



Global Sustainable Transport Conference, Ashgabat, 26-27 November 2016

*ICAO, UN-OHRLLS Side event*

*“Aviation partnerships for sustainable development”*

## **Climate Change Impacts and Adaptation for Transport Infrastructure in SIDS**

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[unctad.org/ttl/legal](http://unctad.org/ttl/legal)



## Climate Variability and Change – CV & C

- A global challenge and “*defining issue of our era*” (UN SG)
- Compelling scientific evidence (IPCC AR5, 2013)
- Huge potential costs associated with inaction (at least 5 % of the Global GDP, annually (STERN Review 2006))
- A development threat particularly for the Least Developed Countries (LDCs) and the Small Island Developing States (SIDS)
- Since 2008, integration of climate change considerations into UNCTAD's work on transportation

See [unctad.org/ttl/legal](http://unctad.org/ttl/legal) for further information



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

<p><b>2009</b></p> <p>Follow-up</p>	<p>UNCTAD Multiyear Expert Meeting: "<a href="#"><u>Maritime Transport and the Climate Change Challenge</u></a>"</p> <p>UNCTAD edited multidisciplinary book: <a href="#"><u>Maritime Transport and the Climate Change Challenge</u></a> UN-Earthscan (Routledge/Taylor&amp;Francis) (2012) 327 pp</p>
<p><b>2010</b></p> <p>Follow-up</p>	<p>Joint UNECE-UNCTAD Workshop: <a href="#"><u>"Climate change impacts and adaptation for international transport networks"</u></a></p> <p>UNECE Group of Experts on Climate Change Impacts and Adaptation for International Transport Networks (2011-2014); mandate extended in 2015;</p> <p>2012 International Conference - including session on SIDS</p> <p>2013 EG Report - <a href="#"><u>Climate Change Impacts and Adaptation for International Transport Networks</u></a></p>
<p><b>2011</b></p> <p>Follow-up</p>	<p>UNCTAD Ad Hoc Expert Meeting: "<a href="#"><u>Climate Change Impacts and Adaptation: a Challenge for Global Ports</u></a>"</p> <p>Academic paper co-published by Experts (2013)</p> <p><a href="#"><u>Becker et. al, A note on climate change adaptation for seaports, Climatic Change, 2013</u></a></p>
<p><b>2014</b></p>	<p>UNCTAD <a href="#"><u>Ad Hoc Expert Meeting</u></a>: "Addressing the Transport and Trade Logistics Challenges of the Small Island Developing States (SIDS): Samoa Conference and Beyond"</p> <p>UNCTAD Multiyear Expert Meeting: "<a href="#"><u>Small Island Developing States: Transport and Trade Logistics Challenges</u></a>"</p>
<p><b>Ongoing</b></p>	<p>UNCTAD Port-Industry Survey on Climate Variability and Change</p>
<p><b>Ongoing</b></p>	<p>UNCTAD DA Project "<a href="#"><u>Climate change impacts on coastal transport infrastructure in the Caribbean: Enhancing the adaptive capacity of Small Island Developing States (SIDS)</u></a>"</p>



## CV & C implications for Transport

The Climate Change debate: two sides of the “coin”: causes - effects

- **Mitigation:** action directed at addressing CC causes (long-term)
- **Adaptation:** action directed at coping with impacts of CV & C (short- and long- term); requires understanding of impacts, which vary considerably by physical setting, type of forcing, sector, mode, region etc.

### **In Transport:**

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



## CV & C Impacts on Transport

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

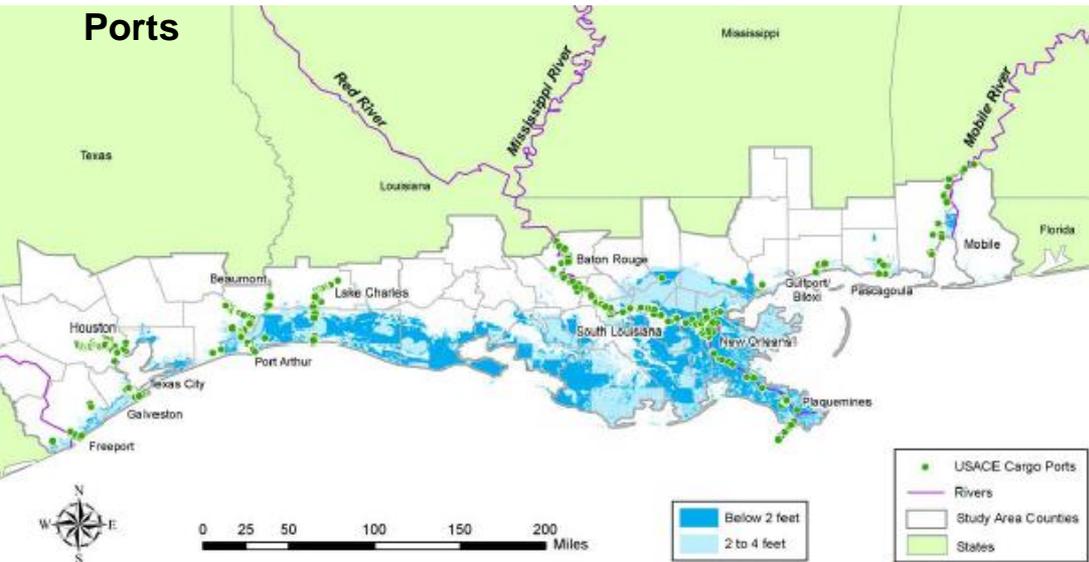
Sea-level rise, temperature and precipitation changes, extreme storms and floods and other climatic factors are likely to

