UNITED NATIONS CONFERENCE ON TRADE AND DEVELOPMENT
UNCTAD

International Conference on Raising awareness on adaptation of transport infrastructure to climate change impacts

18-19 November 2019, Athens

Climate change impacts and adaptation for international transport networks - key issues and UNCTAD work

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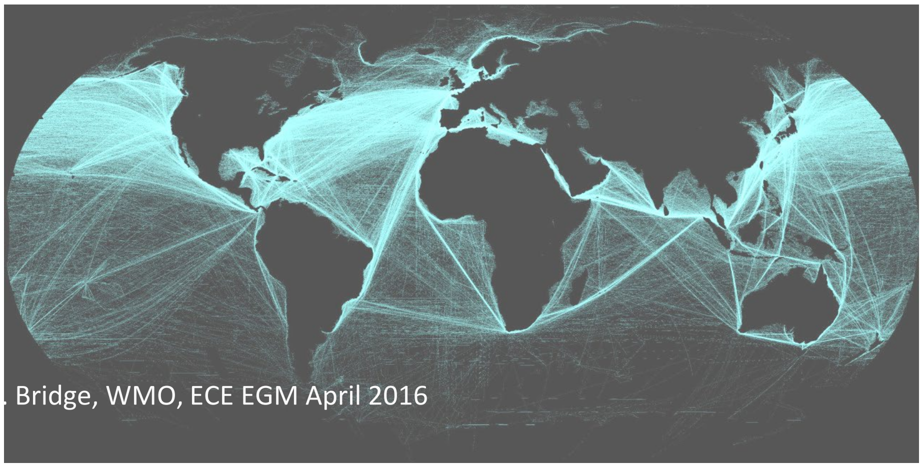
Transport: a critical facilitator of global trade and development



Global shipping movements

Over 80% of volume (70 % of value) of world merchandise trade is carried by sea (port to port): shipping and ports are key nodes in the network of closely linked international supply chains

Globalization: interconnectedness/interdependence of shipping/ports and of transport across supply chains

Seaborne trade: 60% of goods loaded and 63% of goods unloaded in developing countries (UNCTAD)

Environmental challenges: two sides of the coin

- **Effects of transport on the environment** (e.g. pollution, CO_2 emissions)
- **Environmental impacts on transport** (e.g. Climatic Variability and Change, CV&C)

Important to address these global challenges effectively, also in the light of the *Paris Agreement* and the *2030 Sustainable Development Agenda*

Relevance in the context of the 2030 Sustainable Development Agenda

2030 Agenda adopted in September 2015, effective as of 1st January 2016

Consensus by international community on a 'plan of action' involving 17 sustainable development goals with 169 targets, which are '***integrated and indivisible, global in nature and universally applicable'***

Sustainable and resilient transport among the cross-cutting issues, of relevance for achievement of progress on several of the goals and targets, e.g.

SDG 13	Take urgent action to **combat climate change and its impacts**
SDG 9	**Build resilient infrastructure**, promote inclusive and sustainable industrialization and foster innovation
SDG 14	Conserve and **sustainably use the oceans, seas and marine resources** for sustainable development
SDG 1.5	By 2030, **build the resilience of the poor and those in vulnerable situations and reduce their exposure and vulnerability to climate-related extreme events** and other economic, social and **environmental shocks and disasters**

Climate Variability and Change (CV & C)

A global challenge and "a defining issue of our era" (UN SG Ban Ki Moon, 2008)

Compelling scientific evidence of increasing CV & C / impacts (IPCC, 2013; 2018; 2019)

Huge potential costs associated with inaction

- *WEF (2019) Global Risks Report*: Top 3 economic risks are extreme weather events, failure of CC mitigation and adaptation, natural disasters
- *Stern Review (2006)*: 5 - 20 % of GDP, annually
- By 2100, global flood damages due to sea-level rise (and related extreme events) might amount to up to US$ 27 trillion/year – about 2.8% of global GDP in 2100 (*Jevrejeva et al 2018 Environ. Res. Lett*)
- *Global Comm. on Adaptation (2019)*: Investing US$1.8 trillion over next decade - in measures to adapt to climate change - could produce net benefits worth more than US$7 trillion

Very serious development threat, particularly for LDCs and the SIDS

Since 2008, integration of CV & C considerations into UNCTAD's work on transportation

UNCTAD work on climate change implications for maritime transport and relevant follow-up

