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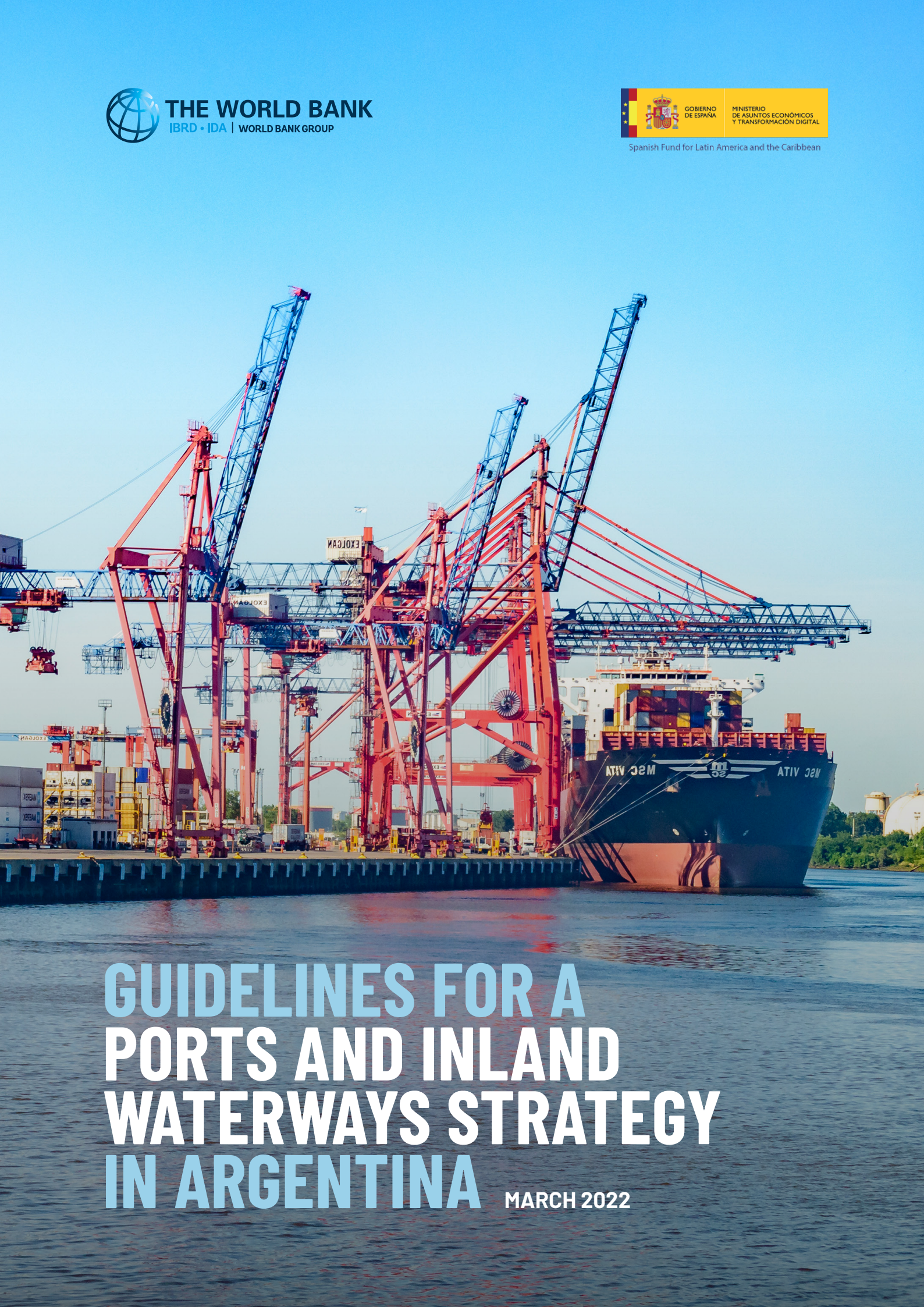

GUIDELINES FOR A PORTS AND INLAND WATERWAYS STRATEGY IN ARGENTINA

MARCH 2022

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This report condenses two years of work and the contents of two base studies on the situation and outlook of Argentina's river-sea navigation system: Argentina Inland Waterways Strategic Studies (World Bank, unpublished), carried out by Serman & Asociados S.A. and Royal Haskoning DHV; and National Ports Strategic Plan for Argentina (World Bank, unpublished), carried out by AIC Estudios y Proyectos, Maritime and Transport Business Solutions and Maritime & Logistics Consulting Group, S.A. This report summarizes the results of the diagnoses of the two studies and presents strategic guidelines for the sector's public policy.

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ACRONYMS

AGP	Administración General de Puertos (General Administration of Ports)
AMBA	Área Metropolitana de Buenos Aires (Metropolitan Area of Buenos Aires)
BAU	Business As Usual
BGT	Channel system of the Paraná Bravo, Paraná Guazu and Talavera
CABA	Ciudad Autónoma de Buenos Aires (City of Buenos Aires)
CAGR	Compound Annual Growth Rate
CARP	Comisión Administradora del Río de la Plata (Administrative Commission of the Río de la Plata)
CARU	Comisión Administradora del Río Uruguay (Administrative Commission of the Uruguay River)
CFH	Consejo Federal Hidrovía (Federal Waterway Council)
COMIP	Comisión Mixta del Río Paraná (Mixed Commission of the Paraná River)
CONTRASE	Sistema de Control de Tráfico y Seguridad (Traffic and Security Control System)
GDP	Gross Domestic Product
GHG	Greenhouse Gas
HPP	Programa de la Hidrovía Paraguay-Paraná (Paraguay-Paraná Inland Waterway Program)
KPI	Key Performance Indicator
IMO	International Maritime Organization
MTR	Ministry of Transport of Argentina
NRT	Net Registered Tonnage
OPEC	Organization of the Petroleum Exporting Countries
PANTyCC	Plan de Acción Nacional de Transporte y Cambio Climático (National Action Plan for Transport and Climate Change)
PNA	Prefectura Naval Argentina (Argentine Coastguard)
ROSAFE	Rosario-Santa Fe
SSPVNyMM	Subsecretaria de Puertos, Vías Navegables y Marina Mercante (Undersecretary of Ports, Navigable Waterways and Merchant Navy)
tCO2e	Tons of Carbon Dioxide Equivalent
TEU	Twenty-foot Equivalent Unit
TIW	Trunk Inland Waterway
tkm	ton-kilometer
TOE	Ton of Oil Equivalent
UNCTAD	United Nations Conference on Trade and Development

EXECUTIVE SUMMARY

Maritime Connectivity and Competitiveness

Argentina has a fairly developed transport system, which in the case of cargo shows a performance in progressive decline, with remarkable differences between components, logistic chains, and regions. Water transport, a key sector for the country's connectivity with world markets, encounters difficulties when it comes to facilitating international trade. Two of these difficulties are of a structural nature. The first is related to Argentina's location in global maritime networks, far from key markets and major cargo corridors. The second relates to the limitations inherent to the waterways accessing ports with the largest movements of agri-bulk commodities and containers, on the Río de la Plata and the Lower Paraná River. Ports and waterways were subject to far-reaching reforms in the 1990s, fostering greater participation by the private sector through dredging and port terminal operation concessions. The contractual terms of these reforms are coming to an end. The government of Argentina now has an opportunity to redefine these reforms within the framework of a global context in which maritime navigation—and cargo logistics in general—faces major changes and challenges. It can redefine strategies for ports and inland waterways while safeguarding the country's maritime connectivity and fostering greater competitiveness in international trade, whose growth is intrinsic to economic development and poverty reduction.

Characterization of Ports, Inland Waterways, and Navigation Services

Waterborne transport consists of three interconnected elements: ports, inland waterways, and navigation services. Argentina's inland waterways are made up of the access channels from the Atlantic Ocean to the Río de la Plata and the rivers flowing into it, particularly the Paraná River. These waterways penetrate deep into the South American continent, enabling significant flows of foreign and domestic trade, either originating in, or bound for, Argentine river ports and those of other countries in the Río de la Plata Basin. The lower section of the Paraná River is where overseas navigation—vessels that penetrate the continent along the estuary called the Trunk Inland Waterway (TIW)—converge with purely fluvial navigation. Numerous port terminals have been set up throughout this section, particularly for export of agri bulks. In the upper section of the Río de la Plata, in the Metropolitan Area of Buenos Aires (Área Metropolitana de Buenos Aires; AMBA), lie the main maritime container terminals, referred to collectively as the Port of Buenos Aires (Puerto Buenos Aires).

The management of the Trunk Inland Waterway was granted in concession with a toll charging mechanism in the 1990s that met the needs of the time. This concession meant substantial improvements for the maritime connectivity of the Argentine river ports, however its design responded to the needs of seagoing vessels of those times in terms of drafts, channel width, and other design parameters. Despite some improvements, navigation conditions have been lagging behind with regard to the evolution in size of vessels.

Agri-bulk terminals are private undertakings, while the container terminals are the result of public port concessions and permits granted to private operators; the so-called Puerto Nuevo, in Buenos Aires, has been organized under the landlord model following three concessions granted by the national government to specialized operators running numerous terminals around the world. There are other major container terminals in the AMBA (for example, Dock Sud, La Plata, and Zárate), as well as specific facilities dedicated to other kinds of traffic (for example, fuels, vehicles, minerals, fertilizers, cruise ships, and so on). As for navigation, most of it is oriented toward foreign trade, although there is considerable domestic traffic, much of which links the river ports with ports on the Argentine seacoast. Argentina does not have a developed and competitive merchant marine; most container ship movement is carried out by liner services, while solid and liquid bulk transportation services predominantly use the charter modality.

Today, private ports, public ports operated by private companies, and public ports under state management operate in Argentina. Those ports with several terminals and a variety of different operators have entities responsible for exercising coordination functions, both public and mixed. There are also several public-private management consortia, a setup that has proved to be quite effective in various cases. Management of regulation is mostly the remit of the provinces; despite the existence of a specific area and a National Ports Council, the sector lacks the institutional framework needed to oversee its long-term development.

Evolution and Performance of the Sector

The Trunk Inland Waterway, in those sections most used by commercial shipping, has been granted in concession at risk with toll payment. Another section, the Martín García Canal, operates with a toll but without demand risk, while the other waterways are not under concession and are subject to sporadic interventions. In general terms,

the Trunk Inland Waterway concession has exhibited good performance; the level of conflict between the concessionaire and users has been low, and users, according to recent surveys, are generally satisfied with the service provided. The greatest deficiency has been the absence of a control entity, which has prevented not only the grantor from accessing regulatory information but also the existence of a transparent body that is able to settle differences in the event of incidents.

The navigation system exhibits uneven performance according to the different segments of activity. Waterways have relatively low travel speeds, especially in the case of bulk carriers and tankers. As regards line services, Argentina has progressively lost its degree of integration in global maritime transport networks; the shipping lines connectivity index prepared by the United Nations Conference on Trade and Development (UNCTAD) shows that over the course of 15 years, from 2006 to 2020, Argentina fell from 34th to 57th place.[1] In the case of container management, the performance registered at the terminals is also uneven, as their operational performance is, in general, relatively low compared with other ports of reference; thus, stays in port are relatively long by comparison. The main reasons for this are inefficient port terminal organization, the lack of port infrastructure modernization, and low productivity in the use of existing resources (or low cargo levels). Agri-bulk ports, on the other hand, by and large exhibit efficient performance, although the load factors at the different terminals are, in general, relatively low. Key performance indicators (KPIs) reveal significant potential capacity in the main port systems, either because current utilization is low or because there is ample room to improve efficiency.

The total volume of cargo moved by Argentine ports has not changed substantially in recent years, although there has been a major change in the composition of non-containerized cargo, with a significant growth in grains and vegetable oils, offset by a drop in oil, fuels, and metallurgical products. As a result, in just six years, the set of solid and liquid agri-bulk products increased its relative share by 17.4 percent, going from representing 43.3 percent of total non-containerized cargo movements in 2014 to 60.7 percent in 2020. Among the many factors explaining the explosive growth in agri-bulk products is the improvement of the waterways and the deployment of new river terminals. In a system (the Trunk Inland Waterway) otherwise characterized by capacity limits, the increase in vessel size has made it possible to effectively manage this growing flow of cargo. As for container movements, activity levels in the Trunk Inland Waterway and the AMBA terminals remain relatively constant, in the order of 1.5 to 1.7 million twenty-foot equivalent units (TEUs) per year, reflecting the overall stagnation of the national economy.

Scenarios and Trends

A look at transport activity around the world in recent decades shows that the sector has grown exponentially, and that although this may have contributed decisively to greater economic prosperity, it has also created impacts that call into question its sustainability in environmental, social, financial, and economic terms. This suggests the need for a change in the development model, particularly with regard to the decarbonization of the economy. Along with this trend of mitigation and adaptation to climate change—that will have a significant impact on waterborne transport—there are three other factors: the technological changes associated with Industry 4.0, the concentration and vertical expansion taking place in global logistics services markets, and the effects of the COVID-19 pandemic. These trends affecting maritime transport are as follows:

- With respect to ***climate change***, actions are already under way to reduce emissions in maritime navigation: the International Maritime Organization (IMO) has established maximum greenhouse gas (GHG) emission standards by vessel type, proposing a reduction of up to 70 percent by the year 2050, compared with 2008. A range of carbon pricing market initiatives are also being analyzed with a view to levying emissions charges. This is bound to affect prices as well as the organization of line services. In ports, mitigation strategies are expected to cover not only actions related to operations, but also their relationships with the hinterland and the supply of new energy sources to ships, with the aim of developing green ports. Dredging offers ample opportunity to reduce GHG emissions as this activity consumes high amounts of energy, traditionally based on hydrocarbons. Actions to reduce GHG emissions include project design, equipment design, project execution (work methods, type of equipment to be employed), and operational efficiency in management. Governments and companies involved in these activities have articulated a strong commitment to reducing GHG emissions by offsetting the amount produced with the amount eliminated (net zero).
- The climate change agenda in water transport also includes the ***adaptation*** and formation of resilient networks and services, particularly regarding ports and waterways, and contemplates internal movements linking ports with the hinterland, which requires a comprehensive view of the transport system. The reduction of the flow in the waterways due to extraordinary downspouts in the rivers is surely the main challenge, since it conditions the access and loading of ships, and can also affect the transport of

sediments and erosion, which in both cases usually requires additional dredging efforts or other types of interventions to ensure adequate navigational conditions.

- ***New technologies*** linked to Industry 4.0 are having a major impact on vessels and their operational and commercial management, as well as on the administration of ports and waterways, also affecting interaction between the different players in the sector. The expression "smart shipping" has been coined in the navigation sector to describe the adoption of digital technologies aimed at improving operational efficiency and environmental performance, which can involve many areas: construction materials, design, propulsion, automation, and so on. In ports, as in other segments of the logistic chain, techniques such as remote operations, autonomous systems, or integrated information and communications platforms are being incorporated, making it easier to monitor vessels and cargo, improving warehousing management and customs operations, and speeding up delivery times. As regards dredging, new technologies allow for greater operational efficiency, automating functions, and enabling remote operations, as well as the adoption of dynamic positioning and monitoring systems, leading to improvements in knowledge of the material to be extracted and its management.
- ***Horizontal concentration*** in container shipping, a process whereby the participation of larger operators grows at the expense of smaller ones, is a phenomenon that began several decades ago. However, it has picked up speed recently, affecting the market for regular line services and the port terminals serving them. The combination of larger ships and business concentration leads to a lower frequency of regular services and a reduction in direct port-to-port connections. Large vessels tend to limit their calls to those ports that offer higher cargo volumes and have adequate nautical access and port facilities to serve them. In the case of Buenos Aires, the number of direct services has been significantly reduced. With the arrival of ever larger container ships (19,000 TEU vessels are expected to be assigned to services on the east coast of South America by 2027), there is a risk that this scale will not be attractive to shipping lines, which would have to handle some of the current direct traffic through feeder ships and transshipments in hub ports in other countries. Additionally, there is a trend toward vertical integration in container transport, whereby shipping companies are absorbing a range of logistic functions traditionally provided by other players in the chain, which can undermine competition in the international cargo services market. As regards bulk carriers, the market is competitive and there are only moderate trends toward larger vessels.
- The initial ***impact of COVID-19*** on global shipping activity was less intense than on other transport segments, although given the abrupt recovery in trade, there have been bottlenecks in several segments of the logistic chains resulting in less reliable services and increases in freight rates. While some of the pandemic's impacts are probably transitory, there are others that will be longer lasting. Given the uncertainty generated in supply chains, many firms are reviewing their logistic strategies, shortening their supply chains to reduce risk, and reducing the outsourcing of supplies.

These macro trends will significantly affect the sector and should thus be taken into account when projecting possible scenarios. The competitiveness of Argentina's exports will depend on both the prices of the export offer and their carbon footprint, an area where transport has considerable weight. Customers and final consumers will pay increasing attention to this issue, and other states may use this to establish nontariff barriers. River ports will have to ensure that their nautical and land accesses are adapted to the changes produced by global warming, particularly the droughts affecting the waterways' feeding basins and flooding in the hinterland. In this sense, the adaptation and resilience policies adopted by ports and their accesses will be key to ensuring the operational continuity of supply chains. As things stand, the natural conditions of the Río de la Plata and Lower Paraná estuary are not favorable, and this new scenario will complicate them even more. The reconfiguration of liner service routes and the incorporation of larger container ships on the east coast of South America require special attention since Argentina runs the risk of losing direct connections with relevant markets, which can make freight prices more expensive for exports and imports. The choice of the vessel design to adapt the Trunk Inland Waterway must especially consider this aspect, as well as the new terminal concessions in Puerto Nuevo.

The future demands of ports and waterways depend largely on the direction taken by Argentina's economic policy, and this in turn is based on the performance of cargo logistics and their ability to contribute to export competitiveness. Given the uncertainty inherent to these times of change, there are two possible scenarios of demand to be explored. The first projects moderate growth rates, consistent with those registered in recent years (of the business as usual kind), and the other takes into account the need to increase exports and envisages the ensuing greater demands on ports and waterways.

- The first scenario is the result of a recently prepared study that covers all the country's ports, defining expected growth rates for different types of products

based on a set of case-specific drivers [for example, world and Argentine GDP evolution—aggregate and per capita, United States Department of Agriculture agricultural projections, crude oil production capacity and non-Organization of the Petroleum Exporting Countries (OPEC) production trends, vehicle production forecasts, among others]. Considering an average scenario of continuing current demand trends, an increase of 40 percent in the movements at Argentine ports is estimated over the next two decades (1.7 percent compound annual growth rate), although with pronounced disparities between product groups. The greatest dynamism is expected in the case of containers, liquid agri bulks, and vehicles, but no substantial increases are expected in the production of commodities. The projections for other solid and liquid bulks, vehicles, and other products point to values that are systematically lower than those observed in previous years. One prominent conclusion drawn from this projection is that with containers, the cargo projected on the basis of these criteria does not imply a level of demand liable to saturate current capacity. With solid and liquid agri-bulk cargo, current capacity could meet the demands of future traffic, although it might also reach full occupancy points in some port nodes.

– The second scenario arises from an estimate of export growth needs in the context of a development strategy designed to balance the macroeconomy, considering the possible growth of various export complexes and speculating on the impact this could have on cargo logistics. In this context, agri bulks will continue to play a central role, but the greatest growth will be seen in container movements. Exports would reach annual growth rates in the order of 4 to 5 percent (CAGR) and, presumably, imports would follow a similar pattern. In 2018, the proportion of Argentine exports originating in agribusiness represented approximately 60 percent of the total. In 2030, in this scenario, this would be 50 percent due to the higher growth expected in goods produced by other export complexes. A first reflection linking a demand scenario of these characteristics with the river ports suggests that the current capacity of the agri-bulk and container terminals could be sufficient in the short term but would require considerable expansion later. As for inland waterways, these growth rates highlight the need to make improvements to the Trunk Inland Waterway in the short term.

Challenges Facing the Inland Waterway System

The main objective of the waterway system under analysis is to ensure the conditions guaranteeing the best possible connectivity between Argentina and world markets, favoring market competitiveness, and making domestic navigation easier by helping to develop this mode of transport. The review of the current conditions and performance of the waterways and river ports shows that in general terms they perform adequately and have spare capacity to absorb a higher level of activity. The current demand outlook is highly uncertain, fluctuating between moderate growth, similar to the average rate achieved in recent years, and intense growth accompanying a process of economic recovery. In either scenario, the port system has the capacity to absorb greater cargo volumes: either in the long term (some 20 years) in the first scenario, or in the shorter term in the second scenario (most likely no less than 10 years). This could be the case as long as there are substantial improvements to the dimensions and operability of the Trunk Inland Waterway in the short term, as well as improvements in the operational standards at the AMBA container terminals, adapting them to handle larger vessels.

Given that the tender documents for the concession of the container port terminals of Buenos Aires and the Trunk Inland Waterway are currently being drawn up, this is a good opportunity to develop an integrated strategy for ports and inland waterways that could contemplate two stages. The first stage, which has a more limited scope, would maintain the structure of the current system, introducing some significant improvements to ensure needs can be met over the next 10 to 15 years. The second stage would be the result of strategic planning based on a careful evaluation of future scenarios, which could include, if necessary, certain structural changes to be made to the organization of the system.

This strategy involves a set of actions to be executed in the short term. Considering the characteristics and performance of the inland waterway system, the major global trends likely to condition it in the future, and the possible demand scenarios, the following four issues have been identified as priorities to meet the proposed objectives:

(1) ***The Trunk Inland Waterway must offer channels with adequate depth, width, and waiting and maneuvering areas.*** *The improvements made in recent decades have been essential to accommodate the progressive increase in the country's foreign trade flows without major inconvenience. However, it is time to take the next steps in terms of improving infrastructure and operating conditions: increasing the draft throughout the waterway, creating new crossing sections, making changes in alignment and new anchorage areas, among others. These steps are essential if logistic costs are to be reduced (meaning lower wait times, the possibility of*

larger vessels entering the system, or more efficient ship hold use) and to improve navigation safety conditions. The upcoming concession renewal is an opportunity to evaluate the optimal concession structure. Among the main issues to be analyzed are the determination of the toll structure and its effect on competitiveness, checking the service unit on which tariffs are applied, the type of vessel (for example, container ships, agri-bulk, ro-ro, cruise ships), the way in which distance is measured, and other factors aiming to prevent distortions and cross-subsidies. (The current system of tariffs by net registered tonnage, vessel design draft, and sections traveled does not necessarily represent the proportional effort of dredging and marking.)

(2) ***As for the Port of Buenos Aires, Argentina needs a broader vision that looks beyond the Puerto Nuevo terminals.*** *The way in which the movement of containerized cargo is to be dealt with in the future must be analyzed and defined in detail, considering the many terminals in the area as well as potential new projects. Other factors to be taken into consideration include current restrictions governing nautical access, maneuvering areas, water depths at the foot of the dock, yards, and so on, as well as demand projections and the trends likely to condition activity, particularly the behavior of the line services market. This approach requires decisive leadership on the part of the National Ports Authority, involving all the principal players, and the issue must be handled together with the definition of the Trunk Inland Waterway concession.*

(3) ***The environmental agenda must be at the center of the ports and waterways strategy.*** *The IMO has set a series of increasingly stringent standards in environmental matters (particularly as regards the reduction of GHG), and players in the international trade and transport arena are increasingly committed to clean transport strategies, which will constitute a factor of competitiveness. On the other hand, Argentina has assumed international commitments regarding transport decarbonization that enshrine the potential to mitigate emissions by promoting the domestic river and maritime transport system. Also manifest is the need to implement adaptation measures to mitigate the effects of climate change, with a tendency to reduce the specific vulnerabilities of different infrastructures.*

(4) ***The port system and inland waterways must coordinate their actions with modes of land transport and adapt to the urban environment.*** *A sustainable development strategy for the sector must consider the multiple interactions and frictions inherent to the port-city relationship. These have to do with the role played by the port in the urban area, which in many cases (mainly in large cities such as Buenos Aires and Rosario) tends to be seen more as point of conflict than as a driver of economic activity. In this context, there are also issues related to land transport*

modes, where problems are associated with road and rail access, and the need to rethink the current setup of the transport modal matrix which is heavily biased in favor of the trucking industry.

