

Bocconi

**MARITIME INTERMODALITY: THE
ROLE OF THE SECTOR FOR THE
ITALIAN ECONOMY AND THE SOCIO-
ECONOMIC AND ENVIRONMENTAL
EFFECTS FOR BUSINESSES**

Executive Summary

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**Università
Bocconi**

GREEN
Centro di ricerca sulla geografia,
le risorse naturali, l'energia,
l'ambiente e le reti

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This study was prepared by a research team from the GREEN Centre - Bocconi University coordinated by Oliviero Baccelli (responsible for all activities), with the collaboration of Martino da Col.

Contact details:

oliviero.bacelli@unibocconi.it



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Executive Summary

- 1) The Italian Government's 'Piano Strategico del Mare', unveiled last October 2023, calls for the development of appropriate policies to ensure a 'level playing field' between the maritime transport service and competing services on land routes. The Plan argues that economic measures, in the form of incentives and compensation, should be adequately integrated with European funds.
- 2) The study highlights **the socio-economic impact resulting from a further development of maritime intermodality, deriving from both environmental benefits and reduced operating costs**. The incentive strategy must be also prioritized by policy makers and industry stakeholders to offset the effects of the introduction of the new European Emission Trading Scheme regulations in the maritime transport sector from 2024. This development can be further pursued thanks to the main e-commerce operators and their organizational capacity and attention to environmental sustainability. Over the next few years, these players are expected to increase their level of offer and service throughout Europe and to support the development of small and medium-sized enterprises.
- 3) **In Italy, maritime intermodality stands out as a distinctive element in medium and long-distance freight transport** to and from Sicily and international key destinations. In Italian ports, they are handled at embarkation and disembarkation around 121 million tonnes of goods annually on Ro/Ro and Ro/Pax ships, constituting 25% of total goods. 64% of this traffic is estimated to be national traffic, while 36% has origins and destinations in other Mediterranean ports. According to data from the Bank of Italy, the value of imports utilizing Ro/Ro ships in 2022 amounted to € 17.7 billion, while exports reached € 28,8 billion, representing a significant increase compared to 2013, with a growth of +174% and +200%, respectively.
- 4) **Italy retains the position of global leader in the Ro-Ro fleet**, which is particularly well-suited for domestic and intra-Mediterranean trades. Moreover, some Italian shipping companies stand at the top of the European rankings in this sector. Notably, this market segment has shown lively growth rates between 2013 and 2022, recording a +38.5% increase in volumes, compared to a +7% growth in other segments of the Italian port maritime sector during the same period. In the 2013-2022 timeframe, the average value of goods handled via Ro/Ro more than doubled (+104%). **70% of Ro/Ro maritime traffic in the Italian port sector is technically alternative to all-road transport**, as it either originates from and is destined to non-island territories or is connected with road transport services (such as in the case of Sicily).
- 5) **The ambitions of Europe's sustainability initiatives have been reinforced by the 'Greening Freight Transport' measures** presented by the European Commission in July 2023. This package aims to help achieve the goal of reducing emissions in the transport sector by 90% by 2050, concurrently supporting the economic growth of companies adopting new, efficient and sustainable freight transport policies. These policies support the idea that accounting for greenhouse gas emissions can lead customers to make more informed choices and influence the business decisions of entities involved in organizing and providing these services within the market. The provision of reliable emissions data can encourage sustainability, innovation and behavioral changes towards sustainable transport options.



- 6) European and national transport policies support the development of Ro/Ro traffic in order to enhance the operational and environmental efficiency of the transportation network. **The employment of maritime intermodality proves, in fact, to be cost-effective, and to offer significant environmental benefits, including the reduction of externalities such as CO2 emissions, local pollutants, congestion, and accidents, in comparison to an all-road transport approach.** Analyzing the primary routes to and from Italian ports with a door-to-door approach and considering all environmental externalities, maritime intermodality allows a reduction in external costs ranging from a minimum of 42.6% to a maximum of 73.2%, with an average of 56.7%. This translates to average savings of € 138 per shipment.

