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FACILITATION OF TRANSPORT AND TRADE IN **LATIN AMERICA AND THE CARIBBEAN**

Proposals to expand river connectivity in South America

Background

River transport of freight and passengers is crucial in vast areas of South America owing to the geographical difficulty of building roads or railways, as well as the high cost or scarcity of airport infrastructure and aviation services. In most countries, the richest areas in hydrographic terms are precisely the poorest

This *FAL Bulletin* presents opportunities for physical river integration in South America that could mark an important step in the design of a sustainable river navigation system for the region. It also examines the opportunities that intermodal transport offers for regional logistics.

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and most backward. For example, in Peru, the Amazon region accounts for 62% of the territory but contributes just 8% of the country's gross domestic product (GDP), while its social indicators (family income and access to public services, such as health, education, electricity, water and sanitation) are the weakest in the country. Overall, around half of the Amazon region's inhabitants live below the poverty line; in the Plurinational State of Bolivia, for example, the proportion is 60% (ARA, 2011).

South America accounts for 12% of the Earth's landmass, but its river runoff amounts to 25% of the world's total. Likewise, the volume of water in its rivers adds up to nearly half (47%) of the total volume of all the watercourses on the planet. This is due to the vast size of its major river basins, forming a system for potential river navigation totalling more than 50,000 kilometres in length (CAF, 1998).

Despite this enormous potential, the level of physical river integration in the South American subregion is low. Indeed, each of its three main river basins (i.e. the Amazon, La Plata and Orinoco river basins), which cover about two thirds of South America's territory, are at varying levels of development and offer different opportunities for river interconnection and integration, most of which are stalled or underdeveloped. Likewise, the presence of various road networks (including railways), as well as airports and air traffic routes offer opportunities for intermodal transport that are not being fully tapped.

The coronavirus disease (COVID-19) pandemic further exacerbated the economic, social and physical integration problems of South America. In economic terms, it brought the largest drop in GDP in more than a century (ECLAC, 2022). In that sense, Latin America and the Caribbean was the hardest hit region of the emerging world in a comparison of health, social and inequality indicators (ECLAC, 2021). Although a slight recovery was observed in the first quarter of 2023, ECLAC (2023) confirms the economic slowdown in all four quarters of 2022.

The economic contraction resulting from the stoppage of some economic activities during the pandemic had a profound impact on freight and passenger transport, both because of the need to restrict the movement of people and because of disruptions to logistic chains. Compounding this was the postponement of various integration projects, and the unequal levels of progress in different South American countries with regard to converting navigable rivers into genuine waterways. Today, in the post-COVID-19 landscape, opportunities may arise to revive the subregion's river integration agenda.

The purpose of this document is to identify the best opportunities for river integration in South America, taking into account its river basins, most notably the Amazon, La Plata and Orinoco basins. The document seeks to advance the design of a sustainable river navigation system for the region and, at the same time, present some of the opportunities for regional logistics that intermodal transport offers.

Google Earth was used to identify the projects that have been studied, as well as to visualize on a map of South America the direct integration connections by rivers and interbasin connections, in addition to indirect links by road and rail. The roads and railways shown on the maps are for reference purposes and do not necessarily include all existing transport infrastructure.

I. Limits of waterway integration

There is an extensive body of literature comprising studies and publications that have addressed waterway integration in South America. Organizations such as Initiative for the Integration of Regional Infrastructure in South America (IIRSA) and the Development Bank of Latin America and the Caribbean (CAF) have prepared specific studies on the subject. In this regard, it is necessary to distinguish between two scales of integration:

(i) **Fluvial.** When transposition with canals (or pipelines) is used to distribute river flows for human consumption (urban and rural) and irrigation, such as the transposition of the São Francisco River;

(ii) **Navigation.** When a canal is used for navigation, such as the Deoclécio Bispo dos Santos Canal in the municipality of Pereira Barreto (São Paulo, Brazil), or the canals that interconnect the Great Lakes in North America.

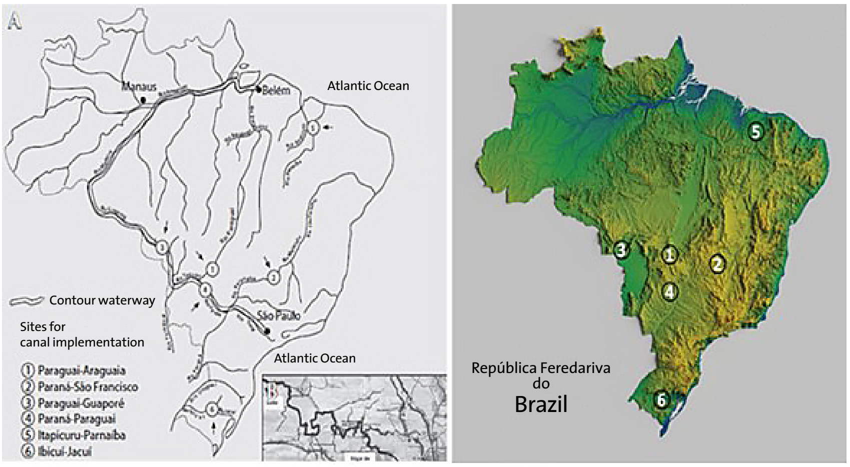
At the river scale, physical geography (i.e. terrain) is the main variable when it comes to integrating rivers from different watersheds along the best course to the riverbed; the more uneven the terrain and geography, the greater the integration difficulties. Care must be taken with the decision as to the location of the connection, so that the intended objectives are not jeopardized. For example, integration very close to the headwaters of rivers, where the flow is lower, should be avoided. Thus, where the objective is navigation, the flow and geometry (width and depth) of the river must allow the passage of vessels as projected. In some cases, the most efficient connection may be by road or rail.

