conditions, while also identifying risks and vulnerabilities that may remain relevant across different future scenarios.

Operational Resilience of Key Export Routes and Nodes

Border crossings and cross-border road freight

After the closure of the deep-sea ports in February 2022, the western and south-western road border absorbed a large and disproportionately high-value share of Ukraine's redirected trade, and it remains the most exposed node in the export-logistics system. Operational capacity at these crossings is measured by the eCherha electronic queue system,⁶ piloted at Yahodyn–Dorohusk in December 2022 and subsequently expanded across additional border points. As registration is mandatory where it operates, the data captures nearly all regulated truck flows.⁷

The dataset covers eleven monthly snapshots from March 2023 to April 2026. Coverage expanded significantly during this window, from one pilot crossing to 28 crossings and as many as 42 queues. While aggregate figures are therefore not strictly comparable across

⁶ <https://echerha.gov.ua/statistics>

⁷ Cabinet of Ministers of Ukraine, Resolution No. 1349 of 2 December 2022, "On the experimental project on the functioning of the electronic queue for crossing the state border".

the full dataset, there is a robust indicator of where road freight is concentrated and how traffic reallocates under periods of disruption.

Trade statistics put the road border's weight in context (Table 1). By value, the road's share of exports rose from 22.3% in 2021 to 36.7% in 2022 and has held between 33% and 40% since (39.8% in 2025). By weight, it carried 5.6% of export tonnage in 2021, peaked near 12% in 2022–2023, and eased back to 8–9% by 2025 as bulk cargo returned to sea. Road cargo is therefore about four times as valuable per ton as the average Ukrainian export (a value-to-tonnage share ratio near 4.3 in 2025, against 0.7 for sea and 0.5 for rail). The road border is carrying the highest-value, most time-sensitive trade, for which marginal hours of border delay are disproportionately costly.

Table 1. Modal composition of Ukrainian exports, by mode of transport at the border (% of total)

By value

Mode	2021	2022	2023	2024	2025	Jan–Mar 2026
Road	22.3	36.7	38.0	33.0	39.8	38.4
Rail	12.2	20.6	19.9	14.5	12.0	12.3
Sea	62.4	40.4	41.0	51.8	47.0	48.4
Other	2.8	2.4	1.0	0.7	1.2	1.0

By volume (tons)

Mode	2021	2022	2023	2024	2025	Jan–Mar 2026
Road	5.6	12.0	11.7	7.6	9.2	8.5
Rail	20.2	33.8	33.1	23.4	24.2	21.9
Sea	74.0	54.0	55.1	69.0	66.4	69.2
Other	0.2	0.2	0.1	0.0	0.2	0.4

Source: author's calculations from monthly foreign-trade statistics by mode of transport at the border. "Other" groups air, pipeline, and unspecified modes; columns may not sum to 100% owing to rounding.

Road freight is heavily concentrated on the Polish border, which handles 46–61% of all trucks across the series, with Yahodyn–Dorohusk alone processing 16,000–20,000 trucks in a typical month, by a wide margin the busiest road node. The Romanian border consistently ranks as the second most important corridor (Table 2).

Table 2. Trucks handled through eCherha by border section (per snapshot month)

Crossing / border	Mar 23	Jun 23	Aug 23	Nov 23	Mar 24	May 24	Sep 24	Dec 24	Jun 25	Oct 25	Apr 26
Poland	19,931	44,859	47,168	28,021	13,817	34,719	33,310	34,105	48,655	54,044	47,596
Romania	–	14,578	13,951	11,857	14,331	14,794	14,323	13,027	12,183	12,610	12,202
Moldova	–	9,470	9,975	8,258	10,469	8,354	6,617	7,123	8,043	9,857	8,735
Hungary	–	8,380	7,391	8,555	7,947	6,770	5,255	4,700	7,833	7,774	7,068
Slovakia	–	3,985	4,312	3,815	3,369	3,488	3,658	2,939	4,476	4,959	4,150
Total	19,931	81,272	82,797	60,506	49,933	68,125	63,163	61,894	81,190	89,244	79,751
Poland, % of total	100%	55%	57%	46%	28%	51%	53%	55%	60%	61%	60%

Source: author's calculations from eCherha system data. "–" = crossing not yet covered in that snapshot. Totals are not strictly comparable across the series because system coverage and queue categories expand over time.

The 2023–24 Polish carrier and farmer blockades are the clearest tests of the section's resilience. Throughput on the Polish section fell about 70%, from 47,000 trucks in August 2023 to under 14,000 in March 2024. The shock was highly uneven: the blockaded points collapsed while Krakivets–Korchova held and the Romanian and Moldovan borders reached their highest readings of the series (Annex A, Table A1).

The national modal data confirms this. Road tonnage fell about 40% and its value about 21%, indicating that scarce road capacity was reserved for the highest-value consignments, while heavier, lower-value loads were shed first. Road's per-ton value rose from about USD 1,110 to USD 1,450 at the trough (Annex A, Table A2). The episode shows both the Polish corridor's vulnerability to non-physical, political disruption and a real but costly capacity to reroute southward.

The Polish border was reopened, receiving about 34,000 trucks per month by December 2024, and total monitored throughput peaked near 89,000 in October 2025 before easing to about 80,000 in April 2026. Part of this reflects genuine normalization and part the broadening of coverage (separated empty-truck lanes, weight bands, and dedicated perishable and agri-food queues) as the system moved toward category-specific queues.⁸

⁸ Ministry for Communities and Territories Development of Ukraine, Order No. 1028 of 20 June 2025, establishing the rules of priority of arrival of cargo vehicles at international and interstate border crossing points using the eCherha system (adopted pursuant to CMU Resolution No. 1411 of 5 December 2024).

The crossings fall into four groups: a saturated Polish core (Yahodyn–Dorohusk, Krakivets–Korchova, Rava-Ruska–Hrebenne, Shehyni–Medyka) carrying most freight near capacity; stable, demand-driven southern crossings on the Romanian and Moldovan borders that function as the main relief valve; Chop–Zahon, the only significant Hungarian crossing, which held through the blockade; and a long tail of underused crossings carrying negligible freight. Effective substitution capacity is therefore far narrower than the headline count of 28 crossings implies.

Three structural constraints sit behind these flows. Road haulage is fragmented, with 80–90% of pre-2022 capacity held by operators running one or two trucks, and the in-country fleet contracted about 40% as vehicles moved abroad. Many trucks now run only to Lviv or the border, where cargo is transloaded onto a domestic leg, making a single through movement difficult to arrange.

Labor also remains the primary constraint. A persistent driver shortage, compounded by restrictions on military-service exemptions, has left a significant share of the fleet underutilized. Transport firms can secure exemptions for only about half of their drivers, while sole proprietors, who account for roughly half of the market, lack access to the same reservation mechanism. At the same time, demand has weakened as wartime declines in production and imports have reduced freight volumes, leaving much of the international haulage sector operating in survival mode.

Border throughput is also a governance variable, not only a physical one. Operators place current throughput at least 30% below its early-war level and attribute much of the gap to process organization. At Chop, a carriers' group that obtained daily customs statistics and sustained oversight pushed throughput toward a record 390 vehicles per 24 hours, against 220 when pressure lapsed; on the Slovak side, process analysis and resolution of a scanner problem once lifted a crossing from 70 to 190 vehicles per day before it fell back. A recoverable share of capacity therefore lies in management and coordination, much of it on the EU side, rather than in new construction. Part of it is now being addressed: from 17 July 2026, eCherha began trialing a priority lane for pre-cleared cargo, fast-tracking Authorized Economic Operators and T1/TIR transit on a three-in-five basis.

The principal institutional barrier at this node is the Polish RMPD regime. Since 1 November 2024, every foreign truck over 3.5 tons entering Poland must register the journey in advance and transmit continuous geolocation data throughout transit, under Poland's tax-enforcement monitoring system. Its stated purpose is to combat smuggling and enforce VAT and excise control, and it imposes no quota. However, it is a substantial barrier, because of how the penalties are triggered. A missing registration, incorrect data, or an interruption in the signal draws a fine of up to 12,000 zł per vehicle plus a 12,000 zł deposit posted on the spot.⁹ Contesting a case can take around eighteen months, locking up working capital in the meantime. The trigger can be minor: penalties have been applied for the loss of a GPS signal over a few hundred meters of road,¹⁰ and the region's rising GPS

⁹ <https://www.gov.pl/web/gitd/sent>

¹⁰ <https://www.money.pl/gospodarka/ukrainscy-przewoznicy-oburzeni-karami-w-polsce-apel-rzadu-7118309144202016a.html>

jamming, linked to Russian electronic warfare,¹¹ can sever the very signal a carrier is then fined for losing.

Because the penalties fall only on foreign carriers, operators read the regime as carrying a competitive-protection dimension, though one stakeholder considers the underlying cabotage fear overstated, since cabotage is possible only under ECMT permits that are now digital and trackable.

The most consequential effect is indirect: rather than absorb the fine risk, many Ukrainian carriers, especially the small operators who dominate the market, avoid the Polish border and redirect to Slovakia and Hungary. Since Poland handles roughly half of all truck-crossing capacity, this displacement congests the smaller crossings, producing 24-hour entry queues on the Slovak side and colliding with Hungary's prescribed fixed routes and strict vehicle-condition checks. A monitoring measure on one border thus degrades throughput across the entire western frontier.

Assessed against the study's criteria, the road border preserves aggregate market access but on a fragile, concentrated basis, since disruption at two or three Polish crossings removes a large share of national capacity at once. Delivery predictability is the corridor's principal resilience gain under eCherha's queue management, but it is still undermined by three- to five-day queues, RMPD-driven uncertainty, and slot shifts. Trade costs are elevated by border idle time, the RMPD working-capital drain, foreign penalties, and forced transloading. Route diversification is nominally wide, at 28 crossings, but effectively narrow, because the southern relief crossings are lower-capacity, the long tail is largely inactive, and regulatory displacement from Poland quickly congests the alternatives.

