Climate Resilience at Ports

October 24, 2017

Vibrant Ports – Healthy Ports

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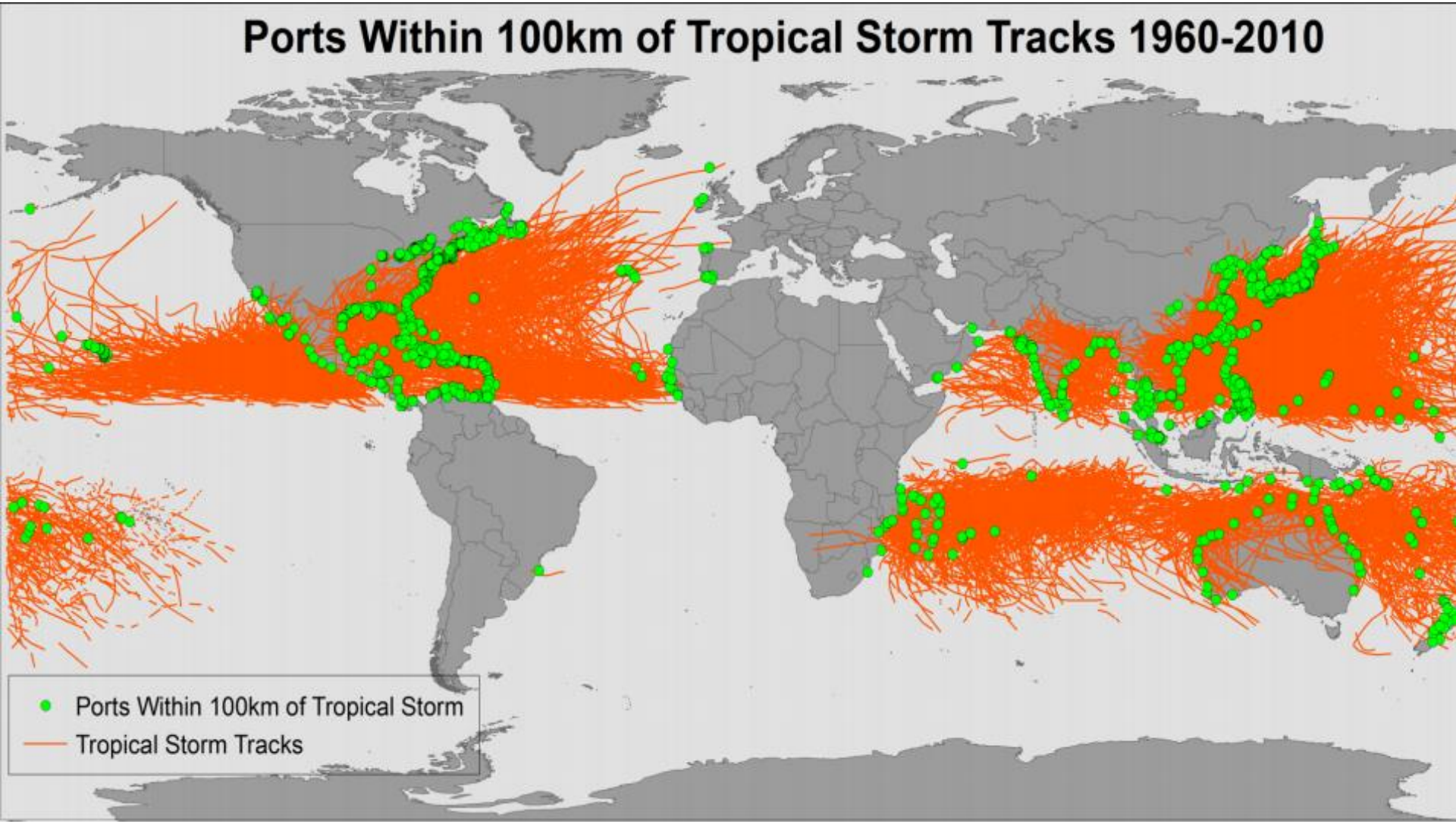
The Challenge

