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The strategic response of northern Adriatic ports in view of melting Arctic ice and geopolitical changes: A study of Trieste and Koper

This article explores the strategic positioning of the ports of the northern Adriatic, particularly Trieste and Koper, in the evolving landscape of global trade, with a special focus on responses to challenges posed by the Northern Sea Route, the India-Middle East-Europe Corridor, and geopolitical and geographical shifts. The potential of these ports to serve as a multi-port gateway connecting the Mediterranean, North Africa, Turkey, and Central Europe through a K-shaped double corridor is emphasised. The analysis highlights the importance of intermodality, streamlined cargo handling, and regional cooperation within the Northern Adriatic Ports Association. Grounded in a mix of geopolitical analysis, primary data from stakeholders, and scenario planning, the article underscores the importance of resilience and diversification for Trieste and Koper in navigating an increasingly multi-polar world order.

Key words: ports, seaport strategies, Political Geography, Northern Sea Route, IMEC, northern Adriatic, Trieste, Koper

Introduction

In a global economy that depends on reliable trade routes, ports play a crucial role as hubs guaranteeing the undisturbed flow of goods, connecting suppliers and markets across continents. Currently, the global geopolitical situation is in turmoil, plus climate change is bringing about epochal geographical changes. Historical trade routes, such as the one connecting Asia and Europe through the Suez Canal, are becoming increasingly unstable and new alternatives are appearing: the Chinese Belt and Road Initiative (BRI), the India-Middle East-Europe Corridor (IMEC) and the opening of the Northern Sea Route (NSR) pose significant challenges and opportunities for many ports. This article explores the current role and strategic importance of the ports of Trieste and Koper as case studies representing the most important ports of the northern Adriatic (at the time of writing) and aims to identify how they are, or should be, planning their strategy for the radically changing global shipping market.

The Ports of Trieste in Italy and Koper in Slovenia occupy significant positions in the Adriatic Sea. Together with the ports of Monfalcone, Ravenna, Rijeka and Venice they form a north-Adriatic multi-port gateway that is crucial for trade towards Central and Eastern Europe (Notteboom, Rodrigue, 2008). Within this gateway, united in the North Adriatic Ports Association (NAPA), Trieste and Koper can be considered the two main actors, each for its own reasons: Trieste is the busiest port per tonnage of total cargo and provides a vital role in energy security of Central Europe (Gombacci, 2024), while Koper is the busiest port concerning containerized goods and “Slovenia’s only international cargo port and is therefore of strategic national importance” (Slovenia Business, 2021).



Fig. 2 Map of the Northern Adriatic showing its main ports

Source: www.Mapchart.Net, modified by author

Tab. 1 2024 Cargo Throughput Comparison: Port of Trieste vs Port of Koper. Data across categories and total does not fully match due to different reporting periods and methodologies

Cargo Category	Trieste 2024	Koper 2024
Containers (TEUs)	841,867 TEUs	1,133,340 TEUs
Fossil Fuels	41,177,502 tons	4,829,544 tons
Other Liquid Bulk	84,252 tons	N/A
Dry Bulk	121,052 tons	5,195,865 tons
General Cargo	1,162,068 tons	1,199,186 tons
Ro-Ro Units (vehicles)	295,386 vehicles	884,666 vehicles
Total Throughput	59,540,505 tons	23,009,335 tons

Source: Informare.it (2024); Transport Events (2024); PortsEurope (2024); Adriaports (2025); InterCapital (2025)

The two ports, though geographically close (only 12 km apart), have evolved under very different circumstances in historical, geopolitical, economic terms. Trieste, once the only seaport of the Austrian and then Austro-Hungarian Empire with the status of a free port, which gave it a big development boost, fostered the growth of a deep hinterland connectivity network and served as the main gateway for Central Europe. After the Second World War, despite war damage and the geopolitical effects of the Cold War divisions, it maintained its prominence, especially thanks to the Trans-alpine Pipeline and the expansion of its new port. The Port of Koper, by contrast, was born as a strategic response to Trieste remaining part of Italy, despite Yugoslavia's desire to incorporate it. Initiated in 1955 as a grassroots project, Koper's development grew steadily into Slovenia's only maritime outlet. While Trieste focused on integrating port and urban development under Italian planning frameworks, Koper's growth was based on a bottom-up approach, but increasingly sustainability-driven. Despite periods of complementary specialization, political and symbolic borders have hindered true integration, and both ports continue to compete rather than collaborate in planning and infrastructure development (Sluga and Momirski, 2024).

Each of the two ports has developed competitive strengths, making them valuable assets for the whole region. Understanding their roles, strengths, and recent developments is vital for visualizing the geoeconomics of the whole port region. The scope of this article is to analyze the strategic situation and assess what may lie ahead, especially in the light of geopolitical realignments and rapidly changing geographical realities.

While both Trieste and Koper have leading roles in the northern Adriatic, their strategies indicate relevant differences. Trieste's alignment with Italy's larger economic strategy provides it with access to significant investment and diplomatic support, while Koper is focusing on maximizing its existing infrastructure and catering to niche markets that larger ports may overlook.

Trieste is Italy's busiest commercial port, capable of handling large container vessels and high cargo volumes (Buixadé Farré et al., 2014). Recent infrastructure investments are further strengthening Trieste's competitive position, including expanding container terminals, upgrading storage facilities, and improving intermodal connections, all aimed at boosting Trieste's ability to handle increased cargo flows and accommodate larger vessels (AdriaPorts, 2024).

The Port of Koper, Slovenia's only maritime gateway, is smaller in scale, but has managed to build a strong reputation for versatility, handling a wide array of cargo types including containerized goods, bulk cargo, and automobiles. With some delay compared to Trieste, the Port of Koper is now getting a modern and fast railroad connection that is "vital for the future development of this port" (Zasiadko, 2021), especially if it intends to keep its leading role in container traffic (Luka Koper, 2023 and Trasporto Europa, 2024). One of Koper's defining strategies has been to diversify its service offerings, reducing its dependency on specific cargo types or trade routes.