2009 Follow-up	**UNCTAD Multiyear Expert Meeting: "*Maritime Transport and the Climate Change Challenge*"** UNCTAD ed. multidisciplinary book: **Maritime Transport and the Climate Change Challenge** UN-Earthscan (2012)
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* (2011-2014); mandate extended in 2015; 2012 International Conference - including session on SIDS 2013 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*"** Becker et. al, **A note on climate change adaptation for seaports**, Climatic Change, 2013
2014	**UNCTAD Ad Hoc Expert Meeting: "*Addressing the Transport and Trade Logistics Challenges of the Small Island Developing States (SIDS): Samoa Conference and Beyond*"** **UNCTAD Multiyear Expert Meeting: "*Small Island Developing States: Transport and Trade Logistics Challenges***
2017	**UNCTAD Port-Industry Survey on Climate Change Impacts and Adaptation**
2015-2017 Follow up	**UNCTAD DA Project *"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	**UNCTAD Ad Hoc Expert Meeting: *"Climate Change Adaptation for International Transport: Preparing for the Future"*** **UNCTAD – UNEP *Project (funded by Germany):*** ***"Climate-resilient transport infrastructure for sustainable trade, tourism and development in SIDS***

CV & C implications for Transport

Two sides of the "coin": causes - effects

- **Mitigation**: action directed at addressing causes (long-term)

- **Adaptation**: action directed at coping with impacts (short- and long- term); requires assessment of impacts that can vary considerably by physical setting, type of forcing, sector, mode, region etc.

In Transport:

- much of the international debate/policy action focuses on mitigation (i.e. reduction / control of GHG emissions).
- comparatively little focus on study of impacts and development of adaptation policies/actions

BUT: Transport is not (just) a 'culprit', it is (also) a victim

CV & C Impacts on Transport

Direct and *indirect* impacts on transport infrastructure and services:

Sea-level rise, temperature-, humidity-, precipitation- changes, extreme storms and floods and other climatic factors are likely to

- affect coastal transport infrastructure, hinterland/connecting transport infrastructure, and transport throughout global network of supply-chains
  - potential for *damage, disruption and delay* – economic/trade related losses
- affect demand for transport
- exacerbate other transport-related challenges
- open new arctic sea-lanes due to polar ice melting

Enhanced climate resilience / adaptation for ports and other key transport infrastructure is of strategic economic importance

How prepared are we?

UNCTAD Port Industry Survey on Climate Change Impacts and Adaptation

Online survey to

- improve the understanding of weather and climate-related impacts on ports
- identify data availability, information needs and levels of resilience and preparedness

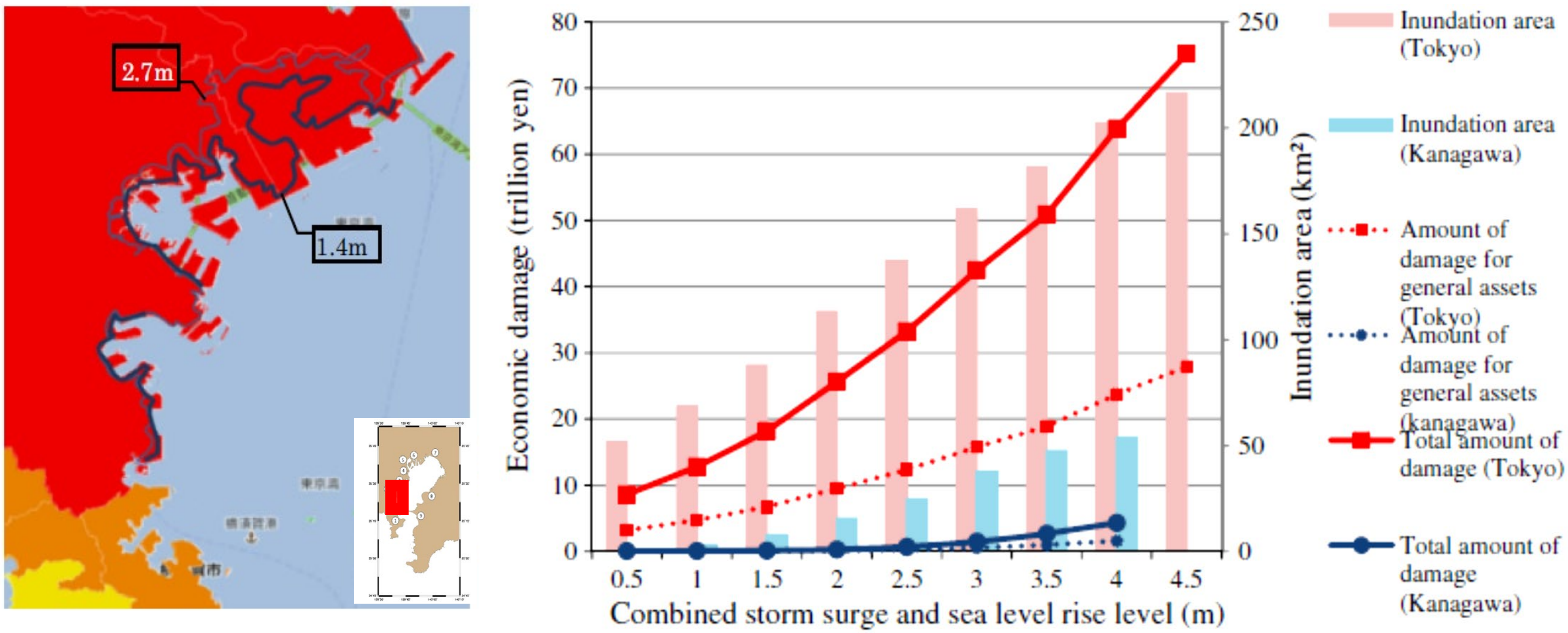
Respondent port sample collectively handle more than 16 % of global seaborne trade and can be considered as representative

