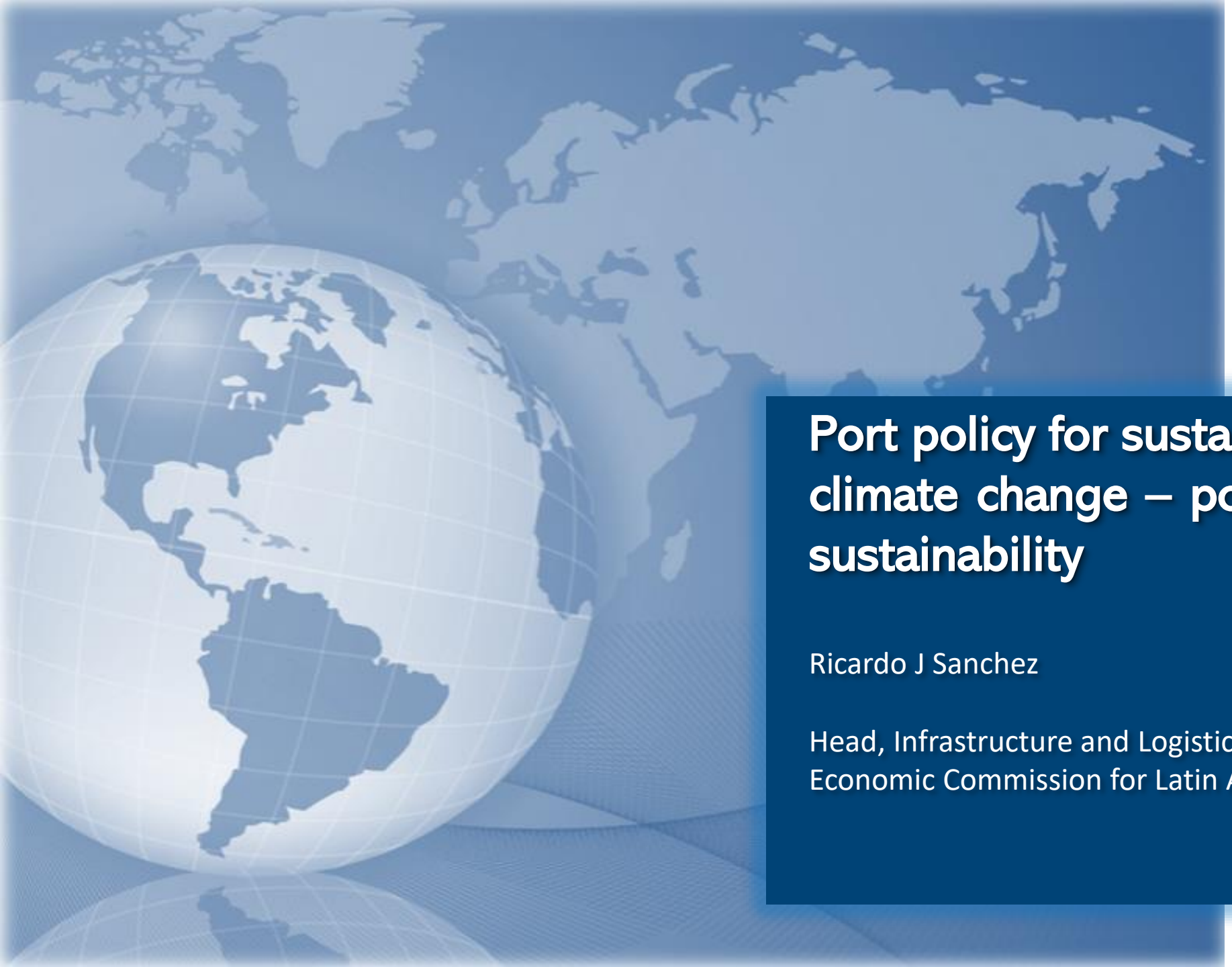

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Port policy for sustainable development: climate change – ports – supply chain – sustainability