At the same time, economic variables (e.g. regional or national development, investment and operating costs) and environmental variables tend to become obstacles to river integration. In the São Francisco River transposition (river scale), for example, despite the regional economic gains in terms of irrigation and consumption for the northeastern states of Brazil (where long dry seasons are common) and the low catchment in the river (26.4 m^3/s, or 1.4% of typical flow of 1,850 m^3/s), environmental licences for sections of the project, which started in 2004, were still under review in 2018.

In terms of navigation, the Deoclécio Bispo dos Santos Canal, in the municipality of Pereira Barreto in São Paulo, Brazil, for example, was built in the 1980s and connects the Três Irmãos and Ilha Solteira reservoirs via the São José dos Dourados River, providing navigability. It is the second largest freshwater canal in the world and measures some 10 kilometres long, 50 meters wide and 8 meters deep when the water level is at its lowest.

Before turning to the river integration proposals in the following sections of this bulletin, map 1 shows six different integrations that illustrate the orographic difficulties in South America.

Map 1
River integration in Brazil



Source: Prepared by the authors on the basis of P. Alfredini and E. Arasaki, *Engenharia portuária. Manual técnico*, Edgard Blucher Ltda. (ed.), São Paulo, Brazil, 2013.

II. Intermodal transport: integration by inland waterways and railways

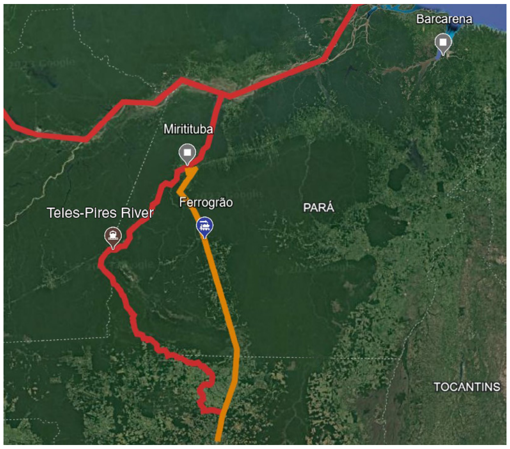
It is common for modes of transport (road, rail, inland waterways and pipelines) to compete for the flow of different types of cargo. Inland waterways and railways are the modes with the highest transport capacity and, through cargo unification or consolidation, make for an efficient intermodal system.

The following are examples of competition and complementarity between these modes.

A. Ferrogrão (greenfield) railway and Teles-Pires Tapajós River

In Brazil, the Ferrogrão railroad (a greenfield project) and the Teles-Pires Tapajós River compete for dominance of cargo transportation from the city of Miritituba, in the state of Pará, from where barges carry cargo to Barcarena (the port area of Pará) to be loaded onto ocean-going vessels (see map 2).

