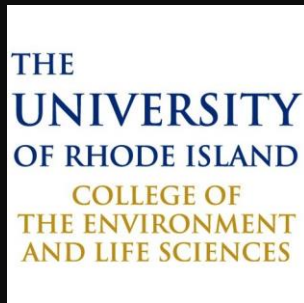


Moving toward resilience: A research agenda for sustainable seaports



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University of Rhode Island



Green Boats and Ports for Blue Waters

4-9-14

Overview

BACKGROUND

1 Ports cities and the climate change challenge

CONTEXT

2 Setting the table for adaptation research

RESEARCH AGENDA

3

- a) Vulnerability assessments
- b) Risk indices
- c) The leadership vacuum

2100

Ports: Critical, complex, constrained

Critical - Economic engines at every scale

Complex – Multiple stakeholders across space and time

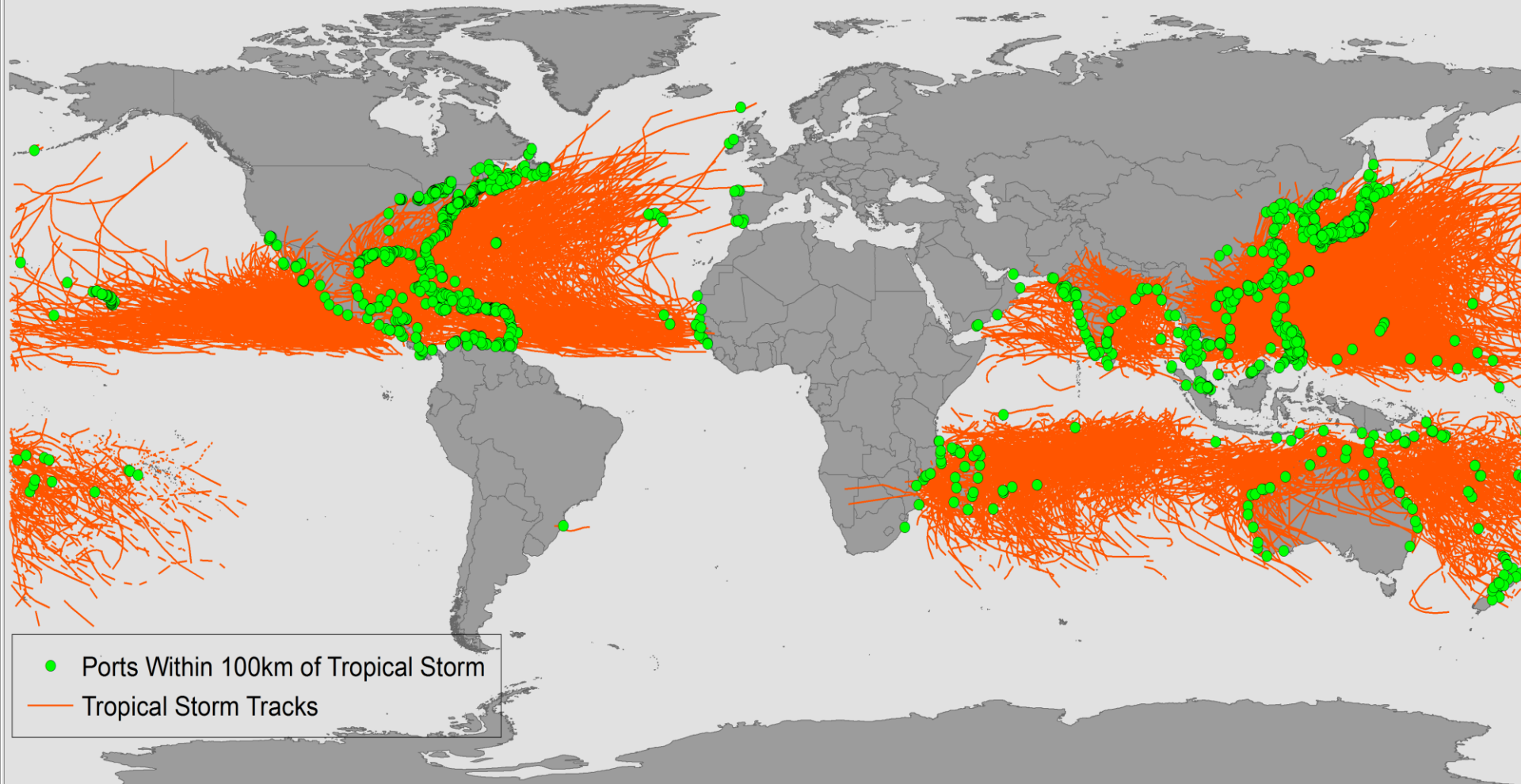
Constrained - Dependent on specific and environmentally-sensitive locations

(Asariotis and Benamara 2012; Notteboon and Winkelmanns 2003; EPA 2011; AAPA 2013)



Ports and port cities in harm's way

Ports Within 100km of Tropical Storm Tracks 1960-2010



Climate change challenges



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



Sea levels to rise 0.7 to 1.9 meters by 2100

1-in-3 year storm event of 2100

Inland flooding

Cascading consequences for port cities



1) Direct damages

(e.g., structures, equipment, freight, land, etc.)



2) Indirect costs

(e.g., lost wages, business interruptions, cleanup costs)

Rotten Meat From Katrina Still in Gulfport Neighborhood

surrounding Regnault Avenue.

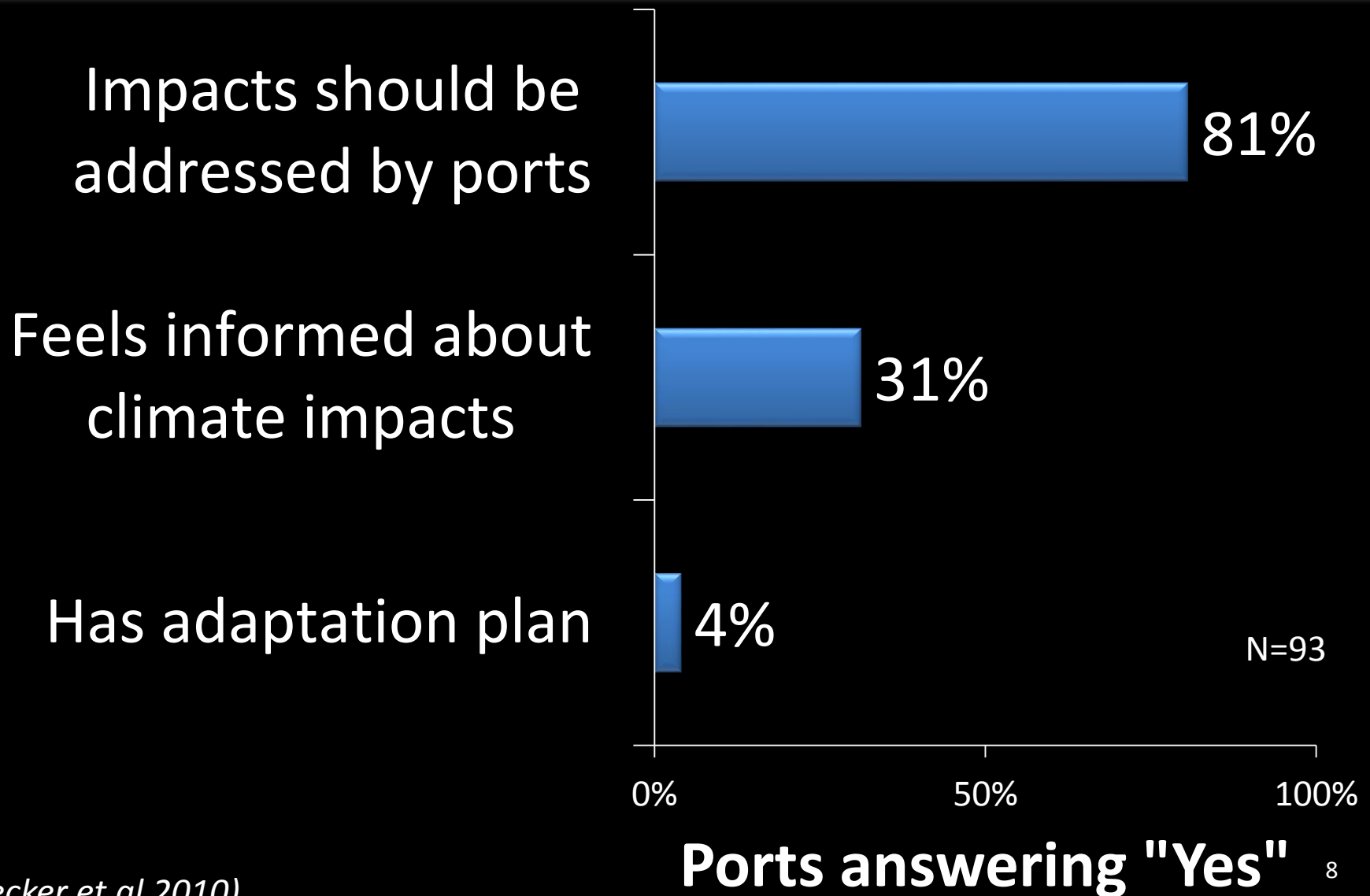
"It's nine months now. They say, 'Well, you ought to be used to it by now.' You ain't gonna get used to that smell. My gosh," said resident Gary Tatum.