Rail export logistics and cross-border rail interfaces

Rail is the second major land-based export mode and, unlike road transport, is primarily geared toward bulk commodities. By weight, cross-border rail accounted for about 20% of exports in 2021 before rising to roughly one-third in 2022-2023, as the loss of deep-sea port access forced grain and other bulk cargo onto western land corridors. Its share then declined to 22-24% in 2024-2025 as the Ukrainian Sea Corridor redirected bulk exports back to maritime routes (Table 1). Rail's share by value remained consistently about half its share by tonnage (12.0% versus 24.2% in 2025), underscoring its role as the low-value-density counterpart to road transport. It primarily carries grain, ores, and other bulk commodities for which border delays impose relatively modest costs per ton compared with the high-value, time-sensitive cargo that typically moves by road.

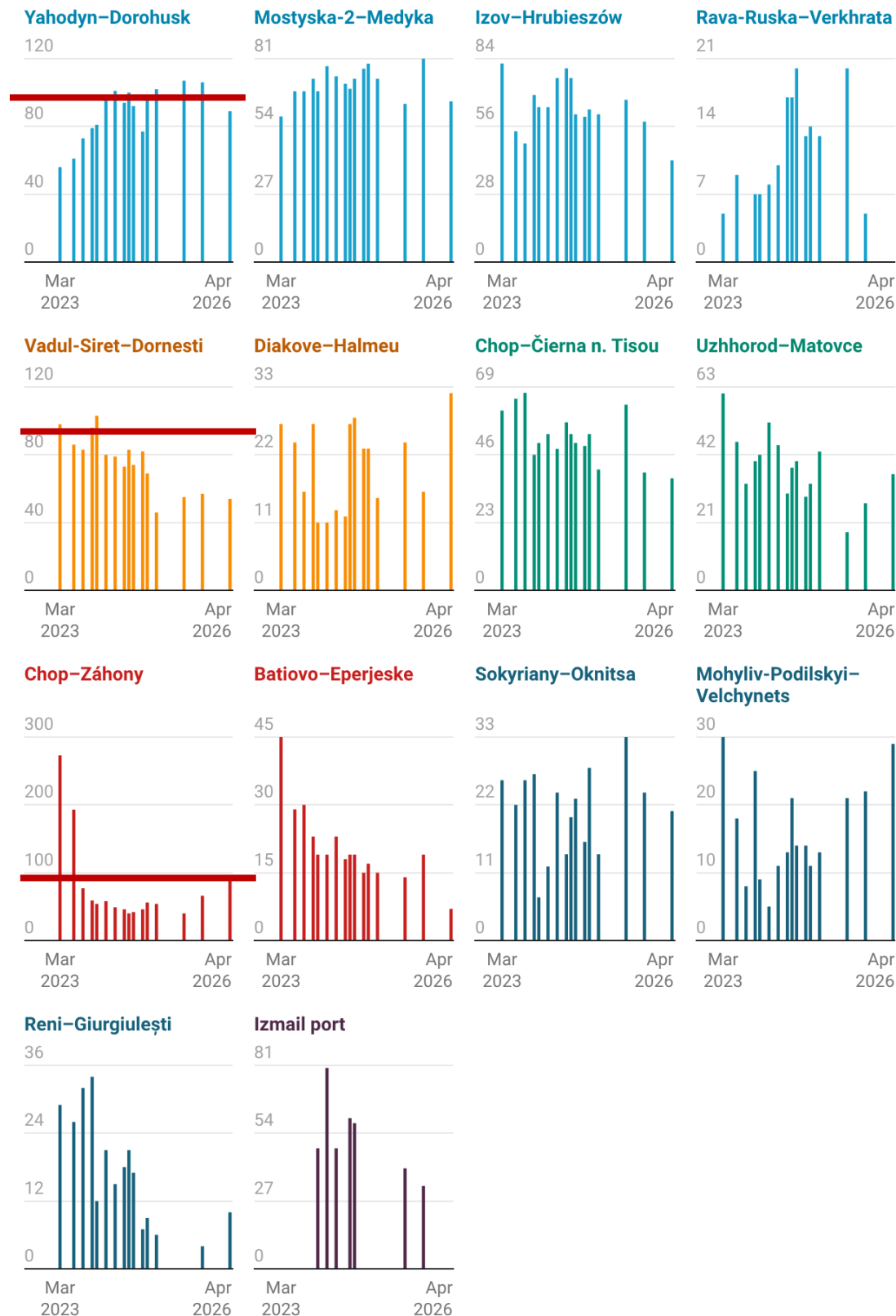
This bulk-oriented profile helps explain rail's greater resilience during the 2023-24 disruption. Cross-border rail export volumes remained within their typical range of roughly 2.4-3.1 million tons per month throughout the blockade, avoiding the sharp disruption experienced on road, where volumes contracted by as much as 40%. The blockade was therefore primarily a road transport phenomenon and had only limited effects on rail operations. This divergence underscores that the two land-based modes are imperfect

¹¹ <https://cybernews.com/cyber-war/poland-warning-russia-jamming-gps-cyber-war/>

substitutes: while rail absorbed some diverted bulk traffic, it was unable to accommodate the high-value, time-sensitive cargo flows typically carried by road.

Interface performance is measured as the ratio of average daily wagon transfer to each crossing's planned daily handover capacity, across eleven monthly snapshots from March 2023 to April 2026 (Figure 1; underlying values in Annex B).

Figure 1. Railway per-crossing utilization rates, %



The crossings fall into four groups. The Polish core is persistently saturated: Yahodyn–Dorohusk has run at or above 90% since January 2024, frequently exceeding its planned maximum, and Mostyska-2–Medyka follows a similar path; these are the binding capacity constraint of the EU rail interface.

A second group of high-capacity crossings is demand-driven and cyclical, running high under EU restrictions and falling as cargo returns to sea (Izov–Hrubieszów, the largest at 600 wagons per day, fell to 42% by April 2026), leaving substantial reserve capacity unused.

The third, Chop–Záhony, is a natural experiment in capacity expansion. Its planned limit was tripled to 90 wagons a day in 2023; utilization then settled at 40–60% for two years before spiking to 96% in April 2026, showing that targeted expansion relieves saturation, but can re-saturate within a few years.

A fourth group is structurally underused across every regime, most notably Batiovo–Eperjeske, where utilization fell from 45% to 7% against a planned 420 wagons a day; its roughly 390 wagons a day of permanent slack is the largest single pool of unused land-route capacity in the system. Persistence across all regimes rules out demand and points to structural causes specific to each crossing.

The interviews conducted help explain why substantial cross-border rail capacity remains underutilized. Ukrzaliznytsia's (UZ) own account matches the per-crossing picture: against a network capable of roughly 3,600 wagons per day, only 1,000–1,300 are transferred, an average utilization of 30–35%, with 4–5 crossings carrying the bulk of the flow. Underloading is a matter of route economics rather than redundancy, since carriers weigh route length, tariffs, wagon rental, and idle time costs, and often find it cheaper to wait at a congested crossing than to divert to a more expensive one. Alternative crossings, therefore, do not activate under the current tariff and incentive structures, and some can take only 10 train pairs per day, capping any large-scale rerouting.

A related feature, visible only at operator level, is gauge asymmetry within a crossing. At Yahodyn–Dorohusk, the standard-gauge track into Ukraine is fully loaded with petroleum and fertilizer imports, while the broad-gauge track runs at 40–50%, so headline utilization can conceal idle capacity on one gauge.

The dominant constraint on rail continuity is the war itself. Attacks on locomotives, wagons, and traction substations force changes to the movement order, with trains halted under air-raid alerts and cargo accumulating against repair windows, and the cumulative loss of traction has become a critical bottleneck. More than 400 locomotives have been damaged since 2022;¹² body strikes take three to six months to repair, and some components, such as transformers, are no longer manufactured; the shortage is of locomotives, not crews. Daily rail freight turnover has fallen to roughly a quarter of its mid-2010s level.¹³

¹² Of which roughly 260 in the last eighteen months (2025–2026).

¹³ A stakeholder estimate of about 260,000 tons per day against close to 1,000,000 in late 2015–early 2016.

Another distinct bottleneck lies on the approaches to the southern ports, where aging rail infrastructure and limited throughput produce acute seasonal congestion three to four times a year, most notably during the autumn export peak when ore, metals, and grain flows peak. During these periods, loaded wagons and vessels face delays that can cost an estimated USD 30,000–80,000 per day. The resulting port-side congestion is further examined in the section of maritime constraints. According to industry operators, the rail-to-port corridor lacked sufficient capacity to handle Ukraine's full export potential even before the war.

Many of rail's weaknesses stem from institutional rather than physical constraints. UZ remains the sole operator on the general rail network as private traction and new carriers are not admitted, and freight revenues continue to cross-subsidize loss-making passenger services. Together, these raise costs and reduce predictability for shippers. This model and its reform are further examined in later institutional chapters. Meanwhile, corridor development is driven substantially by the EU through European Commission and EBRD financing, as well as investment such as the standard-gauge extension to Mostyska. This reflects the growing importance of the EU as Ukraine's principal export market, accounting for roughly half of Ukraine's goods exports in 2025, much of which was moved by rail.

Assessed against the study's criteria, cross-border rail is, in principle, the strongest land mode for market access and route diversification. Rail provided genuine redundancy when sea access collapsed and held through the road blockade. In practice, its diversification value is narrower than the count of 15 crossings suggests, since only four or five are loaded, the Polish interfaces cap surge capacity, and the largest pool of latent capacity is unreachable under current tariffs. Predictability is undermined by air-raid stoppages, a shortage of traction, congestion at saturated crossings, and uncertainty over future tariff and service terms. The principal resilience gap is on the upside: the saturated Polish ceiling that any future maritime disruption would immediately reach, and the latent capacity elsewhere that the system cannot currently access.

Maritime corridor and seaport logistics

The maritime route has re-emerged as the backbone of Ukraine's export logistics system. Measured as customs exports leaving the country through its sea and river-sea ports, it carried 74% of export tonnage before the war, fell to 54% in 2022 as deep-sea ports were blockaded, and has recovered to 66–69% in 2024–26 under the Ukrainian Sea Corridor (Table 1). By value, the recovery has been more limited: the maritime share fell from 62% in 2021 to 40% in 2022 and has returned to just 47–48%. The route regained its bulk dominance but not its value, its value-to-tonnage ratio falling from 0.84 in 2021 to about 0.70 in 2025, because the high-value, time-sensitive cargo that shifted to road during the blockade did not return.