Due to their differences in origins, status, specialization and size, they employ different strategies to solidify their position and market share. Trieste, as Italy's principal port in the Adriatic, leverages its unique free port status to attract global trade. The port's fiscal and regulatory advantages, such as reduced customs fees and flexible tariff structures, have helped maintain its competitiveness (Rodrigue, 2020).

Infrastructure development is the other pillar forming the backbone of Trieste's strategy. The port is investing in modernizing its cranes (Adria Ports, 2024) and thus expanding terminal capacities; it also has improved rail links to neighboring countries, facilitating seamless intermodal transport. In addition to these efforts, Trieste has adopted sustainability measures such as energy-efficient port operations and reduced emissions to align with EU green policies (Autorità di Sistema Portuale del Mare Adriatico Orientale, 2023).

The Port of Koper, Slovenia's key maritime gateway, has embraced specialization and agility to counteract potential disruptions. The completion of the new high speed Divača-Koper railway, due to replace the older one built in the 1960s, will dramatically improve access to Central Europe, solidifying Koper's role as a key intermodal hub. Koper has also prioritized sustainability, aligning it with broader EU directives and enhancing the port's attractiveness to environmentally conscious clients (Rodrigue, 2020).

Methodology

This research applies multiple methods in a comprehensive approach that combines a qualitative comparative review of relevant secondary sources, a case study analysis, a collection of primary data through interviews and official responses, geopolitical insights and logical deductive reasoning.

The basis of the theoretical postulates is a comprehensive review of academic and industry sources, allowing for a thorough understanding of the broader geopolitical and geoeconomic context and serving as the backbone for further analysis.

Primary data was collected by targeted questionnaires and holding interviews with stakeholders, providing direct valuable insights on the strategic thinking of industry experts and policymakers. Questions were sent via written communication, while responses were recorded based on the method chosen by the interviewees: written answers in the cases of Borut Čok, Ivan Govše and Vasant Shenoy and a recorded video call with subsequent verification of the transcribed answers in the case of Zeno D'Agostino. Questions were structured to explore infrastructure priorities, regional collaboration, and geopolitical concerns. Data from answers from Čok and the interview with D'Agostino provided insights into port-specific strategies.

The ports of Trieste and Koper were chosen as they represent the two most important hubs of the northern Adriatic: the first for its overall dominance and the second for its record results in the field of containerized cargo. The two ports were examined via case studies, with special attention to their infrastructure, market strategies and political dynamics. A comparative qualitative analysis was conducted between the two ports, highlighting their strengths and weaknesses and considering them in relation to other ports of the northern Adriatic like Rijeka, Venice or Ravenna.

All the reasoning is filtered through a geopolitical and geoeconomic lens, especially to assess how emerging trade routes and changes in global power dynamics might influence future cargo flows into these two ports and into the whole region of the northern Adriatic. The study considers the consequences of growing global geopolitical instability, the opening of the NSR, the new possibilities of the BRI and IMEC, in order to offer a holistic view on the regional trade landscape.

Finally, scenario analysis helps to evaluate potential future developments, such as the development of the manufacturing potential of North Africa or the implications of BRI shifting from the passage Ukraine to Anatolia. These scenarios provide useful elements for crafting the responses the northern Adriatic ports should prepare to adapt to global shifts.

The changing geopolitical and geographical landscape

Since its opening in 1869, the Suez Canal has been a pivotal maritime passage, becoming ever more vulnerable to geopolitical tensions (Weitz, 2018) or incidents such as the grounding of the container ship *Ever Given* in 2021, which underscored the route's susceptibility to both geopolitical tensions and operational challenges (Brigham, 2021).

Beyond the canal itself, other points along the route are equally vulnerable. One significant problem is the escalating threat presented by Houthi forces, who, amidst the ongoing Yemen conflict, aim to increase their strategic leverage by targeting vessels passing through the Strait of Bab-al-Mandab (Shay, 2016, 4), adding to the region's maritime insecurity (Notteboom et al., 2024, 15). The region's broader fragility, marked by piracy north of Somalia, weak states such as Eritrea and Sudan, and conflicts in Lebanon, Syria, and Israel, further exacerbates these vulnerabilities (Thamer and Akkas, 2024).

For countries dependent on East Mediterranean trade – such as Italy and Slovenia – the Suez route is vital for maintaining competitive trade links with Asia. Any disruption to this route threatens to isolate the Eastern Mediterranean, reducing the strategic importance of its ports and turning it into a semi-closed sea dependent solely on Gibraltar.

In the northern quadrant, the opening of the Northern Sea Route (NSR) is introducing a significant shift in global maritime trade. This emerging corridor poses a direct challenge to the Mediterranean's strategic

