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U.S. Army Engineer Research  
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# Resilience and Climate Change Adaptation Session

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**JENNIFER OGDONICK**

PIANC Working Group 178 /  
Baird & Associates

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**HELEN BROHL**

Committee of Marine  
Transportation Systems  
(CMTS)

# Outline

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**Background  
Presentations  
(1 hr)**

**JENNIFER OGDONICK**

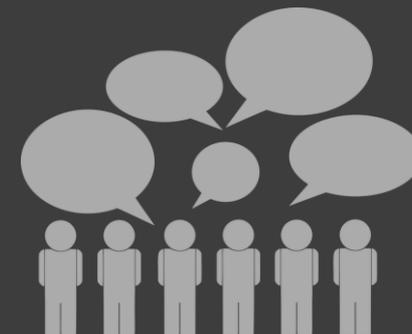
Climate Change Adaptation for  
Maritime and Inland Port and  
Navigation Infrastructure

**KATHERINE TOUZINSKY**

Committee of Marine  
Transportation Systems  
Resilience Integration



**Break  
(30 min)**



**Discussions  
(1.5 hr)**

Resilience

Long-term disturbances

Short-term disturbances

# Forthcoming guidance from PIANC WG 178 Climate Change Adaptation for Ports, Waterways and Navigation Infrastructure

Jennifer Ogrodnick, M.Sc., P.Eng.  
PIANC Working Group 178

April 27, 2017

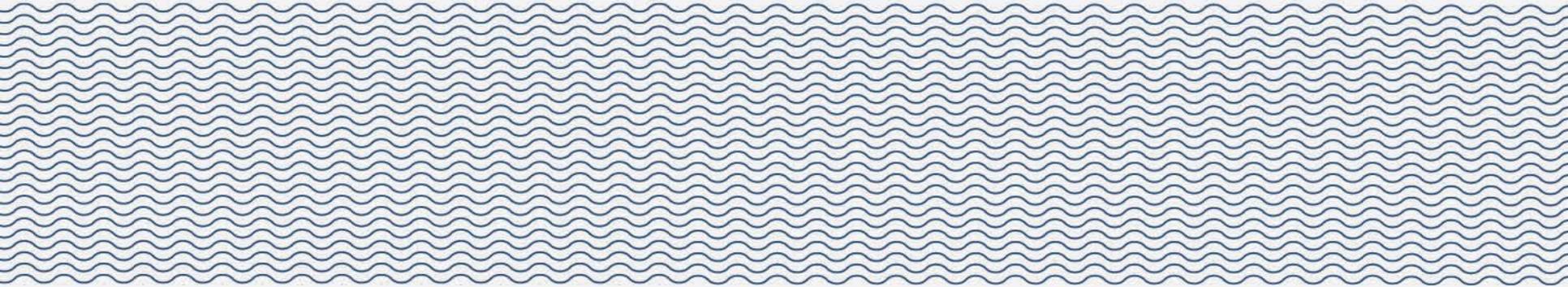


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# Background Information





# What is PIANC?

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PIANC is ...

THE World Association for Waterborne Transport Infrastructure

## Mission

- To provide expert guidance and technical advice
- To keep the international waterborne transport community connected

## What are working groups?

- Global technical experts from private and public sector
- Develop guidance documents

# Background

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- PIANC participated in COP21 in Paris as part of the 'Think Climate' coalition.
- 195 countries adopted the Paris agreement initiating an international plan of action to limit global warming to well below 2°C.
- Despite the Paris agreement, we are 'locked in' to changes caused by temperature increase.



**Think Climate is a multi-stakeholder coalition with interests in waterborne transport infrastructure.**

**PIANC's Think Climate coalition have committed to work together to support the inland and maritime navigation infrastructure sector as they respond to climate change.**

[Navclimate.pianc.org](http://Navclimate.pianc.org)



# Background

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- Key messages from COP21:
  - Significant challenge adapting infrastructure.
  - Countries / organisations that will be hit hardest are the least well resourced to adapt.
  - The time to act is now!
- PIANC formed WG 178.

Time  
to  
Adapt.

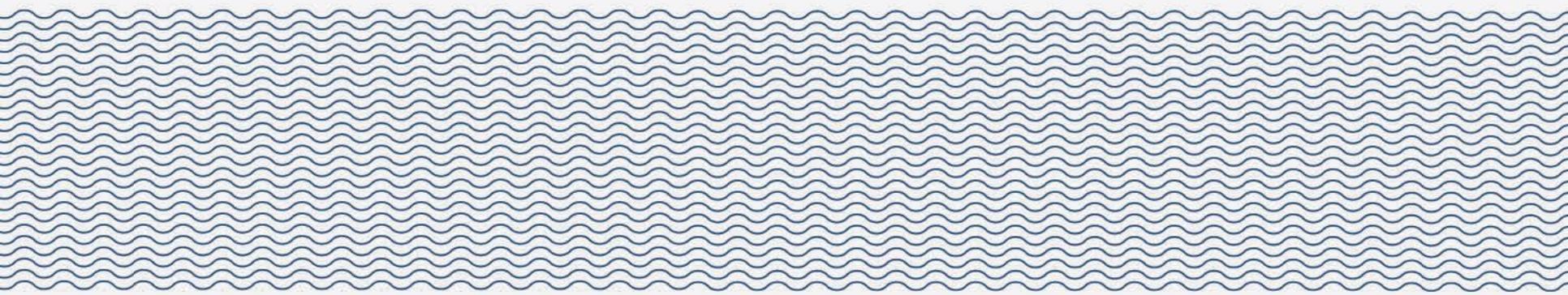


# Background

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- The objectives of the guidance document on Climate Change Adaptation for Ports and Navigation Infrastructure include:
  - Develop an approach to climate change adaptation planning and delivery;
  - Understand and provide guidance on addressing challenges and identifying priorities; and
  - Provide a guidance framework for decision making.
- Especially for organisations with limited resources.

