

ICCT and the sea

Maricruz Fun Sang Cepeda

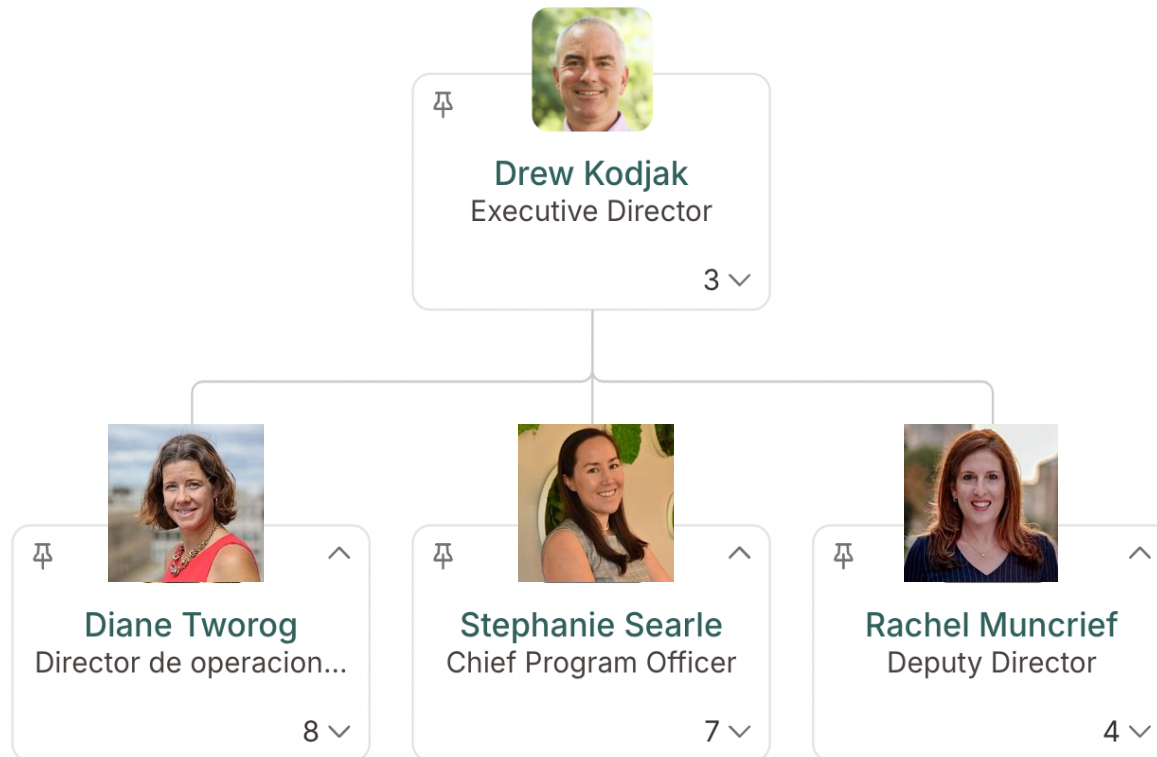
Jun/ 2025

Brazil

ICCT

The International Council on Clean Transportation is an independent nonprofit organization founded to provide first-rate, unbiased research and technical and scientific analysis to environmental regulators. Our mission is to improve the environmental performance and energy efficiency of road, marine, and air transportation, in order to benefit public health and mitigate climate change.

ICCT Leadership Team



ICCT programs, regions, centers, and clusters

Programs

- *Passenger vehicles*
- *Heavy-duty vehicles*
- *Marine*
- *Aviation*
- *Fuels*
- *International partnerships*

Regions

- *US*
- *EU*
- *China*

• *India*

• *Brazil*

• *Canada*

• *Mexico*

• *Latin America (rest of)*

• *ASEAN*

Centers

• *Modeling Center*

• *Data Management Center*

• *Zero Emission Fleets
Center*

Clusters

• *Cities Cluster*

• *Emerging Markets Cluster*

• *Remote Sensing Cluster*

• *EV Infrastructure*

• *Batteries & EV Cost Parity*

• *Hydrogen and Fuel Cell*

• *Equity (program focused)*

• *Writing*

ICCT Brazil Region Team



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ICCT's Marine Team

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Maricruz Fun S. Cepeda, PhD
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★ IMO Delegates

Marine Program Mission:

The ICCT marine program provides policymakers with the data and analysis they need to avoid, reduce, and eliminate pollution from the global shipping sector.