Lessons Learned

The review of the material collected, and the analysis carried out throughout the report, allows us to highlight—beyond the particular recommendations presented above—a series of general learnings, making up a reference framework to be taken into account when defining the sector's structural issues. These are as follows:

(1) The disadvantages arising from a lack of adequate institutional order

(2) The need for a long-term vision

(3) The need for planning to integrate ports and waterways together (rather than as separate areas)

(4) The relevance of linking ports with the urban environment

(5) The need for decision-making in the public sector to be well founded and based on data, and adequate evaluation and planning instruments

(6) The need to link national planning with regional integration strategies, particularly in the context of the Río de la Plata Basin

(7) The global nature of the shipping agenda

(8) The growing importance of the role played by the environmental agenda in the sector's policies

(9) The need and convenience of achieving coordination between the main players in the navigation system

(10) The potential offered by private sector management in the maritime port sector.

Note

[i] UNCTADstat (database), UNCTAD (United Nations Conference on Trade and Development), Geneva (accessed January 2022), https://unctadstat.unctad.org/EN/Index.html.

1. OBJECTIVES AND ORGANIZATION OF THE REPORT

The Relevance of the Sector

Argentina has an extensive continental territory covering an area of 2.78 million square kilometers, characterized by great geographic diversity, and home to a population of 44.5 million people. Its inhabitants and the main productive areas are concentrated in the provinces located in the center of the country. The main productive activities are agribusiness in the center and north of the country, oil and gas production in Patagonia in the south, and a complex set of industrial activities concentrated in the area lying between La Plata and Rosario, including the Metropolitan Area of Buenos Aires, known as the AMBA (Área Metropolitana de Buenos Aires), along the banks of the Río de la Plata and the Paraná River (Barbero, unpublished).

The country has a reasonably well-developed transportation system the characteristics of which are typical of a middle-income country with a low demographic density. According to available data or estimates, the interurban road and highways network is about 240,000 kilometers, of which about 82,000 kilometers are paved. In addition, there are a further 400,000 kilometers of the tertiary road network. The railway network today covers some 18,000 kilometers, which is far less than its original length, and there are some 100 airports for commercial use, although not all of them are served by regular flights. Finally, there are more than 100 relevant ports for cargo traffic located along an extensive seacoast (about 4,200 kilometers) and along a series of large inland waterways (around 2,800 kilometers).

Cargo logistics in Argentina, seen as a whole, have relatively weak performance. The general panorama is diverse, with logistic components and activity sectors exhibiting an uneven and dissimilar performance (Barbero, unpublished); some activities show high performance levels, such as certain segments of freight transport or certain port terminals, while other sectors are correspondingly weaker, such as border crossings, rural roads, or freight transport security. Most demands can be met as required in a timely fashion, but there is no shortage of aspects to be improved, especially in the institutional framework and sector governance, as well as in logistic development, which is currently insufficient. At the international level, considering the different indicators normally used for this type of comparison,[i] Argentina's general cargo logistics performance ranks relatively low, and in many aspects is progressively declining. However, Argentina is on a par with many countries in the region, although a long way off the performance standards shown by the more developed economies.

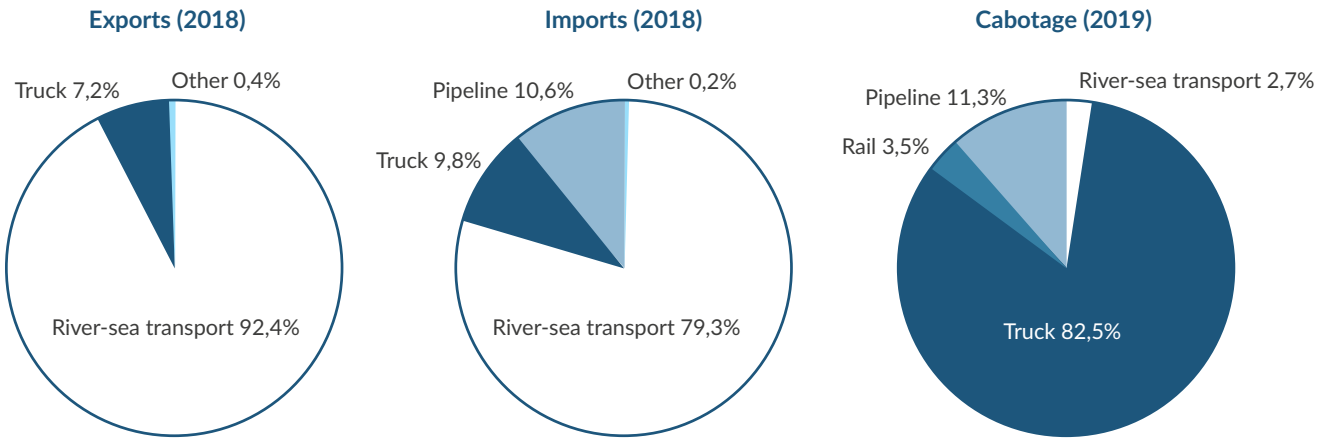
The transport sector, particularly cargo transport, is at a favorable stage in terms of the opportunity to redefine the framework governing its performance today. The expiry of the cargo rail concessions (in 2022-2023), and those of the Buenos Aires port terminals and the Trunk Inland Waterway, have thrust the sector into prominence on the public agenda, as they require institutional decisions that will have a big impact on the design of future configurations. This opportunity is also a challenge since making headway with such a complex agenda demands management capabilities that the state, as it is currently organized, appears to lack.

Waterborne transport plays a central role in the Argentine economy. Although limited in terms of its territorial scope and domestic traffic, its importance is unmistakable. According to cargo origins and destinations, the bulk of foreign trade uses this modality:[ii] it represents 92 percent of the volume of exports and 74 percent of their value, measured in free on board (FOB) prices. As regards imports, these figures are 79 percent and 61 percent—at cost, insurance, and freight (CIF) prices (see **figure 1.1**). Regarding domestic freight (cabotage),[iii] although volumes are comparatively small, somewhat less than 3 percent,[iv] this is traffic of strategic interest given the nature of the products transported (basically, fuels and petrochemicals). These data underscore the key role played by the inland waterways in the Argentine economy and justify the need to carefully monitor their performance. In any case, it should be noted that this mode is generally a link in a multimodal chain, which includes motor and rail transport.

Nautical Connectivity and Economic Competitiveness

Water transport is the main mode of transport for commerce throughout the world. Eighty percent of global trade—and about 90 percent from developing countries—is transported by ship (UNCTAD 2015). Maritime transport is a global system that has been deregulated for several decades since the freight agreements and cargo reservations for flag fleets in force in the mid-twentieth century were dropped. Some services are on demand, required for specific transport (typically the transport of dry and liquid bulks), while others

FIGURE 1.1. Modal Division of Foreign Trade and Cabotage Traffic (in Volume 2018–19)



Source: Own elaboration based on former DNPTCyL (MTR) and Barbero, Sicra, and Millan (unpublished).

are regular services, with established itineraries and routes (typically for container transport). As detailed below, these forms of water transport construe markets that have very different characteristics and behavior patterns.

Maritime transport costs affect the competitiveness of economies and the volume of international trade. The relationships between the volume and nature of international trade and transportation costs have been the subject of numerous studies, which identify the latter as one of the key factors determining trade flows: These flows not only depend on the supply and demand of goods, but also on the possibilities of being able to physically link these markets (Behar and Venables 2013). Traditionally, distance has been considered as a variable that can be measured in various ways and thus the principal factor affecting costs, making interaction easier or correspondingly more difficult. However, more recent studies have recognized the plethora of factors that influence maritime transport costs (Willmsmeier 2014). Identifying these determinants means that public policies can be directed toward mitigating those that limit competitiveness in international trade. The ensuing improvement can constitute a valuable contribution to economic growth.

Market structures and the configuration of the networks have significant influence on maritime transport costs. Empirical analyses have made it possible to recognize the main determinants of maritime transport costs (UNCTAD 2015; Willmsmeier 2014): the position of the country with respect to global navigation networks, the characteristics of its ports (infrastructure and nautical access, terminal productivity, and so on), the structure of the activity (competition, regulation, organization of regular services), the structure of trade (volume and value of cargo to be transported, imbalances, relationship with global flows), and trade facilitation and vessel operating costs. This list makes it possible to identify those aspects upon which countries can act (for example, port and waterway infrastructure and operation, trade facilitation mechanisms) and enables them to recognize others beyond their sphere of influence (for example, their position in global networks, uneven trade flows).

Argentina faces a number of difficulties with respect to these factors due to its geographical position in global navigation networks and the limitations imposed by its waterways regarding access to ports. Argentina is further away from its export markets than several of its main competitors, and its ports are the terminal node for the regular service routes along the east coast of South America (Barbero 2021). The maritime connectivity indicators estimated by UNCTAD show that Argentina is losing out in terms of connectivity, in both relative and absolute terms. Additionally, the country's main ports are located on river courses that restrict the access of large vessels: the agri-bulk export terminals located in the lower reaches of the Paraná River and the container terminals in the ports of Buenos Aires and Dock Sud.

This perspective, whose foundations are analyzed in detail in the following sections, shows that there is significant potential for action to improve Argentina's competitiveness. Waterway improvements, particularly in the so-called Trunk Inland Waterway used by ships to access the main river ports, and improvements in port features and management are key instruments which the country can deploy to improve its trade performance in the coming years. The relevance of national strategies governing ports and

waterways is all the greater when considering (1) the global trends observed in water transport markets, and (2) the need for the country to strengthen its export capabilities, given the external restrictions it has systematically faced.

Objective and Organization of the Report

Given the importance of maritime connectivity for Argentina, in 2020, the World Bank commissioned two studies on its national port system and inland waterways. Complete and updated reports were drawn up on the current situation and outlook for both components of Argentina's river-sea navigation system (AIC, MTBS, and M&L, unpublished; S&A S.A. and RH DHV, unpublished). Given the breadth and complexity of the issues involved, the World Bank subsequently commissioned a document that summarized the results of the diagnoses of the two studies and articulated the strategic guidelines of a public policy. This document was prepared by Alberto Müller and Alberto del Vecchio, professionals who had supervised the drafting of the baseline studies (Müller and Del Vecchio, unpublished). The present work builds on these valuable antecedents, seeking to synthesize the data and analysis contained in the baseline studies, and incorporate them into a summary of the main challenges facing the navigation system.

The objective of this report is to identify the main challenges facing water transport in Argentina, particularly along its river coastline, considering the Trunk Inland Waterway and the ports on the Río de la Plata and Lower Paraná River. To do this, an introduction of the subject in chapter 1 is followed by a general characterization in chapter 2 of the main components of the water transport section being analyzed. This contemplates the network of inland waterways, the port system, and associated navigation services. Chapter 3 analyzes their recent evolution, reviewing the changes that have occurred in the context of their management model and the activity levels registered, and evaluates their performance by comparing key indicators. After reviewing the current conditions given in the previous chapters, chapter 4 focuses on the scenarios projected according to the global trends most likely to influence these conditions, drawing up possible projections of the demands that the water transport system must meet. Based on the results of the previous analyses, chapter 5 aims to identify the main challenges facing the Argentine coastal river navigation system. To this end, we propose objectives and a vision for the development of the transport system, as well as guidelines for action covering the four issues seen as imperative—these are the concession of the Trunk Inland Waterway, the development and management model for the Port of Buenos Aires, the link between these initiatives and the environmental agenda, and the relationships between ports and other modes of transport as well as with the urban environment. Finally, chapter 6 presents a summarized set of lessons learned from the process of preparing the report.

Notes

[i] Such as the World Bank's Logistics Performance Index and the World Economic Forum's Global Competitiveness Index, among others.

[ii] The main export products, measured in volume, are cereals, oilseeds, and their derivatives, which represent more than 80 percent of total tonnage; maritime imports are mostly fuel, minerals, and fertilizers. In terms of monetary value, the top products are capital and consumer goods (mostly containerized) and vehicles.

[iii] In Argentina, the term "cabotage" is used to refer to the transport of goods originating in and bound for ports located in the national territory.

[iv] Although these figures rise to 5.2 percent if the modal matrix is considered based on the distance traveled by cargo, meaning the ton-kilometer (tkm).

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2. CHARACTERIZATION OF THE PORT SYSTEM AND INLAND WATERWAYS

Water transport systems basically consist of three interconnected elements: waterways (river or sea, natural or artificial), ports (and their port terminals), and transport services, which carry out the transfer of cargo and passengers[i] from one port to another. Each of these elements presents different aspects, with particular features and modes of operation, according to the different markets serviced. The main issues characterizing the current situation in Argentina are summarized in this chapter.

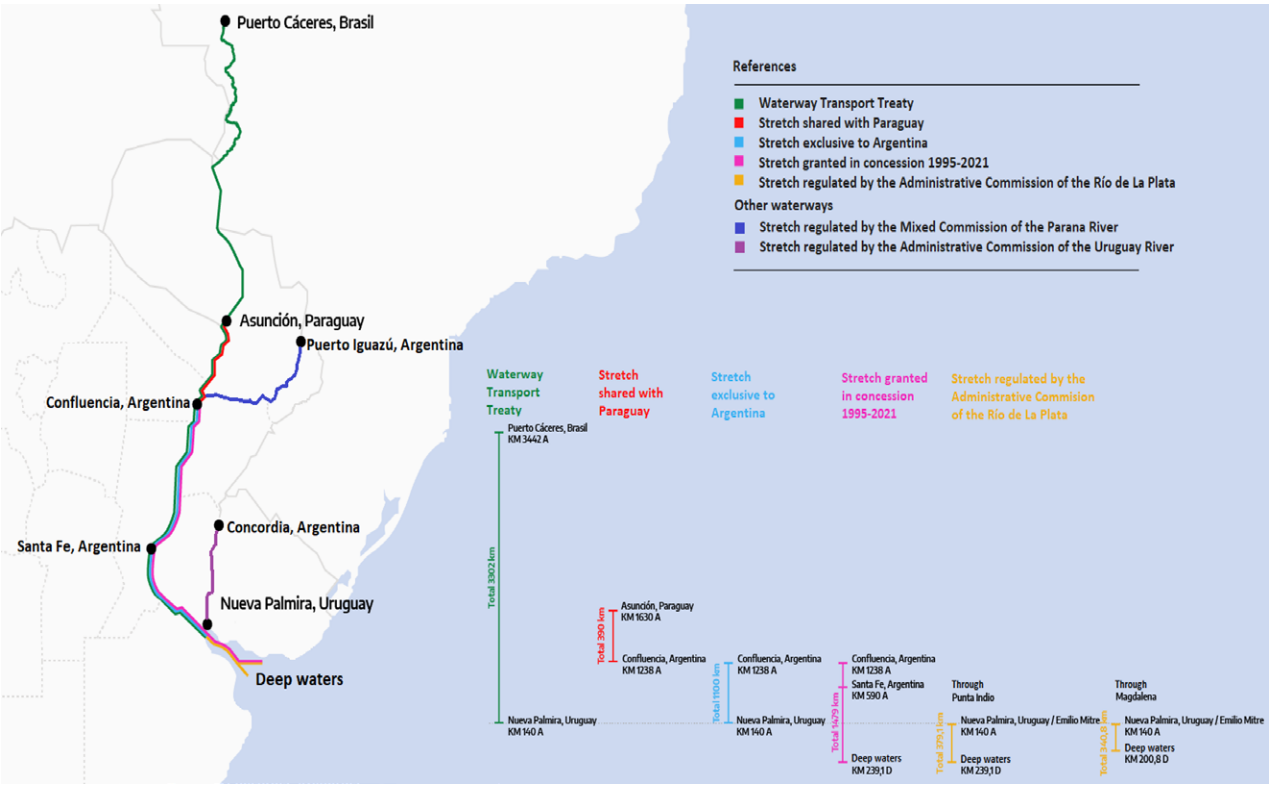
The River Inland Waterway Network

Argentina has a long seacoast and an extensive network of navigable inland waterways. The Atlantic coast along the Argentine Sea is 4,200 kilometers in length (Isla 2006), and the navigable stretches of the rivers making up the Río de la Plata Basin (Paraguay-Paraná-Uruguay-Río de la Plata) measure 2,800 kilometers (S&A S.A. and RH DHV, unpublished). Navigable stretches are to be found on Argentine territory or on land shared with other countries. However, this geography does not always present the best conditions as there are few natural depths throughout most of the system, requiring constant dredging and maintenance work, both along the main navigation routes and in the port access channels (Palomar 2011).

The inland waterway network has been the subject of various improvement initiatives over the years. Of particular note is the Paraguay-Paraná Inland Waterway Program (Programa de la Hidrovía Paraguay-Paraná; HPP) running from Cáceres in Brazil to Nueva Palmira in Uruguay, which was incorporated in 1989 into the Río de la Plata Basin Treaty as a cooperation mechanism between member countries.[ii] The idea was to improve the transport system by working on operational aspects and those related to the improvement or adaptation of the infrastructure (waterway and port terminals). It should be noted that the HPP does not include the Upper Paraná, the Río de la Plata, or the Uruguay River. The second notable initiative was the concession program for the so-called Trunk Inland Waterway from Santa Fe to the Atlantic Ocean—later extended to Confluencia—developed by the Argentine state in 1995. The Trunk Inland Waterway partially overlaps with the HPP, as can be seen in figure 2.1.

The institutional framework is varied, mainly depending on the different jurisdictions involved. Some parts of the inland waterways flow in areas shared with neighboring countries (Paraguay and Uruguay). This is the reason for an extensive array of international treaties and conventions governing the

FIGURE 2.1. HPP, Trunk Inland Waterway, and Other Inland Waterways



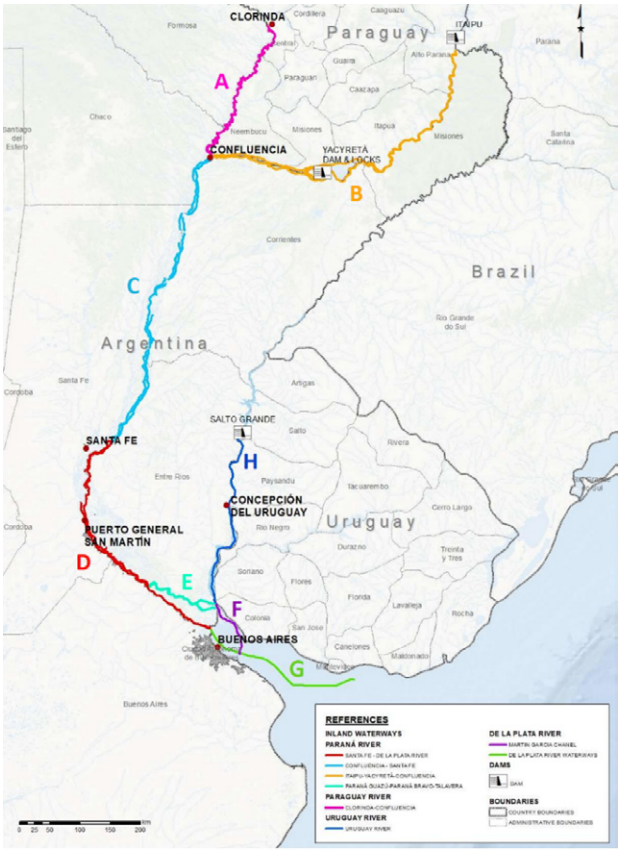
Source: Elaboration based on data from the General Administration of Ports S.E. (Administración General de Puertos; AGP).

Río de la Plata Basin, in particular: the Río de la Plata Protocol (1910); the Uruguay River Treaty (1961); the Navigation Treaty of the Paraná, Paraguay and La Plata rivers, between the Argentine Republic and the Republic of Paraguay (1967); and the Río de la Plata Basin Treaty (1970). Then there are the Agreement of the Mixed Commission of the Paraná River (Comisión Mixta del Rio Paraná; COMIP, 1971); the Treaty of the Río de la Plata—when the Administrative Commission of the Río de la Plata (Comisión Administradora del Río de la Plata; CARP) was formed, in 1973; the Statute of the Uruguay River—when the Administrative Commission of the Uruguay River (Comisión Administradora del Río Uruguay; CARU) was founded, in 1976; and the River Transport Agreement for the Paraguay-Paraná Waterway (1994).

At the national level, the recent creation of different organizations with influence on inland waterways is worth noting. The Federal Waterway Council (Consejo Federal Hidrovía; CFH), created in 2020, is a space for political and strategic coordination, involving the signatories to the Federal Waterway Agreement as permanent members.[iii] The CFH's objectives include advising on all matters related to the HPP concession. In 2021, the National Entity for the Control and Management of the Waterway was created,[iv] an autarchic body under the purview of the Ministry of Transport, with a similar makeup to the CFH. In general terms, its objective is to oversee the follow-up and control of the services provided in the Trunk Inland Waterway.

Each sector of the network displays different technical characteristics. The river sector can be entered from the Atlantic Ocean through different artificial channels and canals along the Río de la Plata, such as Punta Indio, Intermedio, Acceso, Emilio Mitre, and/or Martín García, permitting navigation with drafts of up to 34 feet. These conditions are maintained up to Puerto San Martín, through the so-called Lower Paraná.[v] The Middle Paraná begins upstream, with maximum draft depths of 25 feet until Santa Fe, and of 10 feet from there to Confluencia. Then, continuing both along the Paraguay River and the Upper Paraná, it is possible to navigate with drafts of 10 feet, although along the reaches of the Upper Paraná this is highly restricted by the Yacyretá and the Itaipu Dams. Lastly, the Uruguay River is navigable up to the Salto Grande area, with a draft of 23 feet until Concepción and 17 feet from there to Paysandu. Figure 2.2 and table 2.1 include a classification of the network in different sections, with some main features.

FIGURE 2.2. Inland Waterways—Sections



Source: Elaboration based on S&A S.A. and RH DHV (unpublished).

TABLE 2.1. Inland Waterways—Sections and Main Features

	Stretch	Dredging/ Navigable Draft	Nautical Signage	Jurisdiction/ Administrative Entity
A	Paraguay River from Clorinda to Confluencia	Sporadic/10 ft.	No	Binational/-
B	Paraná River from the mouth of the Iguazu River to Confluencia	Sporadic/10 ft.	No	Binational/COMIP (AR/PY)
C	Paraná River from Confluencia to Santa Fe	Yes /10 ft.	Yes	National/SSPVNyMM (AR)
D	Paraná River from Santa Fe to the Río de la Plata estuary	Yes/25 ft. to Timbúes, then 34	Yes	National/SSPVNyMM (AR)
E	Delta Paraná River, including the Paraná Bravo, Paraná Guazu, and the Talavera branches	No/30–32 ft.	Yes	National/SSPVNyMM (AR)
F	Martín García Canal	Yes/34 ft.	Yes	Binational/CARP (AR/UY)
G	Inland waterways of the Río de la Plata	Yes/34 ft.	Yes	Binational/SSPVNyMM (AR)
H	Uruguay River from the Río de la Plata estuary to the Salto Grande Dam	Yes/23 ft. to Concepción and 17 ft. to Paysandú	Yes	Binational/CARU (AR/UY)

Source: Elaboration based on S&A S.A. and RH DHV (unpublished).

Beyond design draft, navigation conditions are affected by variations in river water levels. Since the second half of 2019, mostly due to a severe drought in the south of Brazil, there has been an unusually marked drop in the water levels of the Paraná River, of a duration and features surpassing values recorded over the last decades. Low water levels produce various environmental and socioeconomic impacts, such as those affecting the supply of water for human consumption, energy generation, and that which is needed to raise and feed animals, among many others. At the level of the navigation system, this implies additional dredging efforts and cargo load limitations for vessels using the Trunk Inland Waterway, leading to higher logistic costs.

The different features of these waterways translate into two forms of navigation. On the one hand, there is river and seagoing or oceangoing navigation, where the rivers act as an estuary allowing access to oceangoing vessels, and on the other hand, navigation purely along inland waterways, where goods are transported between the different ports in the basin, mainly on barge convoys. Each modality has different requirements regarding depth, channel width, and marking, among other aspects. The lower sections of the Paraná and Uruguay Rivers permit both kinds of activity, enabling cargo transshipments. This is not the case on the Río de la Plata, as inland pusher craft cannot navigate on open waters (Barbero 2021).