# **Climate Change Adaptation Process**

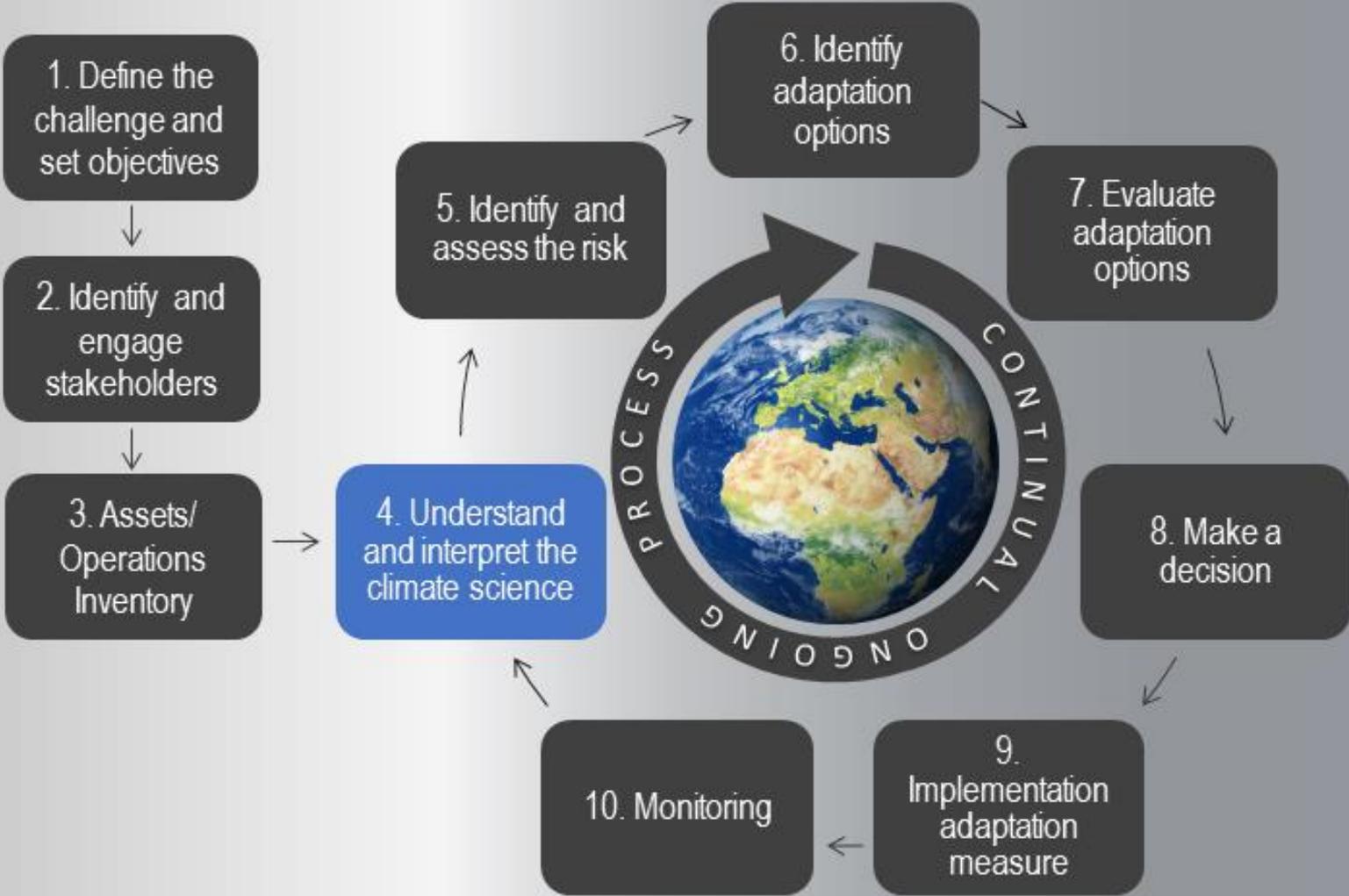








# Climate Change Adaptation Process

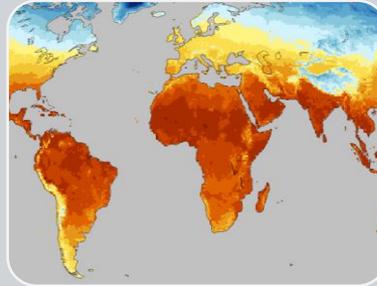


Long-Term Resilience

# Understand and interpret the climate science



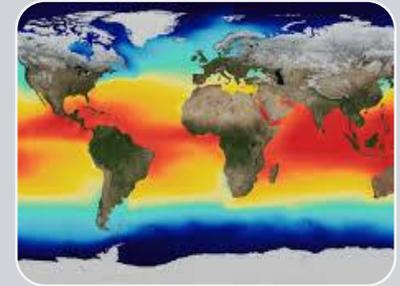
Sea levels



Air temp.