The potential of Brazilian ports as renewable marine fuel bunkering hubs

Maricruz Fun Sang Cepeda

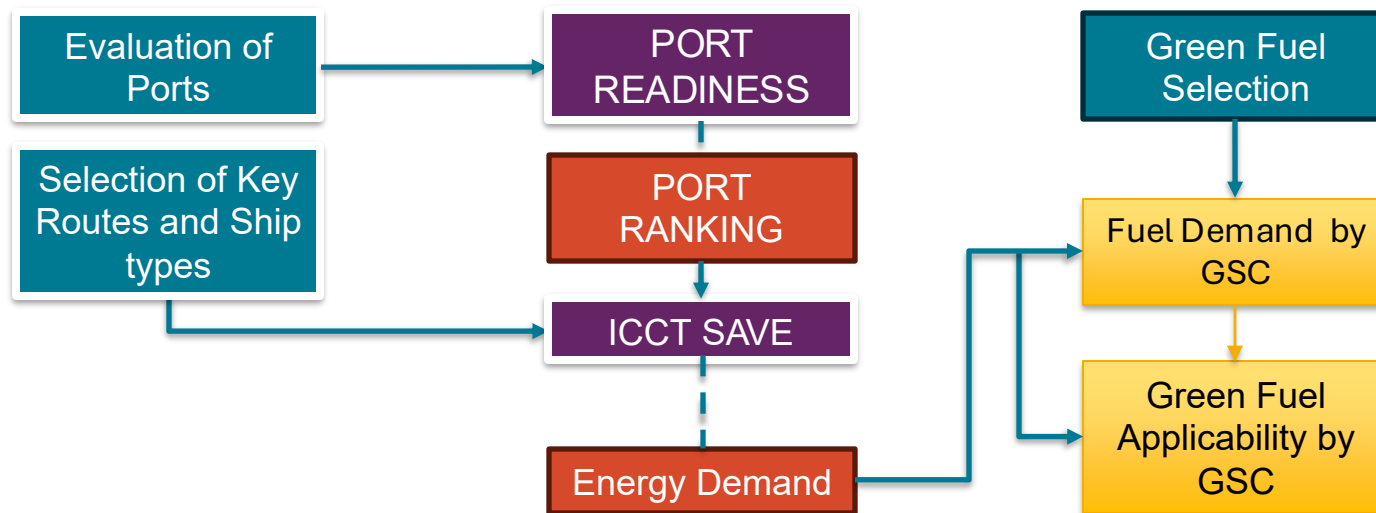
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Brazil

Objective

Explore the Potential of Brazil ports as future bunkering hubs for renewable hydrogen: port readiness and demand analysis through Green Shipping Corridors