Map 2
Ferrogrão (greenfield) railway and Teles-Pires Tapajós River

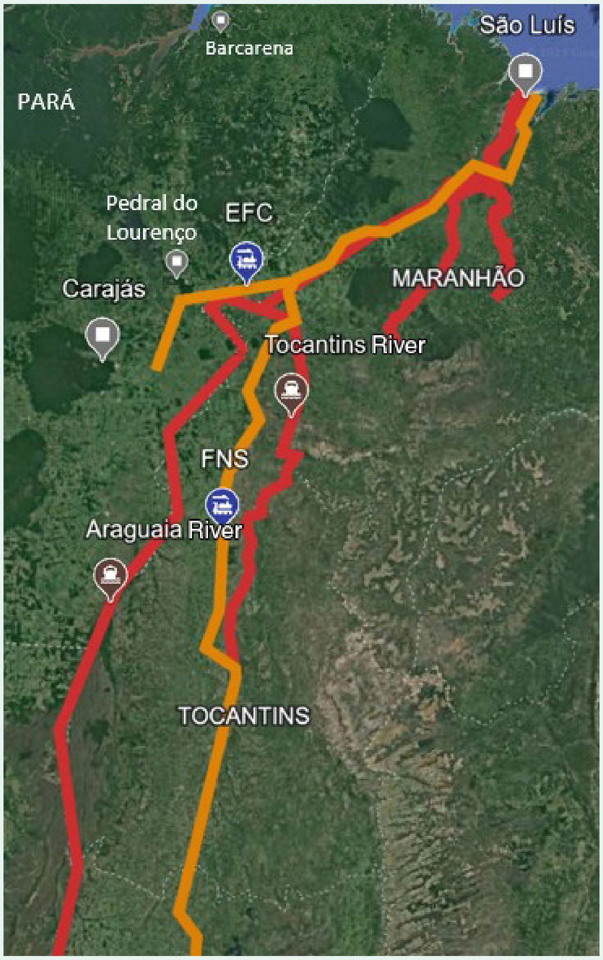


Source: Prepared by the authors on the basis of Google Earth.
Note: Image extracted from Google Earth in .kmz file format. Rivers are highlighted in red, and land connections (roads and railways) in orange.

B. North-South Railway (FNS)

The North-South Railway (FNS) joins the Carajás Railway (EFC) and connects to the ports of Maranhão (all brownfield projects) and the **Tocantins** and **Araguaia** Rivers. The rivers are navigable for most of the year. Arguably its biggest obstacle is the **Pedral do Lourenço**, a rock formation on the rivers that limits navigation to Barcarena (see map 3).

Map 3
North-South Railway (FNS), Carajás Railway (EFC) and the Tocantins and Araguaia Rivers



Source: Prepared by the authors on the basis of Google Earth.
Note: Image extracted from Google Earth in .kmz file format. Rivers are highlighted in red, and land connections (roads and railways) in orange.

C. Tietê waterway and railway to the Port of Santos

When railways and inland waterways are utilized in parallel, there is an opportunity for each mode to complement the other, rather than for one to predominate. Even taking into account drought-related problems, waterways vary greatly in terms of competitiveness.

Map 4 shows the stretches of waterway and railway from **Tietê** to the Port of Santos, in the São Paulo region. Cargo is transported via the **Tietê** River (mostly for export), in conjunction with navigation on other rivers, such as the Paraná, before being transhipped on to trucks or trains bound for the seaport.

Map 4
Tietê waterway and railway to the Port of Santos

Source: Prepared by the authors on the basis of Google Earth.
Note: Image extracted from Google Earth in .kmz file format. Rivers are highlighted in red, and land connections (roads and railways) in orange.

D. São Francisco River

Lastly, map 5 shows the possibility of complementarity between modes of transport. The **São Francisco** River is unnavigable over its entire length before emptying into the Atlantic Ocean (owing to four dams without locks). However, if the river were navigable, the possibility would exist of transshipment on the Midwest Integration Railway (FICO), which is 30% brownfield and 70% greenfield, enabling integration with the ports of Bahia, Maranhão and even São Paulo.

Map 5
São Francisco River

Source: Prepared by the authors on the basis of Google Earth.
Note: Image extracted from Google Earth in .kmz file format. Rivers are highlighted in red, and land connections (roads and railways) in orange.

With regard to railways, this study has identified several possibilities for logistical integration with a number of seaports, including Callao and Paita (Peru), Santos (Brazil) and Antofagasta (Chile), which can be connected to river ports through the construction of new railways or the expansion of existing ones.

III. Inventory of projects

An inventory of national and international river integration projects for South America was developed using specific information documents for each project. Map 6 shows a compilation of all the projects identified, enabling the visualization of the intermodal transport development opportunities.

Map 6

River integration in South America

Source: Prepared by the authors on the basis of Google Earth.
Note: Image extracted from Google Earth in .kmz file format. Rivers are highlighted in red, and land connections (roads and railways) in orange.

The following alphanumeric code system was used to allow the projects included in this paper to be easily identified (see table 1).

Table 1
Project codes

Complete code	99aa99		
Component	99	aa	99
Indicates	Region or river basin	Country	Project numerator
Nature	Numeric, 01–13	Country Internet code	Numeric
Key	01.Amazon 02.Tocantins-Araguaia 03.Northeast Atlantic West 04.Parnaiba 05.SãoFrancisco 06.Southeast Atlantic 07.South Atlantic 08.Uruguay 09.Paraná-Paraguay 10.Plate 11.Magdalena 12.Atrato 13.Orinoco	ar. Argentina bo. Bolivia (Plurinational State of) br. Brazil co. Colombia ec. Ecuador pe. Peru py. Paraguay uy. Uruguay ve. Venezuela (Bolivarian Republic of)	The first project identified is numbered 01, and so on
Special cases	Where a project encompasses more than one watershed, the numerator corresponds to the watershed through which access to ocean navigation takes longest	Where a project covers more than one country, the following is used: in. International	n/a

Source: Prepared by the authors.

To date, 47 projects have been identified, organized by watershed, totalling 32,818 kilometres in length (see table 2).