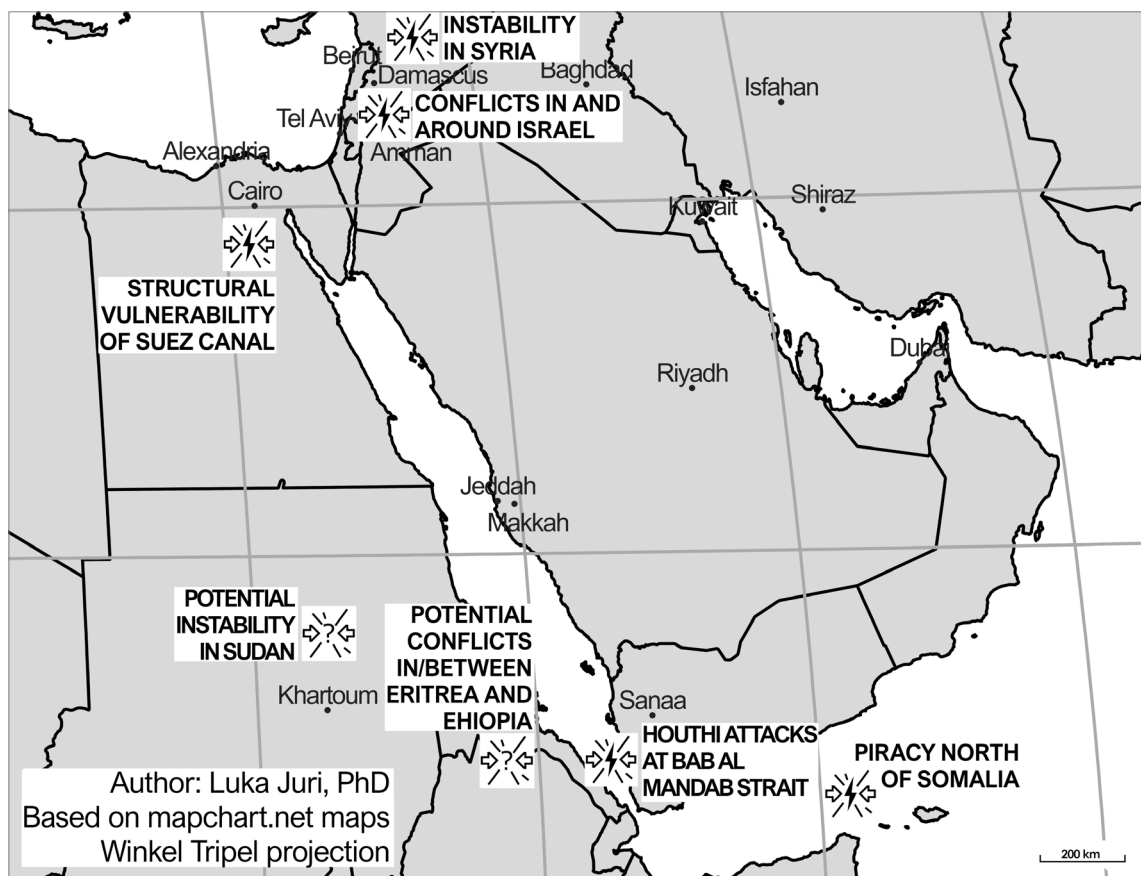


Fig. 2 Suez, the Red Sea and main instability hotspots

Source: www.Mapchart.Net, modified by author

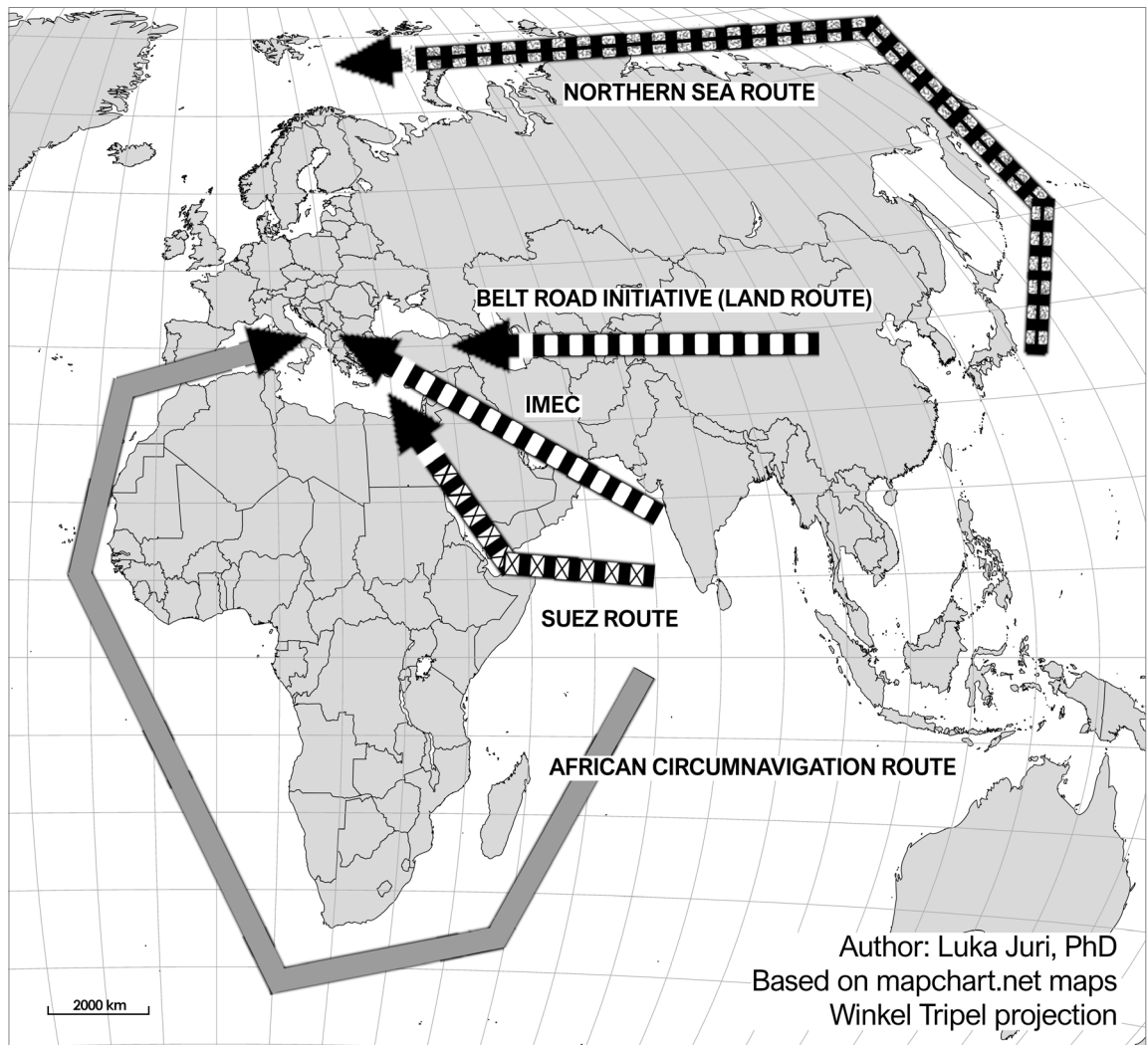


Fig. 3: The main trade routes from Asia to Europe today
Source: www.Mapchart.Net, modified by author

