



Arab Academy

for Science , Technology and Maritime Transport



The International Maritime Transport
and Logistics Conference

“MARLOG 13”

**Towards _____
Smart Green Blue
Infrastructure**

3-5 March 2024 - Alexandria, Egypt



Coping with shocks, disruptions and changing conditions by promoting sustainable and resilient port infrastructure



Eng. Francesc CARBONELL

Head of Sector for Transport

Secretariat of the Union of the Mediterranean (UfM)



CONTENTS

- I. The need for Port Resilience**
- II. The port system and related risk factors**
- III. A closer look at port disruption factors and resilience measures**





I. The need for Port Resilience

- **Maritime transport** underpins **world economic interdependency** and **global supply chain linkages**.
- **Port resilience** is not only **an imperative for supply chains**, but also for the **national economies** they support.



I. The need for Port Resilience

- A paradigm shift has been unfolding since the COVID-19 pandemic, with **risk management** and **resilience building** raising new policy and business concerns.
- In this context, **business continuity plans** and **emergency-response mechanisms** have again shown to be vital.



I. The need for Port Resilience

Integrating resilience interventions across existing port processes



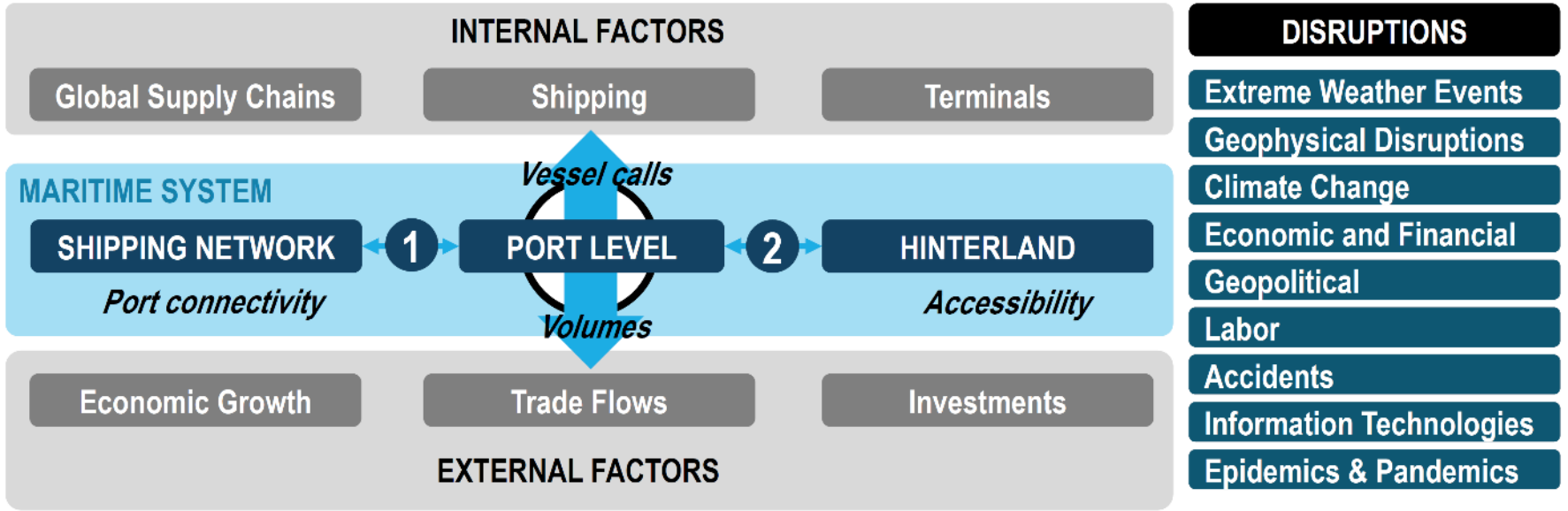


II. THE PORT SYSTEM AND RELATED RISK FACTORS



II. The port system and related risk factors

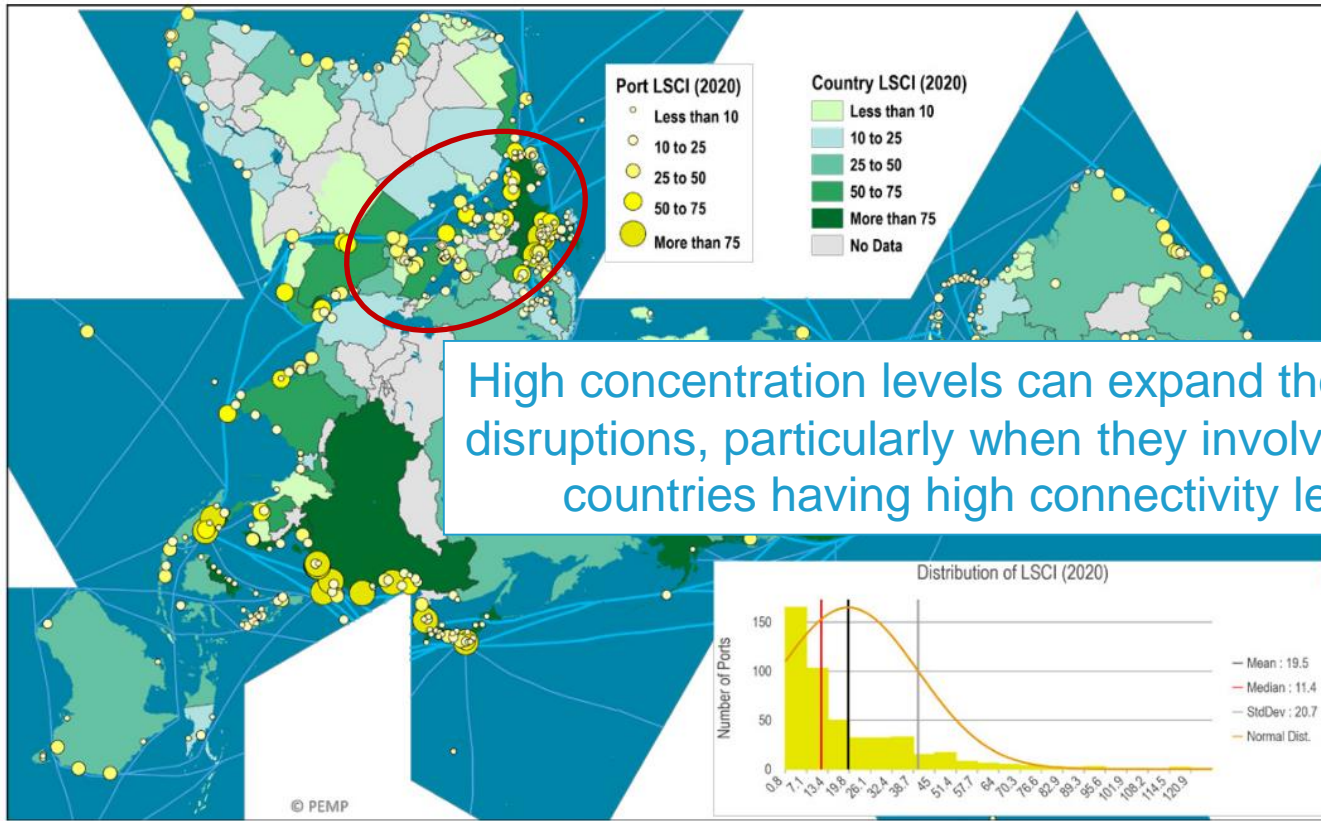
Ports in the maritime supply chain resilience landscape



II. The port system and related risk factors

The shipping network and related risks

Maritime container shipping connectivity

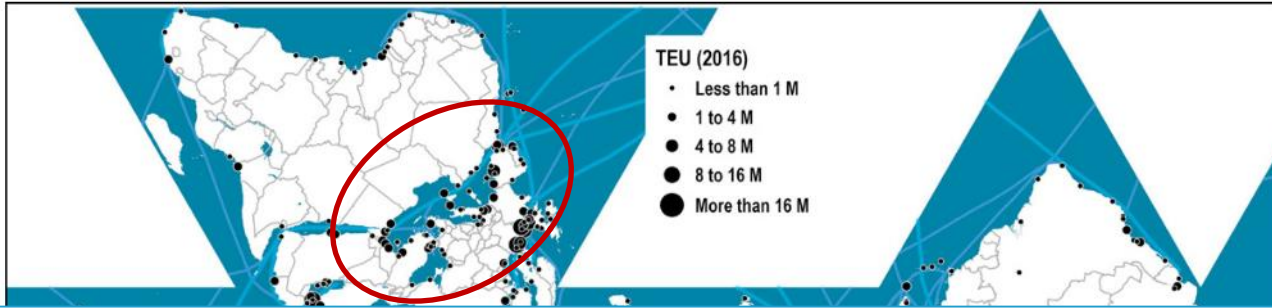


Source: Based on data from MDST, <https://www.mdst.co.uk>

II. The port system and related risk factors

Container port handling and traffic

Container port traffic



The 25 largest ports accounted for 49.8 per cent of twenty-foot equivalent unit (TEU) traffic, highlighting the vulnerability of global shipping focusing on a limited number of ports.