Table 2
Inventory of projects

Watershed	Country	Code	Name	Length *(km)*
01.Amazon	Bolivia (Plurinational State of)	01bo01	Rehabilitation of the Ichilo Mamoré inland waterway	1 400.0
01.Amazon	Brazil	01br01	Madeira-Mamoré River	1 086.0
01.Amazon	Brazil	01br02	Negro River	1 128.0
01.Amazon	Brazil	01br03	Branco River	512.0
01.Amazon	Brazil	01br04	Solimões River	1 355.0
01.Amazon	Brazil	01br05	Amazon River	1 529.0
01.Amazon	Brazil	01br06	Trombetas River	115.0
01.Amazon	Brazil	01br07	Jari River	128.0
01.Amazon	Brazil	01br08	Teles Pires-Tapajós River	1 490.0
01.Amazon	Brazil	01br09	Xingu River	1 266.0
01.Amazon	International	01in01	Madre de Dios River waterway	1 150.0
01.Amazon	International	01in02	Integration of Amazon and La Plata-Guaporé watersheds	8.0
01.Amazon	International	01in03	Improvement of navigability of the Putumayo-Içá River	1 800.0
01.Amazon	International	01in04	Navigability of the Morona River	450.0

Watershed	Country	Code	Name	Length (km)
01.Amazon	International	01in05	Improvement of navigability of the Napo River	860.0
01.Amazon	Peru	01pe01	Amazon waterway-Peru	2 687.0
01.Amazon	Peru	01pe02	Navigability of the Upper Ucayali and Urubamba Rivers	737.0
01.Amazon	Peru	01pe03	Fiscarraldo interconnection	20.0
02.Tocantins-Araguaia	Brazil	02br01	Tocantins River, Pedral do Lourenço	35.0
02.Tocantins-Araguaia	Brazil	02br02	Tocantins River, Pedral de Marabá	222.0
02.Tocantins-Araguaia	Brazil	02br03	Tocantins River, section 3, Imperatriz Estreito hydroelectric power plant	122.0
02.Tocantins-Araguaia	Brazil	02br04	Tocantins River, section 4, from Estreito hydroelectric power plant to Lajeado Palmas	511.0
02.Tocantins-Araguaia	Brazil	02br05	Araguaia River, from Marabá to Conceição do Araguaia	489.0
02.Tocantins-Araguaia	Brazil	02br06	Araguaia River, from Conceição do Araguaia to Luiz Alves	607.0
03.Atlantic West, northeast region	Brazil	03br01	Mearim-Grajaú River	917.0
04.Parnaíba	Brazil	04br01	Parnaíba River	1 023.0
05.São Francisco	Brazil	05br01	São Francisco River	1 572.0
07.South Atlantic	International	07in01	Uruguay-Brazil waterway, Merín Lagoon-Los Patos Lagoon	264.0
08.Uruguay	International	08in01	Improvement of navigability of the Uruguay River upstream from Salto Grande	772.0
08.Uruguay	International	08in02	Dredging of the Uruguay River Paysandú-Salto section	140.0
09.Paraná-Paraguay	Argentina	09ar01	Railway reactivation in the province of Formosa-multimodal river connection	0
09.Paraná-Paraguay	Argentina	09ar02	Deepening of the Trunk waterway	750.0
09.Paraná-Paraguay	Brazil	09br01	Construction Plan Tietê-Paraná Waterway	496.0
09.Paraná-Paraguay	Brazil	09br02	Paraná River	700.0
09.Paraná-Paraguay	International	09in01	Dredging of the Tamengo Canal	10.5
09.Paraná-Paraguay	International	09in02	Itaipu River linkage	0
09.Paraná-Paraguay	International	09in03	Interinstitutional linkage between Barranqueras River Port (Chaco Province) and maritime ports of Antofagasta and Mejillones (Chile)	0
09.Paraná-Paraguay	International	09in04	Navigability of the Paraguay River, Apa-Corumbá section	603.0
09.Paraná-Paraguay	International	09in05	Maintenance dredging of the Paraguay River Confluence-Apa section	920.0
09.Paraná-Paraguay	Paraguay	09py01	Integrated public passenger river transport system	0
09.Paraná-Paraguay	Paraguay	09py02	Puerto Indio logistics integration	0
09.Paraná-Paraguay	Paraguay	09py03	Paraguay River waterway, Asunción-Apa section	630.0
10.La Plata	Argentina	10ar01	Magdalena Canal	61.5
11.Magdalena	Colombia	11co01	Magdalena navigability	1 100.0
12.Atrato	Colombia	12co01	Atrato-Truandó Canal	172.0
13.Orinoco	International	13in01	Orinoco-Negro River interconnection	20.0
13.Orinoco	International	13in02	Amacuro Delta-Buenaventura interoceanic connection	2 960.0
Total length				32 818.0

Source: Prepared by the authors.

Of the 47 projects identified, 15 are international, involving more than one country (including the Putumayo-Içá, which involves four countries), which highlights the great coordination challenge facing the governments of South America in implementing this major river integration initiative.

IV. Types of vessels navigating the waterways

Table 3 contains the types of vessels that commonly navigate the rivers associated with the projects identified in this report.