The meat had been stored at the Port of Gulfport. Katrina washed it in to yards covering an eight block span. The meat in the yards has been picked up, but the meat in hard-to-see areas has not.

3) Intangible consequences

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

Ports concerned, but little action thus far



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WHAT CAN WE LEARN?

Identify vulnerabilities

WHAT CAN WE EXPECT?

ADAPTATION

Identify, assess & select strategies

Process of adjustment to climate and its effects, in order to moderate harm or exploit beneficial opportunities (IPCC 2012).

Revise & share lessons learned

Monitor & evaluate

Implement strategies

WHAT CAN WE DO?

WHAT CAN WE LEARN?

Engineering & design

WHAT CAN WE EXPECT?

Stakeholders

Natural & physical sciences

ADAPTATION

Policy

Social sciences

WHAT CAN WE DO?

Overview

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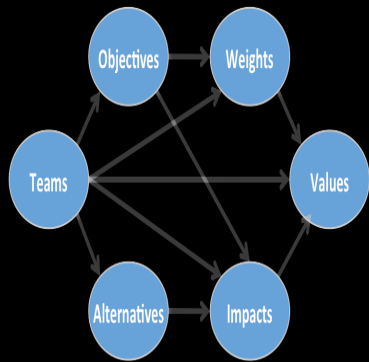
RESEARCH AGENDA

3

- a) Vulnerability assessments
- b) Risk indices
- c) The leadership vacuum

Setting a research agenda

What can we expect? What can we do?



Case study level
vulnerability
assessments



Macro-level
risk and
vulnerability
indices



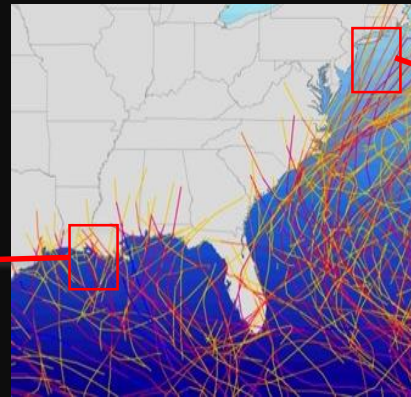
Filling the
leadership
vacuum

1. Vulnerability assessments

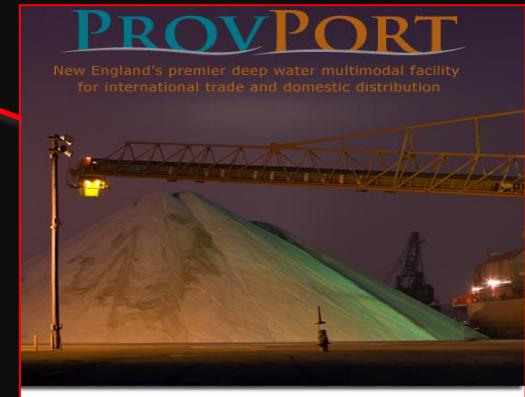
1) GULFPORT, MS



- Container port
- High exposure
- Recent hurricane (Katrina)
- Unique resilience strategy
- 30 stakeholders interviewed

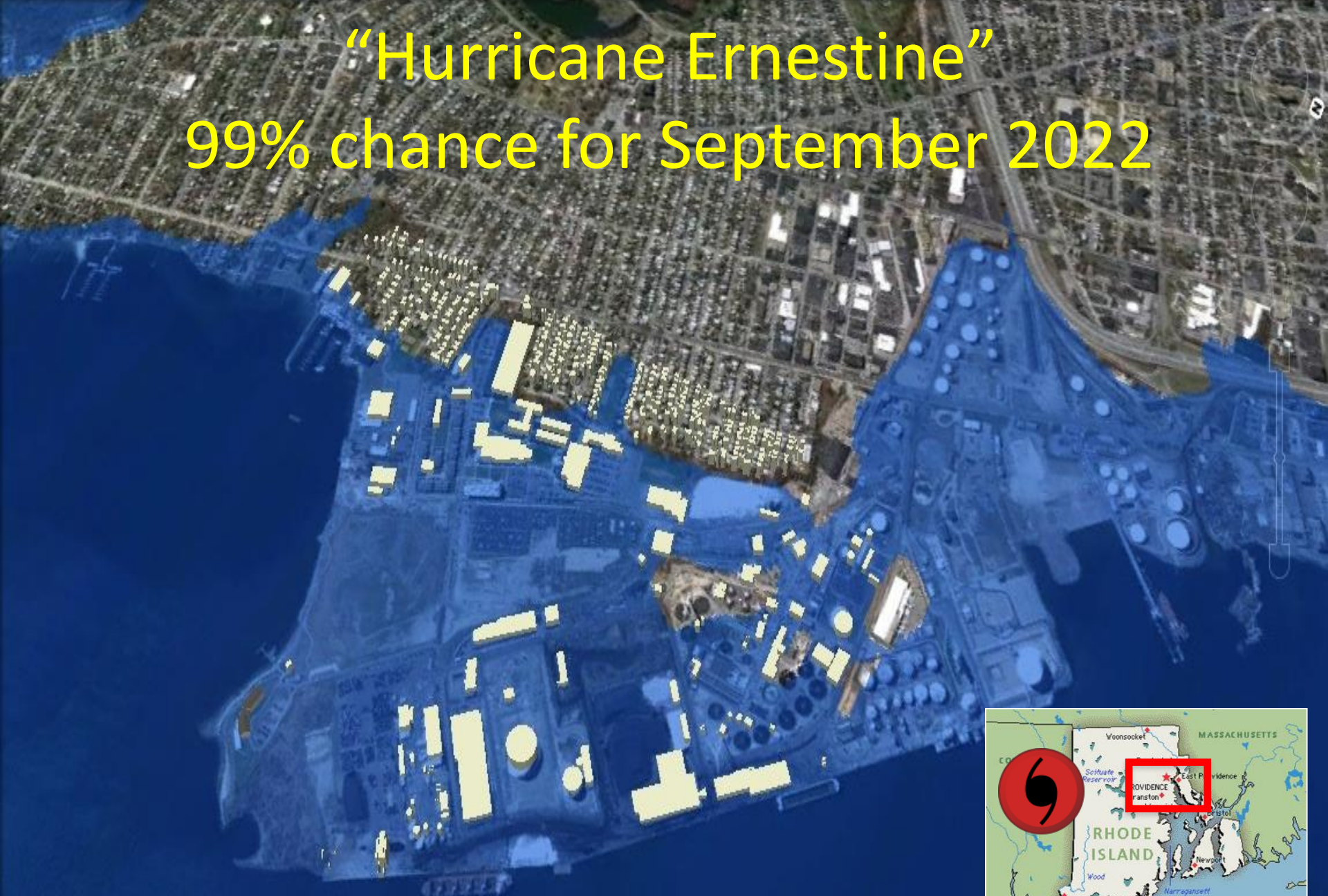


2) PROVIDENCE, RI

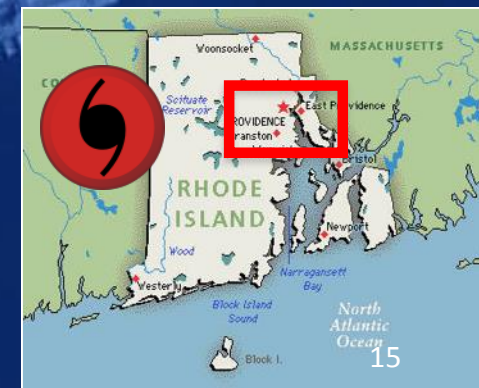


- Energy port
- High exposure
- NO recent hurricane
- 27 stakeholders interviewed

