

Impacts of Climate Change on Seaports: Results of a Global Survey

Joint United Nations Economic Commission for Europe/
United Nations Conference on Trade and Development Workshop
Climate Change Impacts on International Transport Networks

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IAPH

The International Association
of Ports and Harbors

**STANFORD
UNIVERSITY**



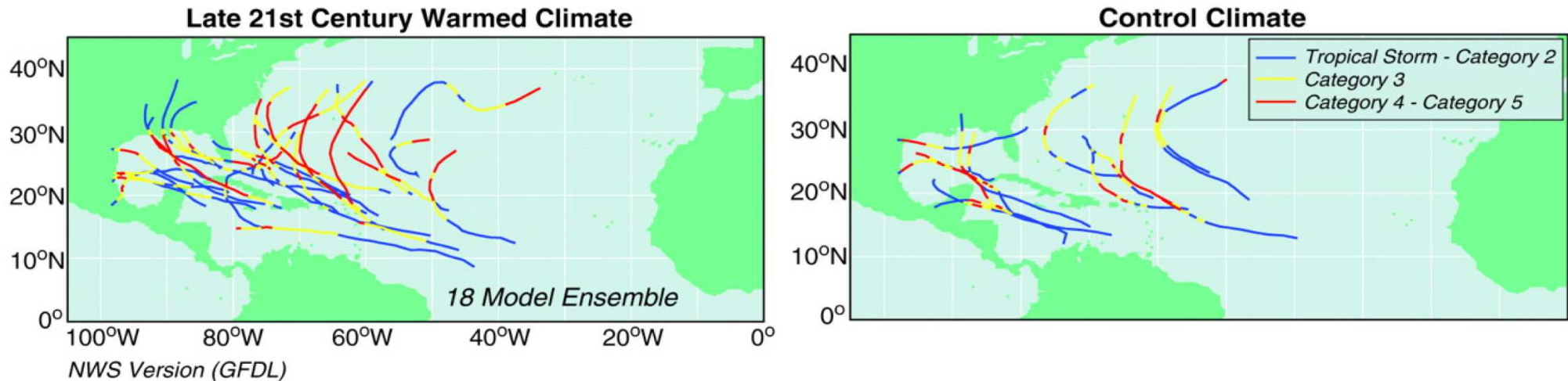
Alliance of the Ports of Canada, the Caribbean,
Latin America and the United States

Why Ports?

- Critical infrastructure in local and global economy
 - 80% of world freight moves by ship
- Highly dependent on specific locations
 - Deep water, protective harbors, multi-modal connections
- Difficult or impossible to relocate
- Highly vulnerable locations
 - Often estuaries or river deltas that provide ecosystem services
 - Prone to flooding, storm surge, and SLR



Climate Change Scenarios



- Sea levels to rise .6 – 2 meters by 2100 🌀
 - The world is not a bathtub!
- Doubling of Cat 4 and 5 storms*
- Ocean storm tracks shifting
- Inland flooding

🌀 Americas Climate Choices, 2010 *Bender et al. Science 2010; 327(5964):454.

Impacts of Storms

IKE

\$2.4 Billion Damage
to TX ports/waterways

Katrina

\$100 Million in Damage to
3 MS Ports

\$1.7 Billion in damage
to Southern LA ports

Just eleven spills
released approximately
7 million gallons of oil



Photos from Alabama State Port Authority

Global Ports Survey Objectives

- **Climate Change Impacts** –An issue for ports?
- **Climate Assumptions** – What impacts do ports foresee?
- **Adaptation Strategies** – What kinds of changes are ports considering with respect to climate change impacts?
- **Categories** - Are certain categories of ports or port directors considering these issues more than others?