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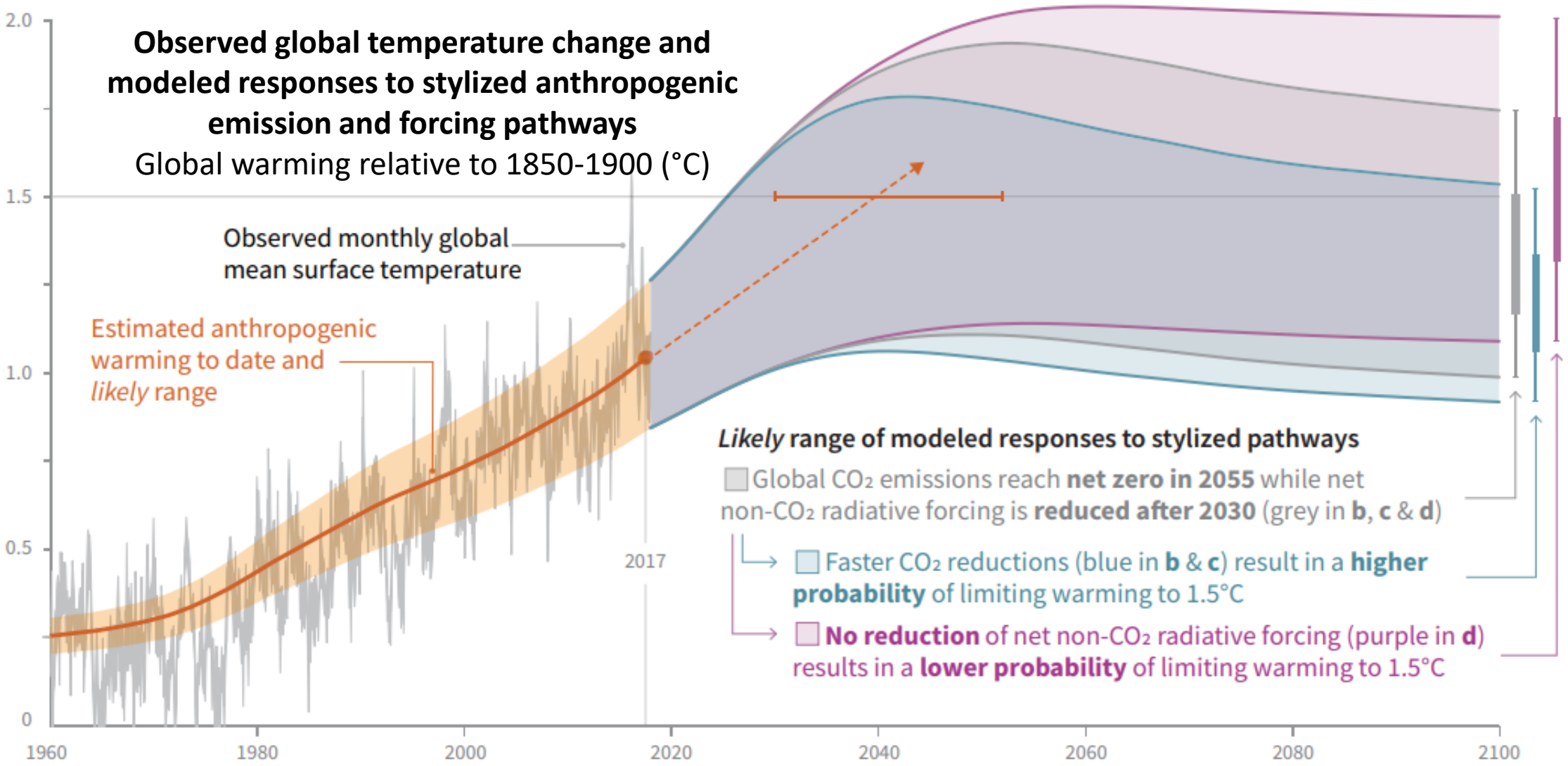
The impact of climate change on ports
The impact of maritime transport and ports on climate change
Ports and sustainability

Environmental and climate change risks



Source: The Intergovernmental Panel on Climate Change (IPCC), Global Warming of 1.5 ºC, 2018.