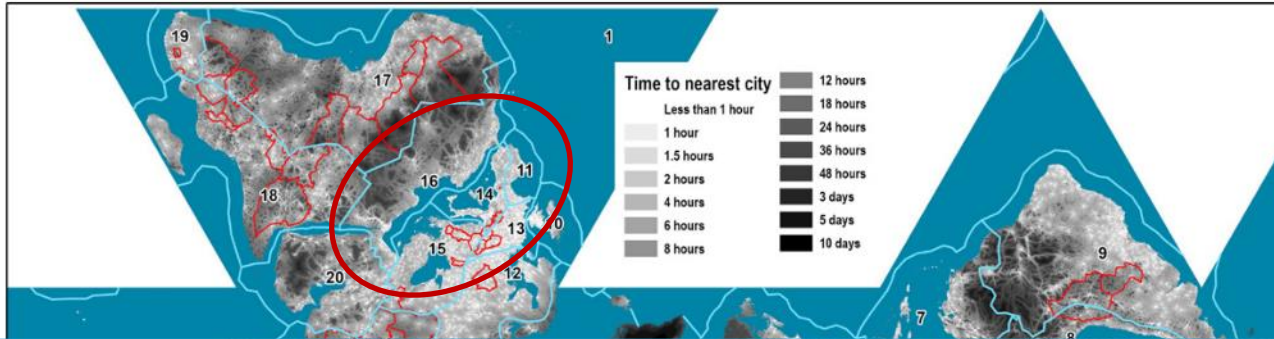
Any significant disruption in the leading 25 container ports will have a ripple effect on other shipping networks through delays in services, which will cascade through other connected ports.

Source: Based on data from J.P. Rodrigue, Global Container Port Database.

II. The port system and related risk factors

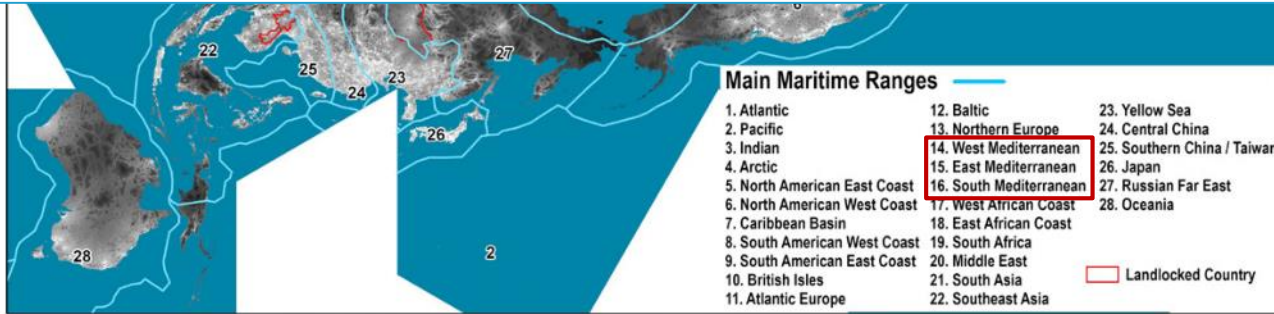
Hinterland access

Hinterland accessibility



For a given port, the hinterland contestability (i.e. the prospect for other ports to capture the cargo from/to the hinterland) affects its resilience.

Maritime ranges and



Source: Nelson A. (2008).