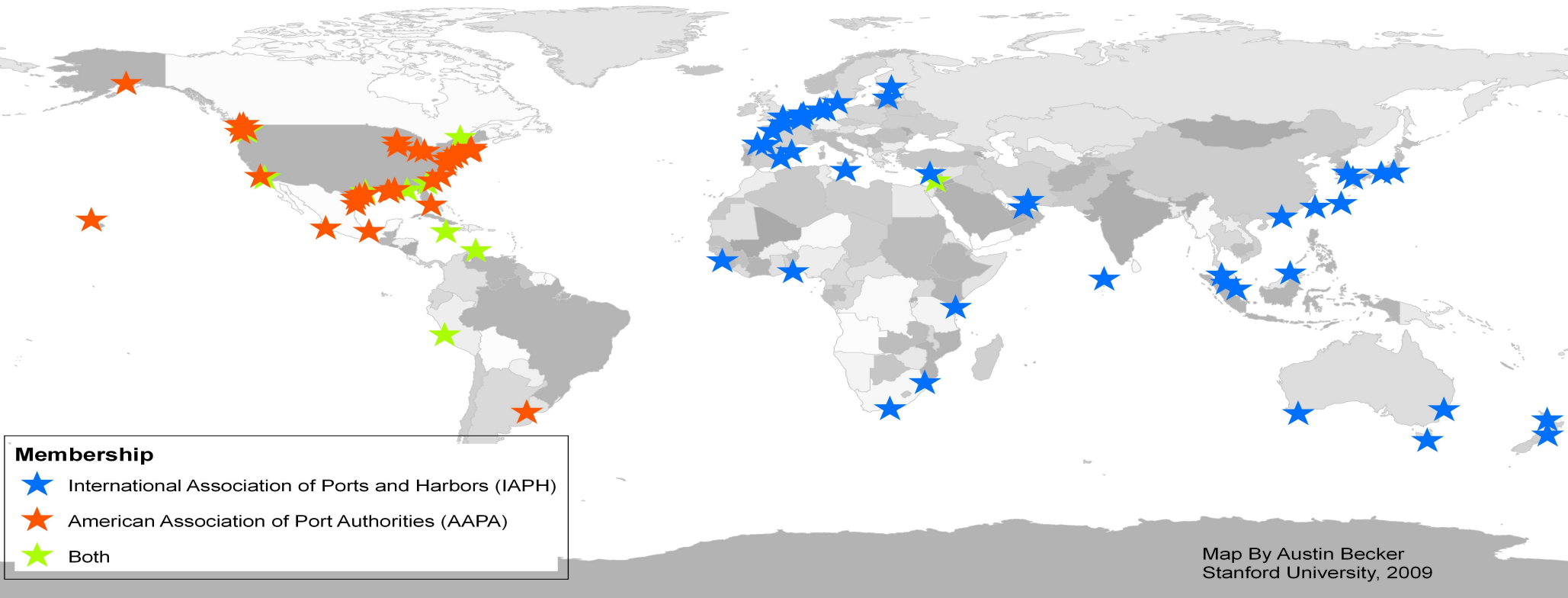
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Climate Change Survey Respondents

IAPH and AAPA



•**Sampled IAPH/AAPA**

•**Survey Monkey**

•**Designed/Pretested with IAPH/AAPA**

•**30 Questions**

•**Distributed Summer 2009**

•**93 Usable Responses**

Finding 1 – Issue relevance

Respondents are concerned, but feel uninformed

Impacts of climate change is something that needs to be addressed by the port community.

81%

I feel sufficiently informed about how climate change will impact my port operations.

