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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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 0.6 – 2 meters by 2100
  - The world is not a bathtub!
- Doubling of Cat 4 and 5 storms*
- Ocean storm tracks shifting
- Inland flooding

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?
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.

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

N = 93
Finding 2 – Sea Level Rise By 2100
69% felt **EXPECTED SLR would not be a problem**

- **Don't Know**: 17%, 13%
- **Decrease**: 4%, 3%
- **None**: 7%, 6%
- **< .5 meters**: 27%, 12%
- **.5 - 1 meters**: 33%, 39%
- **1-2 meters**: 58%
- **>2 meters**: 1%

N = 90
Finding 3 – Perceived Impacts

48% SLR

60% Storm related

38% Greening operations

storm-impacts

sea-level-rise

greening-operations

increase-shipping

higher-design-costs

personal-health

impacts-on-surrounding-community

population-migration

failure-of-storm-protection

revision-of-design-standards

market-shifts

modal-shifts

dredging-concerns

operation-delays
Finding 4 – Ports are building infrastructure

Design standards do not address climate change

Plans for expansion within the next 10 Years*

<table>
<thead>
<tr>
<th>% of surveyed ports</th>
<th>Quays/berths</th>
<th>Terminals</th>
</tr>
</thead>
<tbody>
<tr>
<td>0%</td>
<td>5%</td>
<td>2%</td>
</tr>
<tr>
<td>10%</td>
<td>9%</td>
<td>6%</td>
</tr>
<tr>
<td>20%</td>
<td>14%</td>
<td>12%</td>
</tr>
<tr>
<td>30%</td>
<td>40%</td>
<td>35%</td>
</tr>
<tr>
<td>40%</td>
<td></td>
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<tr>
<td>50%</td>
<td></td>
<td></td>
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<tr>
<td>60%</td>
<td></td>
<td></td>
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<tr>
<td>70%</td>
<td></td>
<td></td>
</tr>
<tr>
<td>80%</td>
<td></td>
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</tbody>
</table>

Design Standard Used

- Better than 100-year flood event
- 100-year flood event
- Less than 100-year flood event
- Not sure/no answer
- Does not consider historic storm events

*16% of these plan new storm protection
Finding 5 – Climate Change Adaptation Policies

- Addressed in port strategic plan
- Carries specific climate change insurance
- Funded as a line item in the budget
- Has specific climate change planning document
- Holds staff meetings to discuss adaptation
- Part of design guidelines or standards
- Other policy noted

1 POINT EACH
Finding 4: Port Categories and Adaptation Scores
Most ports have few climate policies in place

<table>
<thead>
<tr>
<th>Category (of ports)</th>
<th>Score</th>
</tr>
</thead>
<tbody>
<tr>
<td>IAPH (37)</td>
<td>0.9</td>
</tr>
<tr>
<td>AAPA (37)</td>
<td>1.3</td>
</tr>
<tr>
<td>Both (14)</td>
<td>1.8</td>
</tr>
<tr>
<td>Private entity (5)</td>
<td>1.0</td>
</tr>
<tr>
<td>Private/public (30)</td>
<td>1.0</td>
</tr>
<tr>
<td>Public entity (36)</td>
<td>1.3</td>
</tr>
<tr>
<td>In hurricane zone (40)</td>
<td>1.2</td>
</tr>
<tr>
<td>Not in hurricane zone (48)</td>
<td>1.3</td>
</tr>
<tr>
<td>Group/co-op insurance (7)</td>
<td>0.9</td>
</tr>
<tr>
<td>Self-insured (17)</td>
<td>1.1</td>
</tr>
<tr>
<td>Standard insurance (40)</td>
<td>1.5</td>
</tr>
</tbody>
</table>

N = 88  
Max = 5  
Min = 0  
Mean = 1.2  
Std. Dev = 1.3
Finding 5: Global Comparisons

- Asia (16) 0.6
- Europe (15) 1.2
- Africa (4) 1.3
- Oceania (3) 1.3
- N. America (43) 1.4
- S/Cent. America (7) 1.7
- Lower-middle-income (4) 0.5
- Low-income (3) 0.7
- Upper-middle-income (10) 1.0
- High-income (71) 1.3
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?
Next Steps: Comparative Case Study
Risk... and Responsibility

- Env. Agencies
- Coastal Agency
- NGOs
- Insurers
- Engineers
- Insurers
- Reinsurers
- Port Authorities
- Private Firms
- Engineers
- Coastal Agency
- City Planners
- Statewide Planners
- Taxpayers
- Employees
- World Bank
- Army Corps
- Taxpayers

Climate Change Impacts
- Environment
- Local/Regional Economic
- National/Global Economic
- Infrastructure Damage and Cleanup
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