Table 3
Vessels commonly used in the main rivers under consideration

River	Vessel type	Reference code
Amazon (Brazil)	Navigation of offshore vessels, with 14 m of assured draft for navigation and DWT of 55,000 tons	01br06
Araguaia	In the dry season, 2x3 barge convoys reaching up to 10,000 tons; in the wet season, up to 18,000 tons in 3x3 convoys	02br05 02br06
Atrato	From larger vessels up to 32,000 tons, to smaller vessels in the upper part of the river	12co01
Branco	In the dry season, convoys of up to two 60 m barges up to 4,000 tons; in the wet season, 2x2 barge convoys up to 8,000 tons	01br04
Casiquiare	Small vessels only, up to 0.8 m draft	13in01
Guaporé	Vessels of 2 m draft in the wet season and 0.8 m in the dry season	01in02
Huallaga	In the dry season, 2x1 barge 60 m convoys up to 2,000 tons; in the wet season, 2x2 barge convoys up to 4,000 tons	01pe01
Iza (Brazil)-Putumayo (Peru, Colombia and Ecuador)	Vessels with a draft of up to 3.5 m in the wet season	01in03
Jari	Offshore vessels with 9 m of assured draught for navigation and DWT of 30,000 tons	01br08
Madeira-Mamoré	In the dry season, 2x3 barge convoys up to 18,000 tons; in the wet season, 4x5 convoys up to 60,000 tons	01br01
Madre de Dios	Navigable from its confluence with the Manú; vessels with a maximum length of 20 m, a draft of 3 m and a load of 10 tons	01in01
Magdalena	Connected to maritime routes through the port of Barranquilla; navigable for cargo vessels up to Barrancabermeja, with vessels up to 10 m draft at the access to Barranquilla, 7 m from km 22 to km 38, and 2.4 m up to km 689; towage and configurations of up to 9 barges (48 m beam and 365 m length)	11co01
Ichilo-Mamoré	On the Mamoré, vessels with draft of up to 2 m in the wet season and 1.2 m in the dry season On the Ichilo, navigation is more restricted	01bo01
Marañón	In the dry season, 2x2 barge (60 m) convoys up to 4,000 tons; in the wet season, convoys of up to 4x2 barges and 8,000 tons	01pe01
Meta	Barge convoys up to 1.2 m to a maximum of 2,000 tons	13in02
Mearim-Grajaú	Push convoys up to 1,500 tons in a single barge	03br01
Morona	Navigable during the wet season by vessels of up to 1.5 m draft, as far as the Sargento Puño Military Garrison (during the dry season, up to 0.9 m) Smaller vessels can reach the border with Ecuador	01in04
Napo	Boats up to 15 m in length and 1.2 m draft for most of the year	01in05
Negro	In the dry season, convoys of up to two 60-m barges and 4,000 tons; in the wet season, 2x2 barge convoys up to 8,000 tons	01br03
Orinoco	On the lower Orinoco, navigation of offshore vessels up to 200,000 tons; in the middle Orinoco, barges up to 2 m draft; on the upper Orinoco, up to 1.5 m	13in02
Paraguay	Push convoys of different configurations depending on the river section Convoys with a larger number of barges southward (maximum length 290 m, maximum beam 65 m); smaller vessels for passenger transport	09in04 09in05 09py01 09py03

River	Vessel type	Reference code
Paraná	Push convoys of different configurations in the upper section (maximum convoy length of 400 m and maximum beam of 80 m) Navigation by barges, river vessels Offshore vessels to the south; up to 34 ft of draft	09ar01 09ar02 09br02 09in02 09in03 09py02
Parnaíba	Push convoys up to 4,000 tons in configurations of up to two barges	04br01
La Plata	Navigation of offshore vessels, with 10 m of assured draft for navigation	10ar01
São Francisco	Push convoys up to 4,000 tons in configurations of up to two barges	05br01
Amazon (Peru), Solimões (Brazil)	In the dry season, navigation of offshore vessels, with 9 m of assured draft for navigation and DWT of 30,000 tons; in the wet season, navigation of offshore vessels, with 43 ft of assured draft for navigation and DWT of 55,000 tons	01br05 01pe01
Teles Pires-Tapajós	In the dry season, 2x3 barge convoys up to 18,000 tons; in the wet season, 4x5 convoys up to 60,000 tons	01br09
Tietê	Push convoys up to 6,000 tons in configurations of up to 2x2	09br01
Tocantins	In the dry season, 2x3 barge convoys reaching up to 10,000 tons; in the wet season, up to 18,000 tons in 3x3 convoys	02br01 02br02 02br03 02br04
Trombetas	Offshore vessels, with 9 m of assured draft for navigation and DWT of 30,000 tons	01br07
Ucayali	Up to Pucallpa, in the dry season, up to 2x2 barge (60 m) convoys and 4,000 tons; in the wet season, up to 8,000 tons in 4x2 barge convoys Upstream from Pucallpa, navigation is more difficult, requiring small boats of up to 60 tons	01pe01
Urubamba	Navigable for most of the year in small boats up to 60 tons	01pe02
Uruguay	Navigable with offshore vessels (Panamax-type vessels, 224 m length, 32 m beam) in the lower section of the river Northbound, navigable with river vessels and barge convoys of different configurations depending on the river section; convoy maximums of 220 m length and 48 m beam) Greater limitations further north	08in01 08in02
Xingu	In the dry season, convoys of up to two 60 m barges up to 4,000 tons; in the wet season, 2x2 barge convoys up to 8,000 tons	01br10

Source: Prepared by the authors.
Note: DWT, deadweight.