II. The port system and related risk factors

Port-centric activities

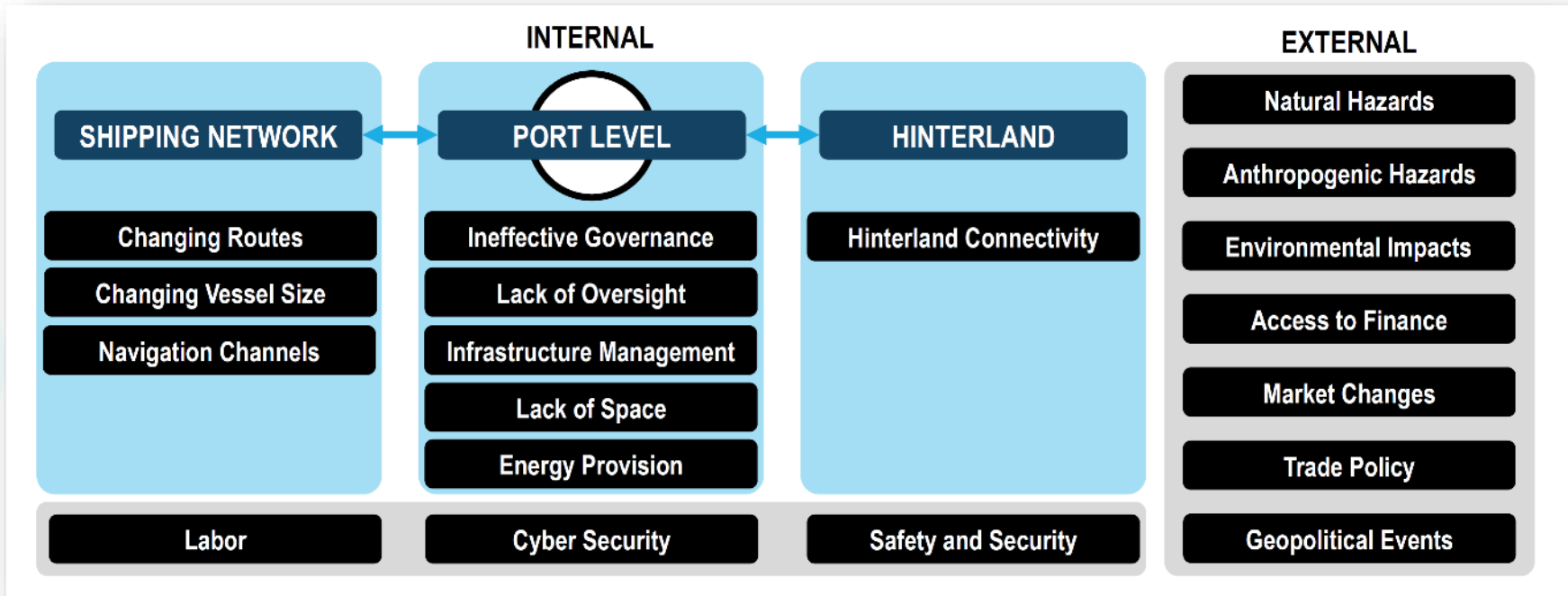
- On a local scale, ports support an ecosystem of activities consisting of port users directly dependent on its capabilities.
- Such **port clusters** include:
 - i. **logistics and warehousing;**
 - ii. **manufacturing;**
 - iii. **heavy industries;**
 - iv. **energy production;**
 - v. **transformation activities.**

This cluster is highly interdependent with port activities, implying that its resilience is based on the capability of the port to handle its cluster's inputs (imports) and outputs (exports).

Under normal circumstances this co-dependency is a factor of efficiency, but can be a vulnerability in the event of a disruption.

II. The port system and related risk factors

Port risk factors and challenges to resilience



Source: Adapted from Kim, Y., and L. Ross (2019).



III. A CLOSER LOOK AT PORT DISRUPTION FACTORS AND RESILIENCE MEASURES

- Hazards and port factors than can disrupt port activity
- Key mitigation and response measures to port disruptions



III.1 Hazards and port factors than can disrupt port activity

- Contemporary challenges to port resilience

Natural

- Extreme weather events
- Geophysical disruptions
- Climate change

Anthropogenic

- Accidents
- Geopolitical events
- Labour issues
- Information technologies
- Economic and financial
- Sanitary threats