Ports: exposed and vulnerable

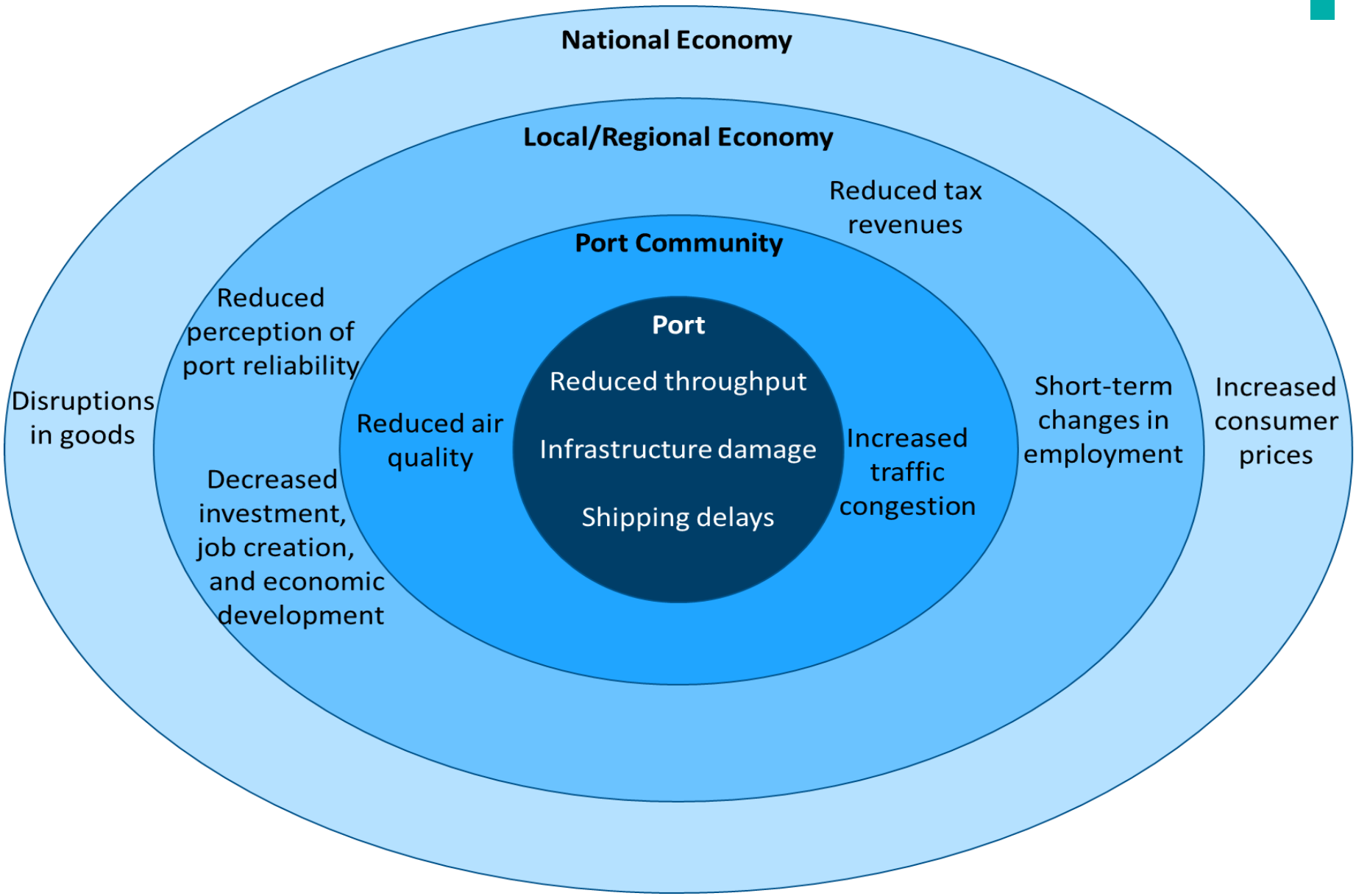


Becker, A., et al. (2013), "A note on climate change adaptation for seaports: A challenge for global ports, a challenge for global society." Journal of Climatic Change.

