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Beyond Maritime Substitution:

Rail, Trucking, and the Emerging Architecture of Iran's Overland Supply Resilience

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Core Assessment

Iran's overland logistics adaptation is becoming a functionally differentiated rail–road architecture. Resilience increasingly depends on converting gateway capacity into reliable delivered supply, not on the number of nominal routes.

Key Judgments

- Iran's overland adaptation has moved beyond route availability toward a more structured rail–road architecture, but it remains a resilience system rather than a system-scale replacement for maritime logistics.
- China's system-level Central Asia rail data show moderate, not indiscriminate, expansion: January–August 2026 traffic reached 9,762 trains (+1.4% year on year) and 784,721 TEU (+4.6%). Iran-bound service growth is therefore occurring inside a broader network that is expanding only gradually.
- Horgos is the stronger westbound gateway signal. Its outbound Central Asia traffic rose to 3,187 trains (+6.6%) and 300,887 TEU (+10.3%) in January–August; Alashankou's outbound traffic remained below 2025 on a cumulative basis despite a clear recovery from June onward.
- Rail and trucking are functionally complementary. Rail is better suited to scheduled, containerized, heavier-volume flows; trucking adds dispatch flexibility, smaller-lot access, urgent replenishment, and final-distribution reach.
- TIR standardizes customs-transit documentation and guarantee arrangements but should not be equated with a single tractor, driver, or zero cargo handling from China to Iran. Current operator evidence shows that services marketed as "direct" can still include transloading.
- The binding issue is capacity conversion: border processing, trucks, drivers, fuel, warehousing, and domestic distribution determine how much nominal access becomes delivered supply inside Iran.

Policy Brief

Executive Summary

Under sustained maritime constraint, Iran's logistics adaptation is evolving from discrete alternative corridors into an emerging overland supply architecture linking Chinese gateways, Central Asian transit networks, Iranian border crossings, and domestic distribution. Rail and trucking are complementary: rail supports more regular, consolidated container flows, while trucking adds flexibility for urgent, high-value, fragmented, and project cargo.

China State Railway Group data through August 2026 recorded 9,762 Central Asia trains carrying 784,721 TEU. New China–Iran services through Kazakhstan, Uzbekistan, and Turkmenistan show route diversification, but regional traffic, new services, and advertised transit times do not by themselves establish sustained Iran-bound capacity. The system remains constrained by serial bottlenecks from gateways to inland distribution.

The central finding is that Iran's rail–road architecture has become more operationally mature and commercially differentiated, but its strategic role remains threshold delay and selective continuity rather than maritime-scale substitution.

Why This Matters

The policy problem is no longer route discovery but capacity conversion. Sustained maritime disruption is redistributing cargo by urgency, value, shipment size, and destination rather than producing a single replacement mode. Rail and trucking are the principal terrestrial layers of that recomposition, but each additional service or gateway improvement adds resilience only if downstream interfaces can process the flow.

Maritime pressure remains severe but not absolute. The relevant question is how much diverted demand rail and road networks can absorb before border congestion, higher costs, and domestic distribution frictions erode the marginal gains from rerouting.

Evidence, Scope, and Methodological Note

This brief combines four evidence layers: official railway and border statistics, published facility capacity, current reporting on route use and disruption, and commercial logistics materials used only to identify marketed service characteristics. The empirical focus is the China–Central Asia–Iran rail–road layer; evidence from Iran's western and eastern borders is used mainly to assess broader downstream constraints. The data cutoff is September 18, 2026.

Three distinctions are essential: regional Central Asia rail data do not equal Iran-bound cargo; published capacity does not equal utilization; and advertised transit times are not observed averages. These distinctions prevent route or service availability from being mistaken for scalable substitution.

All current-event claims rely on publicly available sources through September 18, 2026. Operator claims are treated as commercial evidence rather than independently verified performance.

1. From Corridor Substitution to an Overland Supply System

Iran's overland adaptation is no longer best understood as a collection of discrete alternative corridors. Chinese inland origins connect to a limited set of western gateways; Central Asian rail and road networks provide multiple transit alignments; Iranian border crossings convert regional connectivity into national access; and inland logistics determine whether entry becomes delivery. The relevant unit of analysis is therefore shifting from individual corridors to an interconnected supply architecture.

