

**UNCTAD Regional Workshop**  
5 – 7 December 2017, Bridgetown, Barbados

**“Climate Change Impacts and  
Adaptation for Coastal Transport  
Infrastructure in the Caribbean”**

**A coastal impact assessment framework  
under dynamic physical and socio-  
economic scenarios along SIDS**

**By**

**Michalis Vousdoukas**

European Commission, Joint Research Centre, Italy

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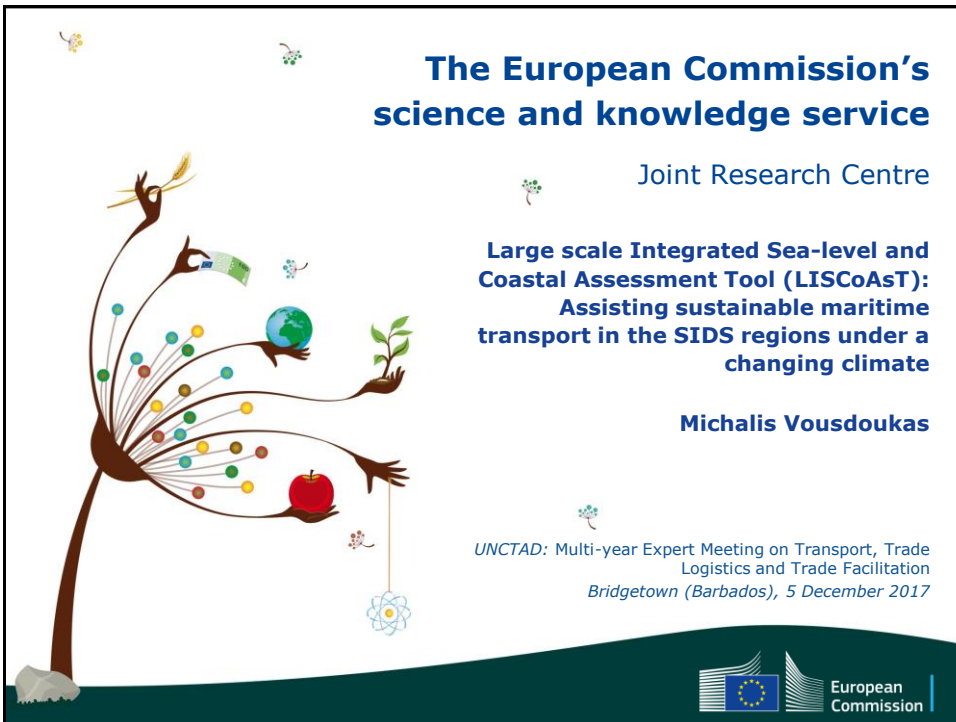
# The European Commission's science and knowledge service

Joint Research Centre

**Large scale Integrated Sea-level and  
Coastal Assessment Tool (LISCoAsT):  
Assisting sustainable maritime  
transport in the SIDS regions under a  
changing climate**

**Michalis Vousdoukas**

*UNCTAD: Multi-year Expert Meeting on Transport, Trade  
Logistics and Trade Facilitation  
Bridgetown (Barbados), 5 December 2017*



## Disaster Risk Management Unit Directorate E, Joint Research Centre, EC

### **Activity on river floods:**

European/Global Flood Awareness System (EFAS/GLOFAS)

Climate change projections (Alfieri L., Feyen L)

### **Coastal floods group:**

Michalis Vousdoukas, Lorenzo Mentaschi, Evangelos  
Voukouvalas, Dimitrios Bouziotas, Tomas Montblanc,  
Georgia Kakoulaki, Francesco Dottori, Luc Feyen

## Presentation outline

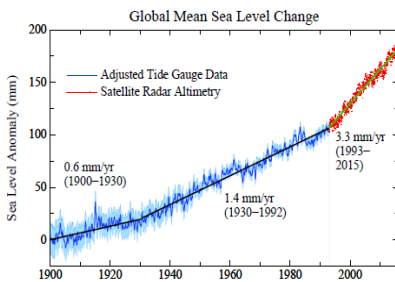
- Challenges for coastal resilience in view of climate change
- The LISCOAST framework
- Insights from our European and global studies
- Preliminary results for the SIDS domain
- The way forward