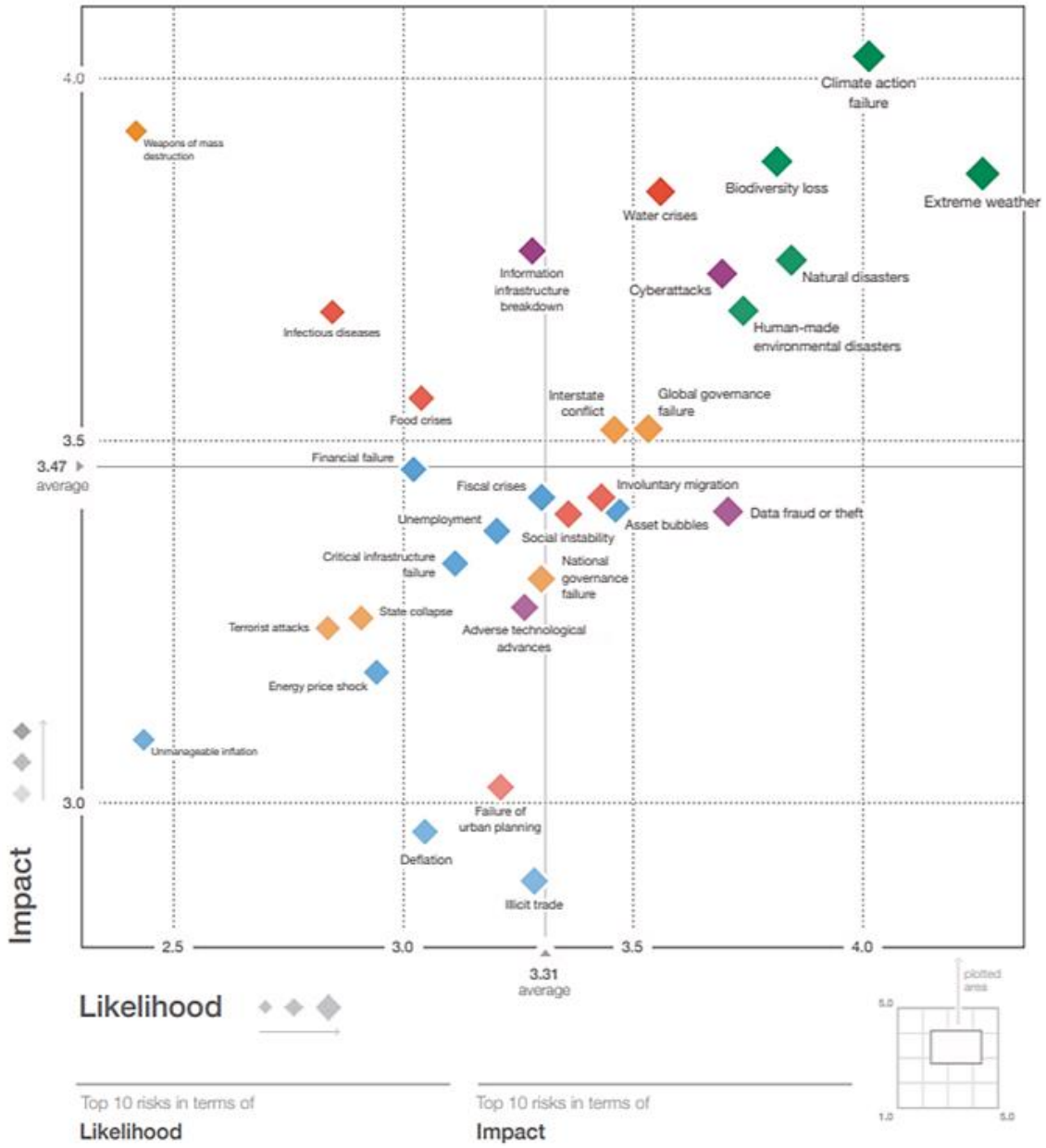
Matrix of risks: the exogenous, endogenous, and mixed risks

Exogenous Risks	Mixed Risks	Endogenous Risks
Macroeconomic Shipping risk (including change in shipping and trade patterns); Industries behaviour; Fiscal and monetary policies; Supply and demand; Income; Investment flows.	**Cultural** Lack of innovation and adaptation to cope with a new market environment; Without cultural change there will be no innovation, and no change at all;	**Finance & investment capabilities** Shorter life cycle of investments; The need to consider the whole logistic chain in investments; Not well-planned investments without considering the technological development; Increase of terminal opex and capex (meaning lower returns).
Political Instability and volatility; Changes in policies, business laws, and investment regulations; Protectionism; Currency wars; Geopolitical.	**Market factors** Competitive environment, concentration, and joint ventures; Consolidation of a new global/regional port hierarchy.	**Commercial Services** No adaptation to new market requirements; The need to think about logistics and not only the volume of cargo shipped; Monopsony & Oligopsony.
Governance Insufficient and obsolete governance models with a unimodal vision; Need of an integrated and systemic approach; Openness to innovation and thus contribute to the expansion of productivity and efficiency in ports.	**Environmental and Climate Change** Spills; Water unevenness; Natural disasters; Intensity of storms & hurricanes.	**Labour** Unsatisfied work demands; Labour threat due technological development generating labour conflicts; Lack of incentive on digital learning.
Regulation Incomplete contracts; Non-clear property rights; Opportunistic behaviours; Concessions.	**Resilience** Global health emergencies; Lack of preparation.	**Technological change capabilities** Fast pace of technological change (blockchain, the Internet of Things (IoT), robotics, artificial intelligence and automation, among others).
Geostrategic Transformation of the global energy, science and transport map; New strategic logistics (for instance One Belt One Road, Trans-Pacific Partnership (TPP) and the expansion of major arteries (Panama & Suez); Trade wars.	**Cyber security** Cyber attacks; Lack of preparation.	**Dynamism, infrastructure, operations, and equipment** Dynamism associated to the operations and obsolescence of assets; Idle time.
Hinterland and inland connectivity Shift in requirements for logistics facilities; Changes of clients demand; Proactive policies on transport governance capacity.		
Foreland connectivity Improvement in supply chain; Introduction of new port operations.		

