Climate Change Adaptation for International Transport: Preparing for the Future

16 to 17 April 2019

Climate change adaptation guidance for ports and inland waterways

Presentation by

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Navigating a Changing Climate

➢ A Marrakech Partnership ‘Global Climate Action’ Initiative
➢ Partners:
  • The World Association for Waterborne Transport Infrastructure (PIANC)
  • International Association of Ports and Harbors (IAPH)
  • International Harbour Masters’ Association (IHMA)
  • International Maritime Pilots’ Association (IMPA)
  • Smart Freight Centre (SFC)
  • European Dredging Association (EuDA)
  • European Sea Ports Organisation (ESPO)
  • Institute of Marine Engineering, Science and Technology (IMarEST)
  • Inland Waterways International (IWI)
Navigating a Changing Climate

**UNFCCC context**

- Contracting parties
- Observers
- Transport (facilitated by PPMC)
- Energy
- Oceans and Coasts
- Human settlements
- Industry
- Land use
- Other transport initiatives

**Marrakech Partnership for Global Climate Action**
- Non-state actors

**Global Green Freight Action Plan**
- Low carbon roads (PIANC)
- Low carbon sustainable rail transport (UIC)
- Navigating a Changing Climate (PIANC-led)
- Other transport initiatives

**Energy**
- Oceans and Coasts
- Human settlements
- Industry
- Land use
- Other transport initiatives

**Navigating a Changing Climate**

**Objectives**

- To improve sector-wide awareness of climate change challenges and opportunities
- To create and facilitate knowledge networks to share experiences and good practice on mitigation, adaptation and integrated solutions
- To develop technical good practice guidance, training opportunities and web-based resources e.g. PIANC WG 178 Adaptation
- To provide a coordinated, global focal point to support the owners, operators and users of waterborne transport infrastructure in building the capacity needed to navigate the changing climate

• See our Action Plan or sign up as a supporter at [http://navclimate.pianc.org](http://navclimate.pianc.org)
PIANC WG 178 guidance comprises a four stage methodological framework to help the user understand:

- the context and objectives
- climate-related hazards and impacts
- vulnerabilities and risks
- climate change adaptation and resilience measures

Also covers case studies; the role of monitoring and data management; and the importance of stakeholder engagement.

**Stage 1: Context and objectives**

**STEPS**

- **Engage with** relevant internal and stakeholders (e.g. via a meeting or workshop)
- Develop **climate change adaptation goals**
- Compile an **infrastructure inventory**, identifying critical assets, operations and systems, and highlighting their current status e.g. design life, residual life
- Establish adaptation **roles and responsibilities**
- Set specific adaptation and resilience **objectives**, recognising boundaries, constraints and possible opportunities
Stage 1  
Key considerations

Stage 1: engage with stakeholders, develop goals, prepare inventory of critical infrastructure, establish roles and responsibilities, set objectives

DON’T FORGET!

• Climate change could affect onward transport, utilities, services, local communities, etc. – internal and external **collaboration** can help to identify mutually beneficial solutions and thus **reduce adaptation costs**

• **Criticality** can relate to business continuity; network connectivity; threshold exceedances; health and safety requirements; social needs; etc.

• The status of an asset or system will influence its future **adaptive capacity**: monitoring and awareness are vital in decision making

• Objectives should reflect an **‘acceptable’ level of risk**

• Adaptation may mean modifying an asset, operation or system to strengthen its **resilience** or enable it to cope with future changes

Stage 2  
Climate hazards and impacts

**STEPS**

Work with stakeholders to develop an understanding of **projected changes in relevant climate-related parameters and processes**

• Confirm climate parameters and processes (hydro-meteorological or oceanographic) to which each critical asset, operation or system is **sensitive**

• Consider **thresholds**: is asset or operation already affected?

• Identify and review projected future changes in parameters and processes using global or regional information; refer to locally-relevant **downscaled data** if these exist; acknowledge any uncertainties and data inadequacies

• Understand **how the projected changes could impact on critical infrastructure** (i.e. identify the climate hazard) under each scenario

• Implement **monitoring** to understand local trends in key parameters and processes and to inform future decision making
Stage 2
Key considerations

Stage 2: understand projected changes and critical asset sensitivities, refer to relevant projections, understand possible impacts, implement monitoring

DON’T FORGET!

• The planning horizon matters! If this is more than 10 years, analysis of historical data alone will not capture the future climate accurately ...

• In addition to projected trends in weather-related, hydro-meteorological or oceanographic parameters, take account of increases in the frequency or severity of extreme events, and possible joint occurrences

• To reduce the risk of maladaptation develop and use a range of plausible climate change scenarios; include ‘most likely’ and ‘worst case’ scenarios

Stage 3
Vulnerabilities and risks

STEPS

Work with stakeholders to identify and assess the potential risks to critical infrastructure assets, operations and systems under each scenario...