3

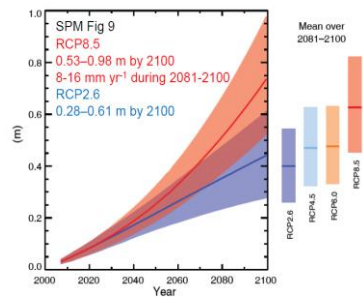


3

## Coastal risks and challenges: SLR



Hansen ACPD, 2015



IPCC 2013

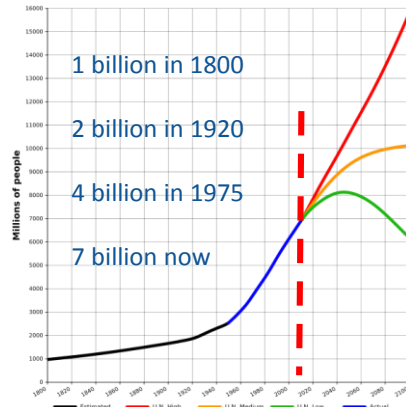
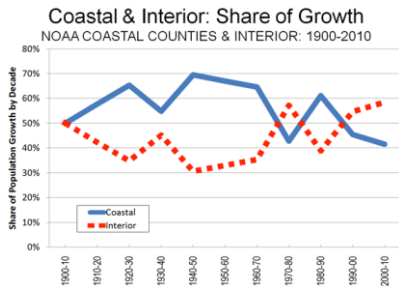
- The ocean absorbs >90% of the increase in incoming solar energy
- Past sea levels under 1.5-2°C warming conditions were 6-10 m higher than present
- Expansion of sea water per °C of warming is faster at higher temperature and higher pressure

4



# Coastal risks and challenges: Socio-economic development

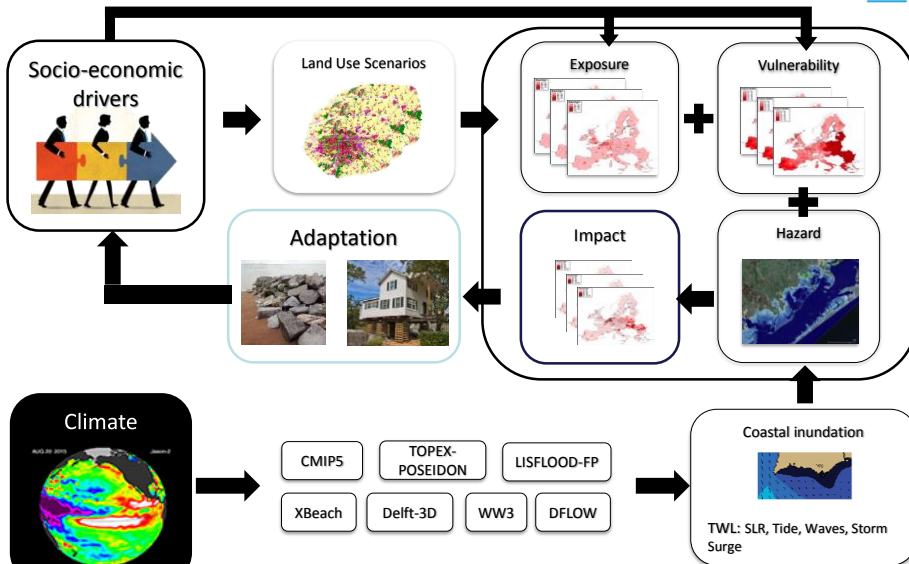
- 44% of global population lives within 100 km of the coast (UN Atlas 2010)
- A great proportion below 10 m elevation
- Population in Jamaica is increasing by 0.2%



