UNCTAD Multiyear Expert Meeting on Transport, Trade Logistics and Trade Facilitation

21-23 November 2018, Geneva

"Sustainable freight transport in support of the 2030 Agenda for Sustainable Development"

Sustainable transport and SIDS – some key considerations

by

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Sustainable transport and SIDS – some key considerations

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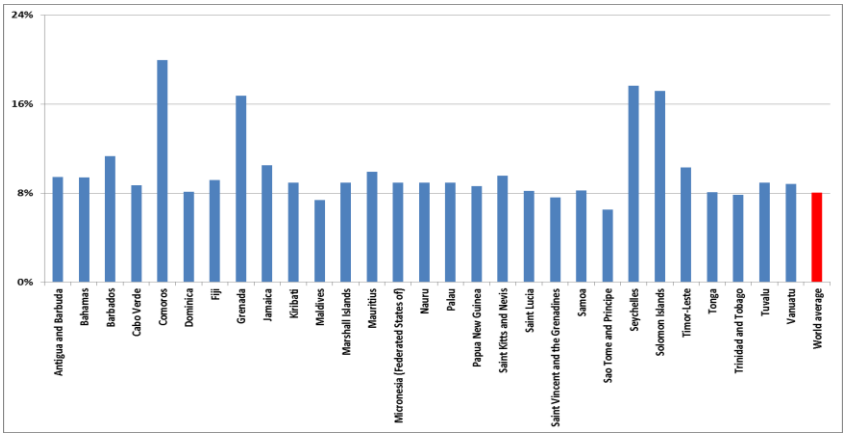
Key transport-related challenges facing SIDS – international, regional and domestic

- Small cargo volumes and imbalances
- Remoteness and limited access to global shipping networks
- Inter-island regional and domestic shipping connectivity
- High degree of dependency on energy imports
- Shipping market structure
- Freight rates and transport costs
- Seaport infrastructure and equipment – financing, maintenance, competing uses (cruise-ships, cargo vessels)
- Financial constraints (middle income countries)

10-year average expenditure (2004-2013) of selected SIDS on international transport as a percentage of the value of imports



Source: UNCTAD estimates. UNCTAD Review of Maritime Transport 2014. Chapter 6.

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Disaster Risks

Natural hazards: Geological and hydro-meteorological hazards (extreme events)

Many SIDS lie at tectonically-active margins or volcanic 'hot spots' and are vulnerable to earthquakes, volcanism and tsunamis

SIDS are exposed to extreme hydro-meteorological events, such as storms, floods, landslides, droughts and heat waves, and changes in climatic patterns e.g. monsoons

These events can compromise infrastructure integrity and disrupt/delay port and airport operations with detrimental effects on SIDS's economies

Disaster-risk reduction for transport infrastructure and services is key

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Climate Variability and Change (CV & C)

A global challenge and "*a defining issue of our era*" (former UN SG)

- Compelling scientific evidence of increasing impacts (IPCC, 2013; 2018)
- Huge potential costs associated with inaction (5-20 % of global GDP, annually (STERN Review 2006)
- A serious development threat particularly for the Least Developed Countries (LDCs) and the Small Island Developing States (SIDS)
- Since 2008, integration of CV & C considerations into UNCTAD's work on transport policy and legislation.

See unctad.org/ttl/legal for further information

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UNCTAD's work on climate change impacts and adaptation for coastal transport infrastructure and follow-up

(see further http://unctad.org/en/Pages/DTL/TTL/Legal/Climate-Change-and-Maritime-Transport.aspx)

2009 Follow-up	**UNCTAD Multiyear Expert Meeting: "*Maritime Transport and the Climate Change Challenge*"** UNCTAD edited multidisciplinary book: **Maritime Transport and the Climate Change Challenge** UN-Earthscan (Routledge/Taylor&Francis) (2012) 327 pp
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*"** Academic paper co-published by Experts (2013) 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	**UNCTAD DA Project *"Climate change impacts on coastal transport infrastructure in the Caribbean: Enhancing the adaptive capacity of Small Island Developing States (SIDS)"***

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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

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CV & C Impacts on Transport

Climate change and extreme events are likely to have *direct* and *indirect* impacts on transport infrastructure and services

Changes in temperature, humidity, precipitation, sea levels, as well as extreme storms and floods and other climatic factors are likely to