Storms



Sea surface temp



Waves



Winds



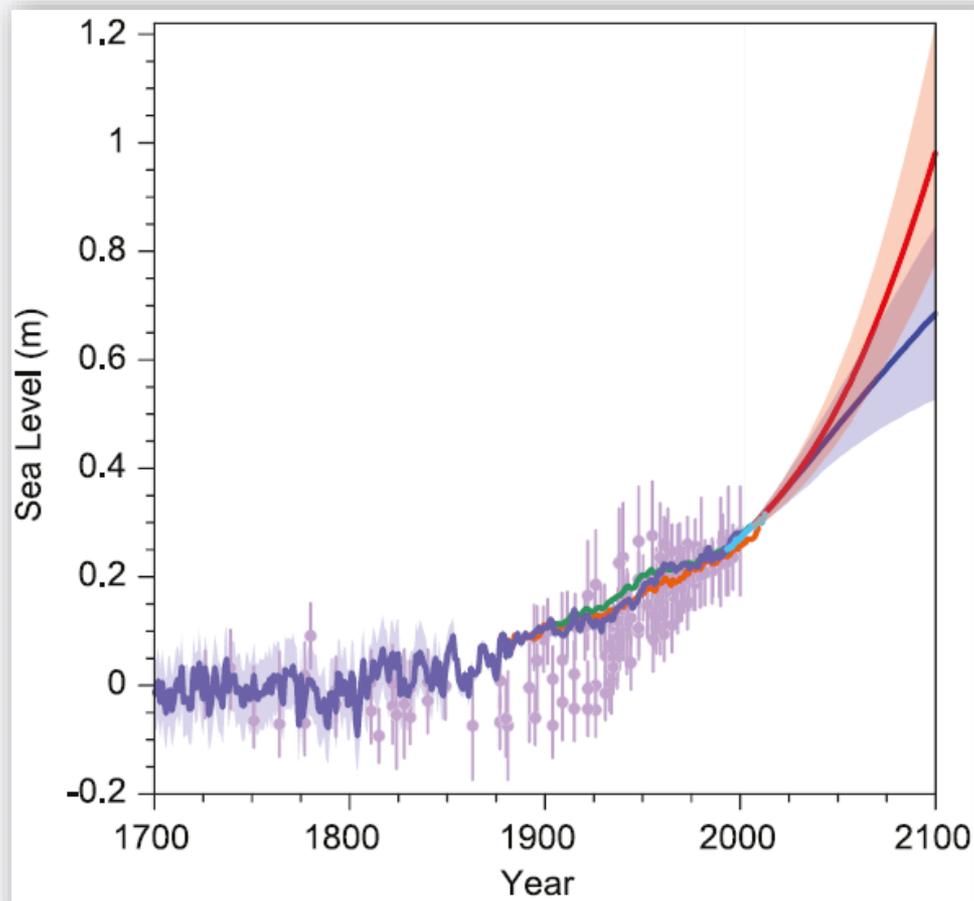
Precipitation



Water Chemistry

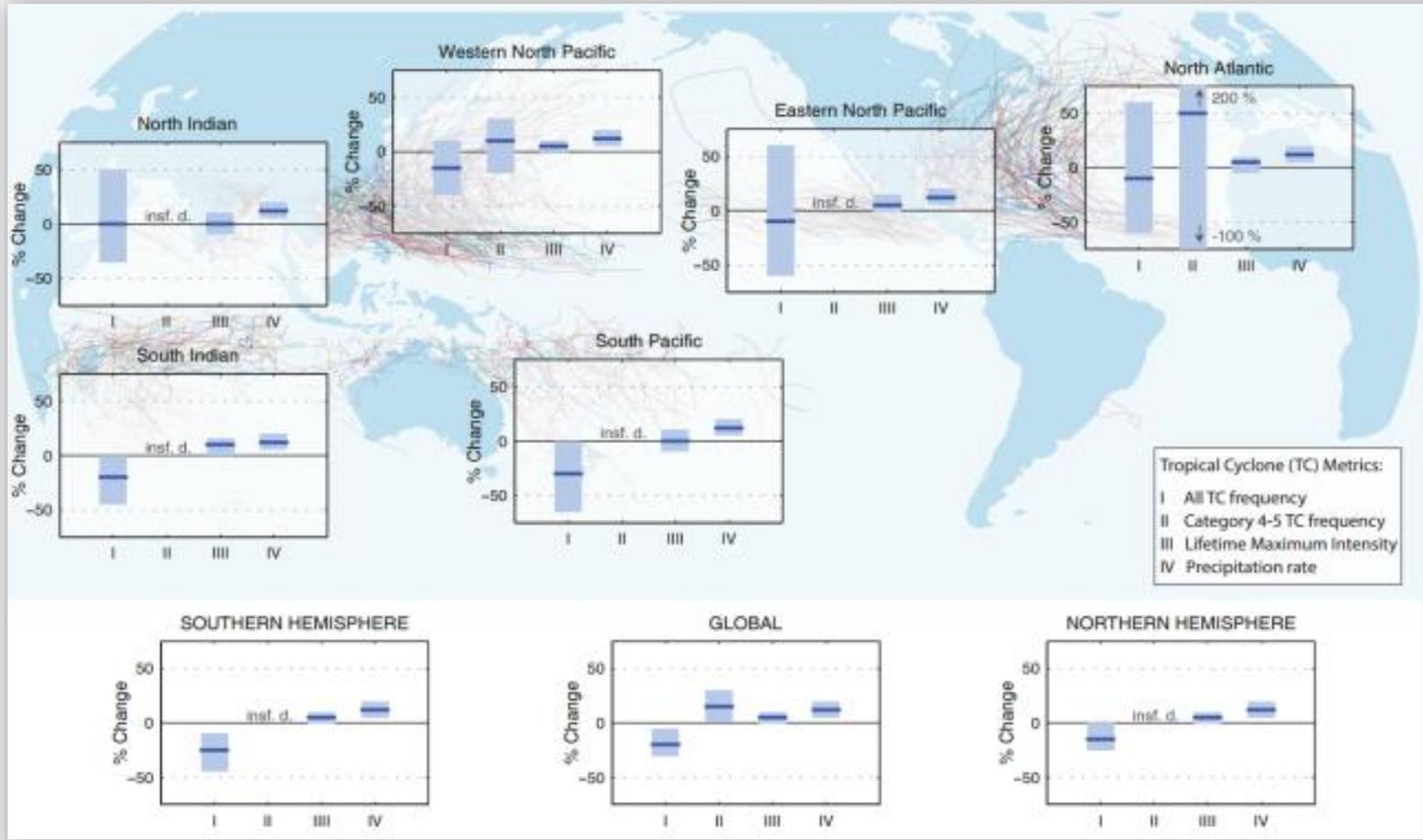
# Sea Levels

- Water levels are changing.
- Increasing seas due to thermal expansion of the oceans and loss of land-based ice.



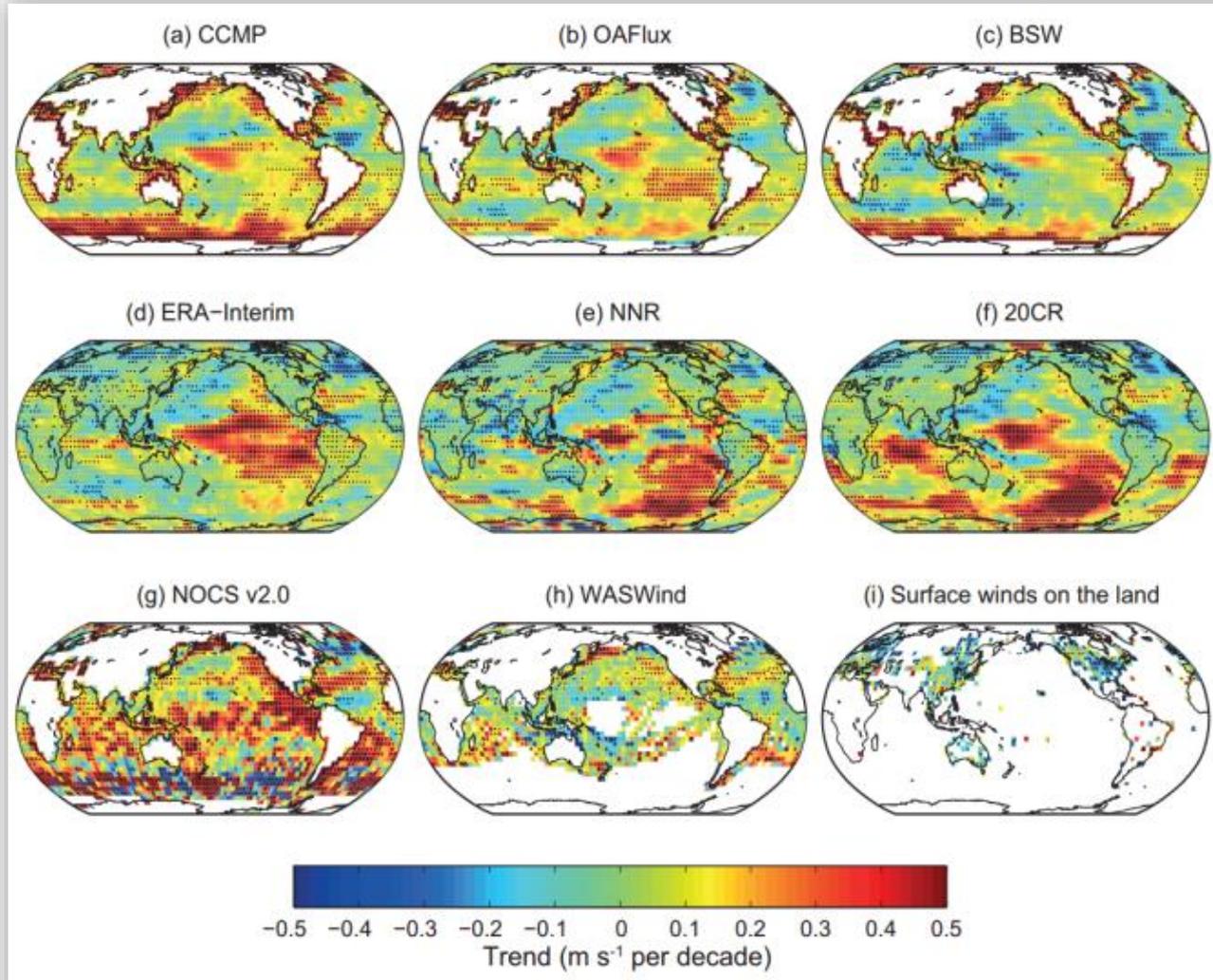
Past and Future Sea Level Rise  
For Representative Concentration Pathways (RCPs)  
(IPCC AR5, Figure 13.27)

# Storms



Projected change in the average cyclone frequency over the period 2081-2100 relative to 2000-2019 (IPCC, 2013)

# Winds



Trends in Surface Wind Speeds for 1988 – 2010 from Various Data Sets (IPCC, 2013)

# Local Data

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- Local data is used to assess the climate change drivers.
- Some form of meteorological or oceanographic data are often available through government monitoring programs.
- It may be necessary to install local monitoring stations.