The width of the channels is another factor that places significant limitations on navigation. In general, this is a one-way channel, requiring traffic controls and the implementation of transit zones. Other aspects, such as those related to geometry (bends in the river), also have an impact, albeit a lesser one. Table 2.2 details the incidence of these restrictions in each of the sections of the Trunk Inland Waterway between Rosario and the Atlantic Ocean. These are quite significant in the channels in the Río de la Plata, which should not be surprising given that this waterway requires the most dredging due to its reduced natural depth. This makes opening the channel particularly expensive, so making a channel floor allowing for the two-way circulation of large vessels would imply an extremely high investment. Upstream, the network splits, and each branch is used predominantly in one direction only. Hence, the restrictions in the Paraná de las Palmas River have less incidence as this is the section that functions as the circulatory pair to the Martín García Canal - BGT (channel system of the Paraná Bravo, Paraná Guazu, and Talavera).

River traffic is regulated by the Argentine Coastguard (Prefectura Naval Argentina; PNA). This body is a police force and mainly handles security issues; but its functions also extend to traffic administration, organizing ship movements, and ordering waiting in detention areas or enabling navigation.[vi] This function is particularly important in those stretches where ships cannot cross in both directions due to the aforementioned restrictions on the floor of the navigation channel. Ship captains are free to choose their route when there are alternatives, so for this reason, ships bound upstream for ports north of San Pedro normally use the Martín García Canal and the Paraná Bravo-Guazu-Talavera branches (sections F, E, and D on figure 2.2). Those going in the opposite direction take the Paraná de las Palmas and Emilio Mitre Canal (section D only).

TABLE 2.2. Trunk Inland Waterway between Rosario and the Atlantic Ocean–Restrictions on Navigation

Sector	Stretch	Type of Restriction	Total Extension (km)	Restriction (km)	% Restriction
Lower Paraná		Speed	281	32.1	11.4%
Via Paraná de las Palmas	Paraná de las Palmas	Crossing	131	45	34.4%
	Mitre Canal-Access Canal	Crossing	61	25	41.0%
Via Martín García-BGT	Bravo	Crossing	96	13	13.5%
	Talavera	Crossing	36	10	27.8%
	Martín García	Crossing	106.5	61.7	57.9%
Intermediate Canal		Crossing	84	18	21.4%
Punta Indio		Crossing	118	42.1	35.7%
		Total	***913.5***	***246.9***	***27%***

Source: Elaboration based on S&A S.A. and RH DHV (unpublished) and complementary information.

Note: Speed restrictions refer to operating maneuvering speed. Crossing restrictions refer to the possibility of crossing or overtaking.

The Port System

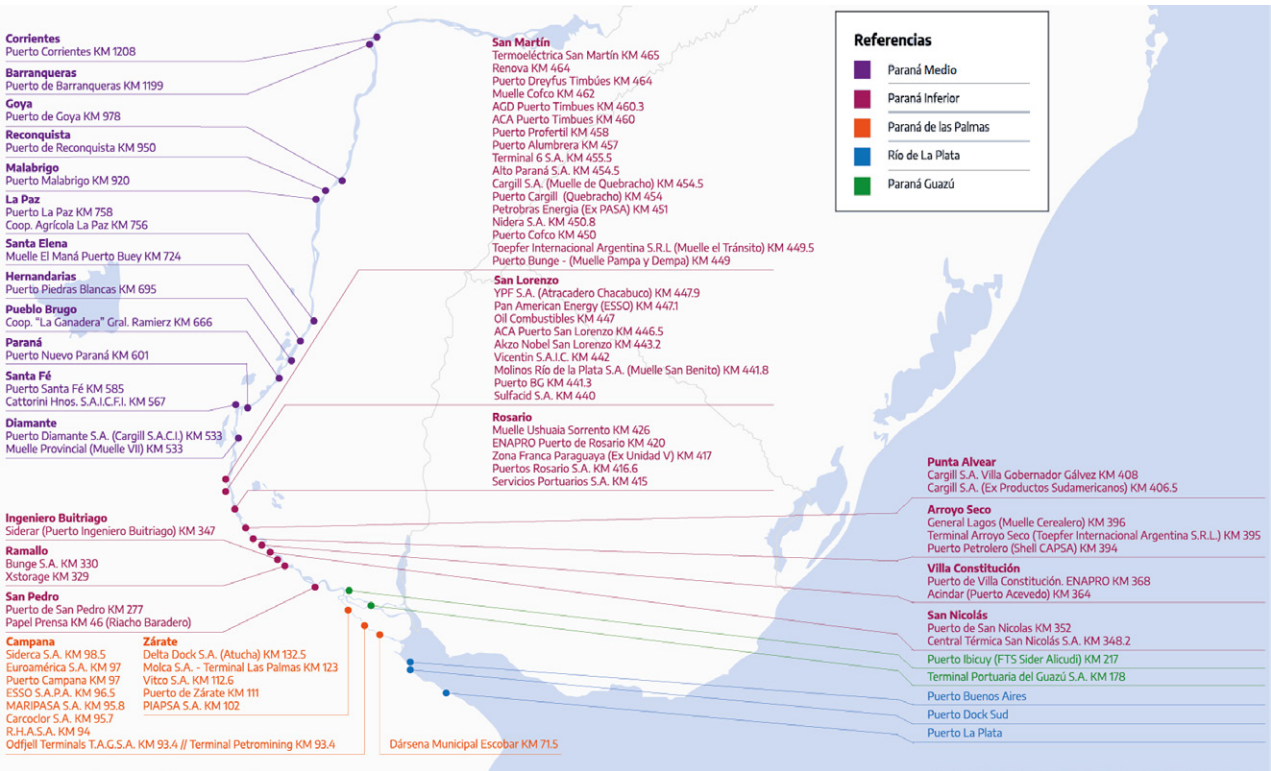
One hundred port units handle 185 million tons of cargo annually throughout Argentina.[vii] These port units can be found in both river and seacoast areas, but mostly the former. Beyond the numbers involved, the market shows some concentration as 80 percent of containerized cargo is served by two ports on the Río de la Plata, while no more than a dozen terminals deal with more than half the amount of non-containerized cargo (García 2019). There are five distinctive port sectors in terms of the kind of navigation, each with very different characteristics (see figure 2.3):

(1) The ports north of Santa Fe lying on the Middle and Upper Paraná and Paraguay Rivers mainly handle barge convoys and to a lesser extent river vessels. The volume of cargo handled at these ports is not as significant as in other regions (1.3 million tons). Also, there are few ports in operation. A total of 13 port units have been identified, generally public, with very old facilities. The possible domestic freight cargo between the ports in this sector and Argentine ports serving oceangoing vessels does not take place by river. There are many reasons for this situation, including the poor condition of port infrastructure and current legislation requiring the use of the national flag fleet, as this fleet is almost nonexistent.[viii]

FIGURE 2.3. Ports in the Argentine Port System, by Area

Source: *World Bank.*

FIGURE 2.4. Ports and Terminals Located on the Confluencia-Ocean Trunk Inland Waterway



Source: *General Administration of Ports (Administración General de Puertos; AGP).*

(2) The 59 ports on the Santa Fe-Ocean Trunk Inland Waterway annually operate over 130 million tons of cargo. Most of Argentina's grain and container cargo is handled by ports located in this region. Although they also serve river cabotage vessels and barge trains, the vessels for which the port infrastructure is designed are usually oceangoing Handysize, Panamax and Post-Panamax vessels. Within this set of ports, there are three distinct groups, depending on the type of cargo they specialize in: those for containerized cargo and vehicles, in the Metropolitan Area of Buenos Aires (AMBA), La Plata and Zarate; industrial cargo, fuels and chemical products, in the riverside cities of Parana de las Palmas and Lower Parana (Escobar, Campana, Zarate, San Nicolas, San Lorenzo and Villa Constitucion); and grains and byproducts, which make up most of the Trunk Inland Waterway's tonnage, located mainly in the so-called ROSAFE complex (Rosario-Santa Fe), specifically between the ports of Villa Constitucion and Timbues (see figure 2.4).

(3) The only important port on the Uruguay River is Concepción del Uruguay. Located in the province of Entre Ríos, the volume of cargo handled by this port is less than 0.5 million tons per year, mostly fuels, which represent more than 50 percent of the total. However, the port has considerable idle capacity (a load factor of 16 percent).

(4) Despite having only four ports, the coastal region of the province of Buenos Aires accounts for major cargo and vessel movements. Traffic in this area represents 16 percent of the country's total, mostly in the ports of Bahía Blanca, Quequén, and Rosales, whereas the port of Mar del Plata has little activity, except for fishing. These are specialized ports which handle a total of 30 million tons per year, mostly fuels, agri bulks, fertilizers, and to a lesser extent, containers. All the ports have access channels which are maintained by the local port authorities, some of which are considerably deeper than the country's inland waterways (45 feet in Quequén and Bahía Blanca).

The Bahía Blanca and Quequén ports also allow bulk carriers coming from the Trunk Inland Waterway to complete their cargo. The operational draft of these vessels is restricted by the depth of the waterway along the Paraná River and the Río de la Plata, meaning that Panamax-type or larger vessels cannot navigate them with a full hold. Thus, it is common practice to complete capacity at these two Argentine ports, or at Brazilian ports. Nearly 30 percent of the vessels exiting the Trunk Inland Waterway do so (see table 2.3), but this proportion grows considerably in the case of vessels with a greater draft (specifically, the Panamax/Kamsarmax and Post-Panamax). This restriction affects slightly under two-thirds of the vessels, as 38 percent of these (in the period from 2015 to 2019) were Handy-type configurations, with design drafts suited to the draft depth of the channel.

(5) The ports along the Patagonian seacoast present low density and are highly specialized. There are few terminals (12 port nodes) and population density is low in these provinces (Río Negro, Chubut, Santa Cruz, and Tierra del Fuego). According to records, some 19 million tons are moved, and the most significant flows are for cabotage traffic, primarily liquid bulks (hydrocarbons, about 75 percent of total tonnage); but there is also movement of other goods, such as fruit and industrial products. The main ports—actually, offshore loading buoys—are Caleta Córdova and Caleta Olivia.

TABLE 2.3. Destination of Bulk Carriers Originating in the Trunk Inland Waterway, According to Type and Draft (2015–19)

Typology (Bulk Carrier)	Average Draft (ft.)	Cases	Bound for Quequén-Bahía Blanca	Destination Brazil	Other Destinations
Small Handy	26.6	160	1.9%	15.6%	82.5%
Large Handy	30.2	2,705	1.8%	15.9%	82.2%
Handymax	33.5	323	0.3%	4.6%	95.0%
Supramax/Ultramax	37.4	2,392	6.6%	4.8%	88.7%
Panamax/Kamsarmax	42.0	2,443	43.5%	12.2%	44.4%
Post-Panamax	46.9	328	26.8%	31.4%	41.8%
	Total	***8,351***	***16.3%***	***11.8%***	***71.9%***

Source: Elaboration based on information from the Argentine Coastguard.

State management of port activity regulation tends to be the remit of provincial governments. In many cases, this has led to public port spaces conceded to the private sector. Only the Port of Buenos Aires remains under the ambit of the Argentine government, through the General Administration of Ports (Administración General de Puertos; AGP), which has also granted the concession for container traffic operations to the private sector. On the other hand, there is a wide range of port facilities that have been developed exclusively thanks to private initiative.

However, the sector lacks a strategic benchmark for its long-term development. This is a task that should be carried out by the Argentine government, through the Undersecretariat of Ports, Navigable Waterways and Merchant Navy (Subsecretaría de Puertos, Vías Navegables y Marina Mercante; SSPVNyMM) of the Ministry of Transport of the Argentine Republic and be developed within the framework of the Federal Port Council.[ix] In this regard, guidelines should be established for those segments of activity where there are interdependencies affecting port units in different jurisdictions. Perhaps the most visible example is associated with the future of Puerto Nuevo, the Port of Buenos Aires,[x] whose definition will have a major impact on the rest of the ports in the region.

The institutional nature of the port system presents a degree of diversity in terms of the involvement of public and private sector players. Three institutional modalities can be distinguished as regards ownership and responsibility for port operations: private ports, public ports operated by private companies, and public ports. Of the 112 operators surveyed, 14 correspond to federal and provincial state administrations, 61 involve some form of concession to the private sector, and 37 are totally private enterprises. Table 2.4 breaks this down by province and port unit, indicating in the case of private operators whether these are concessions or autonomous ventures.

Ports with several terminals and a variety of different operators have entities that exercise coordination functions. In some cases, these are state-owned, such as the Rosario Port Administration authority or the AGP in the Port of Buenos Aires. Public-private management consortia have been formed at other units, as is the case with the ports in the province of Buenos Aires: Bahía Blanca, Coronel Rosales, Dock Sud, La Plata, Mar del Plata, Quequén, San Nicolás, and San Pedro. The experience has in general been judged to be positive, insofar as it ensures the presence of all those interested in the decisions referring to the port unit (AIC, MTBS, and M&L, unpublished).

At the regulatory level, port operations mostly fall under the general commercial regulatory framework. This means that there is no regulatory framework governing public service obligations, and ports are free to set rates. In the case of units previously operated by the former National Grain Board (Junta Nacional de Granos), the terms of the concessions establish that the benefits must respond to public service principles, but this condition has little impact in practice. For their part, ports managed directly by provincial government entities are obliged to provide nondiscriminatory services, while their rates are set by the respective provincial authorities. A total of 33 private port units exclusively operate their own traffic, falling under the modality of "industrial ports."[xi] These are mostly units reserved for the transport of oil derivatives, as well as minerals, chemicals, and fertilizers.

Most of the port system operates under conditions of financial sustainability. This is specifically the case with terminals that make up logistic and commercial chains, where the port business is a link in a broader network. This includes ports that are industrial, properly speaking, and those serving own and third-party traffic, typically in the case of grains and byproducts. Regarding the latter, it should be noted that of the 29 terminals involved, more than 80 percent belong to—or are counted as a concession of—grain industrialization and trading companies, which are mostly international.[xii] For their part, the main dedicated container services terminals are also operated by international companies. As for state ports, these are mostly units with little movement and usually tend to require financial assistance.

This appreciation in terms of financial sustainability does not mean that eventual bankruptcies, mergers, or acquisitions cannot take place. This has in fact happened with many of the container terminals at the Port of Buenos Aires and Dock Sud: of the five operators originally awarded the concessions, only three remain today.

Navigation Services

Water transport in Argentina is mainly linked to the country's foreign trade, with domestic freight navigation in second place. Much of the domestic freight corresponds to river-sea links, between the inland waterways and the seacoast. This means that most of the vessels of interest to Argentina are oceangoing vessels, followed at a distant second place by river vessels, mainly barge convoys. To this must be added river navigation to and from Paraguay, and to a lesser

TABLE 2.4. Institutional Modalities by Port Area

Province	Zone	Port Authority	State Operator	Private Operator under Concession	Autonomous Private Operator
Buenos Aires	Bahía Blanca	Management Consortium	-	9	-
	Campana	n/r	-	8	-
	Dock Sud	Management Consortium	-	10	-
	Escobar	n/r	-	1	-
	La Plata	Management Consortium	-	5	-
	Mar del Plata	Regional port consortium	-	1	-
	Quequén	Management consortium	-	3	-
	Ramallo	n/r	-	-	2
	San Nicolás	Management Consortium	-	1	-
	San Nicolás	n/r	-	-	-
	San Pedro	Management Consortium	-	2	-
	Zarate	n/r	-	-	4
CABA	Buenos Aires	AGP S.E. (Nation)	1	4	-
Chaco	Barranqueras-Vilelas	Non-State Public Entity - Port Administration of Puerto Barranqueras	1	5	-
Chubut	C. Rivadavia	Non-State Public Entity - Port Administration of the Port of C. Rivadavia	-	2	-
	Madryn	Non-State Public Entity - Puerto Madryn Port Administration	1	-	-
Corrientes	Corrientes	Ministry of Public Works and Services - Ports Directorate	-	1	-
Entre Rios	C. of Uruguay	Non-State Public Entity - Concepción del Uruguay Autonomous Entity	1	-	-
	Diamante	Non-State Public Entity - Diamante Autonomous Entity	1	1	-
	Ibicuy	Non-State Public Entity - Ibicuy Autonomous Entity	1	-	-
Formosa	Formosa	Dirección Provincial de Puertos (Provincial Ports Directorate)	1	-	-
Misiones	Posadas	Port Administration of Posadas and Santa Ana	1	-	-
Río Negro	S. Antonio Este	Regulatory Entity of the Port of S. Antonio Este	-	1	-
	Sierra Grande	n/r	-	-	1
Santa Cruz	Caleta Olivia	Santa Cruz Ports Execution Unit	1	1	-
	Puerto Deseado	Santa Cruz Ports Execution Unit	1	-	-
	Santa Cruz Port	Santa Cruz Ports Execution Unit	1	-	-
	Rio Gallegos	Santa Cruz Ports Execution Unit	1	-	-
Santa Fe	Arroyo Seco	n/r	-	-	5
	Rosario	Non-State Public Entity - Administrative Entity of the Port of Rosario	-	2	-
	San Lorenzo	n/r	-	-	22
	Santa Fe	Ente Administrador Puerto de Santa Fe (Port of Santa Fe Administrative Body)	1	2	-
	Villa Constitucion	Ente Administrador Puerto de Villa Constitucion (Port of Villa Constitucion Administrative Body)	-	2	-
	Villa Constitucion	n/r	-	-	1
Tierra del Fuego	Ushuaia	Dirección Provincial de Puertos (Provincial Ports Directorate)	1	-	-
	Cruz del Sur	n/r	-	-	1
	Rio Cullen	n/r	-	-	1
		Total	***14***	***61***	***37***

Source: Elaboration based on AIC, MTBS, and M&L (unpublished).

extent, Bolivia and Brazil. River traffic typically travels to both Argentine ports (mostly in the San Lorenzo area) and Uruguayan ports (Nueva Palmira and Montevideo).

Domestic freight is reserved for national flag vessels. The river and maritime transport service in Argentina are covered mostly by Decree Law 19,492 of 1944, which establishes that navigation, communication, and national cabotage trade may only be carried out by vessels flying the Argentine flag. When national flag vessels are unavailable, the same regulation contemplates the possibility of an exception to this requirement, in which case a foreign flag vessel may be requisitioned. Additionally, Decree 1010/2004 grants the treatment of national flag to ships and naval craft under a foreign flag bareboat charter (see box 2.1). In other words, it allows local shipowners to enjoy the cargo reserve established by the law, as long as certain requirements are met.

BOX 2.1. Modalities of Water Transport Services

The supply of water transport services, given its broad application for any type of merchandise, commercially offers two types of vessel operation: regular line services and charter services.

- Regular line transport, otherwise known as a "liner," provides services of a permanent nature, specific traffic covering regular routes and frequencies. This is the most common form used to transport containerized cargo. Within this typology, there are trunk services that are normally of intercontinental scope and where efforts are made to minimize the number of stops, and feeder services that operate on a regional scale, connecting ports served by trunk services as well as other smaller ports.
- Charter or "tramp" services do not have a predetermined route, itinerary, or frequency, but are carried out by contracting hold space on a ship, totally or partially, for a certain time or trip. This is quite common for transporting liquid and solid bulks. There are different types of charters: for one-off trips, known as "trip charter," for specific periods of time ("time charter"), or a "bareboat charter,"[a] where control of the vessel, including the right to appoint a captain and crew, is given over to the user.

[a] *Contractual modality defined by UNCTAD (1986).*

Source: Elaboration based on Garcia (2019).

Additionally, Argentina has established a series of bilateral cargo transport agreements. These include the Agreement on Maritime Transport between the Argentine Republic and the Federative Republic of Brazil (1985),[xiii] which originally established the obligation to handle bilateral foreign trade traffic using national flag vessels of one of the two countries, with an equal share in all freight generated. However, Brazil decided not to renew the agreement,[xiv] and it expired on February 5, 2022.

Argentina does not have a developed and competitive merchant navy capable of meeting the demand for cargo transport services. To a large extent, this is because of the differences between the legal, fiscal, and labor regimes prevalent in different countries (for example, Paraguay and Bolivia), which translate into a higher relative cost for the Argentine case, something that can be verified beyond the existence of specific regulations and agreements seeking to reserve cargo for national bidders. The offer of national flag vessels—or foreign vessels with national-flag treatment—is basically reduced to fuel and sand traffic. In this sense, the loss of reserves in bilateral traffic with Brazil is a strong additional blow to this industry.

Most container carrier movement involves international vessels. However, there has been a gradual reduction in direct services—from 27 to 8—over the last decade, and there are ocean areas which are no longer covered (Borrelli and Sánchez 2021). These services are provided by large multinational companies and their availability depends on the contracts entered between the port terminals and the shipping companies. Only a modest proportion of current flows is made up of feeder vessels. In accordance with S&A S.A. and RH DHV (unpublished) based on information provided by the PNA, feeder traffic, for the period 2015 to 2019, represented 16.5 percent of the total departures from the Santa Fe-Ocean Trunk Inland Waterway, mainly bound for the ports of Brazil (two-thirds of the total).[xv] The larger number of feeder vessels seems to suggest that part of their movement corresponds to trade between Argentina and Brazil, meaning that it is not necessarily linked to supplying international lines. Lastly, it is not surprising that the presence of these vessels looms over all others in operations at the ports of Rosario and Zarate (more than 90 percent), indicating that larger ships are limited to operating in the ports of Buenos Aires and Dock Sud. It should be mentioned that the share of the tonnage transported by these feeder vessels is relatively smaller since their net register tonnage (NRT) is much lower.[xvi]

Solid and liquid bulk transport services predominantly use the charter modality. The contractual relationship is established between shipping companies/maritime agencies and cargo providers who "charter" out vessels per trip or for a determined period of time. These services are also offered by foreign companies and, in a few cases, by national shipowners, who mostly availed themselves of Decree 1010/2004 (García 2019). Barge traffic transfers at some of the terminals on the Paraná River or in Uruguay mostly take place with vessels flying a foreign flag (for example, Paraguay and Bolivia).

Notes

[i] This segment of activity is not considered in this report.

[ii] Argentina, Bolivia, Brazil, Paraguay, and Uruguay.

[iii] These include the Ministries of Transport, Interior, and Productive Development, and the provinces bordering the Paraná and the Paraguay Rivers (Buenos Aires, Corrientes, Chaco, Entre Rios, Formosa, Misiones, and Santa Fe). Also invited are members of nongovernmental organizations, trade unions, public entities, and academic institutions (MTR Resolution 307/2020).

[iv] Decree of Necessity and Urgency (DNU) No. 556/21.

[v] The alternative route from the Martín García Canal through the Paraná Bravo, Paraná Guazú, and Talavera (BGT) allows for navigation with drafts of 30-32 feet.

[vi] These duties are discharged through the Traffic and Security Control System (Sistema de Control de Tráfico y Seguridad; CONTRASE).

[vii] The tonnages mentioned in this section correspond to the average from 2014 to 2020, based on data from Puertos, Vías Navegables y Marina Mercante, Ministerio de Transporte, Argentina's web page, "Estadísticas de carga" [Cargo Statistics], accessed on January 2022 at https://www.argentina.gob.ar/puertos-vias-navegables-y-marina-mercante/estadisticas-de-carga. For further details, see section on activity level in chapter 3.

[viii] See section on navigation services in chapter 2.

[ix] Created in 2016, with the general objective of "enhancing advice, research and coordination based on the formulation of public policies aimed at the harmonization of interests and coordinated and sustainable development of the port sector throughout the country" (Resolution MTR 99 /2016). It is an advisory body made up of the National Port Authority, the provincial authorities, and the Autonomous City of Buenos Aires with competence in port matters, as well as representatives of the Argentine Port Council and the Chamber of Private and Commercial Ports.

[x] This issue is covered in the section on the Port of Buenos Aires in chapter 5.

[xi] These are "those that operate exclusively with specific cargo from industrial, extractive or capture processes, and there must be an operational integration between industry's main activity and the port." They are different from recreational and commercial ports, as the latter are intended to provide services to ships and cargo, and charge for the provision of these services (Law 24,093).