5

UN 2010  
European Commission

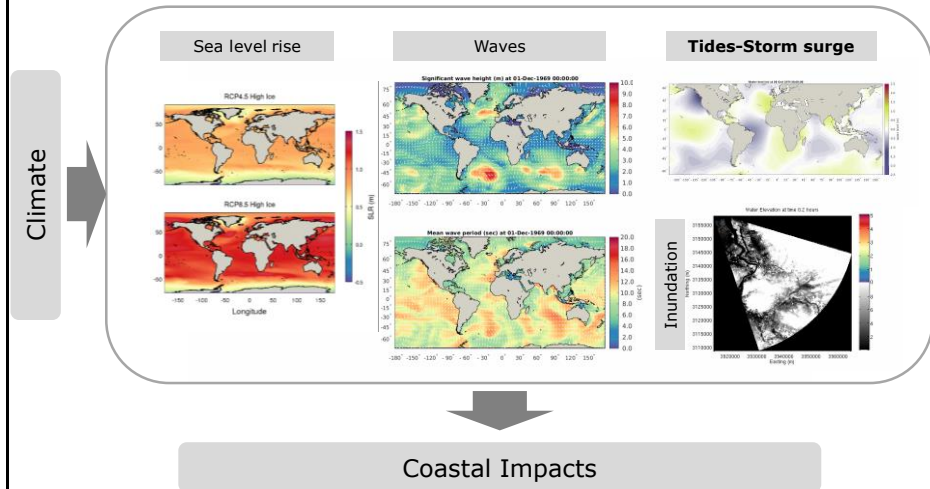
## The LISCoAsT approach



6

European Commission

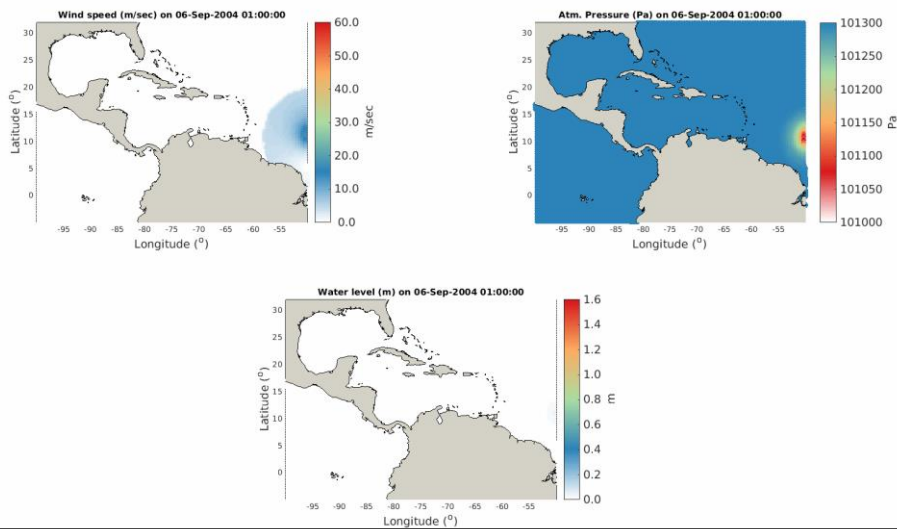
# State of the art hazard assessment



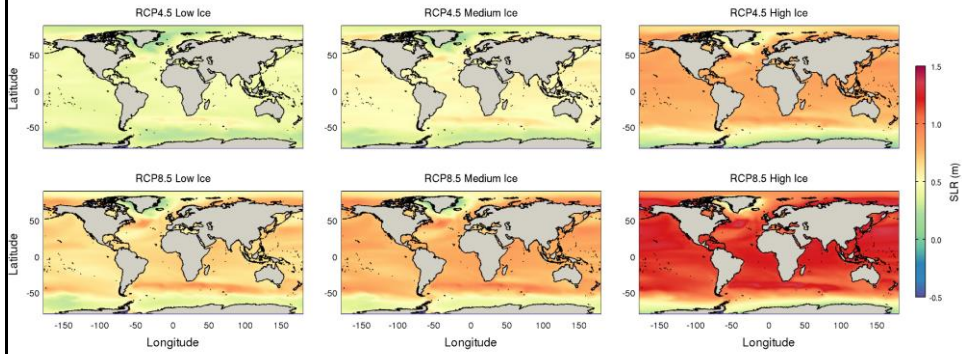
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## Sea level extremes: Tropical cyclones

