Royal HaskoningDHV
Enhancing Society Together

Enhancing Adaptation to Climate Hazards: A Case Study of a Deep Sea Port in Vietnam

PIANC APAC 2024 - PIANC Asia Pacific Conference

Sydney, 27-30 August 2024

Alexandria Norris-Moore and Hang Dao

29 August 2024

Acknowledgement of Country

Gadigal, Acknowledgement Respect by Jeffrey Samuels

Introduction

Royal HaskoningDHV

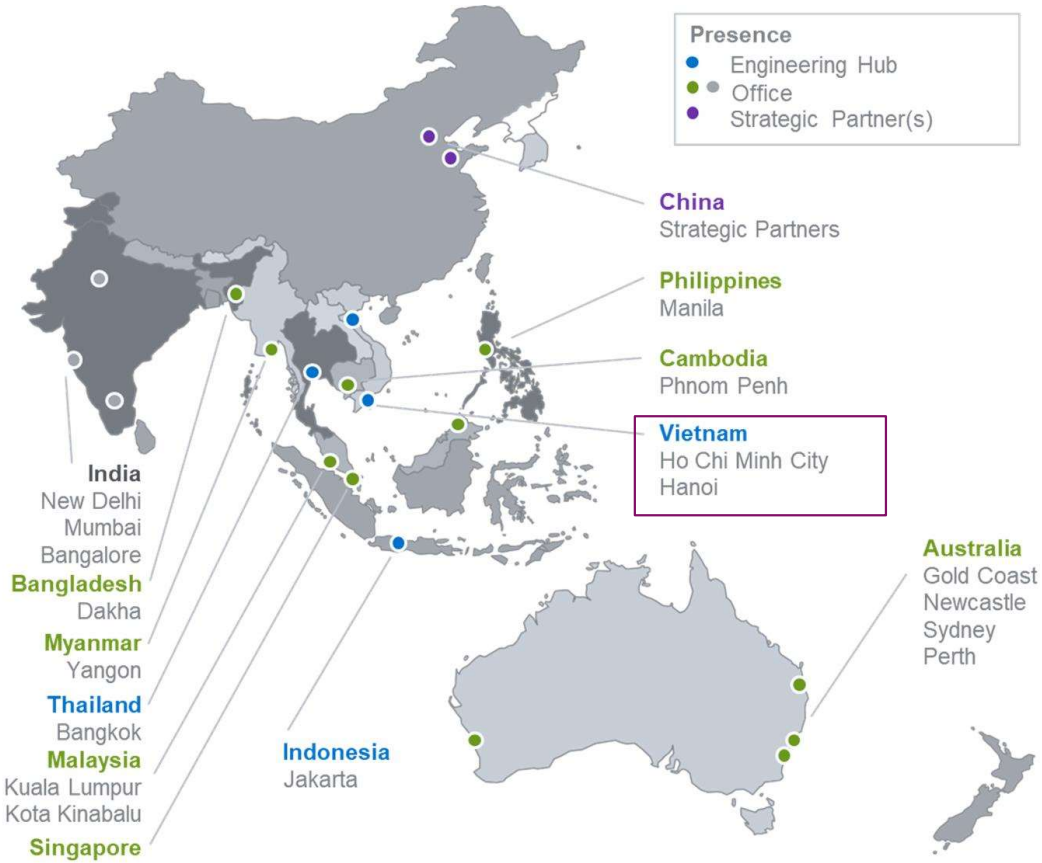
Presentation

1. **Enhancing Adaptation to Climate Hazards**
   - Climate Hazards and Adaptation of Port Sector
   - Importance of Resilient Assessment for Ports in Asia-Pacific

2. **Case Study of a Deep Sea Port in Vietnam**
   - Vietnam Climate Change and Disaster context
   - IFC Building Resilience Index Tool
   - Gemalink Deepsea Port Assessment Outcome

3. **Adaptation for the Port Sector**
   - Conclusions and Recommendations

About Royal HaskoningDHV Asia-Pacific



40+ years in SoutheastAsia
Actively doing business since the 1970's.