III.1 Hazards and port factors than can disrupt port activity

Contemporary challenges to port resilience

Main natural and anthropogenic supply chain disruptions in the 21st century



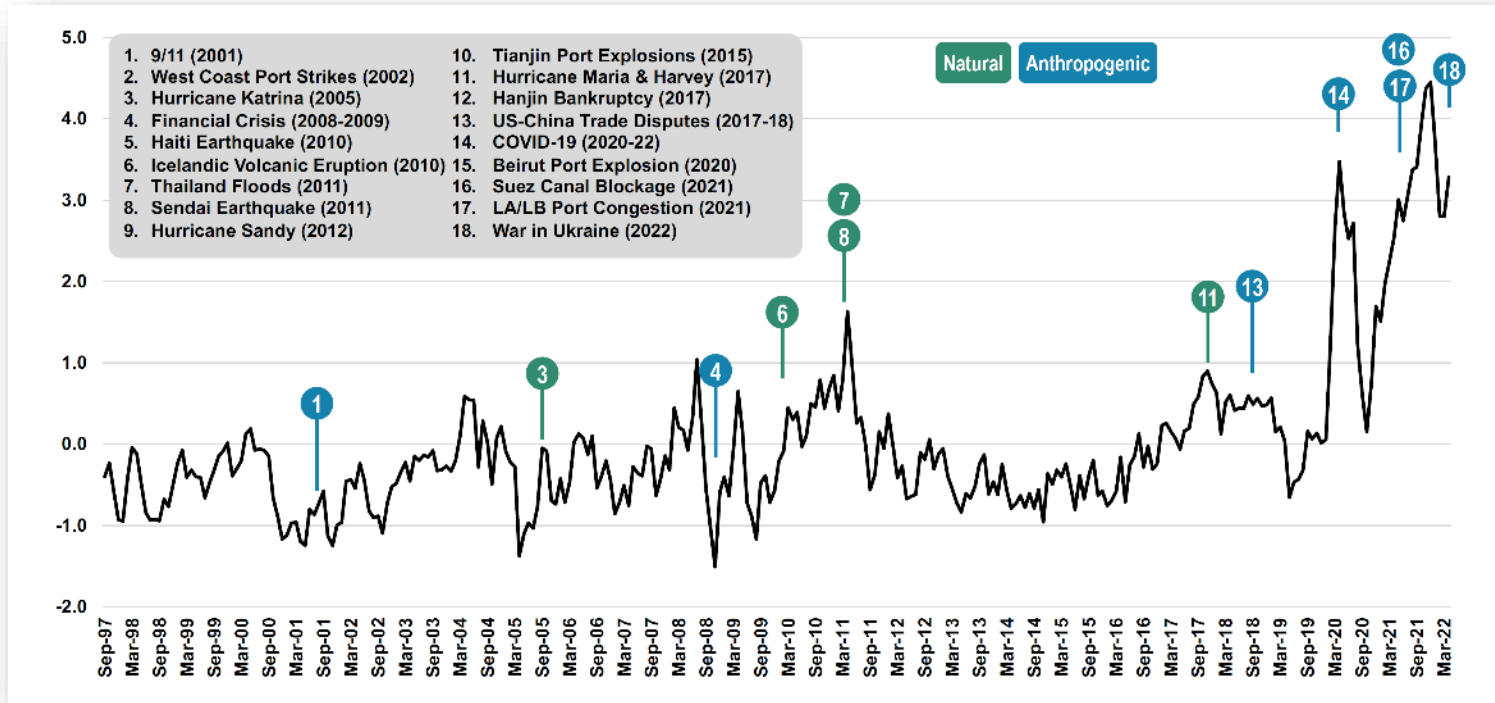
1. 9/11 (2001)
2. West Coast Port Strikes (2002)
3. Hurricane Katrina (2005)
4. Financial Crisis (2008-2009)
5. Haiti Earthquake (2010)
6. Icelandic Volcanic Eruption (2010)
7. Thailand Floods (2011)
8. Sendai Earthquake (2011)
9. Hurricane Sandy (2012)
10. Tianjin Port Explosions (2015)
11. Hurricane Maria & Harvey (2017)
12. Hanjin Bankruptcy (2017)
13. US-China Trade Disputes (2017-18)
14. COVID-19 (2020-22)
15. Beirut Port Explosion (2020)
16. Suez Canal Blockage (2021)
17. LA/LB Port Congestion (2021)
18. War in Ukraine (2022)

Source: Based on data from J.P. Rodrigue, Global Container Port Database.