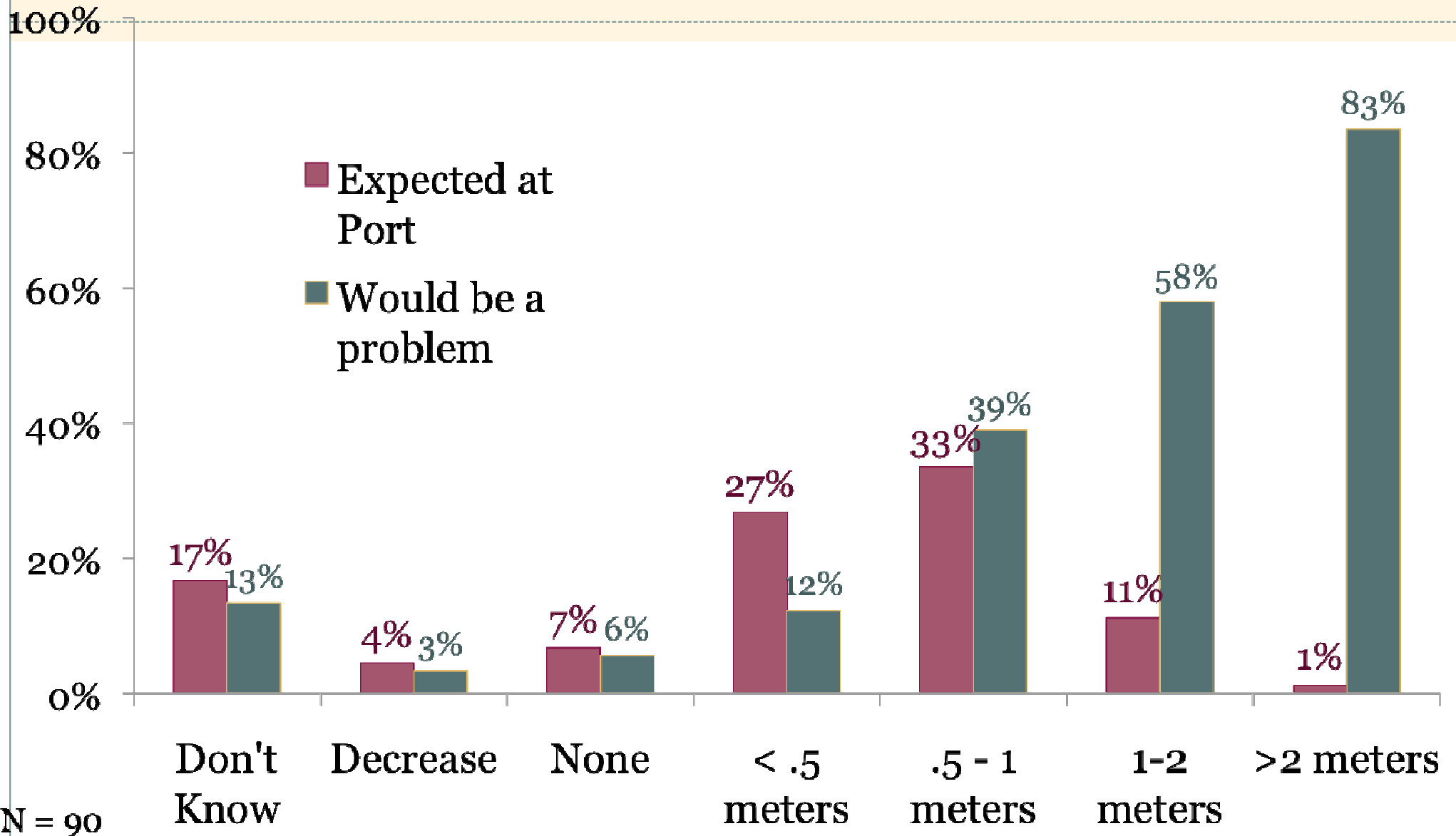
31%

N = 93

0% 20% 40% 60% 80% 100%

Finding 2 – Sea Level Rise By 2100

69% felt EXPECTED SLR would not be a problem



Finding 3 – Perceived Impacts

greening-operations

48% SLR

increase-shipping

60% storm-related

storm-impacts

38% Greening operations

sea-level-rise

operation-delays

modal-shifts revision-of-design-standards

failure-of-storm-protection

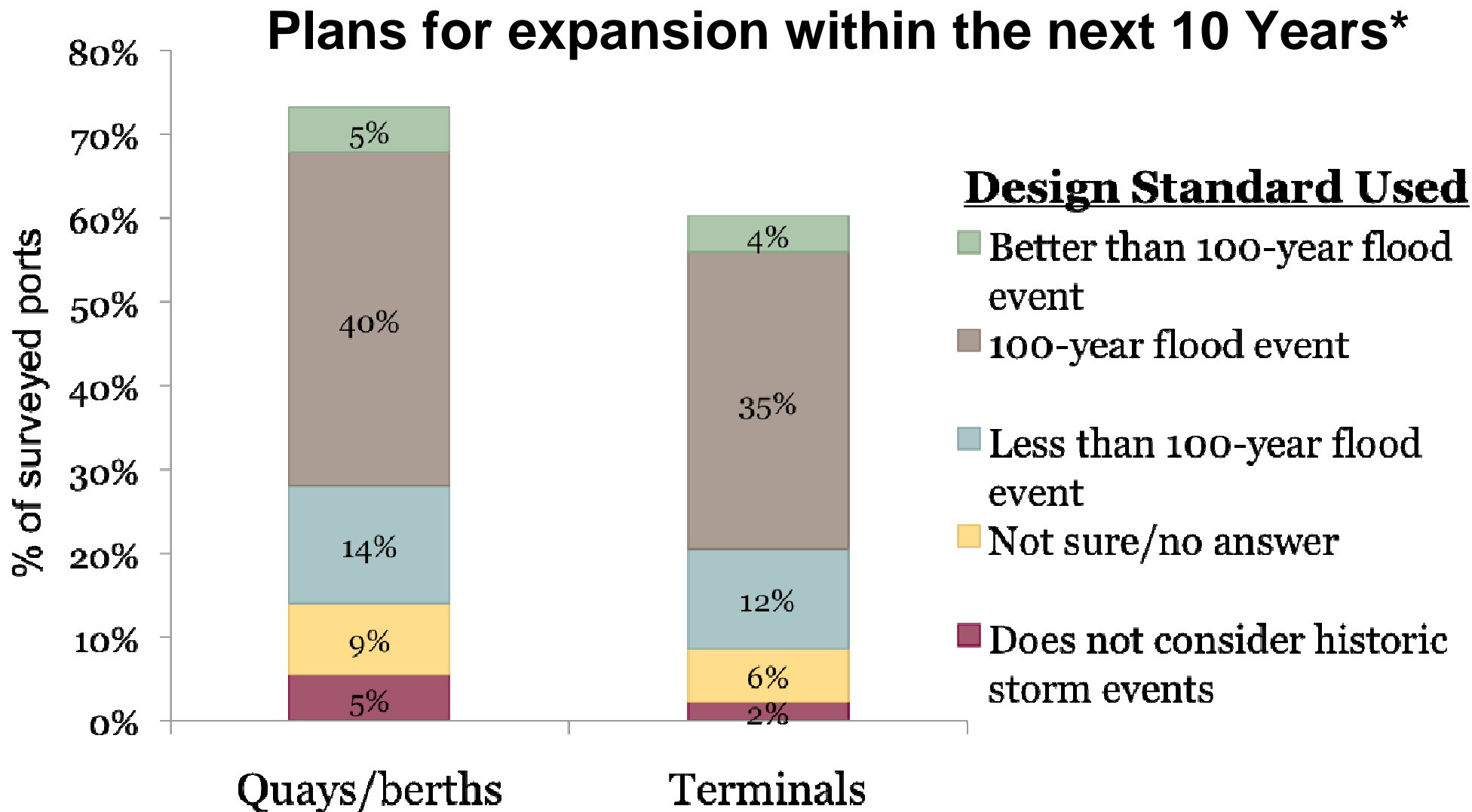
dredging-concerns