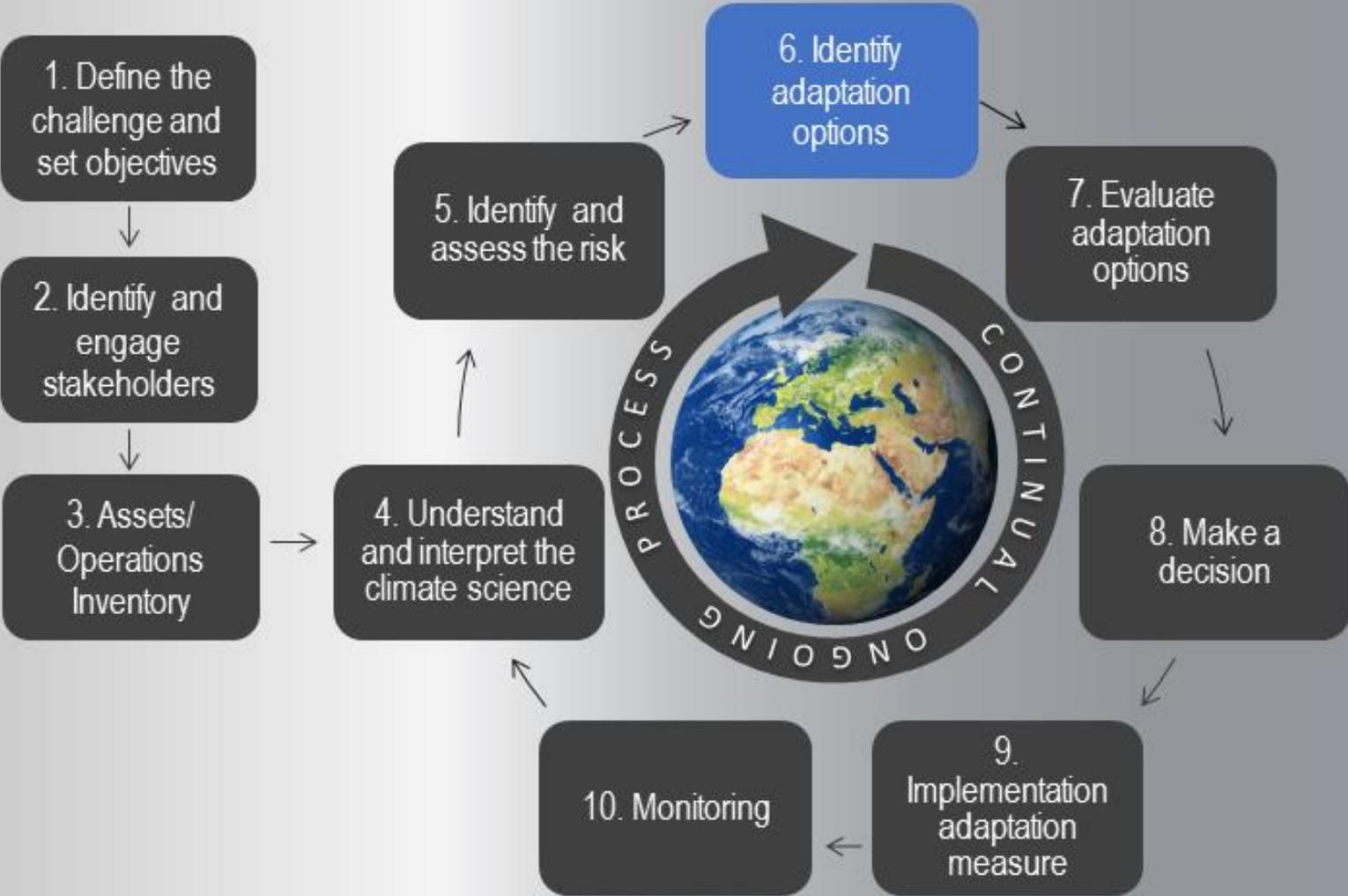




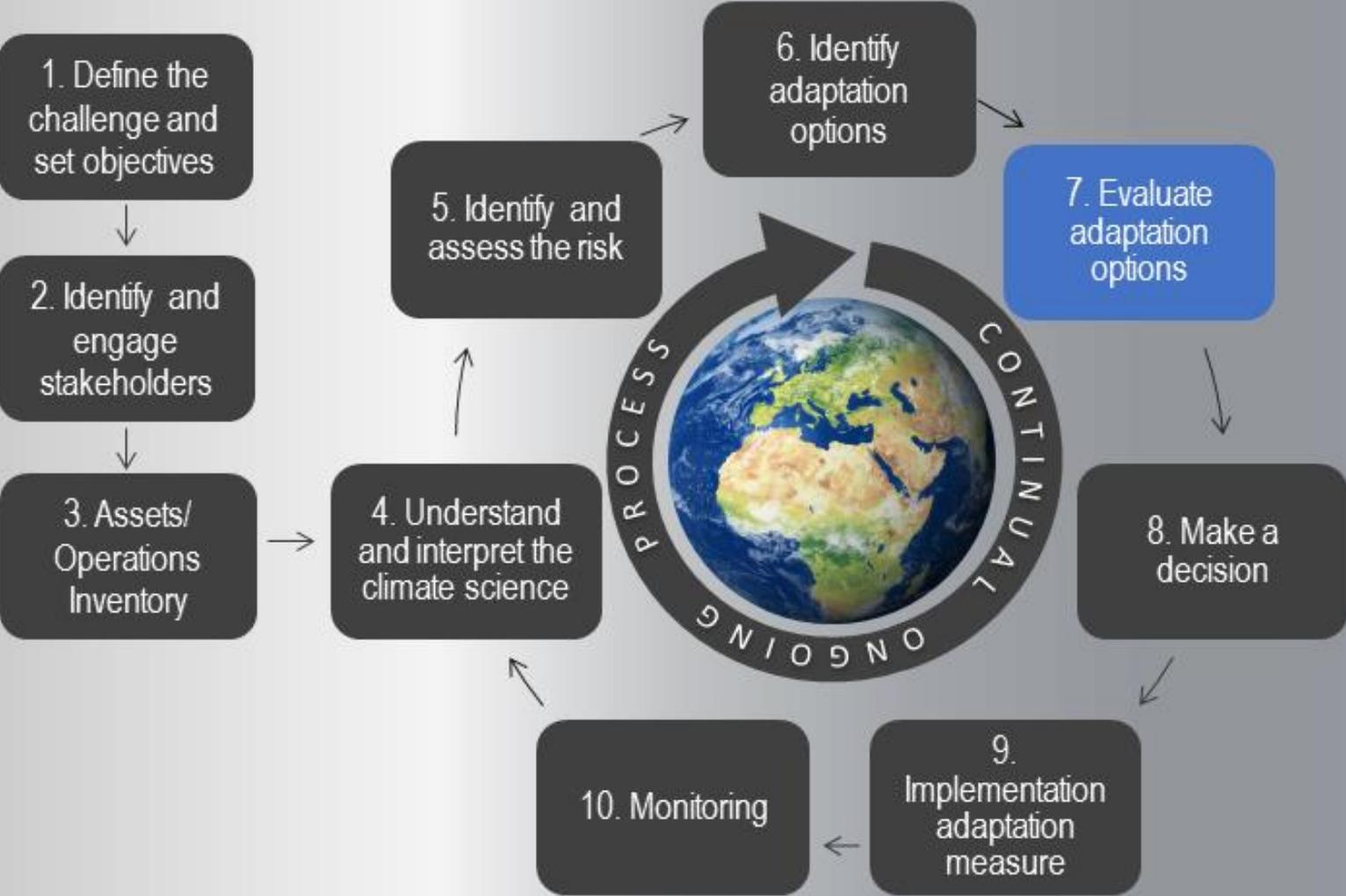
# Climate Change Adaptation Process



Long-Term Resilience



# Climate Change Adaptation Process



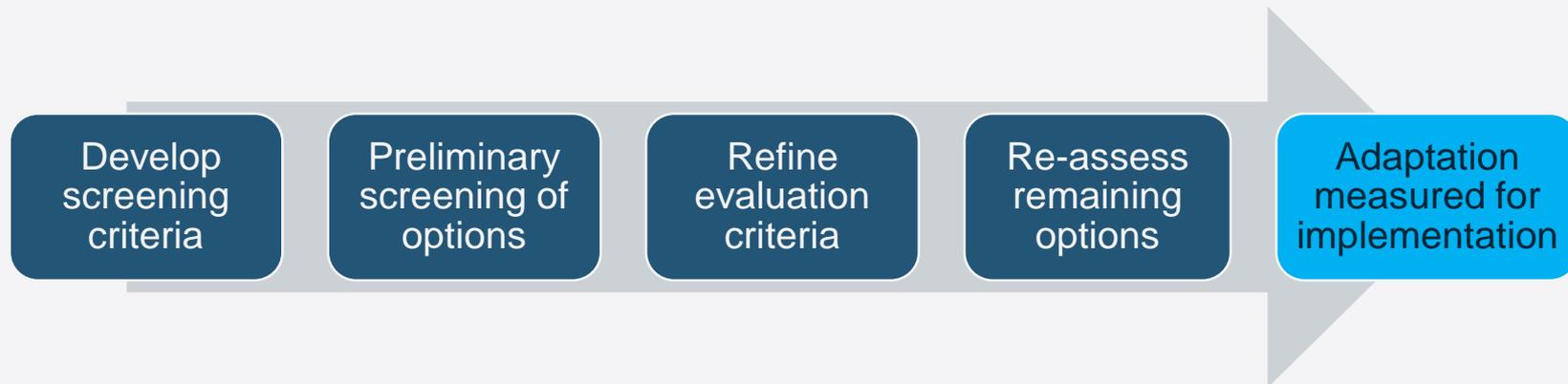
Long-Term Resilience



# Evaluate Adaptation Options

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Identify options that best contribute to the