

Climate Change Adaptation: AAPA/IAPH Member Plans and Perceptions

ASCE PORTS 2010

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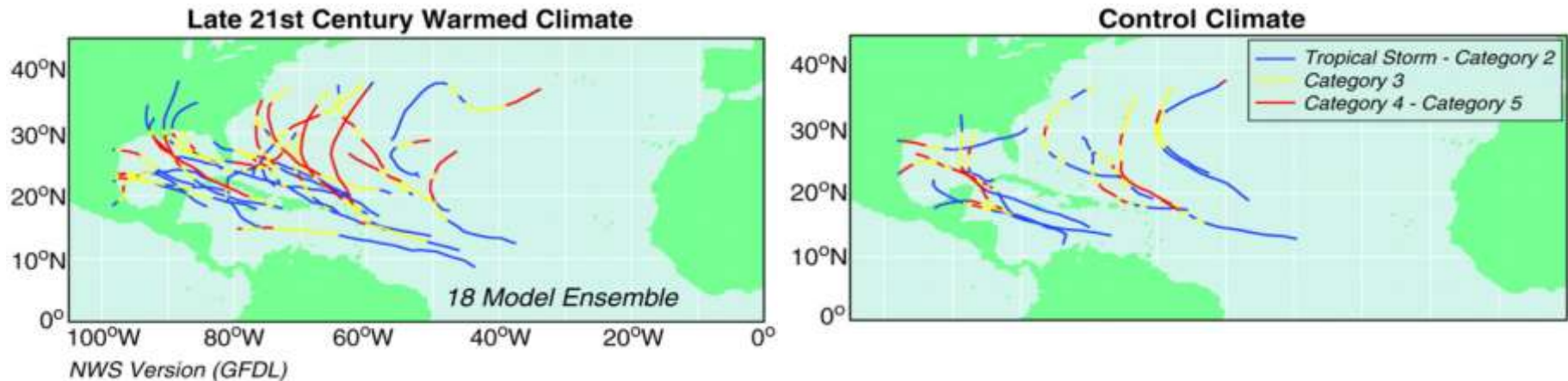


Overview

- Climate Change Impacts and Ports
- Survey Findings
- The Big Picture - Risk and Responsibility
- Next Steps – Case Studies



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

From Bender et al. Science 2010; 327(5964):454.

Why Ports?

- Critical infrastructure in U.S. 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 the provide ecosystem services
 - Prone to flooding, storm surge, and SLR



Impacts of Storms

IKE

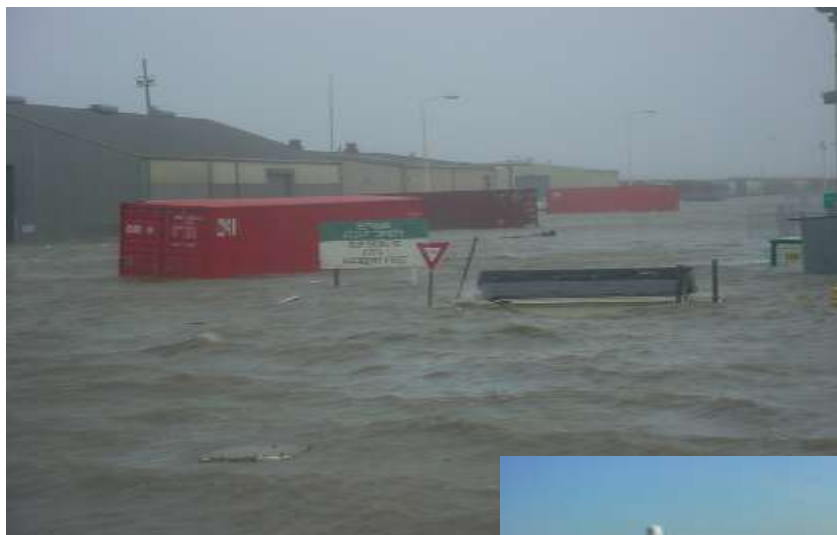
\$2.4 Billion Damage
to TX ports/waterways

Katrina

\$100 Million in Damage to
3 MS Ports

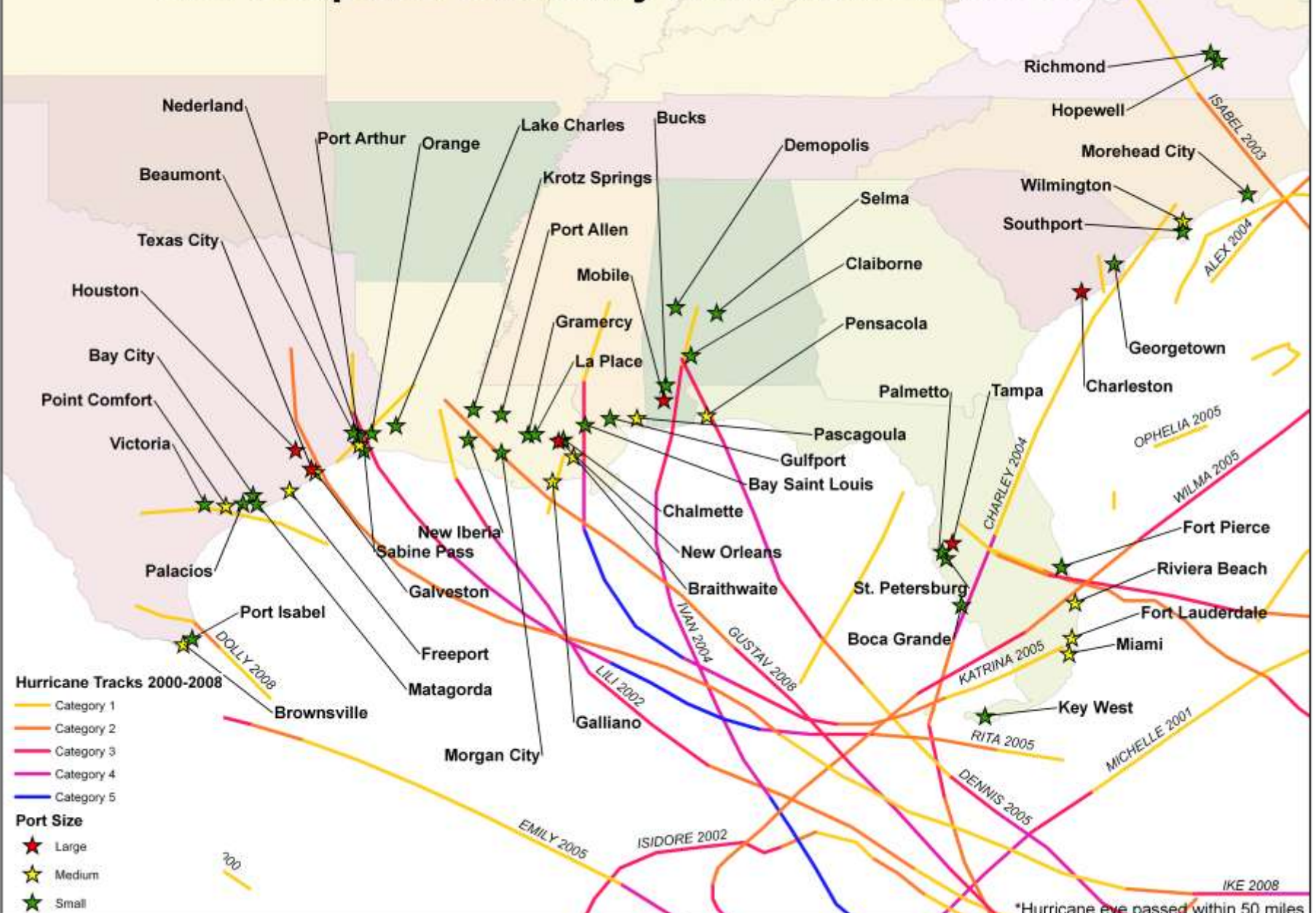
\$1.7 Billion in damage
to Southern LA ports

Just eleven spills
released approximately
7 million gallons of oil



Photos from Alabama State Port Authority

U.S. Seaports Struck by Hurricanes 2000-2008*



*Hurricane eye passed within 50 miles

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?

