Climate change adaptation and resilience-building for seaports - key challenges and gaps from a global perspective

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Zooming in on target-setting, metrics, methodologies and indicators
Seaports are critical for global trade & sustainable development but are at risk of climate change

- Over 80% of volume of world trade carried by sea (port-port)
- Ports: key nodes in the network of closely interlinked international supply chains - gateways to global markets and the blue economy – lifelines for SIDS
- Globalization: interconnectedness/interdependence

Climate change will have direct and indirect impacts:

Sea-level rise; changes in temperature, humidity, precipitation; extreme storms and floods under climate change likely to:
- affect port infrastructure and operations; hinterland transport; and the broader global supply-chain
  - significant potential for damage, disruption and delay – extensive economic/trade related losses
- exacerbate transport-related challenges, including for SIDS/vulnerable economies; increase energy needs and costs

Climate change adaptation and resilience building for ports is of strategic economic importance – especially in the light of growing risks (Climate change impacts on seaports: a growing threat to sustainable trade and development, 2021)
Hazard projections for global ports under CV & C: Extreme sea level (ESL)

All global ports affected, with effects worsening as the SWL increases

Even under a SWL of $1.5^\circ$C, return period of the baseline 1-in-100 years ESL will decrease to every 1 to 10 years for ports in tropical/sub-tropical regions

Under a SWL of $3^\circ$C, many global ports will experience the baseline 1-in-100 years ESL several times per year

Projected changes in the return period of the baseline (mean of 1986-2014) 1-in-100 years ESL under CV & C for about 3700 global ports. Key: SWL (Specific Warming Level) in $^\circ$C above pre-industrial times. Tr (years) return period. Seaport location from World Port Index 2019. ESLs$_{100}$ projections for the global coastline from EC-JRC data collection (see also Vousdoukas et al. (2018). See Asariotis (2021))
Exposure - Coastal flooding projections under CV & C:

SIDSport-ClimateAdapt.unctad.org – 8 Ports and Airports in Jamaica and Saint Lucia

Exposure needs to be understood to adapt effectively

Requires assessment at local / facility level

All international transport assets (ports/airports) of Saint Lucia are at high risk, under all scenarios, and from as early as 2030s

Marine flood maps: (a, c, e) George Charles Int. Airport; Castries seaport; (b, d, f) Hewanorra Int. Airport; Vieux Fort seaport for the: 1-100 year extreme sea level event, ESL100 (1.5C SWL, 2030); 1-50 year extreme sea level event, ESL50 (2050, RCP4.5); ESL100 (2100, RCP8.5). (Monioudi et al, 2018, Reg Env Change; see also IPCC 2018; IPCC SROCC 2019)
Transportation Infrastructure: Timeframes vs. Climate Impacts

How prepared are we?

Source: Savonis, 2011
Huge potential costs associated with inaction:

- Under current conditions global average annual storm damages to ports estimated at roughly US$ 3 billion. By 2100, additional annual damages/port disruption costs projected to be up to US$ 25.3 billion (EDF, 2022, *Act Now or Pay Later: The Costs of Climate Inaction for Ports and Shipping*)

- Hurricanes/Tropical Storms: e.g. Sandy (2012): over US$ 60 billion in NY/NJ/Connecticut

- For SIDS, a single extreme event can cause L&D amounting to a significant share or multiple of GDP

- By 2100 global flood damages due to SLR (and related extreme events) may be up to US$ 27 trillion/year – about 2.8% of global GDP (*Jevrejeva et al 2018, Environ. Res. Lett*)

- By 2100, total value of assets exposed to episodic coastal flooding could increase to 12 – 20 % of global GDP, if no adaptation measures are taken (*Kirezci et al 2020, Sci Rep 10, 11629*)
**Action needed to adapt and build resilience**

Accelerate action to ensure that by 2030 critical transport infrastructure is climate resilient to 2050 (cf. MPGCA Milestones (‘Transport’ & ‘Resiliency’) - will be key in achieving progress on many SDGs (incl. 1.5, 9, 13, 14), SFDRR, GGA

- High-quality risk and vulnerability assessments, based on the best available science/data needed to improve understanding of impacts on ports, guide effective adaptation responses and prioritization of resources