- affect airports, ports and other coastal transport infrastructure, hinterland transport and the broader supply-chain
- affect demand for shipping/air transport
- exacerbate other transport-related challenges

Enhanced climate resilience / climate change adaptation for transport infrastructure is key



**Ports**



US Gulf Coast study (US DOT)

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

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

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

**Roads**



Temporary flooding from storms can also be devastating (during Katrina coastal sea level rose by almost 8 m in some locations)



## Major climate change impacts on coastal transport infrastructure

<b>Factor</b>	<b>Impacts</b>
<b>Sea level (mean and extreme)</b>	Coastal transport infrastructure
<ul style="list-style-type: none"> <li>• Mean sea level changes</li> <li>• Increased destructiveness of storms/storm surges</li> <li>• Changes in the wave energy and direction</li> </ul>	Damages in port/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 links; relocation of people/businesses; insurance issues
<b>Precipitation</b>	
<ul style="list-style-type: none"> <li>• Changes in the intensity and frequency of extremes (floods and droughts)</li> </ul>	Seaport, airport and road infrastructure inundation; damage to cargo/equipment; and vital node damage (e.g. bridges)
<b>Temperature</b>	
<ul style="list-style-type: none"> <li>• Higher mean temperatures,</li> <li>• Heat waves and droughts</li> <li>• Increased variability in temperature extremes</li> </ul>	Damage to infrastructure/equipment/cargo and asset lifetime reduction; higher energy consumption for cooling cargo; changes in transport demand; lower aircraft loads allowed-need for runway extension



## The special case of the SIDS

Large dependency on imports (i.e. international transport)

High transport costs (e.g. transport costs in Caribbean trade at least 30 % higher than the world average, see Pinnock and Ajagunna, 2012)

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

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 very significant SIDS industry, is threatened by climate - driven coastal and beach erosion, together with its facilitating infrastructure (i.e. seaports, airports, coastal access roads)

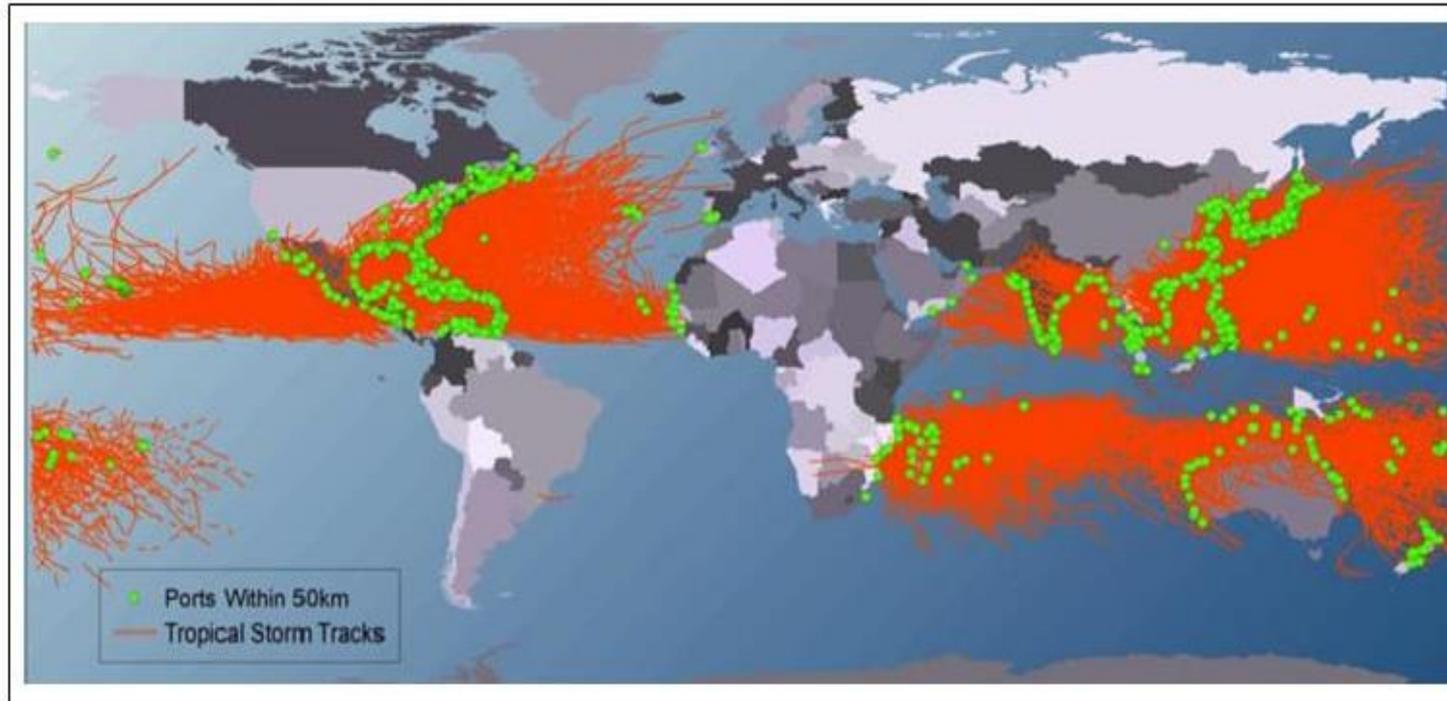
## Caribbean SIDS: The most air-transported tourist dependent region