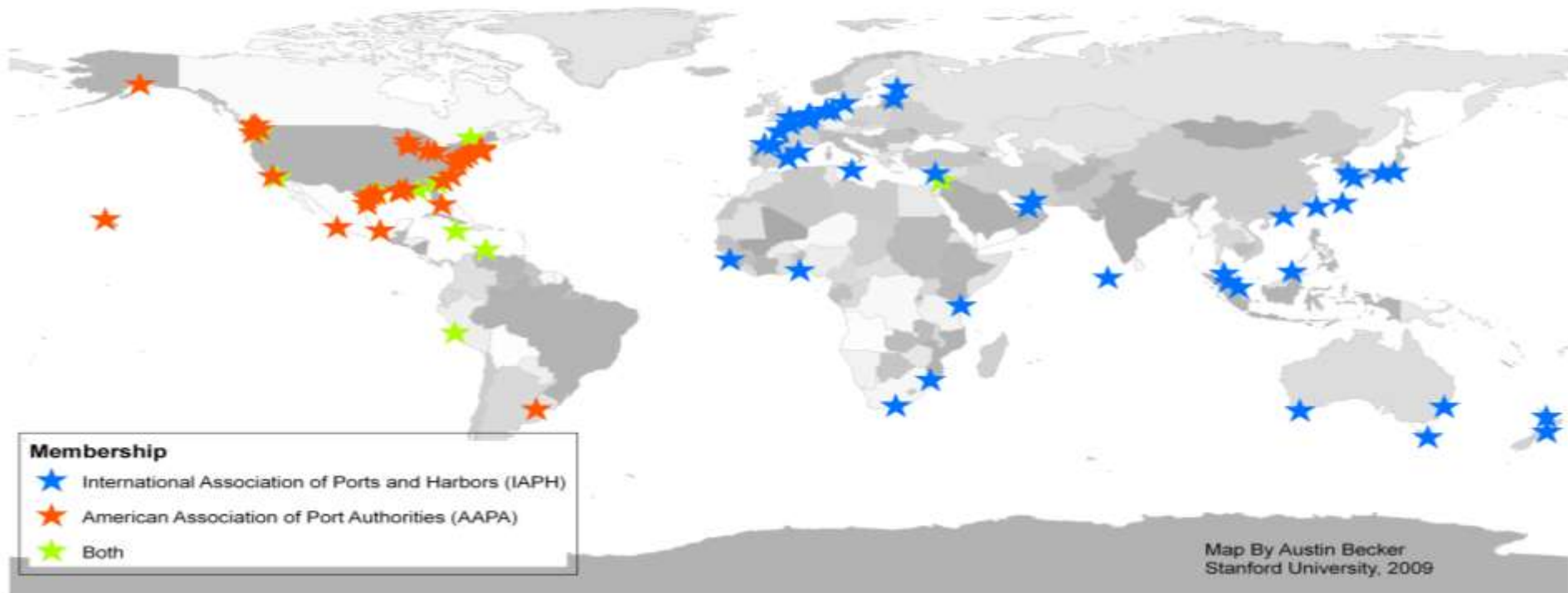


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Climate Change Survey Respondents

IAPH and AAPA



- **Sampled IAPH/AAPA**

- **Survey Monkey**

- **Designed/Pretested with IAPH/AAPA**

- **30 Questions**

- **Distributed Summer 2009**

- **93 Usable Responses**

Finding 1 – Information

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

81%

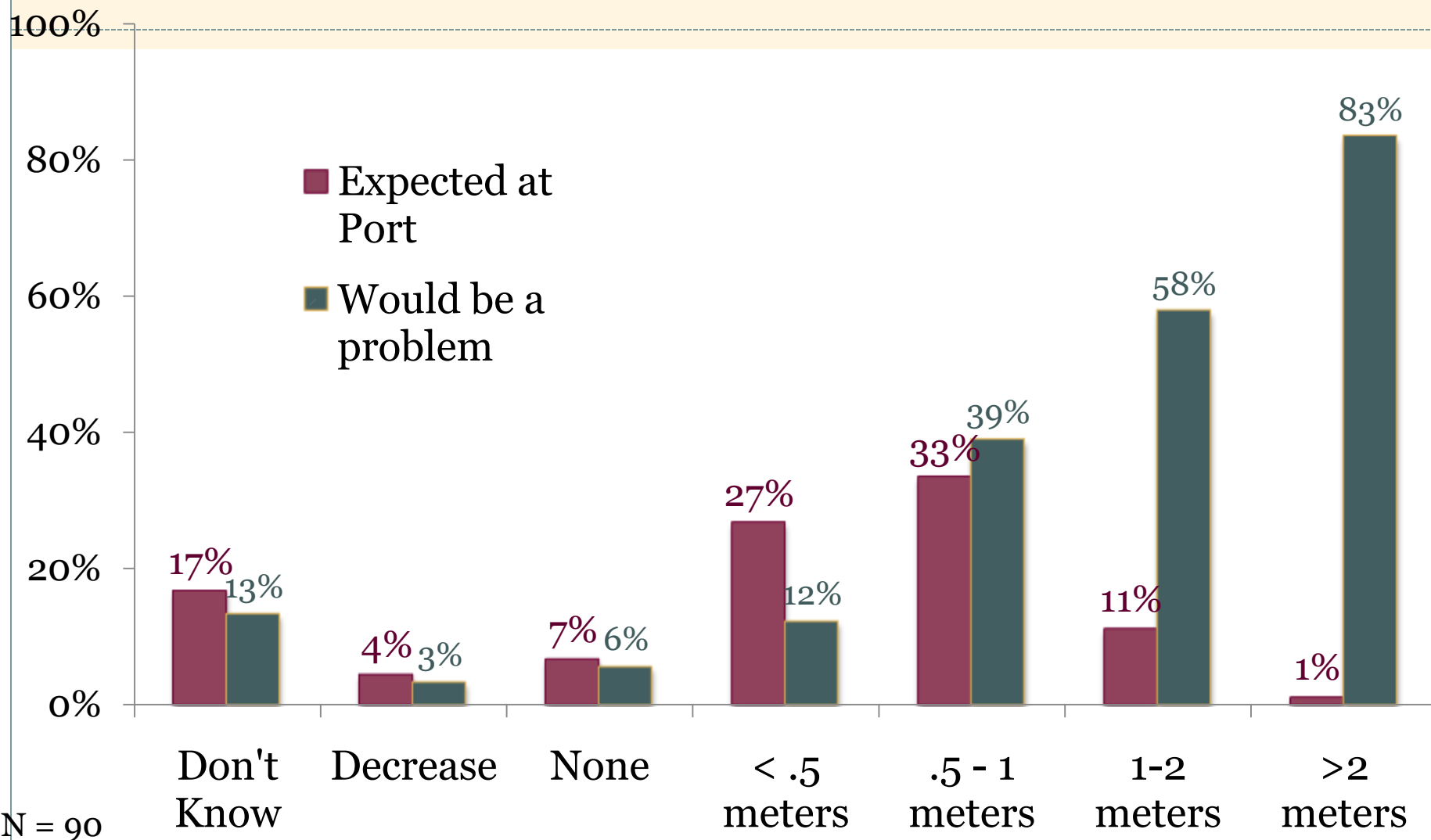
I feel sufficiently informed about how climate change will impact my port operations.