Source: Ricardo J. Sanchez and Eliana Barleta, 2018.

Global risks landscape (2020): the World Economic Forum conducted a Global Risks Perception Survey (GRPS), in which respondents were asked to assess: (1) the likelihood of each global risk occurring over the course of the next 10 years, and (2) the severity of its impact at a global level if it were to occur. As a result, the following graphic shows the major risks that are causing impacts on global supply chains. Major risks facing the world include disruptive environmental events, cyberattacks, and global governance failure with direct effects on infrastructure.

Global risks landscape (2020)



Towards the decontamination of international maritime transport

Going back to the question: why is it so important to measure the emissions?

Import and export shipping CO2 emissions in Latin America and the Caribbean: selected countries

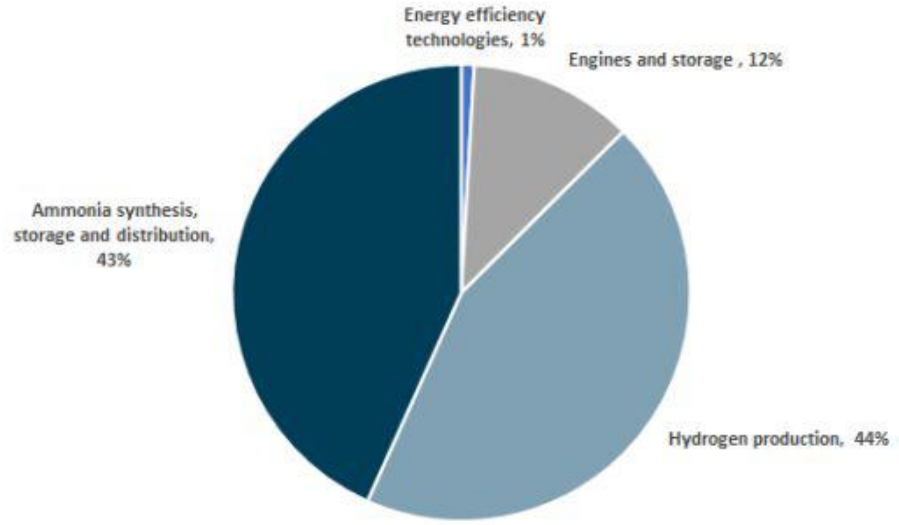
ECLAC has developed the first regional methodology for measuring the carbon emissions of international maritime traffic for the region

Countries	CO_2 emissions in maritime exports	Share of total maritime emissions *(Percentages)*	CO_2 emissions from maritime imports	Share of total maritime emissions *(Percentages)*
Argentina	1 759 253	0.20	366 218	0.04
Brazil	10 491 690	1.21	1 703 751	0.20
Chile	1 268 110	0.15	673 074	0.08
Colombia	1 294 710	0.15	218 936••	0.03
Ecuador	274 163	0.03	130 533	0.02
Mexico	8 043 401	0.92	2 950 107	0.34
Peru	721 366	0.08	286 404	0.03
Uruguay	132 358	0.02	57 809	0.01
Total	**23 985 051**	**2.76**	**6 386 832**	**0.73**

Source: Economic Commission for Latin America and the Caribbean (ECLAC).

Green initiatives: decarbonization & clean energies

- In order to reach zero emission energy sources, and ultimately towards full decarbonization, the maritime sector will require dramatic actions. The latter brings a huge potential for renewable energy production.
- It is necessary for achieving the transition towards full decarbonization to power the global shipping fleet by using fuels produced from renewable energy.
- Hydrogen, ammonia, etc. etc…
- Latin American has a huge endowment of renewable energy resources (solar, onshore and offshore wind, and hydropower).
- Latin America's clean energy transition includes the potential for producing **green hydrogen**.