objectives of the adaptation initiative and are feasible across a range of criteria.

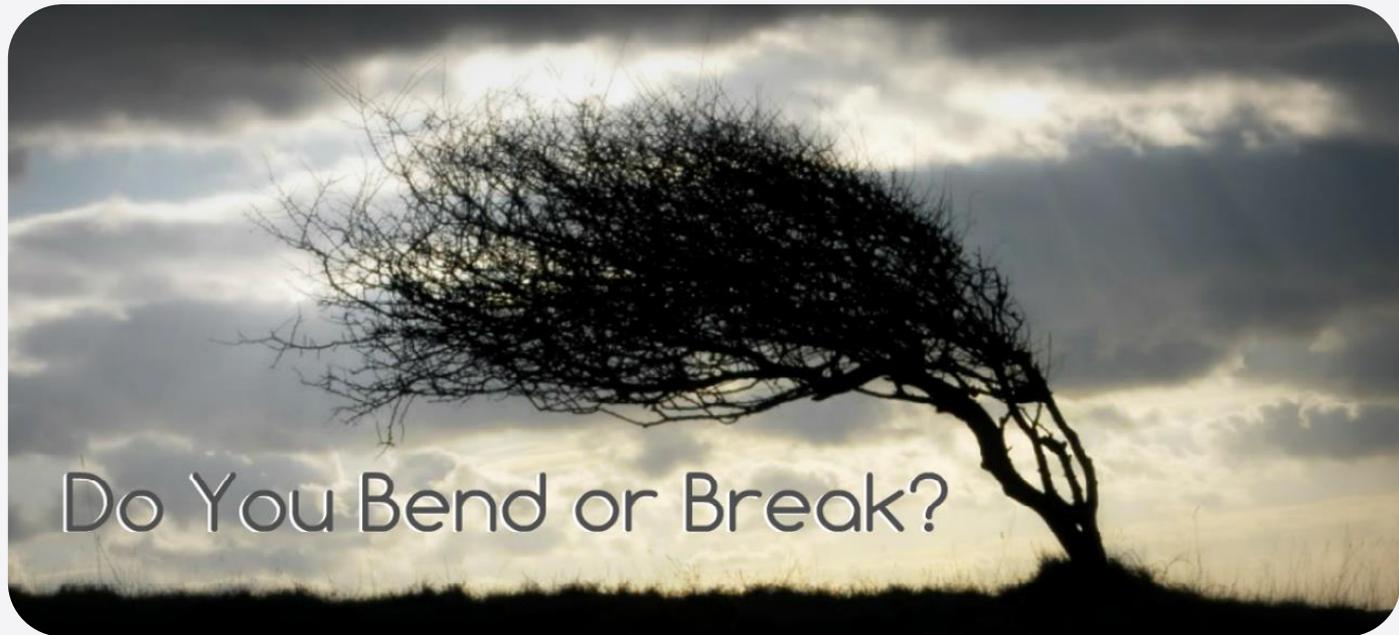




# Resilience

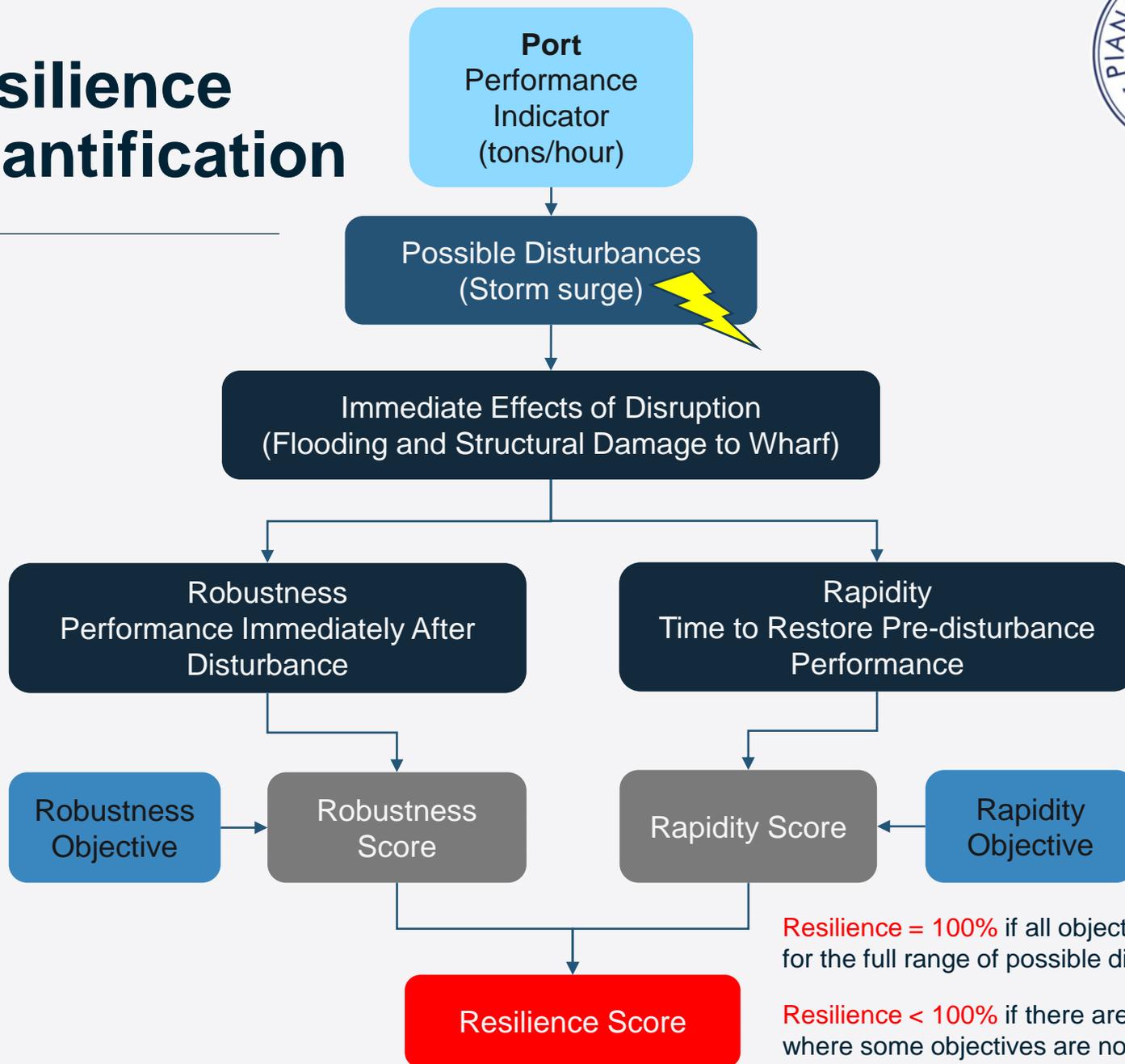
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The ability to anticipate, prepare for, and adapt to changing conditions and withstand, respond to, and recover rapidly from disruptions.