This architecture has several principal geographic layers. On the Chinese side, Horgos–Altynkol and Alashankou–Dostyk form the principal western rail interfaces with Kazakhstan. From Kazakhstan, Iran-bound rail traffic can move south through Turkmenistan toward Incheh Borun, or through Uzbekistan and Turkmenistan toward Sarakhs. The September 2026 launch of a 55-container China–Iran block train through Horgos–Altynkol, Kazakhstan, Uzbekistan, Turkmenistan, and Sarakhs provides direct evidence of the latter alignment; its announced 14–16-day transit time is a service target rather than an observed average (Interfax, 2026). Caspian ports at Aktau, Turkmenbashi, and Bandar Anzali form a separate multimodal layer, while APRIN Dry Port near Tehran functions as an inland consolidation and distribution node rather than a border gateway. These links are better understood as overlapping components of a wider network than as interchangeable routes.

Rail and trucking perform distinct but complementary functions within this network. Rail is better suited to regular, containerized, heavier flows; international trucking offers greater dispatch flexibility, smaller shipment granularity, and stronger compatibility with urgent replenishment, high-value cargo, project shipments, and fragmented orders. The two modes are therefore functionally differentiated layers of the same overland supply architecture rather than direct substitutes.

This network structure changes how capacity should be measured. An open rail or road alignment does not determine how much supply the system can sustain. To distinguish nominal inland logistics capacity from its operational availability, define an inland-absorption coefficient:

$$A_{\textbf{inland}} \approx min\left(a_{\textbf{customs}}, a_{\textbf{trucks}}, a_{\textbf{drivers}}, a_{\textbf{fuel}}, a_{\textbf{warehousing}}, a_{\textbf{roads}}, a_{\textbf{last-mile}}\right) \tag{1}$$

Each component is normalized on a 0–1 scale. The minimum formulation is deliberately conservative: one binding component can cap inland absorption even when other elements retain spare capacity.

At the network level, effective capacity can then be represented as:

$$C_{\textbf{effective}} = min\left(C_{\textbf{China gateway}}, C_{\textbf{transit}}, C_{\textbf{Iran gateway}}, C^{nom}_{Iran\ inland} \times A_{inland}\right) \tag{2}$$

Here, effective capacity is the end-to-end throughput ceiling, while nominal Iranian inland capacity is discounted by the inland-absorption coefficient. Expansion at one node raises network capacity only when the remaining stages can absorb the additional flow.

For cargo that has crossed the Iranian border, realized delivered supply can be expressed as:

$$EDS = min\left(F_{\text{entry}}, C^{\text{nom}}_{\text{Iran Inland}} \times A_{\text{inland}}\right) \times R_{\text{distribution}} \tag{3}$$

where EDS denotes effective delivered supply; F_{entry} is the realized border-entry flow; $C^{\text{nom}}_{\text{Iran inland}}$ is nominal Iranian inland logistics capacity; A_{inland} represents the share of that nominal capacity that is operationally available; and $R_{\text{distribution}}$ captures the temporal and operational reliability with which available capacity is converted into final delivery. The distinction is deliberate: A_{inland} represents capacity availability, whereas $R_{\text{distribution}}$ represents delivery reliability conditional on that capacity. All capacity and flow terms are expressed on a common cargo-unit and time basis, and $R_{\text{distribution}}$ is bounded between 0 and 1. These expressions are analytical heuristics rather than empirically calibrated estimators..

Additional Chinese gateway throughput therefore does not automatically become additional Iran-bound supply; new rail services do not by themselves establish sustained commercial frequency; and higher cross-border trucking activity does not imply maritime-scale substitutability. The relevant question is how effectively nominal connectivity is converted into reliable delivered supply.

Taken together, the system is characterized by functional differentiation, interconnected redundancy, and serial bottlenecks. Resilience therefore depends on capacity conversion across the network, not on route count alone.

Figure 1. Principal China–Iran Rail, Trucking, and Caspian Multimodal Links

Note: Routes are schematic corridor alignments rather than exact track- or highway-centerline geometry. Major nodes are placed using geographic reference points at policy-brief scale. Lines do not imply fixed service frequency, exclusive routing, or same-vehicle continuity.

Sources: Author rendering based on China State Railway Group (2026), China Iran Trucks (n.d.), Interfax (2026), International Road Transport Union (2026), APRIN Dry Port (n.d.), and open-source geographic references.