Methodology



Evaluation of Ports

Methodology - Port Readiness



Existing use and potential access to renewable energy



Port capacity



Port infrastructure



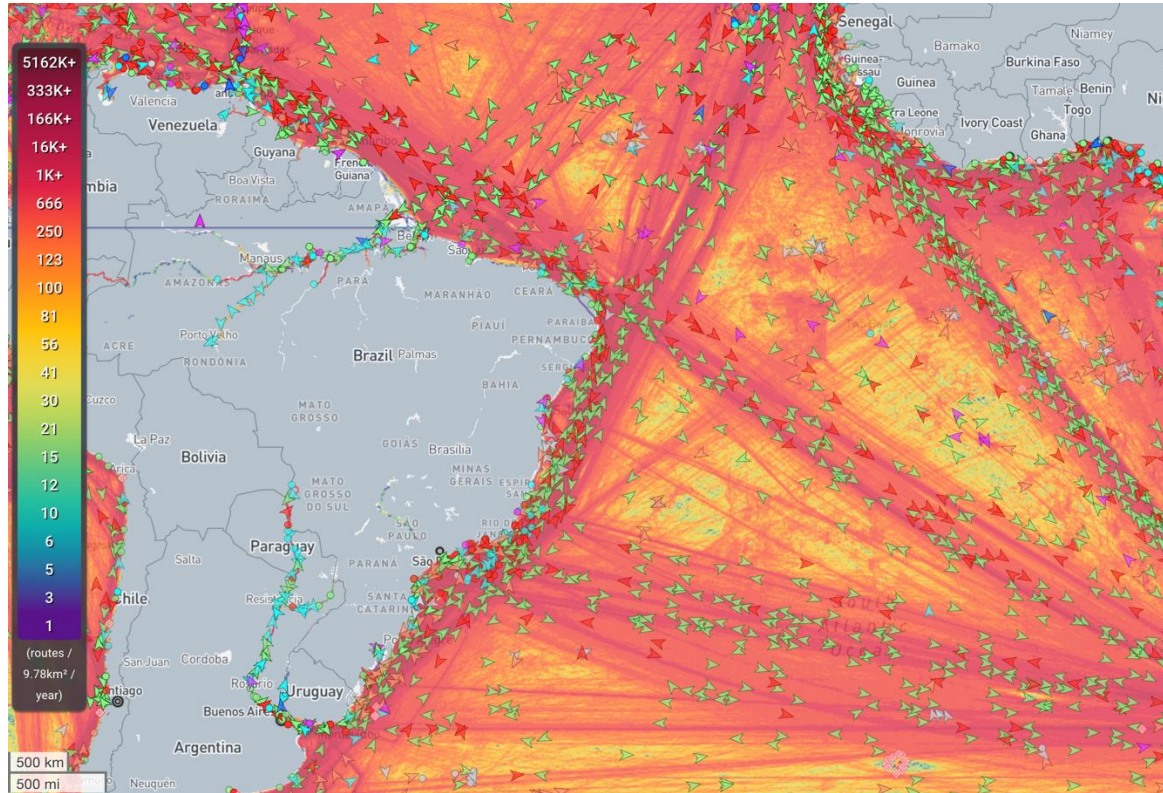
Strategic location and connectivity



Commitment to decarbonization

Selection of Key Routes and Ship types

What are the Best Routes and or ship types?



Selection of Key Routes and Ship types

Port Name	Cabotage			International		
	Typical Route (State)	Number of connection routes	Main Type of Cargo	Typical Route (Country)	Number of connection routes	Main Type of Cargo
Santos	RJ	15	Oil and derivatives	China	135	Soy
Rio Grande	PE	14	Container	China	103	Soy
Rio de Janeiro	SP	14	Oil and derivatives	United States of America	107	Container
Itaqui	MA	13	Oil and derivatives	China	57	Soy
Suape	SP	14	Oil and derivatives	United States of America	58	Petroleum oils
Itaguaí	CE	11	Container	China	73	Iron ores
Imbituba	CE	10	Container	United States of America	53	Petroleum coke
Fortaleza	CE	14	Oil and derivatives	Argentina	24	Wheat
Vitoria	SC	13	Iron and steel	China	41	Cast Iron
Navegantes	SC	11	Container	China	60	Container

Selection of Key Routes and Ship types

•**Route Selection:** Identify the top busiest routes linked to the port candidates and major trade commodities