ty

infrastructure-upgrade higher design-costs impacts-to-surrounding-infrastructure population-migration berthing-issues fluvial-discharge market-shifts
personal-health impacts-on-surrounding-community limit-to-growth air-construction sea-level-fall fresh-water-shortage
project-delay test-business sea-level-rise

Finding 4 – Ports are building infrastructure

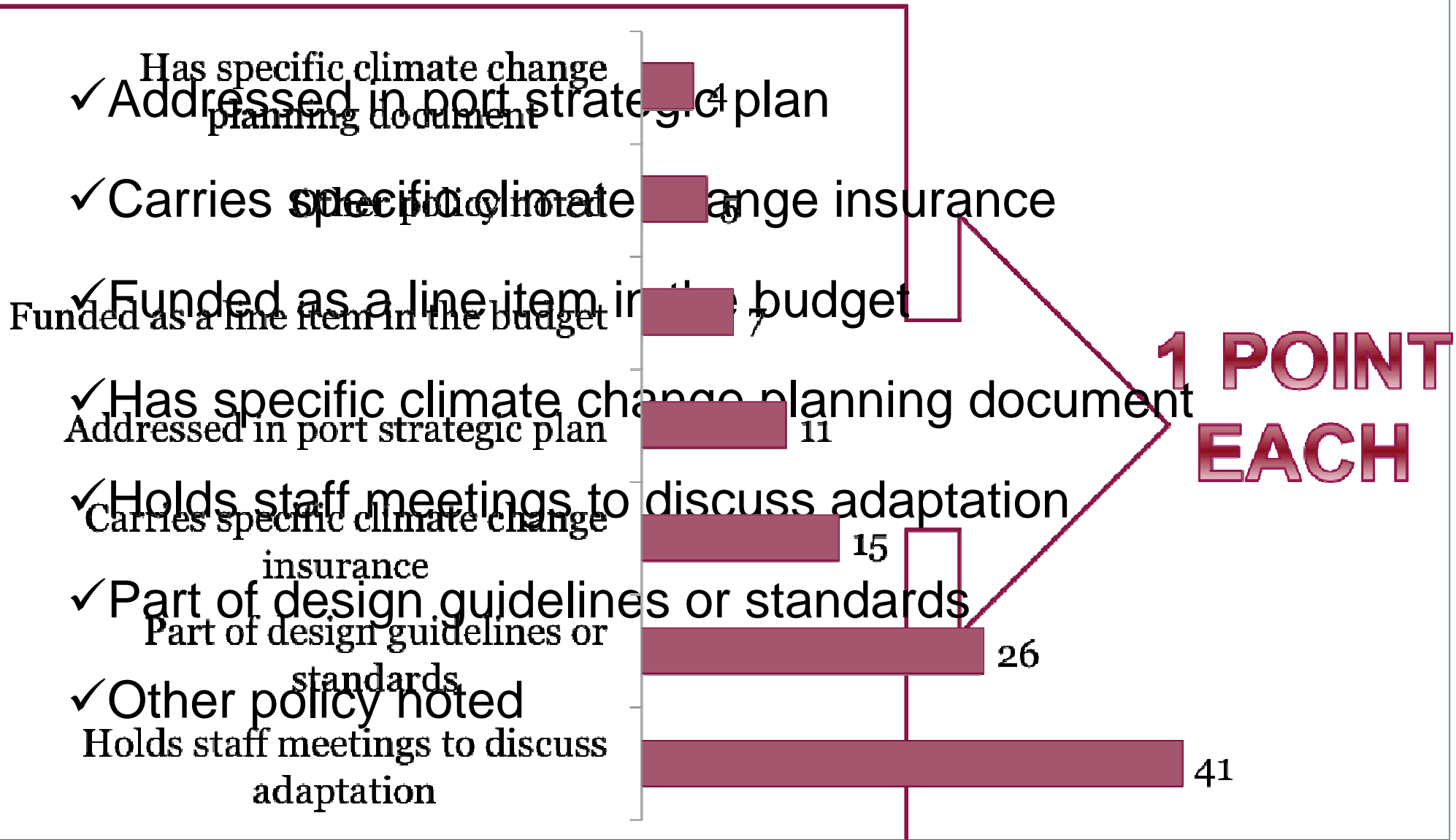
Design standards do not address climate change