III.1 Hazards and port factors than can disrupt port activity

Contemporary challenges to port resilience

Global Supply Chain Pressure Index (GSCPI) and major supply chain disruptions

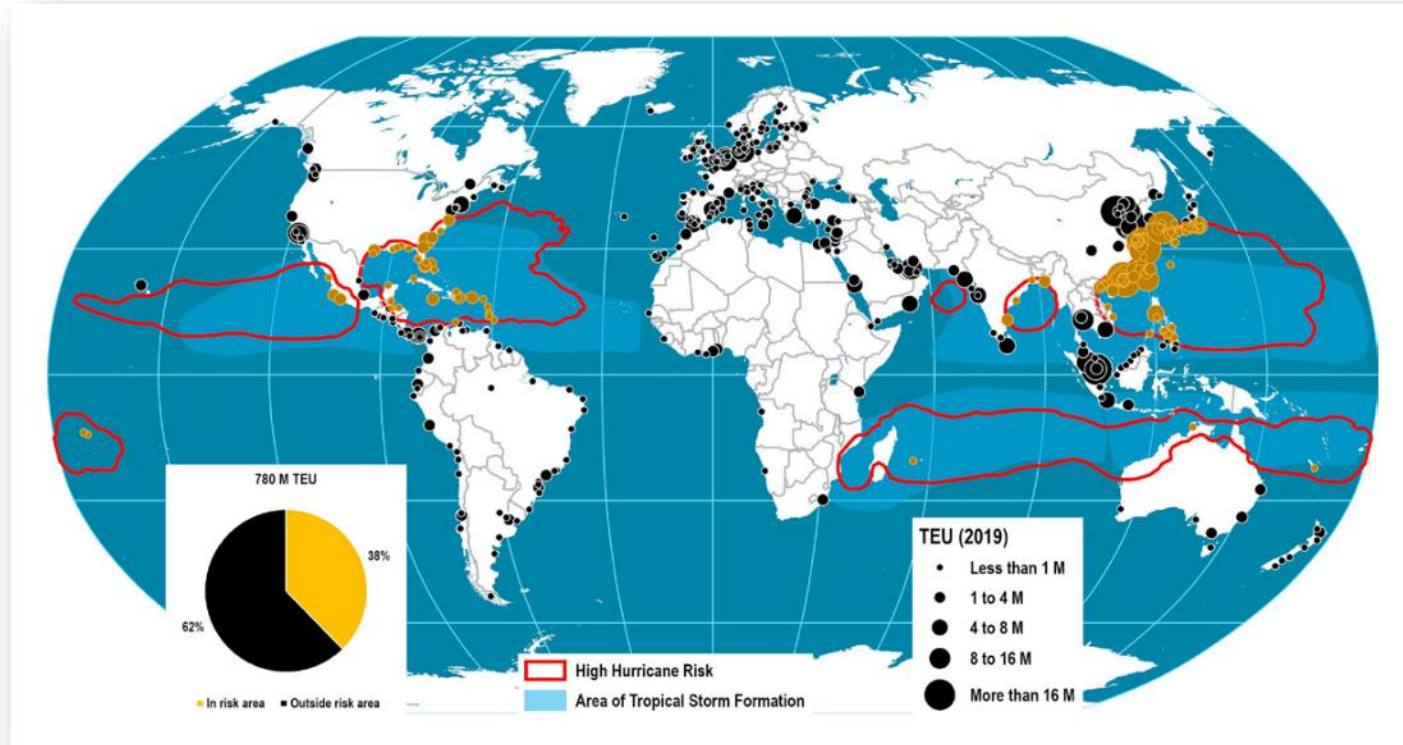


Source: Data from G. Benigno et al (2022).

III.1 Hazards and port factors than can disrupt port activity

Extreme weather events

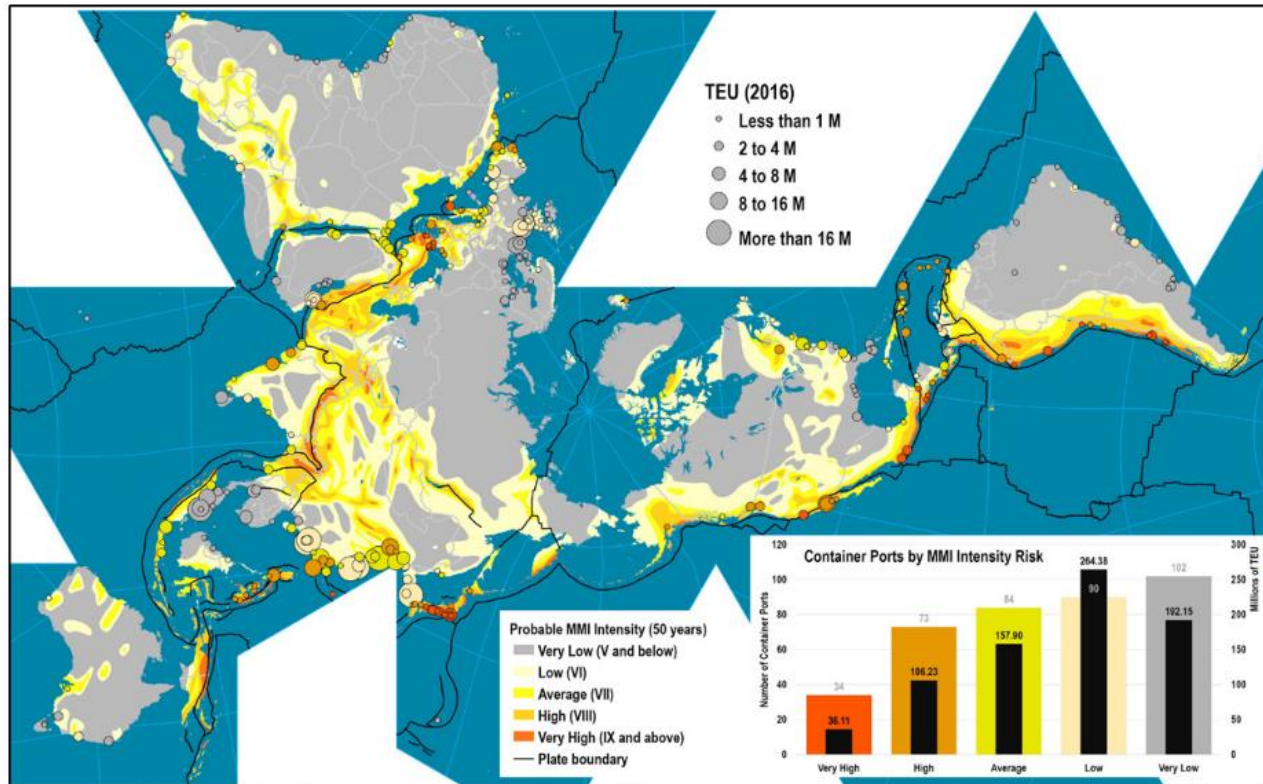
Risk of hurricanes for global container ports, 2019