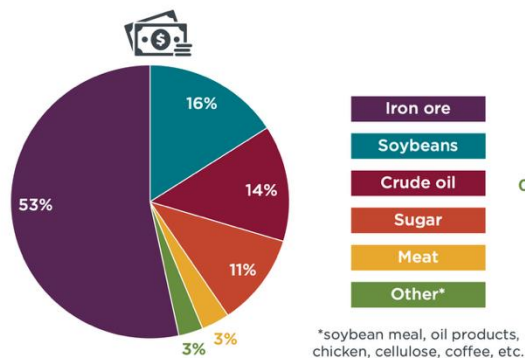


Figure 3. Brazil exports share in 2021

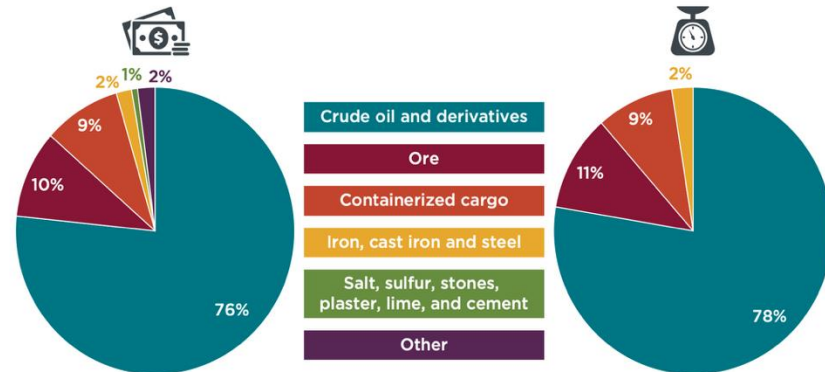
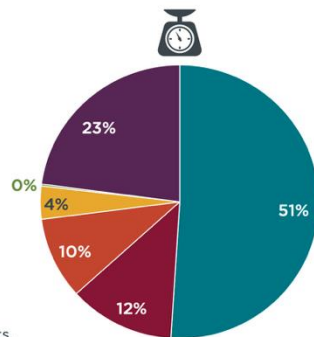
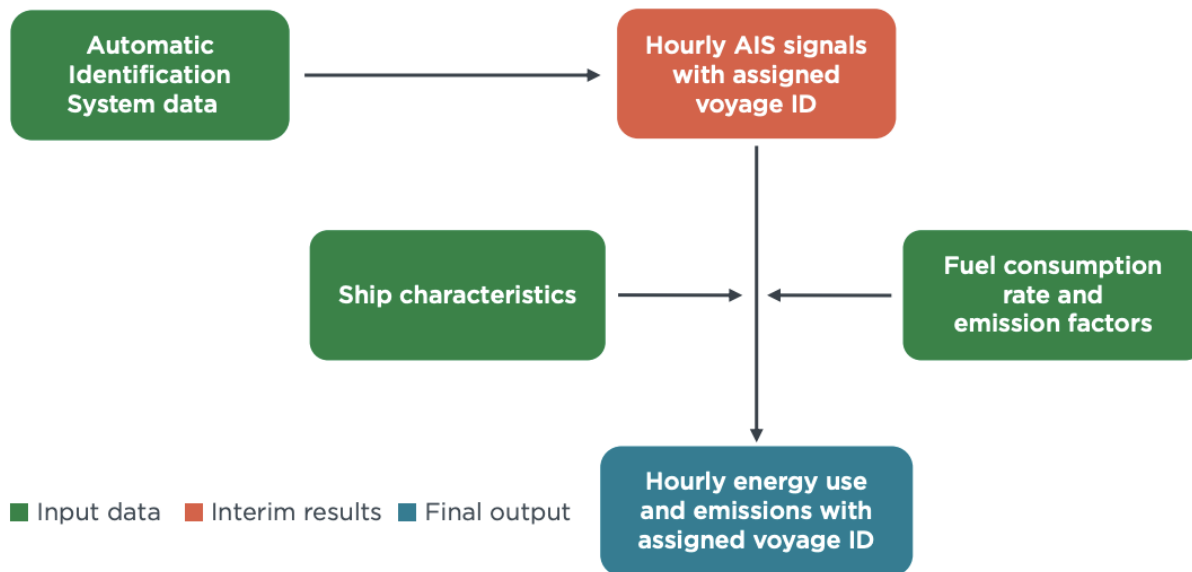