31%

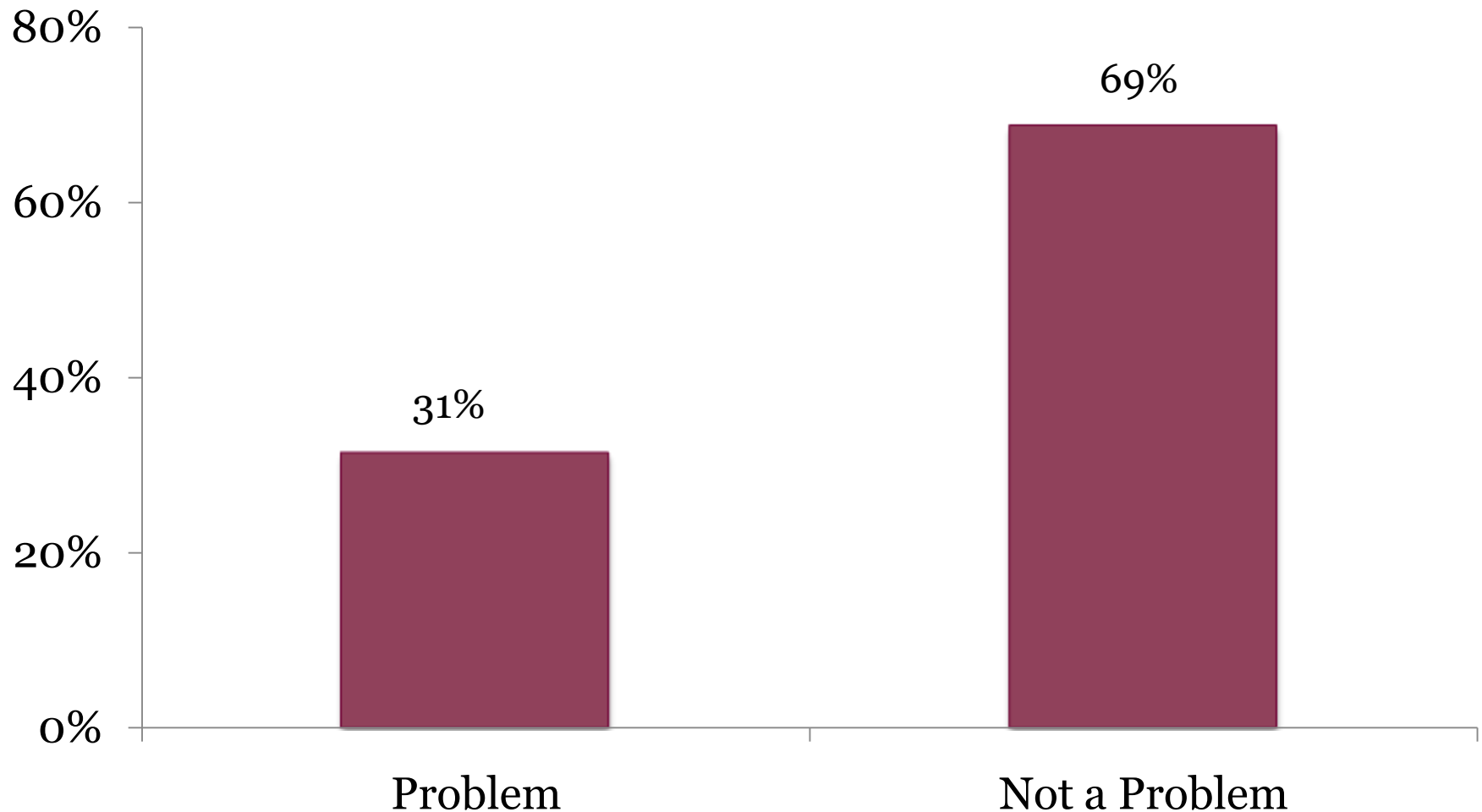
N = 93

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

Finding 2 – Sea Level Rise By 2100



Will the Sea Level Rise You Expect By 2100 Be a Problem For Your Port?