1000+ professionals in APAC
Dynamic local teams, working across borders from branch and project offices

Structure
Integrally managed regional structure based on local "ears and eyes of the ground" with internal support

Network
Embedded in a strong global network

Royal HaskoningDHV

Enhancing Adaptation to Climate Hazards

Climate Change and Disaster Hazards

Physical Risks

Acute risks

- Storms and tropical cyclones
- Precipitation
- Flooding (coastal, pluvial, fluvial)
- Heatwaves and droughts

Extreme weather events

Chronic risks

- Rising average temperatures
- Sea level rise
- Ocean acidification

Long-term processes

Transition Risks

- Policy and legal risks
- Technology risks
- Market and economic risks
- Reputation risks

Shifting economy

Potential Impacts

- Operational impact (production and workforce disruption)
- Scarcity and rising costs of resources
- Supply chain disruptions
- Physical damage to assets
- Increased insurance or lack of insurance availability
- Regulatory / political uncertainty
- Changing demand for products / services
- Reputational damage

Reduce impact

Need to become more resilient to impacts

Reduce our impact on our planet and our people

Resilient Infrastructure

To understand **your opportunities**

You have to first understand **your risks**

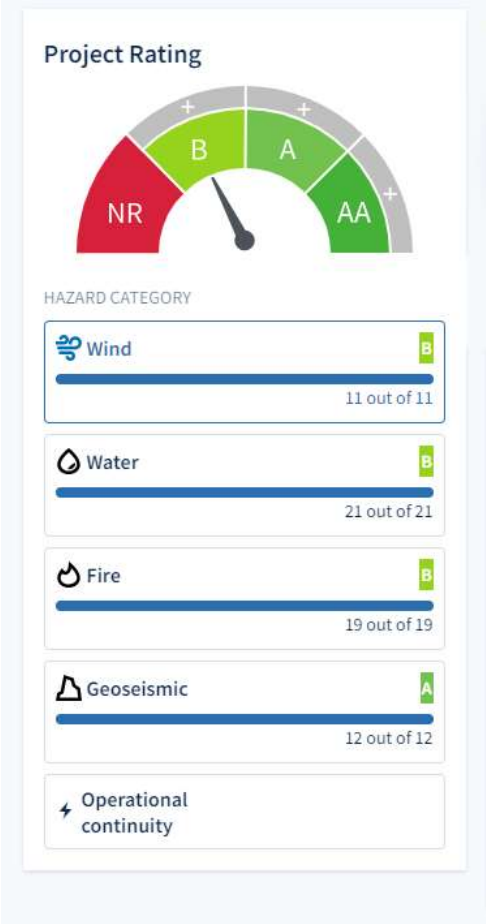
Importance of Resilient Assessment for Ports in Asia-Pacific

Substantial risks faced by ports in Asia-Pacific due to climate change impacts

	Revenue	OPEX	CAPEX	Capital
Direct impact	Operational disruptions due to more frequent hazards	Increased Maintenance costs caused by physical risks	Investment required to apply climate adaptation measures	Risk of devaluation or stranded asset
Indirect impact	Reduce the service capacity and Increase demand for alternative logistic due to disruption of services at ports	Increased insurance and financing costs	Required investments due to insurance, financing	Risk of devaluation as a result of local/regional area and infrastructure at risk

Case Study of a Deep Sea Port in Vietnam

Resilience Assessments – Pilot Project



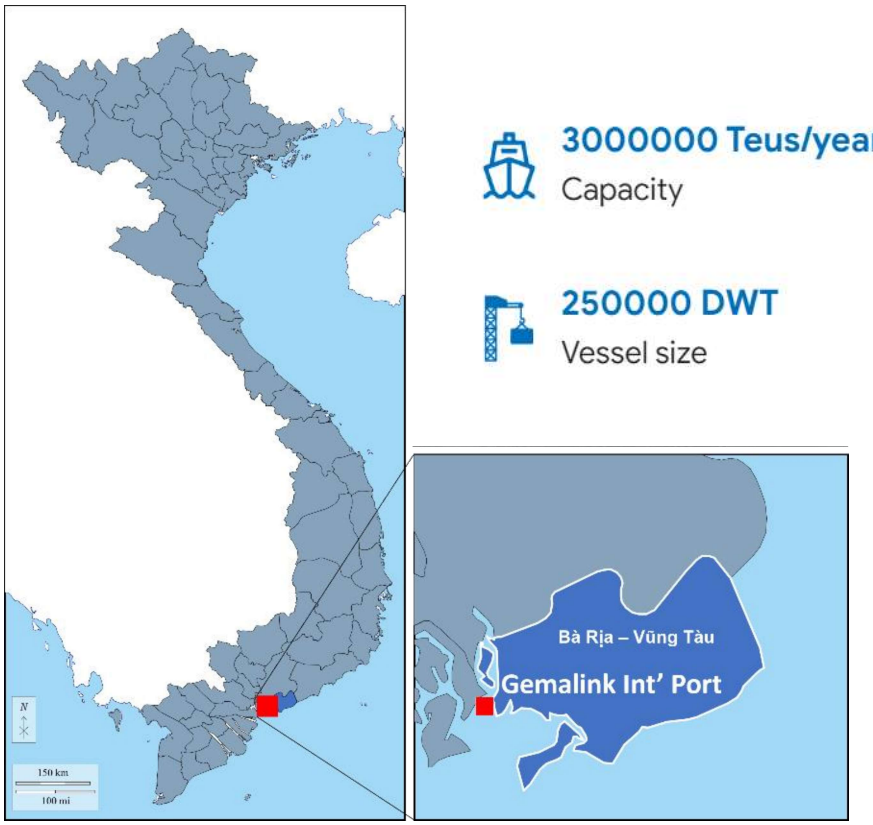
Resilience assessments using the Building Resilience Index framework (developed by the International Finance Corporation), **focusing on mitigation climate and disaster hazard risks.**