V. Project prioritization

A common pattern of the various projects is their age. In fact, some integration possibilities have existed for decades since they were first proposed. However, several projects were halted or postponed for different reasons, including lack of political decision-making and agreements between countries, limited resources, prioritization of overland solutions or challenges in managing social or environmental risks.

Depending on existing and expected opportunities and risks, the likelihood of the selected projects materializing in the immediate, medium or long term varies. However, taking into account the various factors that merit consideration in each case, the prioritization proposal included here provides the most complete overview possible of the river integration opportunities and of the possibilities of moving forward as a region in the implementation of each of the projects.

The prioritization or ranking of projects is based on the advantages that each offers, the risks involved and the responsibilities that can be assumed by the multiple governments and organizations taking part in their implementation over the coming decades. Accordingly, a matrix of five criteria was developed.

The prioritization also provides a preliminary approximation of a project feasibility analysis. Indeed, with regard to the selection of projects with concession or public-private partnership potential, this document helps to facilitate the stages of public-private partnership selection, evaluation and structuring, namely: (i) analysis of the feasibility and technical feasibility of the projects; (ii) commercial viability of the partnership; (iii) value for money; and (iv) fiscal responsibility and risk identification. Naturally, these elements must be evaluated in greater depth by the countries involved in the development stages of the various studies for each project. The five criteria are set out below.

(i) **Regional importance** (30%). Gives preference to the most important projects from a regional standpoint rather than just a national perspective. In that sense, aspects such as the geographical scale of the project, the possibility of connecting countries or watersheds, and the opportunities for intermodal transport development are considered.

(ii) **Economic feasibility** (15%). A higher score is given to projects that will be more feasible in the short term, either because they are smaller, they have secured financing or they are already under implementation.

(iii) **Impact on freight transport** (25%). Primary consideration is given to projects that will enable a greater flow of commercial freight along the waterway under development.

(iv) **Impact on passenger transport** (15%). Emphasis is given to projects that contribute to a greater flow of non-tourist passengers along the waterway under development.

(v) **Lower technical complexity** (15%). Projects of lower technical complexity score higher, for example those that already have a guarantee of regular maintenance or that only require a short road connection for their implementation. If complex or major dredging works are required, the project scores lower, especially if the riverbed is rocky. The lowest-scoring projects are those that require the construction of long roads or railways to facilitate intermodal connections, as well as dams or canals.

The scores assigned by the authors range from 7 to 10, with 7 being very low, 8 being low, 9 being high and 10 being very high. It was decided to use a four-point scale, rather than three or five points, in order to avoid a bias towards neutrality.

The results can be seen in images 1, 2 and 3. Each image contains three graphs presenting the findings of the work by watershed, country and project prioritization:

(i) **Watershed.** Indicates the watersheds of the projects studied, with quantities and percentages;

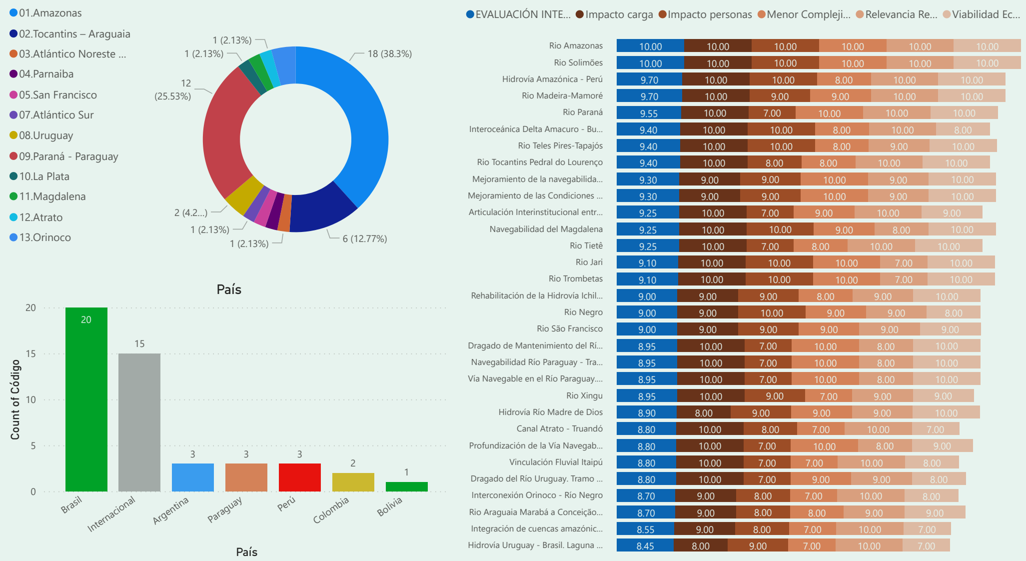
(ii) **Country.** Shows the countries where the projects are located and their quantities. The "international" classification represents cases of rivers bordering or crossing more than one country;

