



Climate Change Impacts on Coastal Transport Infrastructure in the Caribbean:
Enhancing the Adaptive Capacity of Small Island Developing States (SIDS)

Saint Lucia: A case study



UNITED NATIONS CONFERENCE ON TRADE AND DEVELOPMENT

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For further information about the project and relevant documentation, see SIDSport-ClimateAdapt.unctad.org.

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EXECUTIVE SUMMARY

Background

Small Island Developing States (SIDS) share environmental and socio-economic vulnerabilities that can challenge their growth and development aspirations. Their geographical location and geomorphology dictate reliance on coastal transport infrastructure, particularly seaports and airports, a fact that can exacerbate vulnerabilities due to the increased exposure of such assets to the variability and change of several climate-related forcings. At the same time, SIDS' capacity for adaptation and resilience building with regard to the coastal transport infrastructure is constrained by unfavourable economies of scale and limited financial and human resources for the targeted vulnerability assessments necessary to identify requisite adaptation options.

Against this background, an UNCTAD UN Development Account project has been carried out with the objective to design/test a methodological framework for assessing climate impacts on the coastal transportation infrastructure of Small Island Developing States (SIDS), with an emphasis on the Caribbean region. Two Caribbean SIDS with different environmental and socio-economic characteristics were selected as case studies: Jamaica and Saint Lucia. Detailed assessments of the vulnerability of the islands' transportation assets were carried out to: (a) improve knowledge and understanding at the national level, and (b) test new approaches in order to develop an appropriate methodology for assessing climate-related impacts on coastal transportation in other SIDS. The present report presents the assessment of the criticality of Saint Lucia's major transportation assets (airports and seaports) and their potential vulnerabilities to Climate Variability and Change (CV & C).

Saint Lucia: Economic Background and Risks Related to Transportation

Saint Lucia is a Small Island Developing State located at the Lesser Antillean Arc of the Caribbean Archipelago with a total resident population of 185,000 in 2015. The island is of volcanic origin. This has resulted in a mountainous and rugged topography, characterized by steep slopes cut by fast-flowing water drainage networks, confined low-lying coastal areas and 'pocket' beaches. Saint Lucia is an open economy which has progressed within the context of a relatively stable social and political environment. The island's economy is vulnerable to global economic shocks (such as the global financial crisis in 2008), fossil fuel price hikes, and changes in international trade and tourism preferences. In addition, due to its geological and climatic characteristics is subject to natural disasters.

The tourism sector is St. Lucia's main economic driver, which has been estimated to contribute up to 41.5 % of GDP (direct and indirect contributions, 2015), being also the largest earner of foreign exchange. In Saint Lucia, tourism follows the *Sea-Sand-Sun* (3S) model and, thus, most tourism infrastructure and activities are concentrated along the coast. On the back of strong tourism inflows and depressed oil prices, Saint Lucia's economy showed measurable recovery in 2015 following a weak performance over the previous three years. GDP growth reached 0.5 % in 2014, with transportation and hotels contributing mostly to the economic recovery. Saint Lucia, for the first time, surpassed the one million mark in the combined number of stay-over and cruise ship passengers. Between 2012 and 2015, the island recorded

an 11.1 % overall increase in stay-over tourist arrivals, from 306,801 to nearly 345,000. Total visitor expenditure increased to an estimated EC\$2.08 billion, supported by a 3.1 % rise in spending by stay-over visitors. The growth was projected to continue in 2016, with early projections set at 2.8 %.

While Saint Lucia's small size and high degree of openness have made it vulnerable to external economic shocks, its geographic location, climate and geology have also made it susceptible to natural hazards. The island is vulnerable to hydro-meteorological (e.g. high winds, excess rainfall, hurricanes) and geophysical events (e.g. earthquakes, volcanic activity), the impacts of which can be severe and pronounced by the island's small economy; historical information indicates that storm-induced flooding and landslides have been the most likely hydro-meteorological impacts affecting Saint Lucia. Average annual economic losses associated with extreme hydro-meteorological events for the period 1992-2011 have been equivalent to roughly 2 % of GDP or about US\$ 26.94 million PPP. However, singular high-impact events can be devastating: Hurricane Allen (1980) have resulted in damages/losses equivalent to about 60 % of GDP while the recent Hurricane Tomas (2010) resulted in damages/losses estimated at US\$ 336.2 million (43.4 % of GDP).