BRI Tool Aims:

- To **help the built environment improve its resilience** to climate and disaster impacts.
- To help **investors, insurance companies, banks** and governments assess the ability of structures to withstand natural disasters.
- To list the best solutions to help the structure **stay intact and continue to operate after a disaster.**

Royal HaskoningDHV

Port Resilience Assessment – Pilot Project



Source: RHDHV and Google Earth 2024

3000000 Teus/year
Capacity

-16.5 m
Draft

8 Super Post Panamax
Range of up to 70m (25 rows)

250000 DWT
Vessel size

1150 m
Main berth

72 ha
Total area

Port Case Study: Gemalink International Port

One of **the world's 19 largest** deep sea ports and the largest deep-sea port in Vietnam

Source: Gemalink https://www.gemadept.com.vn/gemalink-deep-sea-port-3418/index.html

Royal HaskoningDHV

Port Resilience Assessment – Pilot Project

Approach

- Building Resilience Index (BRI) framework
- **Hazard Assessment** focused on: Wind, Water, Fire, and Geoseismic hazards
- Included Operational Continuity requirements
- Proposing measures to mitigate climate and disasters

Source: Gemalink
https://www.gemadept.com.vn/gemalink-deep-sea-port-3418/index.html

Hazard Identification

HAZARD CATEGORY

Wind	Tornado APPLICABLE	Downburst APPLICABLE	Cyclone APPLICABLE	Surface Winds NOT APPLICABLE		
Water	Flash Flood APPLICABLE	Local/Urban Flooding APPLICABLE	Tsunami APPLICABLE	Storm Surge APPLICABLE	River/lake Flood APPLICABLE	Coastal/Tidal Flooding NOT APPLICABLE
Fire	Local Fire APPLICABLE	Wildfire NOT APPLICABLE				
Geoseismic	Subsidence APPLICABLE	Landslide NOT APPLICABLE	Earthquake APPLICABLE	Volcano NOT APPLICABLE		
Operational continuity						

HaskoningDHV

Steps

1. Self Assessment (Developer) to assess their risks against each measure and provide documentation
2. Verification (Two Third-Party Assessments) of each measure
    1. Conduct Site visit
    2. Propose Mitigation Measures
3. Final Ranking/Score

Required level of rating	Number of measures	Measure code										
WIND												
AA	4	WD01	WD04	WD09	WD10							
A	4	WD02	WD05	WD07	WD08	WD11	WD12					
B	2	WD03	WD06									
WATER												
AA	9	WT01	WT02	WT03	WT04	WT07	WT15	WT17	WT18	WT22		
A	8	WT05	WT08	WT11	WT14	WT16	WT19	WT20	WT21			
B	5	WT06	WT09	WT10	WT12	WT13						
FIRE												
AA	11	FI01	FI03	FI06	FI07	FI08	FI10	FI11	FI13	FI15	FI19	FI22
A	8	FI02	FI04	FI09	FI12	FI14	FI16	FI17	FI21			
B	3	FI05	FI18	FI20								
GEOSEISMIC												
AA	7	GS03	GS05	GS06	GS12	GS13	GS17	GS18				
A	6	GS02	GS04	GS08	GS11	GS15	GS16					
B	5	GS01	GS07	GS09	GS10	GS14						