This recovery is the single largest modal movement in the data: over the corridor's first half-year, monthly maritime exports roughly tripled by weight, from about 3.1 million tons in September 2023 to 8.6–9.7 million tons by early 2024. The maritime route, not the land

border, is therefore where the bulk of Ukraine's export capacity, and its principal future resilience risk, now resides.

Maritime exports are heavily concentrated in a narrow set of bulk commodities. Grain, ore, fats and oils, and oilseeds account for roughly 86% of maritime tonnage and 81% of value (Annex C, Table C1). Dependence is equally strong in the opposite direction: for Ukraine's principal export commodities, maritime transport is the dominant choice, carrying 97% of grain, 77% of oilseeds, 75% of fats and oils, and 58-61% of ferrous metals, ores, and food-industry residues. These are the commodities with the least route flexibility, heavy and low-value-per-ton, for which land alternatives are capacity-limited and far more expensive.

The maritime route is thus at once the system's greatest strength and its greatest concentration risk: it provides bulk capacity no combination of land routes could replace, yet concentrates it in a few commodities, a few ports, and a single exit corridor, so a disruption to maritime access threatens a far larger share of export value and volume at once than any land-side bottleneck.

The deep-water ports of Greater Odesa (Odesa, Chornomorsk, and Pivdennyi) handle the great majority of bulk exports, and their status has defined maritime export resilience across four phases: pre-2022 operation, the full blockade (March–July 2022), the Black Sea Grain Initiative (BSGI, August 2022–July 2023), and the Ukrainian-operated corridor since August 2023 (Table 3).

Table 3. Total export throughput, kt/month (port-level handling statistics)

Phase	Greater Odesa ports	Danube ports	Current 6 ports	6 ports' share of pre-2022, %
Pre-2022 (Jan 2021–Feb 2022)	6,654	262	6,916	100%
Blockade (Mar–Jul 2022)	10	971	981	14%
Grain Deal (Aug 2022–Jul 2023)	2,690	1,929	4,620	67%
Corridor (Aug 2023–Mar 2026)	5,349	871	6,220	90%
Q1 2026	5,477	239	5,716	83%

Source: author's calculations from monthly USPA statistics.

The blockade nearly severed deep-sea export capacity: grain throughput at the three ports fell from about 2,650 thousand tons per month to single digits and stayed below 20% of its pre-2022 level for eight months. The corridor then restored it substantially, with total deep-sea throughput recovering to 90% of these ports' pre-2022 level and standing at 83% in Q1 of 2026. However, that recovery is measured against these six ports alone. Before 2022,

they accounted for only about 69% of national seaport throughput; the balance, Mykolaiv above all together with the Azov and Dnipro-estuary ports lost to occupation or blockade, has not returned, so against the full pre-war system corridor-era throughput is closer to 62%, and Q1 2026 to about 57%. This contraction of the operational port set is a loss of structural resilience distinct from the corridor's own recovery. Continuity is, in operators' description, real but conditional: cargo moves without systemic interruption, but on a higher cost base and a thinner fleet market than before the full-scale invasion.

Recovery in volume has not been matched by recovery in stability. Month-to-month variability in deep-sea grain throughput rose from a pre-invasion coefficient of variation of 32% to 37% under the corridor. The dominant cause is continued exposure to attack. In Q1 2026, the Greater Odesa ports and surrounding infrastructure sustained at least 73 missile and drone strikes, almost one a day,¹⁴ five of which hit vessels and damaged eight civilian ships, even as the corridor handled 668 port calls in the same quarter. Operations continue, but under sustained fire, so reliability rather than the route's existence is the binding constraint, and predictability is the criterion on which the maritime node is weakest. At the voyage level, air-raid alerts, weather, and convoy and canal-transit windows add variability, so time risk is priced into freight and planning buffers.

On cost, freight has normalized as the corridor stabilized. As of mid-June 2026, the benchmark rate for shipping 30,000 tons of corn to the east coast of Italy was about USD 23 per ton, down from a spring peak near USD 30–31, the easing reflecting subdued demand rather than any disruption.¹⁵ Lower, more stable freight is itself a marker of restored resilience. Against this, the structural cost base remains elevated due to war-risk insurance premiums, crew surcharges for the risk zone, and port dues reported as higher than at some competing European ports, which compress exporter margins.

The corridor restored continuity at the cost of concentration. Q1 2026 throughput runs across only three deep-sea ports, with pronounced single-point dependencies: grain exit rides almost entirely on Chornomorsk and Pivdennyi, and ore is handled only in Pivdennyi (Annex C, Table C1). Vessel supply compounds this. The chartering market has narrowed, as some international owners decline calls over shelling risk and European tonnage, Greek owners in particular, is largely absent; the pool is now concentrated among Turkish and Gulf owners with a higher tolerance for war risk, which reduces competition, raises freight, and leaves exporters less scheduling flexibility.

The maritime picture splits sharply by cargo type. Bulk agricultural products reach the ports by rail and load onto bulkers comparatively well, but finished and processed products depend on container logistics that have not recovered. Container exports collapsed with the 2022 blockade, from roughly 478,000 TEU in 2021 to a 2023 low near 35,000 TEU, and have recovered only partially, to about 104,000 TEU in 2025, close to a fifth of the pre-war level. Container ships face different insurance and voyage economics

¹⁴ BlackSeaNews / Institute of Black Sea Strategic Studies, monitoring database, 9 April 2026. <https://www.blackseanews.net/read/243655>

¹⁵ ASAP Agri / Atria Brokers, 15 June 2026. <https://latifundist.com/novosti/70451-fraht-z-ukrayini-zalishayetsya-stabilnim-popri-pozhvavlennya-rinku--asap-agri>

than grain bulkers; large vessels do not call at scale, and workarounds run mainly via Constanța. For finished-product exporters, the binding constraint is the war-risk insurance gap for container carriers, which keeps this substitution channel effectively closed.

Seaport throughput also depends on the inland rail haul that feeds it. UZ supplies 42–45 trains per day to the seaports, compared with 50–55 under normal operations, indicating a shortfall in traction and inland haulage rather than in port handling. The rail queues at the port-direction stations track this dependence (Annex C, Table C3). Their most extreme reading, Izmail's 29-day queue in July 2023, came when the deep-sea ports were not yet operating, and the Danube absorbed the redirected flow; it had eased to a normal 5–7-day band by mid-2024. The Black Sea ports normalized similarly, but the most recent observations show a renewed elevation, with the Odesa queue rising from 2.5 days in July 2025 to 9.3 in April 2026. This is not driven by rising throughput: over the same window, deep-sea handling was flat at Odesa and Chornomorsk and fell about 15% at Pivdennyi, a 6% decline across the three ports. Queues lengthened while the ports loaded the same or less cargo, which points to a constraint on effective loading rather than a demand surge, consistent with the intensified Q1 2026 strikes cutting port operating time. Disaggregated readings sharpen the point: the Ksenieve terminal feeding Chornomorsk and the terminal serving the Odesa Portside Plant at Pivdennyi both queue several times their port aggregate, so transit terminals and operator-specific channels warrant attention as hidden bottlenecks.

Stakeholders set these wartime constraints against a pre-war baseline in which port capacity was already binding. The deep-sea ports entered the war with old infrastructure and an unsettled concession framework, and even under a relatively undemanding bulk profile (roughly 40% mining and metallurgical and 40% grain exports), the system reportedly could not keep pace with export potential, modern assets, such as the private TIS terminal, being the exception. The underlying ownership and investment model is examined in the institutional chapters; the point here is that the maritime node's capacity constraint predates the war and is structural.

Danube logistics

The Danube ports (Izmail, Reni, and Ust-Dunaisk) were marginal to Ukrainian export logistics before 2022, handling about 5,000 tons per month, 0.2% of seaborne grain exports (Table 4). Their significance is entirely a wartime phenomenon: when the deep-sea ports were blockaded, the Danube became the principal maritime exit, and its rise and fall is the clearest demonstration of route substitution in the export system.

During the blockade, with deep-sea grain throughput near zero, the Danube ports carried 97% of all seaborne grain export. As the grain deal allowed the two channels to run in parallel, the Danube total throughput peaked at about 1.9 million tons a month, 42% of the six-port total. This surge is operational proof that the export system had real substitution capacity: a secondary maritime channel able to absorb a large share of displaced volume within months.

Table 4. Grain export, deep-sea vs Danube, kt/month

Phase	Greater Odesa ports	Danube ports	Current 6 ports	Danube ports' share, %
Pre-2022 (Jan 2021–Feb 2022)	2,647	5	2,652	0.2%
Blockade (Mar–Jul 2022)	8	303	311	97.3%
Grain Deal (Aug 2022–Jul 2023)	2,216	466	2,682	17.4%
Corridor (Aug 2023–Mar 2026)	2,904	106	3,010	3.5%
Q1 2026	3,233	2	3,235	0.1%

Source: author's calculations from monthly USPA statistics.

That contribution was decisive but bounded. The Danube kept a maritime grain exit open when the primary channel was closed, but total seaborne throughput during the blockade was only 14% of pre-2022 levels, thereby mitigating rather than replacing the loss.

Danube routing carries a structural cost penalty. As of mid-June 2026, shipping corn from Ukrainian Danube ports to the east coast of Italy cost about USD 39–40/t by coaster, compared with roughly USD 23/t for the deep-water Handysize route, a premium near 70% that persisted throughout June 2025–June 2026.¹⁶ The premium is structural, reflecting the small parcels the river can take (coasters and barges of about 2,000–6,000 t versus 30,000 t for deep-sea), the extra river-sea transshipment stages, and the channel constraints noted below. It caps the Danube's commercial attractiveness whenever the deep-sea corridor is open.

Three constraints bound what the Danube can carry, and they are visible only at operator level. The first is hydrographic: chronic under-investment in dredging leaves channel depths at roughly 4–6 m, compared with the 8–12 m needed even for small 6,000-ton barges, and siltation of the Bystre Canal further limits the admissible vessel size. The second is pilotage: transit is tightly regulated, with some reaches requiring pilots from two countries simultaneously, against a limited pool, adding costs and waiting time. The third is dependence on Romania for access, since the Sulina Canal lies under Romanian jurisdiction, with mandatory procedures, calls at Romanian ports such as Tulcea, fees, and penalties, leaving Ukraine without full control of the corridor.