Key economic and critical infrastructure assets in the country including the airports, seaports and fuel storages, are all located along the coast or on low-lying reclaimed coastal land. Thus, transport infrastructure is vulnerable to the impacts of climate change, as is exposed to both coastal and inland flooding, which is further exacerbated by Saint Lucia's topography.

Critical facilitators of the large tourism sector are the key transport assets (i.e. airports, seaports and the interconnecting road network) that are mostly located on low-lying coastal land. Thus, transport infrastructure and operations are vulnerable to CV & C, particularly to changes in the intensity/frequency of marine storms and high rainfall events that can increase exposure of the major assets to marine and/or riverine flooding (and landslides). Changes in other climatic factors (e.g. the frequency of heat waves) can also disrupt transport operations. Generally, there may be severe effects of the CV & C on the transport infrastructure and operations that, in turn, could cause major disruptions to related economic sectors such as tourism.

Climate: Trends and Projections

St. Lucia experiences a tropical maritime climate. The location, size and geomorphology of the island allow for weather that is affected by large scale weather systems such as the northeast Trades, the El Niño Southern Oscillation (ENSO), the Atlantic High Pressure System and the passage of tropical waves, depressions, storms and hurricanes. Saint Lucia may be already experiencing some of the effects of CV & C. There is increasing evidence to suggest that its climate is changing, with major climatic trends and projections being as follows:

- Minimum temperatures have increased since 1960's at a rate of about 0.16 °C per decade (maximum temperature increase rates of about 0.20 °C per decade).
- The warming trend is expected to continue. The island is projected to be warmer compared to the 1970-1999 average temperature by up to about 1.8 °C by the 2050s and 3 °C by the 2080s. The

frequency of very hot days/nights will increase significantly and that of very cool days/nights decrease.

- There is no statistically significant trend in the historical rainfall, which shows considerable inter-annual variability. Projections by both GCMs and RCM show a drier island by the end of the century (projected median decreases in annual rainfall of up to 22 % and 32 %, respectively). Also, projections suggest likely decreases in total heavy rainfall.
- Sea levels will rise considerably in the course of the century. Recent projections suggest a mean level rise at Saint Lucia of 0.13 - 0.14 m by 2030s, 0.31 - 0.35m by 2060 and 0.56 - 0.76 m by the end of the century, depending on the scenario.
- Recent studies on the regional storm surges and waves project that marine storm conditions may not be overwhelming in the course of the century; these studies project small/moderate increases in storm surge levels as well as mostly decreases in the wave power of the extreme storms (e.g. the 100-year events).
- Hurricane intensity is projected to increase, but not necessarily the hurricane frequency.
- Sea surface temperatures in St. Lucia are projected to increase by 0.8 °C - 3.0 °C by 2080s, with potential adverse effects on the island's coral reefs.

Criticality of Transport Infrastructure

The contribution of transportation to Saint Lucia's economy was estimated at EC\$ 400,920,000 (13.45 %) in 2015, a figure that highlights the importance of seaports and airports and their intermodal connections in the social and economic development. The four major transport assets in Saint Lucia are the two airports (Hewanorra International Airport (HIA) and George F.L. Charles) and the two seaports (Castries and Port Vieux Fort). Their criticality is shown by their throughput:

- In 2015, 71,364 Twenty Foot Equivalent Units (TEUs) were transported through the two major seaports and about 2,965 tonnes through the airports with the incoming/outgoing cargo being also serviced by the road network;
- Visitor arrivals (stayovers and cruise passengers) totalled 1,073,017 in 2015;
- Saint Lucia is a major destination for cruise ships, with up to 677,394 arrivals in 2015, has direct

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