III.1 Hazards and port factors than can disrupt port activity

Geophysical disruptions






Risk of earthquakes for global container ports



III.1 Hazards and port factors than can disrupt port activity

Climate change

Climate change potential impacts on maritime transport

		Operations	Infrastructures
Heat waves		<ul style="list-style-type: none"> Limits on periods of construction activity. More energy for reefer transportation and storage. 	<ul style="list-style-type: none"> Thermal expansion of piers. Pavement integrity and softening. Deformation of rail tracks.
Rising sea levels		<ul style="list-style-type: none"> Frequent interruptions of coastal low-lying road and rail due to storm surges. Flooding of terminal areas. 	<ul style="list-style-type: none"> More frequent flooding of infrastructure (and potential damage) in low lying areas. Erosion of infrastructure support. Changes in harbor facilities to accommodate higher tides and surges.
Intensity of precipitation		<ul style="list-style-type: none"> Increase in weather related delays and disruptions. 	
Increasing hurricane intensity		<ul style="list-style-type: none"> Topple of container stacks and port equipment. Debris on port infrastructure. 	
Increase in arctic temperatures		<ul style="list-style-type: none"> Longer shipping season. More ice-free ports in northern regions. Availability of trans-arctic shipping routes. 	<ul style="list-style-type: none"> Greater probability of infrastructure failure. Greater damage to port infrastructures. More significant flooding on hinterland infrastructures.

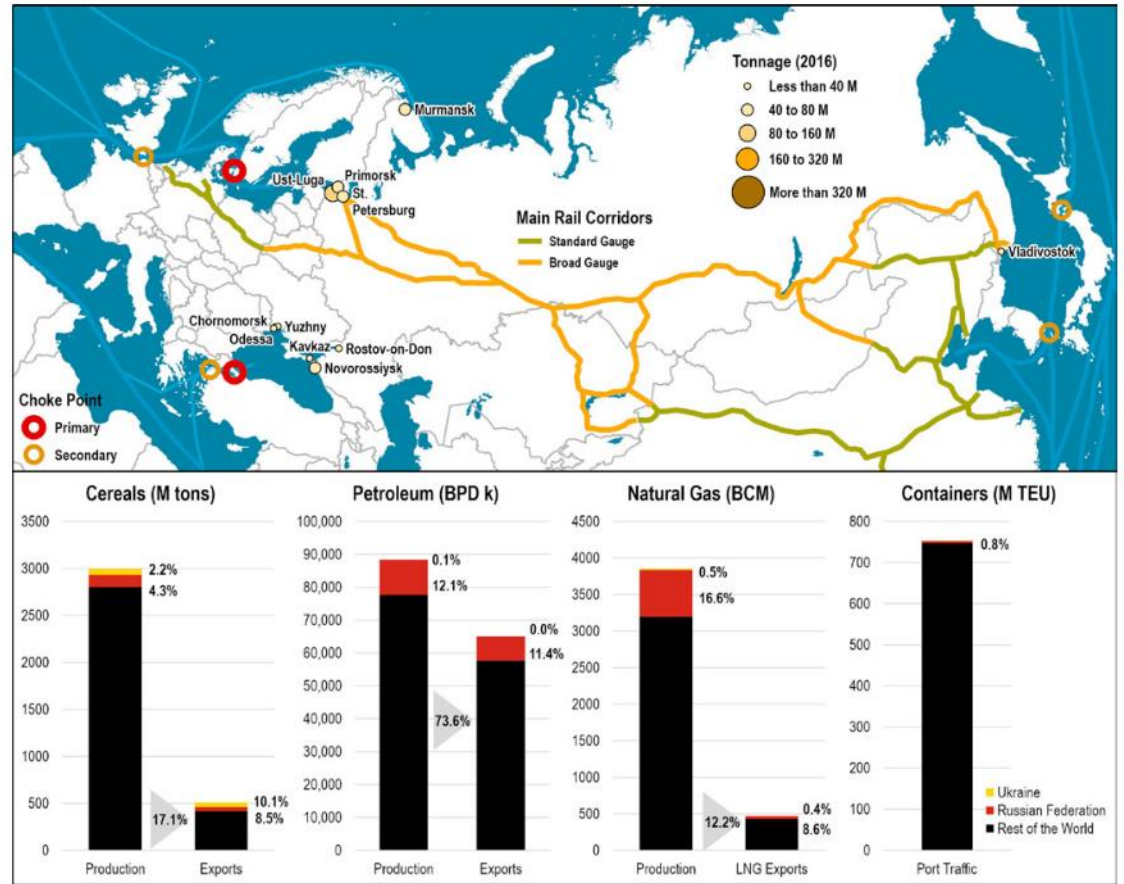
© PEMP

Source: Adapted from National Research Council (2008).