Figure 6. Products share in cabotage transport in 2021

Methodology - ICCT SAVE

Figure 1

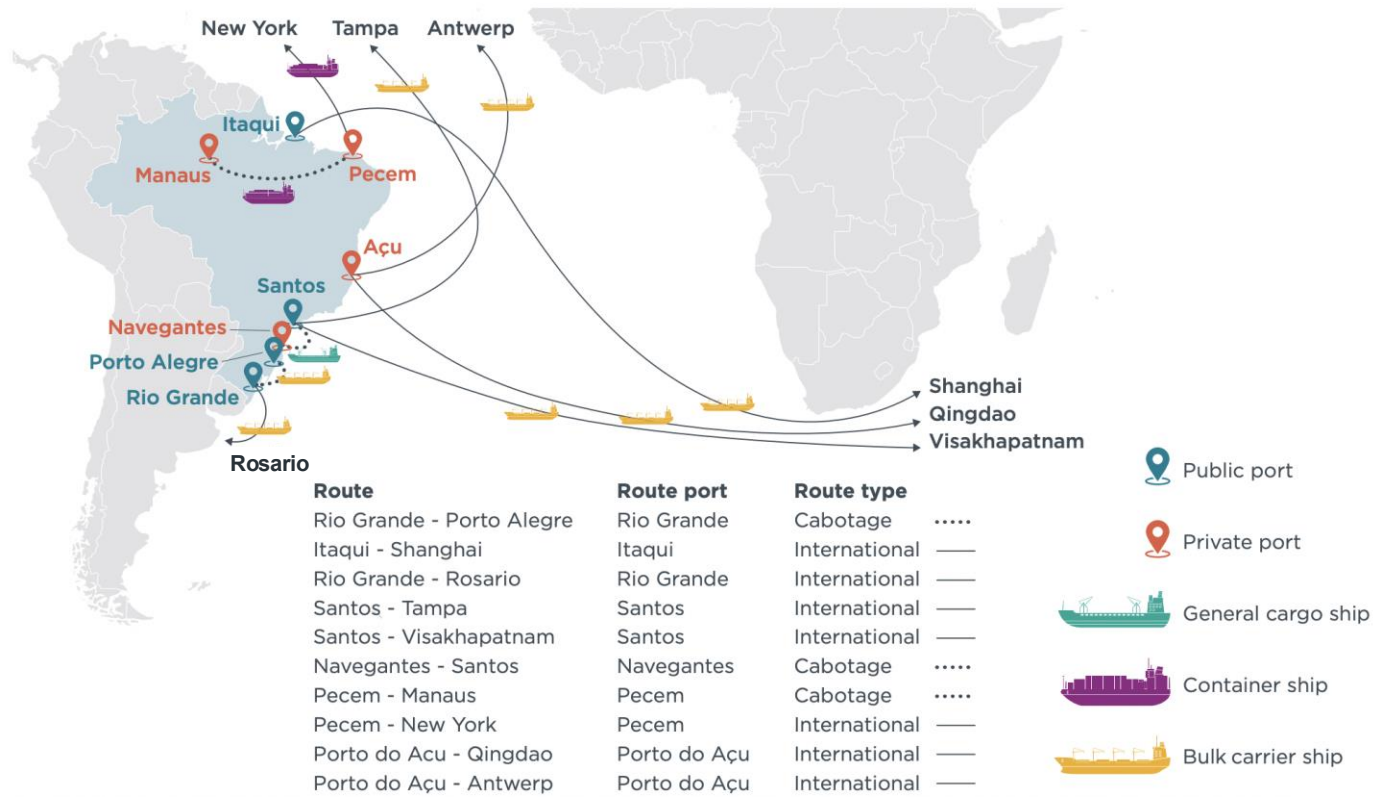
Systematic Assessment of Vessel Emissions (SAVE) model