- The majority of respondents had been impacted by weather/climate related events, including by extremes;
- The survey revealed important gaps in information available to seaports of all sizes and across regions with implications for effective climate risk assessment/adaptation

Key messages: **Better data/information** needed; **mainstream CC considerations**; ‘**piggyback’ climate resilience** when upgrading infrastructure/operations

Other surveys related to (inland) transport provided similar results (UNECE, 2013; 2019)

Projected port city damages due to combined MSL rise and storm surge



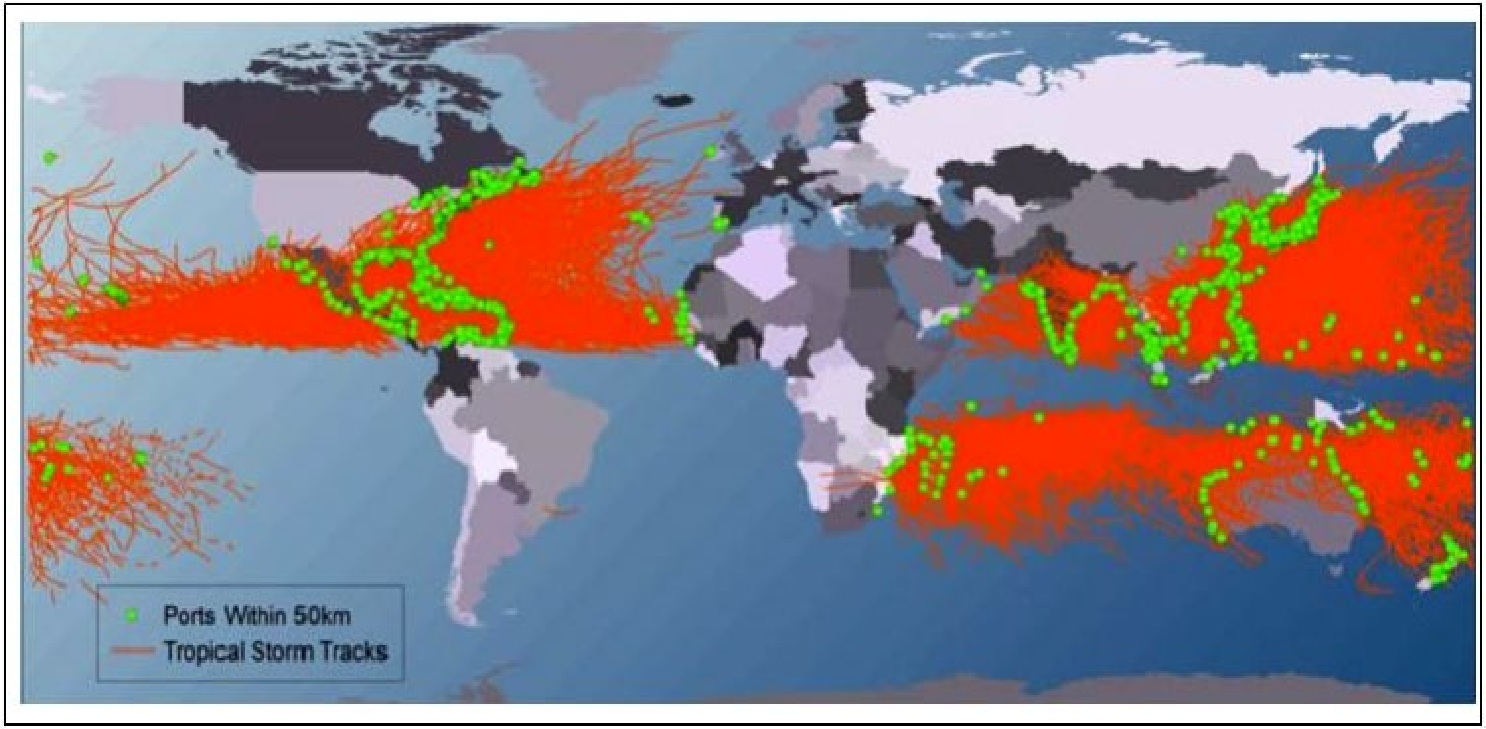
(a) Areas at flood risk in the Kanagawa area (Tokyo Bay) for the mean expected storm surge due to future storm typhoon in the year 2100 for a 0.59-m (thick blue line) and 1.9-m (thin blue line) mean sea-level-rise (MSLR) scenarios and

