



Western Cape
Government

FOR YOU



Department of Economic Development and Tourism

Global Perspective on Disruptive Event Mitigation

12 February 2026

Table of Contents



01 International Literature

Global research on port infrastructure risk and resilience



02 Case Studies

Port of Wellington, Tangier, Hamburg, and others



03 Synthesis

Key findings and common approaches across ports



04 Recommendations

Strategic actions for disruptive event mitigation

International Literature n = 20

Contents lists available at ScienceDirect

Resilient Cities and Structures

journal homepage: www.elsevier.com/locate/rcns

Full Length Article

Resilience framework for seaport infrastructure under extreme wind

A. Balbi^a, O. Kammouh^{b,*}, G.P. Cimellaro^c, M.P. Repetto^{a,*}

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Available online at www.sciencedirect.com

ScienceDirect

Procedia Computer Science 251 (2024) 783–788

Procedia
Computer Science

www.elsevier.com/locate/procedia

The 2nd International Symposium on Intelligent Systems and Future Networks (ISFN 2024)
October 28-30, 2024, Leuven, Belgium

A Review of Wind Impact on Container Port Operations: Current Technologies, Strategies and Future Perspectives

Evaluation of wind load calculations on large container cranes

H. De Backer & A. Outtier
Ghent University, Ghent, Belgium

Risk Profile of Weather and System-Related Port Congestion for the Cape Town Container Terminal

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UNIVERSITY OF KWAZULU-NATAL

REVIEWING PRECAUTIONARY THRESHOLDS AT SEAPORT PRECINCTS
ON ACCOUNT OF INTENSE COASTAL WEATHER CONDITIONS IN
KWAZULU-NATAL

International Literature Continued



BUILDING CAPACITY TO MANAGE RISKS AND ENHANCE RESILIENCE A Guidebook for Ports



63.1B

USD trade at risk



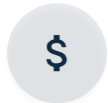
86%

Ports exposed to 3+ hazards



32%

Risk from tropical cyclones



7.5B

USD annual port risk

Multi-hazard risk to global port infrastructure and resulting trade and logistics losses

Jasper Verschuur, Elco E. Koks, Sihan Li & Jim W. Hall

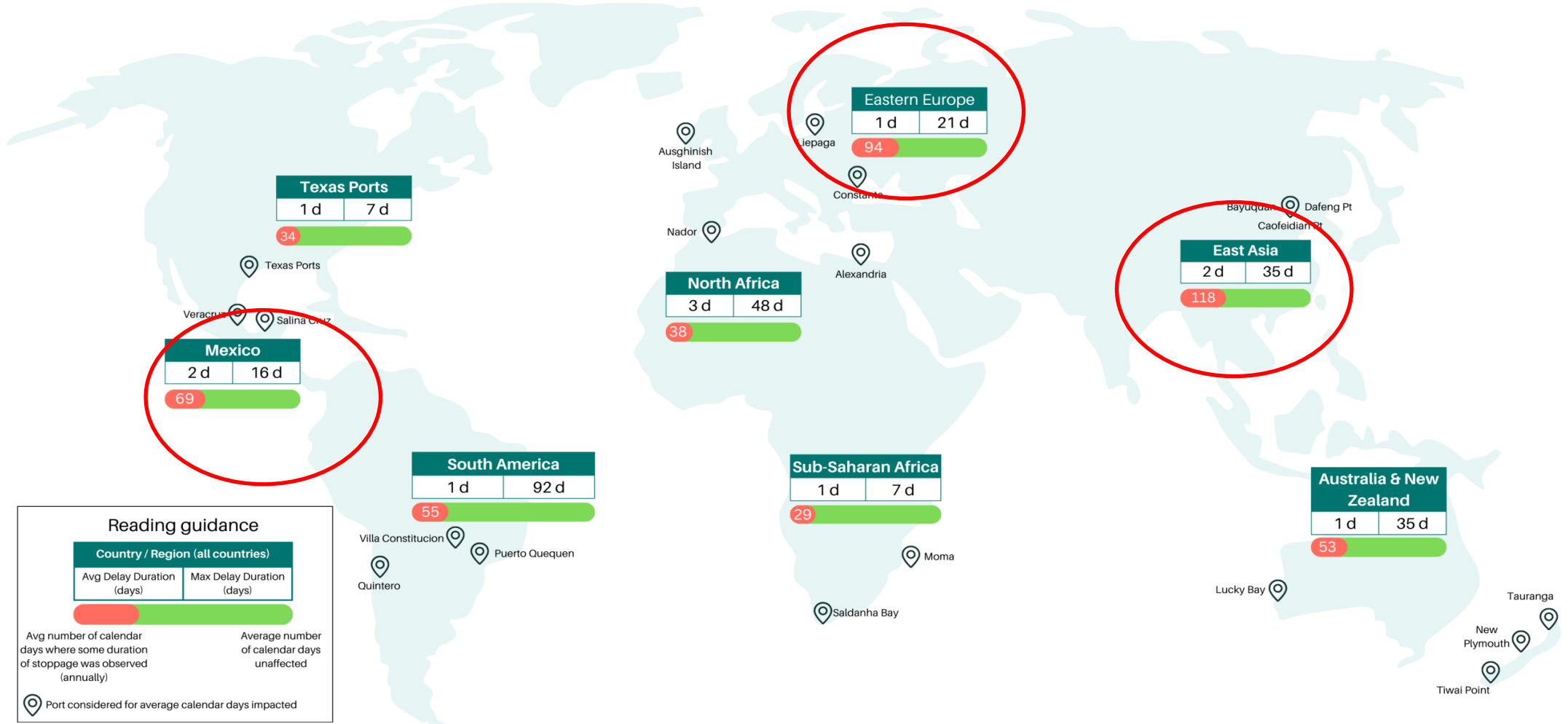
We find that **86%** of ports are exposed to more than three hazards.