*16% of these plan new storm protection

Finding 5 – Climate Change Adaptation

Subissues



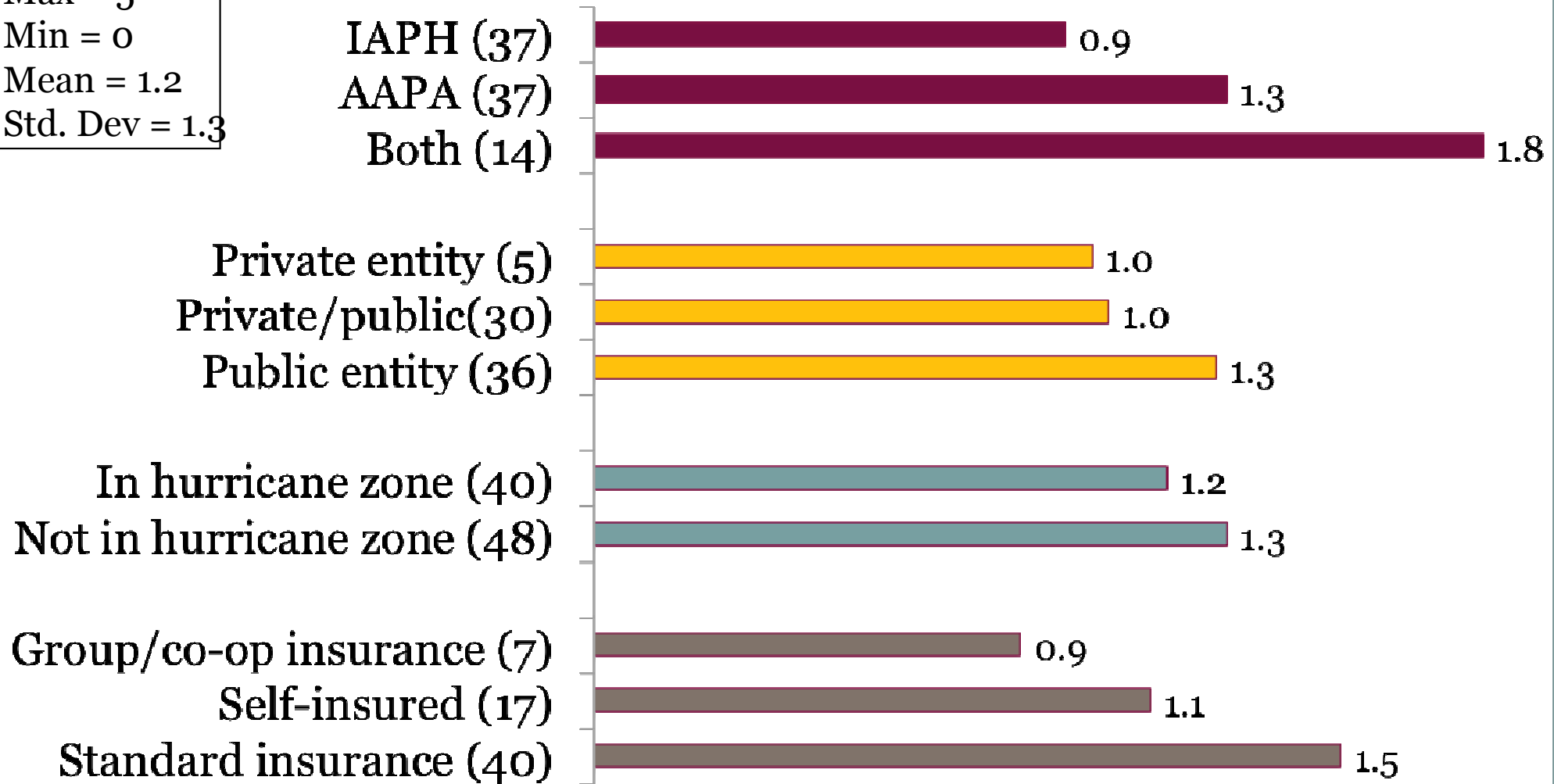
Finding 4: Port Categories and Adaptation Scores