The characteristics of maritime intermodality to and from Italian ports as an alternative to all-road on medium and long distances

The offer	The routes	The ships
<ul style="list-style-type: none"> • 40,5 million linear metres of cargo hold • 5.725 annual round-trip services 	<ul style="list-style-type: none"> • 24 routes of which 11 international and 13 domestic 	<ul style="list-style-type: none"> • 60 vessels of which 22 Ro/Ro and 38 Ro/Pax vessels

- 7) **The supply capillarity enables the transfer of approximately 1.912 million intermodal transport units (ITUs) annually**, consisting mainly of semi-trailers and to a lesser extent of complete vehicles, from all-road to intermodal sea transport. This results in a reduction in operating costs of around € 2.02 billion, which guarantees savings that can be passed on to end consumers.
- 8) The environmental benefits of the Ro/Ro and Ro/Pax services network, providing an alternative to road transport, can be quantified in an annual reduction of 0.7 million tonnes of CO2. **Considering all environmental externalities** (including local pollutants, road congestion and accidents), **the estimated value amounts to € 315 million per year.** The environmental benefits of intermodality vis-à-vis road transport bring about a 56.7% average reduction in the economic value of externalities. A comparison between the environmental benefits induced by the network of 24 routes dedicated to maritime intermodality as an alternative to road transport in 2023 with the Sea Modal Shift support programme (which allocates € 125 million for the 2022-2026 period), reveals a benefit multiplier of 12.6. This value corresponds to the ratio between the environmental benefits for the community of approximately € 1.57 billion and the public subsidies amounting to € 125 million.

The environmental and operational benefits of maritime intermodality to and from Italian ports as an alternative to all-road on medium and long distances

The environmental benefits	The operational benefits
<ul style="list-style-type: none"> • 56.7% reduction in environmental externalities in door-to-door services • € 315 million per year in environmental benefits for society 	<ul style="list-style-type: none"> • 54.6% reduction in operating costs for transmission services • € 2.02 billion per year in benefits for end customers



- 9) Despite the clear benefits in terms of reducing climate-changing emissions, the application of the European ETS¹ regulation in the maritime sector from 2024 will impose additional taxation on users of maritime intermodality, whereas the same taxation is postponed beyond 2027 for road transport users. The following table outlines the two scenarios detailing the estimated amounts of the new taxation in the period 2024-27 for the routes analysed here as alternatives to road transport to and from Italian ports, which are beneficiaries of the incentive instrument Sea Modal Shift (SMS). The first scenario envisages the application of the average market value of 2023, while the second employs the parameters proposed by the European Commission². The strong difference between the amounts of the new taxation and the subsidy is evident. The annual SMS contribution is in fact equal to € 125 million in the period 2023-2027, while the total amount resulting from the surrender of the value of CO2 allowances as per the ETS regulation in Scenario 2 is six times that, totaling € 756 million (in Scenario 1, € 380 million). In summary in Scenario 2 the Sea Modal Shift is only able to offset 17% of the new environmental tax, and in Scenario 1, it can offset around 33%.

Economic impact of ETS regulations on maritime intermodality to and from Italian ports (2024-2027)

Year of reference	Scenario 1	Scenario 2	% of application	Scenario 1	Scenario 2
	Average market value EU Carbon Permits 2023 in €* tonnes CO2eq	Commission indication of shadow carbon cost expressed in €* tonnes CO2eq		Estimated amount resulting from the surrender of CO2 allowances (€)	Estimated amount resulting from the surrender of CO2 allowances (€)
2023	90	131	0	0	0
2024	90	148	40%	49.008.154	80.591.187
2025	90	165	70%	85.764.269	157.234.494
2026	90	182	100%	122.520.385	247.763.445
2027	90	199	100%	122.520.385	270.906.184