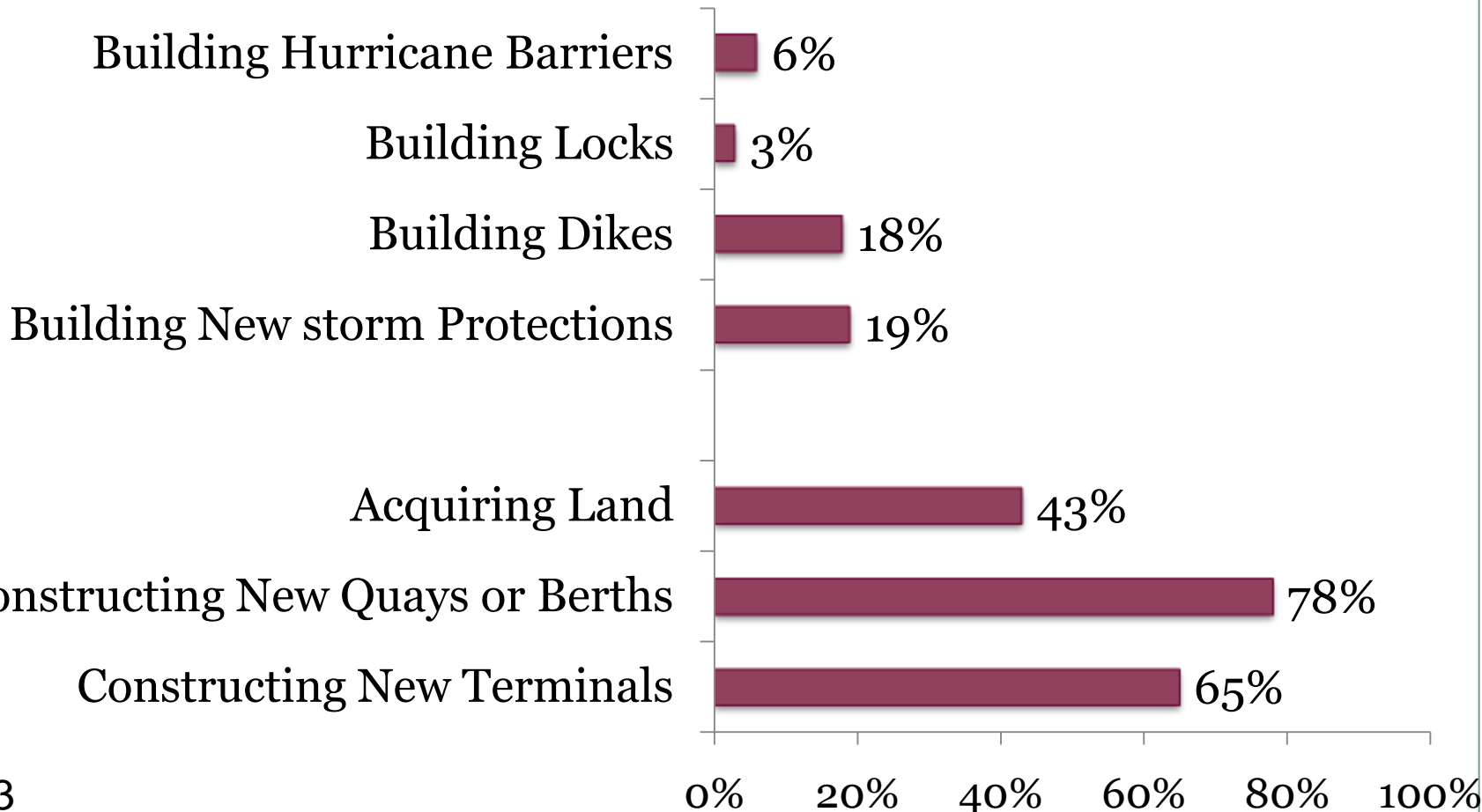


Finding 3 – Ports Expanding

Plans for Expansion in Next 10 Years

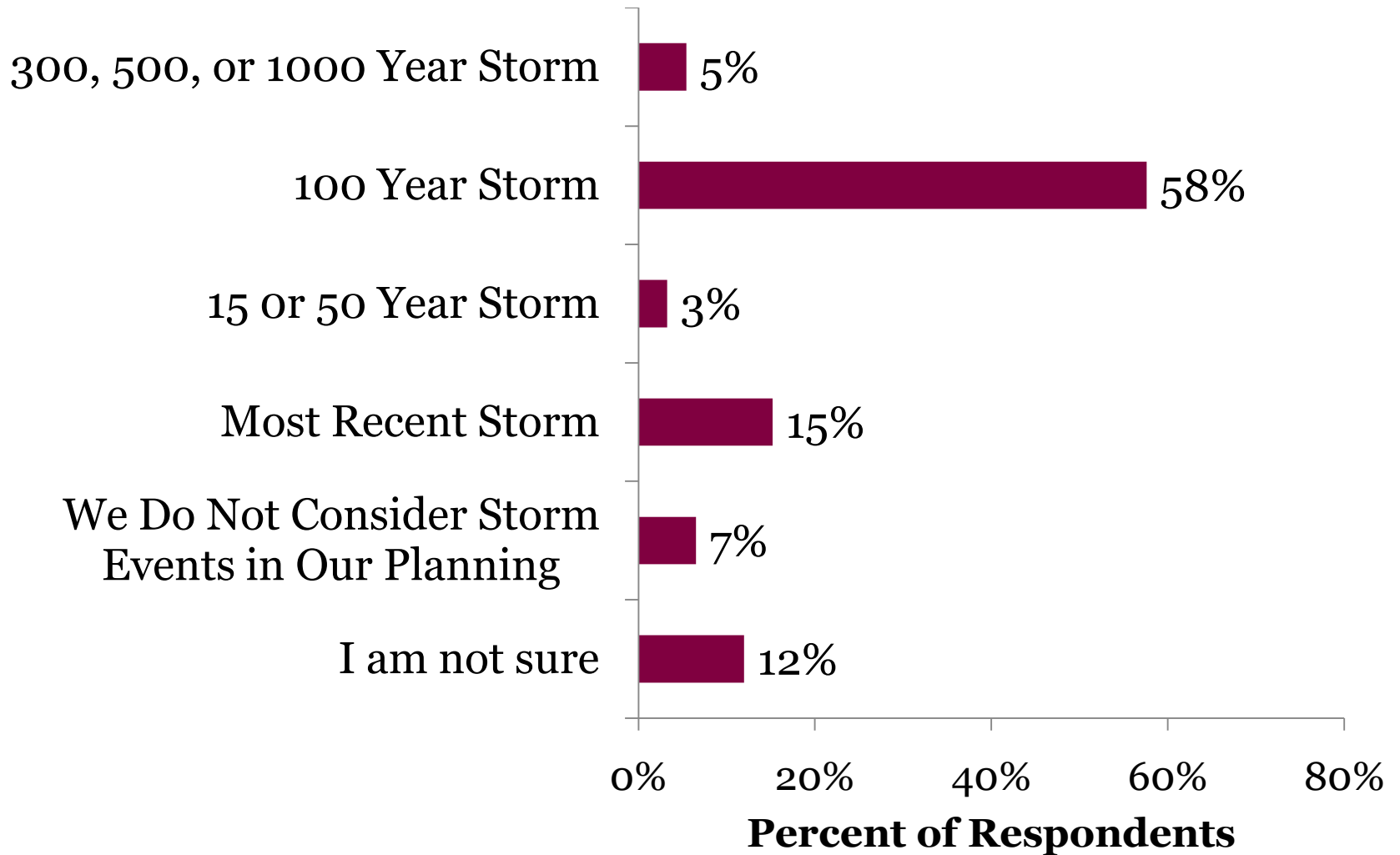
Protection