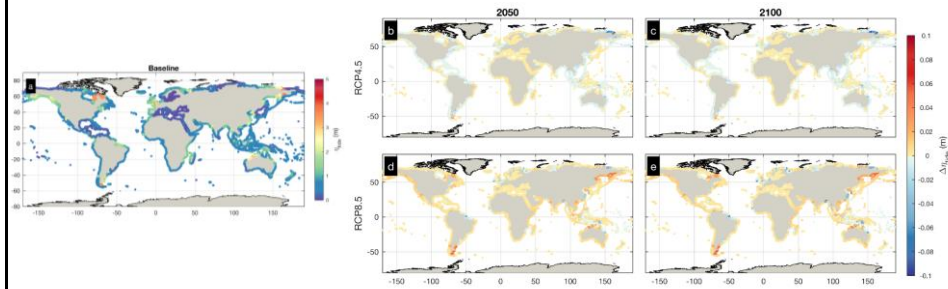


# SLR projections

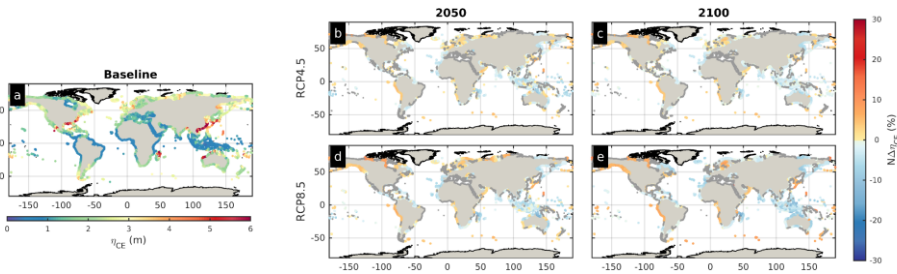


Jevrejeva et al. (2016)