• Is the critical asset, operation or system exposed?

• Is the critical asset, operation or system vulnerable if climate parameters or processes change?

• Is there existing and future adaptive capacity adequate or is there is a need to strengthen resilience

• What are the financial/economic, environmental and social consequences of each scenario; the potential costs and consequences of inaction?

• When might these consequences be expected?

Carry out risk assessment to understand how climate change is likely to affect critical to assets, operations and systems
Stage 3
Key considerations

Stage 3: identify and assess risks, exposure, vulnerability, adaptive capacity, costs and consequences of inaction, timing of impacts, overview of risks

DON’T FORGET!

• **Risk assessment** can be simple or complex
• Change in climate parameters can have a **range of consequences**
• Adaptive capacity is a function of (i) **redundancy** in the system e.g. design overcapacity or operational flexibility; (ii) **residual asset life**; (iii) level of **exposure** and (iv) **availability of alternatives**
• Without adaptation action, future costs could include clean up, damage repair or replacement, disruption or downtime. Awareness of such costs and consequences helps inform adaptation decision making
• **Presentation** matters! A colour-coded matrix, highlighting the main risks, can be a useful aid to decision making

Stage 4
Adaptation measures

**STEPS**

Work with relevant stakeholders to **identify, evaluate, implement** and then **monitor** measures to strengthen resilience or adapt ...

• Identify possible short-term/interim and long-term measures: reference to a **portfolio of measures**
• Screen a long list of potential options to focus in on a **shortlist** for more detailed evaluation
• Develop, agree and apply option **evaluation criteria**
• Prepare an **adaptation** plan, strategy or programme (**pathway**) for implementation: adaptation is likely to be a **phased** exercise
• Develop **monitoring** programmes and effective **data management** to inform decisions on **when** adaptation action is needed
Portfolio of measures

Measure types

- Physical (structural): engineered, technological, service-based
- Social (people): educational, information-related, behavioural
- Institutional (governance): economic, laws and regulations, policy and programmes

Climate-related impacts addressed include:

- Frequency, severity or duration of flooding
- Extreme, high or low river flow or wave conditions
- Sediment or debris transport, erosion, deposition
- Visibility
- Wind
- Air temperature change
- Water chemistry, acidity, salinity
- Biological temperature induced changes

Table 4.3 Indicative combinations of adaptation and resilience measures

<table>
<thead>
<tr>
<th>Impact</th>
<th>Measure 1</th>
<th>Measure 2</th>
<th>Measure 3</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sea level rise leading to increased flooding of certain berths</td>
<td>Modify berthing arrangements or schedules</td>
<td>Monitor asset condition and performance</td>
<td>Depending on residual life of berth, retrofit or replace with elevated structure</td>
</tr>
<tr>
<td>Increased frequency of extreme wave and wind conditions exacerbating erosion</td>
<td>Strengthen legal protection for remaining vegetated shorelines</td>
<td>Educate local communities in role of marsh or mangroves</td>
<td>Habitat restoration and re-planting projects; create breakwaters (e.g. using dredged material filled geo-tubes)</td>
</tr>
<tr>
<td>Increased storm frequency impacting breakwater integrity</td>
<td>Retrofit asset to maximum affordable protection</td>
<td>Prepare disaster risk reduction plan</td>
<td>Educate workforce, local community about risks and risk reduction plan</td>
</tr>
</tbody>
</table>
Stage 4: **Key considerations**

Stage 4: **identify, screen, evaluate, implement** and **monitor** measures, prepare an adaptation strategy, manage data effectively

**DON’T FORGET!**

- Climate change adaptation needs **innovation**. As well as more traditional structural, physical or technological options, think about **operational change**, educational or governance measures, or **nature-based solutions**
- **Win-win** or **low-regret** measures can be cost-effective
- Retrofitting can be costly and complex; understand **adaptive capacity**
- Understand the **costs of inaction***. Include in the **business case** to justify the incremental cost of climate-resilience
- Option evaluation can be **simple or complex** – but be aware that conventional methods may not be the most appropriate for use in climate change decision making (e.g. return periods, discounting ...)

* NaCC **extreme events** costs and consequences survey to launch Q2 2019

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**Role of monitoring**

Develop **monitoring** programmes and effective **data management** to inform decisions on **when** action is needed

**DON’T FORGET!**

- Monitor **asset condition** also **operational performance**
- Collect data and where relevant develop **real-time** monitoring and **early warning** systems for local weather and hydro-meteorological conditions
- Record impacts and damage costs/losses of extreme events and weather-related disruption to **support business case**
- **Monitoring** does not need to be sophisticated; must be **fit-for-purpose**
- Effective data management is critical to **just-in-time** decision making
- Prioritise **maintenance** to maximise resilience, improve adaptive capacity
- **Adaptive management** can help deal with uncertainties but requires data; temporary or interim measures can 'buy time'
Thanks for listening!

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