significance, particularly its eastern regions, by reducing transit times between Asia and Europe by up to 40%, resulting in substantial savings in fuel costs and shipping times (Liu and Kronbak, 2010). Furthermore, being predominantly within the maritime jurisdiction of Russia, the NSR offers an alternative that is more geopolitically stable than traditional maritime routes like the Suez Canal (Lahn and Emmerson, 2012, 40).

Currently, the NSR is more advantageous for bulk cargo than containerized trade due to its shorter distances and less stringent scheduling requirements (Rodrigue, 2020). However, analysts suggest that containerized cargo could also benefit significantly if reliability issues are resolved, potentially challenging bulk shipping's dominance on this route (Liu and Kronbak, 2010, 434-436).

Russia continues to make substantial investments to enhance the NSR's viability. These include expanding its nuclear-powered icebreaker fleet to enable year-round navigation by 2027 (Arctic Russia, 2022) and developing strategic Arctic ports to support resource exports, particularly liquefied natural gas (Ship Technology, 2013). In partnership with China, Russia is positioning the NSR as a cornerstone of Sino-Russian economic and geopolitical strategy (Gupta and Parnerkar, 2024).

Despite its advantages, the NSR faces significant environmental, seasonal, and economic constraints. Its viability is limited by regulations to mitigate pollution risks (Solvang et al., 2018; Pizzolato et al., 2016), the need for costly ice-class vessels (Moe, 2014), and ecological concerns about Arctic shipping (Lasserre and Pelletier, 2011). Addressing these challenges will require technological innovation, economic feasibility, and stringent environmental management (Humpert and Raspotnik, 2012; Østreng et al., 2013, 177–239).

The heightened geopolitical tensions between the EU and Russia are not considered as a limiting factor, as the use of the NSR by international shipping companies is unlikely to be significantly by it, as sanctions that would directly hurt European trade by prohibiting the use of certain routes are unlikely. For many shipping operators, commercial efficiency, shorter transit times, and cost reductions outweigh geopolitical considerations. Consequently, while political frictions may affect state-level cooperation, the route's logistical appeal ensures its sustained relevance in global trade.

The NSR's emergence will have an impact also on the hinterlands of northern Adriatic ports. Being able to offer a more advantageous route, ports like Hamburg and Bremerhaven are expected to extend their reach deeper into Central and Eastern Europe (Button et al., 2017, 12), threatening to diminish the ability of Northern Adriatic ports to serve as gateways for long-haul trade between Asia and Europe.

To mitigate this risk, Adriatic ports must act decisively to strengthen their inland connectivity and intermodality. Strategic investments in further improving rail infrastructure linking ports like Trieste, Koper, and Rijeka to key markets in Austria, Germany, and the Western Balkans will be critical to counteracting the effects of a shrinking hinterland (Button et al., 2017, p. 15). At the same time, differentiation will be essential, especially as it's clear that the NSR is poised to play an increasingly significant role in global trade and, if key challenges are addressed, it could enable year-round operations, reshaping global shipping routes (Aksenov et al., 2017).

The Ports of Trieste and Koper are grappling with shared challenges due to the emergence of the NSR. A primary shared strategy is cargo route diversification. Trieste and Koper aim to strengthen trade relations with North Africa and intra-Europe regions to offset potential losses from diminished Asia-Europe traffic via the NSR (Bekkers and Francois, 2016). Their focus on rail connectivity highlights their strategic roles as gateways to Central Europe: Koper has emphasized developing its new high-speed section of the Divača-Koper rail line, while Trieste has upgraded its intermodal facilities to maintain competitiveness.

Digitalization and automation are key priorities for both ports, aimed at accelerating port processes and reducing operational inefficiencies, aligning with broader regional trends, as seen in Rijeka and Venice, where investments in digital solutions complement infrastructure upgrades to enhance overall performance.

Strategies of other northern Adriatic ports

The other relevant ports of the north Adriatic, including Venice, Ravenna, and Rijeka, are also upgrading their operations (Ports Europe, 2022). The Port of Venice has so far developed a Three-Year Operational Plan for the development of port activities, identifying the need for harmonization with EU and national guidelines (Autorità di Sistema Portuale del Mare Adriatico Settentrionale, 2021). The Croatian Port of Rijeka has made significant investments in infrastructure intended to enhance its role within the region, aligning with the common goal of northern Adriatic ports to improve access to Central European markets and increase their share in global trade (Baniak, 2023).

Research results: shaping the alternatives

The present analysis shows how the northern Adriatic is in an urgent need of alternatives to the established transcontinental routes. These are becoming less and less reliable, both given their instability and the rising alternative of the NSR

The first major attempt relates to the ambition, pushed forward by China, to build a continental dry corridor through Central Asia: the BRI. Launched in 2013, it has attempted to significantly reshape global trade by planning to establish extensive networks of railways, ports, and highways, but its effect in Europe has been less impressive than initially expected.

