Multi-year Expert Meeting
on Transport, Trade Logistics and
Trade Facilitation
8th Session

Climate Change Adaptation for Seaports in Support of the 2030 Agenda for Sustainable Development

27–28 October 2020

Advancing Climate Resilience for Global Seaports: Insights from a Decade of Applied Research

Presentation by

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Advancing climate resilience for global seaports: Insights from a decade of applied research

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The University of Rhode Island Department of Marine Affairs
Coastal Institute
ERDC
Sea Grant Rhode Island
COASTAL RESILIENCE CENTER
A U.S. Department of Homeland Security Center of Excellence

UNCTAD Multiyear Expert Meeting on Transport, Trade logistics and Trade facilitation (8th session)
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27-28 October 2020, Geneva, VIRTUAL MEETING

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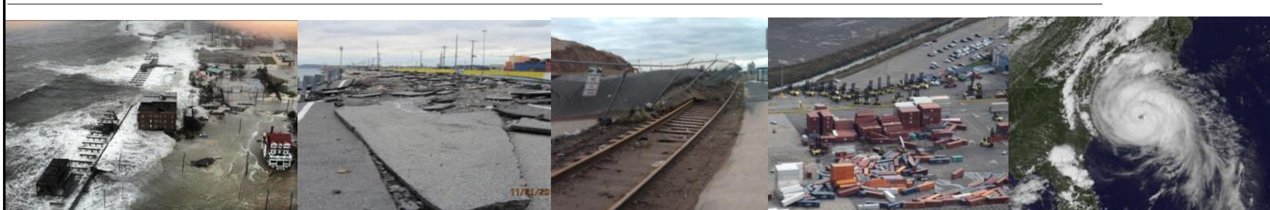
Climate change presents big challenges



Hurricane Sandy photos courtesy Mary Lee Clanton, Port of NYNJ

Doubling of Cat 4 and 5 tropical storms
1-in-100 year storm event of today

Sea levels to rise 0.[illegible] 1.9 meters by 2100

1-in-3 year storm event of 2100

Increased precipitation

(Bender et al. 2010; Grinsted et al. 2013; Rahmstorf 2010; Emanuel 2013; IPCC 2012; Tebaldi et al. 2012)

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Storm impacts on ports are wide ranging

1) Direct damages
(e.g., structures, equipment, freight, land, etc.)

2) Indirect costs
(e.g., lost wages, business interruptions, cleanup costs, knock-on effects throughout supply chain)

3) Intangible consequences
(e.g., quality of life, environmental damages, loss of essential services)

Becker, A. H., P. Matson, M. Fischer and M. D. Mastrandrea (2015). "Towards seaport resilience for climate change adaptation: Stakeholder perceptions of hurricane impacts in Gulfport (MS) and Providence (RI)." Progress in Planning **99**: 1-49.

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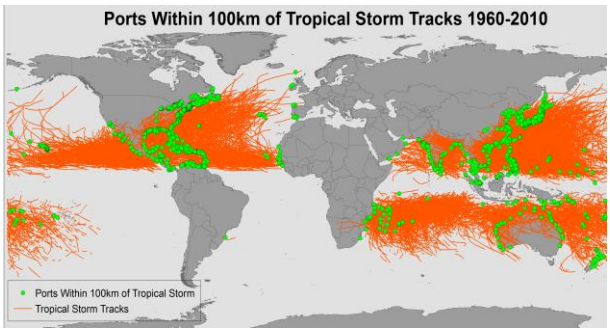


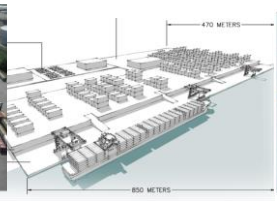
Cement (49mMT)
Aggregate
Sand
Costs
Engineers
Specialty ships

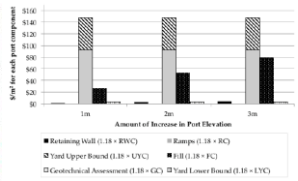
Local/global capacity ?