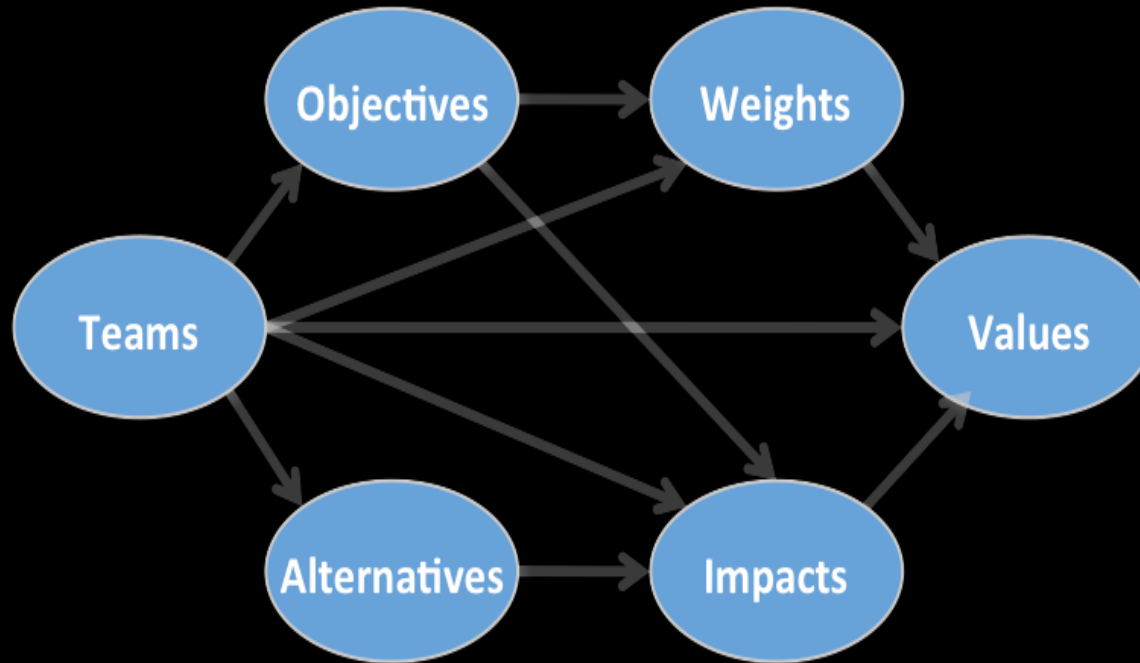
“Hurricane Ernestine” 99% chance for September 2022



Port of Providence in Cat 3 simulated hurricane
(Surge layer provided by Applied Science Associates)



Stakeholder-based multi-criteria vulnerability assessment



What risk and for whom?

2. Risk/vulnerability indices



<http://sealevel.climatecentral.org/images/uploads/slr-maps-odds-national.jpg>

- Local sea level rise
- Age of infrastructure
- Local vs. national contribution to GDP
- Sensitivity of ecosystems

Where to spend resilience \$¹⁷???

3. The leadership vacuum



Incentives?

“Leadership???”

Who makes it happen and how?

What can we expect? What can we do?

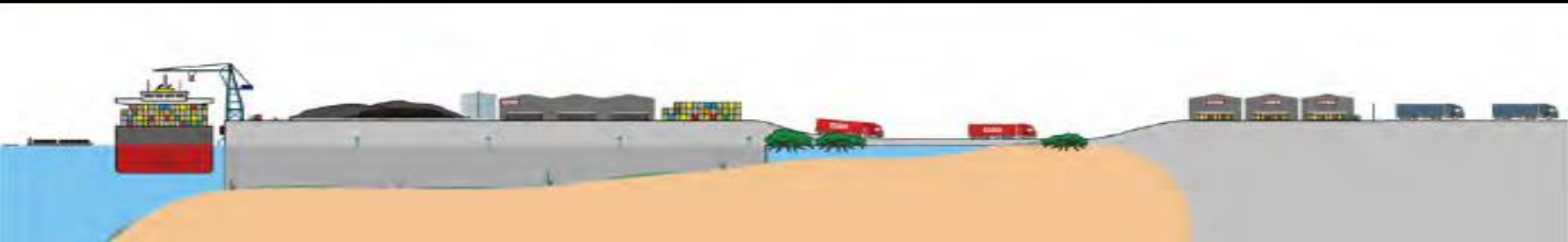
Engage full stakeholder network in resilience planning

Improve climate projections and risk-assessments

Assess large-scale strategies -- Protect, elevate, or relocate?

Create enabling environment for investment in adaptation

(Becker A, et al 2013)



Fundamental shift...