# Global TWL projections: Tides

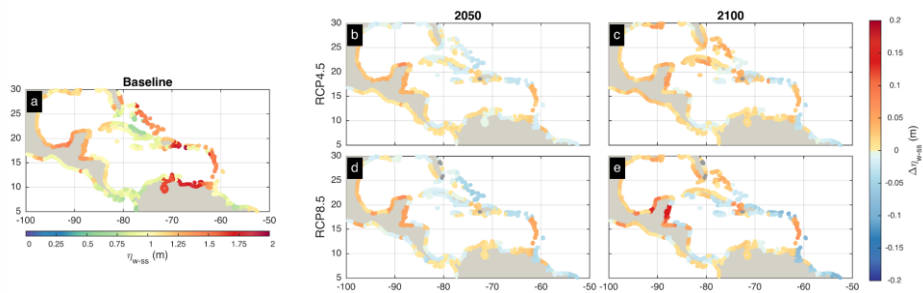


## Global TWL projections: Climate extremes



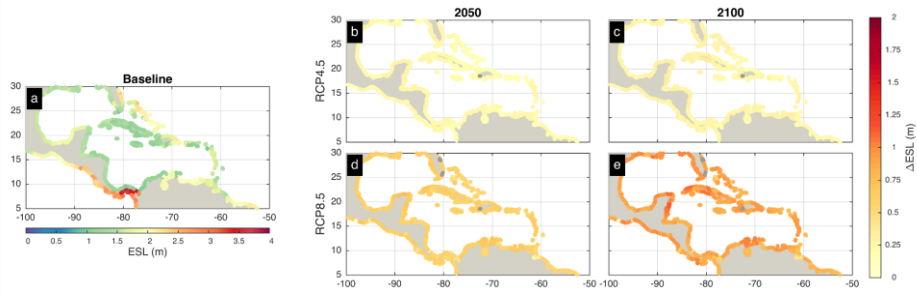
11

## Caribbean TWL projections: Waves and storm surge



12

## Caribbean TWL projections: All components

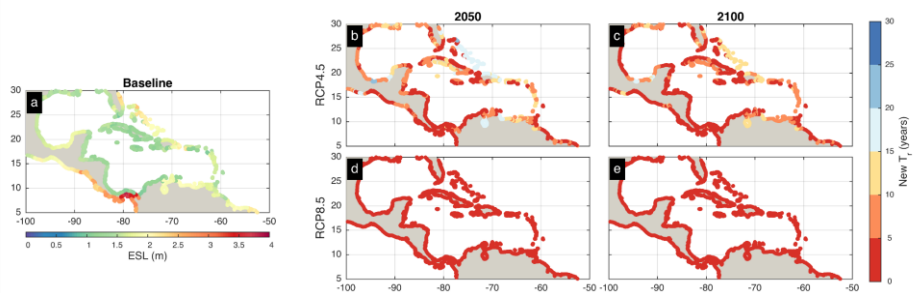


- Rise within 20-30 cm by 2050
- 51-86 cm by the end of the century

13



## Caribbean TWL projections: Changes in frequency



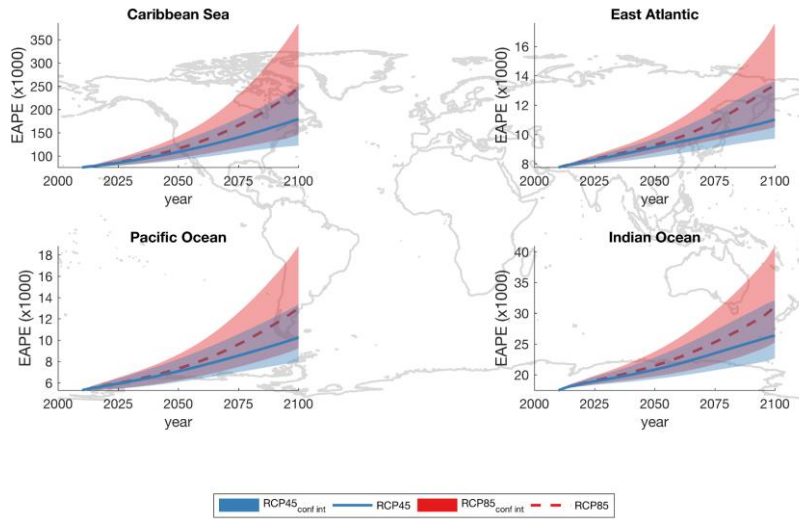
- By 2050 along many areas present-day 100-year event becomes below 5 years
- Occurring annually by the end of the century