2. Rail: Regularity, Volume, and Gateway Conversion

The strongest new evidence comes from China-side regional aggregate data. China State Railway Group recorded 9,762 Central Asia trains in January–August 2026, up 1.4 percent year on year, carrying 784,721 TEU, up 4.6 percent. Outbound traffic totaled 5,767 trains (+1.1 percent) and 481,032 TEU (+4.8 percent). TEU growth exceeding train-count growth is consistent with higher average TEU per train, but the data do not identify cargo mix or final destination (China State Railway Group, 2026).

Table 1. China–Central Asia Rail Traffic by Gateway, January–August 2026

Gateway / System	Direction	Trains	YoY	TEU	TEU YoY	Signal
All Central Asia	Outbound	5,767	+1.1%	481,032	+4.8%	Moderate system growth
	Total	9,762	+1.4%	784,721	+4.6%	Higher TEU than train growth
Horgos	Outbound	3,187	+6.6%	300,887	+10.3%	Strongest westbound gateway signal
	Total	4,738	+5.4%	452,677	+6.0%	Dominant gateway scale
Alashankou	Outbound	521	-9.7%	45,749	-5.1%	Cumulative weakness; recent recovery
	Total	1,141	+11.5%	100,579	+10.2%	Growth driven by return traffic

Note: “Central Asia trains” are China State Railway Group’s regional service category and should not be interpreted as Iran-bound traffic. Percentages are reported year-on-year changes.

Source: China State Railway Group, August 2026 monthly dataset, published September 14, 2026; calculations by author.