Initially, also the Port of Trieste seemed to be poised to become one of the big recipients of Chinese capital through the BRI scheme, which would have helped to divert trade away from the Piraeus and from Northern European hubs (Pugliese et al., 2022: 1044). In 2019 Italy became the first G7 nation to join the BRI, but at the end of 2023 it withdrew due to diplomatic considerations and a disappointing outcome in terms of economic benefits (Insisa, 2023, 1, 4).

Slovenia, on the other hand, has approached the BRI with more caution. While China has shown interest in the Port of Koper, it failed to attract significant investment interest (Istenič Kotar, 2022). Slovenia has been more active in prioritizing European connectivity by integrating into EU transport networks and improving relation with neighbors, for example by participating in the Three Seas Initiative and trying to gain advantage from cooperation between northern Adriatic ports within the Northern Adriatic Ports Association (Motoh et al., 2021).

The Three Seas Initiative

The Three Seas Initiative (3SI), proposed in 2015 by Croatia and Poland with strong support from the United States, is a geopolitical and geoeconomic platform encompassing 13 Central and Eastern European EU countries, including Slovenia, but excluding Italy. Its projects focus on three pillars: transport infrastructure, energy diversification, and digital connectivity (Bojinović Fenko, 2022).

Taking advantage from the absence of Italy from the 3SI, Slovenia managed to emerge as the Northernmost 3SI destination in the Adriatic, pinpointing the importance of its only port. The country already invested 23 million euros into the investment mechanism of the cooperation, even though it remains cautious about its potential; as noted by the Ministry of Infrastructure, there are questions from the point of view of project financing. The nature of the financing foresees a 12–15% profitability of the project and it requires the inclusion of the fund in the ownership structure, so Slovenia is currently leaning toward other financing possibilities which are considered more favorable, such as EU grants (Govše, 2024).

On the other hand, Italy, despite its economic interests in 3SI, did not join the platform. This stance might have negative influences for the Port of Trieste, since it could benefit from 3SI's focus on transport and digital connectivity, which aims to streamline trade routes and improve market access in the region.

The India – Middle East – Europe Corridor, a competitor to the BRI?

The India-Middle East-Europe Economic Corridor (IMEC), unveiled during the G20 Summit in 2023, aims to increase global connectivity by integrating India, the Middle East and Europe through a network of railways, ports, and digital corridors. IMEC is seen as having the potential to redefine trade between Asia and Europe and could be an alternative to the BRI (Ghanem, Sánchez-Cacicedom 2024). The project highlights a strategic realignment of global trade routes and geopolitical alliances, reflecting a collective effort by the participating nations to counterbalance China's growing influence (Rasanah, 2023, 10).

The view about such a counterbalancing role is, on the other hand, not shared by all. IMEC does indeed run on a geographically parallel axis to the BRI and thus appears a competing route, but this ignores the fact that they stem from two very diverse Asian realities: China and India. IMEC is, in this sense, not a competing route to the BRI because the genesis of the two is different: the BRI is a one-country (Chinese) project pushed forward, in several cases, with unsustainable debt, while the IMEC is an international endeavor and, as such, benefits from multiple sources for its financing (Shenoy, 2024).

Should IMEC serve only as a channel to export Indian goods, the main question arising is which goods: the economy of the Indian subcontinent does not (at the time of writing) seem to be poised to become a manufacturing center at the level of China and it may never become one (D'Agostino, 2024). On the other hand, if IMEC would be able to attract other Southeast Asian sea traffic, it could indeed become a realistic alternative to the Suez Canal and avoid channeling traffic around Africa or through the Arctic.

Italy's inclusion in IMEC is particularly noteworthy. It underscores the country's strategic pivot following its decision to withdraw from the BRI in 2023 and its realignment to Western geoeconomic priorities, providing it a platform to enhance its trade partnerships while maintaining strong ties with its European allies and the United States.

While IMEC does have the potential to foster diversification, it responds only partly to the need for more geopolitically stable trade routes. IMEC envisages routes that skip the Red Sea with its two choke points of Bab-Al-Mandab and Suez, but it fails to fully forego all hostility hotspots, as the Israeli port of Haifa is integral to the proposed corridor. (Suri et al., 2023, Shenoy, 2024). Furthermore, it must be noted that IMEC is at present a little more than an idea where all concrete challenges, from solving logistical barriers, to securing funding, are still under question, as many geopolitical obstacles, funding constraints and regional interests could well hinder its realization (Chaturvedi, 2023).

Slovenia is in a different position, as is currently absent from IMEC. By not participating, Slovenia may miss opportunities to integrate the Port of Koper into these emerging trade routes, potentially limiting its role in future global supply chains. The threat of Slovenia remaining sidelined from IMEC and its potential benefits in terms of infrastructural investments and shipowners' preferences is even more worrying if one considers the ignorant approach of Koper's current port management towards the project: when asked about its potential effects, the answer was that "the Port of Koper is not aware of the existence of IMEC and the potential inclusion of the port of Trieste in it" (Čok, 2024).

Nevertheless, IMEC did not, until now, explicitly define which are its ports of choice, giving Slovenia's economic diplomacy a chance to catch up and make Koper one of its European gateways.

Fostering regional connectivity: North Africa and the Balkans

The expansion of port services from Koper and Trieste into the Western Balkans presents significant potential. Currently, the market share of clients from the Western Balkans for northern Adriatic ports remains very small as their focus is mainly on Central and Northern Europe (Zanne and Borkowski, 2021, 174 and Autorità Portuale di Trieste, n.d.). Historically, the Port of Koper played a vital role in serving the region during the Yugoslav era, but following the breakup of Yugoslavia it lost these markets, which shifted to other logistical hubs due to geopolitical and economic fragmentation (Zanne and Borkowski, 2021, 175).