- Improve data collection/availability; plan early (asset lifespan); adopt systems approach; avoid maladaptation / over-engineering; integrate ecosystem approaches

- Mainstream CC considerations in port infrastructure planning/operations

- Increase capacity building and (affordable) infrastructure adaptation finance for developing countries ([UNCTAD, 2022](#))

- Develop and implement strong policy and legal frameworks; as well as standards (eg [ISO 14090](#); [ISO 14091](#)), technical guidance (eg [PIANC 2020](#); [2022](#); [EC, 2021](#)), methodological tools (e.g. [UNCTAD](#))

- Integrate considerations into NAPs, NDCs, as well as Development, DRR and COVID-recovery policies / planning
Key messages

• Seaports are **essential for global trade and development** and **access to the blue economy** but are at high and growing **risk of climate change impacts**. Significant economic **costs of inaction and threat to sustainable development**, including for SIDS that depend on ports as lifelines.

• Much is at stake - Failure to adapt is not an option and time is of the essence (infrastructure lifespans/projections).

• Enhancing and measuring progress on port adaptation is critical for implementation of 2030 Agenda and SFDRR but not covered by existing indicators.

• To avert and minimize potentially crippling L&D, GGA targets, metrics, methodologies, indicators should focus on **key outcomes** (including from a global commons perspective) and **promote, enhance and capture implementation of measures that are fit-for-purpose and effective** e.g.
  
  • **Major/critical ports climate-resilient to at least 2050?**
  
  • **NAPs/Policies/Legislation in place that require and facilitate high-quality risk and vulnerability assessments / climate proofing of ports and other critical infrastructure?** [note e.g. EU approach; EU Climate Law, TEN-T]

  • **Climate-finance for port infrastructure adaptation in developing countries is adequate and affordable?**

See also MPGCA Transport Action Pathway recommendations/milestones (impact area 3)
Many thanks!
### Related work by UNCTAD

<table>
<thead>
<tr>
<th>Year</th>
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<td>2009</td>
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| UNCTAD Multiyear Expert Meeting: “*Maritime Transport and the Climate Change Challenge*”
| 2010 | Follow-up |
| Joint UNECE-UNCTAD Workshop: “*Climate change impacts and adaptation for international transport networks*”
  UNECE Group of Experts on Climate Change Impacts and Adaptation for International Transport Networks
  2013 EG Report - *Climate Change Impacts and Adaptation for International Transport Networks*
  2020 EG Report - *Climate Change Impacts and Adaptation for International Transport Networks* |
| 2011 | Follow-up |
| UNCTAD Ad Hoc Expert Meeting: “*Climate Change Impacts and Adaptation: a Challenge for Global Ports*”
| 2014 | |
| UNCTAD Ad Hoc Expert Meeting: “*Addressing the Transport and Trade Logistics Challenges of SIDS: Samoa Conference and Beyond*”
  UNCTAD Multiyear Expert Meeting: “*Small Island Developing States: Transport and Trade Logistics Challenges*” |
| 2017-18 | |
| UNCTAD Port-Industry Survey on Climate Change Impacts and Adaptation |
| 2015-2017 | Follow-up |
| UNCTAD DA Project - SIDSport-ClimateAdapt.unctad.org “Climate change impacts on coastal transport infrastructure in the Caribbean: Enhancing the adaptive capacity of Small Island Developing States (SIDS)”
  Monioudi et. al, *Climate change impacts on critical international transportation assets of Caribbean SIDS: the case of Jamaica and Saint Lucia*, Reg Environ Change 2018: 2211 |
| 2019-2020 | |
| UNCTAD Ad Hoc Expert Meeting: “*Climate Change Adaptation for International Transport: Preparing for the Future*”
  UNCTAD – UNEP “*Climate-resilient transport infrastructure for sustainable trade, tourism and development in SIDS*”
  *Climate Change Impacts and Adaptation for Coastal Transport Infrastructure: A Compilation of Policies and Practices*
  UNCTAD Multiyear Expert Meeting: “*Climate Change Adaptation for Seaports in Support of the 2030 Agenda*”
  *Climate change impacts on seaports: a growing threat to sustainable trade and development* (2021)
  *Climate-resilience of seaports: Adequate finance is critical for developing countries but remains a major challenge* |