Beyond coastal flooding risks…

- **Higher temperatures →**
  - Higher energy costs
  - Faster deterioration of pavements
  - Increased risk of spoilage for some goods

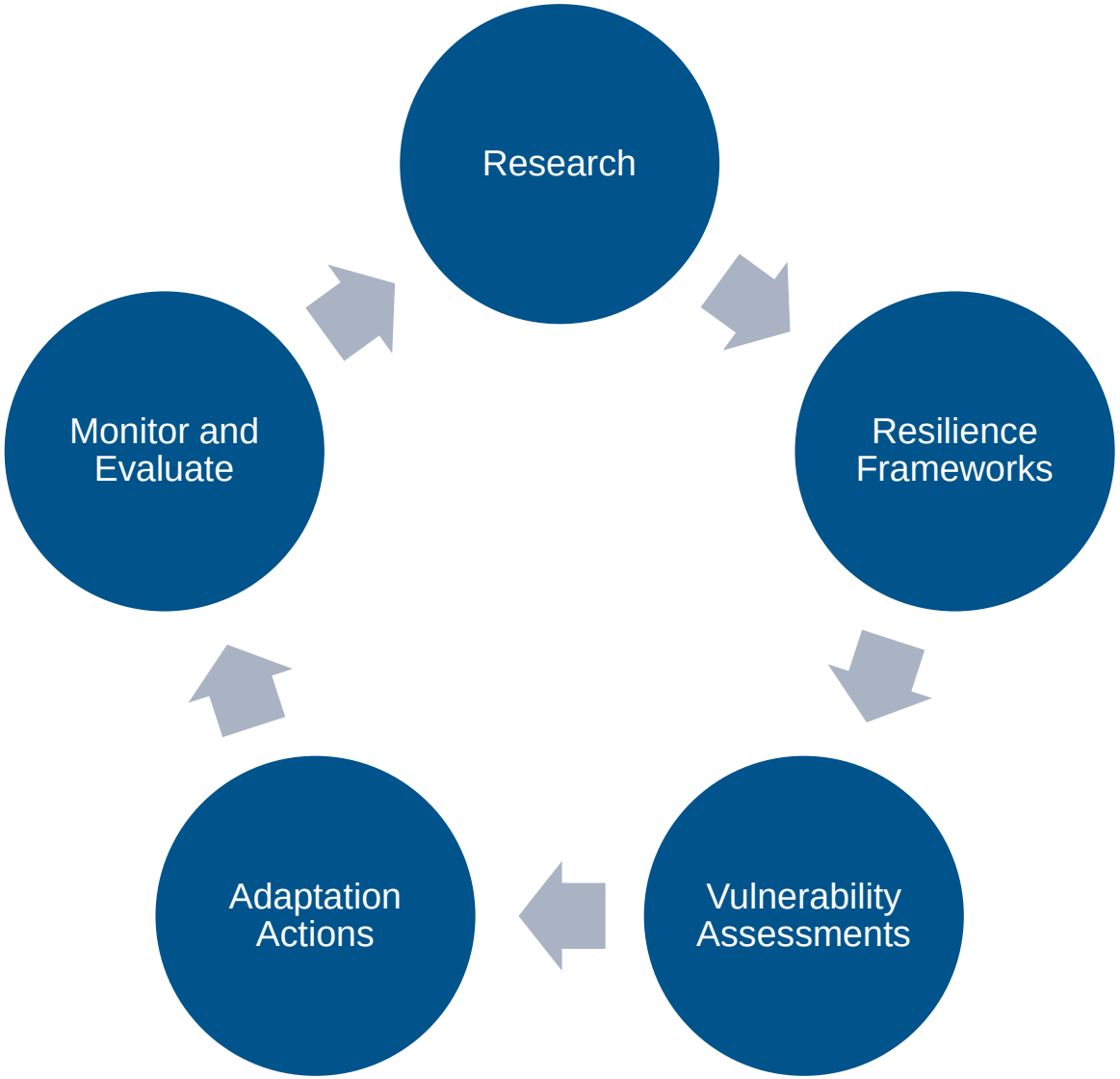
- **Changing precipitation and streamflow →**
  - Changing risk of riverine flooding or low water risks for inland ports