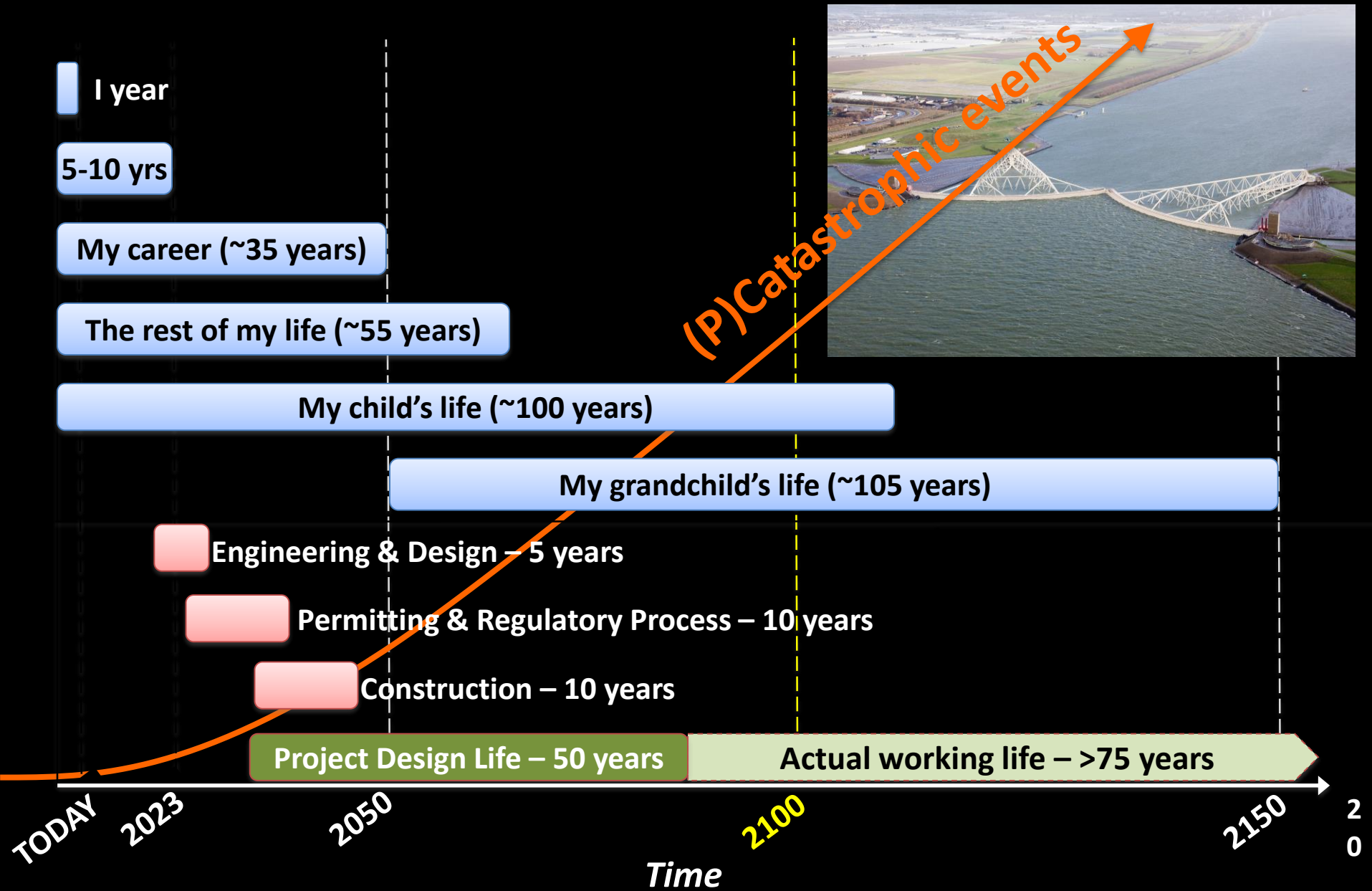
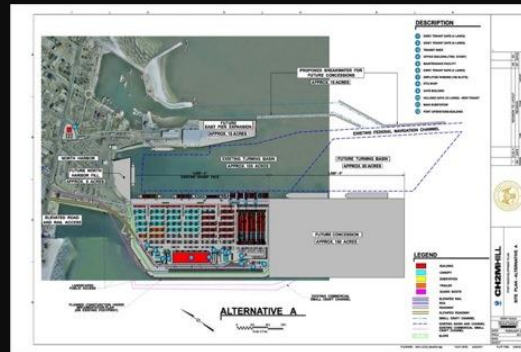




Photo by Austin Becker



www.mspsa.com



Photo by Austin Becker

Questions?

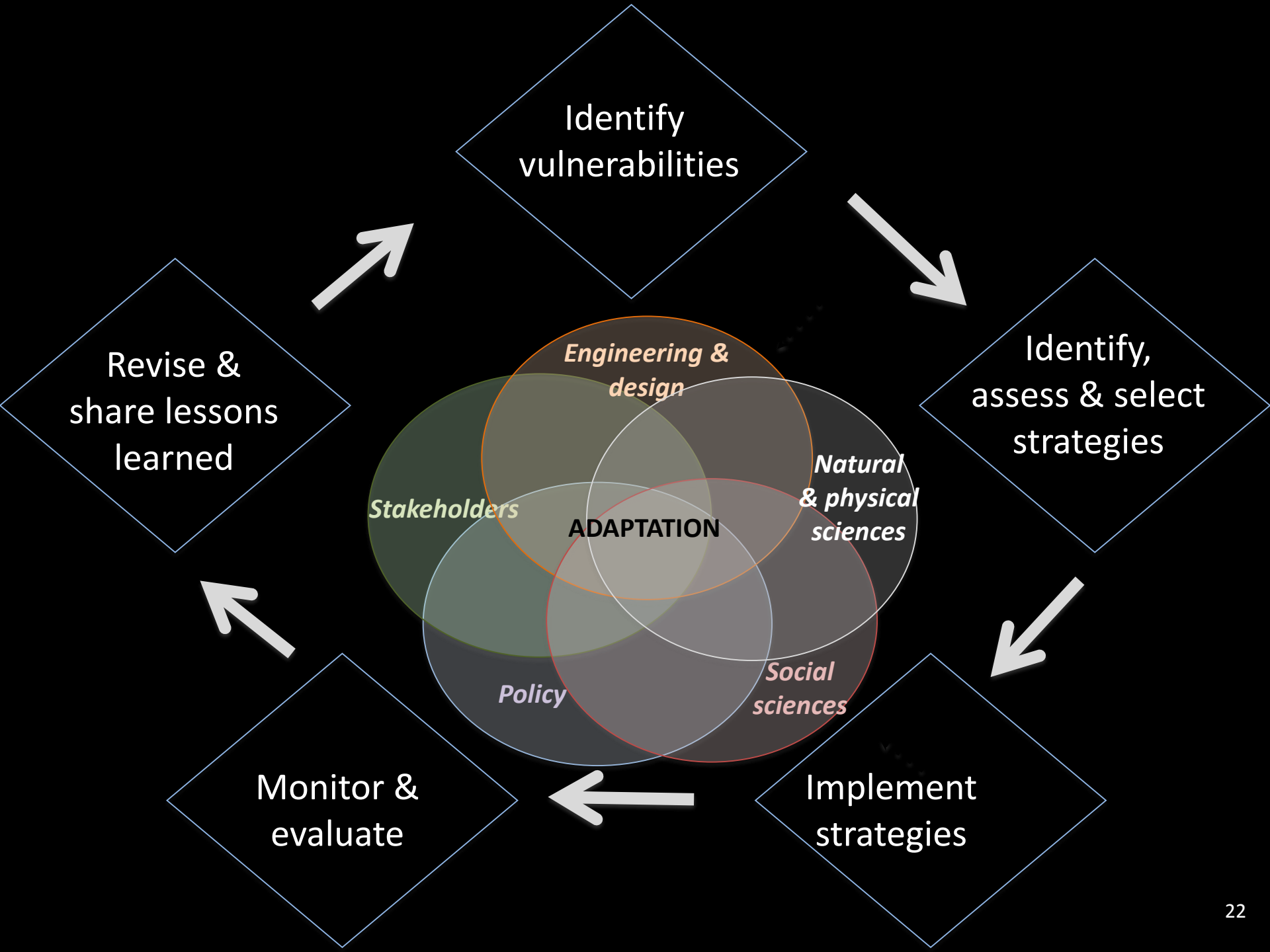
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Many thanks to the Graduate School of Oceanography





EXTRA SLIDES BELOW

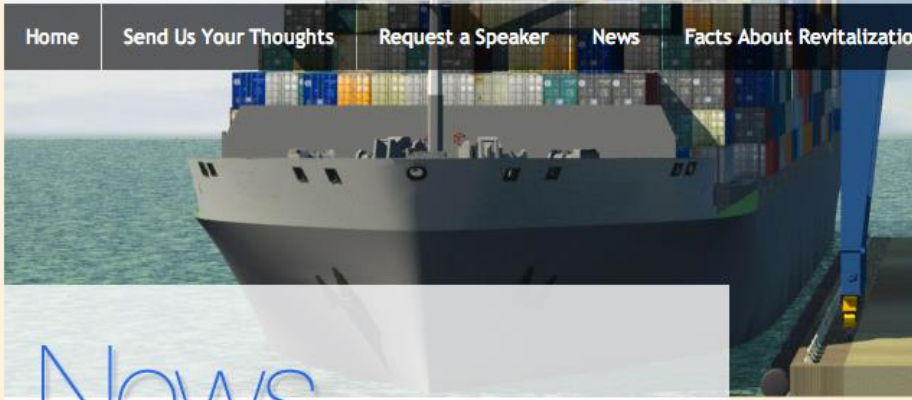
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Port decisions do not always account for stakeholder concerns