Expansion

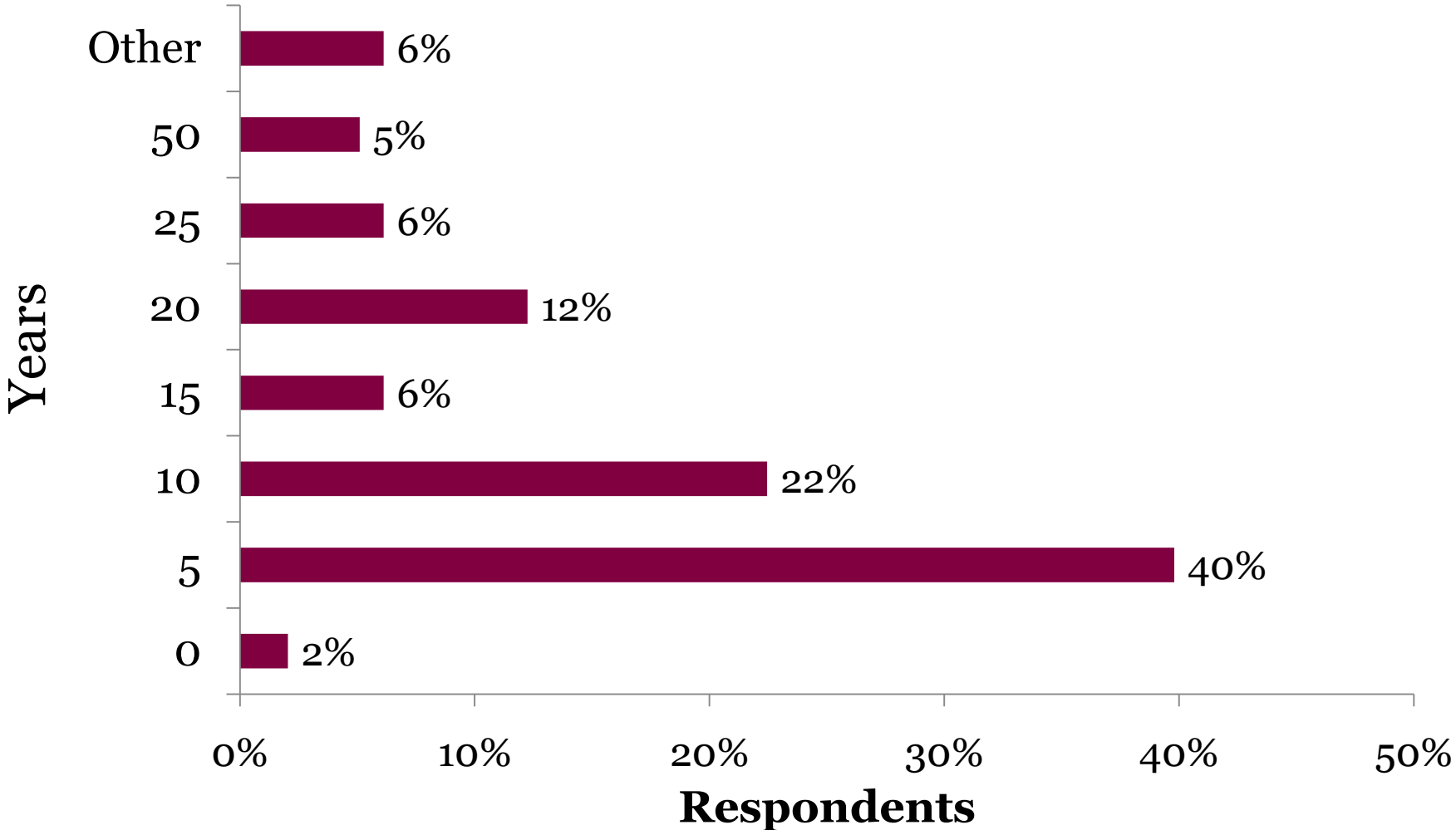


N = 93

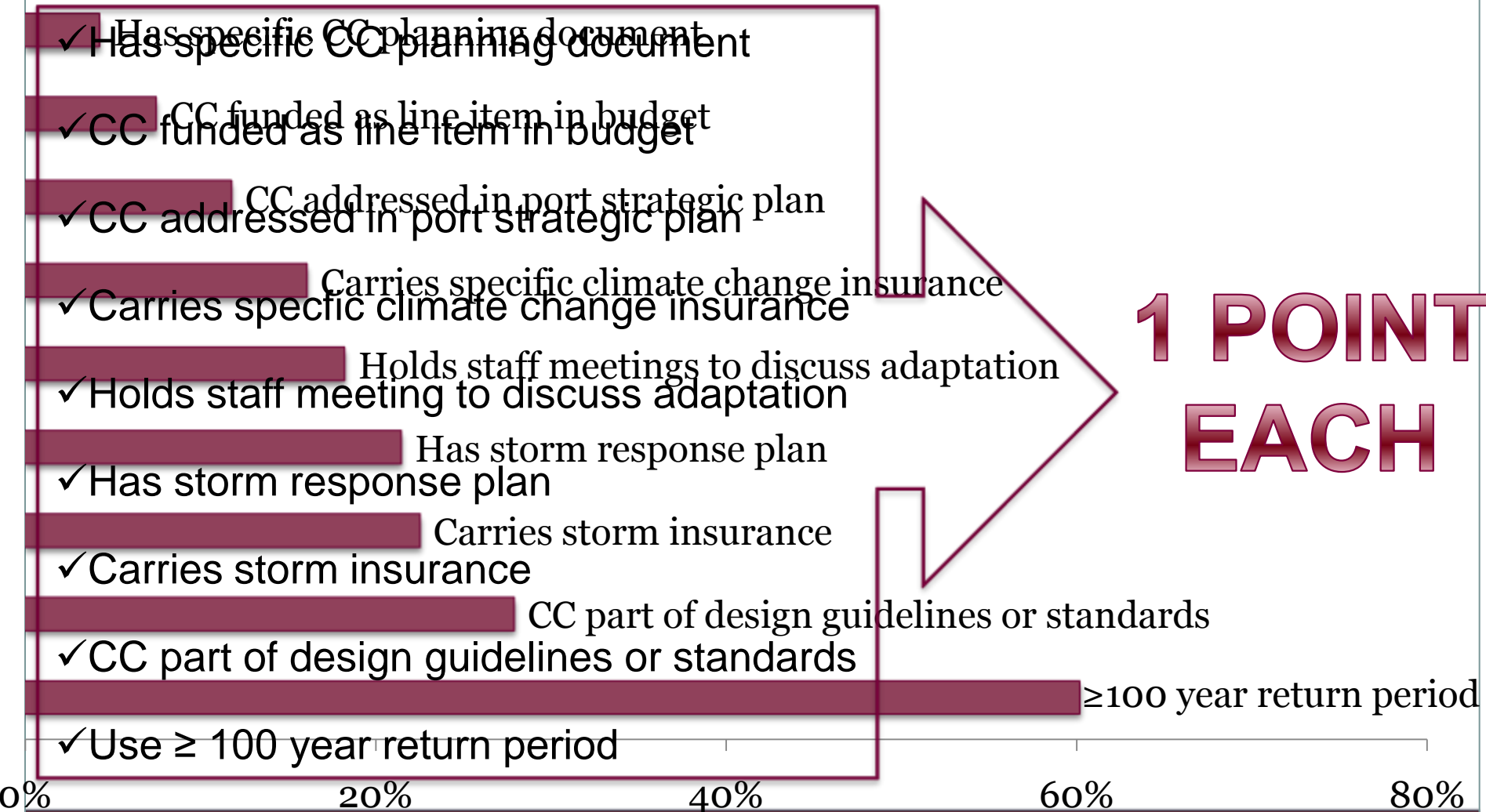
Design Guidelines Used for New Infrastructure