Source: GREEN's own computations

- 10) The evolution of goods distribution methods and the growth of e-commerce, favoring omnichannelity and the development of distribution networks closer to the end customer, benefit organisational models that are capable of certifying the sustainability of choices, such as maritime intermodality based on the Ro/Ro model. The leading shippers employ strategies to reduce the carbon footprint of their distribution models and stimulate shipping companies to enhance the efficiency of their energy carriers and organizational models with a strong focus on sustainability.
- 11) The commercial and organizational partnership for the development of maritime intermodality to and from Italian ports signed as of the end of 2021 between Amazon and Grimaldi Group, the leading shipping company in the Ro/Ro and Ro/pax market in Europe, contributes to the evolution of the sector and plays the role of forerunner in the deployment of the strategies indicated in the 'Piano Strategico del Mare'. This agreement, in fact, has enabled the increase in volumes on board ship holds, with a consequent reduction of operating costs to the benefit of the entire supply chain up to the end consumer, as well as the creation of

¹ The introduction of the Emission Trading Scheme will be gradual and will cover 40% of verified emissions reported for 2024, 70% of verified emissions reported for 2025, and 100% of verified emissions reported from 2026 onward.

² The values provided by the European Commission in its Communication (2021/C 373/01) were used for the valuation of negative externalities caused by CO2 emissions.



environmental benefits for the benefit of the community. Moreover, it has allowed to **expand the target market of maritime intermodality in terms of type of goods and geographic areas.**

- 12) The partnership is characterized by innovative elements, such as the tracking, in a timely manner, of the carbon footprint for each individual shipment, making data on the environmental benefit generated in comparison with all-road transport immediately available, and enabling moreover the real-time tracking of cargo location. Integrations between IT systems foster the development of more streamlined and automated processes for time-sensitive goods that require a higher attention to security elements. These higher safety levels are also made possible by the integration between maritime and port activities, given that Grimaldi Group plays the role of terminal operator in many instances.

- 13) The development of more advanced and sustainability-conscious organizational systems enabled by a greater participation of large e-commerce platforms (whose market vision is internationally oriented) could help enhance the role of maritime intermodality, leading to an increase in maritime modality at the expense of road-only transport. In particular, an increase in ships' load factors (+10%) could be achieved, while more capable and energy-efficient ships could be introduced more quickly. If these two hypotheses were to take place, the additional benefits for the community on an annual basis would amount to € 62 million per year, for a total of € 310 million over the five-year period corresponding to the incentive period in Italy.

- 14) The prospect of developing intermodal maritime traffic and the consequent increase in the load factor of ships, can lead to a rise in the average revenue of shipping companies. In particular, based on current estimates, assuming 216 thousand additional ITUs (+11.3% compared to the estimates for 2022) and an average revenue per ITU of € 614 (excluding port handling costs and port dues), leads to an annual value of € 134.82 million. These additional revenues would help offset the impacts of environmental taxation under the ETS Regulation, assuming a CO₂eq-tonne value of € 100. In an energy-optimized scenario, e.g. employing only GG5G class ships, the balance between revenues for shipping companies and additional costs from ETS taxation could be achieved also with a CO₂ value of € 180 per tonne, i.e. the value estimated by the Commission for the period 2026-27.



Summary of benefits from a 10% increase in the ship's hold-filling ratio and an efficiency boost for the Eco-class (GG5G class, 'zero emissions in port') ship fleet

Environmental benefits	Operational benefits	ETS Compensation
<ul style="list-style-type: none"> • Reduction of an additional 286 thousand tonnes of CO2 for existing traffic and 113 thousand tonnes of CO2 for traffic resulting from the additional modal shift of 216 thousand ITUs. • Environmental benefits deriving from the overall reduction of environmental externalities (efficient trades and additional trades) amounting to € 96.277 million per year 	<ul style="list-style-type: none"> • Benefits for end users deriving from a reduction in operating costs amounting to € 227.81 million per year made possible by the modal shift of 216 thousand ITUs • Additional revenue for the national Port System Authorities from increased loading and unloading fees of € 4.9 million per year and for national terminal operators of € 13.2 million 	<ul style="list-style-type: none"> • The additional annual revenues for shipping companies from the improved hold load factor amount to € 134.82 million. These could compensate for the additional costs resulting from the taxation under the ETS regulations in maritime transport with a CO2 value estimated by the Commission at € 180 per tonne of CO2 eq in 2026-27.