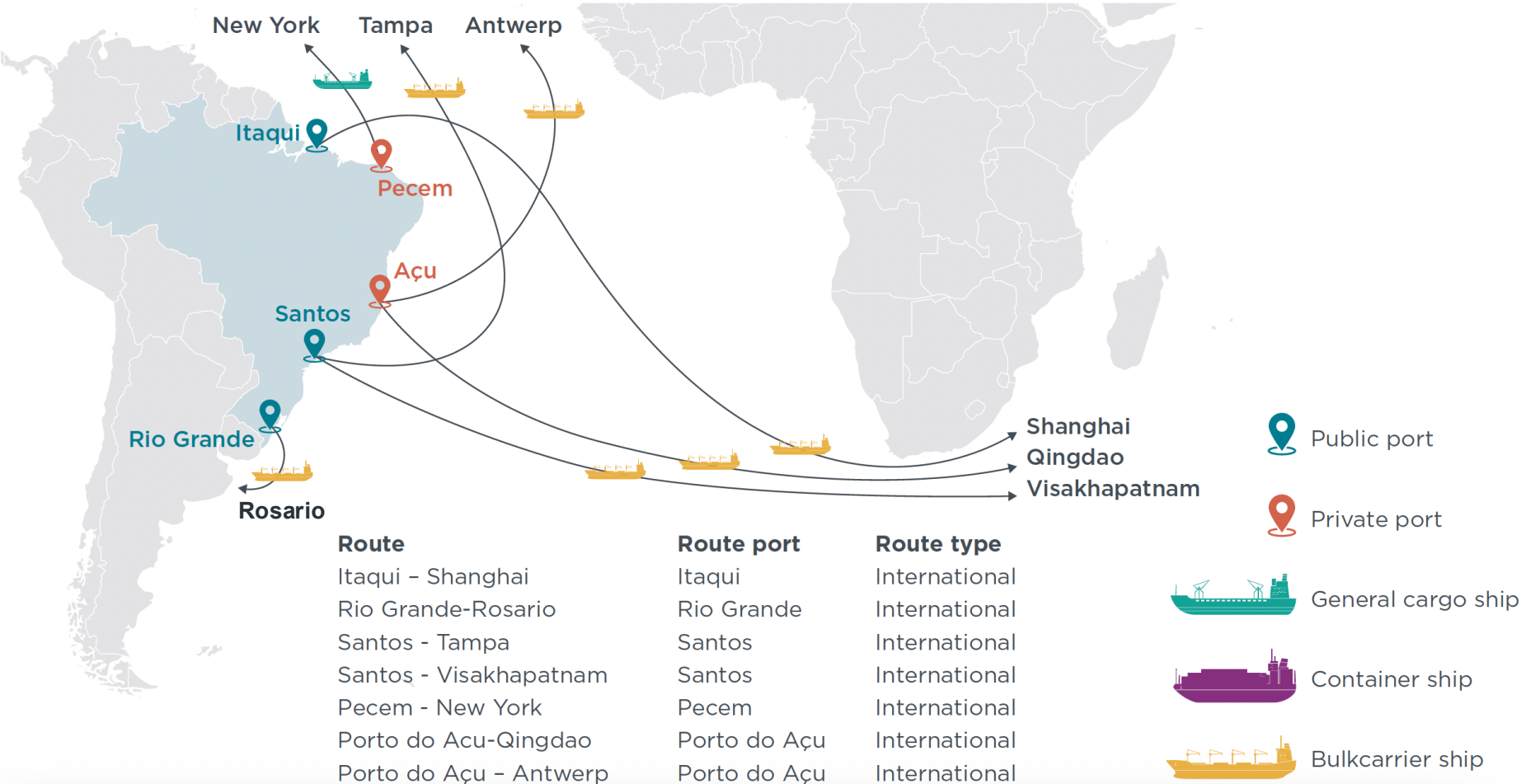
Port Results

Port Results

Candidate ports as future renewable marine fuel bunkering hubs and sample routes



International routes considered in the study



Brazilian cabotage routes considered in the study



Route

Rio Grande - Porto Alegre
Navegantes- Santos
Pecem - Manaus