As the corridor restored deep-sea capacity, the Danube reverted toward its pre-war marginality. By Q1 2026, it handled 4% of export throughput and essentially no grain

¹⁶ ASAP Agri / Atria Brokers, 15 June 2026. <https://latifundist.com/novosti/70451-fraht-z-ukrayini-zalishayetsya-stabilnim-popri-pozhvavlennya-rinku--asap-agri>

(Tables 3, 4), its role reduced to a residual bulk channel concentrated almost entirely at Izmail and led by ore (about 90 thousand tons per month), with ferrous metals and other bulk, while Reni and Ust-Dunaisk fell to negligible volumes. The diversification asset has, in effect, been stood down: held in reserve but no longer load-bearing.

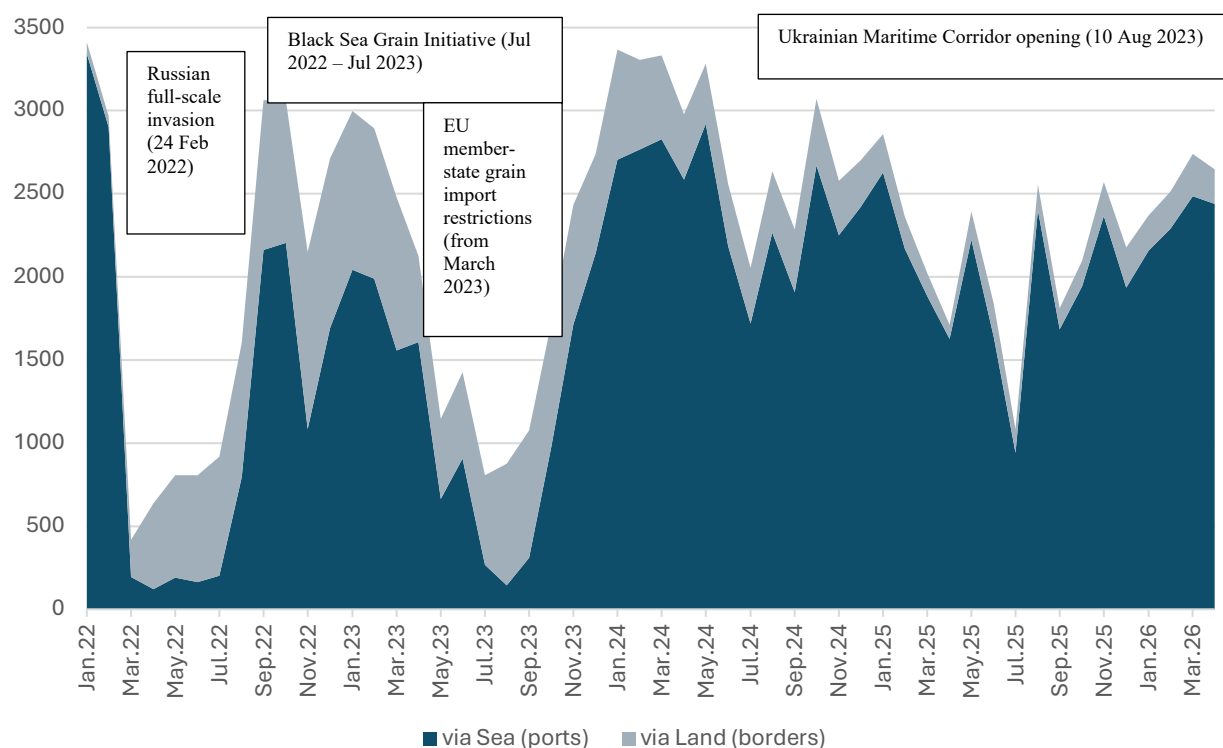
Ukraine's main inland waterway, the Dnipro, is unavailable as an export route: the lower river is a front line, and the destruction of the Kakhovka dam in June 2023 drained the reservoir and broke the navigable cascade that carried most pre-war river freight. River-based export substitution is therefore confined to the Danube.

The Danube episode establishes that substitution between maritime channels is feasible and was executed at scale, but that the substitute is lower-capacity, higher-cost, and physically capped: its resilience value lies in redundancy rather than scale. Beyond Black Sea exit, operators point to a larger unrealized potential up the Danube to Central Europe, where Ferrexpo, for instance, once shipped pellets to Austria by river. How much of a renewed deep-sea disruption the Danube and the land routes could jointly absorb is taken up in the next section.

Intermodal links and route substitution capacity

Figure 2 break downs monthly rail grain exports by exit route, maritime ports versus rail border crossings, from January 2022 to April 2026, across three phases. At the pre-invasion baseline of January–February 2022, grain moved almost entirely through the Black Sea ports (a port-route share above 97%, about 3.0–3.4 million tons a month). From March 2022, the blockade cut port throughput below 200,000 tons a month, while land-crossing volumes rose roughly tenfold, but the substitution was only partial: land routes never exceeded about 1,070 thousand tons in any single month, and total grain exports fell to a third or a half of pre-war volumes. The Black Sea Grain Initiative restored the port share to 70–75% by late 2022; its termination pushed it briefly below 30% in summer 2023; and the Ukrainian Maritime Corridor, opened in August 2023, drove a durable recovery, to 78% by December 2023, 85–89% across 2024, and 89–95% through 2025 and early 2026.

Figure 2. Rail grain export modal split, thousand tons



Two dimensions are particularly relevant for assessing resilience. The first is substitution capacity. Land border crossings have served as an emergency redundancy, not a structural alternative to the ports: their highest annual throughput was 8.4 million tons (2023) against maritime grain throughput of 30 million tons in a normal year (44 million at the 2024 peak), a substitution capacity of roughly a quarter to a third,¹⁷ with a hard monthly ceiling near 1,070 thousand tons. The 2022 blockade tested the combined ceiling: with the deep-sea ports near zero, the Danube (about 300 thousand tons of grain per month, Table 4) and the land crossings together carried only a third to a half of pre-war grain volumes, leaving substantial amounts unexported. Even if both alternative routes were operating at full capacity, a renewed deep-sea disruption would still cut grain exports by roughly half to two-thirds. Maintaining and protecting maritime infrastructure is, therefore, the highest-leverage physical resilience asset in the system, as its capacity cannot be replicated by land-based alternatives within any reasonable timeframe.

The second dimension is the asymmetry between disruption and recovery. The shift onto land routes after the February 2022 invasion was effectively complete within two months, as the port share fell from 97.8% in February to 19.0% in April. Recovery toward the port baseline has been consistently slower: two to three months to climb back above 70% after

¹⁷ Maximum annual land grain throughput (8.4 million tons, 2023) against maritime grain of about 30 million tons in a normal year gives roughly 28%. A peak-month comparison is similar: the highest single land month (about 1,070 thousand tons) against the pre-war peak-season port rate (about 3,400 thousand tons, January–February 2022) gives 31%. The substitution ceiling is therefore roughly a quarter to a third on either basis.

the grain deal, and three to four months after the corridor opened, with a further six months to stabilize in the 85–89% band. Land routes have a hard ceiling, set by gauge mismatch, terminal handling, and customs throughput, that shippers saturate quickly, whereas maritime recovery depends on slower commercial conditions: vessel availability, war-risk insurance pricing, handling contracts, and shipper confidence in new security arrangements. The grain deals' faster recovery is consistent with this, since by August 2023 the commercial relationships still largely intact in mid-2022 had weakened and needed rebuilding.

The implication is that disruption is more durable than recovery: each interruption generates a tail of reduced throughput extending well beyond the disruption itself. This raises the return on damage prevention, the physical and air defense protection of port infrastructure, relative to nominal recovery capacity, and points to pre-positioned institutional instruments (standing war-risk insurance facilities, contingency shipping arrangements, port-handling protocols) as a high-leverage gap, since their function is to compress the slower half of the adjustment.

The same conclusion applies across the other transport modes, as detailed in the preceding sections. The Danube can only partially relieve the deep-sea ports and never absorb their volumes. Containerized exit, which could, in principle, carry finished products around a bulk disruption, is structurally too weak to serve as a lever: it rests on no domestic container stock, a history of monopoly handling and deterred investment, and has de-containerized further during the war (the container collapse is set out in the maritime section). Land diversification is capped by Poland's roughly half of all truck-crossing capacity, so mass diversion quickly congests the smaller Slovak and Hungarian alternatives; southern and eastern routes towards the Caucasus and Central Asia are longer and more expensive, with a Caspian ferry bottleneck; and Ukrainian trucks barred from loading at some Turkish and Polish ports shift that work to foreign carriers and to rail.

The one substitution channel with significant unrealized capacity is multimodal and intermodal (piggyback) transport, which operators identify as the practical lever for a durable modal shift: a single intermodal train can take roughly 54 trucks off the road in one direction. The constraint is an implementation gap, since strategies exist, but little is built, and the early-2000s experience of incentive-based combined transport suggests it will not scale without a deliberate incentive, tariff, and regulatory framework. On the longer horizon, operators are skeptical of Ukraine as a Middle Corridor transit hub under present conditions, given gauge, transshipment, and border-node frictions on the Turkey-Georgia-Azerbaijan-Caspian route, but see potential after EU accession, when the dry ports already built at the border could become dual-use assets.

Assessed against the study's criteria, route substitution supports continuity but only within a hard ceiling: the land side can replace roughly a quarter to a third of maritime grain capacity and saturates within two months, so it buys time rather than replacing the sea. Its weakness is concentrated in route diversification and adaptability, and the asymmetry means trade costs and delivery predictability deteriorate for a prolonged tail after any maritime shock. The highest-value resilience investments are therefore protecting the

maritime node and pre-positioning instruments that shorten recovery time, rather than expanding land capacity that cannot close the gap.