Port of the Future.com

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News

Port of Gulfport Board: No Need to Raise Port Elevation to 25 Feet

Tuesday, October 30, 2012

Mississippi Business Journal - Business Blog

By MBJ News Staff

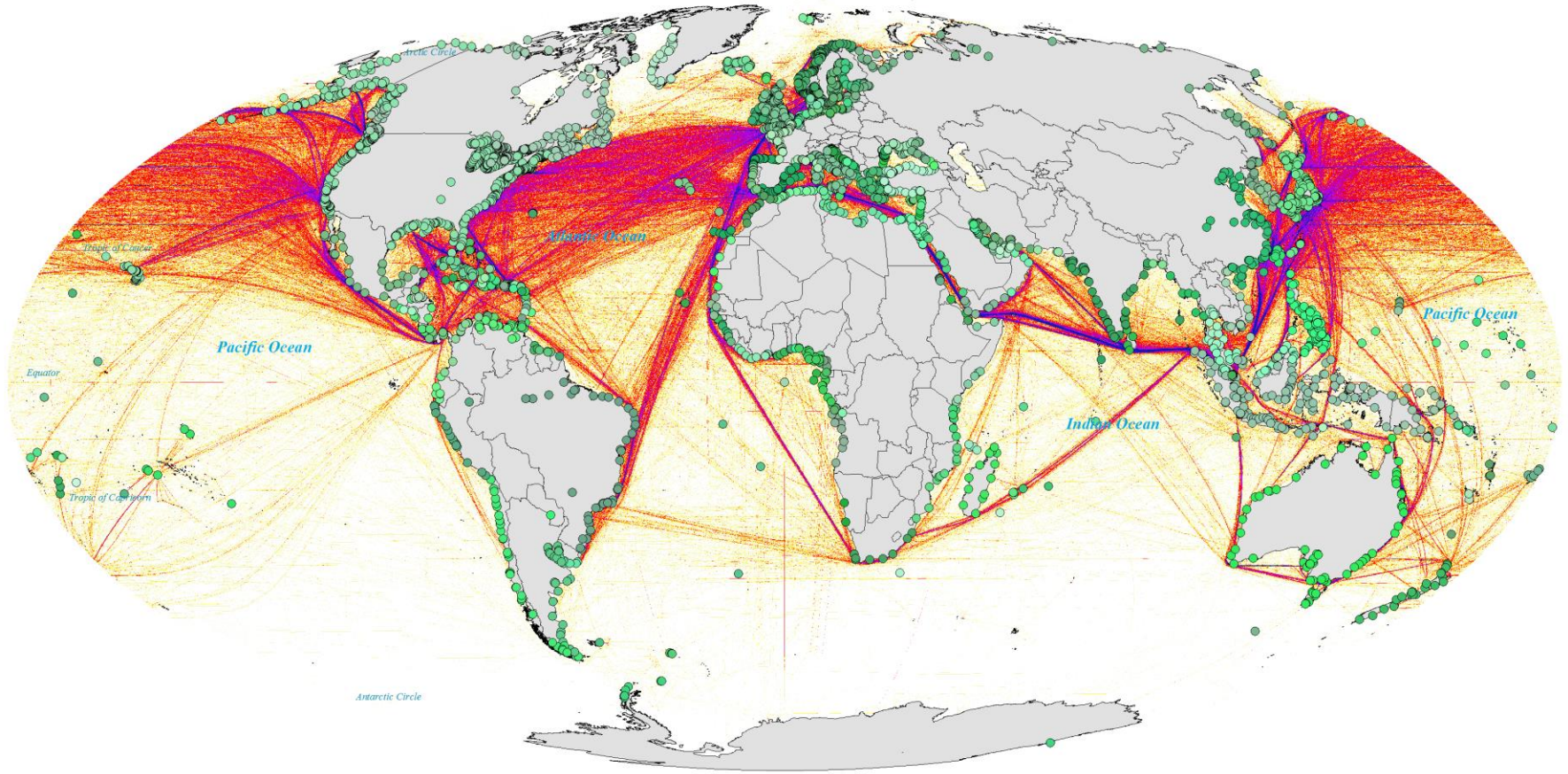
An eagerness to shorten the time frame for upgrading the Port of Gulfport led port commissioners Tuesday to scale back plans to elevate the West Pier to 25 feet as part of a \$500 million-plus restoration and expansion of Mississippi's main seaport.

News Headlines

- OPINION - Frances Fredericks: A Vision for a 'Right-Size' Port
- Port Board Decides Against 25-Foot Elevation
- Port of Gulfport Board: No Need to Raise Port Elevation to 25 Feet
- Port Authority Nixes 25 Feet Elevation for Gulfport
- Port of Gulfport Mulls Higher Pier as Tenants Object
- Gulfport Port is Meeting HUD Mandate for West Pier Work
- Gulfport Port Commission Takes No Action On Elevation Question
- Sun Herald Editorial: Time to Cut



Oct. 29, 2012
"Super storm" Sandy



Shipping Routes & 3700 World Ports

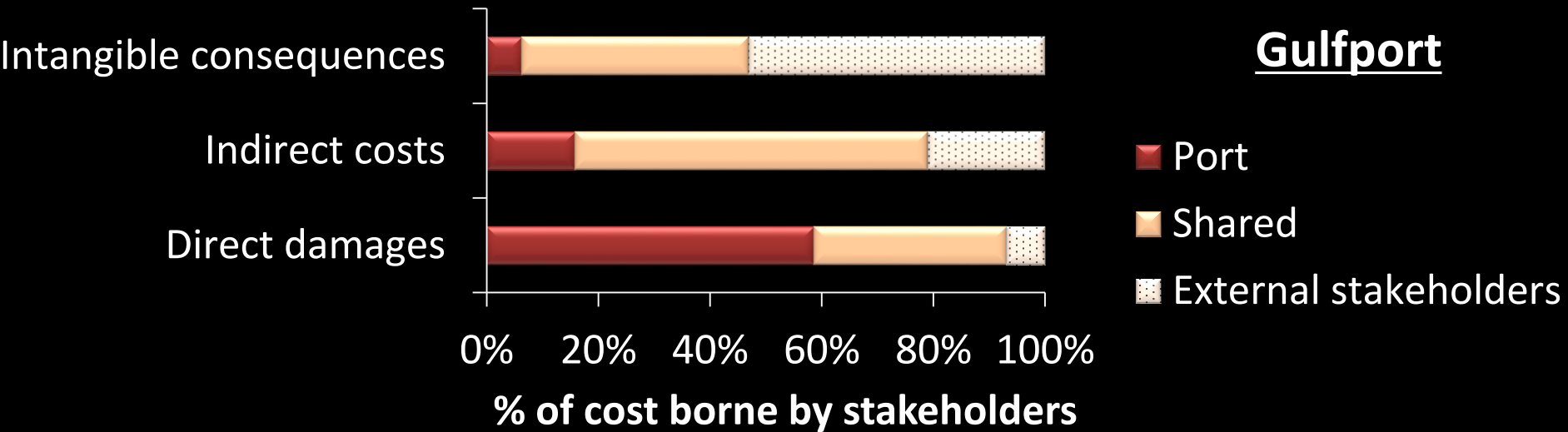
Mollweide Projection
Central Meridian: 0.00
Map by Austin Becker
Data from Pub 150 World Port Index and <http://www.nceas.ucsb.edu/globalmarine/impacts>