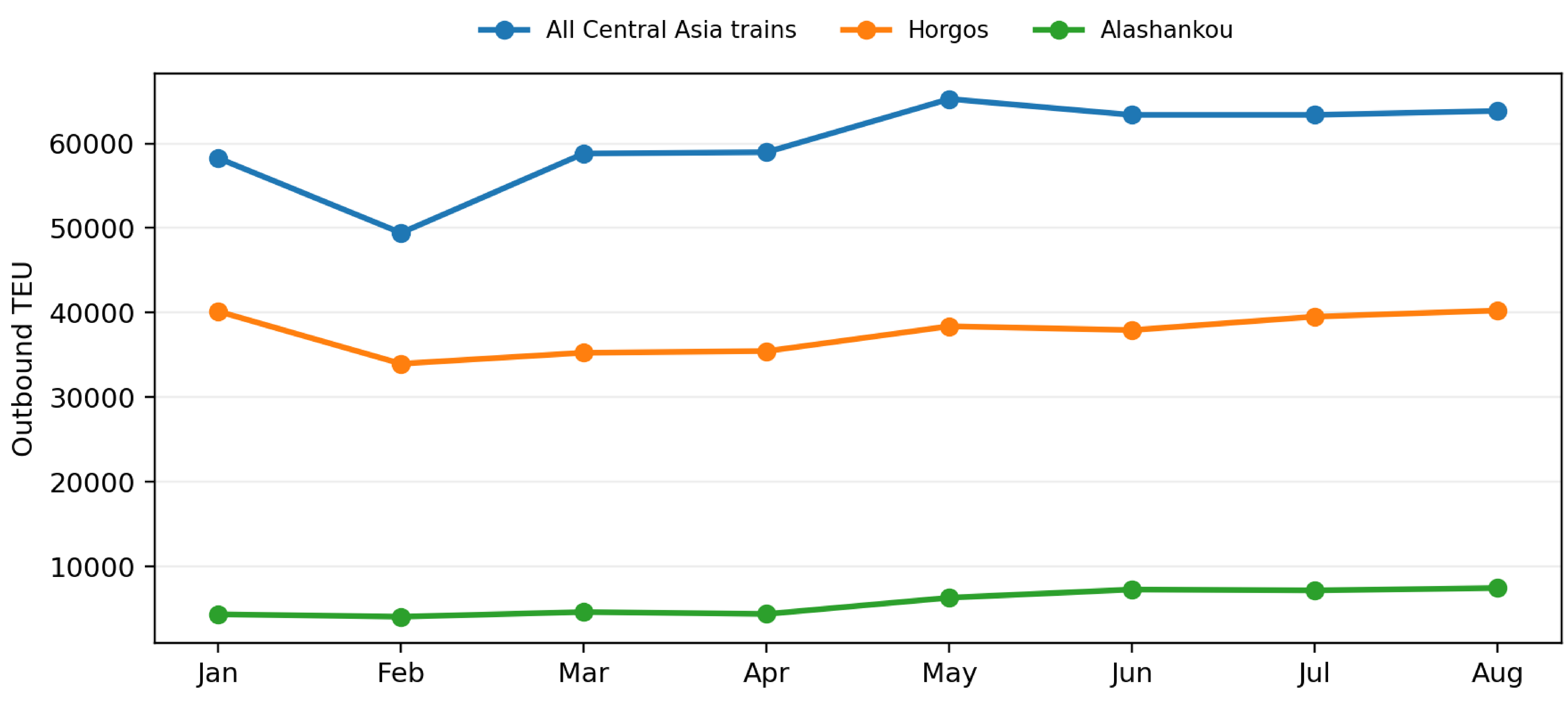

Figure 2. Monthly Outbound China–Central Asia Rail TEU by Gateway, January–August 2026

Note: The all-gateway aggregate includes all domestic border stations in the underlying Central Asia-train dataset; Horgos and Alashankou are subsets. The figure shows China-side gateway activity, not Iran-bound destination volumes.

Source: Author calculations from China State Railway Group data (2026).

The gateway pattern is more informative than the regional aggregate. Horgos and Alashankou together accounted for about 60.2 percent of Central Asia train movements and 70.5 percent of TEU in the January–August dataset. Horgos alone handled 300,887 outbound TEU, 10.3 percent above the same period of 2025. Alashankou's cumulative outbound TEU remained 5.1 percent lower, but outbound train counts shifted from large year-on-year declines early in 2026 to gains of 9.7 percent in June, 20.6 percent in July, and 13.3 percent in August. This indicates gateway differentiation rather than a uniform westbound surge.