Globally, port-specific risk totals **7.5 USD bn** per year, with **32%** of the risk attributed to tropical cyclone impacts.

In addition, **63.1 USD bn** of trade is at-risk every year, with trade risk as a fraction of total trade.

Port resilience is determined by various critical factors, such as engineering standards, operational thresholds, recovery duration, that vary widely across ports, requiring tailored solutions to improve port resilience.

Case Studies, Marcura Project, Analyzing Impact of Wind on Port Delays, 2025



Reading guidance

Country / Region (all countries)	
Avg Delay Duration (days)	Max Delay Duration (days)
Avg number of calendar days where some duration of stoppage was observed (annually)	Average number of calendar days unaffected

Port considered for average calendar days impacted

Case Studies

Port of Wellington (CentrePort)

- Multiple wind/motion monitoring points for accurate modelling
- Stop-secure-resume SOP with partial continuity in sheltered areas
- Utilize windows between gusts
- Rapid recovery after disruption



Port of Hamburg

- North Sea storms
- Automation and appropriate modern infrastructure



Port of Tangier, Morocco

Port of Tangier, Morocco

- APM Terminals Wind Resilience Tool: Custom AI-powered decision support system
- 18 on-site wind sensors, combined with container metadata to build a live 3D model of the yard
- Zero container toppling events since implementation
- Number of pre-emptive moves per wind warning dropped from roughly 800 to ~20

Other

- Ports of Rotterdam and Antwerp were challenged with capacity constraints in face of cargo growth
- Responded with digital planning platforms and hinterland connectivity

Synthesis

- 1. Adequate monitoring of disruptions to facilitate appropriate modelling and decisions**
- 2. Standard operating procedures for unique situations**
 - During disruptive event
 - Recapturing lost production
 - Improving resilience
- 3. Utilize opportunities (sheltered spaces and windows between events)**
- 4. Digital planning integration within the port system**
- 5. Hinterland connectivity**



Recommendations



1

TNPA-CSIR Engagement

Upscale TNPA engagement with CSIR on **wind monitoring** to global best practice



2

Benchmark SOP's

Benchmark SOP's for disruptive events against **global best practice**



3

Event Mitigation Task Team

Establish a port community Disruptive Event Mitigation Task Team to **optimize recapture** after disruptions



4

Hinterland Connectivity

Optimize hinterland connectivity – Test viable opportunities offered by **Saldanha**



5

Digital Platform Integration

Expedite **digital logistics planning platform** integration for all port users

Thank you