# Resilience Quantification

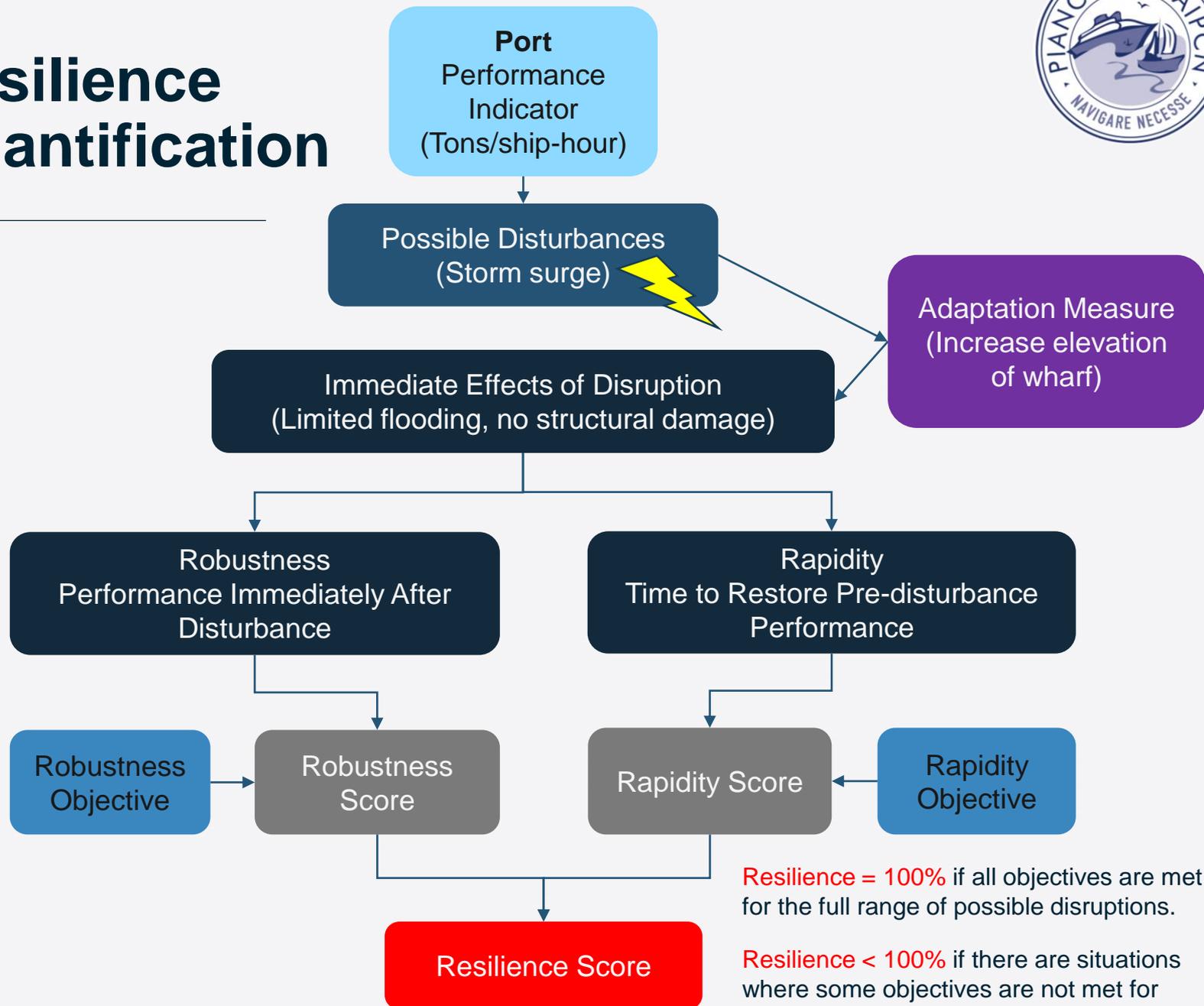


**Resilience = 100%** if all objectives are met for the full range of possible disruptions.

**Resilience < 100%** if there are situations where some objectives are not met for some conditions.



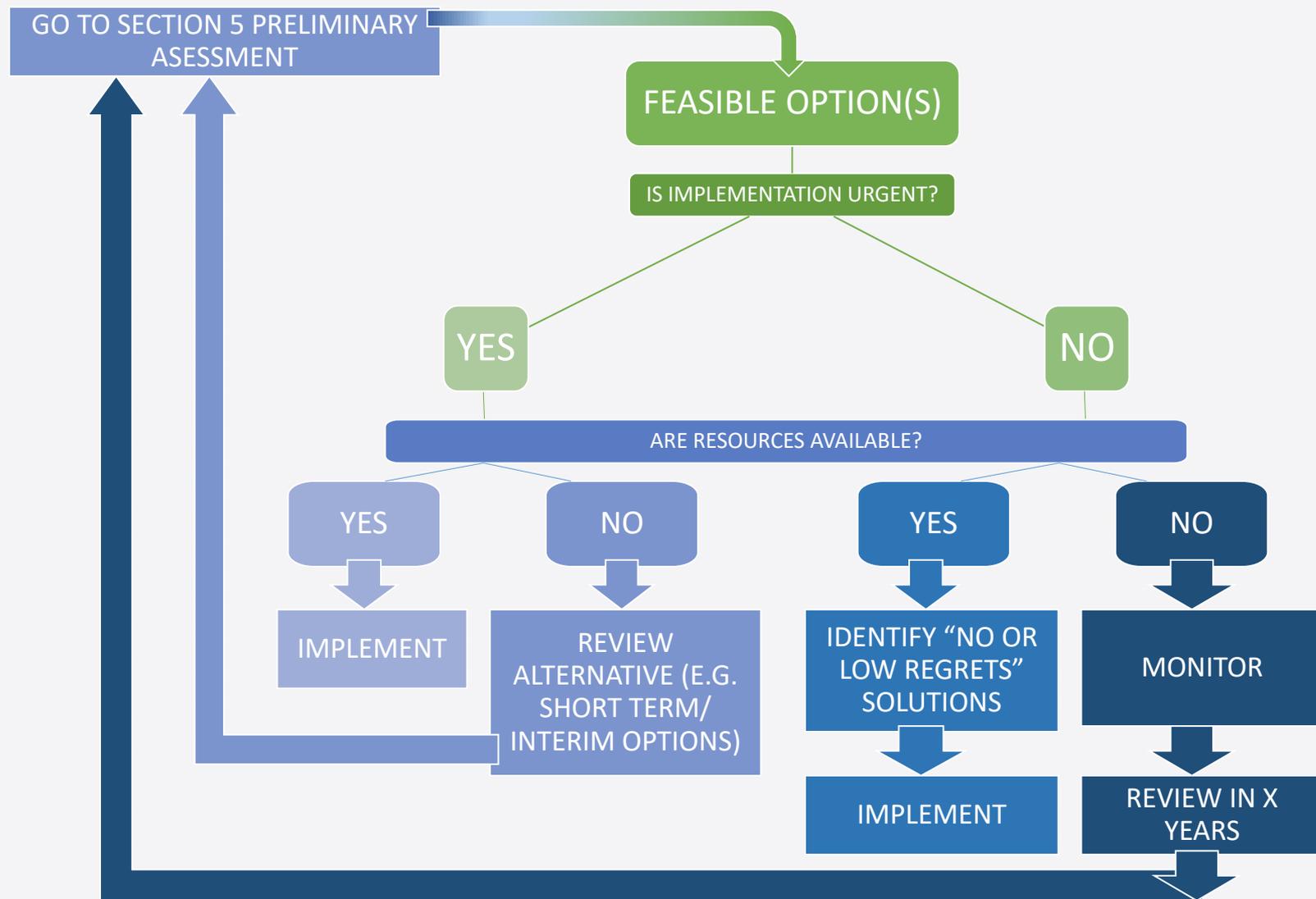
# Resilience Quantification





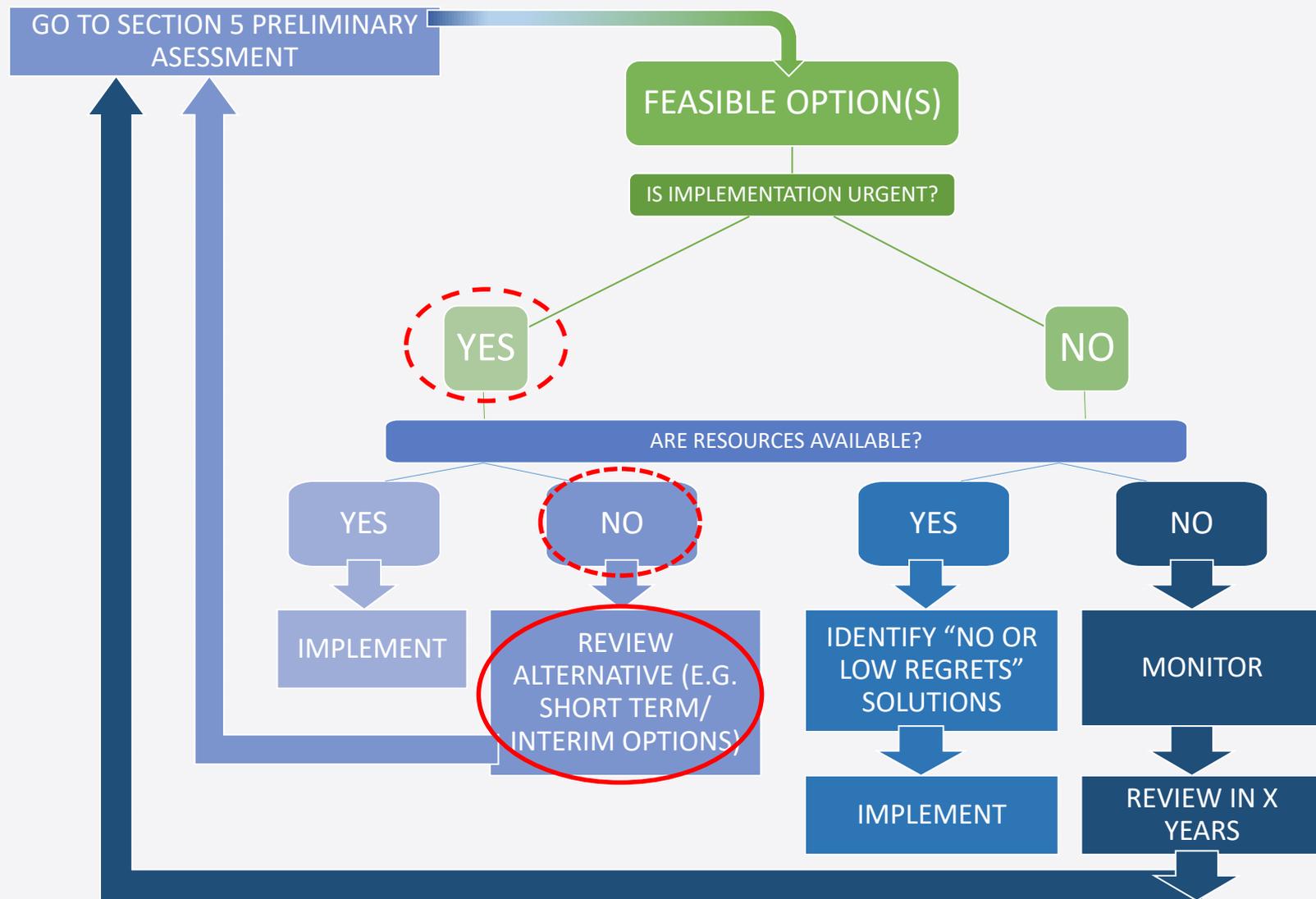


# Make a decision



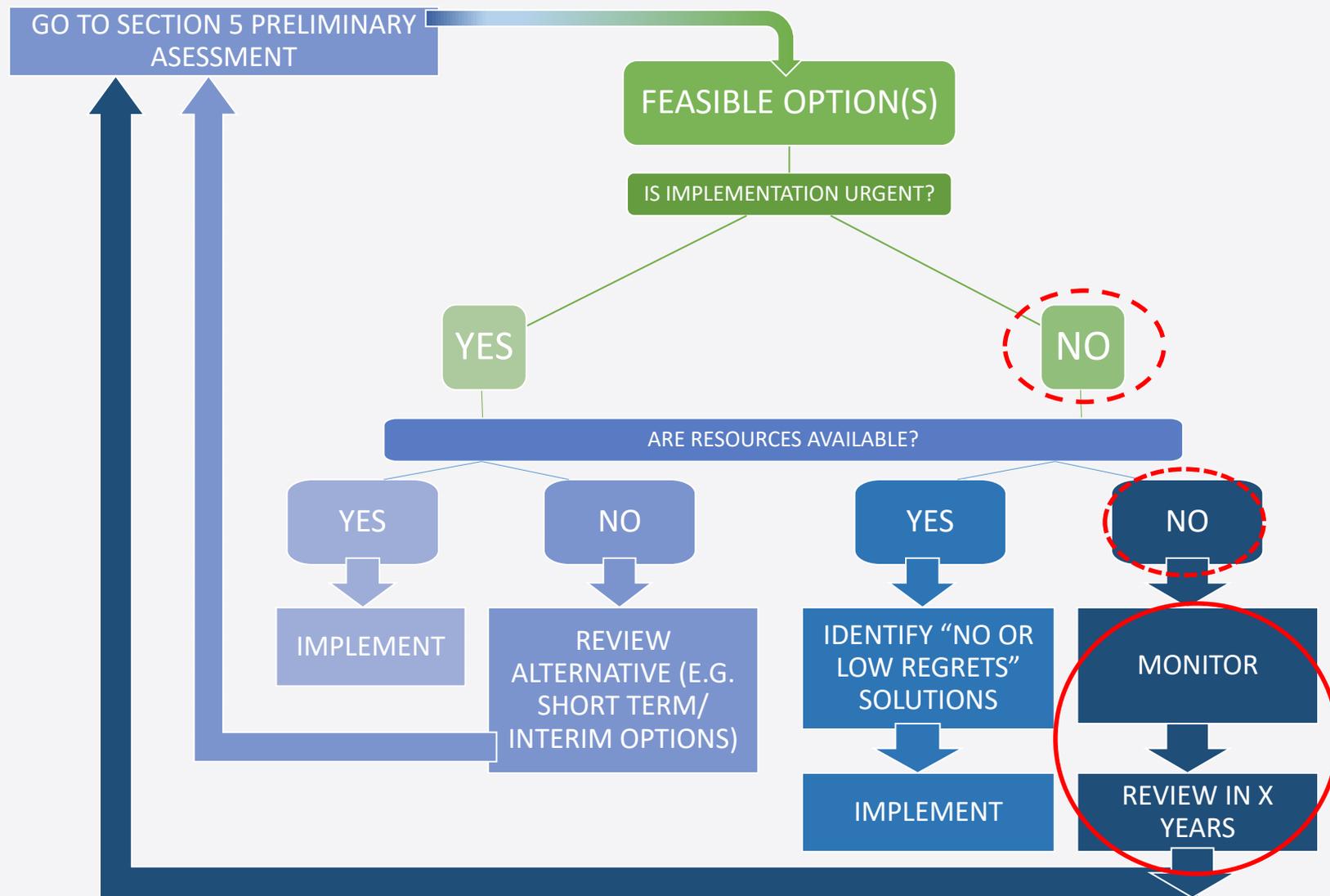