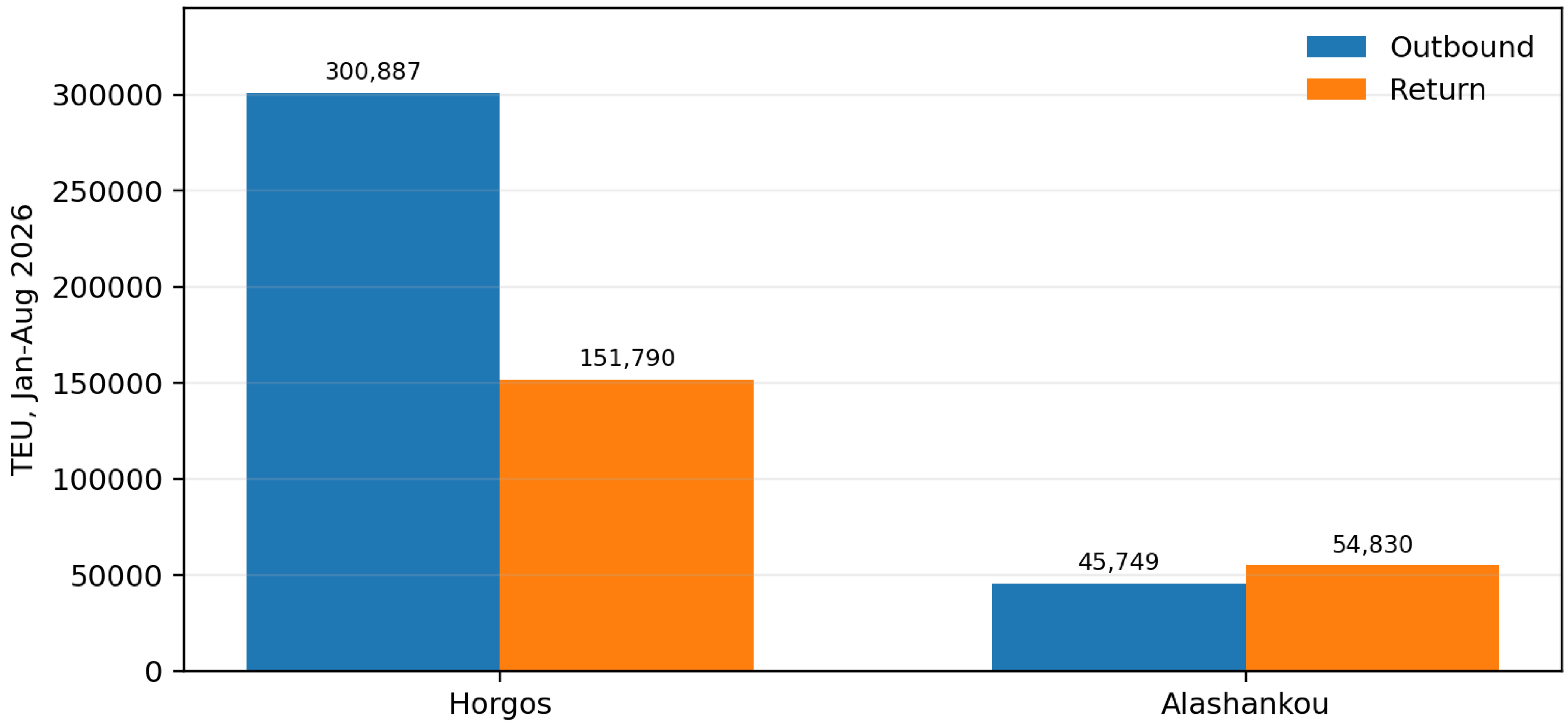

Figure 3. Outbound and Return Central Asia Rail TEU at Horgos and Alashankou, January–August 2026

Note: Horgos is strongly outbound-weighted. Alashankou's 2026 total growth is partly driven by return traffic, so headline total growth should not be used as a proxy for westbound supply growth.

Source: Author calculations from China State Railway Group data (2026).

Corridor-specific evidence shows a different, faster-moving layer. Bloomberg reported in May that Xi'an–Tehran cargo service had increased from about one train per week before the conflict to one every three or four days after the April blockade phase, according to people familiar with the shipments (Sykes & Motevalli, 2026). On September 7, a 55-container block train moved from the Horgos–Altynkol gateway onto an announced China–Kazakhstan–Uzbekistan–Turkmenistan–Iran route, entering Iran at Sarakhs, with a planned transit time of 14–16 days; the Uzbek rail-container operator described the movement as a basis for regular service (Interfax, 2026).

These developments demonstrate service expansion and route diversification, not system-scale substitution. More frequent Iran-bound services can coexist with only modest growth in the broader China–Central Asia rail network. The conversion problem is therefore serial: Chinese gateway capacity must pass through Central Asian trunk infrastructure, border and gauge interfaces, an Iranian gateway, and an inland receiving node. APRIN Dry Port near Tehran publishes design specifications of up to 30 trains per day, about 1,000 rail wagons per day, and 200,000 TEU in annual handling capacity; these are facility specifications, not evidence of current China–Iran utilization (APRIN Dry Port, n.d.).

3. Trucking: Flexibility, Granularity, and the TIR Layer

Road transport is gaining commercial prominence for a different reason. Its strategic value is not that a truck can reproduce rail or maritime volume, but that trucking can move smaller batches, reach inland destinations directly, and serve urgent or cargo-specific demand when rail is too rigid. Current operator material reinforces this segmentation: DuoTrans markets China–Iran trucking at 15–22 days for higher-value goods, electronics, auto parts, and machinery; this remains advertised service evidence rather than observed performance (DuoTrans, 2026). China-side road activity supports the existence of a larger commercial base: in the first four months of 2026, Horgos road freight reached 679,100 metric tons (+20 percent) across 94,500 freight-vehicle movements (+14.7 percent) (Tianshan Net–Xinjiang Daily, 2026). Xinjiang border authorities reported overall freight flows at the region's ports up 25 percent in the first half of 2026 (Xinjiang Uygur Autonomous Region People's Government, 2026). Neither statistic identifies Iran as destination.

TIR is designed to reduce documentary and guarantee friction across transit borders, not to eliminate every handoff. IRU describes TIR as a harmonized customs-transit system using sealed load compartments, a single international guarantee, and customs control across borders; goods may still be loaded or unloaded at controlled locations, and the system can be used intermodally (International Road Transport Union [IRU], n.d.). In April 2026, China launched its first reported intermodal TIR operation, moving car parts by rail from Xi'an to Kashgar North and then by TIR truck through Irkeshtam to Jizzakh, Uzbekistan (IRU, 2026). This is evidence of institutionalization of rail–road transit in the broader Central Asian network.