[xii] This is similar to what happens in the rest of the world, as established by UNCTAD (2017): "Bulk and tank terminals are mainly controlled by commodity trading organizations, which tend to control their own supply chain and logistics network. In addition to owning a quarry or mine and operating a terminal and inland transport services, some bulk operators are also investing in ships to carry their cargo into the respective markets."

[xiii] Law No. 23,557 of 1988.

[xiv] Decree No. 10,786, of September 6, 2021 (Official Union Gazette).

[xv] In accordance with Borrelli and Sánchez (2021), 8 percent of the cargo leaving the ports of the Río de la Plata with an extra-regional destination interconnect with the hub ports in Brazil.

[xvi] The Net Registered Tonnage (NRT) of international vessels is on average 4.6 times higher than that of feeder vessels, which reflects their substantially higher load capacity. However, this variable cannot be used directly as an indicator of the cargo handled since international ships enter the Río de la Plata with low cargo levels due to draft restrictions and because they are at the end of their respective lines.

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3. EVOLUTION AND PERFORMANCE

The different components of Argentina's water transport system have undergone important transformations in recent decades, which have accompanied—or even led to—the substantial changes in the country's productive structure and the characteristics of the cargo transported. The following subsections seek to explain this process, first by commenting on the management models of the inland waterways and the ports system, based on the reforms that took place in the 1990s. This commentary is used as a basis to present the evolution of activity levels, explaining some of the more salient features, and to analyze the system's performance using different indicators that allow for international comparison.

Management Model

During the 1990s, a series of reforms were implemented that transformed the development of the transport system in Argentina. Generally included among the guiding principles of deregulation and privatization, the main actions include, by way of example (IT-ANI 2015): the dissolution of the National Grain Board and the privatization of its functions as the main player handling grain and byproducts storage and shipping; the division and concession of the Argentine railway network; the repeal of the regulations governing cargo reservations for truckers, indicative rates, hiring shifts, and so on; and the concession of the trunk road networks. With regard specifically to the water transport sector, the following actions stand out: the adoption of deregulation measures for cabotage river transport (provisions, origin of craft, and so on); the concession of the Trunk Inland Waterway required to comply with deepening and marking programs; and the adoption of the Port Activities Law, enabling the concession and management of large public ports to be handled at the provincial level, decentralizing the entire network as well as validating and expanding the phenomenon of privately run ports.

Inland waterways

The Trunk Inland Waterway has been granted in concession with a toll payment system covering those sections most used by commercial shipping. The most important stretch runs from the mouth of the Río de la Plata to the confluence of the Paraná and Paraguay Rivers, covering the length of the Río de la Plata, Paraná de las Palmas/Paraná Guazú, and Paraná Rivers in their lower and middle reaches. The Hidrovía S.A. consortium was granted the concession for the Santa Fe-Ocean section in 1995, taking charge of the dredging and maintenance of the 32-foot draft navigable channel (25 feet in the Timbúes-Santa Fe section) and its marking. The initial concession was for a term of 10 years and included the payment of a subsidy of US$40 million per year. In 2004, the concession was renegotiated and the subsidy abolished. The new contract also set a navigation draft depth of 34 feet (with a 2-foot margin) in the Ocean-Timbúes stretch and added the Santa Fe-Confluencia stretch. However, for the latter, only marking tasks were assigned, and no toll collection system was implemented. The renegotiation of the concession extended the term by an additional 15 years, to which another two years were later added, on a temporary basis. In 2021, it was decided to terminate the concession and hold a new call for tenders. Meanwhile, the maintenance of navigation conditions (draft and markings) is being carried out by the AGP.

A second section operated under a toll concession regime is the Martin García Canal. The grantor in this case is the Administrative Commission of the Río de la Plata (Comisión Administradora del Río de la Plata; CARP), a binational entity. The Royal Boskalis-DEME consortium is the concessionaire, having started its activity in 2018, for a period of five years.

The rest of the waterway is not operated under concession and is subject to sporadic interventions. As these are binational sections, these interventions are the responsibility of the governments of Argentina and Paraguay, although there tend to be more actions carried out by Paraguay, as the main party interested in preserving navigation conditions.

The amount of the toll depends on the route and vessel characteristics. In the Confluencia-Ocean concession, the dredging toll applied in the Santa Fe-Ocean stretch is related to the number of sections through which the craft has passed (six in total), the NRT of the ship, and the design draft, compared with the draft permitted by the waterway. To this must be added the marking toll, which depends exclusively on the NRT. In the case of the Martin García Canal, charging criteria are similar, but reduced to a single section. It should be noted that the value of the amount charged is different for international transport as opposed to domestic freight, a condition stipulated following the devaluation of the Argentine peso in 2002 that led to the pesification of rates for domestic traffic.[i] The total amount collected by the concessionaire, Hidrovía S.A., in recent years was to the order of US$200 million per year (S&A S.A. and RH DHV, unpublished). For a total circulating tonnage of 136 million

tons (2017), the toll translates into US$1.5 per ton, which is a relatively low rate, even in the case of bulk of low value per ton transported.

The contractual conditions of both concessions differ with regard to the risk assumed. The concession awarded to Hidrovía S.A. was at its own risk as regards income and the actual conditions of the watercourses. The concession of the Martin García Canal entails a degree of risk for the concessionaire in relation to the condition of the watercourse, although not in terms of income (demand risk). In this case, the Administrative Commission collects the toll and pays for the concessionaire's services once compliance with the stipulated navigation conditions has been established. The collection of the toll, in both cases, is made on the basis of the record of the craft's passage by the Argentine Coastguard, as operators do not use their own structure for collection.

The institutional performance of the concession of the Confluencia-Ocean waterway has revealed some deficiencies. Although the creation of a control body was planned, this never happened during the 25-year duration of the contract.[ii] This led to the dispersion of information about the operation, particularly traffic and any incidents liable to reveal the existence of failures to comply with the established navigation conditions. The intervention of the Argentine Coastguard ensured that there was no evasion or avoidance in toll collection, but the absence of a control instance meant that information was not properly processed, thus making any form of performance analysis unfeasible. This also meant that there was no transparent instance in place to settle responsibilities in the case of incidents (for example, to determine if grounding was attributable to poor signaling, excessive ship draft, or an improper maneuver). Any possible conflicts—of which there is little record—were thus settled in the private sphere. On the other hand, the concessionaire periodically sent the granting body of the state reports about the state of the watercourse, but it is not known whether these reports were ever analyzed and systematized. Thus, there was a degree of informational asymmetry between the grantor and the concessionaire.

In any case, the concession of the Trunk Inland Waterway has shown sustainability. The level of conflict between the concessionaire and users seems to have been low; the opinion contained in S&A S.A. and RH DHV (unpublished) is one of general satisfaction regarding the services provided. On the other hand, although precise indications are lacking, the operation seems to have been financially sustainable, even comfortably so. S&A S.A. and RH DHV (unpublished) also estimates for that the period 2007 to 2018, income exceeded current expenses by 45 percent. The 2016–18 period would have been particularly auspicious; while average income was approximately US$200 million per year, average expenditure was in the order of US$120 million.

The port system

The current configuration of the Argentine port system is the result of the process of deregulation and decentralization that started in 1992. This process, which took place to a greater or lesser extent throughout Latin America, was carried out with the aim of rescuing ports from inefficient services, reducing high fiscal costs, and improving the quality of their services (Sánchez and Pinto 2015). In Argentina, the main milestone was the adoption of Law No. 24,093, which established the regulatory framework for port activity, and in fact defined a new national port model that transferred ownership and responsibility for port administration from the national state to the provinces. The AGP, once directly responsible for most public services operations in much of the Argentine port system, under the new regulatory framework retained its function as supervisor of the concessions at the Port of Buenos Aires (in addition to operating other areas in this port, of a more sporadic nature). This was the only port whose jurisdiction remained in the national sphere.[iii] All other ports were turned over to provincial, municipal, or private administration.

Regarding the Port of Buenos Aires, the different terminals making it up were awarded in concession in 1994, with completion scheduled for 2019. However, given the delays in the bidding process for the new concessions, successive extensions were granted, extending this period to May 31, 2024 (MTR Resolution 346/2021).[iv]

The process of restructuring the system took place in conjunction with the development of multiple private enterprises. The framework established in the aforementioned law also contemplates issues related to the qualification, administration, and operation of ports, either those existing or yet to be created in the national territory. On the one hand, it granted legal recognition to existing private capital ports that were in a precarious or informal situation, which was particularly the case with the bulk ports located in the area of Rosario-San Lorenzo, built in the 1980s. On the other hand, it allowed private terminals to be built on either public or private land. Within this framework, and in line with the expansion of agricultural production in the country's grain belt, large agri-bulk marketing companies built dozens of private port terminals on the banks of the Paraná River, turning the ROSAFE complex into an enormous structure. Today, as well

as being an important oilseed industrial complex, the ROSAFE complex has established itself as the busiest export node for agricultural commodities in the world (Bergero et al. 2020).

The institutional framework in which port activity has been developed can be described, in general terms, as appropriate. The relationship between service providers and users has developed in a climate of low litigation, with no major complaints of abuse of a dominant position; in other words, there appear to be no regulatory obstacles to the operation of port services. Another noteworthy fact is that the 180 percent increase in the export volumes of primary and manufactured products of agricultural origin, which happened between 1991/93 and 2017/19, due mainly to the technological revolution overtaking pampean agriculture, was appropriately handled by the port system. There is little doubt that sustained investment in the sector came in response to the high profitability levels achieved by the export chain; however, the regulatory framework also contributed significantly to enabling an adequate framework and facilitating the deployment of resources to expand port capacity.

Nevertheless, the absence of any form of coordinated planning of the system is striking. The decentralization and privatization of this activity has operated as a limitation in this sense, regardless of any evaluation to be made concerning the success of the legislation (García 2019). The national port authority, although it controls and authorizes port facilities, does not have a direct impact on investment decisions, which remain in the hands of private parties or provincial port entities. Nor, as already mentioned, has the national port authority developed an overall vision that can contribute to an efficient use of resources, avoiding infrastructure oversizing. One example illustrating this problem is that of TecPlata, the container terminal of the Port of La Plata, located 60 kilometers from the Port of Buenos Aires. Inaugurated at the end of 2014 with the capacity to handle 450,000 TEUs, and the possibility of being expanded by over twice the size, it was, nonetheless, inactive for years, and only recently started operating, albeit on a scale that implies high levels of idleness.

Activity Level

The total volume of cargo handled by Argentine ports has not changed substantially in recent years. Between 2014 and 2020, the Argentine port system moved an annual average of 166 million tons of non-containerized cargo, and just over 1.7 million TEUs of containerized cargo—including export, import, and cabotage. It should be noted that the amounts operated are approximately the same at both the beginning and the end of this period. Table 3.1 contains a summary of the data, by type of cargo and area of the country,[v] showing the aforementioned preponderance of the ports located along the Santa Fe-Ocean Trunk Inland Waterway: These explain, on average, 92 percent and 70 percent of the movements of containers and non-containerized cargo, respectively.

TABLE 3.1. Port Movements by Type of Cargo and Zone in Thousands of TEUs and Millions of Tons

Cargo	Zone	2014	2015	2016	2017	2018	2019	2020
Containerized (thousands of TEUs)	Inland waterway north of Santa Fe	2	1	1	2	2	0	0
	Santa Fe-Ocean Inland Trunk Waterway	1,544	1,555	1,487	1,557	1,741	1,537	1,647
	Uruguay River	0	0	0	0	0	0	0
	Buenos Aires seacoast	30	26	41	37	43	31	28
	Patagonian seacoast	124	119	122	130	127	63	68
	Total country	1,700	1,701	1,651	1,726	1,913	1,631	1,743
Non-containerized (millions of tons)	Inland waterway north of Santa Fe	1.3	1.4	1.6	1.7	1.6	1.0	0.4
	Santa Fe-Ocean Inland Trunk Waterway	109.9	121.7	120.1	121.4	107.3	120.3	113.3
	Uruguay River	0.5	0.4	0.3	0.3	0.3	0.6	0.5
	Buenos Aires seacoast	28.9	29.9	33.9	31.6	26.7	28.8	30.3
	Patagonian seacoast	20.3	19.0	18.6	17.1	17.6	16.8	16.4
	Total country	***160.9***	***172.4***	***174.5***	***172.2***	***153.6***	***167.5***	***161.0***

Source: Elaboration based on Puertos, Vías Navegables y Marina Mercante, Ministerio de Transporte, Argentina's web page, "Estadísticas de carga" [Cargo Statistics], accessed on January 2022 at https://www.argentina.gob.ar/puertos-vias-navegables-y-marina-mercante/estadisticas-de-carga.

Table 3.2. Composition of Non-Containerized Cargo, by Product Group

Sector	2014	2015	2016	2017	2018	2019	2020
Grains/cereals	21%	25%	28%	29%	30%	37%	38%
Byproducts	19%	20%	21%	20%	19%	20%	18%
Vegetable oils	3%	4%	4%	4%	3%	4%	4%
Petroleum	18%	18%	16%	16%	17%	14%	16%
Fuels	20%	18%	16%	16%	16%	13%	12%
Metals	9%	7%	5%	5%	5%	4%	3%
Others	9%	9%	10%	10%	10%	8%	8%
Total	*100%*	*100%*	*100%*	*100%*	*100%*	*100%*	*100%*

Source: Elaboration based on Puertos, Vías Navegables y Marina Mercante, Ministerio de Transporte, Argentina's web page, "Estadísticas de carga" [Cargo Statistics], accessed on January 2022 at https://www.argentina.gob.ar/puertos-vias-navegables-y-marina-mercante/estadisticas-de-carga.

However, there is a significant change in cargo composition. If we analyze the evolution of port movements by type of product, we can observe a significant growth in grains and vegetable oils, and a fall in petroleum, fuels, and metallurgical products, among others. As a result, in just six years, the set of solid and liquid agri bulks has increased its relative share by 17.4 percentage points, going from representing 43.3 percent of the total movements of non-containerized cargo in 2014 to 60.7 percent in 2020.

The export of agri bulks has shown an exponential growth in the last decades. Although there are no official historical records describing port movements for all cargo, there are data on agri-bulk export shipments—grains, byproducts, and oils that, as already seen, represent one of the most significant flows—for the last three decades. These figures indicate, in the first place, that the volume operated practically quadrupled between 1993 and 2020, going from 22.8 to 89.7 million tons—a compound annual growth rate (CAGR) of nearly 5.2 percent (see table 3.3). Secondly, the ports along the Santa Fe-Ocean Trunk Inland Waterway—and more precisely in the ROSAFE zone—have been increasing their relative share throughout this period: they went from a minimum of 70 percent of the tonnage shipped in 1994 to 83 percent in 2020.

TABLE 3.3. Export Shipments of Grains, Oils, and Byproducts by Zone in Millions of Tons

Year	TIW Santa Fe-Ocean	Buenos Aires sea-coast	*Total*
1993	16.8	6.0	***22.8***
1994	17.1	7.2	***24.4***
1995	20.9	8.1	***29.0***
1996	23.3	6.9	***30.3***
1997	25.4	10.3	***35.9***
1998	33.0	12.7	***45.8***
1999	33.5	8.7	***42.2***
2000	37.5	9.9	***47.4***
2001	40.2	10.4	***50.6***
2002	39.7	8.6	***48.3***
2003	44.5	9.2	***53.7***
2004	45.6	11.1	***56.7***
2005	52.3	12.7	***65.0***
2006	51.8	10.9	***62.8***

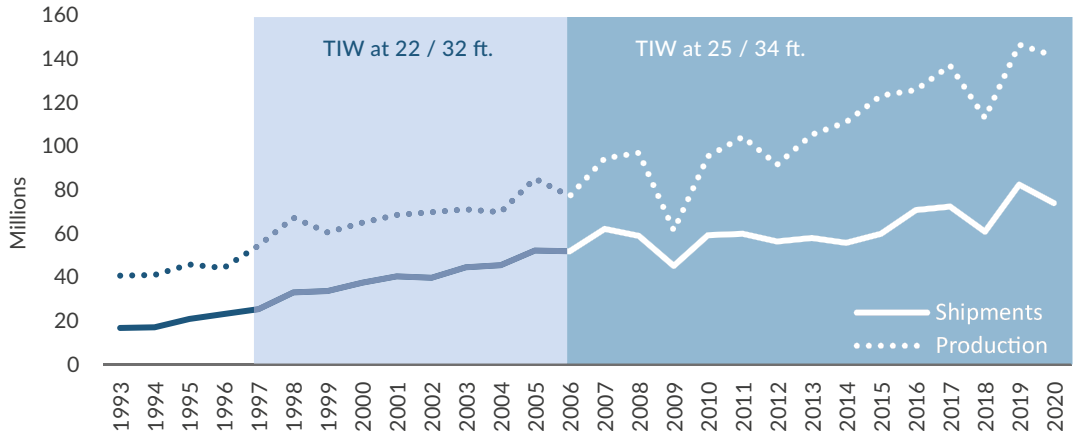
Year	TIW Santa Fe-Ocean	Buenos Aires sea-coast	*Total*
2007	62.1	12.3	***74.4***
2008	59.0	11.5	***70.5***
2009	45.3	8.2	***53.5***
2010	59.3	12.7	***72.0***
2011	60.0	13.8	***73.8***
2012	56.3	15.1	***71.4***
2013	57.9	12.3	***70.2***
2014	55.7	10.3	***66.0***
2015	59.8	10.0	***69.7***
2016	70.8	15.7	***86.5***
2017	72.5	14.0	***86.5***
2018	60.9	12.5	***73.4***
2019	82.4	18.0	***100.5***
2020	74.0	15.6	***89.7***

Source: Elaboration based on data from Argentina's Ministry of Agriculture, Livestock and Fisheries.

Multiple factors explain the explosive growth experienced by agri bulks, including the improvement of the inland waterways. The great increase in the production of cereals and oilseed—due primarily to the expansion of the cultivated area and improvements in yields—occurred in conjunction with an increase in international prices, mainly soybean (Abramovich and Amarilla 2011), and an increase in the processing capacity of the agri-foods industry mostly concentrated on the banks of the Paraná River. It is also essential to consider the role played by investments in infrastructure that have improved operating conditions for navigation on the Trunk Inland Waterway. Figure 3.1 illustrates the evolution of the national production of cereals and oilseeds, and the agri-bulk export shipments along the Trunk Inland Waterway, before and after the different expansions of its capacity. In this sense, Sánchez et al. (2017) establish that the additional depth of the waterway was accompanied by a more than proportional increase in agricultural production. The authors estimate the production response to changes in the waterway infrastructure (that is, depth) using an autoregressive vector model and series of agricultural production—corn, wheat, and soybean—for the 1969–2015 period, among other variables. The result, which is essentially conservative,[vi] yielded an annual average growth rate of 6 percent over production during a 20-year period, in response to a one-foot change in waterway depth.

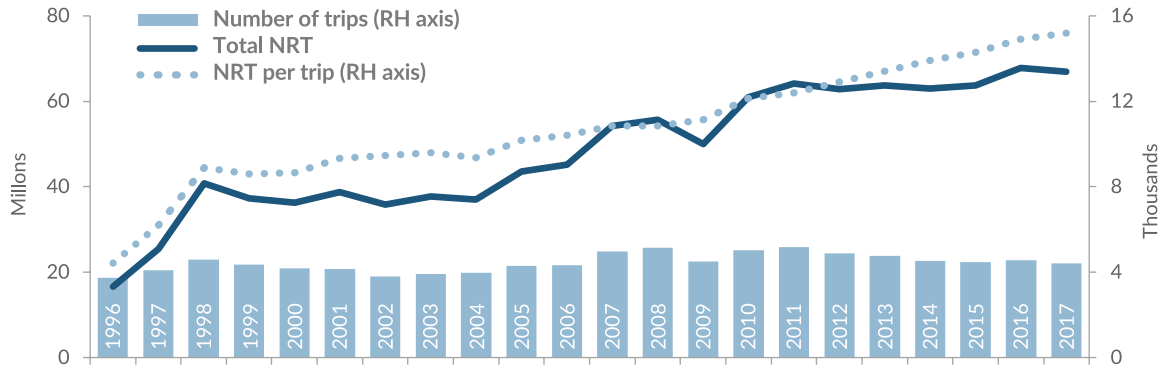
In a system characterized by capacity limits, the increase in vessel size made it possible to effectively manage a growth in cargo flows. In recent decades, there has been a major increase in the size of ships using the waterways. Evidence of this is that aggregate NRT has grown significantly, year after year, while vessel numbers remain relatively constant at around 4,000 to 5,000 per year (see figure 3.2). Consequently, average NRT has virtually doubled, comparing the 1996–2000 and 2015–19 periods. This evolution is, above all, the reflection of a general trend toward growth in bulk carrier size, although, to a certain extent it could also respond to an increase in the depth of the inland waterways. Even so, a significant proportion of bulk carriers are relatively small. Had vessel capacity remained constant, the cargo increase would have meant an approximate twofold increase in circulation, undoubtedly increasing current delays and, consequently, total travel time.

FIGURE 3.1. National Production of Cereals and Oilseeds, and Agri-Bulk Export Shipments in the Santa Fe-Ocean Trunk Inland Waterway in Millions of Tons



Source: *Elaboration based on data from Argentina's Ministry of Agriculture, Livestock and Fisheries.*
Note: *The navigation drafts mentioned refer to the situation in the Santa Fe-Rosario and Rosario-Ocean sections, respectively.*

FIGURE 3.2. Number of Vessels Entering the Trunk Inland Waterway, Total NRT and Average NRT per Year (1996–2017)



Source: *Elaboration based on S&A S.A. and RH DHV (unpublished).*

Performance

The system presents a disparate performance according to different activity segments. Whether concerning navigation itself, or at the level of port operations, the performance of the different components is quite variable, mainly, although not exclusively, depending on the type of cargo considered. The following presents a range of indicators that enable an international comparison, with the focus on containerized cargo and agri bulks. It is important to highlight the need to improve the quantity and quality of current information about the sector. Although the production of information is relatively systematic, it is fragmentary, and there is no overall normalized pattern. For instance, for certain port areas, aggregate information is compiled, but there is no breakdown by terminal, preventing a thorough evaluation of the sector's performance. The same considerations apply to the information gathered by the PNA about shipping movements.

Inland waterways

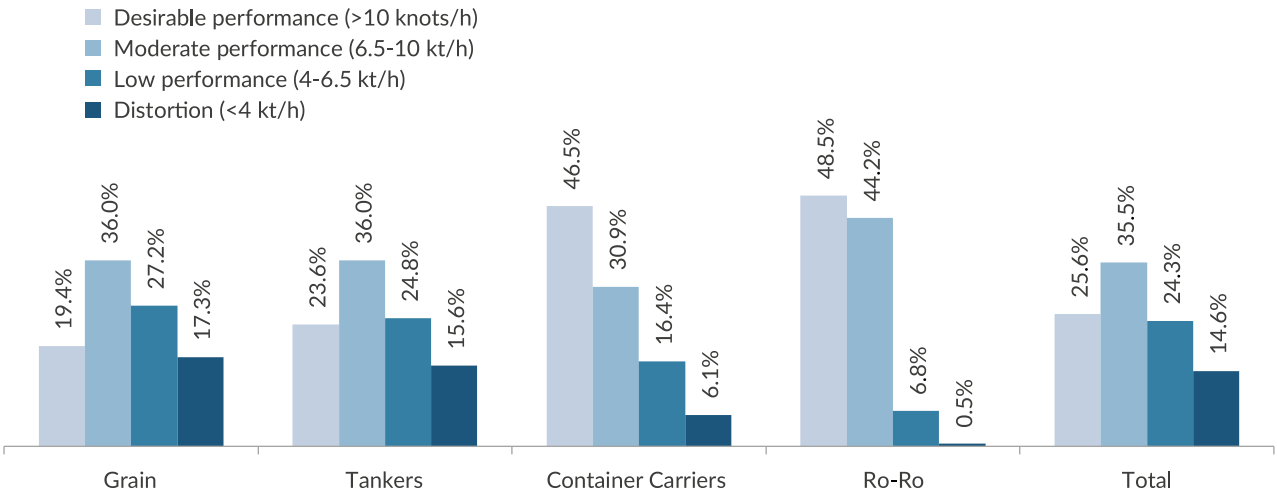
The inland waterways system presents relatively low speeds of movement, especially in the case of bulk carriers and tankers. Figure 3.3 summarizes operating speeds for the main types of ships navigating the Trunk Inland Waterway, in the sections between the Río de la Plata and Rosario.[vii] Their speeds have been classified into four strata, including one of very low speeds, which are probably the reflection of other distorting factors, and should, therefore, not be considered. The analysis indicates that container carriers and ro-ro vessels move at speeds that are significantly higher than bulk carriers and tankers. This result is to be expected since the former have priority of passage, where there are restrictions; as seen above (see table 2.2), restrictions tend to predominate in those channels that provide access to the ports of Buenos Aires and Dock Sud, which are the main destinations for container ships. Additionally, if the theoretical unrestricted speed of movement is compared with that observed on average, it can be estimated that navigation restrictions cause delays of some eight to nine hours for bulk carriers coming from the Rosario area, without considering any eventual delays resulting from entry to and navigation in the Punta Indio Canal.[viii]

Container terminals

Argentina shows a relative loss of integration into global liner shipping networks. Countries' access to world markets largely depends on their transport connectivity, especially regarding regular shipping services for the import and export of manufactured goods. The Liner Shipping Connectivity Index (LSCI, calculated by UNCTAD) offers a complete and updated overview in this regard. Argentina, which had a relatively good position 15 years ago, shows a slight growth in absolute terms (with peaks in 2014 and 2018-2020), but a sharp drop in relative terms, falling 23 places in the global ranking. Other countries in the region, particularly Chile, showed a better performance during this period (see figure 3.4).