Route port

Rio Grande
Navegantes
Pecem

 Public port

 Private port

 General cargo ship

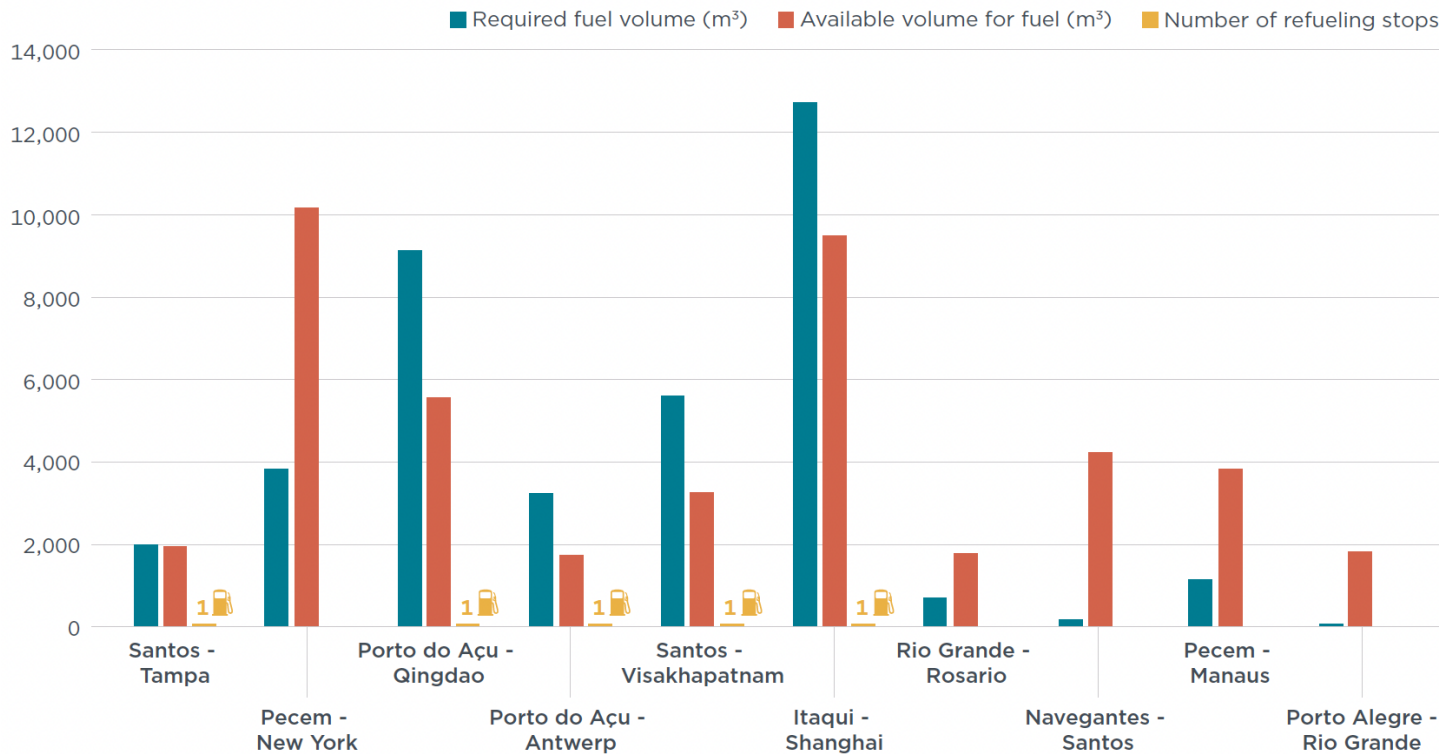
 Container ship

 Bulkcarrier ship

Green Shipping Corridor Results

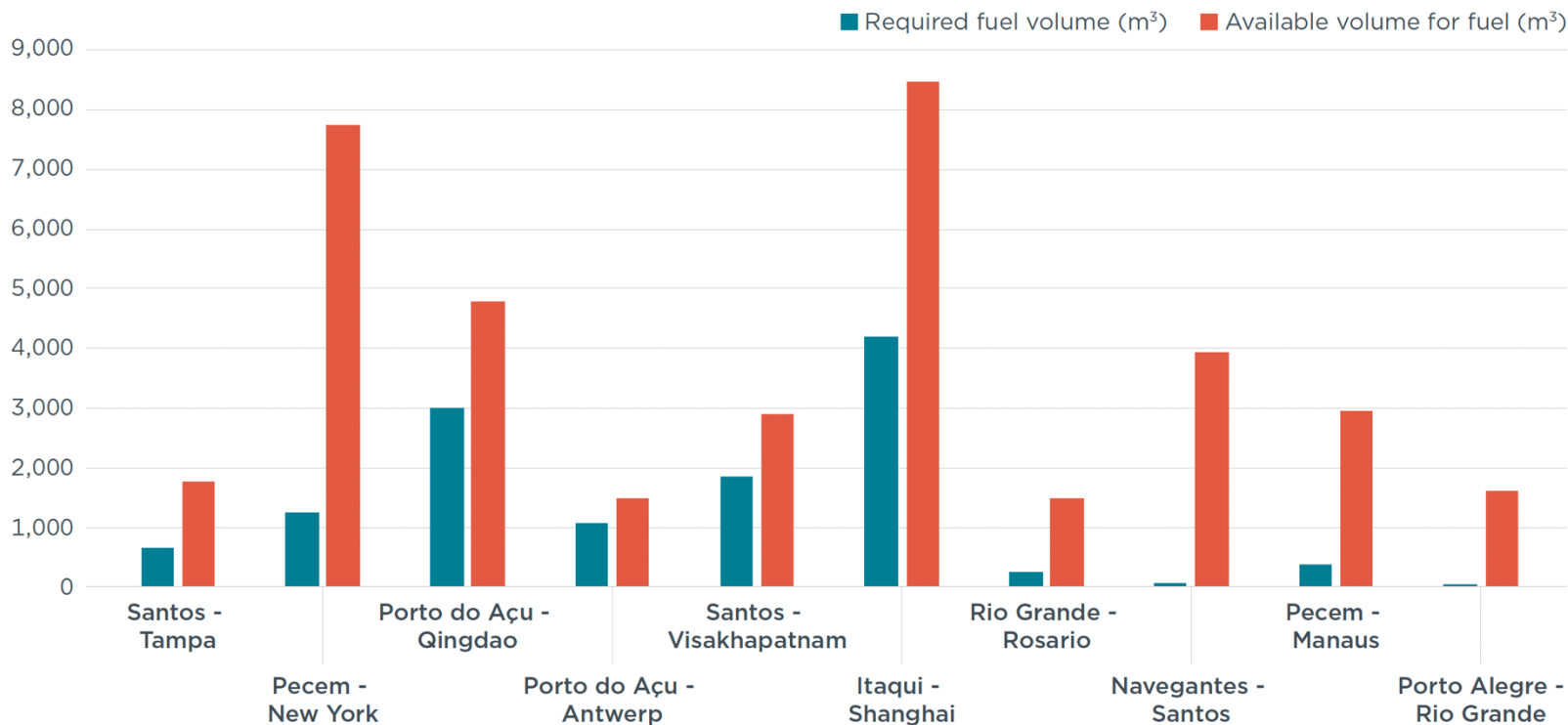
Direct use of hydrogen is feasible, but sometimes requires refueling