- affect seaports, airports, as well as other connecting transport infrastructure and the broader supply-chain
  - potential for *damage, disruption and delay* - economic and trade related losses
- affect demand for transport
- exacerbate other transport-related challenges

Enhanced climate resilience / adaptation for transport infrastructure is of strategic economic importance

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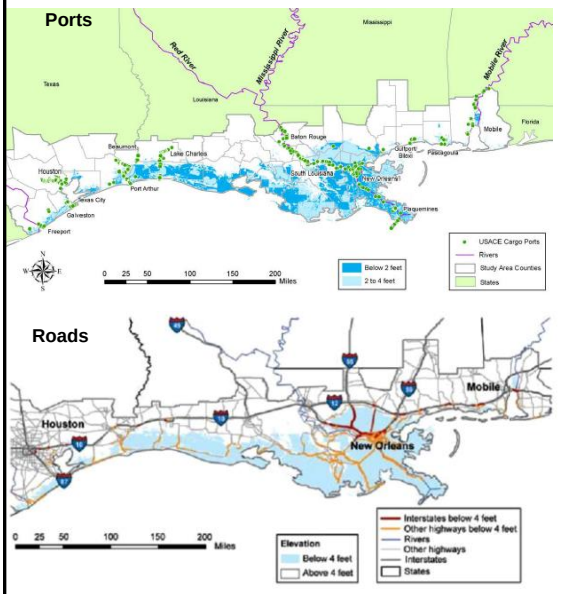

US Gulf Coast study (US DOT)

Flood risk at US Gulf coast under sea level rise 0-6 -1.2 m.

Mean sea level rise of about 1.2 m (4 feet) could permanently inundate:

- 3 airports
- over 70 % of existing port facilities
- more than 2400 miles of roads, and
- 9 % of the railway lines

Temporary flooding from storms can also be devastating

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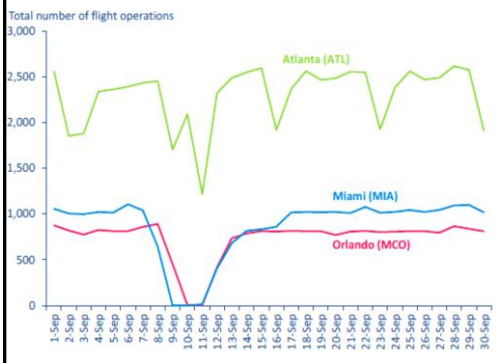
Impacts of extreme events (hurricanes)



Disruptions in flight operations at affected US airports in September 2017 (IATA, 2017: Assessment of Hurricane Irma and Maria's impacts on aviation)

2017 Hurricane season

- At the disruption peak, revenue losses for the industry of US$75-85m per day
- MIA and ATL handle 14 % of total US trade by air (by weight), approx. US$89.2bln of goods; disruptions could have affected about US$245m worth of cargo per day (IATA, 2017)

2018 Hurricane season

- 1,300 flights canceled due to *Florence* (09/13, CNN)
- Total damage from *Florence* in N. Carolina expected to exceed $10.6 billion (NOAA).
- 300 + flights canceled at Charlotte Douglas International Airport (N. Carolina) due to *Michael* (10/11 USA Today)

And these were *no direct hits*

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Major climate change impacts on coastal transport infrastructure

Factor	Impacts
Sea level (mean and extreme)	Coastal transport infrastructure (open sea ports, estuarine ports and inland waterway ports; airports; roads; railroads; bridges)
• Mean sea level changes • Increased destructiveness of storms/storm surges • Changes in the wave energy and direction	Damage to port and airport infrastructure/cargo from incremental and/or catastrophic inundation and wave regime changes; higher infrastructure construction/maintenance costs; sedimentation/dredging issues in port/navigation channels; effects on key transit points; increased risks for coastal road/railway links; relocation of people/businesses; insurance issues
Precipitation	
• Changes in the intensity and frequency of extremes • (floods and droughts)	Seaport, airport, and road infrastructure inundation; damage to cargo/equipment; navigation restrictions in inland waterways; network inundation and vital node damage (e.g. bridges); changes in demand
Temperature	
• Higher mean temperatures, • Heat waves and droughts • Increased spatio-temporal variability in temperature extremes	Damage to infrastructure/equipment/cargo and asset lifetime reduction ; higher energy consumption for cooling cargo; lower water levels and restrictions for inland navigation effects on estuarine ports (e.g. port of Rotterdam); reductions in snow/ice removal costs; extension of the construction season; changes in transport demand; lower aircraft payloads allowed-need for runway extension; increased health risks for staff and passengers
• Permafrost degradation • Reduced arctic ice coverage	Major damage to infrastructure; coastal erosion affecting road and rail links to ports Longer shipping seasons-NSR; new shorter shipping routes-NWP/less fuel costs, but higher support service costs