Planning Horizons in Years

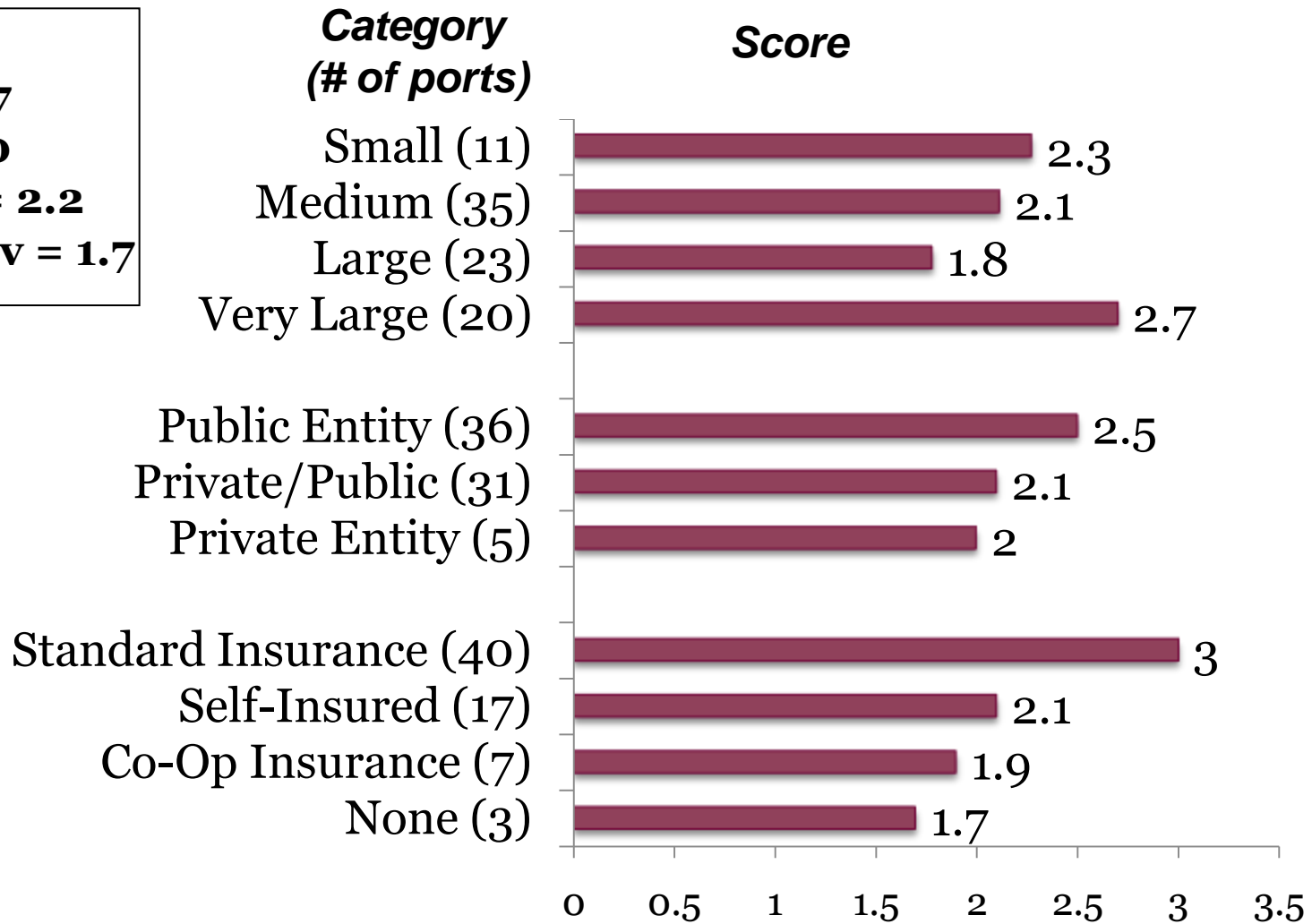


Finding 4 – Climate Change Bolivess

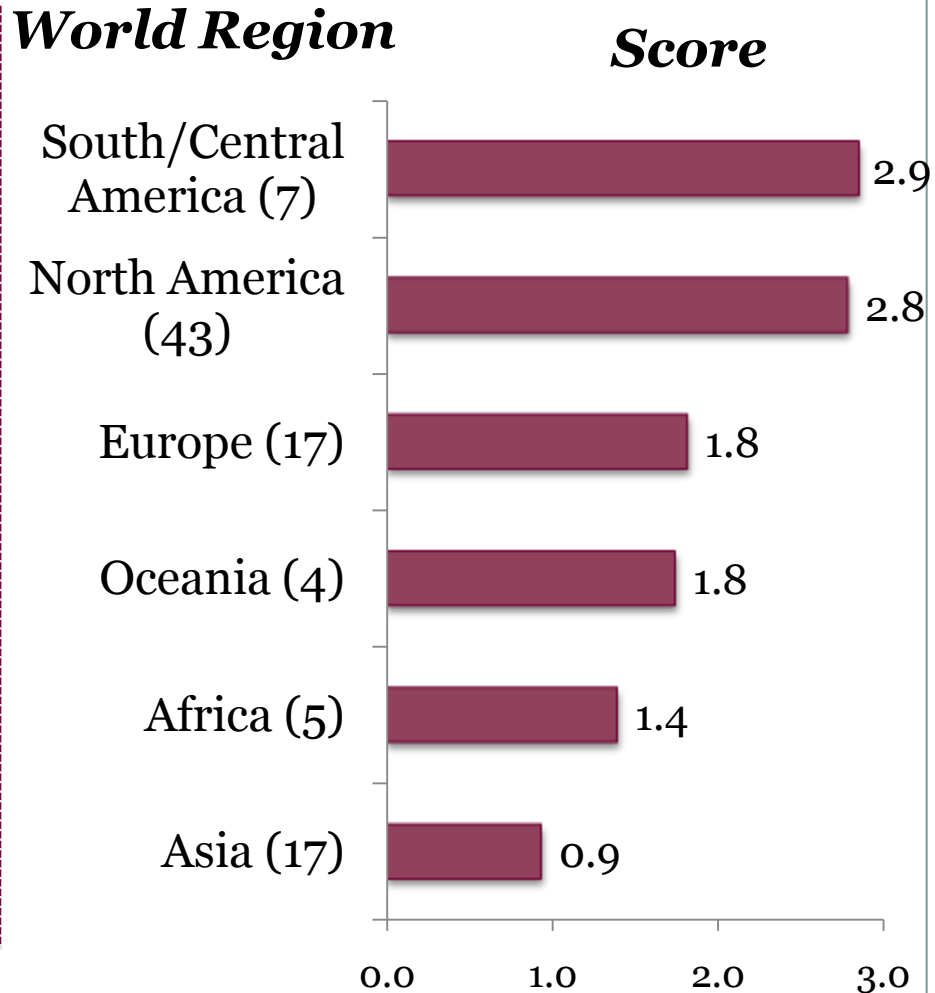
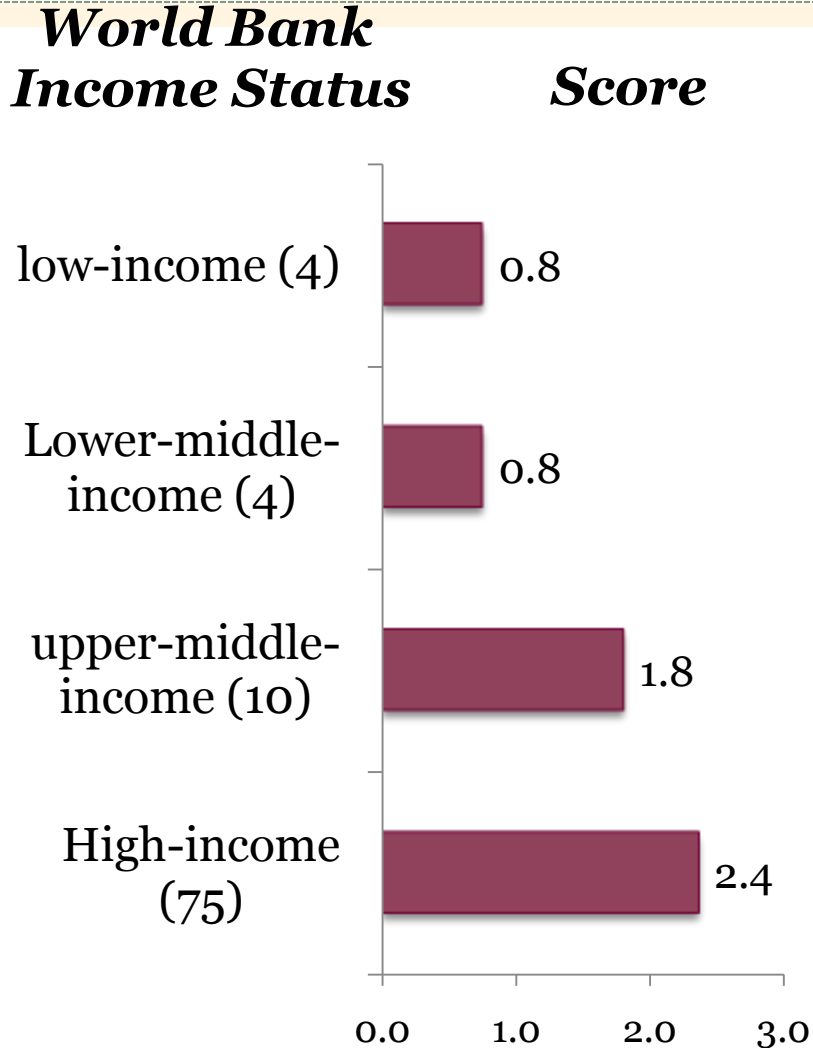


Port Categories and Adaptation Scores

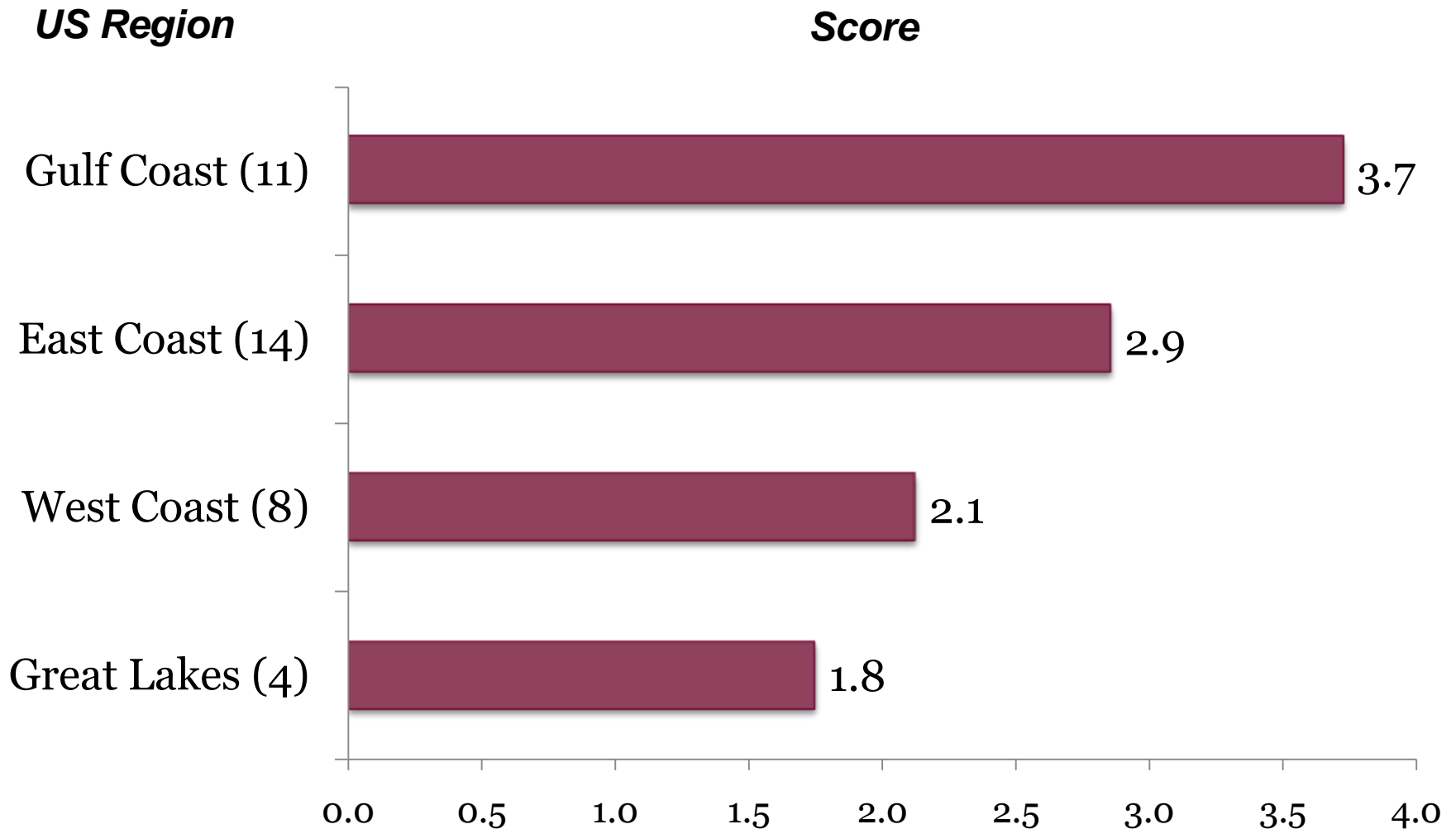
N = 93
Max = 7
Min = 0
Mean = 2.2
Std. Dev = 1.7