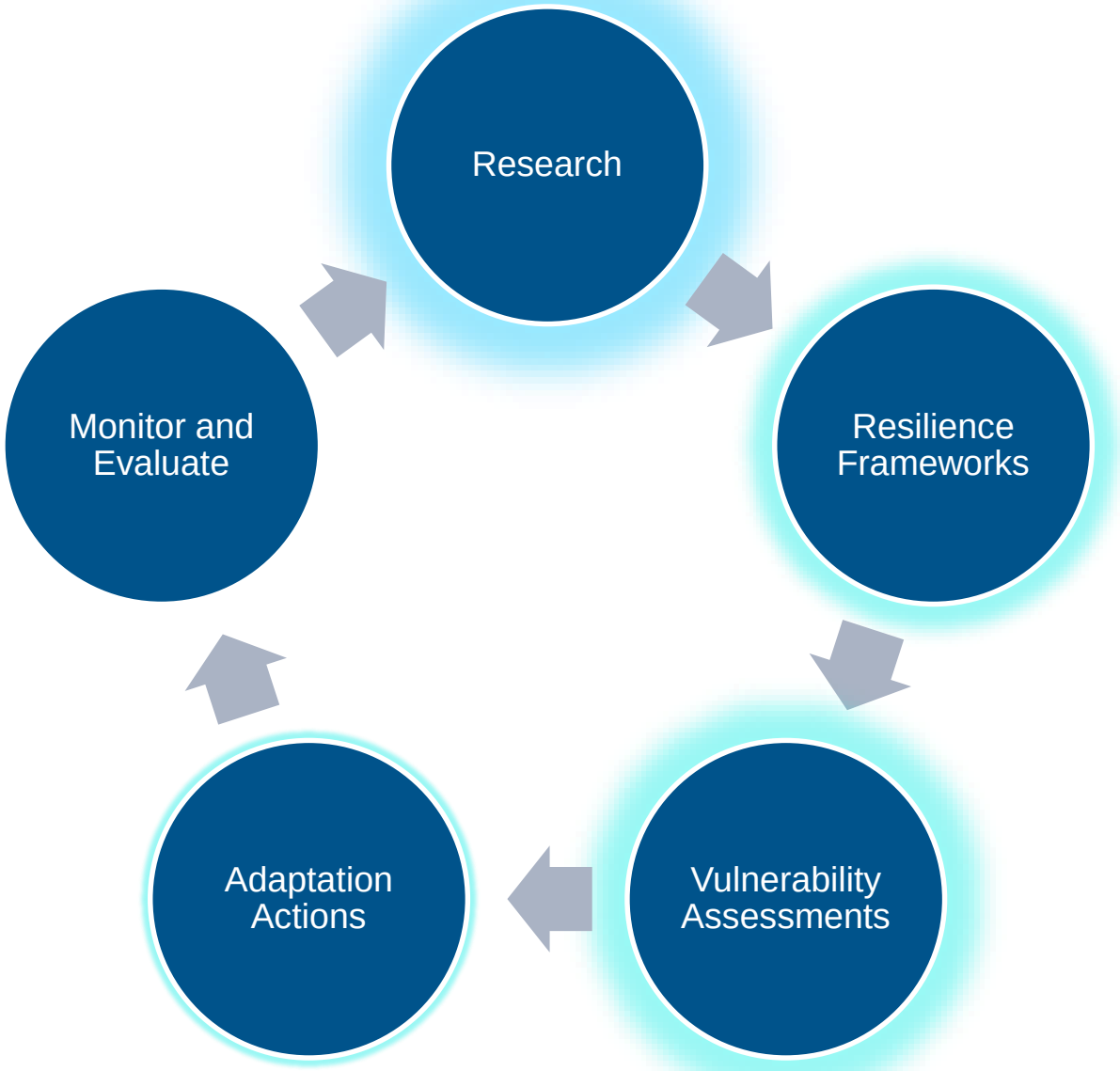
Source: ICF – developed for forthcoming U.S. EPA Inland Port Community Resilience Roadmap