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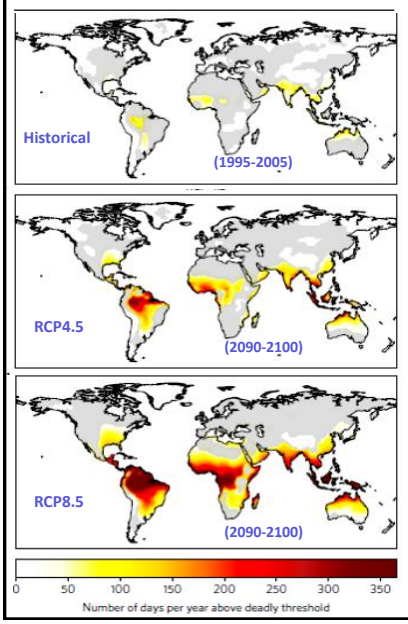

Impacts of temperature and humidity increases

The projected temperature (and humidity) increases will affect the human thermoregulatory system and may create difficult ambient conditions for transport due to

- direct impacts on transport operations/costs and
- changes in travel demand

Geographical distribution of past (1995-2005)and projected (2090 - 2100) deadly climatic conditions (from temperature and humidity increases) under a moderate (RCP4.5) and 'business as usual' (RCP8.5) emission scenario (Mora et al., 2017, Nature Climate Change)

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Regulatory developments

Enhanced climate resilience / adaptation for critical transport infrastructure is going to be key in achieving progress on many of the Sustainable Development Goal and targets

Legal / regulatory approaches will be important in the longer run to mainstream relevant considerations into planning

- Some examples already in existence, e.g.

- EU: EIA Directive 2014/52/EU of 16 April 2014, amending Directive 2011/92/EU); in force since May 2017
- California Bill (Assembly Bill No. 2800 CHAPTER 580) that modified the Public Resources Code (2016) effective Jan 2017
- ICAO Resolution A 39-2

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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 associated 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**

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ICAO Resolution A 39-2: Consolidated statement of continuing ICAO policies and practices related to environmental protection – Climate change

The Assembly (…) 19. Requests the Council to (…)

n) ***identify the potential impacts of climate change on international aviation operations and related infrastructure and identify adaptation measures*** *to address the potential climate change impacts, in cooperation with other relevant international organizations and the industry; (…)*

Annex:

The guiding principles for the design and implementation of market-based measures (MBMs) for international aviation: (…)

n) where revenues are generated from MBMs, it is strongly recommended that they should be applied in the first instance to mitigating the environmental impact of aircraft engine emissions, including mitigation and ***adaptation****, as well as* ***assistance to and support for developing States****;*

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The special case of the Small Island Developing States (SIDS)

SIDS face increased natural hazards, which have already incurred extremely high costs for their economies

Large dependency on international transport and high transport costs; transport costs in Caribbean trade at least 30 % higher than the world average (Pinnock & Ajagunna, 2012)

Coastal transport infrastructure (seaports and airports): critical lifelines for trade, food, energy, tourism (air transport and cruise-ships); disaster response

These assets are threatened by sea level rise and extreme events (storms)

Strong nexus between air transport and tourism: "Sea, Sun and Sand - 3S tourism", a very significant SIDS industry, is threatened by climate - driven beach erosion; the same applies to its facilitating transport infrastructure (i.e. airports and access roads)

UNCTAD UNDA Project *"Climate change impacts on coastal transport infrastructure in the Caribbean: Enhancing the adaptive capacity of Small Island Developing States (SIDS)"*