Becker, A., N. Chase, M. Fischer, B. Schwegler and K. Mosher (2016). "A method to estimate climate-critical construction materials applied to seaport protection." Global Environmental Change **40**: 125-136.

4

Yes, but how much is this going to cost?





To elevate just **100 US coastal ports by two meters:**

$57 - 78 billion (2012 US dollars)

704 million cubic meters of fill

Becker, A., A. Hippe and E. McLean (2017). "Cost and materials required to retrofit US seaports in response to sea level rise: A thought exercise for climate response." Journal of Marine Science and Engineering **5**(3): 44.

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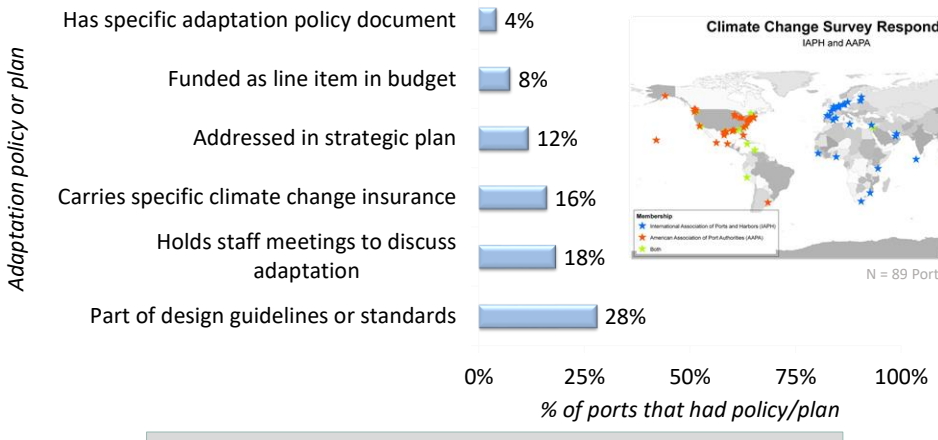
Where were we 10 years ago?



N = 89 Port Authorities

81% of global ports surveyed felt that climate adaptation should be addressed by the ports community

Becker, A., S. Inoue, M. Fischer and B. Schwegler (2012). "Climate change impacts on international seaports: knowledge, perceptions, and planning efforts among port administrators." Climatic Change **110**(1-2): 5-29.

6

Barriers to adaptation

"…you can't control mo

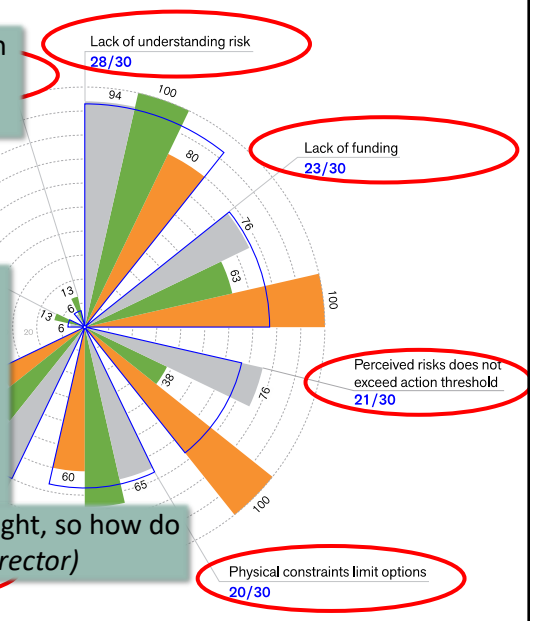
"We need more information to run risk models… (*Environmental Specialist*)

"Money! I think that is the magical answer to everything – if we had the money, or if we had

"For the last 7- 8 years, we had one side of the (half) of the agency where we couldn't say the words : global warming or climate change, where the other half bought in." *(Safety Planner)*

(Safety Planner)

"The infrastructure is only a certain height, so how do you change that at this point?" *(Port director)*



Interviews with 30 port staff from 15 North Atlantic seaports

McLean, E. L. and A. Becker (2019). "Decision makers' barriers to climate and extreme weather adaptation: a study of North Atlantic high- and medium-use seaports." Sustainability Science.