The State of Play

Resilience Activities in US Ports



Resilience Activities at US Ports



Examples

Resilience Frameworks

- FHWA Climate Change and Extreme Weather Vulnerability Assessment Framework
- NCFRP Report 30 – Making U.S. Ports Resilient as Part of Extended Intermodal Supply Chains
- EPA Inland Port Community Resilience Roadmap

Vulnerability Assessments

- Massport
- U.S. DOT Gulf Coast Study (Phase 1 and 2)
- Port of San Diego
- Port of Rotterdam (Netherlands)
- Port of Manzanillo (Mexico)
- Muelles el Bosque (Colombia)
- Port Avatiu (Cook Islands)

Adaptation Actions

- Massport Climate Resiliency Program
- Port Authority of New York and New Jersey Climate Resilience Design Guidelines

Massport Climate Resilience Program

Source: Massport - http://www.massport.com/media/1657/resiliency-and-climate-change_infographic.pdf

Example Massport Resiliency Projects include…

“Soft” strategies…

- Increase coordination across departments
- Update emergency response planning
- “Floodproofing Design Guide”
- Set resiliency performance objectives

“Hard” strategies…

- Temporary flood walls
- Install water level sensors
- Purchase temporary water pump
- Seal electrical conduits

Source: Robbin Peach, Massport, presentation at University of Rhode Island April 5, 2016, https://www.unols.org/sites/default/files/GBIII_April2016_ap05_0.pdf

THE PORT AUTHORITY OF NY & NJ

Engineering Department

Design Guidelines Climate Resilience

LAST UPDATED

1/22/2015

THE PORT AUTHORITY OF NY & NJ
Engineering Department

Design Guidelines
Climate Resilience

LAST UPDATED
1/22/2015

1.3 TEMPERATURE CHANGE GUIDANCE

Designs of infrastructure assets should account for the following temperature changes over the assets design life.

	2000	2025	2055	2085
Mean Annual Air Temperature	54˚F	56.5˚F	59˚F	61˚F
Days at or above 90˚F	18	29	45	60
Days at or below 32˚F	72	55	45	36

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1.4 PRECIPITATION CHANGE GUIDANCE

Designs of infrastructure assets should account for the following precipitation changes over the assets design life. Current climate projections do not include rainfall intensity curves.

	2000	2025	2055	2085
Mean Annual Precipitation	50.1"	52"	54"	55"
Annual Intense Rain Events (rainfall ≥ 2 inches per day)	3	3	4	4

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1.5 SEA LEVEL RISE GUIDANCE

Designs of infrastructure assets should account for the following mid-range estimates in sea level:

	2004	2025	2055	2085
Mean Sea Level	Baseline	+ 6"	+ 16"	+ 28"