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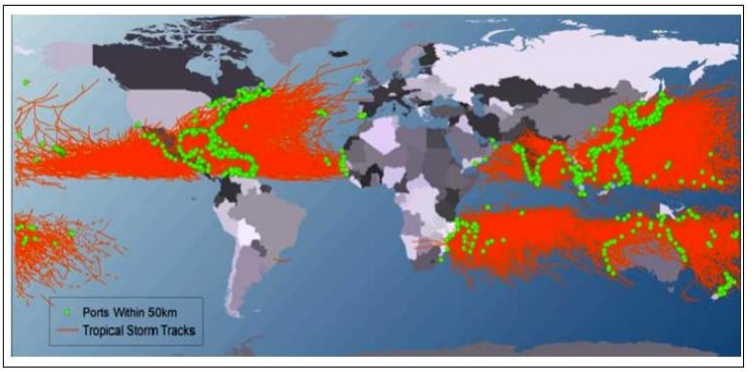
SIDS are vulnerable to storms



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)

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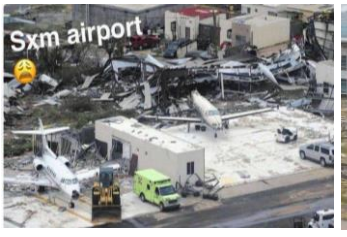
2017 hurricanes: impacts in the Caribbean

- 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

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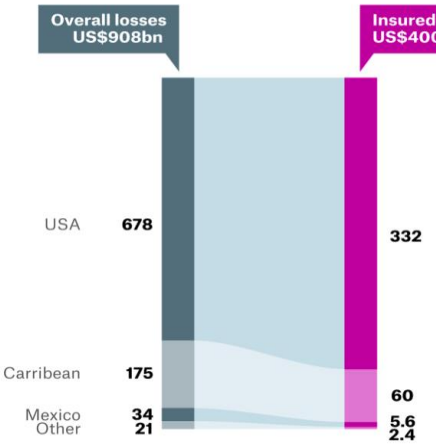
Extensive hurricane losses (mostly uninsured) in the Caribbean



Losses from hurricanes in N. America since 1980
MunichRe, World Meteorological Organization

Past Losses
Very large (for its economy) and disproportionate (uninsured) losses for the Caribbean

Adaptation makes sense
Every US dollar spent on weather and climate services could yield US$ 2 - US$ 14 in revenues as a result of avoided damages (according to the World Bank)

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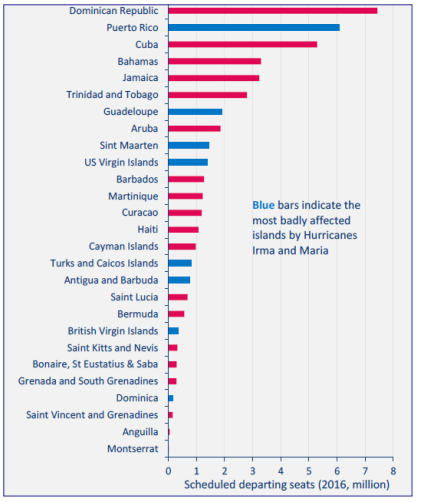
Caribbean: The most air-transport dependent region



Country	Travel & tourism % of GDP World Ranking, 2010)	% visitors arriving by air
Anguilla	61.0 (5)	84
Antigua & Barbuda	78.5 (1)	95
Bahamas (the)	46.5 (8)	88
Barbados	48.1 (6)	92
Belize	28.2 (17)	85
Bermuda	11.2 (65)	86
British Virgin Islands	43.7 (10)	94
Cayman Islands	23.3 (24)	67
Dominica	23.3 (23)	88
Grenada	24.4 (22)	96
Guyana	11.5 (63)	99
Haiti	7.0 (125)	n.a.
Jamaica	25.4 (20)	92
Montserrat	n.a.	99
St. Kitts & Nevis	30.5 (16)	91
St. Lucia	35.1 (13)	90
St. Vincent & the Grenadines	23.6 (23)	98
Suriname	4.6 (164)	93
Trinidad & Tobago	10.9 (66)	95

Caribbean passenger markets (2016) (IATA, 2017
Hurricane Irma and Maria's impacts on aviation)

(UNECLAC 2011)

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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
- Technical EG meeting (2016) to review, discuss and provide substantive inputs
- 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 vulnerabilities to CV & C of two Caribbean SIDS, focusing on potential operational disruptions and marine inundation risk to coastal internat'l airports and seaports of Jamaica and Saint Lucia, under different climatic scenarios*
- Innovative methodological approaches, validated by scientific peer-review