(iii) **Assessment by data sheet.** Presents the ranking of the project data sheets evaluated in descending order. Each data sheet's assessment is a weighted average of the scores for each of the established criteria (i.e. regional importance, economic feasibility, technical complexity and impact on freight and passenger transport).

The data panel is dynamic and allows selection by country, watershed or project. Upon accessing the link, the scroll bar can be used to view all the data sheets (see image 1).

Image 1

Project prioritization data pane[a]



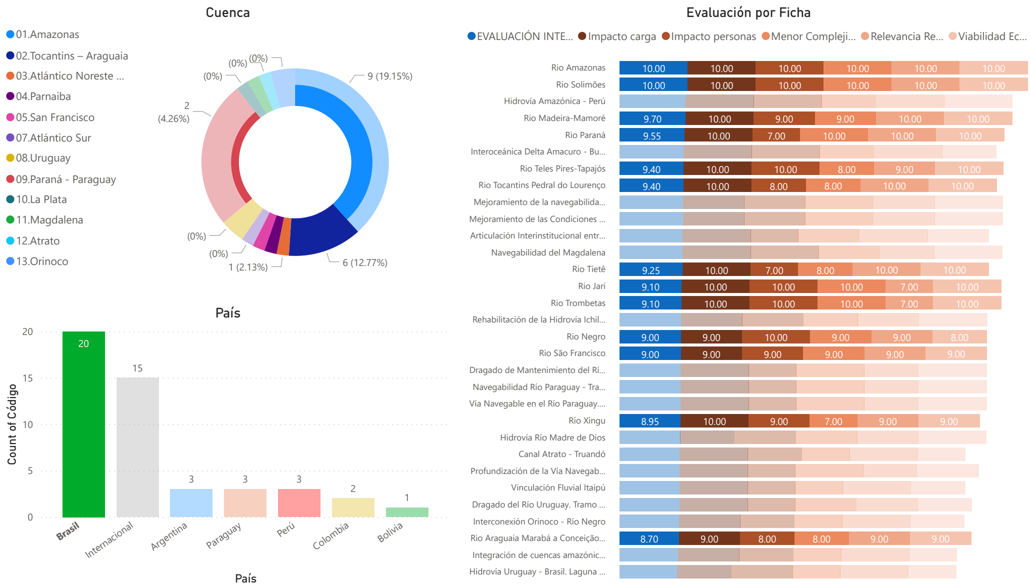
Source: Prepared by the authors.

Note: Image can be viewed in dynamic format (data pane) in Microsoft Power BI.

[a] Public access to the data pane is available at https://app.powerbi.com/view?r=eyJrIjoiZGMoZjA3MDUtMmJmOSoo ZDEyLThmNDItMTdlYTkoMTAxMzI5IiwidCI6IjI5OTlhM2UyLTFiMjYtNDQ1NCo5M2Q4LTcyOGQzYmNhYTNmZiJ9.

In this format, results can be filtered by clicking on the desired option. For example, clicking on Brazil automatically isolates the options for that country (see image 2).

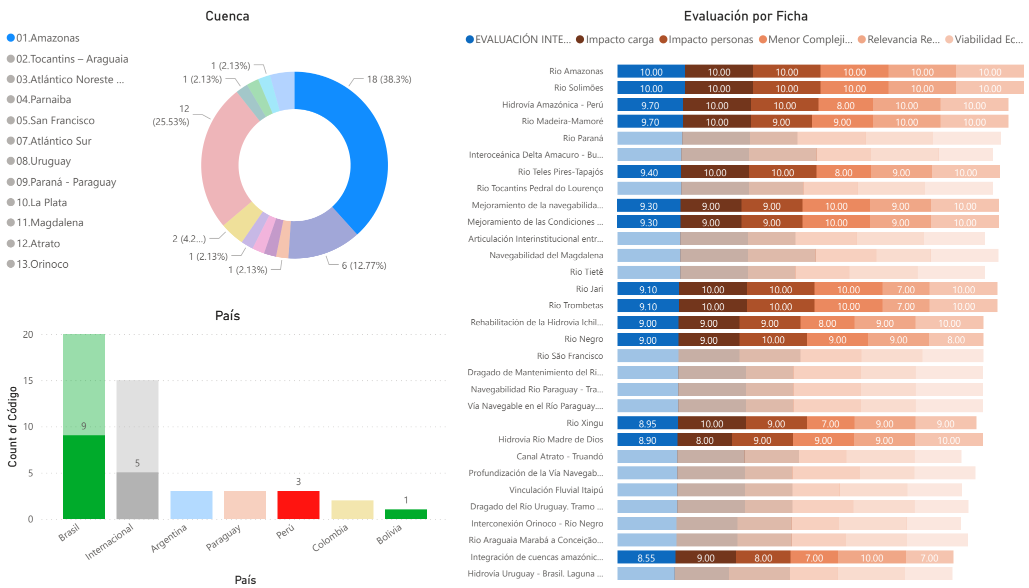
Image 2
Project prioritization data pane, country example (Brazil)[a]