Redwood City, CA

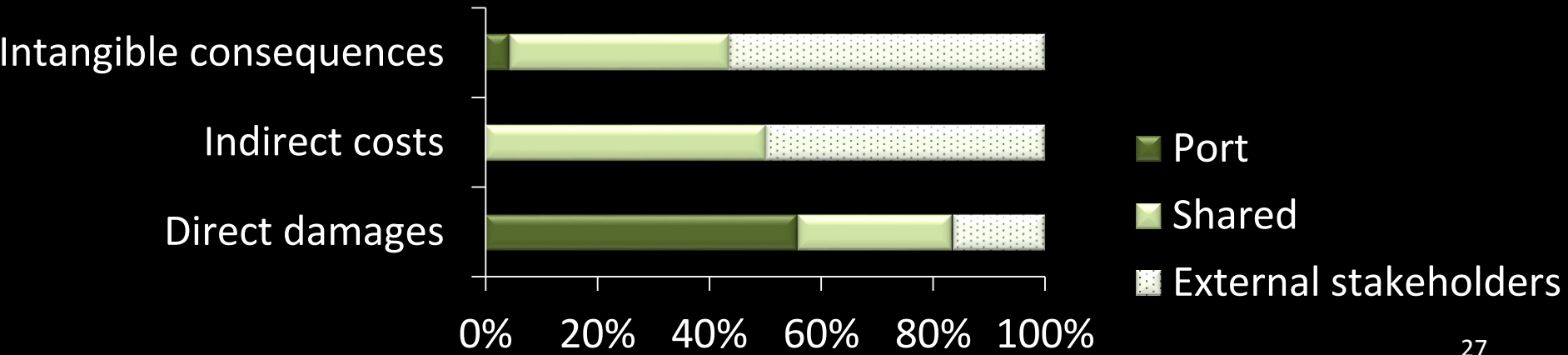


External stakeholders bear high % of costs

Gulfport



Providence

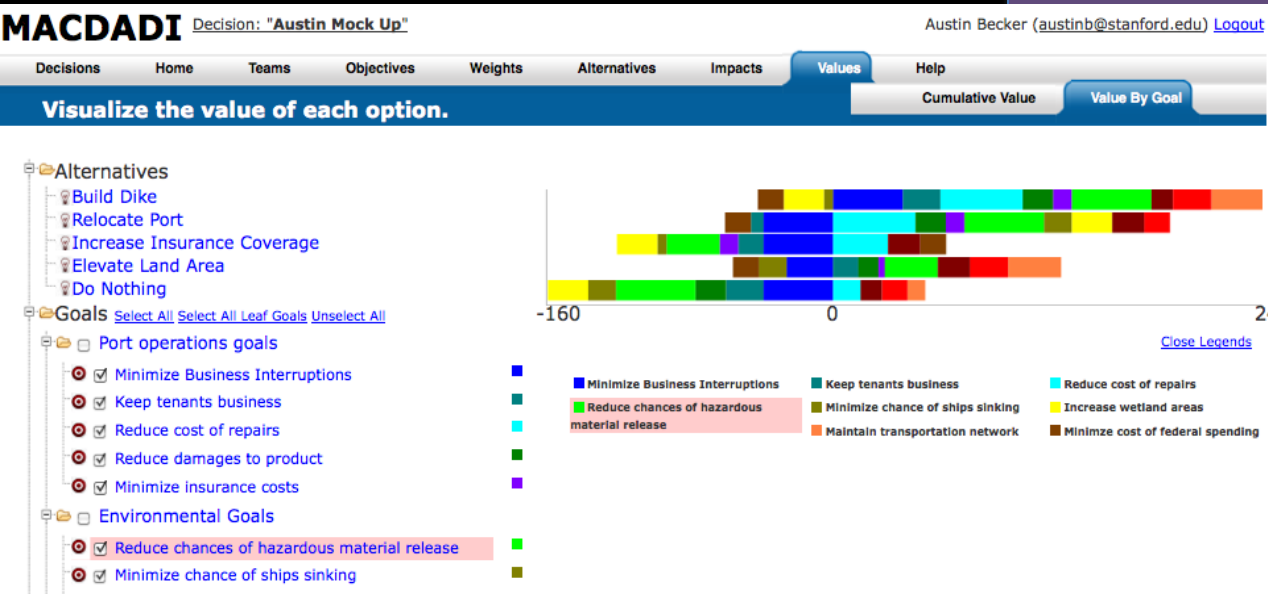


Stakeholders
Internal port
Public policy
Community groups,
etc.

Goals/missions
Profits
Create jobs
Protect
environment, etc.

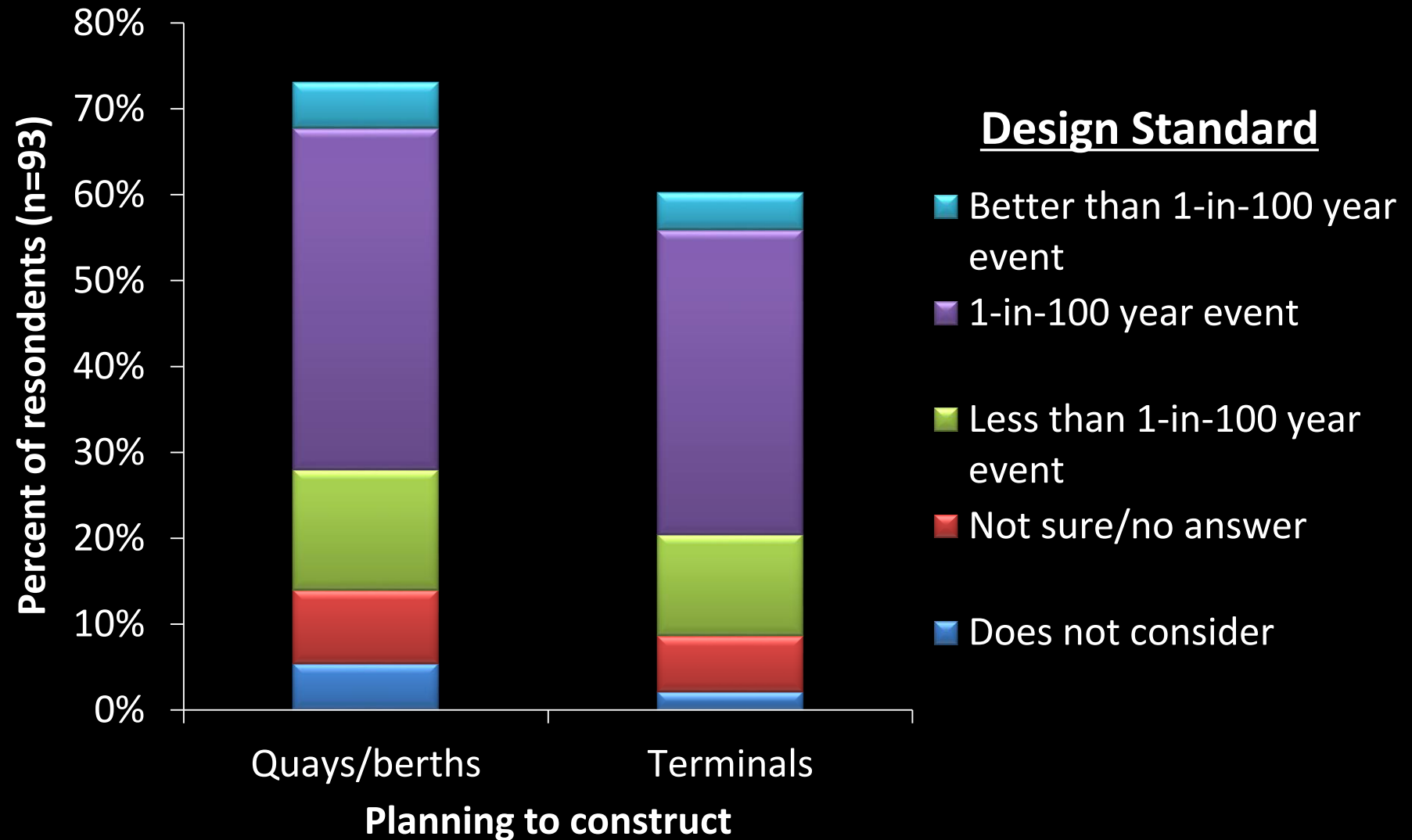
Impacts of concern
Warehouse
destroyed
Materials released
Jobs lost, etc.

Strategy
alternatives
Build dike
Expand planning
horizons,
Elevate, etc.