Main operational barriers affecting continuity, reliability, and flexibility

Across the modes, the operational picture is one of capacity and flexibility constraints rather than outright blockage: the system keeps functioning, but at a higher cost base, with lower predictability, and with fewer fallback routes than before the war. Continuity is broadly maintained, since there are no systemic stoppages, but it rests on narrow foundations, from chronic port capacity erosion to the rail traction deficit to a road border concentrated on a few Polish crossings. Reliability is eroded everywhere by situational factors, air-raid stoppages, weather and transit windows at sea, queues and RMPD uncertainty on the road, tariff volatility and crossing congestion on rail, so that time risk is priced into freight and planning buffers. Flexibility, the ability to substitute routes, is the weakest dimension throughout: containerized exit too weak to serve as a lever, the Danube capped, alternative rail crossings idle, multimodal unscaled, and the road border anchored on Poland. Costs run through all of them. The system is seldom blocked outright; it is made more expensive, slower, and harder to reroute. These barriers share the same source: the institutional model that governs the system, which the next chapter examines.

Factors Shaping Export Logistics Resilience

Customs and border procedures

For a competent shipper using an established broker and normal terminals, the technical side of customs and border-guard procedures is resolvable and not the core logistics problem. Two procedural issues matter more. The first is integrity rather than efficiency: interviewees point to “grey customs” and other shadow practices as the real customs-related problem, a governance issue distinct from how well the logistics system runs, and one expert ranked state monopolism ahead of missile strikes or aging infrastructure among the binding constraints.

The second issue is organization at border crossings rather than physical capacity. As the road-border analysis demonstrates, throughput improved when carriers and authorities maintained access to daily statistics and sustained oversight, even without additional capital investment. Two specific regulatory bottlenecks illustrate this point. First, smart-tachograph verification stalled because new vehicles arrived with tachographs that Ukraine could not verify, so operators removed them or fitted older units. The first verification card was issued only in October 2025, about a year after the problem arose. Second, the eCherha priority for sealed, pre-cleared cargo under an open T1 declaration, long legislated but unapplied, finally entered trial in July 2026. The instruments exist, but the constraint has been implementation.

Coordination among authorities, operators, and market actors

Coordination fails differently in each part of the system. In rail and the ports, the structural problem is that the state is both asset owner and regulator, so the body meant to coordinate the network also competes within it, the incentive model this creates is examined below. In road transport, the problem is the reverse: capacity is fragmented across many private operators the state does not own, and the gaps are the missing market-safety institutions and cross-border friction.

Among market actors, coordination runs largely through freight forwarders, who perform real operational work rather than simply taking a margin: consolidating loads, handling documentation and software, accounting, risk management, and scheduling around twenty trucks a day on a lane. Interviewees argue the market undervalues this, since carriers accept very low commissions, then fail to settle correctly and pass their problems back to the forwarders. This exposes critical institutional gaps, as there are no formal rules to discipline such conduct, nor are there any working blacklists for carriers, drivers, or forwarders.

Coordination within the public sector is weaker still, particularly in the rail sector, where shortcomings extend from strategic planning to day-to-day operations. One stakeholder described sector strategies drafted by external consultants using templates imported from other countries, with little consultation of the line ministry or the firms that actually use the network, and estimated that many donor-funded strategies were never implemented. Communication gaps persist among the ministry, the UZ supervisory board, and UZ's operating divisions, limiting the system's ability to translate policy into action. The proposed remedy, a dedicated and properly staffed interagency working group, is discussed in the recommendations section.

Cross-border coordination is constrained as much by partners and the EU as by Ukraine. "Joint control" with Poland has, for two years, been more aspiration than practice. Although the two sides agreed to a bilateral framework roughly three years ago, the EU treats this as its external border and is reluctant to relax border procedures. Furthermore, a 2012 memorandum to reduce duplicated checks never took effect for Poland. UZ adds that at several interfaces, the binding limit is the partner railway's processing capacity, staffing, and working hours, rather than Ukrainian infrastructure. On security, UZ coordinates with the military administration to keep threatened sections operational, which are now integral to sustaining export flows.

Infrastructure governance and management constraints

Across the ports and the Danube, the binding constraint is management and incentive design. According to the interviewees, the state retains ownership while neither investing itself nor allowing others to invest. This state-ownership trap links the unsettled port concessions, the limited reinvestment of port revenue, and the chronic neglect of Danube

dredging. The asset is not the problem; the regime governing it is. This incentive model is the report's central institutional finding, and it recurs, by reference, throughout the analysis.

In the rail sector, the constraint is acute and managerial. Leaders serve 6-9-month tenures, with no incentive to build on the long horizon the network needs, and the system has come to run in "manual" mode, on individual judgment rather than settled procedure. That mode works only while a capable professional is at the controls, and those professionals are leaving for the private sector, where one stakeholder estimated they earn four to five times more. Physical asset governance compounds this, through traction and substation repair backlogs and gauge extension projects specified for passenger rather than freight use. Two regulatory gaps that keep the railway from mobilizing additional capacity, private traction and the wagon-certification regime, are examined as institutional barriers in the next chapter.

Two further gaps concern adaptation. Modern logistics real estate is thin: Ukraine followed an owner-occupier, build-to-suit model rather than the developer-and-lease model common in Europe, and wartime losses around Kyiv have further reduced capacity, leaving little transloading and buffer space.¹⁸ And port competition abroad is itself a governance variable: Polish ports reacted slowly to the redirection of Ukrainian flows and lost cargo, while Romania invested in fast road access to Constanța and continues to benefit.

Broader regulatory, institutional, and geopolitical factors

Maritime and river logistics depend heavily on conditions that market participants cannot control, including security, weather, and neighboring states' regulations. The Danube is the clearest case; its main access point through the Romanian-controlled Sulina Canal is a structural source of low predictability. This external orientation also shapes the corridor's development, much of which has been financed and directed by the EU rather than Ukraine, through EC and EBRD funding and the standard-gauge extension to Mostyska. The benefit is real, but progress advances on external priorities, and the same logic sets a ceiling, since for security reasons the EU is reluctant to extend the 1520-millimeter broad gauge into its territory.

The specific neighbor-state and trade barriers that follow from this external exposure, the Polish RMPD regime, the EU 90/180 driver rule, and the instability of EU trade access, are treated in the road-border section and the next chapter. Underlying them is a common pattern: the war severed the regulatory dependencies on the Soviet legacy that the system relied on, and Ukraine is now building EU-aligned replacements under pressure, with the Law on Safety and Interoperability (No. 4904) as the leading case. The open question is whether the new institutions can be built before the legacy arrangements lapse.

¹⁸ The experts reported a long-standing per-capita deficit of modern logistics space and significant war losses — around Kyiv, a reduction of roughly 500,000–1,000,000 m².

Main Institutional and Regulatory Barriers

Drawing from analysis of the interviews, the barriers discussed in this chapter stem primarily from the state monopoly and ownership model, and from the absence of a coherent governing policy, both examined in the previous chapter. Aging infrastructure is largely a consequence of that model rather than an independent cause. This chapter groups the resulting barriers according to their effects on exporters: those that increase costs, those that reduce predictability and flexibility, and those that constrain route diversification and access to foreign markets. It concludes by examining how these barriers interact and reinforce one another.

Barriers increasing exporters' costs

Wartime cost pressures affect every mode of transport and are detailed in the operational chapters and Annex D. In the maritime and Danube corridors, exporters struggle with procuring war risk insurance, crew surcharges, port dues, and pilotage fees. Road transport bears the cost of foreign penalties, border idle time, and port-loading bans, while rail faces tariff pressure and slow container handling. Across all modes, the results is higher delivered cost and compressed margins, most acutely for low-value road cargo and finished products.

What turns these costs into a structural barrier is the absence of any mechanism to manage them. Ukraine has no cross-modal tariff regulator, and officials avoid making discretionary tariff decisions because any discount can be read as a risk of prosecution. There is therefore no instrument for the incentive pricing used elsewhere to steer cargo between modes, such as Italy's practice of compensating part of the tariff for long-distance car-on-platform transport. Mechanically equalizing cargo classes would make low-value bulk uneconomic to rail, since for a commodity such as gravel the tariff can exceed the cargo's value, pushing it back onto the roads.

UZ pricing is a particular source of both cost and unpredictability. State-regulated tariffs change only by ministerial order, but the larger set of non-regulated services is reviewed quarterly and indexed to producer-price inflation, which reached 40.2% yoy in April 2026, the month before the new freight-services contract took effect on 1 May. The route accumulation charge, for example, rose from UAH 558 to UAH 893 per day. Subsidiaries¹⁹ may petition to have an indexation step waived, thereby adding discretion to the cost base. The upward pressure reflects index-linked repricing and war-driven costs rather than arbitrary increases, but the quarterly cadence and discretionary waivers make the cost base hard to plan against, so for exporters unpredictability is as much a barrier as the level. The separately debated 30-40% rise in regulated tariffs falls within the same framework: a genuine trade-off between exporters' costs and UZ's wartime financial sustainability, with

¹⁹ <https://uz-cargo.uz.gov.ua/en>

freight already cross-subsidizing loss-making passenger services, rather than a one-sided imposition.

Barriers reducing predictability and flexibility

Predictability is eroded by factors outlined in the sections on operational resilience. Ports are operating under fire, the rail sector is experiencing traction shortage, air raid delays, and congestion at the saturated crossings, alongside uncertainty over the regulated freight tariff and the recurring proposal to raise it, while those using road transport face slow review of RMPD cases, transportation rules scattered across many subordinate acts rather than a single code, and throughput that fluctuates with oversight.

Despite these uncertainties, UZ has been building instruments that increase predictability. Its long-term wagon-use contracts fix wagon-use prices for the calendar year on a ton-kilometer basis, independent of direction or speed, so a shipper's cost is pre-calculable; around 20 such contracts are in place, covering most of the relevant fleet (90–95% of gondola cars, about 70% of cement cars, over 50% of tank cars), with a volume-flexibility clause to accommodate variable flows. Grain hoppers, long the least-covered segment, are the newest addition, with four long-term contracts signed or near signing, extending year-ahead price predictability to grain exporters for the first time.