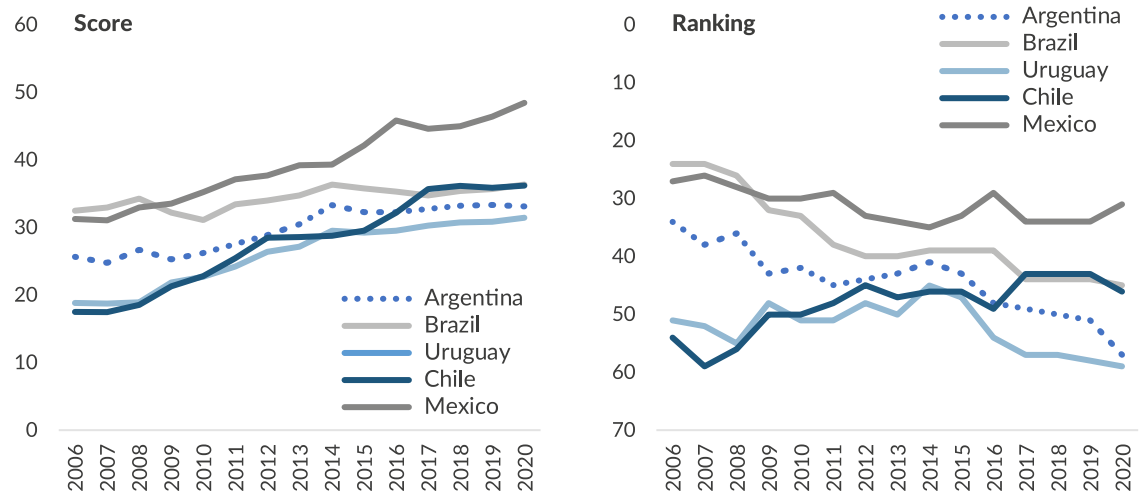
The performance of the ports handling container movements has positive and negative aspects. AIC, MTBS, and M&L (unpublished) shows a set of relevant performance indicators for the Port of Buenos Aires, Exolgan (Dock Sud), and Terminal Zarate, which adequately reflect operating conditions at the terminals, essentially in terms of how efficiently resources are allocated. These conditions consist of cargo volume indices based on the dock meters, numbers of cranes, hectares of

FIGURE 3.3. Vessel Displacement Speed: San Lorenzo Waterway - Par 30 (2015–19)



Source: *Elaboration based on information from the Argentine Coastguard (PNA).*
Note: *Due to deficiencies in the original bases, about 7 percent of the observations were discarded.*

FIGURE 3.4. Liner Shipping Connectivity Index in Select Countries in Latin America (2006–20)



Source: Elaboration based on UNCTADstat (database), UNCTAD (United Nations Conference on Trade and Development), Geneva (accessed January 2022), https://unctadstat.unctad.org/EN/Index.html.

yard, and ships. In order to establish relative performance, the Ports of Santos, San Antonio, Montevideo, Rotterdam, and Hamburg are used as reference. The analysis of the results (see table 3.4) allows us to conclude the following:

(1) The operational performance achieved by the container terminals considered is in general relatively low compared to the ports of reference.

(2) The volume of cargo per linear meter of dock, per crane, and per ship in Argentine ports is similar in terms of values to those in the Port of Montevideo, but well below other regional and world terminals.

(3) The volume of cargo per hectare at the yard in Terminal 4 in Buenos Aires is similar to the ports of reference. The other terminals show lower performance levels.[ix]

(4) The cargo volume per ship at Argentine terminals is similar to that of the ports of reference, with the exception of the Port of San Antonio (Chile), which has a superior performance. However, this indicator depends largely on the commercial conditions and the size of the vessels, rather than on the conditions offered by the port. In fact, in the case of the Port of Zarate, this lower value has to do with the prevalence of feeder vessels.

(5) The best and worst performances are observed within the Port of Buenos Aires, in Terminal 4 and in Terminals 1, 2, and 3, respectively. In recent years, Terminals 1, 2, and 3 saw traffic drop from more than 500,000 TEUs per year to less than 300,000 TEUs per year. By contrast, Terminal 4 increased traffic from 200,000 TEUs per year to 360,000 TEUs per year.

TABLE 3.4. Comparative Performance of Container Ports

Country	Terminal	Cargo movement by...			
		...dock meter (TEU/meter)	...crane (TEU/ crane)	...hectare of yard (TEU/ha)	...vessel (TEU/vessel)
Argentina	Buenos Aires 1,2,3	115	27,600	6,419	1,321
	Buenos Aires 4	725	72,480	25,886	1,066
	Buenos Aires 5	241	71,033	8,524	1,324
	Exoglan	500	60,000	12,000	1,453
	Terminal Zarate	296	35,500	6,455	877
Brazil	DP World Santos	1,037	113,333	17,000	1,097
Chile	San Antonio, international terminal	1,291	150,125	24,020	1,721
Uruguay	Cuenca del Plata Terminal	465	42,143	9,219	1,003
Netherlands	LCT Delta	1,139	113,889	15,769	779
Germany	HHLA Alterwerder	1,857	173,333	26,000	1,555

Source: Source: AIC, MTBS, and M&L, unpublished.

Partly as a reflection of these shortcomings, stays in Argentine ports have a relatively long duration, when compared with international values. As shown by UNCTAD statistics for 2020, the average time in port for container ships is considerably higher than international standards. The record for Argentina—1.44 days on average[x]—exceeds the world average by 104 percent (0.71 days) and is also higher in relation to other countries in the region (see figure 3.5). However, it is notable that average vessel size is in line with other countries, so this is not a factor that can explain the difference in time.[xi]

The low performance of Argentine container terminals, in general, can be attributed to different factors. These include inefficient port terminal organization, lack of port infrastructure modernization, and an inefficient use of existing resources or insufficient cargo. One significant indicator is the depth at the foot of the dock, which could have some impact on ports' ability to be competitive; this aspect should be reflected in the volume of cargo per vessel. However, the volume of cargo per vessel in Argentine terminals is the one closest to the ports of reference. This reflects the end-of-the-line aspect of the Port of Buenos Aires for container carrier lines, as they arrive with low cargo levels. These relatively low performance levels thus require more in-depth study, with a particular look at the question of stays, in order to adjust stay-length indicators to international values. In any case, it is considered that the container terminals in Argentina have sufficient capacity to handle current cargo volumes with reasonable ease.

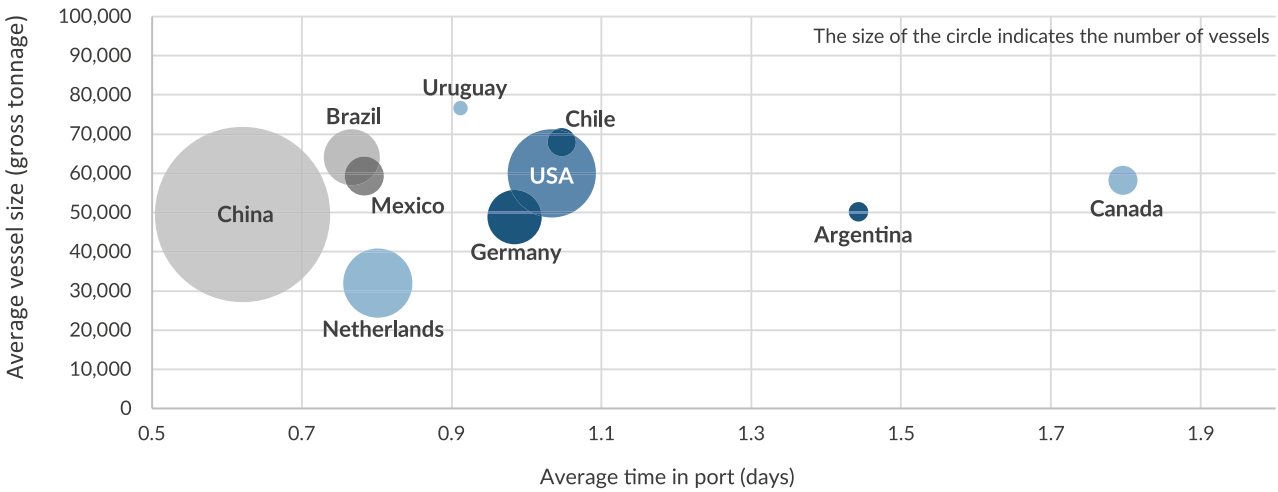
Agri-bulk terminals

Agri-bulk ports show extremely efficient performance levels. The ports of the Greater Rosario area—a set of 28 terminals—move an average volume of 2.8 million tons per terminal and a little over 9,000 tons per dock meter, while the warehousing rotation indicator stands at 15.1x. With these values, the ROSAFE ports head up the ranking of bulk movements at both the regional and world levels, only surpassed by the Port of Chornomorsk in Ukraine. It should be noted that these performance values are an average, as specific terminals may achieve higher numbers (see table 3.5). This efficiency can be attributed above all to the adoption of international practices, as the sector has well-consolidated technology. It should also be remembered that many of the units are operated by world-scale grain trading companies. Furthermore, the efficiency of the Bahía Blanca and Quequén terminals, although a little lower, is also comparable with best practices. The remaining ports in this sector, lying along the Trunk Inland Waterway, present markedly lower scales and yields, and only participate in a minor fashion in agri-bulk and byproducts trade.

Port stay times in Argentina are somewhat higher than those of the ports with the best performance. According to UNCTAD data, the aggregate segment of dry bulk cargo ships in 2020 spends an average of 2.97 days in port (44 percent above the world average). This record far exceeds that of many countries in the region and in the world (see figure 3.6). However, AIC, MTBS, and M&L (unpublished) establishes an average time in the range of 2–2.1 days for agri-bulk terminals in the Greater Rosario, Quequén, and Bahía Blanca areas, values contrasted and corroborated with the PNA database. In short, the performance of these ports, in terms of grains and byproducts, can be considered satisfactory as it corresponds to levels approaching best international practices.

The load factors of the different terminals are, in general, relatively low. According to data from AIC, MTBS, and M&L (unpublished), the set of terminals in the Rosario area present load factor rates of approximately 53 percent, with the Port of Quequén showing a somewhat higher level (60 percent) and Port of Bahía Blanca a lower value (39 percent). These values would indicate that capacity at these terminals is greater than demand, with a reasonable leeway. In conclusion, the performance of those ports dedicated exclusively to handling agri bulks generally deserves a positive assessment; the efficiency achieved is comparable to international best practices and the infrastructure is adequate for the operation, according to current load factor levels, and there is the possibility that these ports will be able to handle larger volumes in the future.

FIGURE 3.5. Container Carriers: Number, Average Size, and Time in Port in Select Countries in 2020



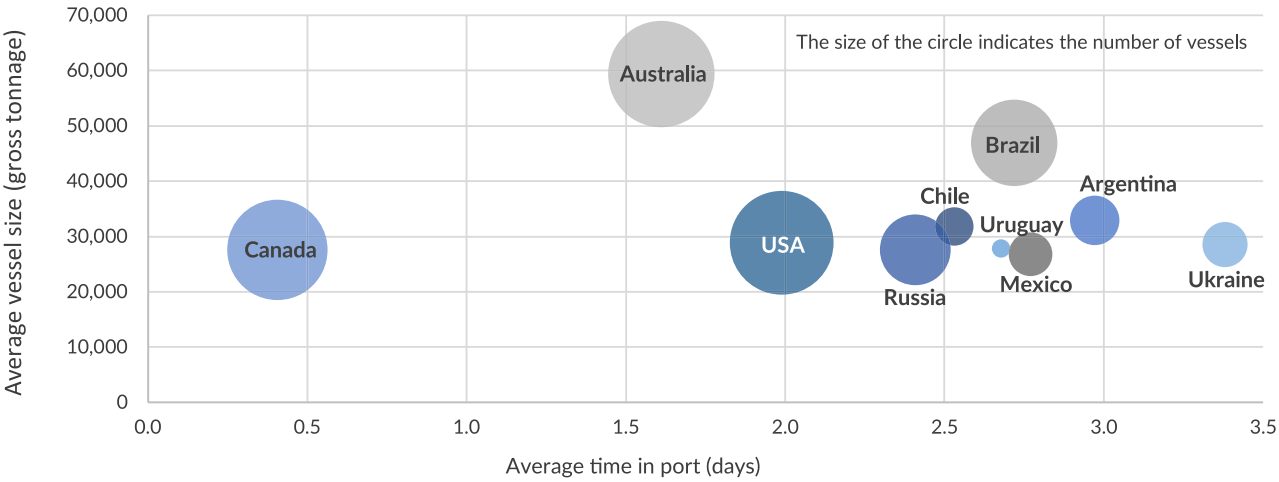
Source: Elaboration based on UNCTADstat (database), UNCTAD (United Nations Conference on Trade and Development), Geneva (accessed January 2022), https://unctadstat.unctad.org/EN/Index.html.

TABLE 3.5. Comparative Performance of Agri-Bulk Ports

Country	Port	Movement (million tons, 2019)	Agri-Bulk Terminals	Performance by Terminal (million tons/ terminal)	Performance by Dock Meter (ton/meter)	Rotation Storage Capacity (x)
Argentina	Gran Rosario	77.8	28	2.8	9,189	15.1x
	San Nicolás	0.1	1	0.1	699	0.8x
	San Pedro	0.4	1	0.4	1,818	3.6x
	Santa Fe	0.5	2	0.3	1,603	7.2x
	Bahía Blanca	11.4	8	1.4	6,199	12.9x
	Quequén	5.6	4	1.4	3,518	11.2x
Uruguay	TGM	0.8	1	0.8	2,581	6.6x
	TGU	1.2	3	0.4	n.a	13.4x
Brazil	TGG Guarujá	2.3	3	0.8	4,167	10.6x
Peru	APM El Callao	0.8	2	0.4	1.428	33.0x
Ukraine	Port of Chornomorsk	4.6	1	4.6	11,500	21.9x

Source: AIC, MTBS, and M&L, unpublished.

FIGURE 3.6. Solid Bulk Cargo Ships: Number, Average Size, and Time in Port in Select Countries in 2020



Source: Elaboration based on UNCTADstat (database), UNCTAD (United Nations Conference on Trade and Development), Geneva (accessed January 2022), https://unctadstat.unctad.org/EN/Index.html.

Notes

[i] The Basic Unit Price for determining the toll rate is US$3.06 for international transportation and ARS3.06 for domestic transportation (Resolution 936/2014 of the Ministry of the Interior and Transport).

[ii] The National Entity for the Control and Management of the Inland Waterways was created in 2021.

[iii] There are claims for the transfer of its management to the City of Buenos Aires (CABA), which when Law 24,093 was passed did not enjoy the degree of autonomy it has today.

[iv] See Resolución 346/2021 at http://servicios.infoleg.gob.ar/infolegInternet/anexos/355000-359999/355209/norma.htm.

[v] The appendix of this report shows the breakdown of this information by port.

[vi] Since this only takes into account agricultural production, and not other industrial sectors that also benefit from the improvement analyzed. Nor does it consider induced effects, or other effects commonly associated with improvements in infrastructure, related to access and welfare conditions, which potentially tend to reduce social inequalities.

[vii] Specifically, between Par 30 (Km 118.5, the beginning of the junction between the Punta Indio Canal and Canal Intermedio) and the area of San Lorenzo (Santa Fe).

[viii] This value coincides with assessments collected from qualified informants, although it should be noted that the calculation made may include the effects of other unidentified factors.

[ix] In any case, this indicator should be taken with caution as and when the layout of the container storage yards is of interest regarding loading/unloading areas. Particularly visible in the case of Terminals 4 and 5, the area reserved for stowing containers demands a certain length in relation to the space corresponding to the berth front.

[x] The information produced by the Argentine Coastguard (PNA), despite not being presented in a way to allow this indicator to be broken down by port terminal, does allow for a comparison at the port level. The results are: Buenos Aires (1.5 days), Dock Sud (1.3 days), La Plata (2.4 days), Rosario (1.4 days), and Zarate (1.7 days).

[xi] Although according to vessel size, as if this is larger due to the greater amount of cargo to be loaded or unloaded one would expect the port stay to be of correspondingly longer duration, it is also true that the ports that are able to better handle larger ships also tend to be more modern and better equipped, so they can work faster. Therefore, there is a nonlinear relationship between both variables (UNCTAD 2021).

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4. SCENARIOS AND TRENDS

A Sector Influenced by Macro Trends

Transport activity has had an exponential growth in the world in the last few decades. The twentieth century saw an unprecedented acceleration in numerous aspects of society (demographics, production, consumption, and so on) with enormous impacts on transport systems. These systems underwent profound changes in their offer through the advent of new modes (road, air, pipeline transport, and so on), as well as in the demand they had to handle, due to the substantial increase in the volume, extension, and features of the services required for the movement of people and goods.

Greater activity in transport systems contributed decisively to greater economic prosperity, but also created impacts that severely question the systems' sustainability in environmental, social, and economic-financial terms. This led to the creation of material wealth for a population that almost quadrupled over the course of a century, but also had significant negative consequences. Some emblematic cases are fossil fuel consumption and the resulting generation of GHGs, the reduction in biodiversity arising from the expansion of networks and economic activity, and social exclusion due to lack of accessibility in both urban and rural areas. The sustainability crisis suggests the proximity of great changes in the organization of societies and in their link with nature. This change, of course, is already being expressed in the form of international policies and agreements, such as the United Nations' 2030 Agenda for Sustainable Development (the platform for the Sustainable Development Goals; SDGs) and the Paris Agreement on climate change. These policies and agreements will have a bearing on the future of transportation systems and the demands they must meet, and environmental challenges will probably be the greatest trigger for these changes.

In line with this variation in the development model, there are other trends that have a significant impact on transport systems, particularly on water transport. Three trends stand out: technological changes associated with Industry 4.0, the concentration and vertical expansion overtaking global logistic services markets, and the effects of the COVID-19 pandemic. These trends will be summarized in the following paragraphs. In brief, looking at freight transport from a historical perspective, it is undergoing a period of transition, facing a possible change of era, with major transformations lying ahead. This implies significant challenges for national transport policies in developing countries, as the as-yet unresolved problems featured in the previous scenario, such as bottlenecks, low productivity, lack of quality services, and so on, are compounded by new challenges arising from these macro trends and their combined impact.

Trends Affecting Maritime Port Performance

The environmental agenda, climate change, and water transport

Transport systems have a wide range of environmental impacts, particularly those related to the emission of GHGs responsible for global warming. The environmental impacts of the sector have manifold effects at various levels: local (such as the emissions of polluting gases from urban transport), regional (the impact on biodiversity from infrastructure and vehicles), and global, as is the case with GHG emissions. Climate change is currently the principal environmental concern related to transport, notably influencing public policy making and private-sector decision-making, both in terms of mitigation (reducing emissions) and adaptation (adjusting systems to a changing context).

Transport is a relevant sector for the mitigation of climate change, including the emissions generated by seagoing and river transport, port activity, and inland waterway management. This relevance has given rise to multiple responses from governments and companies, as they seek to reduce emissions within the framework of a decarbonization strategy enabling them to offset the amount of GHGs produced with the amount removed from the atmosphere (net zero). The carbon footprint of supply chains will surely become a competitiveness factor of growing importance for international trade, to be taken into account by countries in

their policy making (as it could become a nontariff barrier, deployed as an instrument of protectionist policies) and by private sector companies and consumers.

In seagoing navigation, emissions reduction will probably impact prices and the organization of line services. The International Maritime Organization (IMO) has established various standards to reduce GHG emissions, pointing to increasingly ambitious levels which go so far as to propose a significant reduction of up to 70 percent by 2050, using 2008 as a baseline. Accordingly, it has established maximum emissions standards for each type of vessel, as well as guidelines for the efficient design of new vessels and plans for energy management. Market initiatives of a global scope, such as carbon pricing, are also under analysis, aiming to set charges on emissions. Within this framework, liner shipping companies are seeking to incorporate ships that can reduce emissions per traffic unit: larger vessels that use new technologies and propulsion mechanisms, circulating at a slower speed and with their activity focused on those routes with the highest density (meaning that they can make more efficient use of their hold capacity) where there are ports and waterways able to handle large vessels. These trends are not favorable to the ports along the Argentine river coast. The goals being set for the sector by the IMO are promoting the use of alternative energy sources, such as gas, hydrogen, or electricity, which can already be observed in the shipbuilding sector with current ship construction orders (Faber et al. 2021). Bulk carriers are also reflecting the trend toward the adoption of new energy sources, although not so much the trend regarding an increase in vessel size.

In ports, mitigation strategies will cover not only actions affecting their operations, but also their links with the hinterland and the supply of new energy sources to ships. A green port is one that invests in and promotes sustainable and environmentally friendly operations in all aspects of the port and maritime industry. Ports and their terminals will thus be attempting to reduce emissions in their operations, for example, by adopting the use of electric cranes, handling equipment and intra-port transport, or by digitalizing processes to reduce movements. They will also seek to improve links with the hinterland by employing modes of transport with lower emissions (typically rail and river navigation) and deploy facilities capable of serving those vessels involved in decarbonization strategies (for example, with the capacity to supply gas or hydrogen). It is to be hoped that future public-private partnerships (PPPs) will require specific measurable and verifiable emissions targets from terminals.

Dredging offers ample opportunity to reduce GHG emissions, as this activity consumes high amounts of energy, traditionally based on hydrocarbons combustion. The actions envisaged to reduce dredging emissions encompass project design, equipment design, project execution (working methods, type of equipment to be used), and efficiency in operational management.

The climate change agenda in water transport also includes the adaptation and creation of resilient networks and services, particularly in ports and inland waterways. It contemplates internal transport, which links ports with the hinterland, requiring a comprehensive approach to the transport system. Low water levels in the inland waterways are probably the main challenge in terms of adaptation, as already seen in the extraordinary falls in water levels affecting the Paraná and Paraguay Rivers in recent years. This not only reduces the depth of the waterways but also conditions vessel access and loading capabilities, and can affect sedimentation, erosion, and accretion.[i]

New technologies

New technologies linked to Industry 4.0, the Fourth Industrial Revolution, have a major impact on shipping and on vessel operational and commercial management, as well as port and inland waterway management. This also affects the interaction between the different players in the sector, such as shipping companies and agents, carriers, port terminals, and maritime traffic control agencies. Some examples are the adoption of blockchain technology and digital documents for commercial management and customs-border paperwork, process automation and the Internet of Things, as well as the use of big data, analytical techniques, and artificial intelligence on ships and in ports. The application of these technologies has far-reaching impacts on areas as diverse as the economy, environment, security, and employment.