Most ports have few climate policies in place

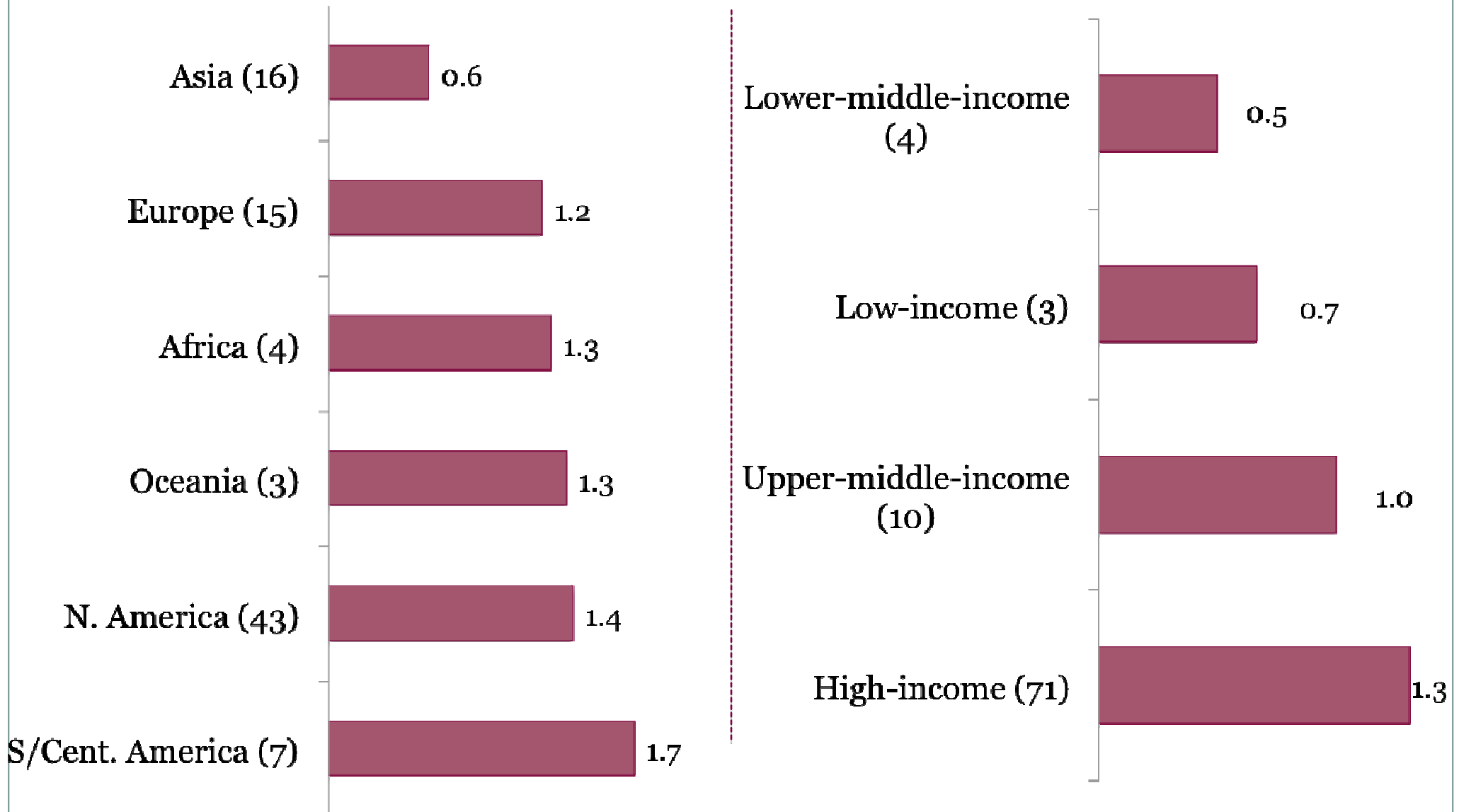
N = 88
 Max = 5
 Min = 0
 Mean = 1.2
 Std. Dev = 1.3

Category (# of ports)