Source: Prepared by the authors.
Note: Image can be viewed in dynamic format (data pane) in Microsoft Power BI.
[a] Public access to the data pane is available at https://app.powerbi.com/view?r=eyJrIjoiZGMoZjA3MDUtMmJmOSoo ZDEyLThmNDItMTdlYTkoMTAxMzI5IiwidCI6IjI5OTlhM2UyLTFiMjYtNDQ1NCo5M2Q4LTcyOGQzYmNhYTNmZiJ9.

Clicking on watershed option “01. Amazon” highlights the countries where the projects are located, along with their respective data sheets (see image 3).

Image 3
Project prioritization data pane, watershed example (Amazon)[a]



Source: Prepared by the authors.
Note: Image can be viewed in dynamic format (data pane) in Microsoft Power BI.
[a] Public access to the data pane is available at https://app.powerbi.com/view?r=eyJrIjoiZGMoZjA3MDUtMmJmOSoo ZDEyLThmNDItMTdlYTkoMTAxMzI5IiwidCI6IjI5OTlhM2UyLTFiMjYtNDQ1NCo5M2Q4LTcyOGQzYmNhYTNmZiJ9.

VI. Concluding considerations

River transport presents an opportunity to advance the integration of South American countries. This study has not only verified the existence of 47 river integration projects for consideration by different South American countries for implementation but has also prioritized them on the basis of criteria developed from an economic, technical and social perspective. As these projects are implemented, the supply of logistics infrastructure, in general, and of river transport, in particular, as well as river transport demand, may change significantly. This potential change in infrastructure supply and transport demand will lead to regional economic and social changes, which should be evaluated on a case-by-case basis.

As explained, there are challenges and limits to the implementation of river integration projects, such as elements of physical geography (i.e. terrain), as well as economic and environmental variables, such as falling river levels as a result of prolonged periods of drought. Such effects have the potential to make shipping unfeasible in some cases, and the situation could be exacerbated by the effects of climate change. Likewise, some rivers do not offer the possibility of year-round navigation, impairing the operational capacity of the river modality.

Nevertheless, given the scarcity of infrastructure and logistical difficulties in the region, the river modality is an important solution for the countries. Despite its implementation challenges and besides its connectivity benefits, river transport has the potential to pollute less than other alternatives while also providing economic benefits. It is important not only to take advantage of this type of transport, but also to continue to move forward with transitioning ships to low-emission energy sources.

The level of progress of the identified projects is not uniform. Some are still at the ideas stage, while others are more advanced. Moreover, the projects proposals require further analysis as well as social and environmental impact assessments.

An important benefit of river transport is the possibility of expanding intermodal connection opportunities. As discussed, the complementarity that exists between different modes of transport offers better alternatives for users. It is important to continue to advance the approach to river transport as a complementary option to facilitate the expansion of alternative forms of integration.

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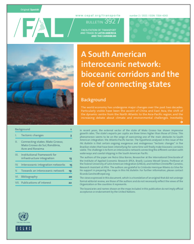
VIII. Publications of interest



FAL Bulletin No. 392

A South American interoceanic network: bioceanic corridors and the role of connecting states

Pedro Silva Barros
Luciano Wexell Severo
Helitton Christoffer Carneiro

In recent years, the external sector of the state of Mato Grosso has shown impressive growth rates. The state's exports per capita are three times higher than those of China. This phenomenon seems to be on the verge of overcoming one of the main obstacles to South American integration: the Atlantic-Pacific barrier. The hypothesis analysed in this issue of the *FAL Bulletin* is that certain ongoing exogenous and endogenous "tectonic changes" in five Brazilian states that have been intensifying for some time will finally make bioceanic corridors viable. The challenge is to form an interoceanic network connecting the different corridors with waterways and coastal shipping in the South American Pacific.

Available in: Spanish English

FAL Bulletin No. 351

Inland navigation and a more sustainable use of natural resources: networks, challenges and opportunities for South America

Azhar Jaimurzina
Gordon Wilmsmeier

This issue of the *FAL Bulletin* explores a number of challenges and potential opportunities for inland waterway development in South America. The main focus of the discussion is on financing and policy challenges for efforts to develop inland waterways in a way that will allow them to play a key role in a more sustainable transport system in the future.

Available in: Spanish English