(b) Simulated damages for Tokyo and Kanagawa port areas due to combined MSLR and storm surge (Hoshino et al., 2015) (*30 trillion yen approx. 276 billion US dollars*)

The special case of the SIDS

- Small (land mass, economies, population), remote & highly vulnerable to external shocks
- Large dependency on imports (i.e. international transport)
- Key concerns: connectivity and transport costs (accessibility and affordability)
- High transport costs (e.g. transport costs in Caribbean trade at least 30 % higher than the world average, see Pinnock and Ajagunna, 2012)
- High exposure to natural disasters and CV&C; low adaptive capacity
- **Coastal transport infrastructure (seaports/airports): critical lifelines for external trade, food, energy, tourism (cruise-ships and air transport) and DRR**
- These assets are threatened by sea level rise and extreme events (storms)
- Strong nexus between transport and tourism: “Sun-Sea-Sand (3S) tourism“, often a most significant SIDS industry, is threatened by climate - driven beach erosion / coastal inundation, as is its facilitating transport infrastructure

SIDS are vulnerable to storms



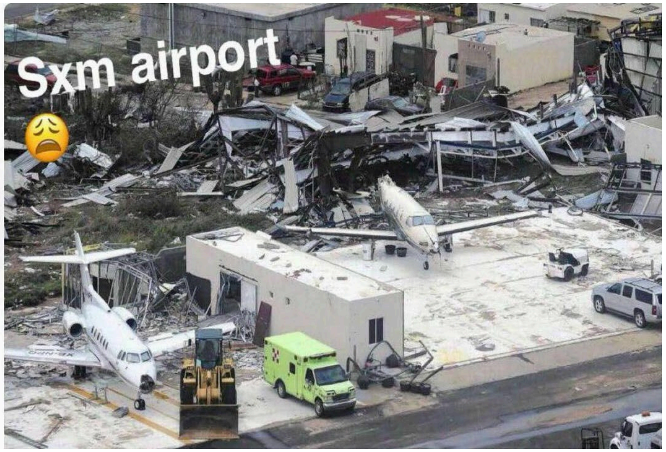
Ports within 50 km of tropical sea storm tracks (1960–2010) Data: Knapp et al. (2010). (Becker et al., 2013)

N.B. Airports in SIDS are mostly located at low coastal elevations, due to physical constraints (volcanic islands with little level land)

2017 hurricanes: impacts in the Caribbean

- Major impacts in Dominica, Dominican Republic, Guadeloupe, Montserrat, Antigua & Barbuda, Saint Kitts & Nevis, Puerto Rico, Turks & Caicos, Virgin Islands
- Most costly hurricane season on record (WMO 2018)
- Estimated losses: Dominica, US$ 1.3 billion or 224% of GDP; BVI, about 300 % of GDP; St. Maarten: 797% of GDP (French part of island 584% of GDP) (UNISDR CRED)
- Estimated losses for Anguilla, Bahamas, BVI, St Maarten, Turks & Caicos: US$ 5.4 billion (UNECLAC 2018)