In the navigation community, the expression “smart shipping” has been coined to describe the adoption of digital technologies to optimize operational efficiency. These include capabilities such as planning trips and the dynamic adjustment of routes according to weather conditions, optimizing fuel consumption, controlling emissions, and carrying out predictive maintenance. New technologies enable improvements to be made in efficiency and environmental performance, and may affect a broad range of dimensions, from construction materials and design to propulsion and automation. It is to be hoped that in the near future ships will be smarter, data-managed, and more environmentally friendly, offering flexible power and fuel options, fully wirelessly connected on board, and digitally connected via GPS (Lloyd’s Register 2015).

New technologies have an impact on port management and dredging. In ports, as in other segments of the logistic chain, incorporating techniques such as remote operations, autonomous systems, or integrated information and communications platforms, which facilitate vessel and cargo monitoring and improve warehouse management and customs, will speed up deliveries overall. In the case of dredging, new technologies will enable greater operational efficiency, automating functions such as remote operations, as well as adopting dynamic positioning and monitoring systems which will improve knowledge of the material to be extracted, optimizing refill management, and so on.

Concentration in the logistic markets for general cargo

Horizontal concentration in container shipping is a process that increases the participation of larger operators at the expense of smaller ones. This process began several decades ago and has recently deepened, particularly affecting the market for regular line services as well as the port terminals serving them. The process of concentration is being driven by the economies of scale and networks inherent to the sector, and is taking shape in the form of acquisitions, mergers, and commercial alliances. Currently, the five main line shipping companies account for 66 percent of the world market.[ii] The three main alliances[iii] that have formed the large shipping companies currently control 90 percent of the global maritime container movements. In addition to concentrating activity at a horizontal level, shipping companies and container port terminals have also tended to integrate vertically. In some cases, shipping lines operate their own terminals, while in others, there are commercial agreements between them and the terminal-operating companies on a global scale.

The combination of larger ships and business concentration leads to a lower frequency of regular services and a reduction in direct port-to-port connections. Large ships tend to limit their calls to those ports offering greater cargo volume handling and more extensive port facilities as well as adequate maritime access. In the case of the Port of Buenos Aires (including the Puerto Nuevo and Dock Sud terminals), the number of direct services has been significantly reduced.[iv] With the arrival of increasingly larger container ships (19,000 TEU ships are expected to be assigned to services on the east coast of South America in 2027), there is a risk that this scale will not be attractive to shipping companies, which would go on to handle some of the traffic that is now direct through feeder ships and transshipments at hub ports.

As to the trend toward vertical integration in container transport, large shipping companies are absorbing functions in the logistic chain traditionally provided by other actors, which may erode competition in the market for international cargo services. These firms have been gradually displacing the functions of intermediation and provision of auxiliary services traditionally performed by freight forwarders and customs brokers, particularly for large shippers. They are also venturing into other international services (for example, air cargo transport) and domestic services (including urban distribution). This trend could affect competition in the cargo-handling markets, although there has not yet been any reaction from the regulatory entities.

Regarding bulk carriers, the market is competitive and does not present a pronounced tendency toward gigantism. The transport of dry bulks (such as grains and byproducts) works in a very different way to that of containers.[v] These vessels do not sail with preestablished itineraries, but rather respond to demand. They are often operated by charterers who rent the vessels to their owners by voyage or time (Stopford 2009). It is usually considered as an example of a competitive market: multiple shippers, numerous operators with easy market entry and exit, transparency in information, and a fairly uniform service. Bulk terminals are also far more diversified, and in many cases operate their own cargo. Unlike container carriers, the trend toward using larger ships is moderate as regards bulk carriers. Most of the recent orders have been concentrated in Panamax and Supramax-type vessels, while those involving larger ships basically include the transport of coal and iron ore (Nugent 2021).

The impact of the pandemic

The initial impact of the COVID-19 pandemic on shipping activity was less intense than on other transport segments, although as trade began to recover, there were bottlenecks in various links of the logistic chains leading to less reliable services and to freight cost increases that benefited shipping companies. At the start of the pandemic in 2020, demand did not fall as expected and international trade picked up toward the end of the year. The continuity of cargo services implied a complex humanitarian situation for personnel working in maritime transport. In 2021, the operational limitations resulting from the impact of COVID-19 on the labor sector became evident, as it reduced capacity in the production chain and throughout the international trade logistic chain. Economic recovery from the pandemic led to a global increase in the demand for goods, in many cases encouraged by the stimulus packages implemented in more developed

economies. This increase exceeded the capacities of logistic operators in various links of the supply chains, still limited in terms of capacity by the effects of COVID-19. This led to the corresponding shortage of equipment and containers, as well as less reliable services, congestion in ports, and an increase in delays and vessel downtimes. In the maritime transport segment, there was a dizzying rise in freight rates and surcharges, which negatively affected shippers while notably increasing the profitability of shipping companies (UNCTAD 2021).

The COVID-19 pandemic has left its marks, some of which are transitory, but others that will continue to be felt over time. Given the uncertainty created in the supply chain sector, many firms are reviewing their logistic strategies, reconfiguring supply chains and seeking to shorten them to reduce risks, and limiting the outsourcing of supplies. The context of restriction in international transport strengthened the market power of the large shipping companies, which, in addition to notably increasing freight costs, are now making inroads into other logistic services by conditioning the availability of space on ships to the contracting of services (generally local), such as forwarding or customs clearance. One positive aspect of the pandemic has been the acceleration in the adoption of digital technologies, particularly for border management.

The possible impact of macro trends on Argentina

The previous sections show that international trade and maritime transport face profound changes in several aspects, which need to be considered when projecting possible scenarios.[vi] Their review allows some relevant conclusions to be drawn as regards the challenges Argentina will face in the near future in terms of its ports and inland waterways.

The competitiveness of Argentina's exports will depend on both their cost and their **carbon footprint**, in which the transport sector will undoubtedly play a considerable role. Clients and end consumers will pay increasing attention to the carbon footprint issue, and states can use this to establish nontariff barriers as a form of protectionism. "Clean" ports and dredging, committed to decarbonization policies (net zero), will contribute to reducing this footprint, and will favor the presence of "clean" ships, to the extent that the ports have the capacity to serve them (for example, with the supply of gas).

River ports must ensure nautical and land accesses adapted to the changes brought on by global warming, particularly droughts in the watersheds feeding the waterways (especially the Paraná and Paraguay Rivers) and floods in the hinterland. The **adaptation and resilience policies** of the ports and their accesses (particularly the Trunk Inland Waterway) will be key to ensuring the operational continuity of the supply chains. The natural conditions of the Río de la Plata and Lower Paraná estuary are not favorable, and the effects of global warming will bring further complications.

The **reconfiguration of line services routes** and the incorporation of larger container carriers on the east coast of South America deserves particular attention as the country runs the risk of losing direct connections with relevant markets, which can make export and import freight costs even higher. The choice of the design vessel adopted in the Trunk Inland Waterway concession, as well as the new terminal concessions in Puerto Nuevo, must take this aspect into account.[vii]

A strategic view requires taking into consideration the initiatives that the **competing ports** are taking, especially, due to their relevance and particularities, in the case of container ports. In this segment, Brazilian ports already have access depths of 16 meters (Rio Grande do Sul, Itapuã), 15 meters (Rio de Janeiro, Santos), or 14 meters (Navegantes), all greater than the 10.5 meters offered by Buenos Aires. The Port of Santos has announced its intention to offer access with a depth of 17 meters.

The **incorporation of new technologies** means greater efficiency in the logistic chain, highlighting the potential for impact on ports as key nodes. In a management context where there is a high degree of private involvement, public entities and the many actors involved in the port community must continue to promote the implementation of new technologies, such as the single window for foreign trade, and various other aspects related to port operations and trade facilitation. To enable the widespread adoption of new technologies, there must be adequate digital infrastructure, and this depends largely on public policies. Another key aspect will be how to adapt human resources to different management modalities, which requires specific training.

Given that most of Argentina's exports are **food-related products**, it is worth considering to what extent the megatrends observed can compromise these markets. Recent studies point to future changes in people's diet, as much in the type of food products sought as in how they are produced, but this is a transition that will probably have effects in the medium term (see box 4.1). It should be noted that plant-based diets reduce emissions compared to meat-intensive ones, not because of food-transport-related issues, but because of the actual production process.

BOX 4.1. Trends in Diets, Food Consumption, and Production

A recent OECD-FAO analysis for 2030 indicates that consumers in middle-income countries will significantly increase their food intake while diets in low-income countries will remain largely unchanged (OECD and FAO 2020). The study also forecasts that while the consumption of animal protein is expected to stabilize in high-income countries, the demand for animal protein will increase in middle-income countries. It also suggests that compliance with SDG 2 by 2030 (zero hunger and food security) is highly compromised. The study predicts a slow transition to healthier diets, although fats and staple foods will continue to dominate growth in food consumption. Global food demand will grow, driven by rising livestock numbers, leading to higher feed intensity, albeit tempered by improvements in feed efficiency.

A detailed report published by the World Economic Forum in 2017, analyzing possible scenarios, highlights the importance of encouraging consumers to adopt diets which are more efficient diets in the use of natural resources, anticipating a future redesign in food production systems (WEF 2017). Technological innovations are expected to dramatically change the way food is produced, managed, and demanded in select markets, but their effects will be unevenly distributed. Climate change and the degradation of natural resources can affect the long-term productive capacity of food systems, compromising social stability and economic well-being. The dynamics of the food system are likely to exacerbate inequality within and between nations.

Possible Demand Scenarios

An uncertain context for projecting future activity levels

The future demands of ports and waterways depend largely on the direction taken by Argentina's economic policy, and this in turn is based on the good performance of cargo logistics and their ability to contribute to export competitiveness. The context for projecting the activity of Argentine ports and waterways presents numerous unknowns. In addition to the global changes detailed above are the uncertainties inherent to the country's economy, which is at a critical moment in the definition of its macroeconomic policies. One of the central aspects of these policies is the direction being taken by foreign trade and especially exports, as the hard currency they bring in is a vital factor in avoiding economic stagnation and enabling growth, which in turn boosts imports. There is a correlation between the direction taken at the macroeconomic level and the projections for cargo at ports and inland waterways, as well as the capacity inherent to ports and waterways to ensure exports are competitive and imports can flow smoothly.

Given the uncertainty inherent to these times of change, there are two possible scenarios of demand to be explored. One projects moderate growth rates, consistent with those registered in recent years, of the business as usual (BAU) type, and the other takes into account the urgent need to increase exports, focusing on the potential demands on ports and inland waterways. The first scenario is the result of a study recently carried out for all the ports in Argentina and defines expected growth rates for different types of products.[viii] The second arises from an estimate of the export growth needs of a development strategy designed to balance the macroeconomy, considering the possible growth of various export complexes and speculating on the impact of such a strategy on cargo logistics.

Demand growth in a BAU scenario

Considering an average scenario in which current demand trends continue, recent studies estimate a 40 percent increase in the movements at Argentine ports in the next two decades, although with pronounced disparities between product groups. According to estimates made by AIC, MTBS, and M&L in 2021, the volume of cargo handled by all national ports would rise from 176 million tons in 2019 to 248 million in 2039,[ix] an increase of 1.71 percent per year, accumulated over a period of 20 years. As seen in table 4.1, the greatest dynamism is recorded in the segments

TABLE 4.1. Projection of Port Movements by Product Type (in Thousands)

Product Group	Unit	2019	2039	Variation %	CAGR %
Containers	Thousands of TEUs	1,631	2,640	61.8%	2.4%
Solid agri bulks	Thousands of tons	92,413	124,642	34.8%	1.5%
Other solid bulks	Thousands of tons	13,410	18,858	40.6%	1.7%
Liquid agri bulks	Thousands of tons	8,706	14,633	68.1%	2.6%
Other liquid bulks	Thousands of tons	43,071	59,148	37.3%	1.6%
Others	Thousands of tons	2,091	3,309	58.3%	2.3%
Vehicles	Thousands of units	351	660	88.1%	3.2%
Total	***Thousands of tons***	***176,355***	***247,648***	***40.4%***	***1.7%***

Source: Based on AIC, MTBS, and M&L (unpublished).
Note: This does not include movements associated with transit or transshipment. To calculate the total, the following are used: TEU = 10 ton, Vehicle Unit = 1 ton.

of containers, liquid agri bulks, and vehicles, with variations of more than 60 percent throughout the period considered. These relatively moderate rates respond to hypotheses that contemplate modest growth in activity levels.[x] On the other hand, they indicate the unlikelihood of substantial increases in the production of export commodities, after the significant expansion experienced since the mid-1990s.

Official projections to 2030 made in 2018 for the port and Trunk Inland Waterway system (DNPTCyL 2018) produce somewhat higher values and foresee an annual growth in exports of 2.6 percent, also contemplating a greater growth in container movements (3.2 percent CAGR) than in agri bulks (2.5 percent CAGR).

In the case of containers, the amount of cargo estimated according to these criteria does not imply a level of demand that would saturate current capacity. Although this is valid for the group of ports in the Buenos Aires-Dock Sud zone, it could transpire that some of the terminals would have to give up some of their share. In an optimistic scenario, and assuming equitable growth rates among the different actors, the Port of Buenos Aires would be managing 1.377 million TEUs in 2039, which means barely 177,000 TEUs more than what it was moving in the years 2008, 2010, and 2011 (1.2 million TEUs). The load factor, currently 21 percent, would in this case reach 34 percent, which is within the appropriate range for a container port. Dock Sud would have capacity for growth, but would reach its limit toward 2039, possibly opening up an option for the La Plata port terminal, which is clearly underutilized today. As for the remaining terminals, it is unlikely that they will require increases in capacity, given current low usage levels. However, the growth trend in the size of container carriers at the global level should be taken into account. Even if the yards around ports were able to handle higher future volumes, the maritime spaces of access to the port and at the foot of the dock would need to be conditioned to be able to take the new dimensions of these vessels.

With solid and liquid agri-bulk cargo, current capacity would be able to meet future traffic demands, although it might also reach full occupancy peaks at some port nodes. In weighted terms, a 38 percent growth in agri-bulk volumes can be expected over a 20-year horizon. If this growth percentage is applied to the load factor at the ROSAFE complex, which is 53.4 percent at present, a relatively high value of 74 percent is obtained, which is within its tolerance limit for bulk cargo. Thus, the perception that there is sufficient capacity today, if not slack, is ratified considering the projected distribution of traffic. Other ports on the river coast, such as San Nicolás and Villa Constitución, could take part of the traffic that the ROSAFE port terminals would eventually turn away once it reaches capacity. In any case, experience indicates that private investments in this area generally preceded demand. In fact, the result obtained by the comparison between projections and existing capacity shows that there has even been some overinvestment, despite the significant growth in the volumes handled over the last quarter of a century.

Regarding the scale of vessels dedicated to transporting agri bulks, it is expected that the proportion of Panamax and Supramax vessels served at these ports will increase. Given that most terminals in general already handle these vessels, while none has an access channel (as is the case with container ports), the forecasts envisaged do not condition either the operation or the development of projects designed to improve port facilities. The increase in vessel size could even contribute to improving turnover rates by reducing downtime. This change, which is restricted only to ships transporting solid bulks, is in any case moderate. The restrictions thus appear on the side of the waterway, resulting in a need to expand capacity, which not only refers to depth but also to channel width and geometric corrections. In short,

the idea is to be able to admit larger vessels and enable them to achieve better hold usage while reducing travel times and increasing navigation safety.

The projections for other solid and liquid bulks, vehicles, and other products point to values that are systematically lower than those observed in previous years. Due to this, it is possible to assume that for this kind of cargo it is not strictly necessary to make significant investments in infrastructure. These are mainly ports linked to industrial activities, such as oil refining, petrochemicals, and the steel industry, although multipurpose ports, located both on the inland waterway and on the seacoast, should also be taken into consideration. A change in vessel size corresponding to this traffic is not expected, except in the case of solid bulks, where the numbers of Panamax vessels would see a moderate increase.

Possible demand in the face of a significant expansion in foreign trade

A scenario considering the increase in exports as tantamount to a macroeconomic imperative allows us to visualize a more ambitious demand scenario. Recent studies (Rapetti et al. 2019; Llach and Rozemberg 2019) posit the need for Argentina to develop an aggressive export strategy as a condition for establishing a solid macroeconomy, thus reducing the volatility of its economic cycle and creating employment. These studies also identify the export complexes where such growth could materialize. Those creating the highest expectations are the petrochemical, mining, energy, pharmaceutical, and automotive industries (Llach and Rozemberg 2019). According to this source, exports would have an annual growth rate of around 4 to 5 percent (CAGR), while, presumably, imports would behave in a similar fashion. In 2018, the proportion of Argentine exports originating in the agro industry represented approximately 60 percent of the total. In 2030, in this scenario, this would be 50 percent, due to the higher growth expected in goods produced by other export complexes.

In such a scenario, agri bulks will continue to be very relevant, but the greatest growth is expected to be in the container movement sector. The outlook contemplates the growth in traditional exports of dry and liquid agri bulks, and a greater volume of food products requiring general cargo logistics (which will probably be partially refrigerated) using container terminals. Also envisaged is a growth in container movements for the inflow and outflow of goods related to sectors such as the automotive, metalworking, pharmaceutical, or textile sectors, and an increase in flows related to the production and export of energy, mining, metals (lithium, gold, silver, copper), and petrochemical products (using gas as an input).

A first reflection linking a demand scenario of these characteristics to the river ports seems to suggest that the current capacity of agri-bulk and container terminals would be sufficient in the first years but would require considerable expansion later. Studies of the Port of Buenos Aires (Borrelli and Sánchez 2021) point out that it would be advisable for the new concession to cover only a relatively short time horizon, some 10 years. This would ensure efficient management and provide enough time to evaluate market evolution and propose a comprehensive master plan, which could eventually include far-reaching changes in port organization. For example, these changes could involve the development of satellite terminals associated with the Port of Buenos Aires but located near deep waters.

Regarding the inland waterways, the growth rates contemplated underscore the need to make improvements to the Trunk Inland Waterway in the short term. In this case, both the moderate and aggressive scenarios indicate the advisability of improving current infrastructure, expanding channels, and implementing improvements to enable the access of larger ships and better hold use, leading to time savings and better reliability regarding sailing times. The master plan drawn up should take into account future strategies for the inland waterway in conjunction with those for the ports.

Notes

[i] Accretion or aggradation is the deposition of sediment along rivers due to the decrease in current speed.

[ii] Measured in TEUs transported in 2021, according to Alphaliner. Considering the seven largest companies, the share is as high as 80 percent.

[iii] These are: 2M Alliance (Maersk and MSC), Ocean Alliance (COSCO, OOCL, CMA CGM, and Evergreen), and the Alliance [Hapag-Lloyd, ONE (Ocean Network Express), Yang Ming, and HMM].

[iv] There are currently eight direct deep-sea services operating from Buenos Aires, down from 27 a decade ago.

[v] Larger dry bulk ships are used for iron ore, coal, and bauxite. Grains and their byproducts represent less than 20 percent of the dry bulk transported by sea and are transported by bulk carriers of intermediate size.

[vi] "Longer-term prospects are being reconfigured due to structural megatrends that go beyond the pandemic and its immediate effects." (UNCTAD 2021).

[vii] Recent studies suggest a length of 366 meters and a beam of 52 meters (Borrelli and Sánchez 2021). The vessel design adopted by the Trunk Inland Waterway concession in the 1990s was 230 meters long with a beam of 32 meters.

[viii] These projections were made by AIC, MTBS, and M&L (unpublished).

[ix] Due to the impossibility of discriminating between the types of operation, these values do not include movements associated with transit or transshipment.

[x] An evaluation of these projections points out that: "[T]hey are somewhat pessimistic regarding the drop and subsequent recovery in activity levels, compared with developments in 2020 and 2021; consequently, they should be taken with caution, particularly in the case of containers, since their sensitivity to variations in activity levels is highly pronounced." (Müller and Del Vecchio, unpublished).

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5. CHALLENGES FACING THE SYSTEM

Objectives and Vision

The main objective of the river-sea navigation system in Argentina is to provide the conditions that guarantee the best possible connectivity with world markets and facilitate internal navigation. The focus of a national strategy should be to promote the competitiveness of the national economy, aiming to develop an efficient, clean, and resilient water transport system that allows sustainable development demands to be met and facilitates the deployment of the country's productive capabilities.

The review of the current condition and performance of inland waterways and ports shows that they have provided, in general terms, an adequate performance and have sufficient spare capacity to absorb higher activity levels. Box 5.1 summarizes the evaluation of the performance of ports and inland waterways. The main difficulty facing the system as it looks to the coming years is how to adapt its infrastructure and services to be able to admit and handle larger vessels, in parallel with the adoption of new environmental standards.

The outlook for demand along the inland waterways and river ports appears very uncertain, fluctuating between moderate growth, similar to the average achieved in recent years (in the order of 1.5 percent CAGR), and intense growth accompanying a process of economic recovery (in the order of 4 to 5 percent CAGR). In either scenario, the port system has the capacity to absorb greater cargo volumes: either in the long term (some 20 years) in the first case, or in the shorter term in the second (most likely no less than 10 years). As has been suggested, this could be so as long as the container terminals in the AMBA can improve operability, and adapt to serve larger ships and vessels. Substantial improvements also need to be made to the Trunk Inland Waterway as regards its dimensions and operability. As for agri-bulk terminals, these currently have excess capacity and are able to deploy a rapid response capacity to meet higher demand. The same is generally true for ports exclusively handling vehicles, mining bulks, and hydrocarbons. Regarding the cruise ship segment, the passenger terminal at the Port of Buenos Aires is considered to be the best of its kind throughout South America, enabling it to handle a possible increase in activity (Borrelli and Sánchez 2021).

Given that the tender documents for the concession of the Buenos Aires container port terminals and the Trunk Inland Waterway are in the process of being drawn up, there is a favorable opportunity to develop a comprehensive strategy (for ports and inland waterways) that could contemplate two stages. The first, which has a more limited scope, would maintain the structure of the current system and make some significant improvements to ensure needs can be met over the next 10 to 15 years. The second stage would be the result of strategic planning based on a careful evaluation of future scenarios, which could include, if necessary, certain structural changes to be made to the organization of the system.

BOX 5.1. Summary of the Performance of Inland Waterways and the Port System in Argentina

The management of waterway dredging, and the system of navigational aids have exhibited effective performance. This can be seen not only in the maintenance of the dredging levels committed and in adequate marking, but also in the incorporation of additional capacity commensurate with the increase in traffic volumes, including both the increase in the draft assured and the opening up of the Martin García-Bravo-Guazu-Talavera waterway. Although there are no doubts about the financial sustainability of the dredging and marking scheme associated with the collection of the toll, it would be a good moment to review the conditions of a new concession, given that the current one has expired. What has been stated above also goes for the section running from Confluencia to the Ocean. The remaining waterways, which have been subject to specific and sporadic interventions in the past, are of interest to users based in third countries, but also open up supply and transfer opportunities for Argentina, construing a relevant aspect for the regional agenda for physical integration.

A reasonable operation of the port system is also observed, and the sustainability of the port system may be guaranteed in general terms. Demands are being met in a timely manner, and, except for specific situations, no critical restrictions have been observed. The private sector has been attentive to the need to build capacity, and has managed to mobilize the corresponding resources, which shows that it was willing to invest where deemed necessary. The operation of the ports also shows, in general, appropriate levels of efficiency in handling agri bulks, although it is less competitive in the case of containers, reflected in the long port stay times. For its part, the growth forecast in port movements in

general does not create any imminent need to expand capacity. Container traffic could, however, face some restrictions in the event of a higher growth rate than expected, given the significant degree of elasticity exhibited by this segment in relation to activity levels. In this segment, one of the most important aspects has to do with the risk of the Río de la Plata port complex losing its status as the gateway for Argentine cargo served by direct line services and dropping to the category of feeder. The private ports sector operates in economic/financial conditions that ensure continuity, as they are part of profitable production chains. Terminals under concession for container traffic do not have any structural difficulties, given the considerable volumes they handle, and the same goes for concession terminals dedicated to handling agri bulks. On the other hand, the industrial ports exclusively handling bulks, such as minerals, oil and derivatives, and chemical products, are also viable as they are part of activities producing sufficient profitability in the private sector. State financial assistance is only required for low-traffic public ports.