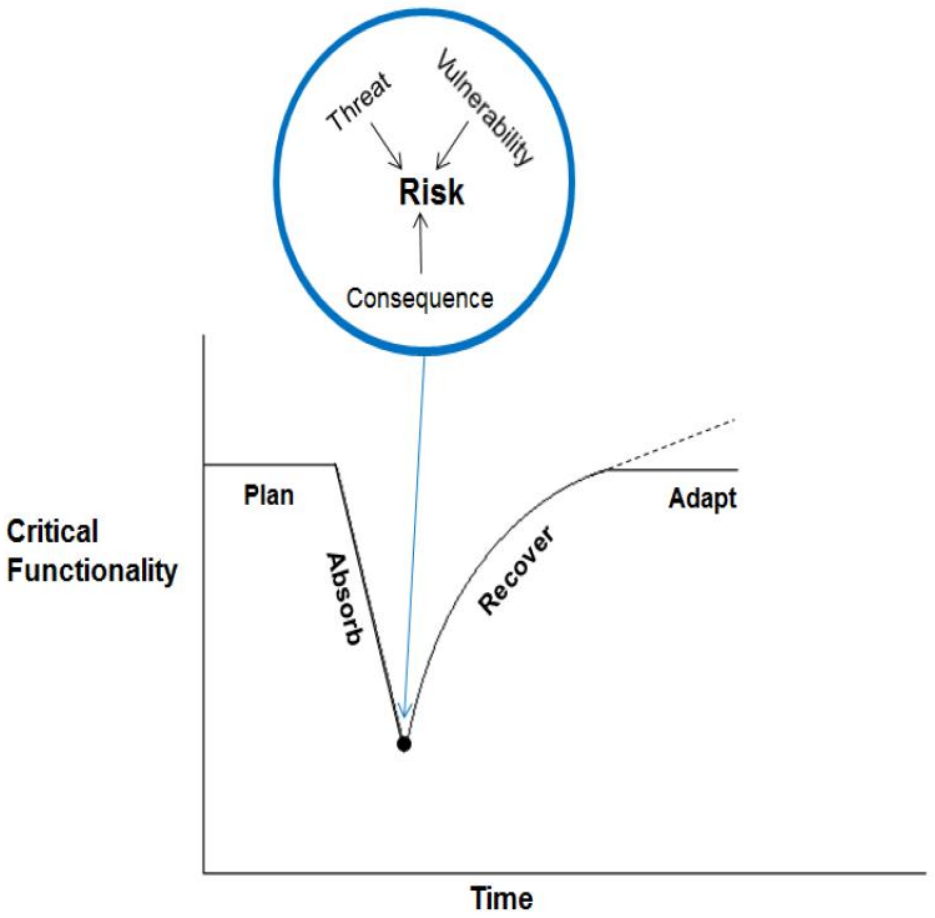


Source: Getting to zero coalition ((Global Maritime Forum, EDF and Ocean Conservancy).

Climate change costs

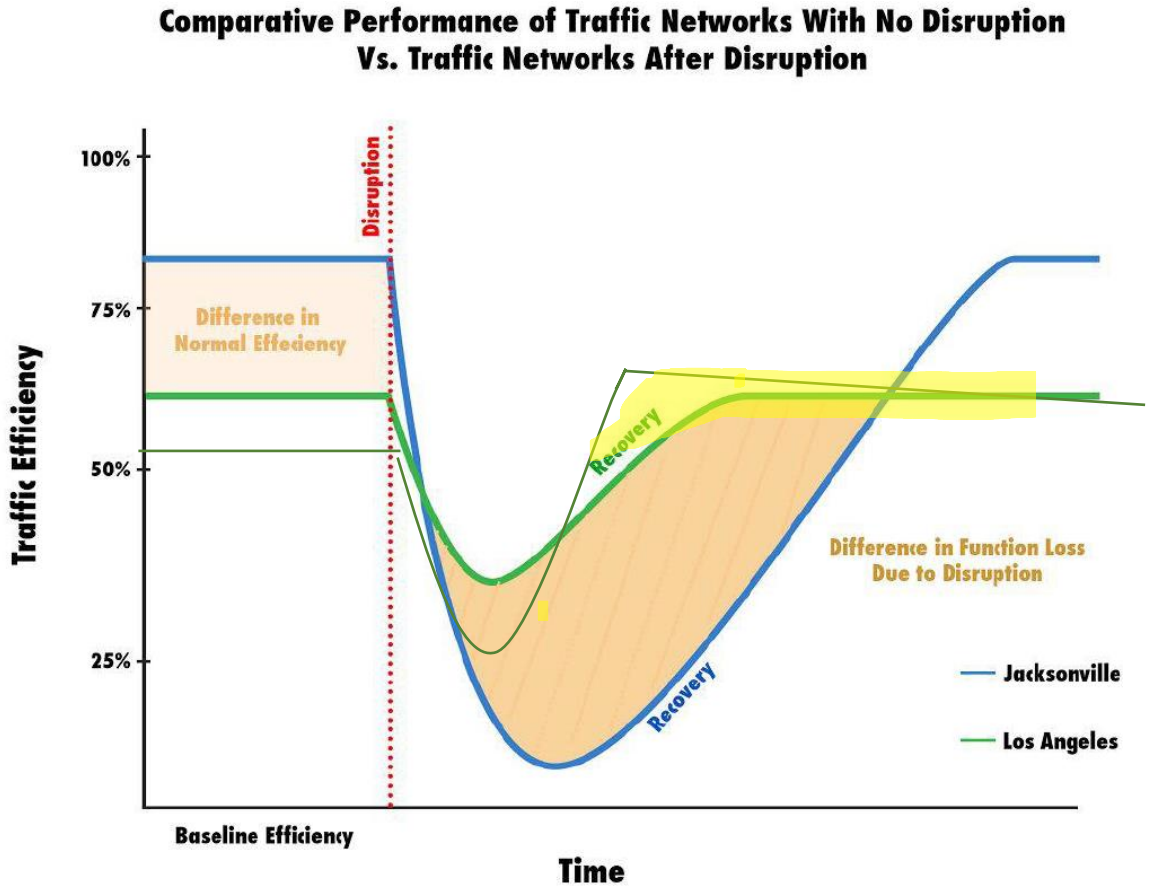
Source: UNCTAD (2020). Climate change adaptation for seaports in support of the 2030 Agenda for Sustainable Development. Geneva, 20–22 April 2020