Global Comparisons



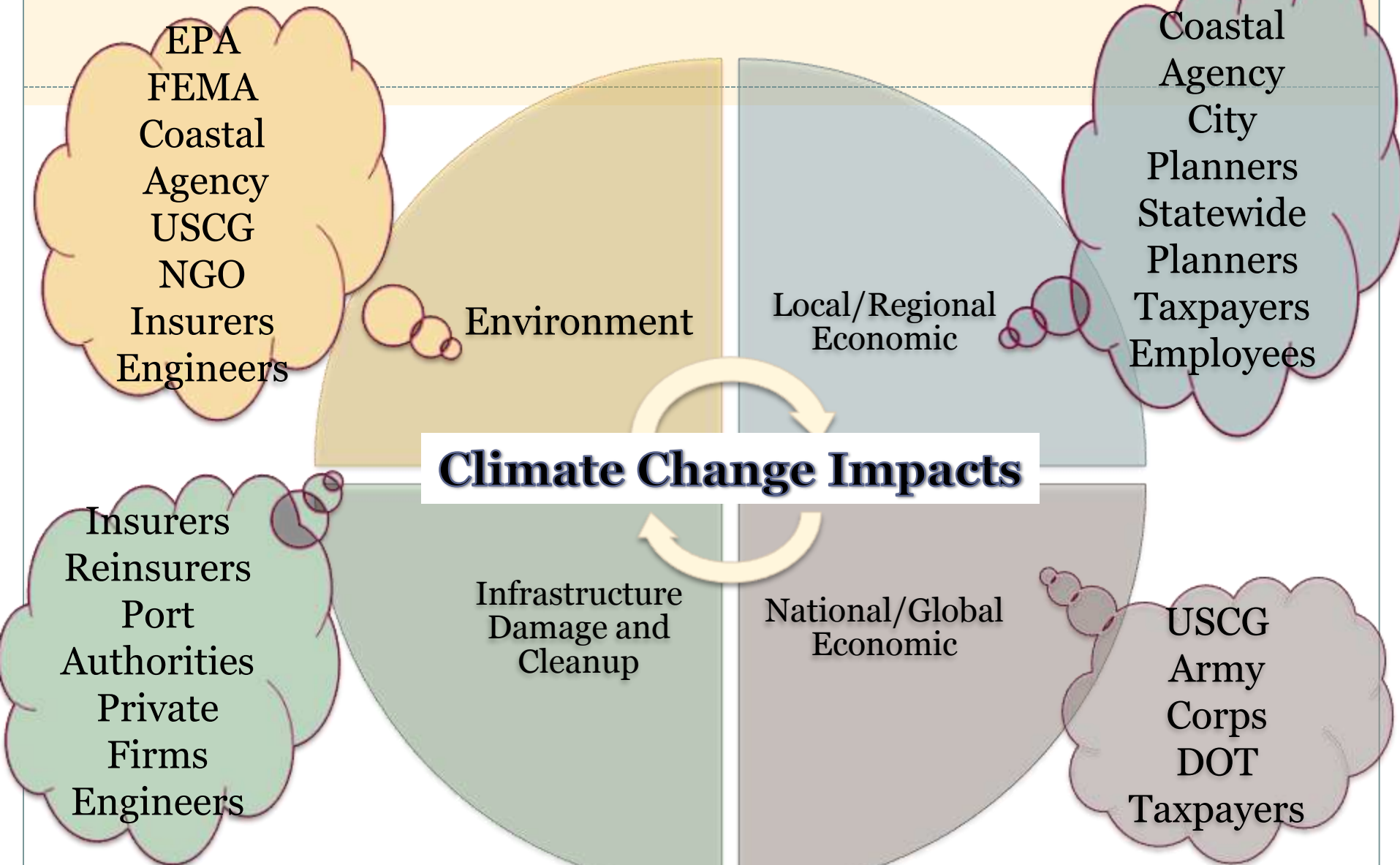
Gulf Coast Ports Scored Highest



Survey Results Summary

- Port staff concerned, but feel uninformed.
- Ports rapidly expanding and building new infrastructure.
- U.S. Gulf Coast ports tend to have more climate policies already in place.
- Planning horizons, design specifications, and management need to incorporate uncertainty and adaptation.

Risk... and Responsibility



Next Steps: Look to the Past to Plan for the Future

- **Looking for case-study ports to further this research**
- Continue to work with AAPA/IAPH
- *How have hurricanes changed port planning, technology, and policy?*
- *How do port stakeholders define resilience?*
- *How do port stakeholders work independently and in aggregate to create more resilient ports?*

Acknowledgements

The Survey Respondents

Meredith Martino, *AAPA*

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Pam Matson, *School of Earth Sciences*

Mike Mastrandrea, *IPCC/Woods Institute*

CEE 129/229 Class



Deltaworks in the Netherlands

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Extra Slides Below

Well-Functioning Ports for the Future

- Maintain or grow the regional economy
- Are good ecosystem stewards
- Are profitable

Perspectives

“...most ports do not appear to be thinking about, let alone actively preparing to address, the effects of climate change.”

US Environmental Protection Agency, 2009

“The insurance industry is moving from being a passive climate change sufferer that has to sustain some very expensive consequences to becoming a proactive shaper of the future.”

Geneva Association, 2009

“Ports should effectively prepare for the impacts of climate change to ensure their role as the indispensable nodal points of global logistic systems.”

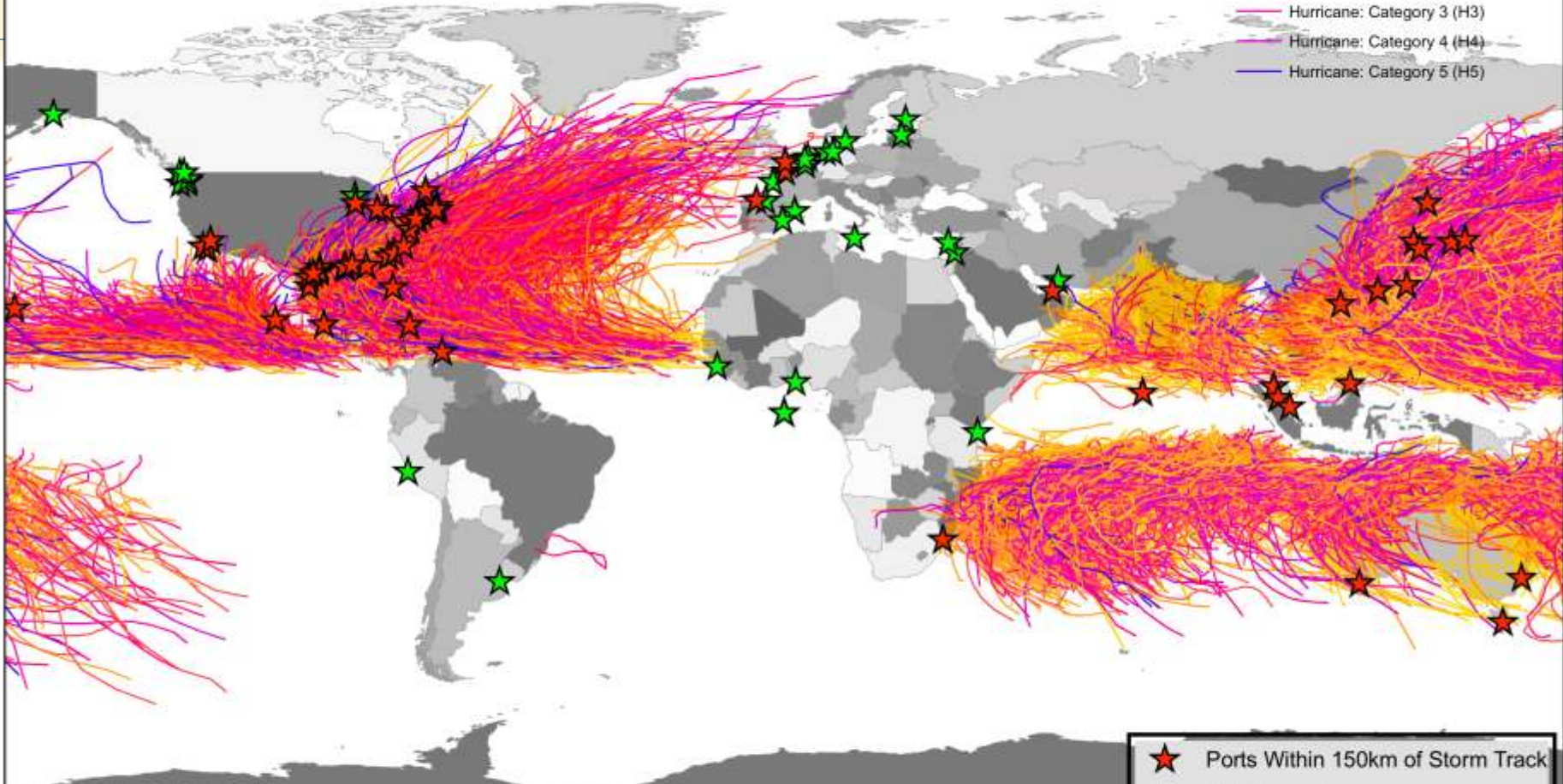
Resolution of the IAPH, Genoa, Italy May 2009