Commercial claims require stricter treatment. A current China–Iran operator advertises Wuqia–Tehran "direct" TIR at 21–23 days from the border crossing to a bonded customs terminal, while explicitly stating that the cargo is transloaded once at Bukhara and that the China domestic leg and Iranian clearance are outside that headline time (China Iran Trucks, n.d.). This is useful market evidence because it directly contradicts a common marketing shorthand: "direct" or "TIR" does not necessarily mean the same tractor, driver, or untouched cargo unit for the entire China–Iran journey. Operator times are therefore recorded as advertised operating ranges, not observed corridor averages.

Table 2. Functional Differentiation of Rail and Trucking in Iran's Overland Supply Architecture

Dimension	Rail	Trucking
Primary Function	Scheduled, repeatable container flows; heavier and more consolidated cargo	Flexible dispatch; urgent replenishment; smaller and fragmented loads; direct inland reach
Typical Cargo Fit	Machinery, industrial inputs, containerized consumer goods, heavier consignments	Auto parts, electronics, high-value equipment, project cargo, LTL/FTL replenishment
Batch Economics	Stronger at larger, regular loads	Typically higher unit cost, but lower minimum batch and greater routing flexibility
Schedule Profile	More dependent on train paths, assembly, border transfer, and terminal handling	More dispatch-flexible, but exposed to road-border queues, permits, driver and fuel constraints
Last-Mile Role	Usually requires onward trucking or inland terminal release	Can support more direct inland reach, subject to customs and carrier arrangements
Core Evidence	Official railway system data plus reported China–Iran services	Border statistics, IRU institutional evidence, and operator service offerings
Main Analytical Risk	Treating regional trains as Iran-bound throughput	Treating advertised "direct" service as no handoff, no transload, or guaranteed door-to-door time

Note: The matrix describes relative functions under current constraint; it does not imply that all cargo of a given type uses the listed mode.

Source: Author's analysis based on China State Railway Group (2026), IRU (n.d., 2026), Sykes and Motevalli (2026), Interfax (2026), China Iran Trucks (n.d.), and DuoTrans (2026).

The key implication is micro-macro separation. A truck can be the economically rational choice for a firm facing a delivery deadline even when trucking is incapable of replacing maritime tonnage at the national level. In compact form: firm-level road advantage ≠ system-level road substitution. Rail and road should therefore be evaluated by cargo fit and supply-chain function, not by a single ranking of "best" route.

4. The Land Diversion Paradox

September 18 reporting reinforces the scale mismatch: before the war, more than 80 percent of Iran's roughly 180 million tonnes of two-way trade moved by sea, while expanded land traffic has produced longer queues, infrastructure strain, and higher costs (Financial Times, 2026). The Wall Street Journal separately documented delays at borders with Pakistan, Turkey, Afghanistan, and Turkmenistan (Faucon & Bayan, 2026b). These conditions show how diversion loads the same systems on which overland resilience depends.

Fuel and driver availability add a second internal constraint. Separate reporting documented gasoline shortages, reduced subsidy allocations, queues at filling stations, and walkouts or protests involving truck, taxi, and ride-hailing drivers (Faucon & Bayan, 2026a). The evidence does not establish a uniform nationwide shortage of heavy-truck diesel, but it is sufficient to treat fuel access and driver availability as live distribution risks rather than background constants.

These pressures create an endogenous constraint. As maritime capacity falls, more cargo is diverted to rail and road, increasing demand for train slots, border processing, tractors, drivers, fuel, customs brokerage, warehousing, and inland distribution. If these inputs do not expand at the same pace, diversion itself raises congestion and cost, reducing the marginal effectiveness of the alternatives intended to absorb the maritime shock.

$$\mathit{Maritime\ Capacity} \downarrow\ \rightarrow\ \mathit{Land\ Demand} \uparrow\ \rightarrow\ \mathit{Border\ /\ Mode\ Load} \uparrow\ \rightarrow$$
$$\mathit{Congestion\ \&\ Cost} \uparrow\ \rightarrow\ \mathit{Marginal\ Land\ Effectiveness} \downarrow$$

This is an analytical mechanism rather than a deterministic law; its effects depend on spare capacity, border coordination, cargo mix, and the speed at which additional road and rail resources can be mobilized. The framework is developed by the author and informed by September 2026 evidence on Iran's land-border and domestic transport constraints (Faucon & Bayan, 2026a, 2026b).