# Make a decision





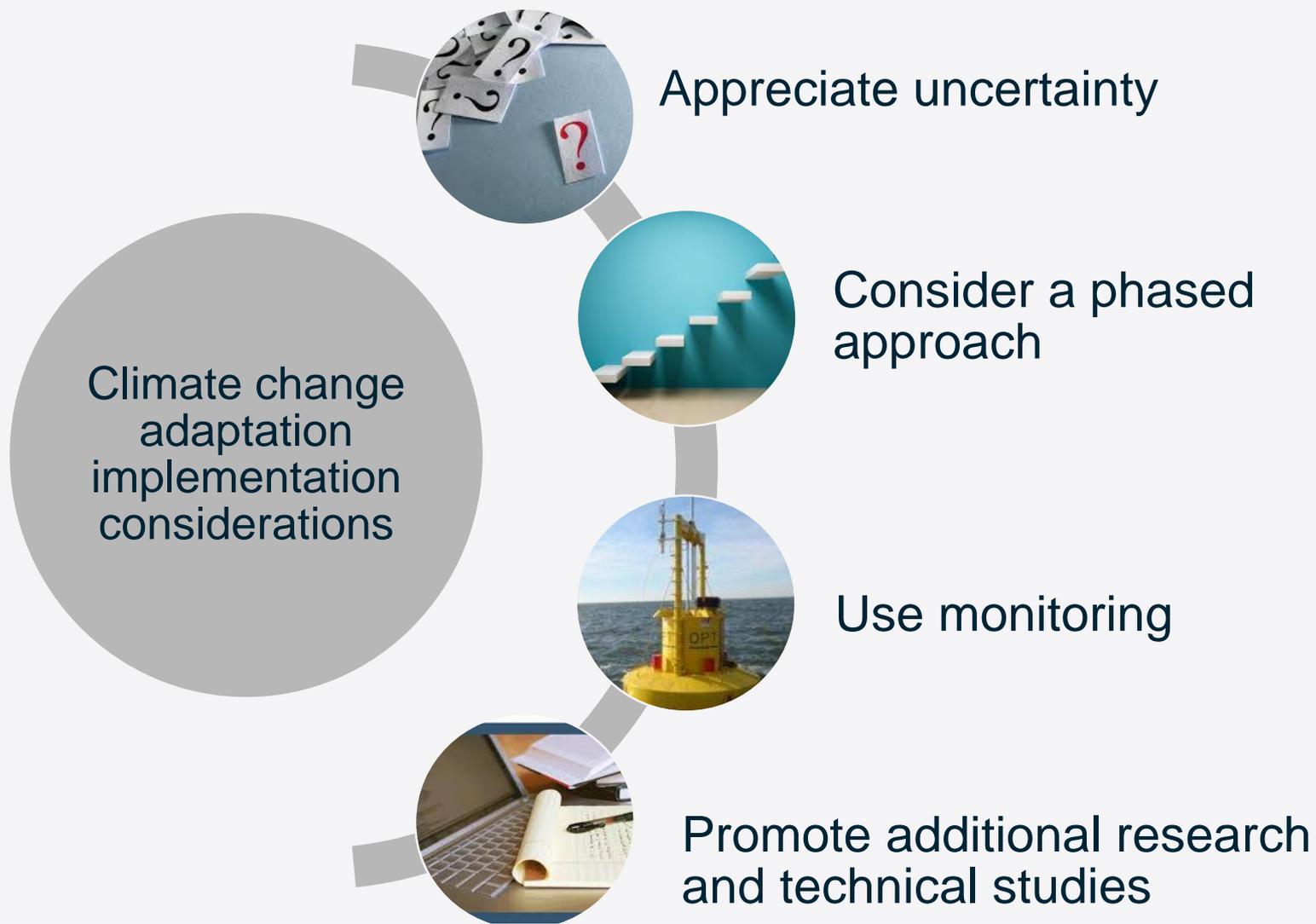
# Make a decision





# Implement Adaptation Measures

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# Key Messages

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- Future planning → consider changes in the climate.
- Set clear objectives
- Have an open mind
- Use a resilience based assessment
- Ensure long-term resilience through a constantly evolving adaptation plan