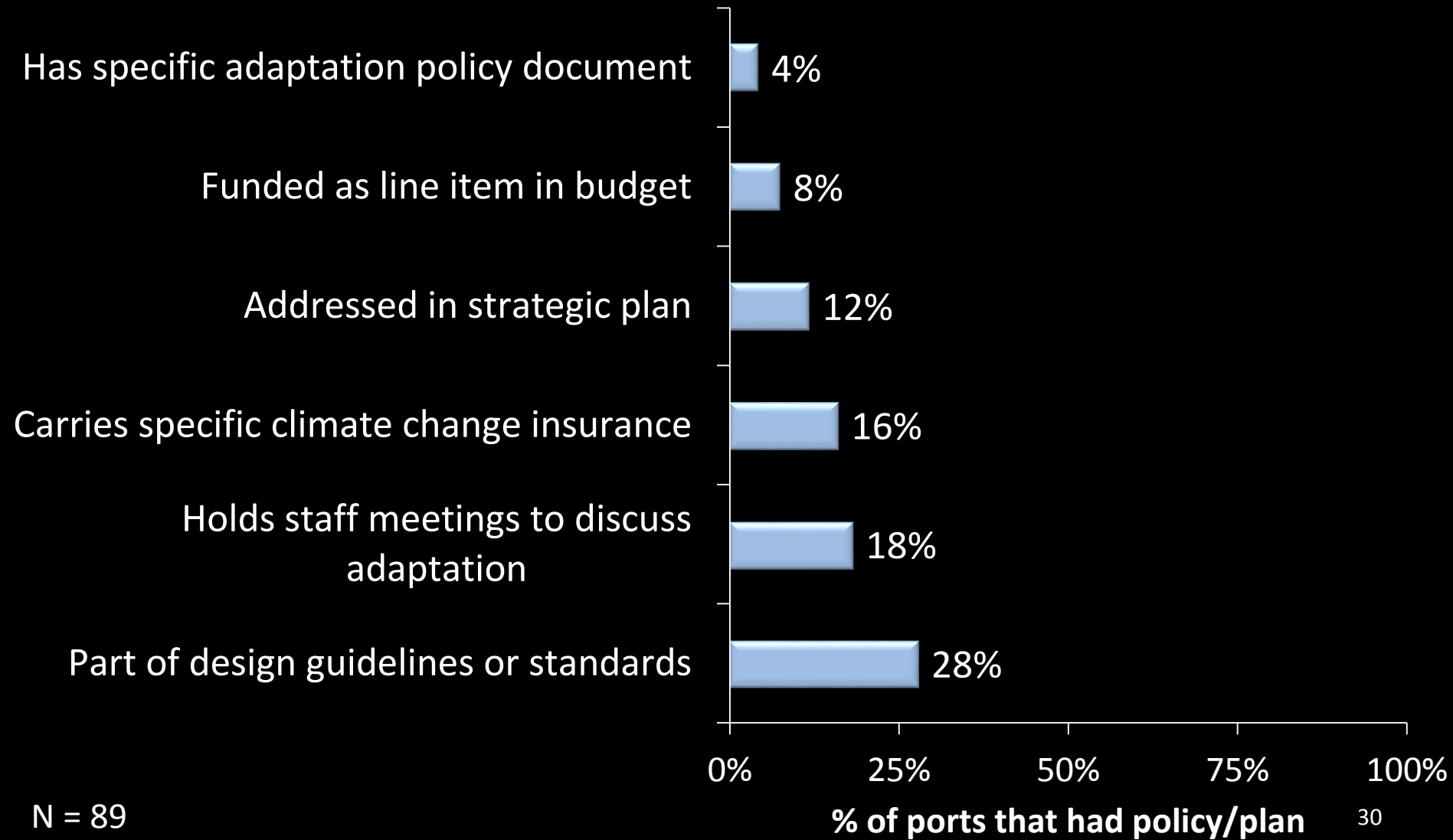


(Haymaker, 2006)

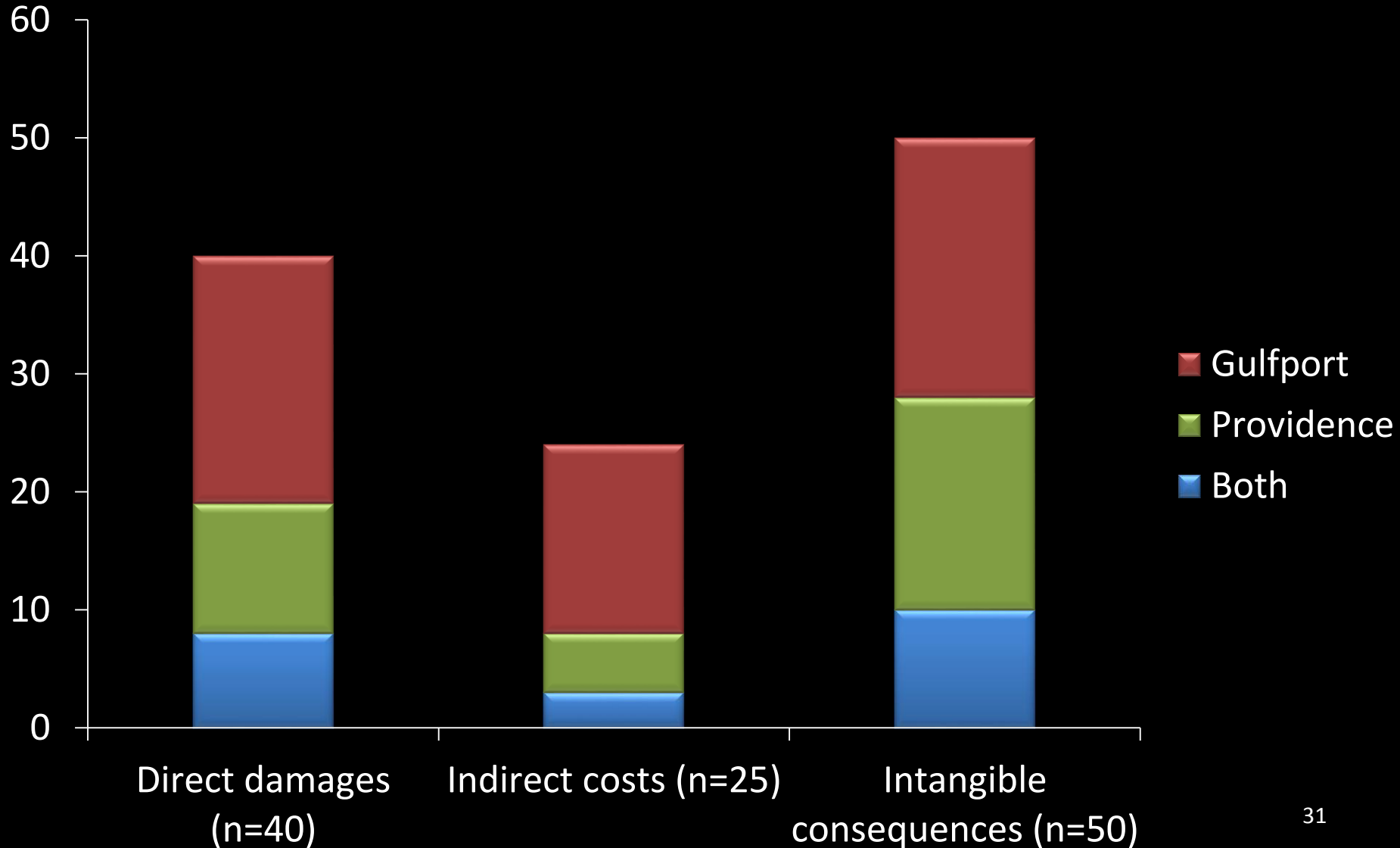
Unsuitable design standards for climate change