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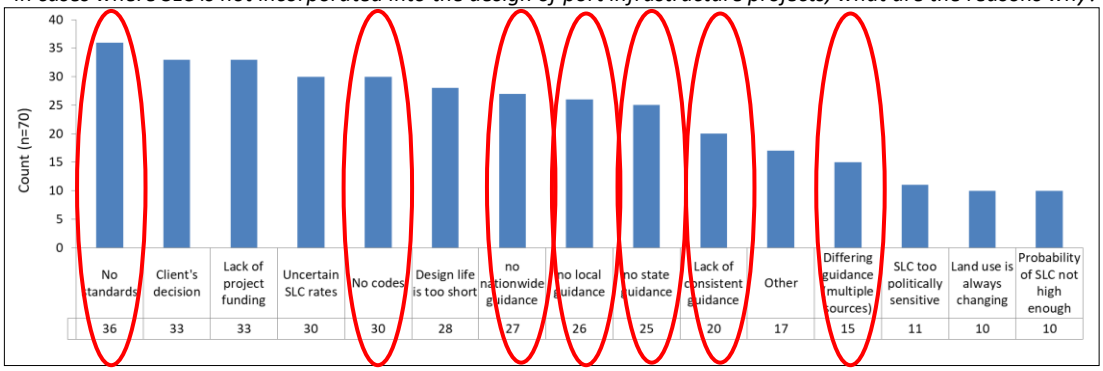
No clear guidance

Our 2018 survey of N. American maritime infrastructure engineers reports that only 9% of organizations use a policy/planning document that communicates how SLC should be incorporated into design

In cases where SLC is not incorporated into the design of port infrastructure projects, what are the reasons why?



Sweeney, B. and A. Becker (2020). "Considering future sea level change in maritime infrastructure design: A survey of US engineers." Journal of Waterway, Port, Coastal, and Ocean Engineering **146**(4).

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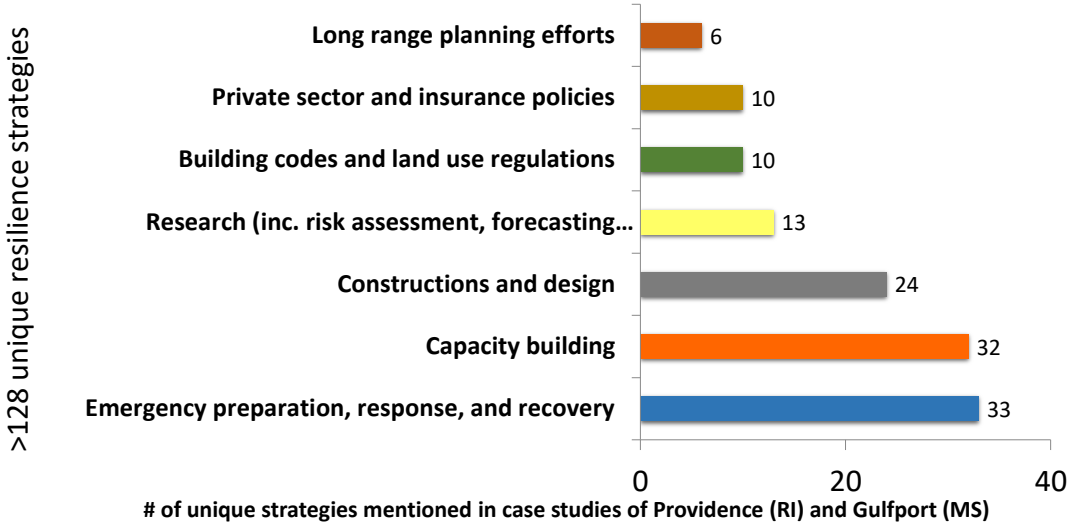
Good news: There's plenty to be done!