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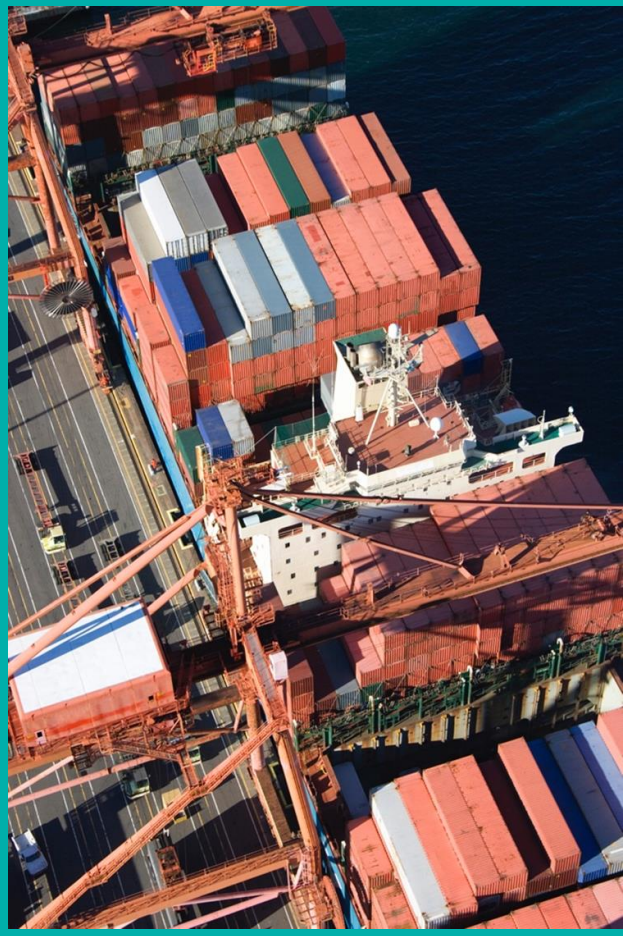
1.5 SEA LEVEL RISE GUIDANCE

Designs of infrastructure assets should account for the following mid-range estimates in sea level:

Table 2 – Flood Protection Levels

	Non Critical Assets			Critical Assets		
Asset Design Life	Code Requirement	Sea Level Rise Adjustment	Final Flood Protection Elevation	Code Requirement	Sea Level Rise Adjustment	Final Flood Protection Elevation
Up to 2020	12"	6"	FEMA 1% Elevation + 18"	24"	6"	FEMA 1% Elevation + 30"
2021-2050	12"	16"	FEMA1% Elevation + 28"	24"	16"	FEMA1% Elevation + 40"
2051-2080	12"	28"	FEMA1% Elevation + 40"	24"	28"	FEMA1% Elevation + 52"
2080+	12"	36"	FEMA1% Elevation + 48"	24"	36"	FEMA1% Elevation +60"