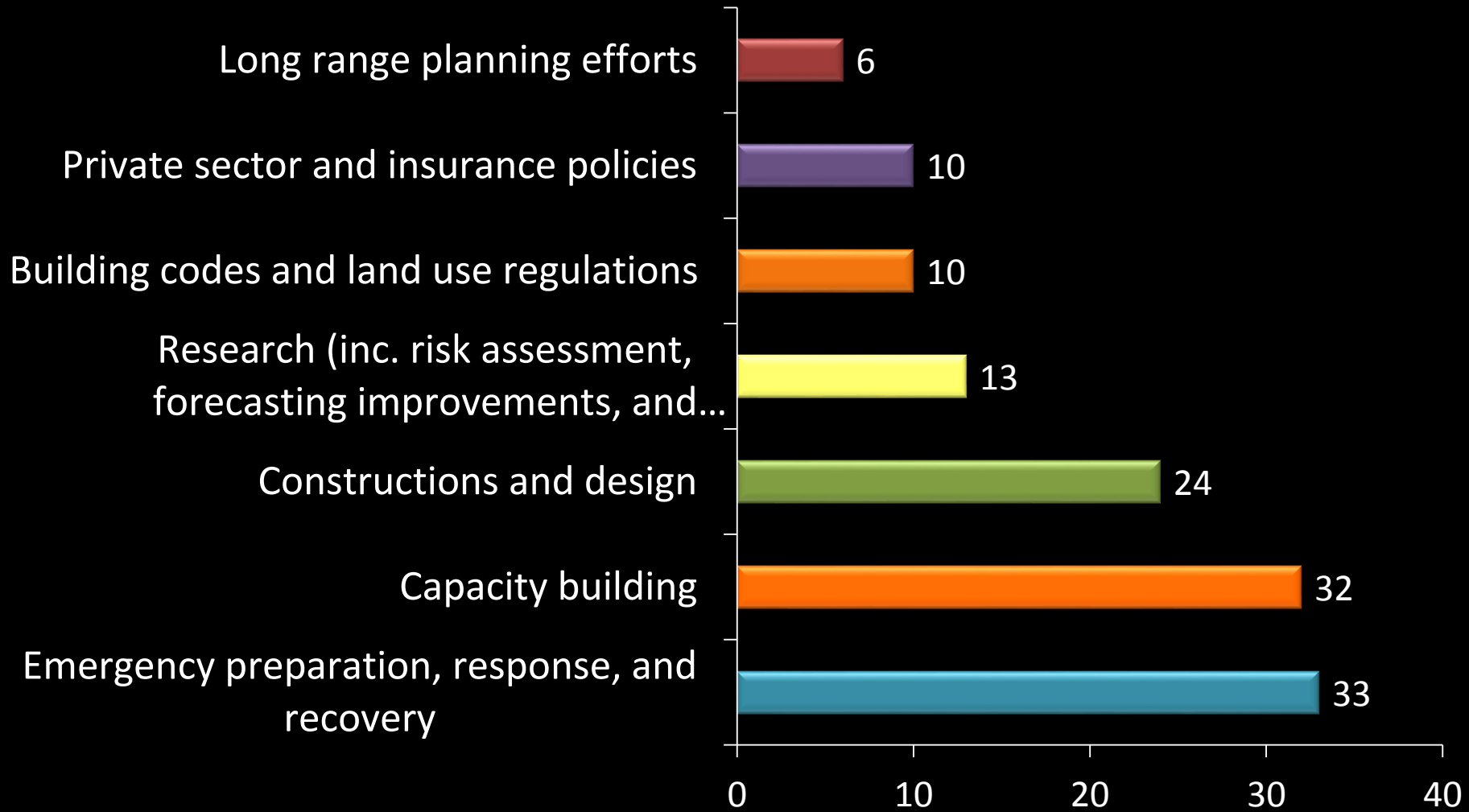
Ports have few formal plans that address adaptation



Majority of 115 impacts: Intangible consequences



128 port resilience strategies



of unique strategies mentioned in case studies ³²

STAKEHOLDER GROUPS BEST POISED TO IMPLEMENT STRATEGIES

Building codes and land use regulations (10)

Long-range planning (6)

Construction and design
 OFF port lands (12)
 ON port lands (12)

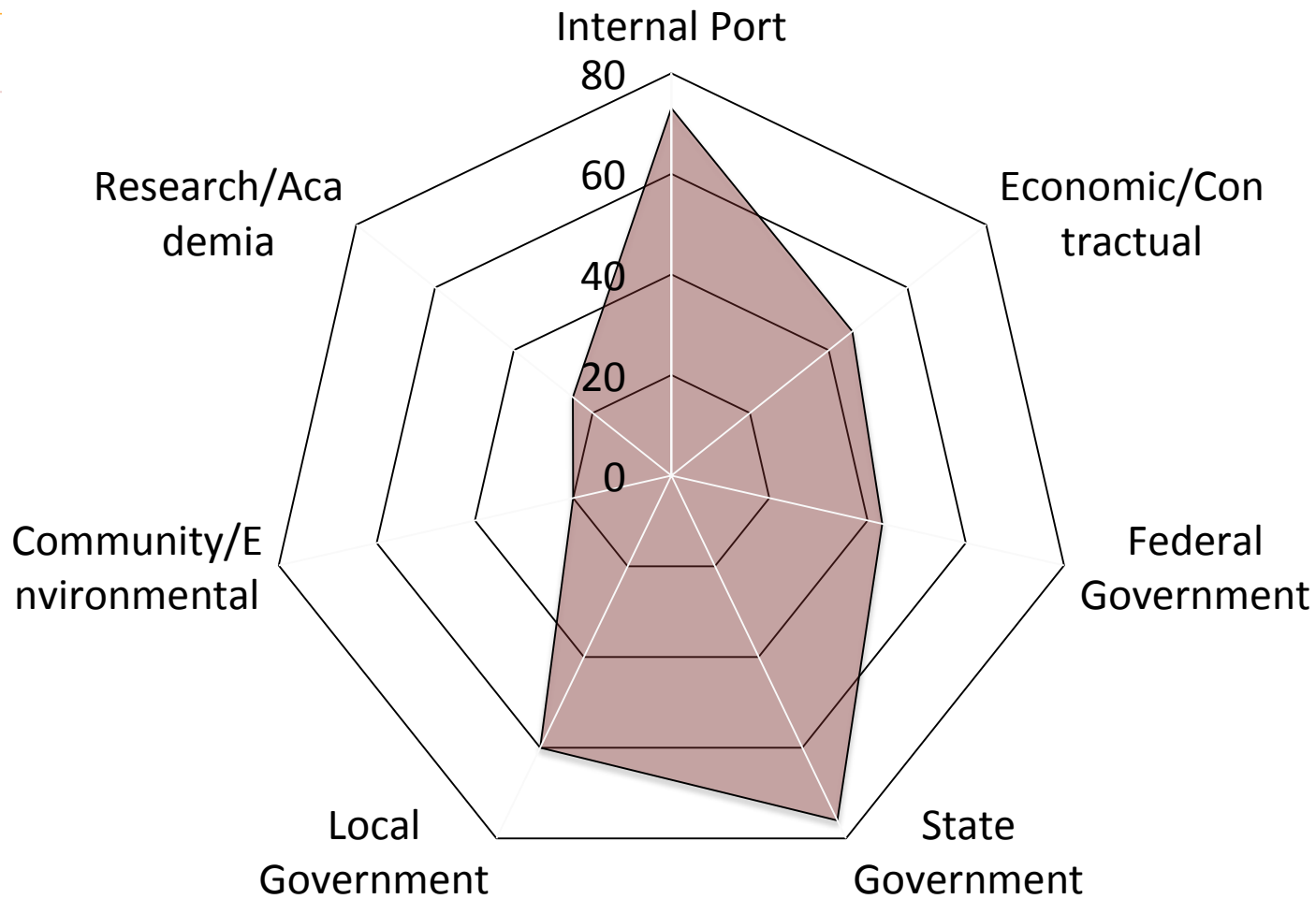
Private sector and insurance (10)

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)



■ # of strategies stakeholder poised to implement