III.1 Hazards and port factors than can disrupt port activity

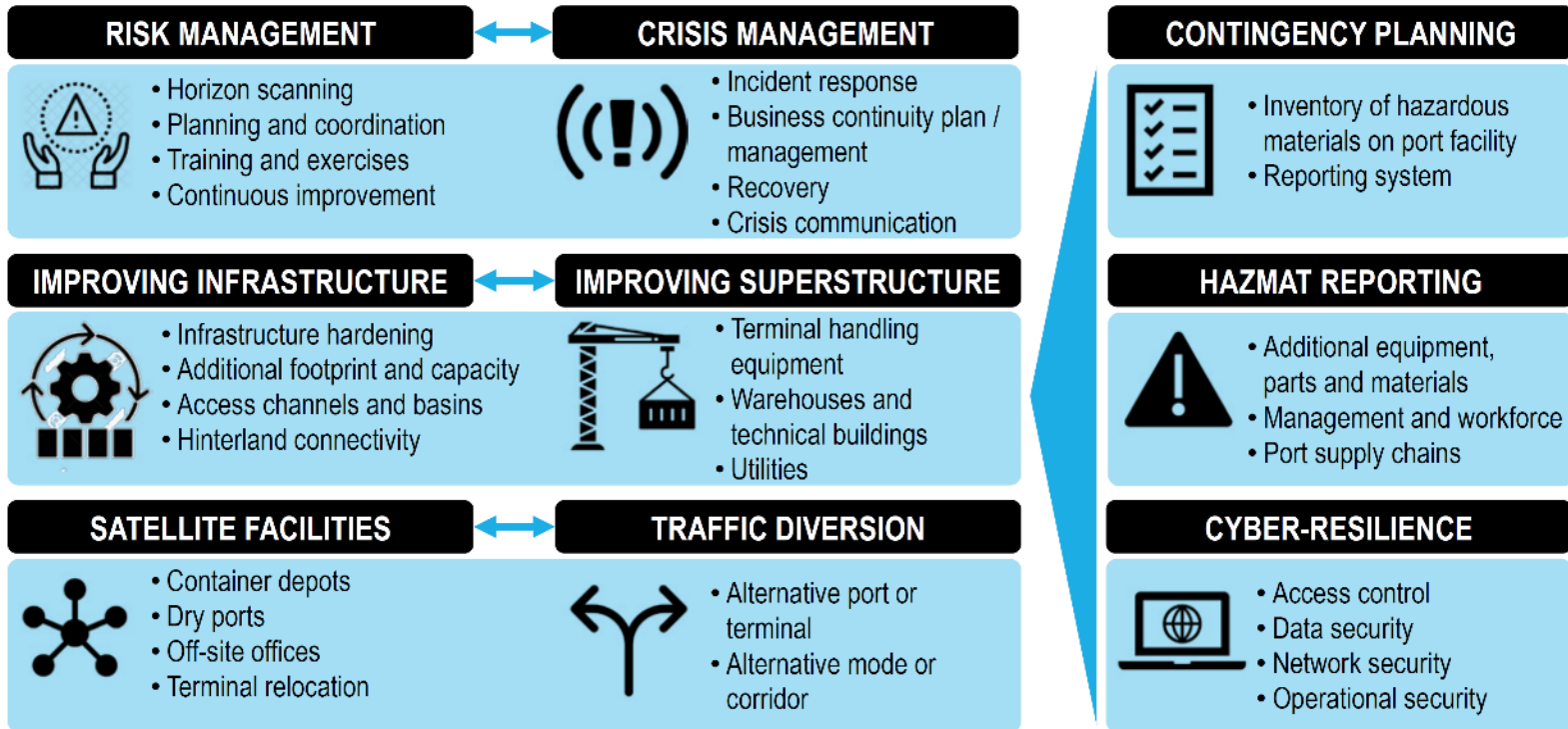
Geopolitical events

Russian Federation and Ukraine
 – Transport networks and contribution to global trade



Source: Based on data from FAO, the BP Statistical Review of World Energy July 2021, and J.P. Rodrigue, Global Container.

III.2 Key mitigation and response measures to port disruptions



Thank You !

Eng. Francesc CARBONELL

Head of Sector for Transport

francesc.carbonell@ufmsecretariat.org

Secretariat of the Union of the Mediterranean



Union for the Mediterranean
Union pour la Méditerranée
الاتحاد من أجل المتوسط

Follow us on:
@UfMSecretariat
www.facebook.com/ufmsecretariat
www.UfMSecretariat.org