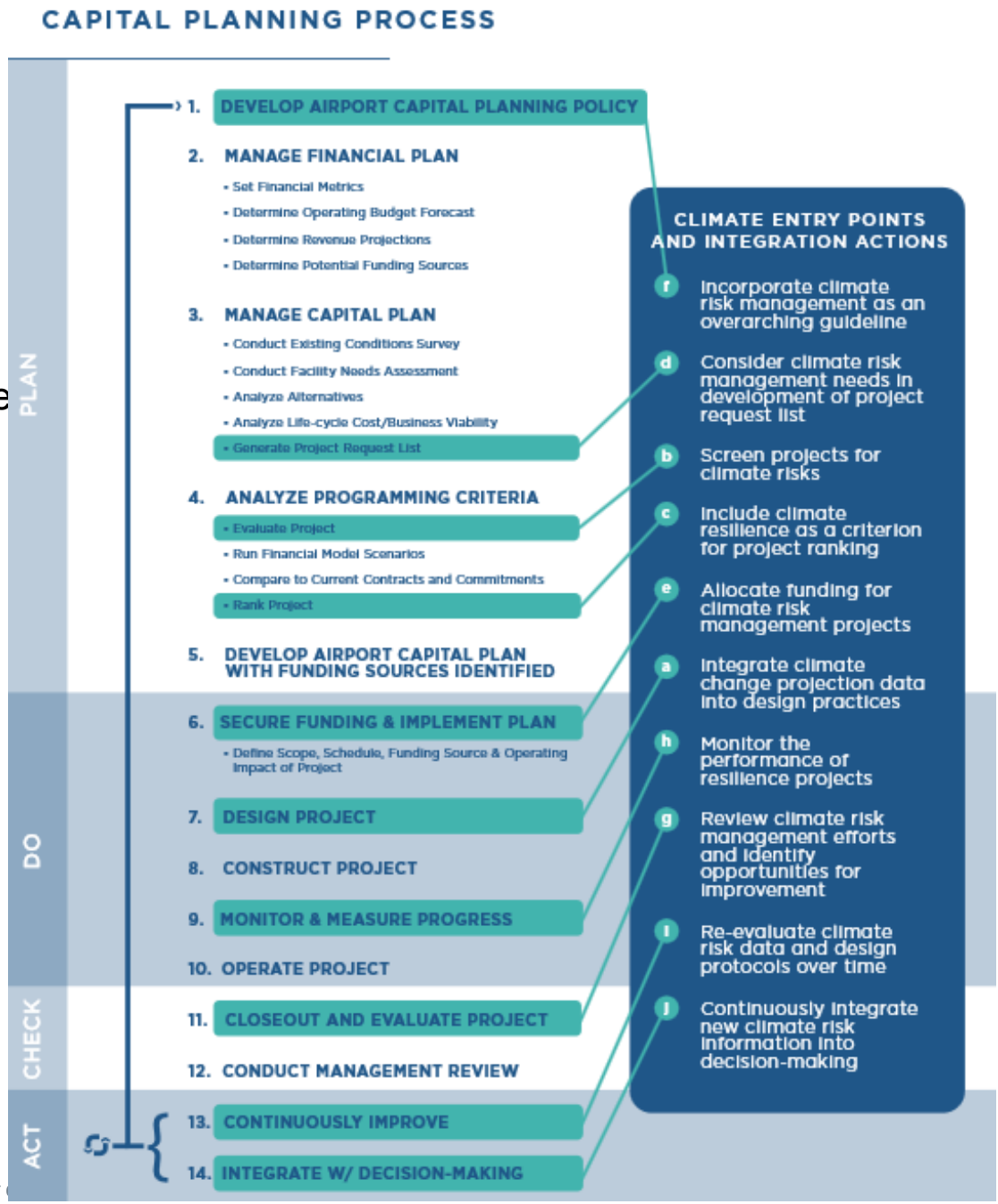
Lessons Learned



What drives success?

- **Leadership**
  - Identifying the strategic priority + business case
  - Find champions who can ‘sell’ the concepts to management and to staff ‘on the ground’