A visual representation of resilience



Risk Analysis

System Resilience



*"The **ability to resist, absorb, recover** from, or successfully **adapt** to adversity or a **change** in conditions".*

Not only natural disasters

Source: Liknov, 2018.

How to apply resilience in infrastructure?

ROBUSTNESS:
The ability of the system to withstand a given level of stress and/or demand

REDUNDANCY:
Measure of the inherent substitutability of inputs

RESILIENCE

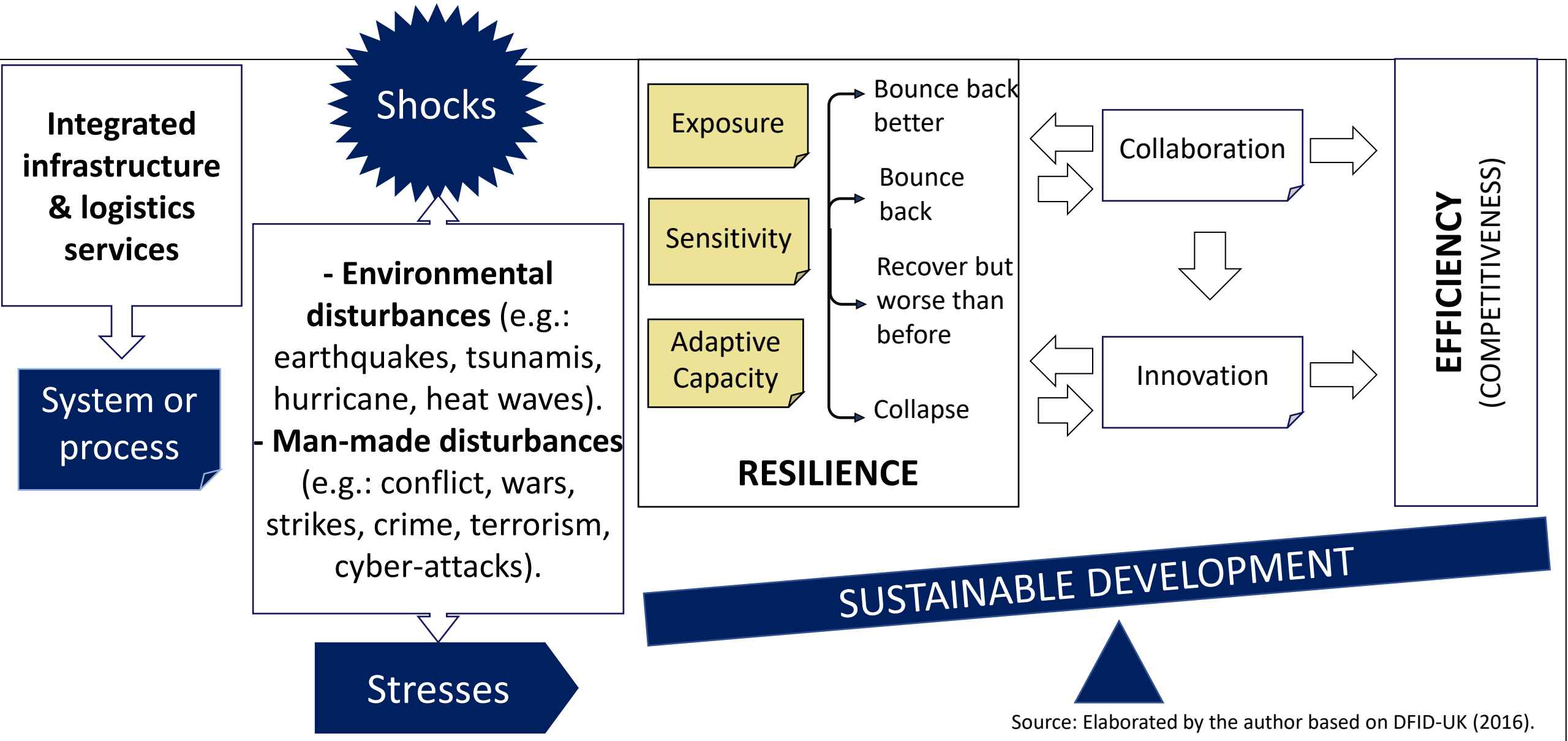
RESOURCEFULNESS:
Measure of the capacity to mobilize resources in the event of disruption