Ports Proximity to Historic Storm Tracks

Survey Respondents

Hurricane Tracks 1850-Present

- Tropical Depression (TD)
- Tropical Storm (TS)
- Hurricane: Category 1 (H1)
- Hurricane: Category 2 (H2)
- Hurricane: Category 3 (H3)
- Hurricane: Category 4 (H4)
- Hurricane: Category 5 (H5)



Map by Austin Becker, 2009

- ★ Ports Within 150km of Storm Track
- ★ All other ports

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AAPA American Association
of Port Authorities

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



IAPH

The International Association
of Ports and Harbors

By Austin Becker
Stanford University
Nov. 15, 2009
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RI Emergency Management Agency

City Zoning

Structures Insured
Against Losses

US Army Corps

P&W Railroad

Private Terminal Operator

City Owned Land

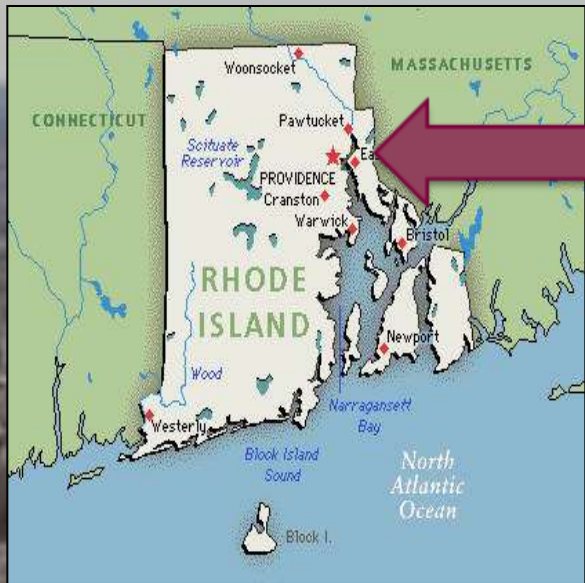
State
Jurisdiction over
Coastal Lands

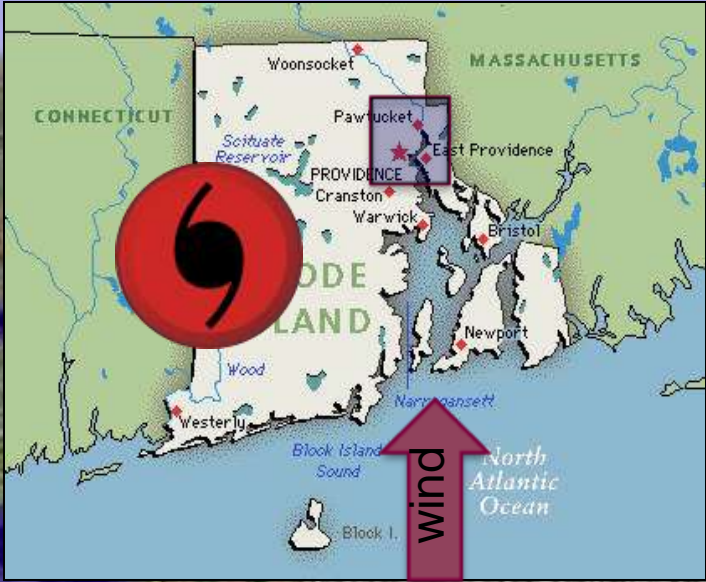
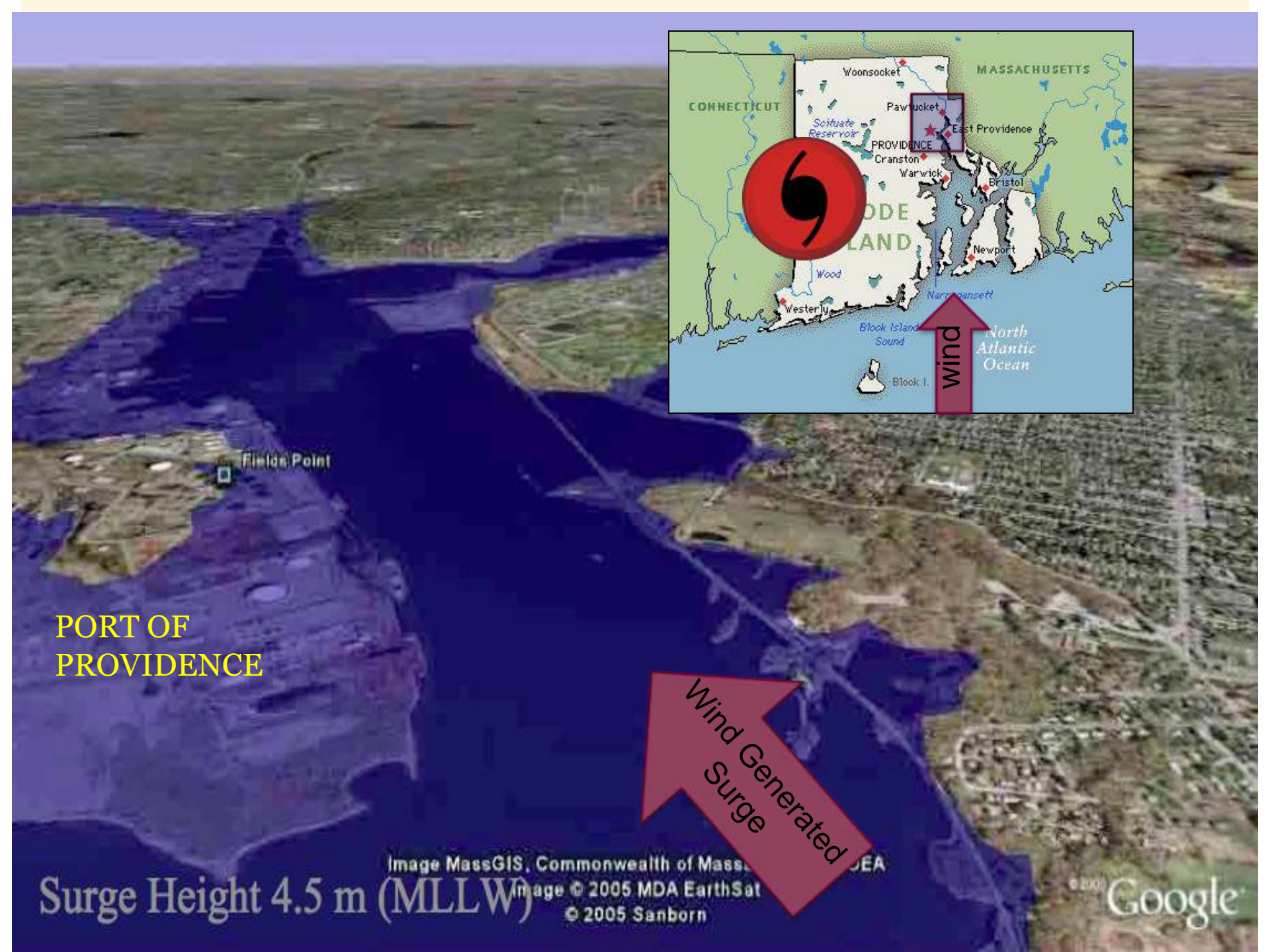
RI Dept. of
Transportation

Federally Maintained Channel

Estuary

US Coast Guard





PORT OF PROVIDENCE

Fields Point

Surge Height 4.5 m (MLLW) Image MassGIS, Commonwealth of Massachusetts
Image © 2005 MDA EarthSat
© 2005 Sanborn

Google

Future Work/Next Steps

Case Studies

- What makes a resilient port?
- How have past storms led to long-term changes in port planning?
- How do ports work with government to



<http://www.portoflosangeles.org>

www.seaports2100.org