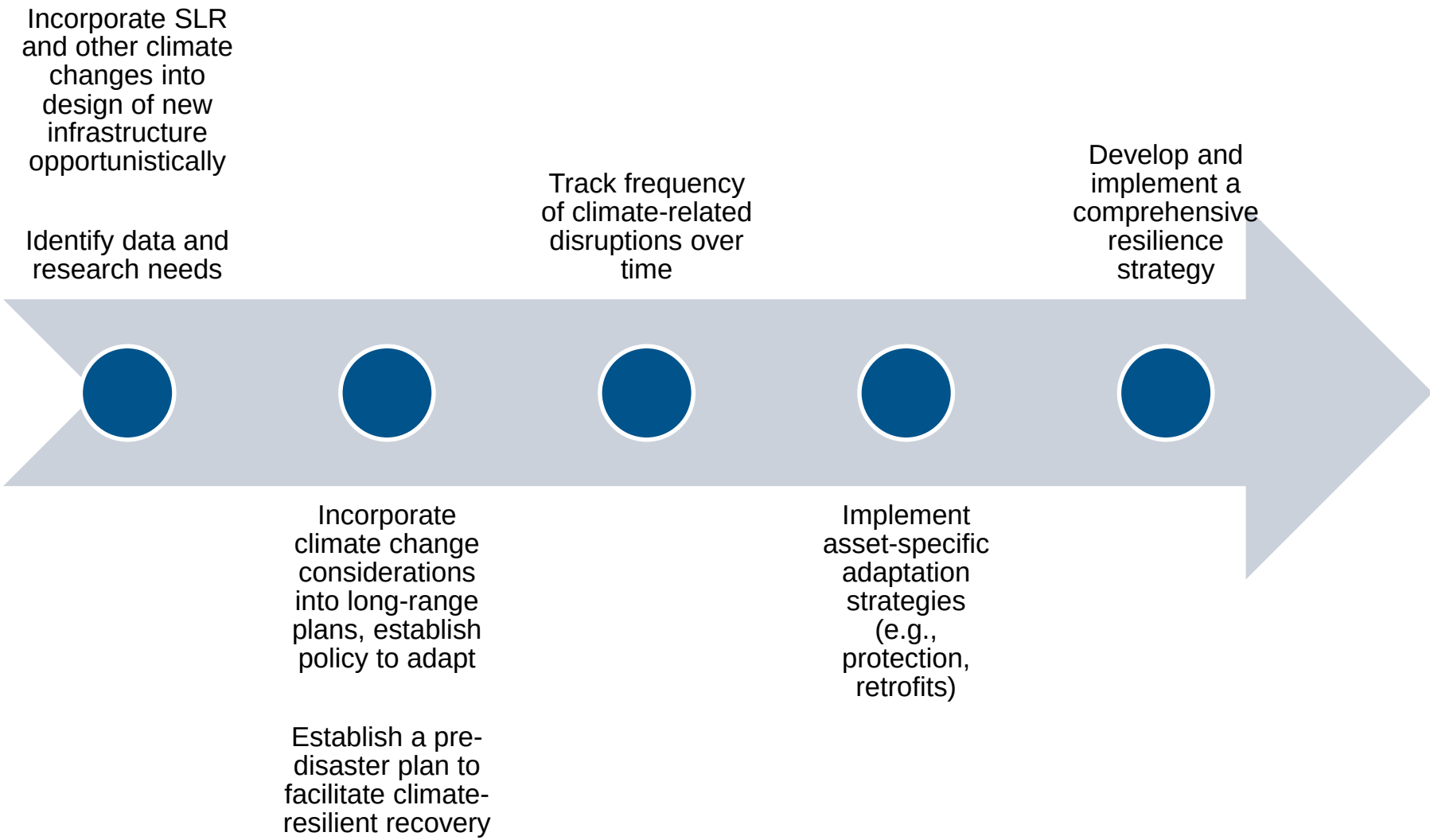
- **Integration**
  - *Recognizing* and *addressing* climate change risks through existing systems



Where to start?

- **Don’t build things today that are not designed for the conditions they will face in their lifetime**
  - Identify the need as early as possible in the process
  - Lots of guidance on how to work with climate data from and engineering perspective
- **Improve routine communication among stakeholders**
  - Port authority, port tenants, port users, local government, nearby residents, Coast Guard, USACE, etc.
- **Identify climate-linked performance metrics and track trends over time**
  - Climate changes (water levels, frequency of certain thresholds being exceeded)
  - Climate change impacts (frequency of flooding, frequency/duration of shutdowns)
  - Operational performance measures (volume of freight moved, operating costs, power outages)

Example of phased adaptation



Final thoughts

- **Adaptation can apply to all levels of decision-making**
- **Adaptation options may not be technologically innovative or climate change-specific – many will involve well-established technologies and management approaches applied wisely to address climate risks**

Thank you!

Anne Choate

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