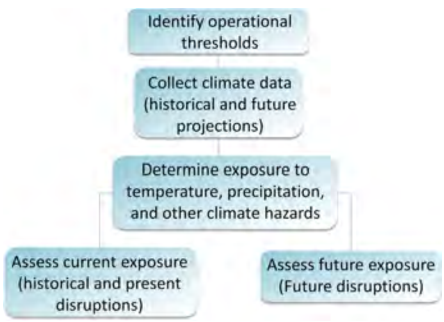
Operational thresholds method

The operational thresholds that were identified concern:

- Employee ability to work safely outdoors which depends on the heat index (a function of temperature and relative humidity)
- Take-off runway length requirement of aircraft affected by temperature
- Energy cost under increasing temperature



The Caribbean Community Climate Change Centre's (CCCCC) daily downscaled climate data from the RCM PRECIS, available for the SRES A1B scenario were used.

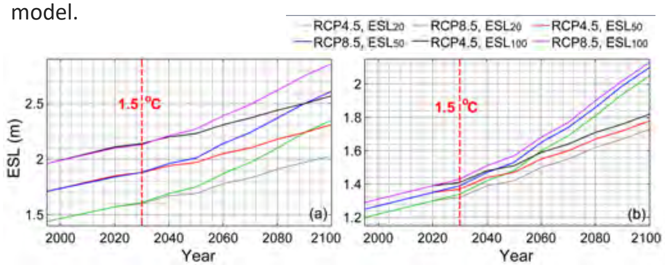
Flow chart of the operational thresholds method.

The analysis showed that:

- under the 1.5 °C Specific Warming Level (SWL), staff working outdoors at the Jamaican and Saint Lucian critical assets could be at 'high' risk for 5 and 2 days/year (d/y), respectively. Under a standard SRES A1B scenario, such days could increase to 30 and 55 d/y, respectively, by 2081-2100
- under the 1.5 °C SWL, Boeing 737-800 aircrafts will have to decrease their take-off load for 65 d/y at SIA and 24 d/y at NMIA
- for the Jamaican seaports, the 1.5 °C SWL will increase the baseline energy requirements by 4% for 214 d/y. Saint Lucia seaports are projected to experience similar trends

Coastal flooding

Extreme coastal inundation is driven by extreme sea levels (ESLs), considered here as the sum of the mean sea level, the astronomical tide and the episodic coastal water level rise due to storm surges and wave set ups. Inundation maps for the critical transportation assets were obtained using the Lisflood-ACC (LFP) model.

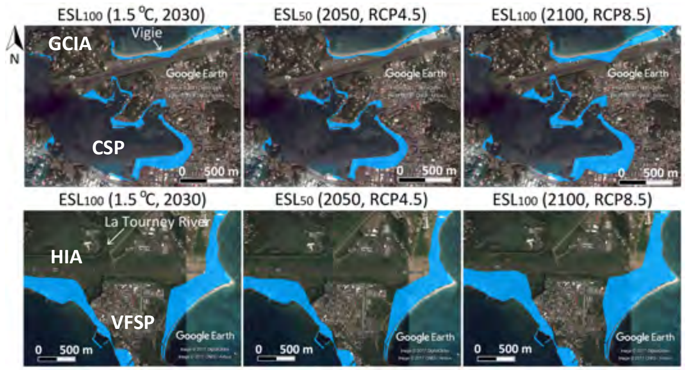


Time evolution of ESLs in relation to their baseline return periods for the 20- 50- and 100-year event, under RCP4.5 and RCP8.5, and for Jamaica (a) and Saint Lucia (b).

In both islands ESLs are projected to increase during the century, with the rise being faster under RCP8.5.

Inundation maps of Jamaican critical international transportation assets.

In Jamaica, even under the 1.5 °C SWL, the 100-year event will cause considerable flooding of the SIA runway. NMIA is less prone to coastal inundation. Under the 1.5 °C SWL, some areas of the KCT seaport are projected to be flooded under the 100-year event, whereas by 2100 extensive areas will be affected. The HFCP cruise port will be very moderately affected until the 2080s.



Inundation maps of St. Lucian critical international transportation assets.

In Saint Lucia, under the 1.5 °C SWL, GCIA appears vulnerable to the 100-year event mostly at its northern side (Vigie beach). HIA appears vulnerable at its eastern (seaward) edge. CSP is projected to be severely affected by the 100-year event under the 1.5 °C SWL. VFSP appears vulnerable to coastal flooding under all tested scenarios.

UNITED NATIONS CONFERENCE ON TRADE AND DEVELOPMENT

UNCTAD

SIDSport-ClimateAdapt

Climate change impacts on coastal transport infrastructure in the Caribbean: enhancing the adaptive capacity of SIDS

UNDA 1415O
Duration: 2015-2017
Full documentation is available at:
SIDSport-ClimateAdapt.unctad.org

Partners: UNECLAC, UNDP, UNECE, UNEP, CCCCC, ECJRC, OECS Comm., International/regional academic experts, among others

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About the project

Small Island Developing States (SIDS) share a number of socio-economic and environmental vulnerabilities. Their climate, location and geomorphology, as well as their reliance on coastal transport infrastructure exacerbate these vulnerabilities, including their susceptibility to climate variability and change (CV&C). At the same time, however, SIDS have limited capacity to conduct targeted risk – and vulnerability assessments and identify, prioritize and implement requisite adaptation options. Against this background and drawing on earlier related work, UNCTAD has carried out a technical assistance project.