Port Resilience Assessment – Pilot Project

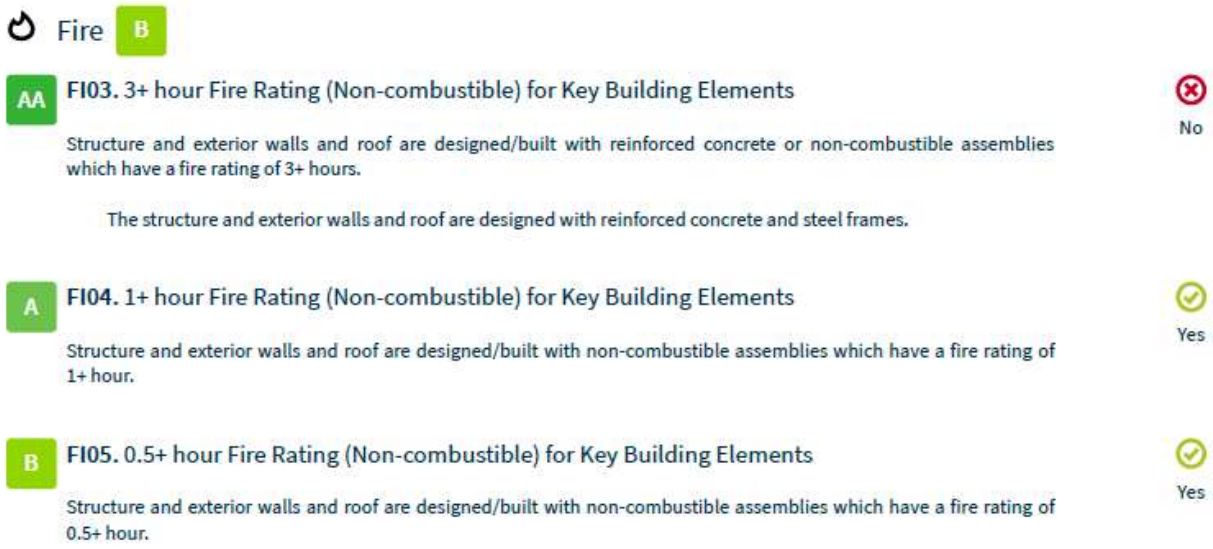
Port Case Study: Gemalink International Port

Techniques and Material Studied

- The BRI tool evaluated 71 risk mitigation measures under the four hazards against Wind, Water, Fire, Geoseismic hazards, and also assessed Operational Continuity.

- Architectural design, structural design, electro-mechanical design, fire-fighting plan, geotechnical survey, etc.

- Site Visit & Staff interviews



Port Resilience Assessment – Pilot Project

Port Case Study: Gemalink International Port

Results

- The design of the Gemalink have already incorporated some resilient practices across their assets.
- Gemalink's ability to withstand applicable hazards of wind, water, fire, and geoseismic **was found to be at a moderate level.**

Output

- IFC Certification through the BRI tool to enable Gemalink to obtain additional international investment through climate lending.
- Key recommendations for the Gemalink International Port project to **improve its resilience in alignment with the BRI measures** for Wind, Water, Fire and Geosemic.
- Investment measures (structural and non-structural solutions) to improve the assets and operational **capacity of the port to withstand future climate change risks** such as rising heat temperatures, extreme wind and hailstorms, increased storm surges and seal level rise and ocean acidification.

Adaptation for the Port Sector

Port Resilience Assessments – APAC

Conclusions

- The study showed that localised and accurate hazard data is important for determining risks, this is a limitation in Vietnam (and other parts of Asia-Pacific).
- Maintaining operational continuity measures are also critical to enhance an assets physical integrity and reflect the improvement of the infrastructure's resilience.
- Need to go beyond local design standards to cope with extreme weather events such as heavy rainfall, wind and storm surge.
- Consider multiple climate change projections to explore different scenarios for hazard events.
- On-going process that requires continuous improvement, innovation, and robust expert assessments.

Port Resilience Assessments – APAC

Recommendations

- Leverage existing frameworks and tools to assist with widespread adoption the climate risk assessments for ports and maritime infrastructure.
- Tailor assessments to geographical and regulatory contexts.
- Share results to help facilitate better identification of region-specific vulnerabilities.
- Involve relevant stakeholders throughout the assessment – including engineers, planners, policymakers, and community members.

Authors

Alexandria Norris-Moore

Climate Change & Resilience Advisory Lead - APAC

M +84 01 826 997 | E alexandria.norris.moore@rhdhv.com

Based in HCMC

Hang Dao

Senior Climate Change & Resilience Consultant

M +84 366 763 305 | E hang.thi.thu.dao@rhdhv.com

Based in HCMC