14



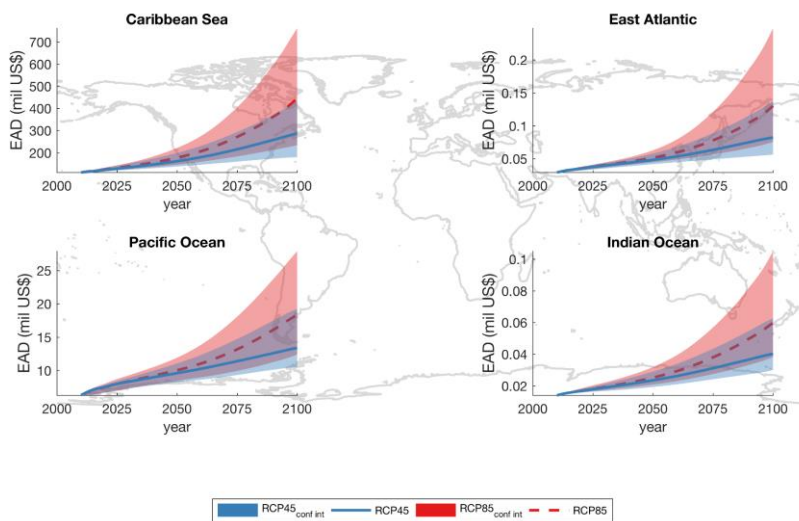


## SIDS: projected impacts



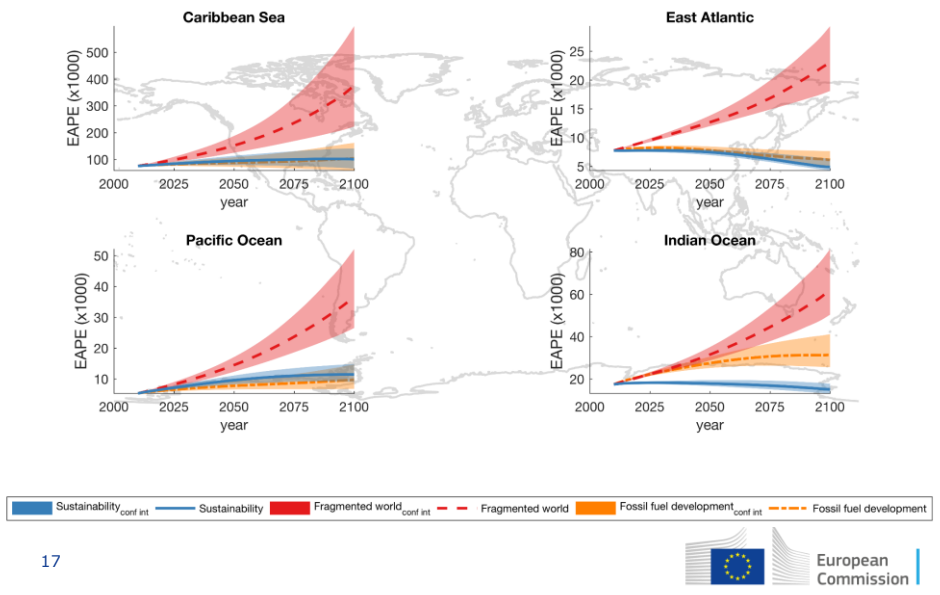
15

## SIDS: projected impacts

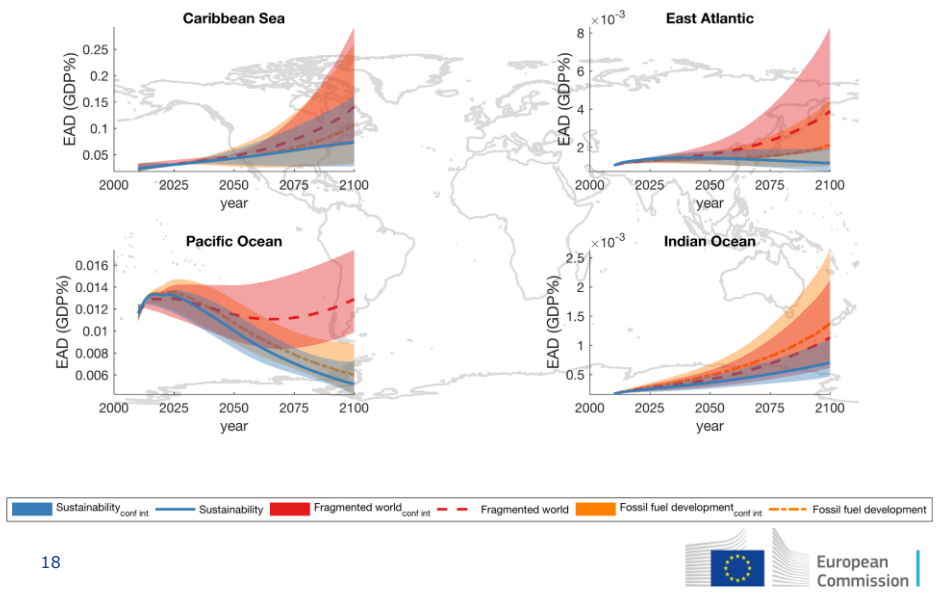


16

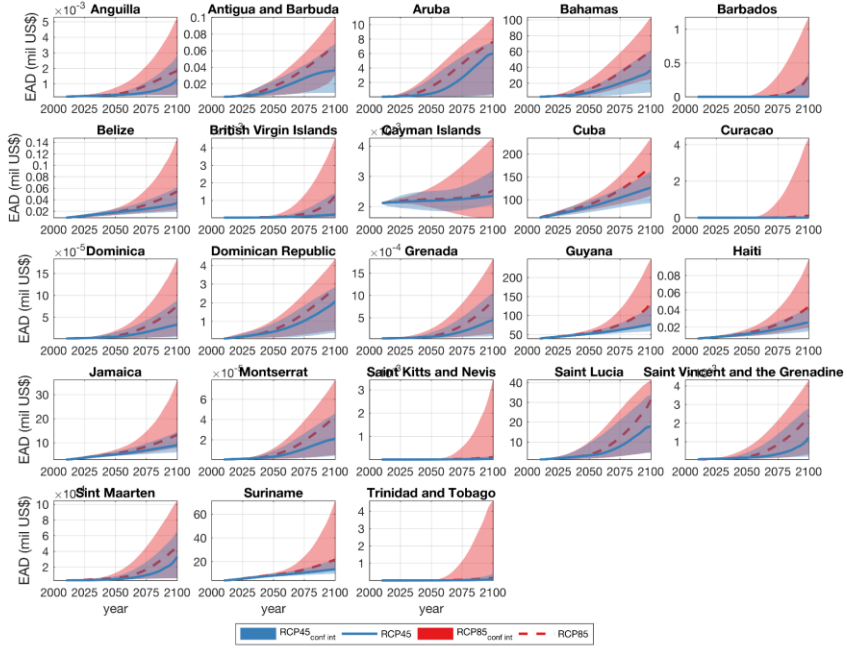
## SIDS: projected impacts



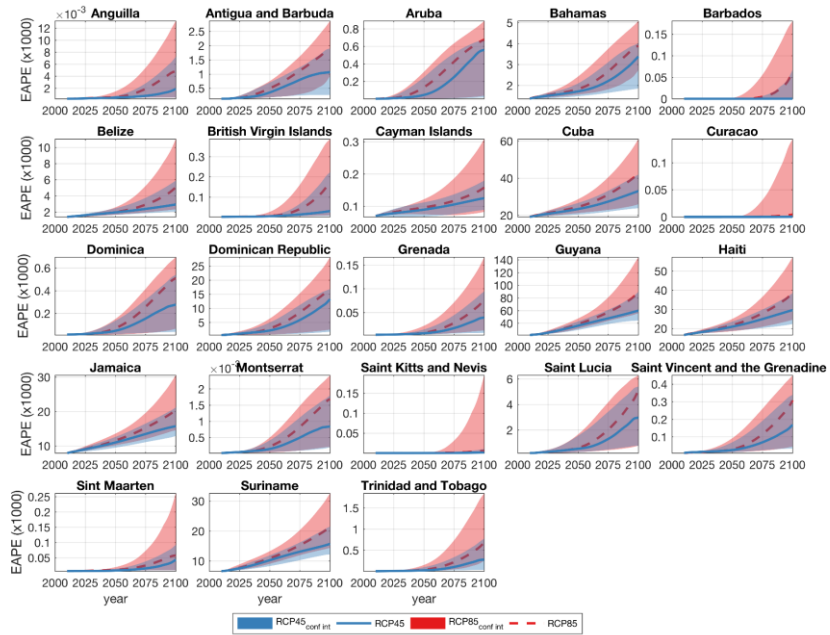
## SIDS: projected impacts



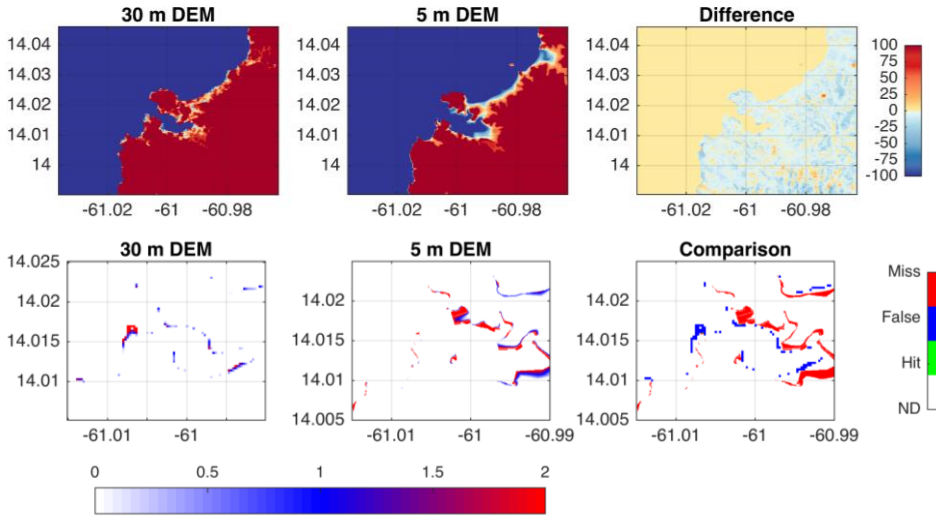
# Caribbean SIDS: projected impacts



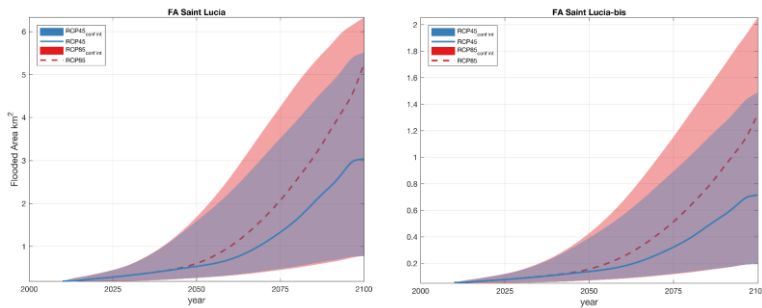