Fleet availability turns on the wagon-certification regime, which is in transition and cuts both ways. The bodies authorized to extend wagons' service life were designated under the Soviet/CIS legacy system; Ukraine's 2022 withdrawal from that agreement stopped new designations, existing five-year authorizations have lapsed one by one, and the certificate of the last remaining body (DETUT, now part of the State University of Infrastructure and Technologies) expires in September 2026. The Ministry is bridging the gap by designating six already accredited organizations to diagnose all freight wagons, and the durable fix under Law No. 4904²⁰ is an independent conformity-assessment system that would exclude UZ from certifying wagons it also repairs and operates, unless its research institute is spun off. The new regime also raises costs through a higher capital repair tier and the "conditional number," whose assignment UZ controls, effectively limiting it to UZ-affiliated repair shops. The Ministry is amending the rules²¹ to admit any certified shop. At the same time, martial-law orders 267 (2024)²² and 62 (2024)²³ allow condition-based extension of serviceable wagons, which the Ministry estimates approximately half of eligible wagons make use of this option, making it a meaningful adaptation measure that helps preserve fleet availability.

²⁰ <https://zakon.rada.gov.ua/laws/show/4904-20#Text>

²¹ Cabinet of Ministers Resolution No. 133 of 14 February 2023, "On the organisation of accounting and control of railway rolling stock and railway-purpose products," in force from 17 February 2023.
<https://zakon.rada.gov.ua/laws/show/133-2023-п>

²² <https://zakon.rada.gov.ua/laws/show/z0517-24#Text>

²³ <https://zakon.rada.gov.ua/laws/show/z0281-24#Text>

Barriers limiting route diversification and foreign market access

The barriers that narrow Ukraine's usable routes run through every mode and are set out in the sections on operational resilience. A thin, concentrated charter market at sea; a rail network where only 5–6 of 14 crossings are actively loaded; a road border where Poland handles roughly half of all truck traffic, causing diversion to quickly congest the smaller alternative routes; and container logistics remain too undeveloped to serve as an effective substitute. The net effect is a narrow set of usable routes and weaker price competitiveness abroad.

The deeper barrier is that few mechanisms exist to deliberately expand Ukraine's route network. There is no regulator to create the tariff differentials that would draw cargo onto idle crossings and broad-gauge capacity. A single railway law was meant to combine safety and interoperability with the unbundling of UZ, but the combined bill proved unpassable, so it was split into multiple regulations. A single railway law was originally intended to combine safety and interoperability reforms with the unbundling of UZ, but the package proved politically unpassable and was split.

The safety and interoperability component became Law No. 4904, adopted on 9 June 2026 under deadline pressure to unlock Ukraine Facility funding, although it includes a three-year transition period and roughly 30 subordinate acts that remain to be drafted. The component most relevant to route diversification, private traction, and the separation of infrastructure from operations was left behind. While it remains a binding EU commitment, no bill has yet reached parliament. As a result, the reforms needed to unlock additional route capacity have not advanced, leaving substantial latent capacity, including idle crossings, broad-gauge infrastructure, and locomotives already owned by major shippers such as Zaporizhstal and ArcelorMittal, unused because of regulatory constraints and commercial inertia rather than physical limitations.

Two external barriers directly limit foreign market access. The EU rule limiting non-resident drivers to 90 days in any 180-day period, loosely enforced in 2022–23, became a binding constraint in 2026 following the introduction of automated entry-exit recording. As a result, exceeding the limit can leave a driver eligible to work only on domestic routes.

The regulation has not been adapted to wartime conditions and hits Ukraine hardest by proximity. EU trade access has also been unstable. The EU applied three regimes over 2025, and the effectively unlimited access of 2023–2025 is partly returning to quotas from 2026. When quotas bind, exporters of finished goods must seek alternative markets, while Solidarity Lanes routing can increase delivered costs by as much as 100 percent. Competitiveness on third markets turns on that surcharge, and the uncertainty itself has depressed export volume. The recent move to a three-year quota horizon restores at least basic predictability.

The cumulative result is the system's defining weakness: it operates with little redundancy. Containers cannot substitute; the Danube ports cannot absorb deep-sea volumes;

multimodal transport is unscaled; gauge integration is incomplete; and the Middle Corridor is not viable now. In the stakeholders' phrase, the system is thin but working its functions, but with little capacity to reroute around the next major shock.

Interplay with other constraints affecting export development

These constraints are not independent; they share a root and reinforce one another. As the state retains the assets without investing or letting others invest, private capital stays out, aging infrastructure persists, and the cost, predictability, and diversification problems compound. Around this sit the missing institutions: no licensing or guarantee framework, no blacklists, fragmented regulation, no tariff regulator, and no modal policy. The uncounted road freight market, the absent regulator, the under-reformed railway, and the shortage of qualified personnel feed each other, so no single fix resolves the others.

The clearest downstream sign of the missing modal policy is fiscal: the state lets cargo shift onto the roads, then pays to repair the damage that heavy freight, rather than cars, does (a recorded 153-tonne overload is the extreme case). This budget cycle, paying for road damage after the fact, has become a substitute for a policy that would distribute flows across modes. The constraints also differ in how fast they can be relieved: border staffing and the e-queue priority for pre-cleared cargo is a quick, cheap fix, while the RMPD regime, the 90/180 rule, and physical crossing capacity need bilateral or EU-level resolution, so the binding gap is in implementation and coordination rather than law. The most consequential interaction is between trade policy and logistics costs, since a binding quota and a high surcharge are each survivable on their own, but together push a product below competitiveness. With no risk fund and no backup corridor, the system remains fragile to the next shock.

Priority Resilience Gaps and Risks

Criteria for prioritizing resilience gaps and risk

This section ranks the gaps and risks identified above along three dimensions. Impact is how severely a gap degrades the resilience criteria (market access, predictability, trade costs, route diversification) and how much of Ukraine's export value or volume it touches. A constraint that raises costs, reduces predictability, and narrows route choice at once, as the RMPD regime does, ranks highest. Substitutability is whether the affected function has a credible fallback at comparable cost, so a bottleneck on a route with no usable alternative, such as a deep-sea grain exit, weighs more than one that can be worked around. Feasibility is whether a gap can be relieved quickly and cheaply, through staffing and process, or only through slow, capital-intensive, or externally dependent change. Together these separate binding gaps from secondary ones and distinguish quick reserves, where high impact meets high feasibility, from systemic risks, equally consequential but slow to resolve.

Highest-impact bottlenecks and resilience gaps for exporters

One bottleneck is both high-impact and high-feasibility - the priority quick reserve: border crossing throughput, which runs three to five days behind in queues recoverable largely through staffing and oversight rather than capital, and which the eCherha priority for pre-cleared cargo, in trial since July 2026, has begun to address. It offers the largest gain at the lowest cost of any available intervention.

The highest-impact discrete bottlenecks lie on rail and at the maritime node. On rail, the binding one is the locomotive deficit, the proximate cause of reduced train deliveries to the ports and slow to offset given continuing attrition; the saturated western crossings and the congested southern port approaches compound it. At the maritime node, fleet availability is the most-cited determinant of both cost and capacity, and is tied to security risk, and the collapse of container logistics closes off finished products' exit; its binding lever is the missing war-risk insurance for container carriers.

Three regulatory barriers rank highest. The Polish RMPD regime is the most damaging, raising costs, reducing predictability, and narrowing route choice at once, and unresolved for about 18 months. The EU 90/180 driver rule compounds the sector's most serious long-run labor problem, an acute driver shortage that caps how much fleet can be mobilized. The instability of EU trade access shapes the competitiveness of Ukrainian finished products in third markets, though the recent shift to three-year quotas has partially restored predictability.

The defining systemic risk is the absence of an alternative corridor. A renewed maritime blockade would load every western crossing at once, against a border where Poland carries about half of all capacity and the alternatives have little headroom. The system is thin but working, with almost no redundancy to absorb another shock. This exposure is sharpened by two conditions outside transport policy: wartime demand contraction and the security environment, taken up next.

Policy Recommendations

The recommendations are grouped by the actor best placed to act. Public authorities, including legislator, regulator, fiscal authority, and negotiator; the infrastructure and border-related institutions that operate the assets and processes, including UZ, the port and Danube authorities, the customs and border services, and the certification bodies; and the market participants and business associations that move the cargo. Many measures require more than one of these to act together and are placed by their primary actor, with partners noted. Two priorities run through all three groups. The fastest and highest-return action is on border-crossing throughput, which is recoverable largely through management rather than capital. The most consequential is the reform of the state monopolies' incentive model, which is slower but conditions almost everything else.

Recommendations for public authorities

- Recover border-crossing throughput: mandate daily crossing statistics from customs, sustain oversight, and maintain structured dialogue with the EU side, and build on the July 2026 eCherha priority for AEO and T1/TIR cargo by verifying it shortens waits and widening AEO eligibility.
- Negotiate an RMPD package with Poland: an added tolerance for signal loss, a warning step before penalties, a justification mechanism, faster case review, and less automatic collection.
- Change the incentive model of state monopolies so that UZ and the port authorities are rewarded for growing freight volumes and attracting investment.
- Pass the outstanding legislation for the sector, including the unbundling half of the railway law (private traction and infrastructure separation), the enabling by-laws for multimodal transport, and a codified transport code that replaces the fragmented subordinate acts with clear rules on licensing, accountability, and customs interaction.
- Create a national cross-modal tariff regulator empowered to set differentiated tariffs and incentives to attract cargo to underused crossings and modes.
- Establish a standing inter-agency working group to coordinate transport policy and resolve cross-cutting problems among state bodies, UZ, and industry, bringing together the relevant central executive bodies, UZ, the transport safety service, research institutes, and sector experts.
- Launch a joint risk-insurance fund for container carriers, modeled on the grain-corridor mechanism, and prioritize the physical and air-defense protection of port and rail infrastructure.

Recommendations for infrastructure and border-related institutions

- Maintain the Danube as a usable reserve channel through regular dredging and channel maintenance and expand pilotage capacity.
- Sustain the throughput fixes, including process oversight, scanner reliability, and staffing on both sides during peak periods, that worked at Chop and on the Slovak side.
- Complete the interim designation of the six specialized railway-wagon certification organizations before the last legacy certificate lapses in September 2026.
- Stand up an independent conformity-assessment system under Law No. 14174, with accredited third-party inspection bodies and clear repair-enterprise responsibility, removing UZ's conflict of interest in certifying wagons it also repairs and operates.
- Base wagon life-extension and renewal decisions on independent, EU-aligned safety assessment rather than on the commercial interest of any party, consistent with Ukraine's obligations as an EU candidate.