Becker, A. and M. Caldwell (2015). "Stakeholder perceptions of seaport resilience strategies: A case study of Gulfport (Mississippi) and Providence (Rhode Island)." Coastal Management **43**(1): 1-34.

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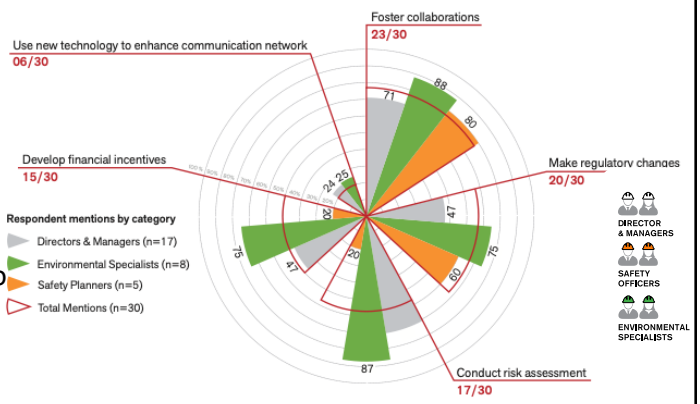
Conduct risk assessments

". . . the port has done some assessments and they are incorporating it [information from the assessments] into long-term planning." *(Safety Officer)*

Foster Collaborations

"We will participate with anybody who wants to do anything on the climate resilience topic, (*Environmental Specialist*)



Make Regulatory Changes

". . . to make those resilience investments, the state and the city [need] to start to consider these adaptations." *(Environmental Specialist)*

Develop Financial Incentives

"The only way that we have been able to achieve [adaptation] is through getting funding through the federal government." *(Port Director)*

McLean, E. & Becker, A. (In Prep). "Advancing seaport resilience: Strategies to overcome decision making barriers."

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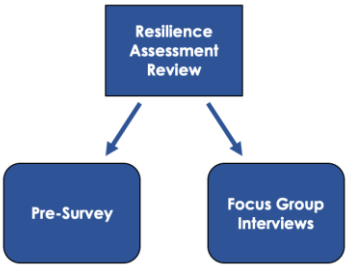
How do resilience assessments change port culture and preparation?



- Institutional capacities (e.g., resources sharing, external collaboration, and so on) have improved after assessment completion
- Initial assessments prompted seaports to undertake additional assessments
- Assessments have influenced new developments in seaports' resilience planning (for example, incorporating resilience-related capital improvements into budgets)

Kalaidjian, E. & Becker, A. (In Prep). Institutionalizing resilience: Insights from assessment initiatives at seaports.

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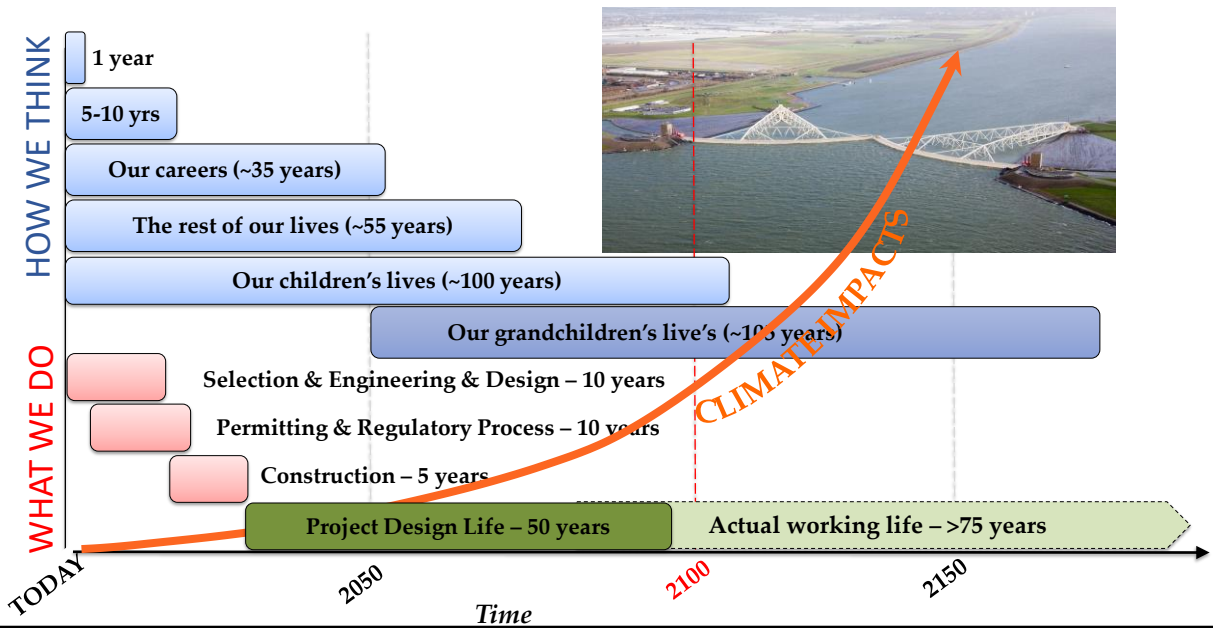
Fundamental shift in thinking …