Estimated required versus available LH₂ by route



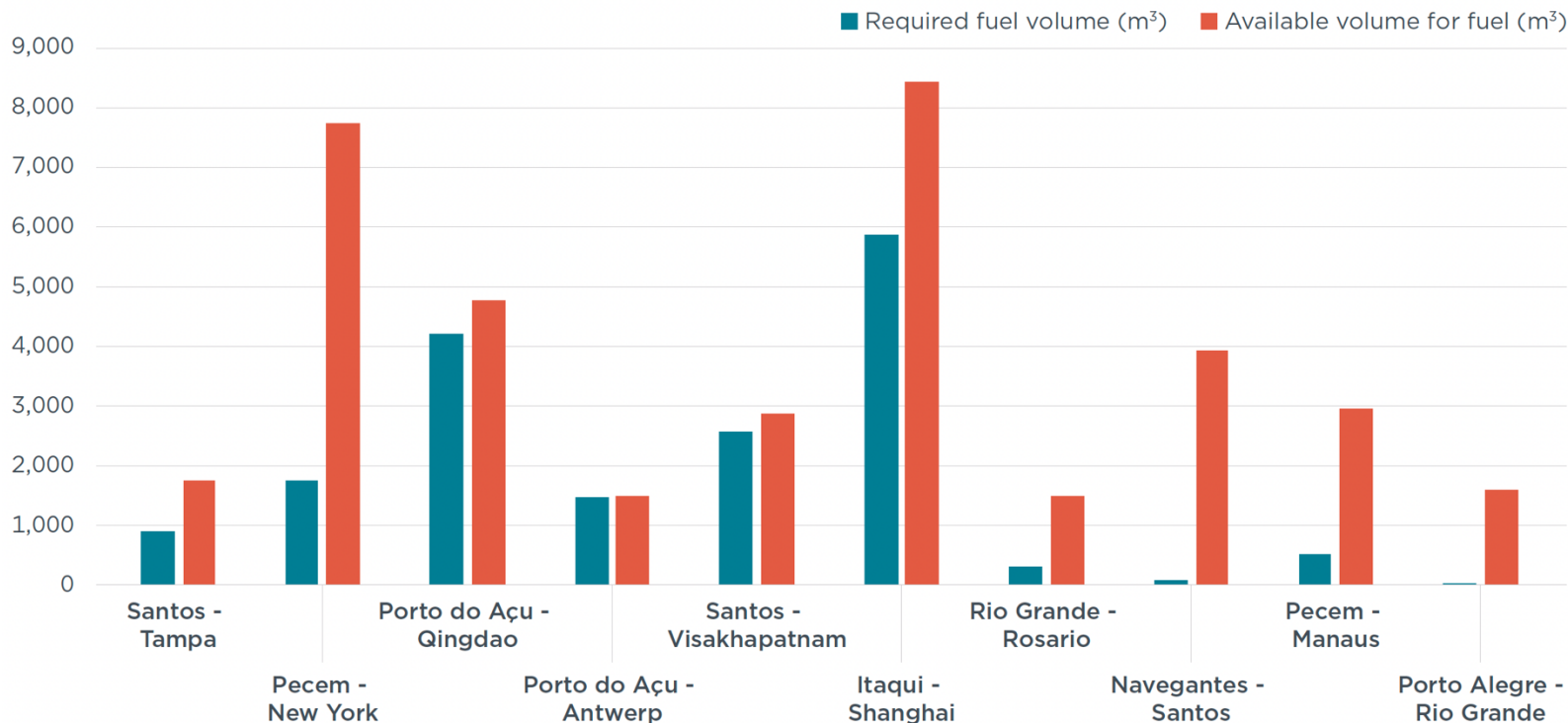
Methanol is feasible without any refueling

Estimated required versus available MeOH by route



Ammonia is feasible without any refueling

Estimated required versus available NH_3 by route



Conclusions

- Brazil is poised to become a leader in providing renewable hydrogen-based fuels to help decarbonize international and domestic shipping
- Six ports —Santos, Itaquí, Rio Grande Porto do Açu, Pecem, and Navegantes— have the greatest opportunity to become refueling hubs for renewable e-fuels.
- Ten routes connecting to these ports can be decarbonized using fuels like methanol, ammonia, or even hydrogen directly, but that comes with additional challenges.
- Brazil could produce enough renewable hydrogen to decarbonize one voyage on each of these 10 routes by adding approximately 80 or 90 GWh of additional renewable electricity supply, equivalent to about 0.1% of Itaipu's 2023 production.
- This could be a good opportunity for Brazil to demonstrate leadership in establishing one of the world's first green shipping corridors.

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