- Remove the conditional-number bottleneck by amending Resolution 133, so that any repair enterprise with certified processes can return wagons to service without UZ gatekeeping.
- Extend UZ's existing long-term, fixed-price wagon contracts to the segments still thinly covered, grain hoppers in particular, so that harvest-driven exporters gain the year-ahead price predictability that gondola shippers already have.

Recommendations for market participants and business associations

- Consolidate the fragmented road fleet, shifting from the sole-proprietor model toward company structures to widen driver-reservation eligibility and compliance capacity.
- Take up the long-term, fixed-price wagon contracts now available, locking in year-ahead pricing to insulate volatile flows from quarterly tariff changes.
- Spread flows to underused crossings and idle broad-gauge capacity where commercially feasible, directing suitable volumes, such as petroleum, fertilizer, ore, metals, and oilseed products, to crossings like Vadul-Siret and Chop.
- Press for, and help operate, the market-safety institutions the sector lacks, namely carrier, driver, and forwarder blacklists and the codified transport code.
- Organize shared compliance services for business association members on smart-tachograph verification and wagon-repair certification: arrange group training with qualified specialists, negotiate bulk-rate access to certification, and circulate standard documentation, so that individual firms are not each solving the same problem alone.
- Provide association members with practical guidance for adapting to EU trade-regime changes: how to recalculate competitiveness in alternative markets, including the logistics surcharge, and how to identify which products fall below viability once a quota is reached.
- Sustain engagement in the bodies negotiating the RMPD, joint control, and in the inter-agency working group, so that operator-level evidence reaches the negotiations.

Conclusion

Ukraine's export logistics system is, in the recurring phrase by stakeholders, thin but functioning. Four years of war have not severed the country's access to foreign markets, but they have reshaped how access is maintained: a durable shift of high-value trade onto the western road border, a maritime route that has recovered its bulk volumes but not its value, a rail network operating under a hard saturation ceiling at its Polish interfaces, and a Danube reserve that proved it could absorb displaced grain at scale but only at higher cost and lower predictability. Measured against the four criteria used throughout (market access, delivery predictability, trade costs, and route diversification), market access has

been the system's relative strength, while predictability, trade costs, and route diversification are where resilience has been lost.

The evidence points consistently to an institutional rather than a purely physical diagnosis. The most binding constraints, including the state-monopoly and ownership model in ports and on the railway, the absence of a state modal-distribution policy and a cross-modal tariff regulator, the missing market-safety institutions, and leadership-dependent regulatory capacity, are upstream of the operational bottlenecks they produce. This is why several of the highest-leverage interventions require management, coordination, and legislation rather than capital, and why border-crossing throughput, largely recoverable through staffing and process oversight, is the highest-impact-per-cost measure available. It is also why the asymmetry between fast disruption and slow recovery matters: it raises the implicit return on protecting infrastructure and on pre-positioned instruments (war-risk insurance facilities, contingency shipping arrangements, standing handover protocols) whose function is to compress the slower half of the adjustment.

The system's defining vulnerability is the absence of a spare corridor. A renewed maritime shock would load every western crossing at once, against a land network that can replace only about a quarter to a third of maritime throughput and a border where Poland alone carries roughly half of all truck capacity. Reducing that exposure is partly a matter of physical protection and partly a matter of activating the latent capacity that already exists through the tariff signals, incentives, and modal policy that are currently missing. Much of the corridor's recent progress has been externally driven, financed, and prioritized by the EU; accession-linked conditionality and co-financing are therefore among the most practical levers available. The agenda that follows from this analysis is less about rebuilding assets than about changing the incentives and rules that govern how they are used. That is the condition on which Ukraine's export logistics can move from manually managed survival to durable resilience.

Annexes

Annex A. Road

Table A1. Leading individual crossing points (trucks per month via eCherha)

Crossing / border	Mar 23	Jun 23	Aug 23	Nov 23	Mar 24	May 24	Sep 24	Dec 24	Jun 25	Oct 25	Apr 26
Yahodyn–Dorohusk (PL)	19,931	18,080	19,131	3,076	–	15,838	12,383	14,762	17,455	18,990	16,657
Krakivets–Korchova (PL)	–	10,263	11,572	12,754	9,967	7,688	7,980	7,157	8,101	7,735	8,050
Rava-Ruska–Hrebenne (PL)	–	6,948	7,143	3,575	353	4,151	5,319	4,175	5,845	6,429	6,411
Shehyni–Medyka (PL)	–	6,010	6,121	5,519	2,298	5,681	4,988	5,064	4,153	8,083	4,916
Uhryniv–Dolhobychuv (PL)	–	–	–	–	–	–	–	–	5,800	5,847	4,631
Ustyluh–Zosyn (PL)	–	3,558	3,201	3,097	1,199	1,361	2,640	2,947	4,741	4,210	4,595
Chop–Zahon (HU)	–	8,380	7,391	8,555	7,947	6,770	5,255	4,435	6,575	6,515	5,754
Porubne–Siret (RO)	–	8,951	8,337	7,163	8,348	8,958	7,769	6,983	6,560	6,461	5,552
Dyakove–Halmeu (RO)	–	3,359	2,702	2,648	2,715	2,744	2,530	2,136	2,632	3,086	3,129
Orlivka–Isakcha (RO)	–	2,268	2,912	2,046	3,268	3,092	2,759	2,760	1,810	1,936	2,289
Uzhgorod–Vyshne Nemetske (SK)	–	3,985	4,312	3,815	3,369	3,488	3,658	2,939	4,387	4,649	3,964
Starokozache–Tudora (MD)	–	2,276	3,012	1,327	2,443	2,274	1,575	1,592	1,840	1,862	2,196
Mamalyha–Kryva (MD)	–	1,722	1,764	2,597	2,768	2,045	1,867	1,891	2,020	2,506	2,225

Source: author's calculations from eCherha system data; values aggregate all queue categories (loaded, empty, perishable/agri-food) at each crossing. Border indicated in parentheses: PL Poland, HU Hungary, RO Romania, SK Slovakia, MD Moldova. "–" = crossing not covered in that snapshot.

Table A2. Road and substitutable modes during the 2023–24 border blockade, monthly

By value (USD million)

Mode	Sep 23	Oct 23	Nov 23	Dec 23	Jan 24	Feb 24	Mar 24	Apr 24	May 24
Road	1149.6	1131.9	1034.6	903.1	952.8	1000.5	1001.3	1015.8	1019.7
Rail	600.7	614.6	561.6	562.6	565.3	535.3	550.2	466.2	492.5
Sea	863.5	887.8	1282.6	1677.7	1860.5	1845.2	1662.0	1869.3	1835.8
Other	26.4	30.0	48.5	29.6	8.9	20.2	26.2	32.2	26.8
Total	2640.2	2664.2	2927.3	3172.9	3387.5	3401.1	3241.6	3383.5	3374.9

By volume (thousand tons)

Mode	Sep 23	Oct 23	Nov 23	Dec 23	Jan 24	Feb 24	Mar 24	Apr 24	May 24
Road	1034.1	1038.0	762.7	621.4	813.4	833.5	776.2	805.9	893.0
Rail	2946.5	3087.8	2537.4	2428.8	2503.7	2489.3	2630.0	2646.6	2750.5
Sea	3060.3	3482.8	5903.9	7354.7	8703.1	8640.7	8449.3	9677.3	8586.0
Other	0.8	1.1	8.0	7.8	1.9	0.6	1.5	9.2	4.8
Total	7041.7	7609.7	9212.0	10412.7	12022.0	11964.2	11857.0	13139.0	12234.3

Source: author's calculations from monthly foreign-trade statistics by mode of transport at the border. "Other" comprises air, pipeline, and unspecified modes.

Annex B. Rail

Table B1. Railway per-crossing utilization rates

		Mar-2023	Jun-2023	Aug-2023	Nov-2023	Mar-2024	May-2024	Sep-2024	Dec-2024	Jun-2025	Oct-2025	Apr-2026
Yahodyn–Dorohusk	PL	56%	61%	73%	81%	101%	94%	77%	102%	107%	106%	89%
Mostyska-2–Medyka	PL	58%	68%	68%	68%	74%	71%	77%	73%	63%	81%	64%
Izov–Hrubieszów	PL	82%	54%	49%	64%	76%	80%	60%	61%	67%	58%	42%
Rava-Ruska–Verkhata	PL	5%	9%	0%	7%	10%	17%	13%	13%	20%	5%	0%
Vadul-Siret–Dornesti	RO	98%	86%	83%	103%	79%	73%	82%	46%	55%	57%	54%
Diakove–Halmeu	RO	27%	24%	16%	11%	13%	12%	23%	15%	24%	16%	32%
Chop–Čierna n. Tisou	SK	61%	65%	67%	50%	48%	57%	49%	41%	63%	40%	38%
Uzhhorod–Matovce	SK	61%	46%	33%	42%	45%	30%	29%	43%	18%	27%	36%
Chop–Záhony	HU	273%	193%	77%	54%	49%	46%	46%	54%	40%	66%	96%
Batiovo–Eperjeske	HU	45%	29%	30%	19%	23%	18%	15%	15%	14%	19%	7%
Sokyriany–Oknitsa	MD	26%	22%	26%	7%	24%	14%	16%	14%	33%	24%	21%
Mohyliv-Podilskyi–Velchynets	MD	30%	18%	8%	9%	11%	13%	14%	13%	21%	22%	29%
Reni–Giurgiulești	RO/MD	29%	26%	32%	12%	15%	18%	7%	6%	0%	4%	10%
Izmail port					48%	48%				40%	33%	

Source: author's calculations from Ukrzaliznytsya data.

Note: Chop-Záhony's capacity was increased in July 2023, from 30 to 90 wagons per day.