The main objective of the project has been to strengthen the capacity of policymakers, transport planners and transport infrastructure managers in SIDS to take appropriate adaptation response measures to climate change impacts on seaports and airports.

To this end the project included:

- The development/application of a methodology to assist transport infrastructure managers and other relevant entities
- Case studies to enhance the knowledge and understanding at the national level
- Workshops for training/demonstration and feedback by a wide range of stakeholders

Case studies

Two vulnerable Caribbean islands: Jamaica and Saint Lucia were selected as case studies. Each case study sought to:

- assess the potential climate change impacts on main ports and airports; this includes the 1.5 °C global warming scenario (included as an aspirational goal in the Paris Agreement 2015), which may be reached as early as in the 2030s

- assess options for adaptation in response to the potential impacts
- support the development of the methodological framework

Key: SIA, Sangster International Airport; HFCP, Historical Falmouth Port; NMIA, Norman Manley International Airport; KCT, Kingston Freeport and Container Terminal

Jamaica

- Area of 10,990 km^2, population 2.7 million
- GDP ~14.75 billion USD (2014)
- Direct contribution of tourism is 8% (2014)
- ~7% of GDP is the cumulative loss (estimated in 2012) due to damage associated with natural disasters

Saint Lucia

- Area 616 km^2, population 185,000
- GDP of 1.43 billion USD (2015)
- Tourism contributes up to 41% (direct and indirect, 2015)
- 2% of GDP average (1992-2011) annual losses due to natural disasters. 60% and 43.4% of GDP were the damages/losses caused by Hurricane Allen (1980) and Hurricane Tomas (2010) respectively

Key: HIA, Hewanorra International Airport; VFSP, Vieux Fort Seaport; GCIA, George Charles International Airport; and CSP, Port Castries

The methodology

The methodology ("***Climate Risk and Vulnerability Assessment Framework for Caribbean Coastal Transport Infrastructure***") has been designed with a view to its transferability and replication in other SIDS, subject to to location-specific modifications.

Major stages of the assessment framework:

1. **Set context and scope** – at the outset, briefly set the parameters for the assessment
2. **Assess criticality** – understand the contributions of different elements of the transport system to the society and economy
3. **Assess vulnerability** – understand how critical elements of the transport system respond to climate stresses, and how risks of costly damages or disruptions may change in the future
4. **Develop adaptation strategies and mainstream in existing processes** – identify where further analysis is needed (and if so, circle back to stage 3), and where action can be taken without further analysis. Understand available options and strategies to reduce risks from CV&C. Monitor and evaluate to adaptively manage over time.

For technical details, see also Monioudi et.al, Reg Environ Change (2018). https://doi.org/10.1007/s10113-018-1360-4

Workshops

As part of the project the following workshops were held:

- A national workshop in **Jamaica**, which brought together a range of relevant stakeholders from the transport sector, as well as relevant ministries, national authorities, academic and research institutions.
- A national workshop in **St. Lucia**, which brought together a range of relevant national stakeholders (e.g. SLASPA) as well as policy makers and representatives of national authorities.
- A regional capacity-building workshop (**Barbados**), which brought together seaports and airports authorities, a range of other stakeholders, experts, development partners, and organizations from the wider Caribbean region (21 countries and territories).

The workshops provided an opportunity to present and discuss the findings of the case studies, and to provide demonstrations and training on the methodological framework developed under the project. In addition a series of high quality expert presentations complemented the programme.

Jamaica

In **Jamaica**, the assets selected for assessment are: the Sangster International Airport (SIA) in the north and the Norman Manley International Airport (NMIA) in the south, as well as the Historic Falmouth Cruise Port (HFCP) in the north and the main cargo handling Kingston Freeport and Container Terminal (KCT) in the south. 70 % of international passengers arrive at SIA at Montego Bay, whereas NMIA, located in the capital Kingston, caters mostly for visiting family and business travellers (1.6 million passengers in 2016). Due to its location and ability to host large cruise vessels, the HFCP is a major asset for the island's cruise ship industry, whereas the KCT facilitates most of imports and exports, and is a regional transhipment hub.

Saint Lucia

In **Saint Lucia**, the assessed critical international transportation assets are: the George Charles International Airport (GCIA) and the Port Castries seaport (CSP) located in the capital Castries; and the Hewanorra International Airport (HIA) and the Vieux Fort Seaport (VFSP), both situated at the southern coast of the island. HIA facilitates about 77 % of all air traffic (840,000 passengers in 2016), serving as the gateway for international long-haul flights, whereas GCIA handles mainly regional flights. CSP and VFSP seaports handle a significant fraction of the total OECS container traffic, with Port Castries being also a major cruise ship destination (677,400 arrivals in 2016).