St Maarten airport

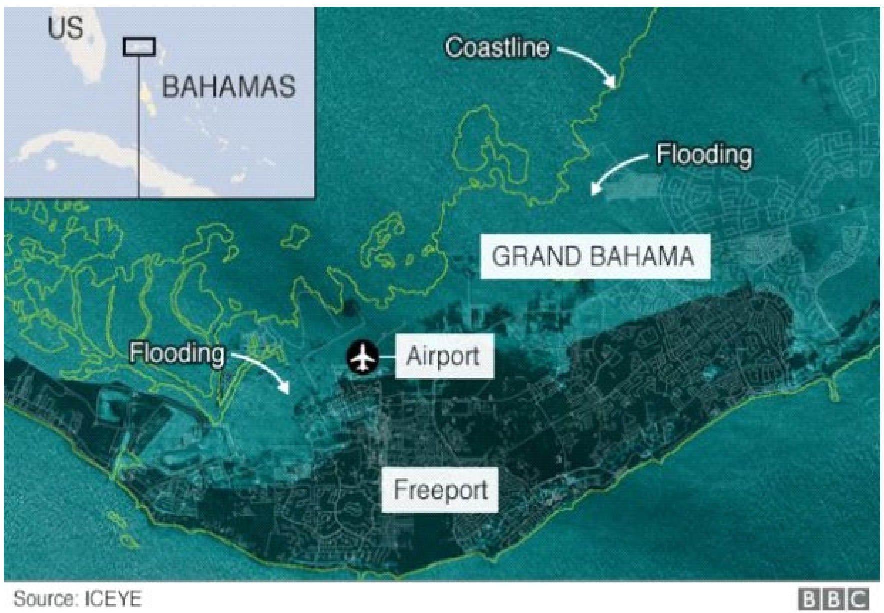


Source: https://sxmgovernment.files.wordpress.com/2017/09/hurricane-irma-destroys-st-maarten-princess-juliana-airport-photo.jpg

2019 hurricanes: Impacts on the Bahamas

Hurricane Dorian, a slow 5-hurricane devastated part of the Bahamas archipelago:

High human losses and extreme damage to infrastructure and assets



https://www.bbc.co.uk/news/world-latin-america-49561450

Airport inundation

https://en.wikipedia.org/wiki/Hurricane_Dorian

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Climate change impacts on coastal transport infrastructure in the Caribbean: Enhancing the adaptive capacity of Small Island Developing States

- Focus on key coastal transport infrastructure (i.e. airports and ports)
- Case-study approach involving 2 Caribbean SIDS (Jamaica and St Lucia) to
  - enhance the adaptive capacity at the national level (case-study countries)
  - develop a transferable methodology for assessing climate change impacts and adaptation options for coastal transport infrastructure in Caribbean SIDS
- 2 national and 1 regional capacity building workshops in 2017 – seaports and airports authorities from 21 countries/territories, regional/international stakeholders and experts
- Web-platform - *SIDSport-ClimateAdapt.unctad.org*
- Key outcomes include
  - Assessment of *potential operational disruptions and marine inundation risk* to coastal international airports and seaports of Jamaica and Saint Lucia, under different climatic scenarios; *Climate Risk and Vulnerability Assessment Framework for Caribbean Costal Transport Infrastructure*
  - Innovative methodological approaches, validated by scientific peer-review