RAPIDITY:
Measure of the capacity to contain losses or prevent further degradation in a timely manner

Source: Based on Bruneau et al. (2003)

Source: Moor et al. (2015)

An expanded framework for understanding infrastructure resilience

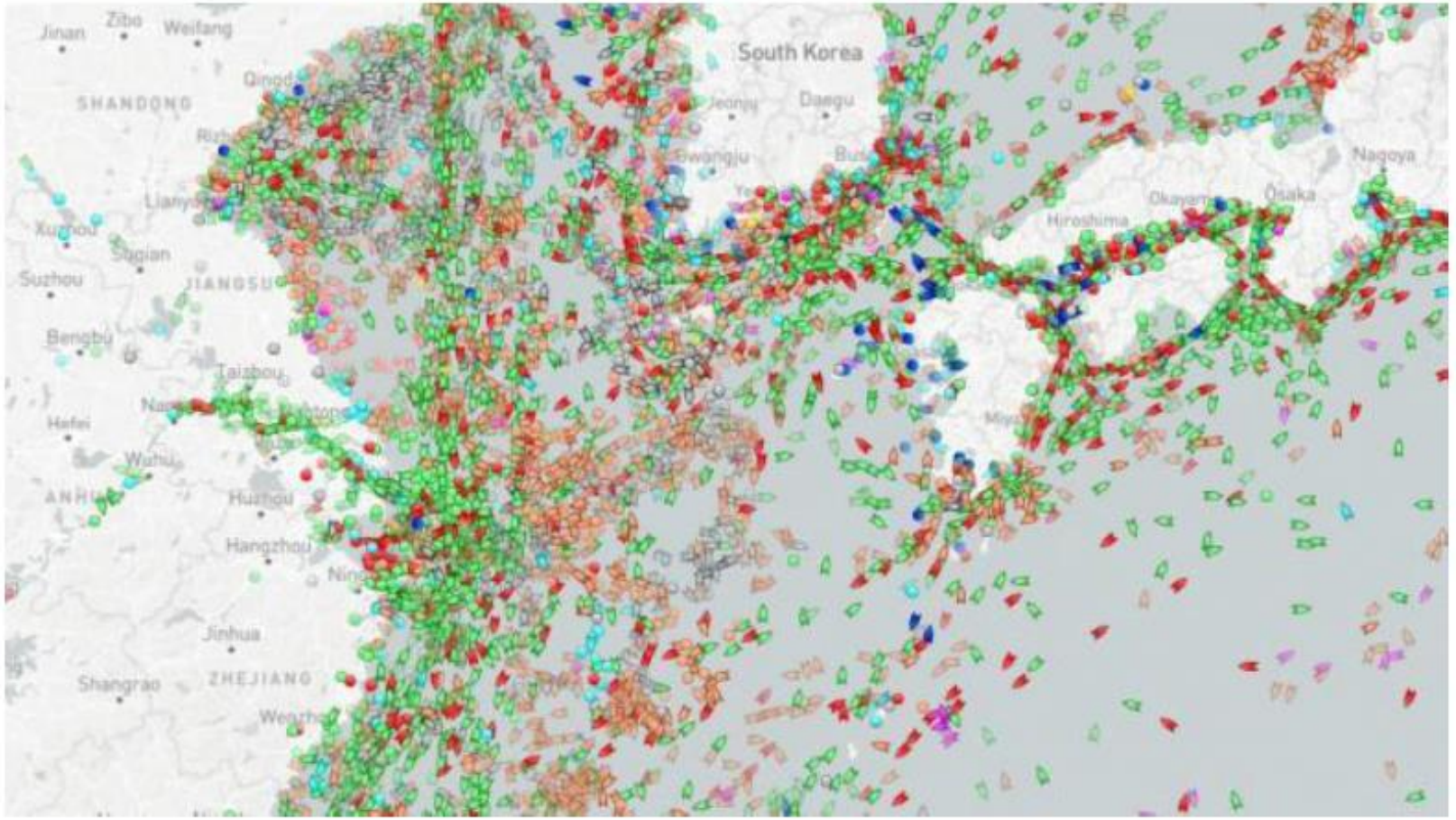


Source: Elaborated by the author based on DFID-UK (2016).