# Caribbean SIDS: projected impacts



## Effect of DEM quality on estimated impacts

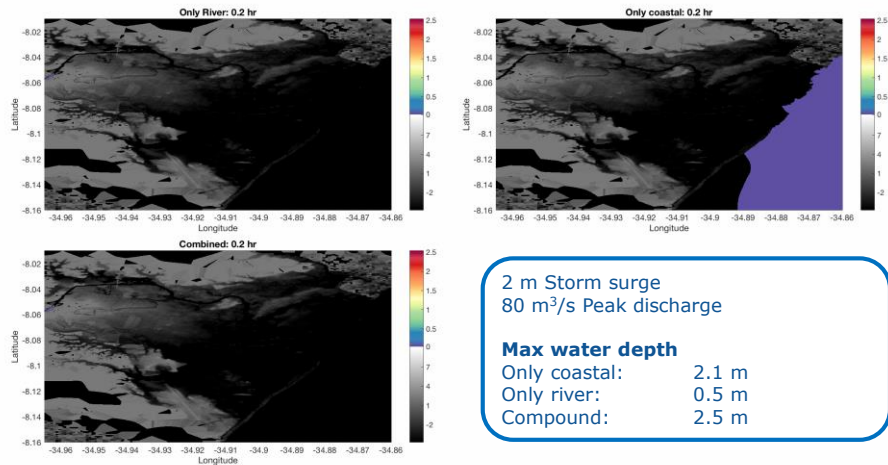


## Effect of DEM quality on estimated impacts



Parameter	HR	Standard	Ratio
FA (km <sup>2</sup> )	3	0.7	1/4
EAPE	3000	200	1/15
EAD (mil USD)	18	0.15	1/100

## Compound flooding events



23



## What is really at stake?

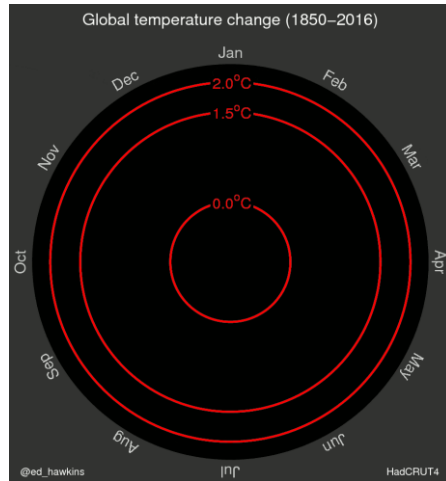
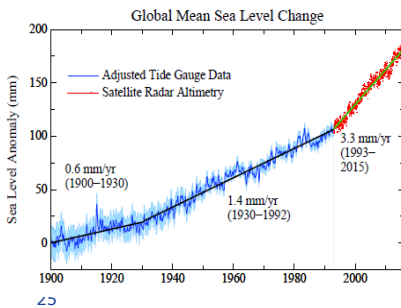
- Projections indicate an order of magnitude increase of direct impacts by the end of the century
- Without considering tipping points