Geographically, the Western Balkans are well-situated to benefit from northern Adriatic ports due to the relatively flat terrain of the Sava River valley and its tributaries. Mountainous terrain, by contrast, necessitate costly construction of bridges, tunnels, and other infrastructure, which increases project costs and maintenance demands (Ghoreshi et al., 2019). Capitalizing on this natural benefit, however, requires substantial investments in modernizing regional transport infrastructure, especially in railways, which remain underdeveloped (CEI, 2022, 18).

Another critical issue is the need to streamline customs processes. Both the Port of Trieste and the Port of Koper already benefit from operating as free zones, providing tax and customs advantages. While Trieste's zone dates to the 19th Century and Koper's is a fairly recent consequence of the otherwise largely forgotten *Resolution on the Maritime Orientation of the Republic of Slovenia* from 1991 (Pavliha, 2021), they both help by reducing customs duties, streamlining procedures and allowing efficient cargo storage, creating a strong foundation for attracting businesses from the Balkans (Trieste Marine Terminal, 2022 and Ports of NAPA, n.d.).

Another role that the ports of Trieste and Koper might fulfill more intensively is improving regional connections with Turkey and North Africa. The economic potential of the area should be taken very seriously not only for its current trajectory, but for a fundamental shift in global manufacturing policies: as deglobalization becomes a reality, it can be expected that industries serving Western economies will start moving away from markets considered less friendly, such as China, to areas inside the Western geopolitical sphere of influence or at least considered compatible with Western geopolitical priorities (D'Agostino, 2024). Furthermore, rising labor costs in China are adding to geopolitical pressures, prompting industries, particularly textiles, to relocate. Countries like Morocco, Tunisia, and Egypt offer competitive labor costs and proximity to European markets, making them attractive hubs for manufacturing, especially for the textile industry, characterized by its labor-intensive nature and need for fast transportation (Altenburg et al., 2020).

Discussion: the challenge of the K-shaped double Adriatic corridor

The strategy for the ports of Koper and Trieste and, by extension, for the whole northern Adriatic port system, emerges as a synthesis uniting the different approaches presented so far. Its key foundation is recognizing the ports of the northern Adriatic as a multi-port gateway region, being the keystone point of a K-shaped double corridor. This corridor connects the Middle East and Turkey to the south-east, North Africa to the south, Central and Eastern Europe via the Three Seas Initiative to the north and north-east, and the Western Balkans to the east.

In doing so, the Northern Adriatic becomes not just a recipient of goods but a dynamic hub where supply chains intersect and converge. This approach echoes the concept of multi-port gateway regions discussed by Notteboom and Rodrigue (2008), where collaboration among ports enhances regional competitiveness and connectivity. For example, a direct railway link between the ports of Trieste and Koper could strongly guarantee "an alternative to existing transport routes and in case of possible natural disasters and other extraordinary events maintain the reliability of supply chains" (Čok, 2024). The Adriatic, which can be likened to a river basin due to its deep penetration into Europe, while at the same time maintaining the advantages of a deep-water sea, becomes a conduit for trade that combines the efficiency of maritime transport with direct access to inland regions.

Considering the argument for betting on regional, short shipping routes, for example from Turkey, Northern Africa and even Haifa in case of IMEC, it becomes interesting to consider the potential of focusing more on Roll-on/Roll-off (ro-ro) transport (D'Agostino, 2024). Ro-ro's efficiency, speed and flexibility make it ever more suitable for handling increasing amounts of goods, especially considering how little it is currently being used in short sea shipping and how much room there is for growth. Handling time in ro-ro cargo is minimal as the goods are already loaded on trucks and these can enter the ships much faster. Even in the case of trains, cargo can be loaded fast, provided ships are properly fitted. This feature is particularly valuable for time-sensitive goods and short-sea shipping routes, where it's important to minimize the time spent on loading and unloading (Christodoulou et al., 2019).

Besides native regional trade, also IMEC and BRI bring more potential for ro-ro demand. In the case of IMEC, trucks loaded with cargo will pass through the Arabian Peninsula to Israel, while the BRI will bring ro-ro ready cargo through Central Asia, ready to seamlessly hop on ships at Turkish or Greek ports.