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Two key messages:

1. Policy makers should support the development of flexible sea level rise regulatory guidance documents for infrastructure engineers

2. Direct funding to support collaboration for long-term resilience planning

Bonus key message:
Develop credentialed training programs for climate change assessment for infrastructure practitioners (e.g., port staff)

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Questions?

Acknowledgements
Funding support for this work provided by the following: USACE, DHS, RIDOT, RI Sea Grant, URI Coastal Institute, USDA
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ERDC COASTAL RESILIENCE CENTER A U.S. Department of Homeland Security Center of Excellence COASTAL INSTITUTE Sea Grant Rhode Island THE UNIVERSITY OF RHODE ISLAND DEPARTMENT OF MARINE AFFAIRS

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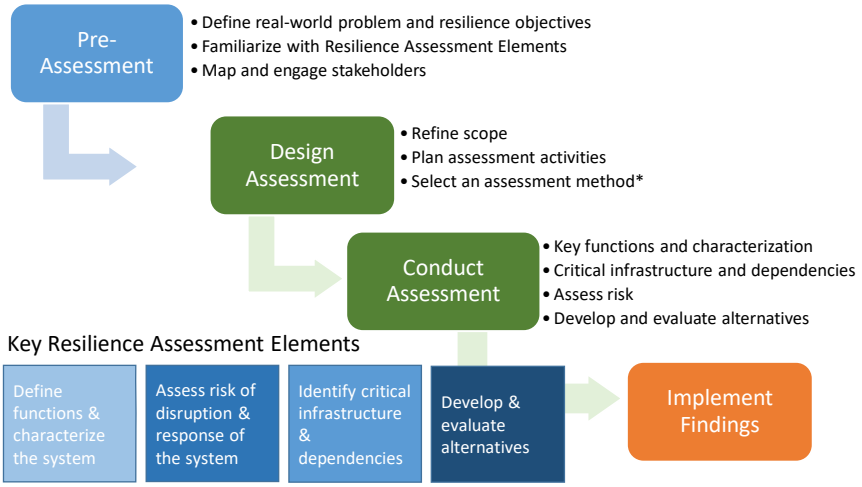
The Port and Marine Transportation System Resilience Assessment Guide: A Collaborative Approach



*Tools and methodologies are recommended according to 1) objectives and 2) funds and level of effort available to undertake study.