Score



Finding 5: Global Comparisons



Questions

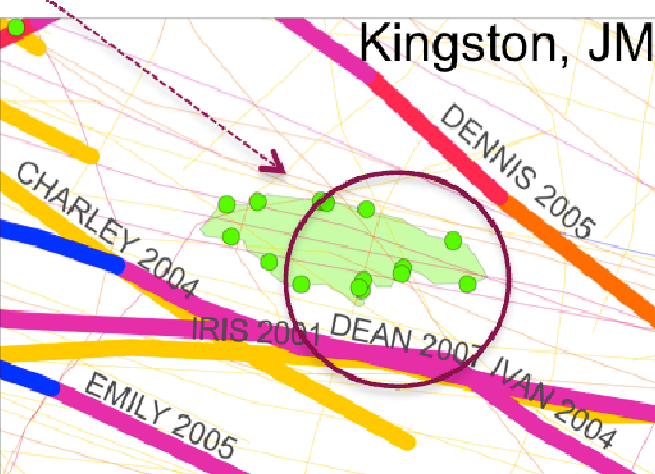
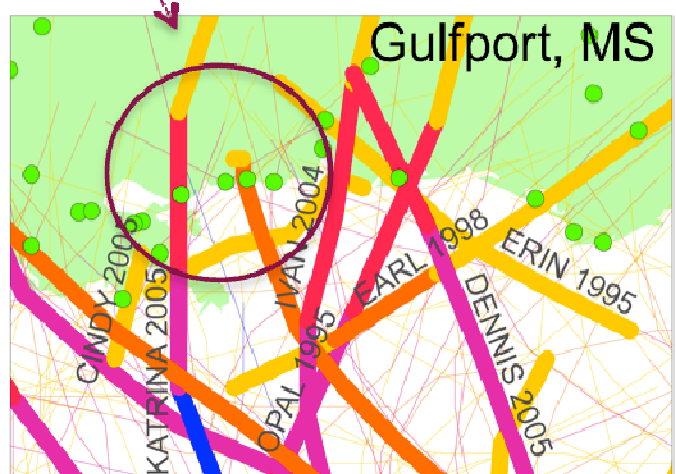
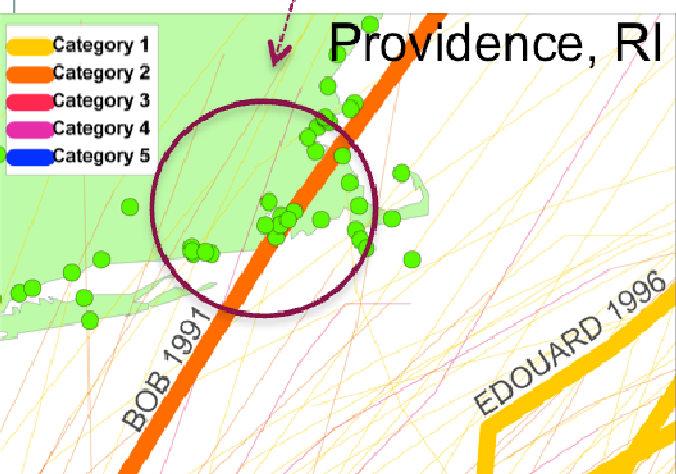
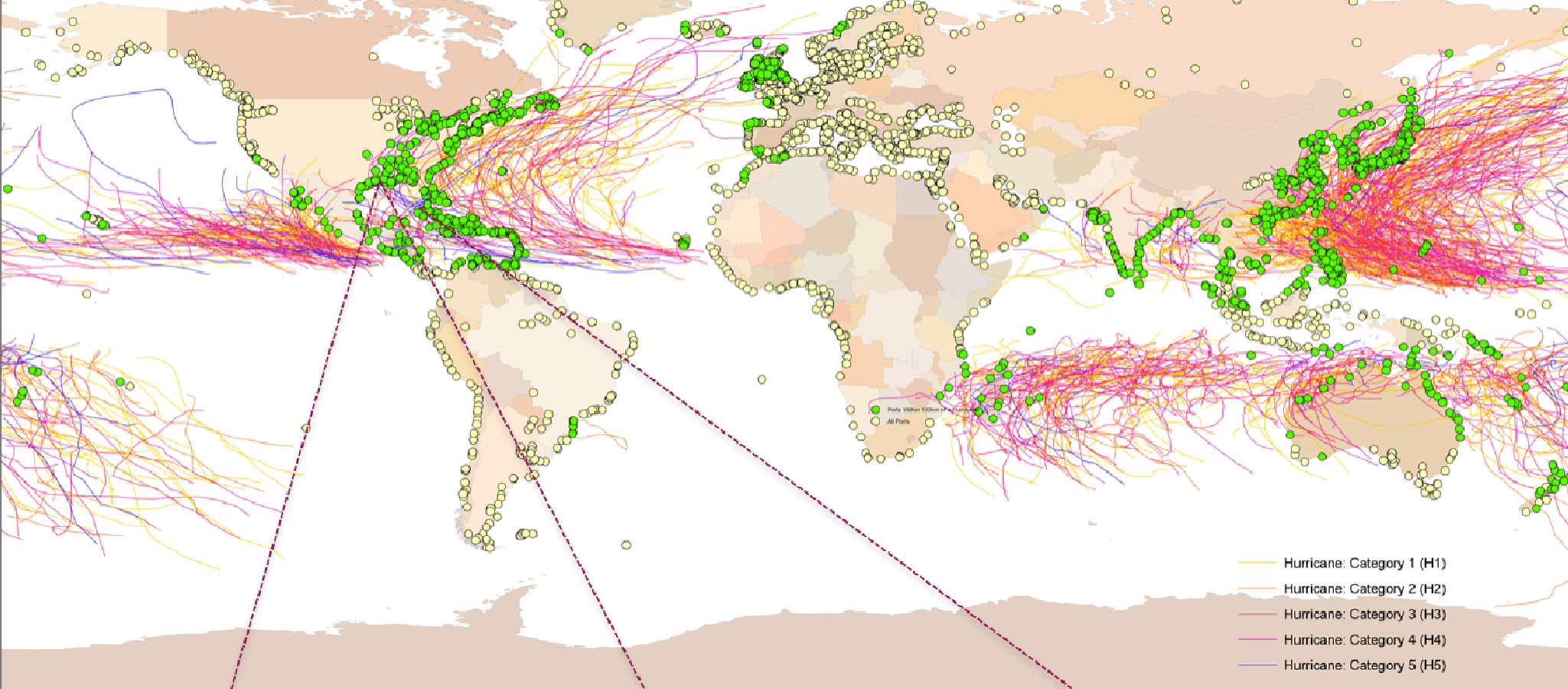
How do different stakeholders in a port system characterize impacts, objectives and alternatives with respect to storm-hazard mitigation?