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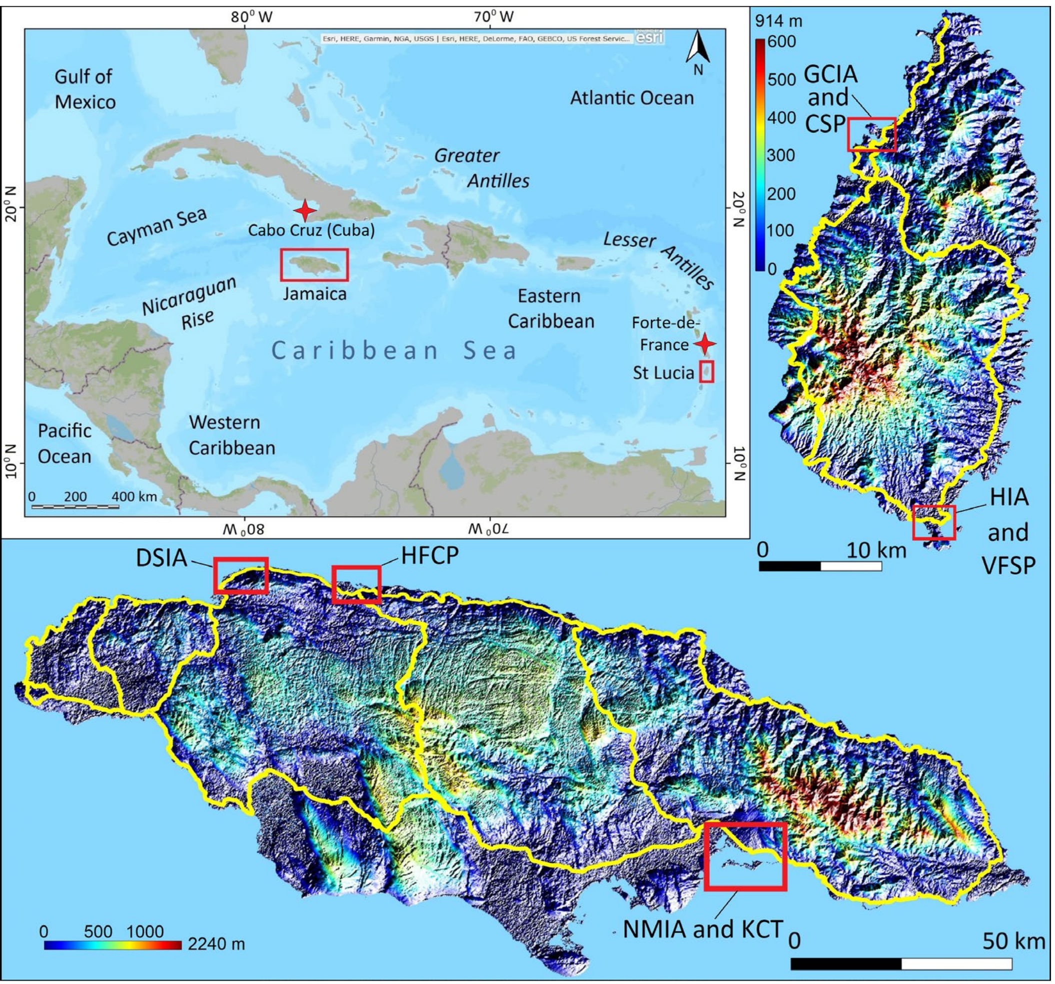
Climate change impacts on coastal transport infrastructure in the Caribbean: Enhancing the adaptive capacity of Small Island Developing States