Annex C. Maritime

Table C1. Composition of Ukrainian maritime (sea-port) exports by commodity group, 2025

Commodity group (HS-2)	Volume (Mt)	Value (USD m)	Value/ton (USD)	Sea share of group, %
HS 10 Cereals	32.27	6,982.0	216	96.8
HS 15 Fats and oils	4.12	4,740.0	1,149	74.6
HS 72 Iron and steel	4.00	1,807.9	452	60.0
HS 12 Oil seeds	4.04	1,741.0	431	77.0
HS 26 Ores, slag and ash	18.60	1,253.6	67	58.3
HS 23 Food residues; fodder	3.56	809.8	227	61.1
HS 02 Meat and offal	0.19	343.6	1,788	41.5
HS 73 Articles of iron/steel	0.18	207.8	1,154	29.7
HS 17 Sugars	0.22	117.1	528	37.7
HS 25 Salt, sulphur, stone	0.89	78.4	88	17.3
Other	0.81	860.2	1,067	11.1
Total	68.89	18,941.5	275	–

Source: author's calculations based on monthly foreign-trade statistics (customs exports by mode of transport at the border and HS-2 commodity groups). "Sea" denotes all sea and river-sea ports. "Sea share of group" is sea volume as a share of that group's total exports across all modes. Groups ordered by maritime export value; "Other" aggregates all remaining HS-2 chapters.

Table C2. Q1 2026 throughput composition by port, kt/month

Port	Grain	Ore	Ferrous	Oil	Containers	Total
Odesa	583	0	175	42	72	1,014
Pivdennyi	1,147	1,018	99	116	0	2,464

Chornomorsk	1,503	4	2	144	66	1,999
Deep-sea	3,233	1,022	276	302	139	5,477
Danube	2	93	33	9	0	239

Source: author's calculations from monthly USPA statistics.

Table C3. Rail queue at port-direction stations, days

Port	Jul 23	Oct 23	Nov 23	Jan 24	Mar 24	May 24	Jun 24	Jul 24	Sep 24	Oct 24	Dec 24	Jul 25	Oct 25	Apr 26
Chornomorsk	4.1	7.1	7.1	6.4	6.1	5.9	2.8	5.8	6.5	5.2	7.8	3.7	5.7	6.0
Pivdennyi		8.0	6.3	6.0	3.1	1.8	2.4	2.8	2.9	3.7	5.9	2.2	3.2	5.4
Odesa		11.6	6.1	6.1	8.0	3.8	4.3	6.3	6.1	5.4	4.3	2.5	5.9	9.3
Izmail	29.1	11.1	8.4	9.4	6.6	6.1	5.5	5.4	5.5	4.4	6.7		7.7	7.2
Reni	6.3	8.2	5.2	9.8										

Source: author's calculations from Ukrzaliznytsya's data.

Note: Days-of-queue is computed at the port level as the sum of rail wagons committed to all stations serving that port, divided by the aggregate average daily wagon delivery across those same stations. Pivdennyi accordingly aggregates Chornomorska (for TIS), Chornomorska (for OPP), and Berehova stations; Chornomorsk aggregates the port station and the Ksenieve transit terminal. The metric shows how many days it would take for the port to clear if the current aggregate processing capacity were applied to the current aggregate queue.

Annex D. Barriers and drivers identified through stakeholder interviews

Barrier / driver	Criteria affected	Nature
Maritime and ports		
Thin, concentrated charter market (European/Greek tonnage largely withdrawn; pool dominated by Turkish and Gulf owners)	Route diversification; trade costs	Capacity / cost
War-risk insurance premiums and mandatory crew surcharges for the risk zone	Trade costs	Cost
Limited crew willingness to serve at Ukrainian ports (human factor)	Trade costs; route diversification	Capacity
Port dues reported above some competing European ports	Trade costs	Cost
State-ownership model of ports (USPA/AMPU): limited reinvestment of revenue; unsettled concessions deter private capital	Trade costs; adaptability	Governance / investment
Ageing rail approaches to southern ports; seasonal congestion leads to vessel idle time	Continuity; trade costs	Capacity / cost
Air-raid alerts, weather, convoy/caravan and canal transit windows suspend operations	Predictability; market access	Predictability
Polish ports slow to adapt vs Romania's Constanța investment	Route diversification; trade costs	Governance / adaptation
Danube		
Capacity ceiling: small parcels (2–6 kt/vessel), higher unit cost, longer multi-actor chain; cannot absorb deep-sea volumes	Route diversification; adaptability; trade costs	Capacity / cost
Channel constraints: chronic dredging neglect (4–6 m vs 8–12 m needed); Bystre Canal siltation	Adaptability; trade costs	Capacity
Governance: Romanian jurisdiction over Sulina access; dual-country pilotage on some reaches, limited pilot availability, strict transit rules; mandatory Tulcea procedures, fees and penalties	Predictability; trade costs; route diversification	Governance / cost
Rail - Operational		
War damage to traction: >400 locomotives damaged (260 in 18 months), substations, 3–6-month repairs, scarce transformers; daily turnover from 1 M to 260 k t/day	Continuity; predictability	War / capacity
Saturated western rail corridors: only 4–5 of 15 crossings actively loaded; per-crossing ceilings; alternatives unused without tariff incentives	Route diversification; predictability	Capacity / regulatory
Gauge integration incomplete (passing loops, junctions, freight logic); not built as full freight infrastructure	Route diversification; adaptability	Capacity
Road and cross-border		
Polish RMPD regime: automated penalties on signal loss; cautions and deposits drain	Trade costs; predictability; route diversification	Regulatory (neighbour)

working capital; 1–1.5-yr reviews; cash and transfer frictions Fragmented road haulage (80–90% 1–2-truck operators); wartime fleet down 40%; forced transloading at border Chronic driver shortage; episodic, short-horizon workforce policy Border throughput recoverable through staffing and process, not capital; queues now 3–5 days; idle time raises leasing and mileage costs Queue process gaps: empty/loaded queue merger and missing accumulators (buffer zones) → slot-shift, multi-day waits (Zakarpattia) Legislated NCTS (T1) e-queue for sealed cargo unimplemented (funding; Ministry of Development bottleneck) Poland 50% of all UA international truck-crossing capacity; diversion congests Slovakia and Hungary (24h Slovak queues; Hungarian fixed routes) EU 90/180 driver rule, now binding via automated entry/exit recording Foreign fines and tolls (sensitive-goods up to 20,000 zł; RMPD 10,000 zł) Port-pickup bans (Turkish ports; some Polish ports) shift work to rail and foreign carriers Unspent EU border funds (Hungarian direction; Berehove bypass unresolved) Stalled “joint control”; unrevised 2012 memorandum → duplicated controls both sides Forwarder non-payment; absence of market-safety blacklists Modal imbalance → road overloading (a recorded 153-t truck) → budget-funded road-repair cycle	Adaptability; trade costs	Capacity / cost
	Adaptability; trade costs	Capacity / labour
	Continuity; predictability; trade costs	Capacity / staffing
	Predictability	Process
	Predictability; trade costs	Implementation gap
	Route diversification; adaptability	Capacity (structural)
	Trade costs; adaptability	Regulatory (EU)
	Trade costs	Cost
	Trade costs; route diversification	Regulatory (neighbour)
	Route diversification; adaptability	Governance / absorption
Stalled “joint control”; unrevised 2012 memorandum → duplicated controls both sides Forwarder non-payment; absence of market-safety blacklists Modal imbalance → road overloading (a recorded 153-t truck) → budget-funded road-repair cycle Intermodal and containers Containerisation structurally weak (no domestic box stock; UZ/Liski monopoly; deterred investment, K+N withdrew); container exports collapse (478 k → 104 k TEU, 2021–2025) and de-containerising in war War-risk insurance gap for container carriers; the proposed risk-fund mechanism never launched Multimodal / container / contrailer transport unscaled (no single document, NPAs, tariff solutions, first/last-mile) Cross-cutting institutional and regulatory State monopoly and ownership model of logistics assets (USPA/AMPU, UZ); weak incentives to grow flows or attract investment	Predictability; trade costs	Regulatory / coordination
	Trade costs; predictability	Trust / regulatory
	Trade costs; adaptability	Externalised cost
	Route diversification; adaptability	Structural / capacity
	Trade costs; continuity	Risk / insurance
Multimodal / container / contrailer transport unscaled (no single document, NPAs, tariff solutions, first/last-mile) Cross-cutting institutional and regulatory State monopoly and ownership model of logistics assets (USPA/AMPU, UZ); weak incentives to grow flows or attract investment	Route diversification; adaptability	Structural / policy
	All criteria	Governance / incentives

UZ monopoly: private traction and new carriers blocked; private wagon owners squeezed Railway unbundling deferred: safety/interoperability law (No. 14174) passed 9 June 2026; blocked second part (private traction and infrastructure separation) UZ tariffs: regulated freight tariff frozen since 2022 with a recurring 40% rise proposal; non-regulated charges re-priced quarterly; freight cross-subsidises passenger services UZ management: short leadership tenures (6–9 mo); specialist exodus (4–5× private-sector pay); "manual" management Absence of a state modal-distribution policy steering cargo across modes No cross-modal tariff regulator; no mechanism for differentiated tariffs or incentives Fragmented "decree-on-decree" regulation; no codified transport code Leadership-dependent ministry regulatory capacity; weak market-safety institutions Modern warehousing deficit and war losses; thin transloading/buffer capacity Uncounted internal road-freight market — no full transport matrix for modal policy Trade policy and external EU trade-regime instability (three regimes in one year; quotas returning from 2026) Solidarity-Lanes surcharge up to +100% on finished products → third-market competitiveness eroded Demand and system level Demand contraction during the war (less production and imports → fewer cargoes; "survival mode") No spare corridor — system "thin and poor but working," fragile to a new shock Middle Corridor transit not viable now (Russia/Belarus squeeze; gauge, transshipment, border nodes)	Route diversification; trade costs	Governance
	Route diversification; trade costs	Regulatory / governance
	Trade costs; predictability	Cost / predictability
	Predictability; trade costs	Governance / labour
	All criteria; esp. route diversification	Governance / policy
	Trade costs; route diversification	Regulatory
	Predictability	Regulatory
	Predictability; route diversification	Governance
	Adaptability; continuity	Capacity
	Policy design	Data / measurement
	Predictability; trade costs	Trade policy (EU)
	Trade costs; route diversification	Cost
	Continuity; trade costs	Macro / demand
	Adaptability; continuity	Resilience gap
	Route diversification	Geopolitical / infrastructure



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