Over the past decades, however, there were no significant advances in terms of sectoral planning and the development of state capabilities in terms of regulation and oversight. This translated into a lack of adequate control mechanisms and the absence of a strategic framework of reference, not only at the sectoral level, but also from a multimodal and multidisciplinary perspective.

This strategy implies, then, the need for a set of actions considered imperative for deployment in the short term. Considering the current conditions of the system, the major global trends likely to condition its performance, and possible demand scenarios, we have identified the following four priority issues to move toward meeting the objectives proposed.

(1) The Trunk Inland Waterway must be able to offer channels with adequate depth, width, and waiting and maneuvering areas. The improvements made to the Trunk Inland Waterway in recent decades have been essential to accompany the progressive increase in Argentina's foreign trade flows, principally agri bulks, without any major inconvenience. However, it is time to take the next step in terms of improving infrastructure and operating conditions: this includes increasing the draft along the inland waterway, as well as making new crossing sections, changes in alignment and new anchorage areas, among others. This is an essential step, not only with a view to reducing logistic costs by reducing wait times and enabling larger vessels to access the system, as well as more efficient hold usage, but also with a view to seeking to improve navigation safety conditions.

(2) As for the Port of Buenos Aires, Argentina needs a broader vision that goes beyond the Puerto Nuevo terminals. The way in which the country will deal with the movement of containerized cargo in the future must be analyzed and defined, considering the many terminals in the area, as well as eventual new projects, current restrictions (maritime access, maneuvering areas, depths at the foot of the dock, yards, and so on), demand projections, and the trends likely to condition activity. This approach requires decisive leadership on the part of the National Ports Authority, involving all the principal players, and the issue must be tackled together with the definition of the Trunk Inland Waterway concession.

(3) The environmental agenda should be front and center of the ports and waterways strategy. The IMO is setting higher standards in environmental matters (particularly regarding the reduction of GHGs), and international trade and transport players are increasingly committed to clean transport strategies (net zero). The transformation toward clean transport will play a key role as a competitiveness factor. On the other hand, Argentina has assumed international commitments regarding transport decarbonization, and in this context there is the potential to offset emissions by promoting the inland waterway and maritime transport system. It is also clear that there is a need to adopt measures to adapt to the effects of climate change in order to mitigate the specific vulnerabilities affecting different infrastructures.

(4) The port system and inland waterways must coordinate their actions with other modes of land transport, and with the urban environment. A sustainable development strategy for the sector must take into account the multiple interactions and frictions arising in the context of the port-city relationship. This means considering the role played by the port in the urban environment, as in many cases, mostly in the large metropolises, such as Buenos Aires and Rosario, this tends to be seen more as a point of conflict than as a driving force for activity. In this context, there are also issues related to land transport modes, where problems mostly tend to be associated with road and rail access, as well as the need to rethink the current set-up of the transport grid which is heavily biased in favor of road transport.

Sectoral Imperatives

The concession of the Trunk Inland Waterway

The Trunk Inland Waterway dredging and marking concession, financed by tolls, has been generally successful, and it is recommended that it be replicated between Confluencia and the Atlantic Ocean, including the Bravo-Guazu-Talavera system. In this sense, the experience allows us to add certain aspects that could be improved to the agenda:

- The first is the need to have an explicit body in charge of monitoring and auditing all issues related to the development of the Trunk Inland Waterway concession. This body should be able to provide arbitration in the event of a dispute between the concessionaire and the user, and oversee the gathering, systematizing, and publicizing the information about the traffic and the execution of services, such as vessel movement, courses, bathymetry, financial economic indices, and so on. This would undoubtedly contribute to more effective public management. The recently created National Entity for the Control and Management of the Inland Waterways is an encouraging step in this direction.
- Next, it is worth asking how advisable it is for the concessionaire to assume demand risk. The evolution of the previous concession was closely linked to the significant rise in agricultural exports, but this phenomenon will probably not be repeated in the future, at least not to this degree. Consequently, the solution adopted for the Martín García Canal concession should be considered as an alternative. This involves a collection system aimed principally at the certification of works and compliance with navigation conditions, rather than at actual traffic. The reduction in demand risk could reduce the discount rate that a potential bidder would adopt when making their offer, meaning a lower toll value. The adoption of a revenue-sharing model should be analyzed within this framework.
- Along the same lines, it would be convenient to carry out an in-depth evaluation to optimally structure the future concession. Among the main issues to be analyzed is the determination of the toll structure and its effect on competitiveness, checking the service unit on which tariffs are applied, the type of vessel (for example, container ships, agri-bulk, ro-ro, cruise ships), the way in which distance is measured, and other factors aiming to prevent distortions and cross-subsidies (the current system of tariffs by NRT, vessel design draft and sections traveled, does not necessarily represent the proportional effort of dredging and marking).
- Finally, it should be noted that it is vital for the ensuing set-up to be able to guarantee its ability to be self-financing, without the need for state subsidies. It must also be able to ensure the execution of a series of works considered economically justified, requiring the concessionaire to comply with the conditions regarding draft and the availability of crossing areas. The concession period should not exceed the time required to permit the strict recovery of the investment works in order to pave the way for a new program of works within the framework of a future new concession.

The new concession must tackle the reasons for current bottlenecks in the inland waterway. Two basic types of interventions have been identified accordingly: deepening the navigation channel to allow for a better use of vessel design draft, and geometric corrections, meaning straightening out curves and bends, and extending crossing or waiting areas, to facilitate navigation, especially crossing between vessels. These works do not present any obvious dimension and their design essentially depends on the cost-benefit ratio associated with each alternative. Additionally, whatever is determined must comply with environmental and safety criteria. Among the various projects and courses of action identified, the following stand out:

- First, deepening of the navigation channel, from its current 34 feet to 36 feet, for the sections between Timbues and the Atlantic Ocean. The analysis carried out by S&A S.A. and RH DHV (unpublished) is unequivocal as to the desirability of this intervention, in terms of a cost-benefit approach (see table 5.1), although the results should be taken with caution, as they are highly vulnerable to changes in certain variables taken into consideration in the evaluation (demand projections and vessel types, for instance). Independently, the same source concludes that advancing to greater depths, such as 38 or 40 feet, is not viable in economic terms.[i] At all events, the environmental impacts of dredging should be carefully monitored.
- Second, evaluating the possibility of widening certain passages in the channels of the Río de la Plata in order to make it safer and reduce delays. S&A S.A. and RH DHV (unpublished) Identifies six stretches which could become new crossing zones in the Punta Indio Canal (kilometer 182.7–194.4 and 124–130), Access channel (kilometer 16–20 and 13.2–12.4), and Emilio Mitre Canal (kilometer 25–28.5 and 40.5–42.5).
- Third, modernizing traffic management and implementing technology enabling greater safety and efficiency in navigation, such as own communications system, digital

TABLE 5.1. Trunk Inland Waterway Timbues-Ocean Project to Deepen the Waterway Channel to 36 Feet

Sector		Value	Measurement Unit
Volume of material to be removed	Investment	20.7	Millions of m^3
	Operation (annual average)	42.1	
Current value of investment		94.4	Millions of US$
Present value of recurring costs		487.5	
Present value of benefits		1,106.1	
Net present value		524.1	
Internal rate of return		56.4	%

Source: Elaboration based on S&A S.A. and RH DHV (unpublished).
Note: Discount rate adopted = 12 percent.

charts, a system that can be operated using the available bathymetric data, and water depths and river levels. At the same time, public registries must be set up to enable the system's performance to be evaluated with reference to information about the natural features of the waterway, vessels, routes, cargoes, delays, tidal management, and so on.[ii] One alternative to be considered is the implementation of slot allocation systems, which could provide greater predictability for users and reduce wait times.[iii]

- Finally, for the Timbúes-Santa Fe stretch, it is suggested that the waterway features be left in their natural condition, around 22 to 25 feet, as there is no significant cargo in this sector to warrant deepening of the channel. In the case of the Santa Fe-Confluencia section, the recommendation is to continue managing the watercourse based solely on the adjustment of the nautical marking system, as has been the case up to now. Although performing systematic dredging does not seem advisable, it would make sense to monitor the navigation channel.

The Port of Buenos Aires

In general terms, experience would seem to indicate that it is advisable to maintain the basic guidelines that have governed the operation of the port system over the last two decades. This refers particularly to the space granted to private sector initiatives in building capacity, managing operations, and the freedom to set rates. Given that the environment of free contracting of port services has been shown to be generally effective, the proposal is to continue with this modality in the future; this requires state capacities to deal with eventual anti-competitive actions or abuses of a dominant position. In the case of terminals dedicated to providing services to third parties, it is necessary to prevent discriminatory practices, particularly in the case of vertical integration between shipping operators and port terminals.

It is important to ensure that both public and private decisions have a reference framework. Beyond the competences assigned by current legislation to each jurisdiction, the National State, in dialogue with other members of the National Port Council (Consejo Nacional Portuario) and sectoral actors the National Port Council, should be responsible for drawing up and updating this reference framework, with an emphasis on the long term. This may include, among others, cargo demand projections and ship movements, mentions of critical points, projects in the pipeline, and sectoral policy recommendations formulated by the various actors.

The design of a national strategy is particularly relevant in the case of the Port of Buenos Aires. It is essential to adopt a systemic and strategic vision regarding the role to be played by the ports of the Río de la Plata regarding container traffic, considering not only local but also regional and global competition. The possibility of losing the opportunity to provide deep-sea services for regular lines, and the consequent conversion into a feeder terminal of some other regional port, presents an almost certain risk, with the potential to negatively affect Argentine trade. Various studies emphasize the relationship between connectivity and trade; Fugazza and Hoffmann (2017) conclude that the lack of direct maritime connectivity with a trading partner can be associated with a lower value in bilateral trade. Adding a transshipment would imply a 40 percent drop in the value of trade and, conversely, this would be 5 percent higher if there were an additional direct destination. The same source claims that a 1,000 TEU increase in the largest vessel operating a sea route is associated with a 1 percent increase in the value of trade.

Renewing the concessions of the container terminals in the Port of Buenos Aires offers the opportunity to review conditions

and thus correct any shortcomings. On the one hand, the different terminals need to improve their performance. This means that it would be advisable to proceed to identify those factors responsible for the subpar performance of container ports compared with international standards. It is essentially a matter of determining whether this is merely an effect of scale, or whether performance can be improved by making economically justifiable additional investments in equipment or in the review of practices. If appropriate, new concessions may include incentives that reward increases in efficiency based on reducing vessel port-stay times.

Consideration should be given to the capacity expansions required to serve larger vessels. This statement is valid both for the port infrastructure, mainly regarding dock dimensions, as well as for maritime access. As mentioned above, this aspect must be articulated with the technical definitions of the new Trunk Inland Waterway concession, particularly with respect to the standards and characteristics adopted for the navigation channels of the Río de la Plata.

The definition of the future of the Port of Buenos Aires must be considered a matter of strategic public policy, at the state level. As this decision envisages a temporal scope of several decades, it should be framed in a progressive and clear plan. In this framework, it seems advisable to split up the actions as proposed by Borrelli and Sánchez (2021), including a first transition stage defining the main conditions for decision-making, such as the depth of the Trunk Inland Waterway and the adoption of a new design vessel. These conditions should also envisage the possibility of analyzing market behavior as well as the evolution of the port system and regional maritime traffic over time. This would be the basis for a proposal envisioning a long-term horizon as befits the typical port scenario in terms of planning. Both stages must be conceived of as parts of a single plan, which requires both coherence and political support.

Finally, container port traffic presents long-term challenges that deserve detailed treatment. Although current facilities can handle the demand expected in the coming years, the surrounding urban insertion areas do not allow for any substantial expansion in capacity. In short, it is necessary to consider a new port enclave, which will have to be developed in a space and time to be defined. The complexity of this issue, which also includes the question of the possible urban use of land currently dedicated to port use, and its crucial importance for the economy as a whole, call for leadership by the National State. This is one of the most important topics on the sectoral agenda.

The link with the environmental agenda

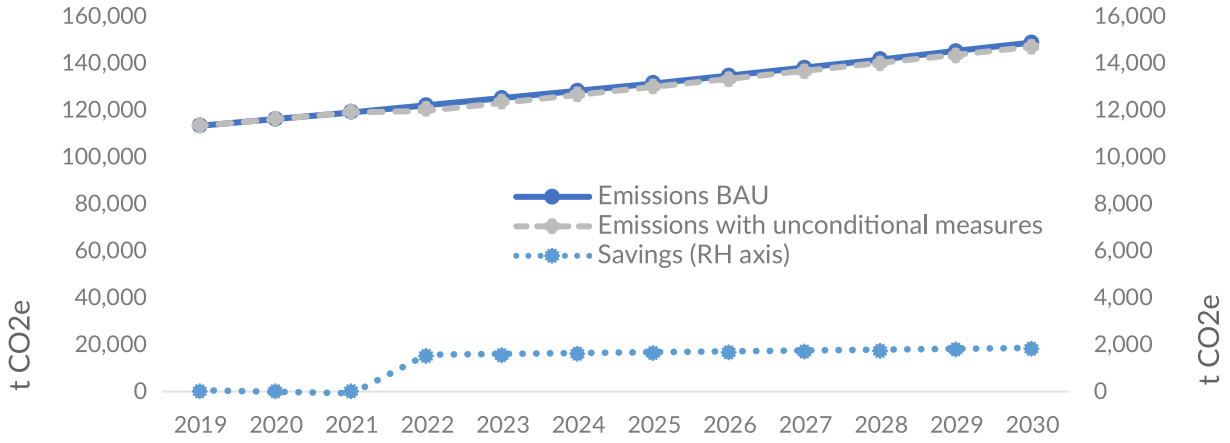
The transport sector is responsible for 14 percent of Argentina's carbon dioxide (CO2) emissions. In absolute terms, this comes to 51 million tons of carbon dioxide equivalent of annual emissions (tCO2e) estimated for the year 2018, out of a total of 366 million tCO2e, considering all sectors of the economy.[iv] More than 90 percent of these emissions come from road transport activities, and most of these are produced by trucks. River and maritime transport accounts for barely 2 percent of these emissions. Considering that the national inventory does not include emissions associated with international aviation and navigation, this value is related to the sector's low share in the country's internal transport matrix.[v]

The decarbonization of the sector is one of the objectives included in Argentina's Nationally Determined Contribution (NDC). The strategies to achieve this are established in the National Action Plan for Transport and Climate Change (Plan de Acción Nacional de Transporte y Cambio Climático; PANTyCC). In the plan's 2019 version, there was only one mitigation measure directly linked to the port and waterways sector: the deepening of the Trunk Inland Waterway to 36 feet. This measure provides for "the greater use of the hold capacity of vessels whose design draft exceeds 34 feet and, as a result, a reduction in the number of trips required to transport merchandise, with the consequent decrease in the use of fossil fuels" (Gabinete Nacional de Cambio Climático, 2019). Figure 5.1 illustrates the estimated impact associated with the implementation of the measure: as regards the BAU scenario, where there is no change, there would be savings of 1,810 tCO2e by 2030, representing 0.019 percent of the total estimated savings for the transport sector in that year.

The main bodies governing maritime activity at global level and the principal private sector actors have expressed their commitment to the decarbonization of water transport. The IMO has established more exacting standards for shipping in terms of GHG emissions (a reduction by 2050 of up to 70 percent of emissions compared with a 2008 baseline) and, accordingly, the industry in general (shippers, shipping companies, ports, and dredging companies) has adopted decarbonization strategies. This means that public policies are bound to address these trends, for example, regarding the conditions established for port and waterways concessions.

River-sea transport presents undoubted environmental advantages over other transport modes, in particular road. These advantages translate into a lower energy cost per ton-kilometer transported and lower emissions of atmospheric

FIGURE 5.1. Impact of Deepening the Trunk Inland Waterway on GHG Emissions and Emissions Reduction (in tCO2e)



Source: Gabinete Nacional de Cambio Climático 2019.

pollutants. In terms of energy consumed, a recent analysis (GFA/FB/EQO, 2019) has determined that water transport in Argentina requires 0.0027 ton of oil equivalent/ton-kilometer (toe/tkm), compared to 0.0088 toe/ton-km in the case of rail and 0.0275 toe/ton-km for motor transport. This makes water transport an interesting tool for decarbonization strategies. Thus, one of the unexplored potential areas in the PANTyCC consists of capturing flows currently using other modes.

There is potential for a greater share of water transport in the modal distribution of traffic in Argentina. There are three cases of traffic types of relative magnitude that could be shifted from road to river-sea transport (AIC, MTBS, and M&L, unpublished): (1) agri-bulk flows originating in the north of the country, bound for the ROSAFE ports; (2) the movement of regional products and general cargo between the north of the country and the river coast (ROSAFE-AMBA); and (3) the movement of general cargo between the AMBA and the Patagonian seacoast. Box 5.2 details the potential of each one of these. The results should be interpreted with caution as, although there are grounds for such a projection given the lower cost of water transport, it is worth asking why this kind of shift has never taken place. The possible reasons for this could be the concentration in the supply of capacity in seagoing transport, leading to the possibility that rates do not fully reflect the difference in costs, compared with a far more fragmented offer of automotive transport. Likewise, in the case of industrialized products, the low incidence of transport costs on the value of what is being transported may encourage shippers to prioritize other aspects, typically, the greater predictability of road transport. Other factors may also have an influence, such as the bureaucracy required by domestic navigation, together with other regulatory requirements set by different control bodies.

Achieving this shift as proposed under the most optimistic scenarios could represent approximately 3.5 million tons, 0.6 percent of domestic cargo movements in Argentina.[vi] Although it appears to be a relatively low value, it would imply a 21 percent increase in river-sea domestic freight transport. In terms of emissions, a preliminary estimate suggests annual savings of some 265,000 tCO2e;[vii] that is, 2.8 percent of the savings generated by all the mitigation measures included in the PANTyCC for the year 2030. There do not appear to be any other sources for a traffic shift of a magnitude comparable to those discussed here.

The development of adaptation policies is particularly relevant in the context of the possible impacts of climate change. Linked to this, projected dredging efforts, as well as other infrastructure investments, need to take into account potential environmental impacts, such as shallower waterways, increased sediment flow, and extreme weather events (ITF 2020). Along the same lines, and given Argentina's specific vulnerabilities, Segunda Contribución Determinada a Nivel Nacional de la República Argentina (Second Nationally Determined Contribution of the Republic of Argentina) incorporates as one of its national adaptation measures the "development of sustainable and climate-resilient river and sea transport infrastructure" (MAyDS 2020). This measure seeks to contribute to safety for navigation, given the high frequency of heavy rainfall and flooding increasing water flows in the waterways, as well the drought events and fall in average water flows in rivers making up the Río de la Plata Basin.

BOX 5.2. Potential for Shifting Road Traffic to River-Sea Transport

Flows of agri bulks originating in the north of Argentina destined for the ROSAFE ports. Three areas producing traffic in agri bulks have been identified, depending on the location of the production areas: the center-east of the Province of Chaco, the east of Salta, and the north of Santiago del Estero. This produce is bound for the ROSAFE area, involving the use of the Port of Barranqueras (Chaco) as a transfer point, thus combining land transport and river transport. The costs corresponding to an alternative for using only land transport and land-river transport, which are of a similar order, were estimated, and a simple probabilistic modal allocation model was applied, yielding a possible shift of 53 percent of the cargo. This is equivalent to 2.3 million tons/year, according to the calculation of existing flows arising from the cargo origin-destination matrix estimated by the Ministry of Transport (DNPTCyL 2019).

The movement of regional products and general cargo between the north of the country and the river coast (ROSAFE-AMBA). In this case, the same areas of northern Argentina were considered, and at the other end, the ROSAFE-AMBA coastal strip. Applying the same methodology, it was estimated that 500,000 tons per year of regional products and general cargo traffic could be shifted. Once again, the Port of Barranqueras could operate as the point of transfer. If both flows considered are taken together, this means that potential traffic of 2.8 million tons could be achieved for this port node. It should be noted that the private cost differentials between the different alternatives are not very significant, so this port will have become more competitive to absorb this potential traffic. Additionally, it should be remembered that the hold offer for river domestic navigation is currently very scarce, and this is a decisive factor in terms of achieving the estimates set out here.

General cargo movements between the AMBA and Patagonian seacoast. The two main pairs for general cargo have been taken into consideration: Buenos Aires-Puerto Madryn and Buenos Aires-Ushuaia. These already present a 36 percent share of water transport on average—approximately 79,000 TEUs per year—although this figure is not particularly high if the significant distances involved are considered. According to different sources, there is the potential to shift away from the road mode that would allow for an increase in the share of the river-sea mode of between 54 to 66 percent, in line with different scenarios. This translates into an additional 41,000 to 66,000 TEUs per year.

The link with other modes and the urban environment

Ports frequently constitute territorial areas of high-density land use, which can establish either virtuous or conflictive relationships with their surroundings. In many cases, port facilities are drivers of local development, creating quality jobs and demand for inputs and services. This is the case of port facilities such as Bahía Blanca and Quequén, as well as smaller ones like Madryn, Ushuaia, and Zarate. In certain cases—in line with what tends to happen in other regions—port interests clash with urban development, insofar as they occupy areas susceptible to urban uses of value. This has been observed in the port areas in the cities of Buenos Aires and Rosario where decisions taken involve decommissioning units located in areas offering more efficient and profitable uses. In the case of the City of Buenos Aires (Ciudad Autónoma de Buenos Aires; CABA), given that it has no jurisdiction over the Port of Buenos Aires, the incentives for meeting its demands are limited, but it could focus more on using part of the port land for urban development (Merk 2018).

The eventual decommissioning of port land to free it up for urban use is a relevant issue, which relates port activity to its surroundings. This issue has been raised with regard to the Ports of Buenos Aires and Rosario, but it is likely to come up in other cities as well. It is recommended that both urban and economic aspects be considered in its treatment. In particular, it is worth recommending that the value of the freed-up land justify the cost of any displacement of port activities. Likewise, this process must be implemented with due care so as not to affect the efficiency of port activities during the transition phase. It should also be seen to what extent the facilities associated with port activity—typically, railway yards—justify a relocation on their own, without affecting port activity itself.

Achieving a harmonious relationship between the port and the surrounding urban area is an unavoidable condition for achieving a sustainable port system. A central aspect here is the accessibility and circulation associated with port movements. In this sense, the situation regarding land accesses is uneven. According to AIC, MTBS, and M&L (unpublished), the Port of Buenos Aires has adequate road and rail access, as the road network has been substantially improved due to recent works;[viii] but the other container terminals lying between Zarate and La Plata require improvements, a need particularly visible in La Plata.

Land access to the port areas dedicated to agri bulks in the Greater Rosario area presents significant restrictions, although there have been considerable improvements. The endless lines of trucks waiting on the side of the road to enter the different ports in the area are no longer as common as they were, thanks mainly to the implementation of a shift assignment system,[ix] and the creation of waiting areas. At all events, the situation is far from optimal, considering the area receives approximately 2 million trucks per year.[x] This prompts the need to review current land traffic distribution, strongly biased in favor of motor vehicles (85 percent of land transport flows). An eventual redistribution in favor of the railway mode will require access works and the readjustment of existing railway lines running through the urban area, beyond the necessary systemic interventions to foster a greater capture of traffic. There would also be a need to develop network infrastructure, yards, rolling stock, and equipment, and improve operational and management structures, among other aspects.[xi]

The set of public and private entities involved in port matters interacts today at various levels. This happens both within the framework of institutions (typically, management consortiums) or in negotiations related to specific issues (projects for land access to ports, for example). Where there are no entities able to foster stable links between the actors in a port environment, it would be advisable to create them. They should incorporate local councils, essentially for matters related to the port-city interface, and deal with environmental aspects and accessibility to the port area from the surrounding urban areas. This could also be a forum to discuss projects to free up land for port use, if necessary.