Some findings:

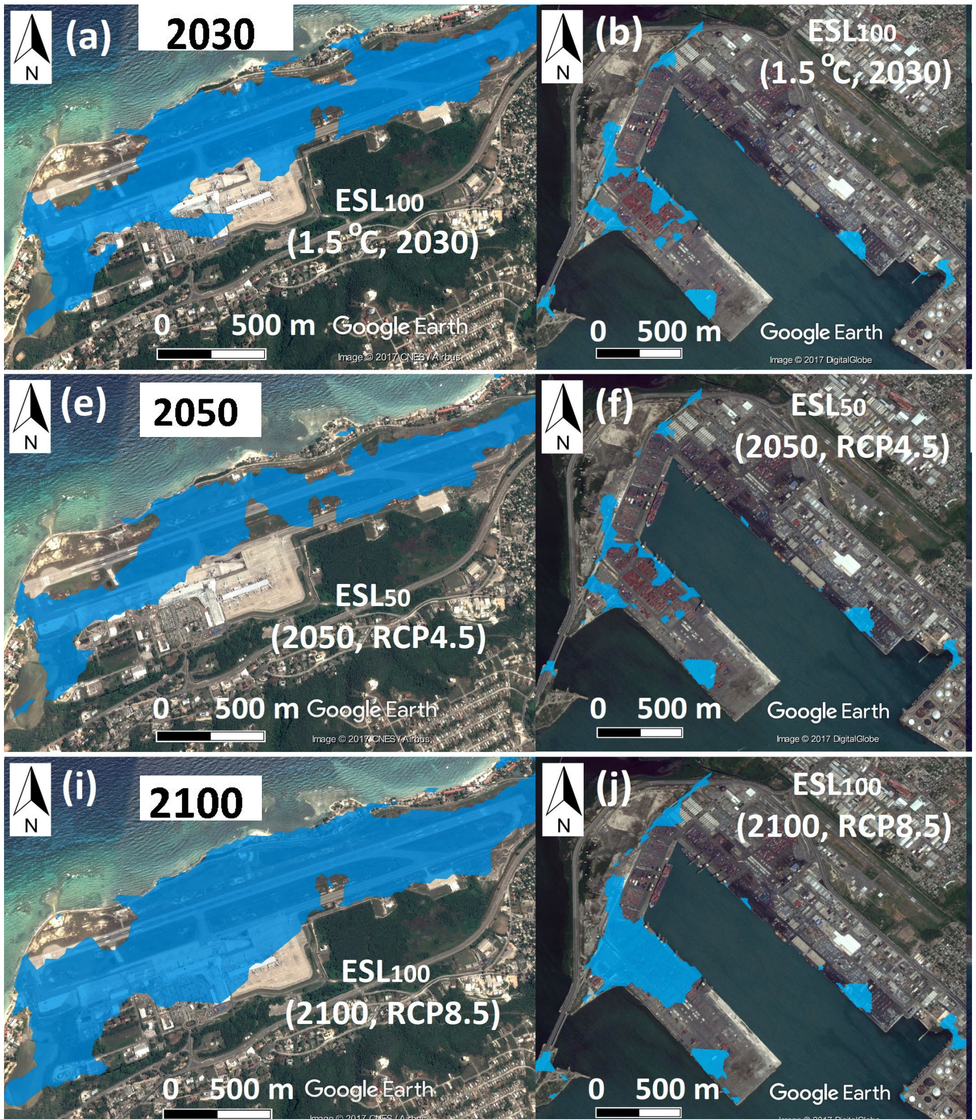
High risk of marine flooding for key assets under extreme events and different CV & C scenarios, as early as in the 2030s