# Guidance Document

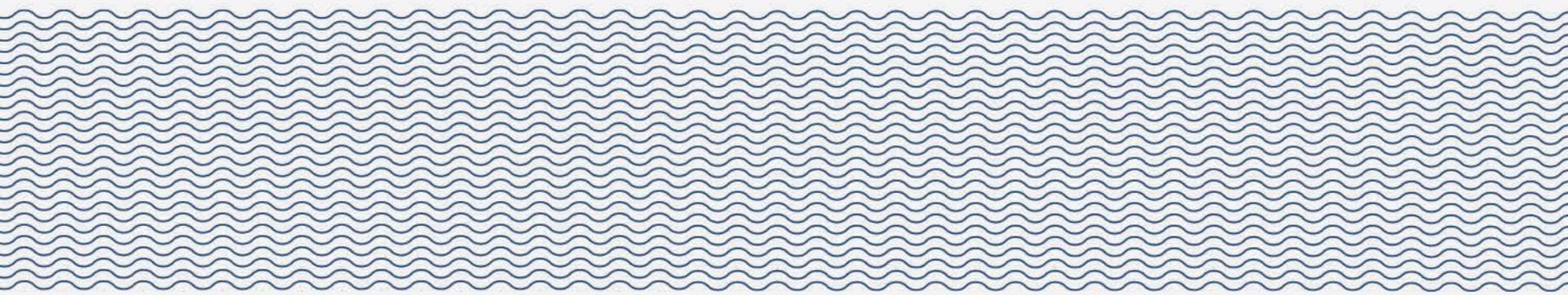
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- Status → Under development
- Draft deadline → end of 2017
- We need your help!

## Case studies:

- Looking for examples of Ports who have started the climate change adaption process.
- To contribute, please email me at [jogrodnick@baird.com](mailto:jogrodnick@baird.com)

**Thank you**



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