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

Mr. Austin Becker
Associate Professor
University of Rhode Island
United States of America

This expert paper is reproduced by the UNCTAD secretariat in the form and language in which it has been received. The views expressed are those of the author and do not necessarily reflect the views of the UNCTAD.
Advancing climate resilience for global seaports: Insights from a decade of applied research

Prof. Austin Becker, Dept. of Marine Affairs
University of Rhode Island

UNCTAD Multiyear Expert Meeting on Transport, Trade logistics and Trade facilitation (8th session)
Climate Change Adaptation for Seaports in Support of the 2030 Sustainable Development Agenda
27-28 October 2020, Geneva, VIRTUAL MEETING

Climate change presents big challenges

Doubling of Cat 4 and 5 tropical storms
Increased precipitation
Sea levels to rise 0.75 – 1.9 meters by 2100
1-in-3 year storm event of 2100
Increased precipitation

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

Hurricane Sandy photos courtesy Mary Lee Clanton, Port of NYNJ
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)

Rotten Meat From Katrina Still in Gulfport Neighborhood

"You ought to be used to it by now" said Mr. Graf, "the smell, it's normal."  The meat in the yards has been placed in a shed to keep it off the ground.

Stakeholder perceptions of hurricane impacts in Gulfport (MS) and Providence (RI).


Cement (49mMT)  
Aggregate  
Sand  
Costs  
Engineers  
Specialty ships  
Local/global capacity ?

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


Where were we 10 years ago?

<table>
<thead>
<tr>
<th>Adaptation policy or plan</th>
<th>% of ports that had policy/plan</th>
</tr>
</thead>
<tbody>
<tr>
<td>Has specific adaptation policy document</td>
<td>4%</td>
</tr>
<tr>
<td>Funded as line item in budget</td>
<td>8%</td>
</tr>
<tr>
<td>Addressed in strategic plan</td>
<td>12%</td>
</tr>
<tr>
<td>Carries specific climate change insurance</td>
<td>16%</td>
</tr>
<tr>
<td>Holds staff meetings to discuss adaptation</td>
<td>18%</td>
</tr>
<tr>
<td>Part of design guidelines or standards</td>
<td>28%</td>
</tr>
</tbody>
</table>

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

Barriers to adaptation

"We need more information to run risk models..."

"...you can't control mother nature."

"Money! I think that is the magical answer to everything – if we had the money, or if we had the money allocated appropriately." (Safety Planner)

"I think we are pretty much centered on the design standard for a category three storm – which in this area is very likely event. So as far as taking action for an extreme weather event... for something such as SLR or anything, that really hasn't been done." (Safety Planner)

"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)

"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


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

Good news: There’s plenty to be done!

Long range planning efforts 6
Private sector and insurance policies 10
Building codes and land use regulations 10
Research (inc. risk assessment, forecasting...) 13
Constructions and design 24
Capacity building 32
Emergency preparation, response, and recovery 33

>128 unique resilience strategies

# of unique strategies mentioned in case studies of Providence (RI) and Gulfport (MS)


**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)

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)


Fundamental shift in thinking ...

<table>
<thead>
<tr>
<th>HOW WE THINK</th>
<th>WHAT WE DO</th>
</tr>
</thead>
<tbody>
<tr>
<td>1 year</td>
<td>Selection &amp; Engineering &amp; Design – 10 years</td>
</tr>
<tr>
<td>5-10 yrs</td>
<td>Permitting &amp; Regulatory Process – 10 years</td>
</tr>
<tr>
<td>Our careers (~35 years)</td>
<td>Construction – 5 years</td>
</tr>
<tr>
<td>The rest of our lives (~55 years)</td>
<td>Project Design Life – 50 years</td>
</tr>
<tr>
<td>Our children’s lives (~100 years)</td>
<td>Actual working life – &gt;75 years</td>
</tr>
<tr>
<td>Our grandchildren’s lives (~105 years)</td>
<td>CLIMATE IMPACTS</td>
</tr>
</tbody>
</table>

Time

- 2050
- 2100
- 2150
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)

Questions?

Acknowledgements
Funding support for this work provided by the following: USACE, DHS, RIDOT, RI Sea Grant, URI Coastal Institute, USDA
Students and post docs who contributed include: Ellie McLean, Peter Stempel, Duncan McIntosh, Eric Kretsch, Ellis Kalaidjian, Noah Hallisey, Ben Sweeney

Austin Beker
abecker@uri.edu
web.uri.edu/abecker
Leadership is lacking

Who should take the lead in implementing resilience strategies?

Who bears the cost of storm damage?


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