What strategies for reducing vulnerabilities could be considered “optimal” by a port system?

Does the current system configuration allow storm impacts to be reasonably addressed?

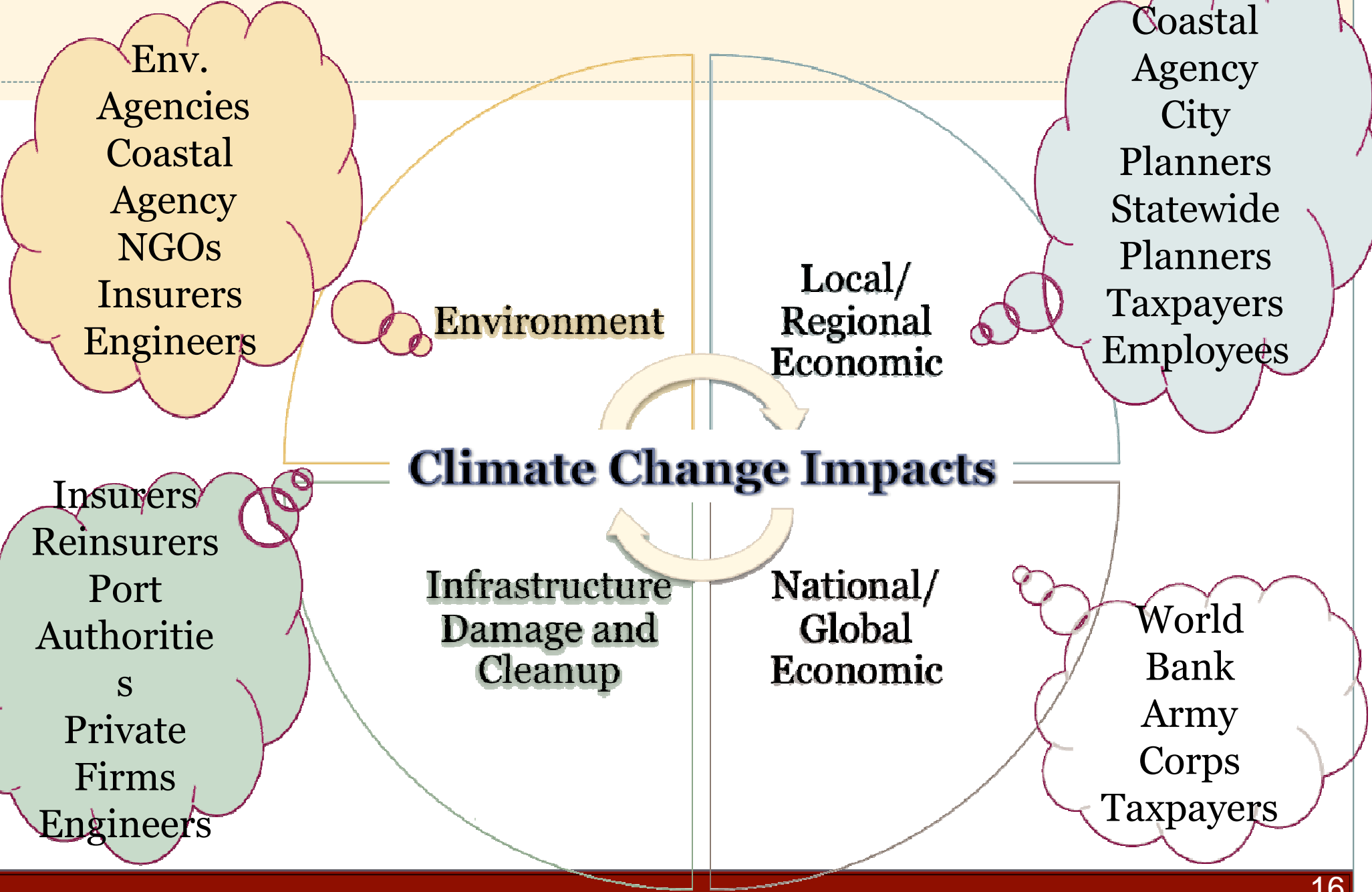


Ports within 100km of a Cat 1-5 storm 1990-2008



Next Steps: Comparative Case Study

Risk... and Responsibility



Acknowledgements

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CEE 129/229 Class



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Extra Slides Below