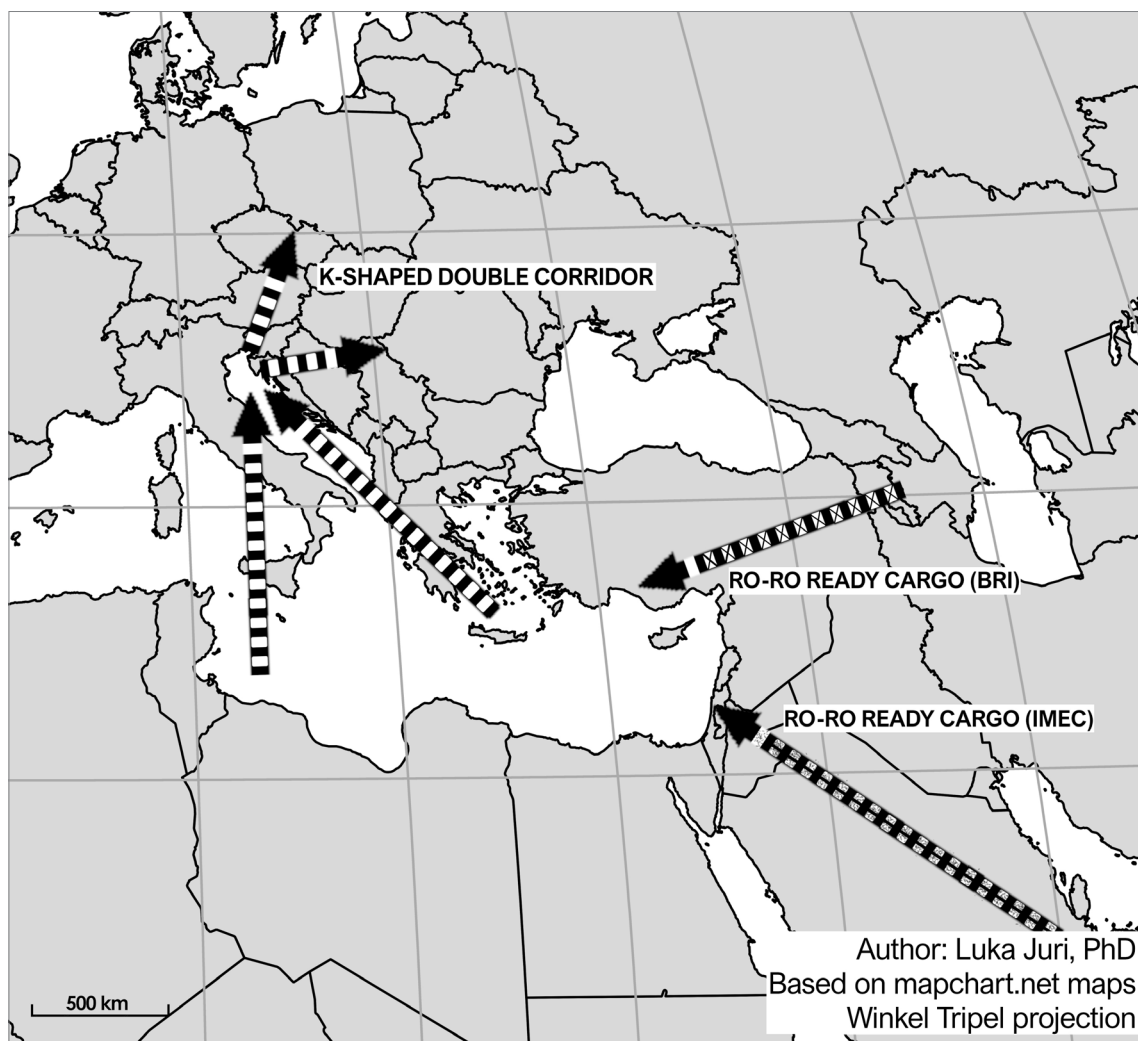


Fig. 4: The K-shaped double corridor

Source: www.Mapchart.Net, modified by author

Trieste and Koper are in a good position to capitalize on this, though they are not equally prepared. Trieste has made big advancements, including the construction of dedicated ramps and berths, as well as strong rail and road connections. The future Pier 8, as currently planned, will be fully prepared for ro-ro handling (D'Agostino, 2024). The port is the most competitive ro-ro terminal in the northern Adriatic (Forte, Siviero, 2014, 270) and is thus poised to become a key gateway for inland distribution of goods.

Koper, while already fully operational in ro-ro handling, still requires further investment in infrastructure. The port is starting the adaptation of the northern section of the first pier for additional container handling and storage capacity, although no explicit mentions about its ro-ro compatibility have been made (Luka Koper, 2024), making its future competitiveness in this sector unclear.

As ports play an ever more prominent strategic role in global supply chains, evolving from simple transshipment points to complex logistical hubs, they integrate with inland logistics centers and transport networks (Notteboom and Rodrigue, 2008, 165). In this perspective, Trieste boasts well-developed rail and road connections allowing efficient distribution of goods across Central and Eastern Europe. Its ro-ro facilities

align with the need for seamless transitions between maritime and inland transport, making it a model for integrated logistics. Koper, on the other hand, still has room to improve its integration.

To complete the picture, it's necessary to consider that ro-ro is not a one-size-fits-all solution. It excels in handling vehicles and time-sensitive cargo, but it's less suitable for bulk goods or standard containerized cargo due to its space utilization inefficiency. Furthermore, it makes sense if there is a balanced bidirectional trade flow, otherwise it produces additional costs and inefficiencies, mainly in the form of empty trucks having to be shipped back. Based on this reasoning, intermodality becomes the evident cornerstone of this strategy. Integrating efficiently sea, rail and road transport is essential for any port with the ambition to retain and improve its competitiveness. Adriatic ports are currently well positioned, with Trieste having already developed a modern intermodal structure and Koper in the process of finalizing the modernization of its railway connections.

This last element is a critical component of the strategy, particularly via enhanced ro-ro capabilities. The ports of Koper and Trieste, positioned at the endpoint of emerging corridors, can attract significant volumes of truck and train-borne goods. These ports must not only improve their infrastructure, but also update their operations by adopting fast and precise digital technologies that are crucial for minimizing turnaround times.

All these elements must also be placed within the geopolitical framework. The ports of Koper and Trieste have the potential to benefit from their respective national alignments. Italy is a foundational signatory of the IMEC protocol and Slovenia a founding member of the Three Seas Initiative; these affiliations provide unique leverage to attract investment and influence regional trade policies. Croatia, with its shared mem-