Operational disruptions also identified, using an operational thresholds method

Monioudi, et al. Reg Environ Change (2018). **Climate change impacts on critical international transportation assets of Caribbean Small Island Developing States (SIDS): The case of Jamaica and Saint Lucia**. https://doi.org/10.1007/s10113-018-1360-4; https://rdcu.be/Q1OY

See also **IPCC Special Report on Global Warming of 1.5ºC 2018** (Ch. 3); **IPCC 2019**

Marine flooding projections for ports/airports under CV & C: **Jamaica**

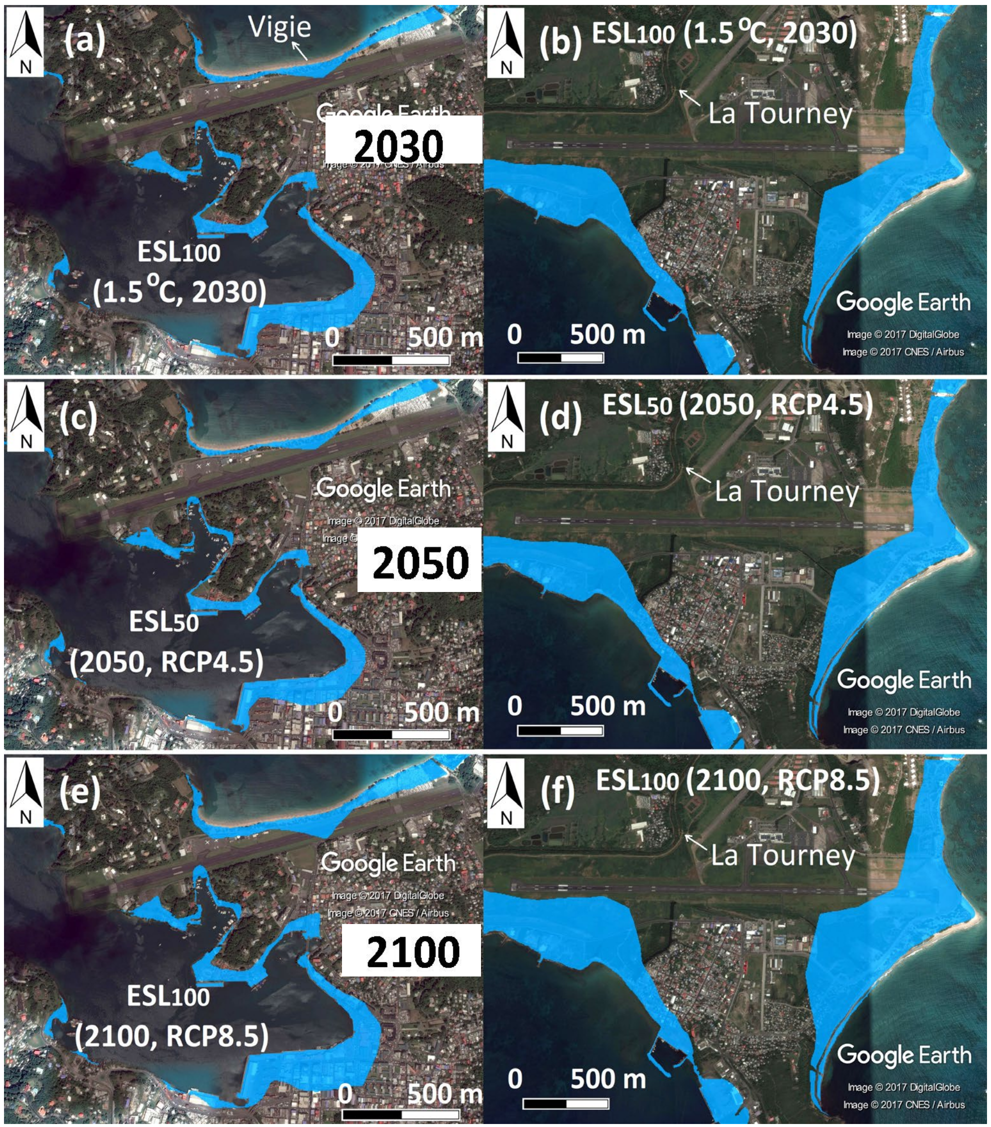


- Dynamic modeling inundation projections for coastal assets
- Different scenarios were tested
- SIA (70% of international tourist arrivals) and Kingston seaport (KFTL) appear vulnerable under all scenarios

Flood maps for: (a, e, i) Sangster International Airport (SIA, Montego Bay, Jamaica); (b, f, and i) Kingston Container Terminal (KFTL, Kingston, Jamaica) under the 1-100 year extreme sea level event- ESL100 (for 1.5 ° C temperature increase, 2030), 1-50 year extreme sea level event -ESL50 (2050, RCP4.5) and ESL100 (2100, RCP8.5)

Monioudi et. al. (2018)

Marine flooding projections for ports/airports under CV & C: **Saint Lucia**



All international transportation assets (airports and seaports) appear vulnerable under all scenarios

Flood maps:

(a, c, e) George Charles International Airport and Castries seaport and (b, d, f) Hewanorra International Airport and Vieux Fort seaport for the:

- *1-100 year extreme sea level event, ESL100 (1.5° C SWL, 2030),*
- *1-50 year extreme sea level event, ESL50 (2050, RCP4.5) and*
- *ESL100 (2100, RCP8.5)*

Monioudi et. al. (2018)

Regulation and Standards: Key tools for adaptation and resilience building

Enhanced climate resilience / adaptation for (critical) transport infrastructure is a matter of strategic economic importance and will be key in achieving progress on many SDGs

Risk assessments, based on the best available science, will be needed as well as innovative adaptation responses (regulation, management and technical measures).

Legal / regulatory approaches and standards will be important in the longer run; some examples:

- EU: EIA Directive 2014/52/EU (in force since 05/2017)
- California Bill (Assembly Bill No. 2800 CHAPTER 580) that modified the Public Resources Code (2016), effective Jan 2017
- ICZM Protocol (2008) to the Barcelona Convention
- ISO 14090 Adaptation to climate change – principles, requirements, guidelines (June 2019)

Considerations for transport infrastructure adaptation

Important to build out of harm's way (eg coastal set-back zones; avoid flood-planes); plan early; adapt over the long term (asset lifespan) and under uncertainty; adopting a systems approach; standardization/accessibility of data important; tools and guidance are needed

Risk assessment for adaptation works need to be at local scale to facilitate local decision making; assessments should be probabilistic to faciliate risk estimation under future climatic conditions (eg coastal flood risk)

Technical capacity is required for

(a) selection of adaptation options (using eg multicriteria-analysis, cost-benefit analysis, decision-tree) to avoid maladaptation, over/under-engineering;

(b) development and implementation of standards, to ensure these are effective and 'fit for purpose';

Capacity building, training, (&finance) critical, particularly for Developing Countries

- Case studies required: Example - *SIDSport-ClimateAdapt.unctad.org*

Thank you!