Obstacles to Be Overcome

The sustainable development of the transport sector faces various institutional shortcomings that act as a brake. A recent analysis of the 2002–15 period (Barbero 2019) concluded that the main reason for the lag in the transport sector in Argentina are questions of an institutional nature. Furthermore, beyond some partial progress, it can be affirmed that this situation is essentially the same today. The point is that this is not necessarily a question of a lack of resources, but one of institutional organization and decision-making mechanisms that fail to direct efforts and resources adequately. Consequently, weak institutional performance is a factor underlying the other weaknesses inherent to the system. Among other characteristics, the following stand out: the dispersion in approaching the sector mode by mode, without a holistic and integrated vision; the lack of strategic policies and plans that generate isolated and even conflicting initiatives; the vertical and horizontal institutional tensions that make difficult the adoption of coordinated actions; and the de-professionalization of the governmental levels that imply a weakening of the state's capacities.

The treatment of the transport sector lacks an integrated approach that is able to incorporate the interrelationships and complementarities between different modes. Treating each mode in isolation has not been the result of proactive and integrative analyses, but rather a reflection of partial and reactive responses that follow on from each other in linear fashion, leading to a labyrinthine network of institutions and rules (Barbero and Bertranou 2015). Although the specific regulation of each mode should be carried out in granular form, as each has its own particularities, this task should be approached in the context of a framework of global policies for the sector as a whole. In this context, the most critical aspects for the implementation of an integrated freight transport and logistic strategy are political support and the organizational scheme, as well as the capabilities in the government areas responsible for planning, implementation, and monitoring (Barbero, unpublished).

Similarly, there is a persistent lack of plans to guide sectoral policies. Over the years, various initiatives have emerged in the search to consolidate a strategic vision for the water transport system; however, planning by the national state has encountered several limitations that have hindered the development of a comprehensive plan that is able to coordinate the actions of the multiple players involved. Although studies have been carried out and documents published that formulate guidelines,[xii] these have not been translated into concrete plans. This deficit is not exclusive to the water model, it is a feature of the transport sector in general.

Closely linked with the issues mentioned above is a set of vertical and horizontal institutional tensions. According to

García (2019), the **vertical tensions** refer to the overlapping of powers between different levels of government, often associated with the presence of conflicting objectives. The national government's capacity to develop an overarching vision for the port area is limited because this is a space for direct action by subnational governments and the private sector, whose interests do not necessarily coincide. One example previously given is that of the extant difficulties related to the planning of the port system on the Río de la Plata, mainly Buenos Aires and Dock Sud, which, although they share areas of influence, correspond to different port jurisdictions and thus compete against each other. The promotion of institutional spaces for articulation, such as the Federal Port Council, may be a way to improve coordination between different actors. The **horizontal tensions** refer, on the one hand, to the multiplicity of functions and overlapping powers of the various organizations involved in transport at the national level. This often translates into a lack of coordination and coherence, both internally and in the relationship with other sectors (energy, environment, production, and so on). Furthermore, the trade-off between the priorities of short-term government administration and long-term planning throws into relief the limited visions and political manipulation of the transport sector, which leads to fragmented and casuistic treatments, undermining any capacity for action (Barbero and Bertranou 2015).

The de-professionalization of government bodies conditions the quality of decision-making. This is a decades-long process, beyond some sporadic and partial attempts to reverse the situation and is one that has led to a persistent weakening of state faculties. On the one hand, the existence of different modalities regarding the occupation of strategic management positions in the state, implying that they are vulnerable to being commandeered by representatives with sectoral interests, have limited the state's independence and ability to develop a comprehensive perspective. On the other hand, the professional and technical cadres in government have either been thinned out or marginalized from the decision-making process, resulting in limited availability of qualified human resources.

Policies and projects are usually defined without the proper technical foundations. It is common for various interested parties to propose interventions classified as "indispensable," but which in fact lack the proper analysis required to support that assessment. In general terms, this usually concerns works that are not inherently necessary in terms of size or relevance, and their design and convenience depend largely on an economic equation between the corresponding costs and benefits, while considering the corresponding impacts, which are mainly environmental. This is valid both for interventions in port areas, as well as in the Trunk Inland Waterway and other sectors of the network. One example that has recently come up in public discussion is the Magdalena Canal project, which may benefit certain activity segments but lacks the evaluation required to justify its current relevance (see box 5.3). Ultimately, it is a question of complying with the requirements established by the National Public Investment System, which also contemplates an ex post evaluation of the investment projects, including a weighting of any deviations with respect to ex ante forecasts, and their interpretation. However, this is an exercise that is seldom carried out but is essential to verify compliance with the project's objectives and contribute to more effective investment decisions based on evidence.

In addition to issues of an institutional nature, there are other conditioning factors of a normative and regulatory nature. Far from claiming to provide an exhaustive analysis of the issue, there are two specific situations that illustrate some of the effects created by the legal frameworks governing the sector:

- First, although the virtues of a greater development of river and sea modes for cabotage transport were mentioned, this is in fact conditioned by the almost nonexistence of a national flag merchant navy. There are many factors explaining the crisis, which has been affecting the sector for decades, but the main reason is linked to the asymmetries inherent to the tax, administrative, and labor regimes of each country, prompting local shipowners to choose "flags of convenience" that imply lower costs.
- Second, there are specific features in the regulations governing control organisms, beyond the impact of their general performance in terms of trade facilitation, which encourage undesirable practices. One case is that of the Customs Service, which considers cargo as exported only when it has arrived at the last Argentine port before being shipped abroad, rather than at the time of shipment in a feeder. Given that postponing the drawing up of formal export documents leads to delays in collections and uncertainty when it comes to transferring responsibilities, shippers from the interior of the country are discouraged from choosing the ports on the Río de la Plata for transshipments, opting in those cases for ports in Uruguay or Brazil (Borrelli and Sánchez 2021).

BOX 5.3. Magdalena Canal Project

The Argentine state has announced its intention to move ahead with a project called the Magdalena Canal and has set up the Special "Magdalena Canal" Temporary Executory Unit within the Ministry of Transport,[a] responsible for assisting and advising on everything related to the tendering process for this work. This project involves the construction, maintenance, and signaling for a navigation channel in the Río de la Plata, starting from a point called Codillo, located on Par 30 of the Punta Indio Canal, heading southeast toward a point with oceanic depth (see figure B5.3.1). The project presents a number of potential benefits associated, mainly, with the decongestion of the Punta Indio Canal and shorter navigation times due to the reduction of distances for traffic traveling between the Trunk Inland Waterway and the seacoast. This applies to cabotage transport and ships that cannot leave the Paraná River with a full hold and have to complete their hold in Bahía Blanca or Quequén.

However, the absence of elements enabling an accurate judgment to be formed about the convenience of this undertaking is striking. Specifically, this should involve a socioeconomic evaluation able to weigh the benefits against the investment and maintenance costs, taking into account its environmental impacts and any others that the project could create.[b]

FIGURE B.5.3.1. Canal Magdalena: Approximate Location of the Project

Source: AGP S.E.

[a] *MTR Resolution N°33/2021.*

[b] *In 2015, a financial study of the project was carried out, although this focused on its use as an alternative to the Punta Indio Canal. It is not known whether there are economic studies that contemplate both channels operating simultaneously.*

In conclusion, a review of the actions to be taken suggests that the main obstacles to progress lie in institutional problems more than in any other field. The difficulties in attracting international investors for projects such as port or dredging concessions should also be considered, taking into account Argentina's macroeconomic framework. However, the fact that these are sectors serving international clients, where rates are mostly charged in US dollars, could probably enable such difficulties to be overcome. It is also worth noting possible environmental obstacles, particularly as regards the deepening of the Trunk Navigable Waterway, which require the preparation of detailed impact studies before moving forward with the bidding process.

Notes

[i] However, it is understood that given the lack of an extensive hydro-sedimentological study, at present there are no precise indications about the volumes of maintenance dredging. The suggestion is to execute these studies accompanied by sedimentation control tests in the years following the deepening from 34 to 36 feet.

[ii] This will make it possible to broaden the spectrum of proposals for intervention, attracting more parties interested in bidding for works or concessions, and enabling them to draw up offers with greater foundation, avoiding any informational asymmetry in favor of the incumbent.

[iii] The slot system could, if appropriate, be linked into a series of priority tolls which would have to be legally validated.

[iv] According to the National Inventory of Greenhouse Gases – INGEI – 2018 (MAyDS 2021).

[v] See figure 1.1.

[vi] Data from 2019, including pipeline transportation (Barbero, Sicra, and Millan, unpublished).

[vii] Considering emission factors used in Gabinete Nacional de Cambio Climático (2019) and estimated energy consumption in GFA/FB/EQO (2019).

[viii] The so-called Paseo del Bajo is a highway running through the City of Buenos Aires, linking the northern port area with the logistic centers located in the south as well as with the urban highway network. Its use is restricted to heavy vehicles (trucks and buses). This work has alleviated the severe congestion that previously affected the area.

[ix] The Shift System for Unloading in Ports (Sistema de Turnos Obligatorios de Descarga en Puertos; STOP) was created in 2017 (Resolution SGT-MTR 25-E/2017).

[x] Average for the 2019–20 period, according to estimates by the Rosario Stock Exchange (Calzada, J.; Sesé, A.; Ybañez, P., 2021).

[xi] The recent construction of rail access to the Timbúes terminals north of Rosario, which was the result of public-private collaboration, has had a major impact, enabling the expansion of this mode of transport and reducing the costs involved in transporting grain from distant productive regions to the port. (Rosario Stock Exchange, information bulletin of November 19, 2021).

[xii] One of the latest initiatives, although not specific to the water transport sector, is the Federal Strategic Plan for Transport, Mobility and Logistics of the Argentine Republic (Plan Federal Estratégico de Transporte, Movilidad y Logística de la República Argentina; PFETRA), drawn up by the Argentine Transport Institute in 2015.

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6. LESSONS LEARNED

The review of the material collected and the analysis carried out throughout this report allows us to formulate, beyond the particular recommendations included in the previous chapter, a series of general learnings. These form a reference framework to be considered during the process of defining the main issues affecting waterborne transport in Argentina.

(1) **The disadvantages arising from the lack of adequate institutional order.** Institutional weaknesses can be seen in a varied set of situations leading to inadequate decision-making processes when directing efforts and resources, preventing the sector from maximizing its potential.

(2) **The need for a long-term vision**, a dynamic strategic framework enshrining the guiding principles for the activity and the policy guidelines orienting the particular actions of the different parties involved, establishing an appropriate overview of the sector's evolution as well as of international trends and technological advances. It is essential to achieve a vision shared by all actors, as this will not only facilitate future decisions but also enrich dialogue.

(3) **The need for planning to integrate ports and waterways together (rather than as separate areas).** Both segments are closely linked and create conditions of impulse and restriction whose consequences have reciprocal effects. The same is true for the relationship with land transport modes, both road and rail, which should be developed together, based on a multimodal and multidisciplinary perspective.

(4) **The relevance of linking ports with the urban environment,** where the traditional relationship between port and city is giving way to a series of tensions and conflicts that prevent a healthy articulation (especially in large urban centers). This makes it necessary to devise integration models that are able to enhance synergies between the two, a sine qua non for achieving a sustainable system.

(5) **The need for decision-making in the public sector to be well founded and based on data, and adequate evaluation and planning instruments.** Decision-making should follow a process that is able to unequivocally confirm the relevance of each action, supported by technical studies and evidence, using the best available practices (cost-benefit analysis, multivariate analysis, strategic environmental assessments, environmental impact assessments, and so on).

(6) **The need to link national planning with regional integration strategies,** such as production, logistics, and environmental planning, ensuring that the ports and inland waterways system have broader scope, beyond the purely local, where the actions and needs of neighboring countries play a decisive role in sectoral dynamics at the national level.

(7) **The global nature of the shipping agenda.** The prevailing uncertainty in the face of the many coexisting and connected trends embracing technology, the markets, and environmental imperatives imply that public policies must take into account external variables that are beyond their control and require well-grounded, reflexive decision-making processes that adequately assess risks and uncertainties.

(8) **The growing importance of the role played by the environmental agenda** in projects, cargo logistics operations, and as it applies throughout the management of the supply chain, including end-consumer preferences, translates into significant challenges of adaptation for the sector.

(9) **The need for and desirability of coordination between the main actors** in terms of the design and management of successful projects. This refers to coordination between levels of government in the public sector, and between them and private actors. The implementation of the different courses of action affecting this sector requires the definition of levels of institutional responsibility and adequate management instruments.

(10) **The potential of private sector administration and management in the maritime port sector** in the context of well-designed PPP projects. The private sector, as the majority operator in the different components of the system, generally exhibits a good performance, including capacity building and the ability to mobilize the necessary resources.

APPENDIX

TABLE A.1. Containerized Cargo Movements by Zone and Port (in Thousands of TEUs)

Zone-Port/Terminal	2014	2015	2016	2017	2018	2019	2020
Trunk Inland Waterway upstream of Santa Fe	**1.7**	**0.8**	**0.5**	**2.2**	**1.7**	**0.0**	
Corrientes	1.7	0.8	0.4	2.2	1.7	0.0	
Formosa			0.1				
Santa Fe-Ocean Trunk Inland Waterway	**1,544.4**	**1,554.8**	**1,487.3**	**1,556.6**	**1,741.0**	**1,536.9**	**1,647.0**
Buenos Aires	997.7	965.2	862.1	844.9	967.9	849.5	913.7
Exolgan	382.0	418.6	443.5	526.3	570.2	495.6	583.1
Zarate Terminal	129.3	125.4	122.9	117.8	129.2	142.4	112.0
Rosario-ENAPRO Docks	27.1	31.6	57.9	66.5	71.5	42.5	31.1
Molca	6.8	9.5	0.1	0.1	0.5	2.9	0.2
La Plata		2.6				2.8	4.6
Euroamerica		0.3	0.0		0.8	1.1	2.3
San Pedro	0.5	1.5		1.1	0.8		
Santa Fe	0.9		0.9				
Uruguay River			**0.1**	**0.4**			
Concepción del Uruguay			0.1	0.4			
Buenos Aires seacoast	**29.7**	**25.9**	**41.0**	**36.6**	**43.3**	**31.3**	**27.7**
Bahía Blanca	29.7	23.4	34.0	28.4	32.4	25.6	22.3
Mar del Plata		2.5	7.0	8.2	10.8	5.8	5.4
Patagonian seacoast	**123.8**	**119.1**	**122.0**	**129.9**	**127.2**	**63.1**	**68.3**
Ushuaia	63.2	66.0	61.1	53.3	58.3	3.9	
Madryn	31.3	25.5	27.8	30.6	22.4	18.5	28.3
San Antonio Este	22.7	17.8	24.9	25.0	28.8	22.1	27.4
Deseado	6.6	9.7	8.2	21.0	17.7	18.5	12.6
General total	***1,699.5***	***1,700.6***	***1,650.9***	***1,725.6***	***1,913.2***	***1,631.4***	***1,743.0***

Source: Elaboration based on Ministerio de Transporte, Argentina, "Puertos, Vías Navegables y Marina Mercante," (accessed January 2022), https://www.argentina.gob.ar/transporte/puertos-vias-navegables-y-marina-mercante.

TABLE A.2. Movements of Non-Containerized Cargo by Zone and Port (in Tons)

Zone-Port/Terminal	2014	2015	2016	2017	2018	2019	2020
Trunk Inland Waterway upstream of Santa Fe	**1.29**	**1.37**	**1.60**	**1.75**	**1.56**	**0.96**	**0.41**
Barranqueras-YPF Pier	0.72	0.72	0.62	0.70	0.65	0.31	0.10
ACA (Vilelas)	0.18	0.16	0.15	0.24	0.20	0.13	0.08
Barranqueras-Provincial Pier	0.00	0.02	0.29	0.21	0.31	0.17	
Barranqueras-Elevator Pier	0.11	0.13	0.25	0.27	0.14		
Shell (Vilelas)	0.12	0.16	0.17	0.16	0.14	0.10	0.00
Coop. Agr. La Paz	0.10	0.10	0.09	0.10	0.07	0.14	0.14
Mana Puerto Buey	0.03	0.03	0.03	0.04	0.02	0.05	0.04
La Paz-Marquez	0.02	0.02	0.01	0.03	0.01	0.06	0.03
Piedras Blancas	0.03	0.03			0.01	0.00	0.01
Santa Fe-Ocean Trunk Inland Waterway	**109.94**	**121.71**	**120.13**	**121.42**	**107.33**	**120.29**	**113.29**
Terminal 6	10.41	11.90	12.72	11.17	9.68	12.78	12.13
Dock Sud	7.94	8.01	7.94	6.46	6.08	6.55	5.54
Renova	3.92	5.13	5.77	6.08	5.06	9.83	9.80

Cargill - Quebracho Pier	5.84	8.06	4.00	4.94	3.99	4.50	4.75
Cofco Int. Argentina S.A. (Timbues)	3.06	3.86	4.73	5.41	6.57	6.43	5.61
Vicentin	5.35	5.58	5.20	5.89	5.28	5.33	2.40
Siderar	6.36	5.55	4.49	4.92	5.30	3.35	3.84
Rosario-ENAPRO Docks	3.80	5.31	5.18	3.84	4.81	4.93	4.35
San Benito Mills	3.35	4.10	4.74	4.30	4.32	5.32	5.88
Dreyfus (Gral. Lagos)	3.96	4.03	5.04	5.20	3.96	4.32	4.16
Dreyfus (Timbúes)	4.15	4.71	4.26	4.05	3.63	3.74	4.15
Cofco Int. Argentina S.A. (PGSM)	3.83	5.16	5.68	5.22	0.73	3.61	4.00
ADM AGRO (Arroyo Seco)	1.25	2.46	2.50	3.15	3.93	5.21	5.37
La Plata	4.56	4.43	3.76	4.14	2.73	2.73	1.50
San Nicolás - Provincial Pier	4.53	3.64	2.94	2.70	2.79	3.69	3.26
Cargill (Punta Alvear)	2.40	1.95	2.97	3.95	3.00	4.06	4.24
Cargill (Villa Gobernador Galvez)	3.10	2.92	3.34	3.69	2.49	3.23	3.11
Bunge (Dempa and Pampa)	2.81	2.41	3.73	3.48	2.87	3.39	3.14
ACA (San Lorenzo)	2.68	3.04	2.85	3.29	2.58	3.08	3.57
Pan American Energy (Campana)	2.49	2.01	2.98	3.21	3.07	3.31	3.60
ADM AGRO- Transit Dock	1.14	1.63	2.32	2.11	3.53	2.40	0.36
Escobar regasifier	1.54	1.85	1.93	1.65	2.64	1.77	1.26
Buenos Aires	3.78	4.03	2.32	1.16	0.53	0.19	0.56
Bunge (Ramallo)	1.53	1.42	1.65	1.22	0.74	1.27	1.07
San Lorenzo - San Martin - YPF Pier	1.29	1.17	1.23	1.51	1.48	0.95	0.11
Acindar (Villa Constitucion)	1.37	1.20	0.76	1.14	1.47	0.81	0.71
Petromining				0.92	1.69	1.78	2.36
Delta Dock	0.35	0.65	1.02	1.06	1.01	1.19	1.39
Vitco	1.07	1.20	0.95	1.18	0.75	0.53	0.80
Del Guazu	0.52	0.99	0.86	1.31	0.80	1.05	0.80
Pan American Energy (San Lorenzo)	0.68	0.71	0.84	0.89	1.05	1.01	0.91
Euroamerica	0.57	0.85	0.83	0.80	0.92	0.77	0.68
Siderca	1.15	0.62	0.43	0.92	1.12	0.80	0.23
Molca	0.54	1.04	0.85	0.98	0.51	0.69	0.67
San Nicolás Power Station	2.42	1.17	1.00	0.62			
Parana Iron	1.03	1.55	1.19	1.00			
San Pedro	0.62	0.58	0.44	0.38	0.72	0.68	0.87
Oil fuels		1.72	1.59	0.89			
Santa Fe	0.52	0.62	0.57	0.56	0.56	0.48	0.63
Xstorage	0.65	0.78	0.62	0.59	0.44	0.22	0.48
Shell (Arroyo Seco)	0.24	0.34	0.40	0.55	0.66	0.54	0.74
Zarate Terminal	0.46	0.40	0.46	0.67	0.60	0.38	0.27
Profertil	0.19	0.13	0.33	0.33	0.45	0.36	0.52
Carboclor	0.20	0.18	0.20	1.18	0.22	0.13	0.18
Argentine Fertilizers Terminal		0.19	0.35	0.42	0.27	0.41	0.41
Villa Constitucion - EAPVC Pier	0.33	0.57	0.33	0.30	0.17	0.22	0.07
Pampa Energy	0.20	0.27	0.22	0.21	0.23	0.35	0.39
San Martin Power Station	0.21	0.49	0.42	0.20	0.21	0.06	0.15
Rhasa	0.23	0.05	0.14	0.48	0.74		
Cargill Diamante - Elevator Pier	0.15	0.17	0.11	0.28	0.20	0.30	0.29
Minera Alumbrera	0.43	0.27	0.37	0.21	0.11	0.06	
Odfjell	0.25	0.26	0.18	0.15	0.14	0.16	0.19
Papel Prensa	0.18	0.18	0.15	0.18	0.19	0.18	0.22

Aceitera General Deheza							1.08
Pobater (Ex Rhasa)						0.68	0.37
Campana - Provincial pier	0.24	0.04	0.01	0.08	0.20	0.13	0.01
Arauco	0.05	0.04	0.05	0.04	0.04	0.28	0.04
Coop. "La Ganadera" Gral. Ramírez	**0.02**	**0.01**	**0.02**	**0.05**	**0.04**	**0.09**	**0.05**
Akzo Nobel	0.04	0.03	0.03	0.04	0.02		
Central Terminal Sorrento - Gen. Rosario			0.14	0.00			
Nouryon (Ex Akzo Nobel)						0.01	0.03
Diamante - EAPD Pier		0.03					
Uruguay River	**0.46**	**0.36**	**0.29**	**0.29**	**0.33**	**0.63**	**0.52**
Concepción del Uruguay - YPF Pier	0.27	0.22	0.21	0.21	0.21	0.23	0.19
Concepción del Uruguay	0.19	0.14	0.08	0.07	0.12	0.40	0.33
Buenos Aires seacoast	**28.87**	**29.93**	**33.91**	**31.59**	**26.73**	**28.82**	**30.33**
Bahía Blanca	11.70	11.47	15.18	13.72	11.42	14.81	13.39
Rosales	11.94	13.27	10.61	10.86	9.44	7.45	9.98
Quequén	4.71	4.57	7.55	6.40	5.58	6.29	6.94
Mar del Plata - YPF Pier	0.14	0.23	0.24	0.26	0.29	0.27	0.02
Mar del Plata	0.38	0.39	0.34	0.35			
Patagonian seacoast	**20.34**	**18.99**	**18.57**	**17.13**	**17.64**	**16.78**	**16.40**
Caleta Córdova	9.61	8.71	9.43	8.71	9.19	9.22	9.61
Caleta Olivia	5.80	5.58	5.48	4.99	4.65	4.15	4.12
Madryn	1.51	1.48	1.27	1.44	1.42	1.54	1.12
Punta Loyola	0.72	0.66	0.46	0.51	0.46	0.65	0.51
Comodoro Rivadavia - YPF Pier	0.55	0.56	0.45	0.47	0.47	0.35	0.29
Río Cullen	0.61	0.58	0.42	0.36	0.37	0.29	0.40
Cruz del Sur	0.12	0.20	0.17	0.13	0.32	0.17	0.10
Deseado	0.26	0.27	0.21	0.14	0.06	0.04	0.09
San Antonio Este	0.29	0.24	0.25	0.06	0.05	0.05	0.05
Punta Colorada	0.48	0.31	0.16	0.03			
Ushuaia - YPF Pier	0.21	0.20	0.14	0.14	0.14	0.15	
Caleta Paula	0.09	0.05	0.05	0.11	0.09	0.12	0.10
Punta Quilla	0.03	0.12	0.04	0.01	0.38	0.01	0.00
Comodoro Rivadavia	0.03	0.02	0.02	0.03	0.03	0.03	0.02
Ushuaia	0.01	0.02	0.02	0.02	0.01	0.00	
General total	***160.90***	***172.37***	***174.51***	***172.18***	***153.59***	***167.49***	***160.95***

Source: *Elaboration based on Ministerio de Transporte, Argentina, "Puertos, Vías Navegables y Marina Mercante," (accessed January 2022), https://www.argentina.gob.ar/transporte/puertos-vias-navegables-y-marina-mercante.*

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