The preliminary version of the Guide will be published October 2020
For questions and comments, contact Jevon Daniel (Jevon.Daniel@cisa.dhs.gov) or Katherine Chambers (Katherine.F.Chambers@usace.army.mil)

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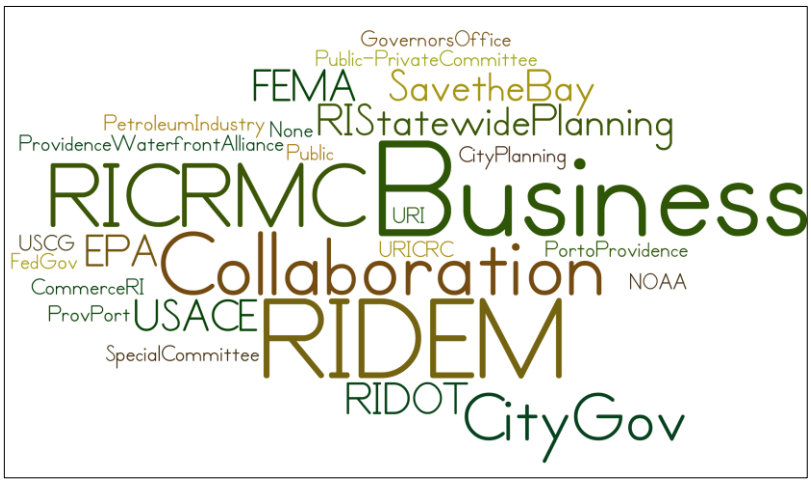
Leadership is lacking

Who should take the lead in implementing resilience strategies?



Becker, A. and E. Kretsch (2019). "The leadership void for climate adaptation planning: Case study of the Port of Providence (Rhode Island, United States)." Frontiers in Earth Science 7.

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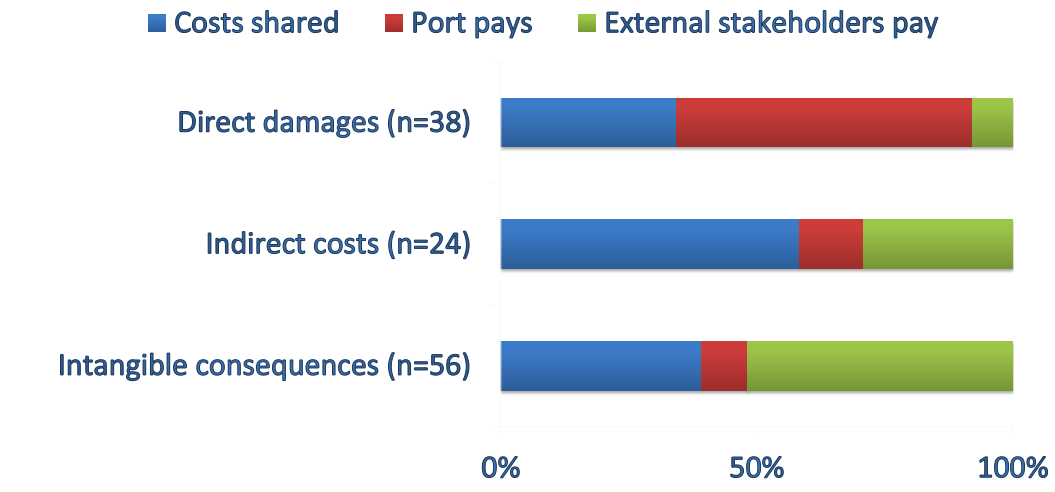
Who bears the cost of storm damage?



Becker, A. H., P. Matson, M. Fischer and M. D. Mastrandrea (2015). "Towards seaport resilience for climate change adaptation: Stakeholder perceptions of hurricane impacts in Gulfport (MS) and Providence (RI)." Progress in Planning **99**: 1-49.

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STAKEHOLDER GROUPS BEST POISED TO IMPLEMENT STRATEGIES

TYPES OF STRATEGIES

- Building codes and land use regulations (10)
- Long-range planning (6)
- Construction and design
- OFF port lands (12)
- ON port lands (12)
- Private sector and insurance (10)
- Emergency response, preparation & recovery
- Business continuity plans (3)
- Drills & pre-event trainings (4)
- Post-storm actions (2)
- Response & recovery guidance (13)
- Storm preparations (11)
- Research (13)
- Capacity building
- Collaborations (7)
- Empower government (6)
- Improve info flow (4)
- Lengthen planning horizons (6)
- Shifts in thinking (9)
- *Total (128)*

All types of port stakeholders have something to contribute to address their collective interest in port resilience

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