- 15) The introduction of access systems based on gate automation and digitalization of processes in Italian terminals can lead to a reduction in operating costs estimated at € 20 million per year.
- 16) The development of maritime intermodality must be at the heart of both national and European transport policies. These should promote investments in both the renewal of fleets and the development of port areas capable of accommodating larger ships with different energy requirements. The redesign of existing national policy initiatives for the promotion of maritime intermodality (Sea Modal Shift, Mission "Intermodality and Integrated Logistics" of the PNRR, "Fleet Renewal" of the Complementary National Plan) must pursue more ambitious strategies and guide policy makers' decisions in the direction of ETS revenues to the maritime sector, both to favor process and vessel modernization strategies and to maximize the potential of a modal shift from road transport. **The excessive burden resulting from the implementation of the ETS, which leads to an increase of between 7.3 and 14.8% in the operating costs of door-to-door shipments (2026 estimates), could lead to a higher reliance on all-road transport, a mode for which the medium-term implementation of the ETS regulations is not yet planned.**
- 17) The national ambitions in this market should help direct policy makers' decisions on allocating the ETS revenues to the specific sector of maritime intermodality, mainly to promote a modal shift from road transport, but also to foster modernisation strategies of both organizational and technological processes of ports and energy efficiency of ships. This strategy enhances the indications of the 'Piano Strategico del Mare', which calls for the development of suitable policies to ensure a level playing field between the maritime transport service and the competing land routes, in the form of incentives and compensation. The recommendation of strengthening the budget dedicated to the Sea Modal Shift instrument is justified by the social environmental benefits of maritime intermodality, currently estimated at € 315 mln per year. These figures are compensated by the SEA Modal Shift's public grants, which have a value of € 21 million. The difference, amounting to € 294 million per year, can be considered the amount of net benefits for the community. Starting from 2024, the application of the ETS regulation on the shipping routes that constitute an alternative to road transport will generate additional



costs for the shipping companies in the Ro/Ro and Ro/Pax sector in the range of € 122.5 - € 247.8 million (data for 2026, the first year of full application of the ETS). **The failure to value environmental benefits over all-road and the application of environmental taxation means that the level playing field between maritime and road transport³ referred to in the Strategic Sea Plan is not met.**

- 18) The revenues originating from the implementation of the ETS on the Ro/Ro and Ro/Pax sector (concerning the share of emissions attributable to freight), is estimated to be in the range of € 98 to € 198 million per year for 2026. Around 80% of what is collected should be used by the Italian State to further strengthen the competitiveness of the sector with respect to the all-road mode. Allocating national ETS revenues to initiatives such as the Italian Sea Modal Shift (SMS) and the Spanish Med Atlantic Ecobonus allows the rapid achievement of significant environmental goals, in terms of a reduction of CO2 emissions and other externalities, using proven organizational mechanisms. In the medium term, the possibility of supporting fleet and terminal modernization should also be included, allowing to cover the additional costs arising from investments in innovations to improve sustainability. These investments could also help develop green corridors between ports, well suiting the specificities of the Ro/Ro transport mode. The repurposing of ETS resources responds to the needs of strengthening the national leadership in the sector, fostering innovations and new technologies to accelerate the process of decarbonization, as well as supporting overall trade exchanges, thus fostering economic and social cohesion.
- 19) Maritime intermodality to and from Italy, at its current state, already offers the opportunity to reduce operational costs, benefitting end customers and generating environmental benefits for society at large. Nevertheless, the system can be developed further and made more efficient by strengthening some organizational aspects, a task that is made possible thanks to the presence of new customer such as e-commerce operators, and to the introduction of technological innovations. **An integral exploitation of the ETS revenues within the maritime intermodal sector is required to pursue a virtuous development of maritime intermodality and to ensure the level playing field invoked by European and national policies with respect to the all-road mode.**

³ The application of ETS to road transport is a European policy proposal, but the implementation, which would eventually start after 2022, is not yet planned.