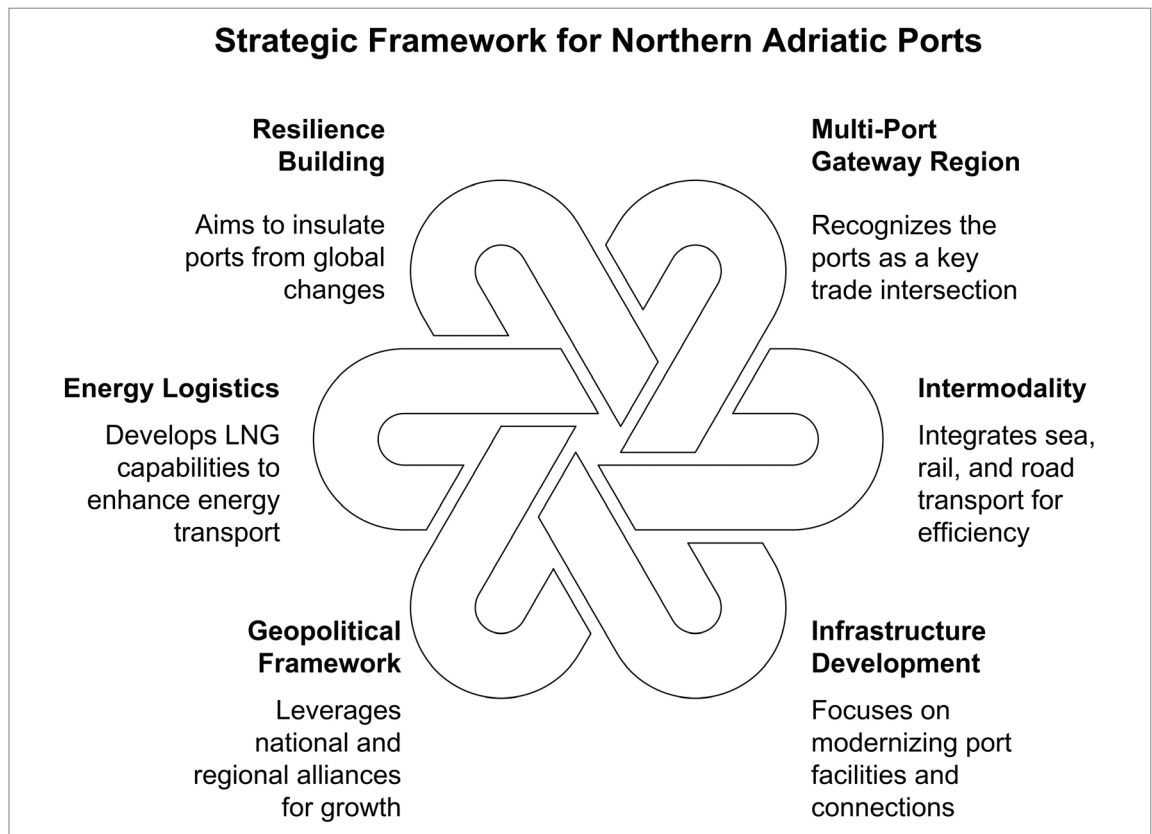


Fig. 5 The comprehensive strategic framework for northern Adriatic ports

Source: Mindmap by author built on www.Napkin.Ai

bership in the Northern Adriatic Ports Association and its strategic interest in developing Rijeka, offers an additional ally in promoting the Adriatic as a cohesive trade hub.

Energy logistics are crucial in this vision, and continued development of LNG capabilities could enhance this even more. Croatia's LNG terminal at Krk Island is already a major energy hub for the region with the potential for more capabilities, even though environmental constraints, linked to the high coastal sensitivity of the northern Adriatic, could impede it.

All these elements aim to constitute a strategy that will increase the logistical resilience of the northern Adriatic, insulating it from global geopolitical and climate changes.

With the fulfilling of this comprehensive strategy, Koper and Trieste could get new definitions to the roles they play in the global trading networks and, at the same time, develop and build on resilience at the regional level.

At this point it's also important to note that most of the pieces of this strategy depend on predictions, however credible, including strengthening manufacturing centers in North Africa, the materialization of IMEC and the opening of Western Balkan markets. Challenges, on the other hand, which include the actual threats of geopolitical instability and the opening of the Northern Sea Route (NSR), are present here and now. This makes it even more pressing to diversify and work for a more resilient northern Adriatic network.

Conclusion: the need for diversification and resilience

The future of the ports of Trieste and Koper lies in how effectively they can adapt to an increasingly complex and multipolar trade environment. This analysis underscores their pivotal role as connectors between the emerging IMEC, the Mediterranean, and the dynamic markets of Central and Eastern Europe.

As Bekkers and Francois (2016) highlighted, the opening of alternative trade routes like the NSR could profoundly disrupt traditional patterns, including those reliant on the Suez Canal. While it promises faster connections between Asia and Europe, its full potential remains somewhat distant. For Trieste and Koper, this creates an opportunity to focus on immediate and tangible strategies, like solidifying their position within a K-shaped double corridor linking the Middle East, North Africa, and Europe. Notteboom and Rodrigue (2008) aptly described the importance of multi-port gateway regions, and this idea is vital for fostering collaboration between northern Adriatic ports.

Intermodality and rapid cargo handling remain at the heart of these ports' competitiveness. Feedback from Čok (2024) and D'Agostino (2024) highlights the strategic prioritization of intermodal connectivity and streamlined cargo handling as immediate responses to shifting trade routes.

Furthermore, as the Krk LNG terminal in Croatia exemplifies, the region has already made strides in energy-related infrastructure. Expanding similar capabilities while safeguarding the northern Adriatic's delicate ecosystem is a pressing challenge. Ports must tread carefully to balance energy security with the environmental dimension (Luka Koper, 2024).

Moreover, their integration with broader geopolitical and geoeconomic shifts cannot be overstated. Italy's involvement in IMEC and Slovenia's alignment with the 3SI give these ports unique leverage to attract investments and define regional trade strategies. Yet speculative opportunities like the rise of North Africa as a manufacturing hub require patience and preparation. While these possibilities may take years to materialize, immediate threats like geopolitical instability in the Suez region (Thamer and Akkas, 2024) underscore the urgency of diversifying trade routes and markets.

Ultimately, resilience lies in diversification. By reducing reliance on global shipping networks and strengthening regional connections, Trieste and Koper can affirm themselves as indispensable hubs in a rebalanced global order. The vulnerabilities of traditional routes and the slow materialization of new trade corridors demand adaptability. In this regard, the ports' future will depend on their ability to embrace change, leverage their unique geopolitical positioning, and remain at the forefront of innovation. This is not only about trade, but about affirming a geopolitical framework where Europe's southern gateway becomes a keystone of stability, connectivity and growth.

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