5. Assessment: From Route Redundancy to Converted Capacity

Three findings follow. First, the overland architecture is more mature than it was in spring 2026. Reported increases in rail-service frequency, a new Uzbekistan-enabled block-train variant, active western Chinese gateways, intermodal TIR practices, and standardized FTL/LTL offerings indicate that adaptation has moved beyond improvised rerouting. Maturation is also functionally differentiated: rail provides repeatability and consolidated movement, while road supplies flexibility and commercial granularity.

Second, the binding variable is increasingly conversion rather than access. China-side gateway expansion creates potential, but end-to-end Iran-bound supply remains bounded by Central Asian transit, border interfaces, Iranian customs and terminals, and domestic distribution. This is asymmetric corridor optimization: one node can become faster without the system improving proportionally.

Third, greater operational development has not erased the scale gap with maritime trade. The overland system can preserve selected industrial inputs, replenishment cargo, spare parts, and other priority flows, but the available evidence does not support maritime-equivalent throughput or cost structure. Its strategic function remains continuity and threshold delay under sustained constraint.

These findings are consistent with earlier EPINOVA assessments of distributed and threshold-delaying logistics (Wu, 2026a, 2026b, 2026c) and with the Day 200 system-wide finding that Eurasian alternatives provide network diversification rather than route substitution (Wu, 2026d).

6. Implications for Monitoring and Policy Analysis

- Track converted throughput, not route counts. A first observed movement may establish operational route feasibility; recurring capacity should be coded only after repeated movements, realized transit, and downstream release are observed.
- Separate regional system data from Iran-bound data. Horgos and Alashankou statistics show gateway conditions; they do not establish how many trains or TEU ultimately reach Iran.
- Measure rail and road by function. Rail performance should be assessed through frequency, utilization, border dwell, terminal handling, and cargo fit; road through dispatch availability, border dwell, transload count, fuel/driver conditions, and final-delivery reliability.

- Record pricing boundaries. Crisis-era quotes can differ because one price covers line-haul while another includes gateway, insurance, customs, or last-mile costs. Quoted prices should not be compared without identifying included cost components.
- Treat inland absorption as a leading indicator. Border queues, customs release time, truck and driver availability, fuel access, warehouse conditions, and Aprin utilization may become more informative than the number of announced routes.

Table 3. What the Current Evidence Shows and Does Not Show

Indicator	What It Supports	What It Does Not Prove
Central Asia train totals	Regional rail activity and gateway trends	Iran-bound volume or cargo composition
Xi'an–Tehran frequency reports	Corridor-specific service acceleration	Observed on-time performance for every departure
September 55-container block train	Operational route variant via Uzbekistan and Sarakhs	Sustained recurring capacity until repeated movements are observed
TIR / FTL / LTL marketing	Commercial readiness and product availability	Zero transloading, same tractor/driver, or guaranteed door-to-door time
APRIN published capacity	Nominal terminal design capability	Current utilization or China–Iran throughput
Border and fuel stress reports	Live downstream constraints on land logistics	A uniform nationwide failure of all road transport

Note: Evidence is graded by what a source can support, not by whether it is favorable to a particular corridor assessment.

Source: Author's assessment.

7. Limitations

Public data remain asymmetric. China reports strong gateway and regional rail statistics, while Iran-bound counts, border throughput, dwell times, and domestic distribution data remain sparse. Operator and news sources are therefore used cautiously, and no single ton-per-day system estimate is attempted.

Conclusion

Iran's rail–road architecture has become more operationally mature and commercially differentiated, yet its strategic value remains continuity rather than replacement. The result is modal recomposition rather than modal replacement: rail and trucking absorb cargo according to urgency, value, batch size, and destination, while the maritime scale gap persists. End-to-end performance remains bounded by Chinese gateways, Central Asian transit, Iranian border interfaces, and domestic logistics.

The most useful measure of resilience is converted capacity: the share of potential flow that survives border friction, operational variability, and inland constraints to become reliable delivered supply. Under sustained maritime pressure, the overland network can preserve selected flows and delay disruption. It cannot reproduce the scale or cost structure of normal maritime access, nor its capacity to absorb large-volume trade.

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