



Guidance Sheet No. 3

Climate change adaptation options

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Date: 27/11/2019

Ref: C3S_428a_JBA/SC1



1. Introduction

Although efforts to reduce greenhouse gas emissions are becoming more important, it is likely that the threshold of dangerous climate change (global warming above 2°C) will be exceeded. Therefore, climate change impacts will have to be faced. Port being coastal infrastructures, the main threat is the sea level rise. Port will have to adapt to this and to other climate change impacts (e.g. rise in temperature, weather, tide changes).

2. Adaptation

Adaptation planning for ports is complex, due to the scope of operations, stakeholders and those in surrounding areas affected by impacts on the port.

- Solutions for adaptation to climate change must be considered at different time scales, e.g.:
 - Short term: elevating electrical equipment, developing better emergency response plans
 - Long term: capital improvements, major changes to operations
- First changes can be soft strategies like new planning documents, change to budgets, adopting new design standard for hard strategies (e.g. new coastal defences, raising port elevation).
- Pro-active adaption must be encouraged as they are shown to be less expensive than reactive solutions.
- To adapt to climate change, many stakeholders must be involved into the process (e.g. engineers, insurers, port operators...). A transformational adaptation must be considered with them. For example, major adaption solutions to sea level rise are: elevate, defend or retreat.
- Being ready to adapt to climate can be an advantage to attract shippers' investment or getting lower insurance premiums.
- Resilience in the port surrounding community is also important as it can directly impact port resilience (e.g. transport access).

Table 1 gives some examples of how adaptation has been implemented.



Table 1 - Examples of climate change adaptation responses by the port industry (Nursesey-Bray et al., 2012)

Agency/Organisation/ Instrument	Action
World Ports Climate Declaration	Signed by 55 ports worldwide, provides guidelines and benchmarks for ports wishing to reduce greenhouse gas (GHG) emissions.
International Association of Ports and Harbours	World Ports Climate Initiative: aims to encourage global collaborative action through six lead projects: (1) carbon footprint management; (2) inshore power supply; (3) environmental ship indexing; (4) clean terminal equipment; (5) energy efficiency; and (6) sustainable lease contracts.
Port of Mississippi	Raise the ports by 3 m above sea level in order to protect against future severe storm events.
Gijon Ports Authority	Commissioned studies by DELTARES and MARIN to assess impact of predicted swell on infrastructure.
Port of Genoa	'Climate proofing' the ports via urban waterfront renewal programs that focus on sustainability.
Port of Amsterdam	Established a citizens panel on sustainable port development to gain fresh insights and ideas on port development and planning.
Afsoitdijk Study, Amsterdam	Assessing short-term measures that may be used to climate proof the Dutch Closure Dyke, focusing on sea defences through creation of tidal marshes.
Marine Insurer IT Club	Assessed weather as one of top three reasons for incidences resulting in claims in sea ports and developed suite of insurance risk reduction measures.
American Association of Port Authorities	Shared practical resource to provide ports with an overarching framework to assist their preparation for emergencies – the Emergency Preparedness and Continuity of Operation Planning Manual.
<i>I2S2</i> (the Institute for Sustainable Seaports)	The <i>I2S2</i> supplies port-specific, sustainability-related tools, information, data exchange, networks, best practices and innovative technology information that members of the maritime industry can integrate into their strategic planning and business operations. The <i>I2S2</i> helps ports determine what does and does not work to leverage successes and avoid problems.
PIANC (Permanent International Association of Navigation Congresses)	Series of measures constituting responses of navigation to possible climate change.

3. Example: Pathways approach

3.1 What is a pathway approach?

- The pathway approach for adaptation is designed to identify decisions that need to be taken now and in the future, and schedule the decision-making in a flexible way.
- Decision-making is triggered by a change (environmental or social) and not by a time. Those triggers are identified during the adaptation strategy design.
- Different options are offered at a decision point and the selection is made by testing the plausible futures and acceptable risk. Options not selected might still be available at a future decision point.



- The pathway approach for adaptation enables to keep a flexible decision-making in function of changing circumstances. By monitoring the changes and reassessing the risk, the pathway helps up take decisions at the right moment.

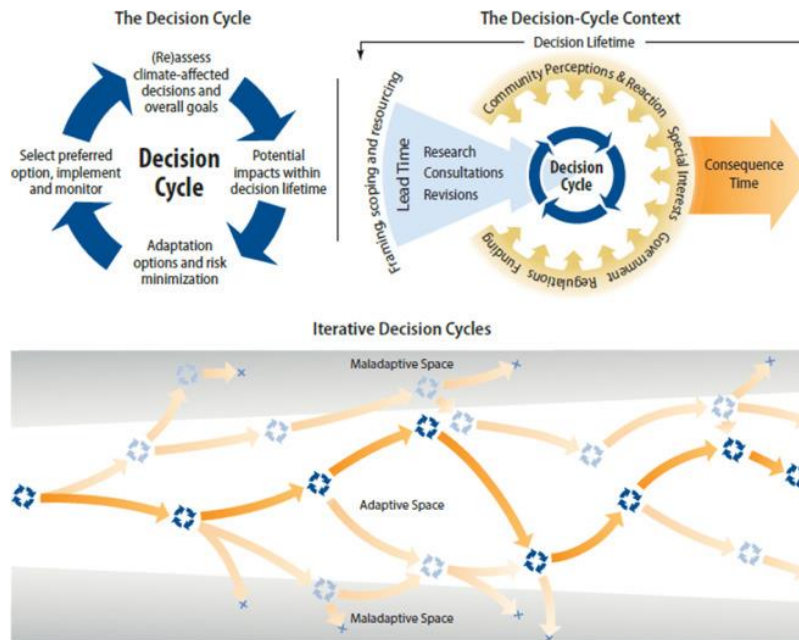


Figure 1 - The current ‘classic’ conceptualisation of adaptation pathways (from Wise et al., 2014)

3.2 Why use a pathway approach?

Key points of the pathway approach (from CoastAdapt):

- It buys time to plan and reduces the pressure of making decisions now.
- It reduces uncertainty by using events not time as decision points.
- Its flexibility enables the plan to reflect local circumstances.
- It keeps options open until there is more information, funding or support for options.
- It allows for learning by along the adaptation journey.

3.3 How to use the pathway approach?

General approach to undertake an adaptation pathway approach (adapted from CoastAdapt):

1. Defining and scoping the areas of decision-making including determining the objectives or a vision of what success might look like. The results of this scoping exercise can be used to identify stakeholders and elicit their values.
2. Determining thresholds and trigger points. Achieving this step is likely to involve stakeholder consultation and/or interrogation of future climate change scenarios and projections.
3. Determining the range of adaptation options and their lead-times and then making an evaluation of each option in terms of a set of criteria involving cost, community acceptability, time to implement, technical complexity etc. Two tools that are likely to be useful in this exercise are:



- a. A checklist that allows each option to be evaluated against the criteria
 - b. Backcasting, i.e. working back from the desired outcome to the present day to understand what steps are required to arrive at the desired outcome.
4. Developing decision pathways and decision points and beginning the journey along the chosen pathway.

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