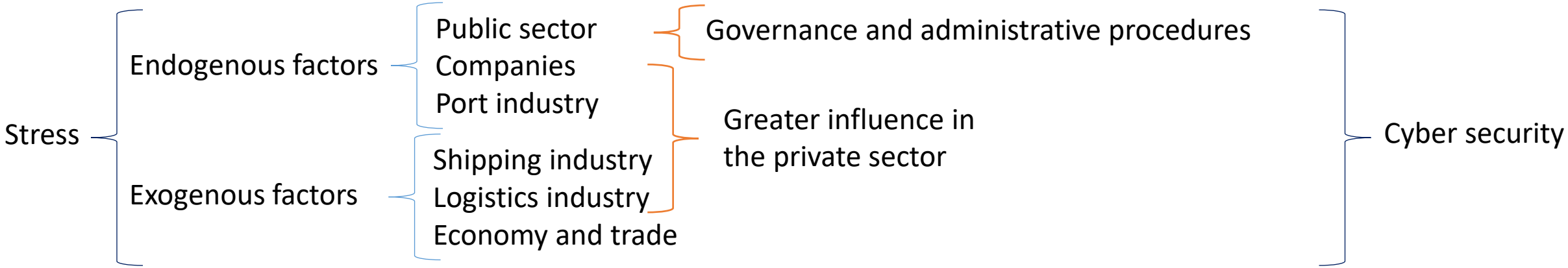
Investment in ports adaptation and resiliency due to climate change

Energy efficiency in ports and clean energy use

Supply chain stress and re-stress



Stress at ports



Source: Ricardo J. Sánchez, Eliana Barleta & Lara Mouftier, 2017; based on initials ideas from the authors in 2016.

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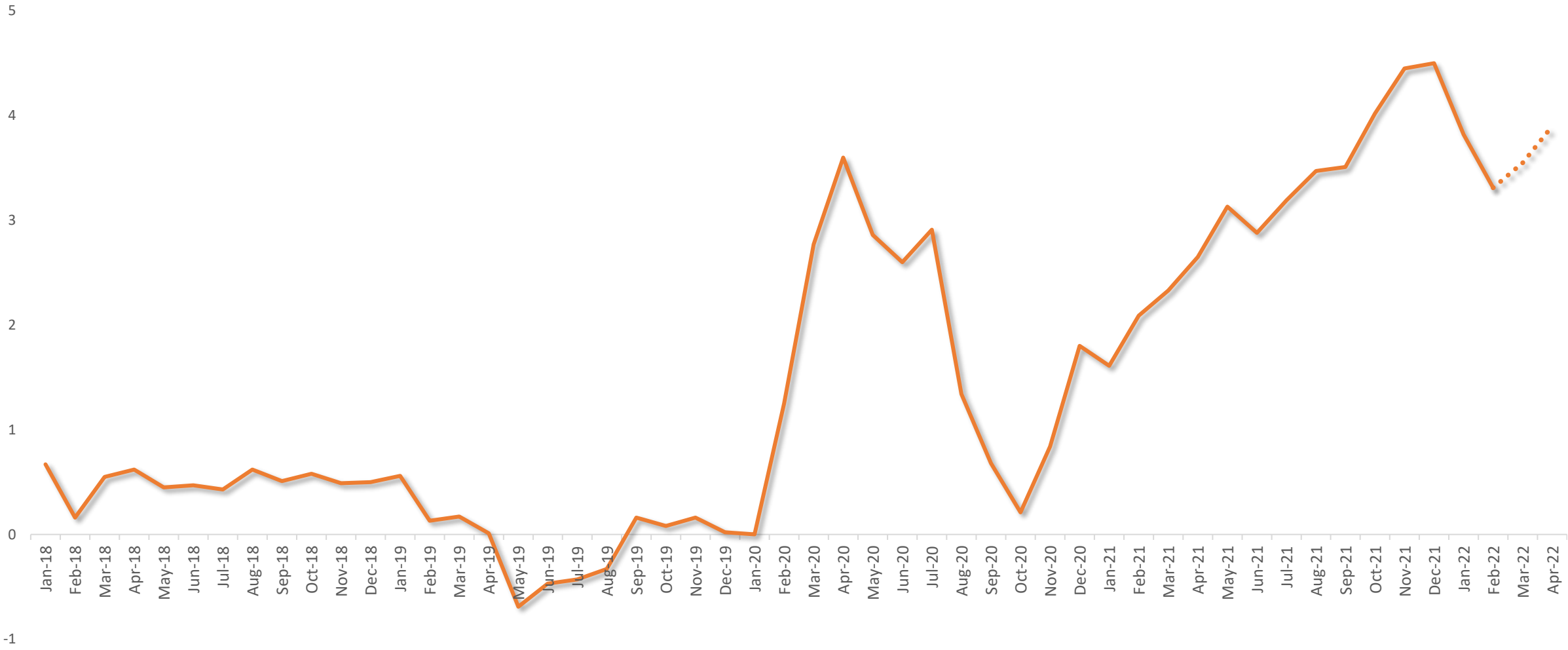
Stress in the supply-chain



Source: Source: Global Supply Chain Pressure Index (GSCPI)

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Next steps & topics for debate

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