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

In some Caribbean SIDS more than 50 % of GDP (ECLAC, 2011)



## SIDS are are vulnerable to storms

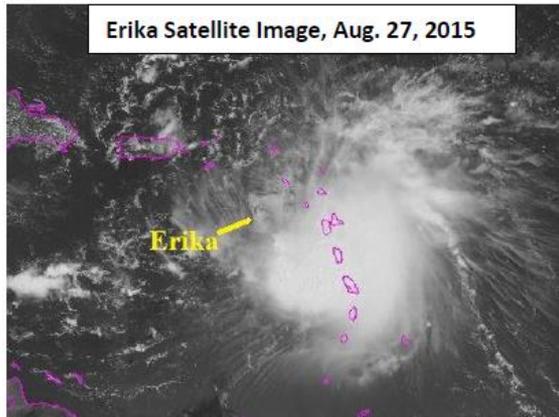


Seaports within 50 km of tropical sea storm tracks (1960–2010). Port and storm data from National Geospatial-Intelligence Agency (2011) and Knapp et al. (2010). (Becker et al., 2013)

N.B. Airports in SIDS are mostly located at low elevation (coastal), due to the physical setting of these islands (e.g. volcanic islands with little level land)



## Storm impacts on SIDS: Tropical storm Erika impacts on Dominica



Rainfall on 27<sup>th</sup> August: 434 mm



Transport infrastructure damages: (a) bridge and (b) airport apron

An initial assessment of impacts:

Tropical Storm Erika resulted in total damage and loss of EC\$1.30 billion (US\$483 million), equivalent to over 90 % of Dominica's GDP

The majority of damages and losses were sustained in the transport sector (60 %), the housing sector (11 %) and agriculture, fisheries, and forest (10 %)

(Source: Rapid Damage and Impact Assessment, Tropical Storm Erika – August 27, 2015 Report by the Government of the Commonwealth of Dominica September 25, 2015)



UNCTAD UN Development Account project to build the adaptive capacity of SIDS, taking into account regional specificities (2015-2017)

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

DRR and adaptation of coastal transport infrastructure to climate variability & change is critical for the sustainable development of SIDS

- Focus is on key coastal transport infrastructure (i.e. ports and airports) in SIDS
- Case-study approach involving 2 vulnerable Caribbean SIDS (Jamaica and St Lucia)
- Objectives:
  - To enhance the adaptive capacity at the national level (case-study countries)
  - To develop a transferable methodology for assessing climate-related impacts and adaptation options for coastal transport infrastructure in Caribbean SIDS
- Technical expert group meeting (including ICAO expert) June 2016 to review, discuss and provide substantive inputs to draft national case-studies and methodology
- National and regional capacity building/training workshops planned for 2017



## Relevance in the context of the SDG 2030 Sustainable Development Agenda

2030 Agenda adopted in September 2015, effective as of 1<sup>st</sup> 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 <b>combat climate change and its impacts</b>   |
| SDG 9   | <b>Build resilient infrastructure</b> , 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, <b>build the resilience of the poor and those in vulnerable situations and reduce their exposure and vulnerability to climate-related extreme events</b> and other economic, social and <b>environmental shocks and disasters</b> |



ICAO ASSEMBLY — 39TH SESSION, Report of the Executive Committee. Resolution 22/1 is recommended for adoption by the Plenary

**Resolution 22/1: 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;



Thank you!