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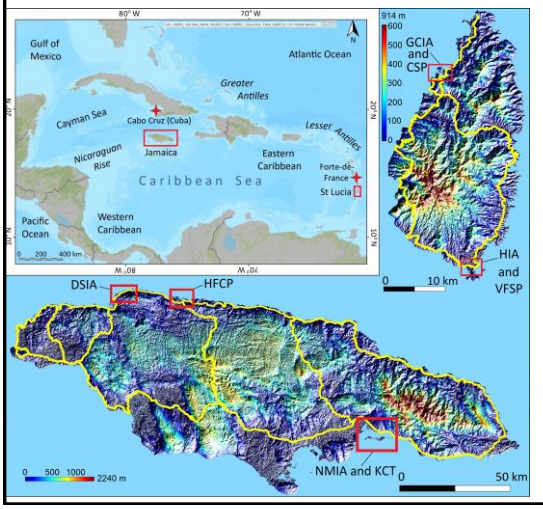
Climate change impacts on coastal transport infrastructure in the Caribbean: Enhancing the adaptive capacity of Small Island Developing States



Some findings:

High risk of marine flooding for key assets under extreme events and different CV & C scenarios

Operational disruptions also identified, using an operational thresholds method

See also:
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

Cited in **IPCC Special Report on Global Warming of 1.5ºC** (Ch. 3)

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

Operational thresholds method

Operational thresholds 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 costs under increasing temperature

Key findings:

Under the **1.5^{0}C Specific Warming Level (SWL, 2030s)**, staff working outdoors at the Jamaican and Saint Lucian airports will be at **'high' risk for 5 and 2 days/year (d/y)**, respectively. Under the SRES A1B scenario, high risk days will increase **to 30 and 55 d/y (2081-2100)** (RCM PRECIS temperature projections)

Under the 1.5^{0}C SWL, Boeing 737-800 aircraft 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^{0}C SWL will increase **the baseline energy requirements by 4 % for 214 d/y.**

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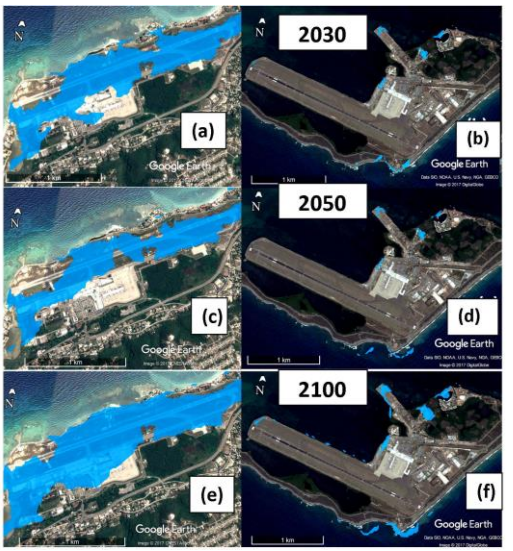
Marine flooding projections for airports under CV & C: **Jamaica**



- Dynamic modeling inundation
- Different scenarios were tested
- SIA (70% of international tourist arrivals) appears much more vulnerable than NMIA under all scenarios

***Flood maps**:*

(a, c, e) Sangster International Airport (SIA, Montego Bay) and (b, d, and f) of Norman Manley International Airport (NMIA, Kingston) for:

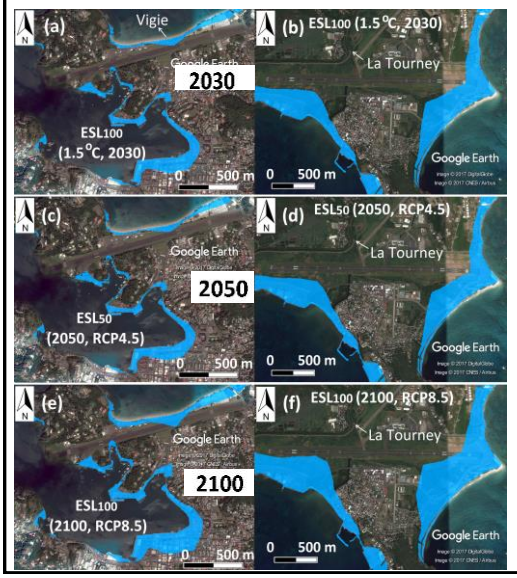
(a, b) 1-100 year extreme sea level event (ESL100) (1.5^{0}C SWL, 2030);

(c, d) 1-50 year extreme sea level event - (ESL50) (2050, RCP4.5); and

(e, f) 1-100-year extreme sea level event (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)

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Thank you!