- Without considering indirect impacts
  - Business interruption
  - Ecology
  - Sector interactions
  - Criticality of transport hubs
  - Etc....

24



## What is really at stake?

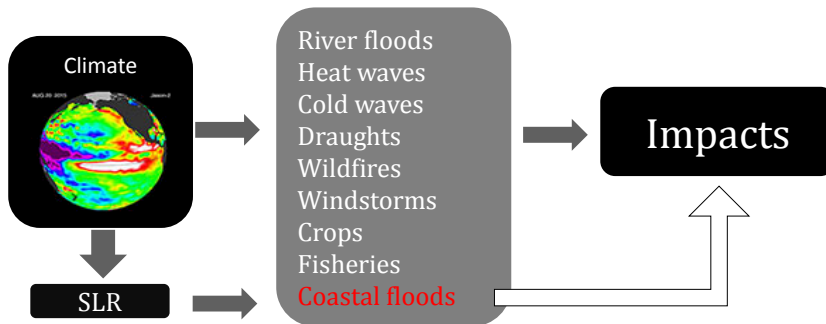
- The ocean absorbs >90% of the increase in energy
- Past sea levels under +1.5-2°C were 6-10 m higher than present
- Expansion of sea water per °C of warming is greater at higher temperature and higher pressure



Hawkins, MetOffice, 2016



## What is really at stake?

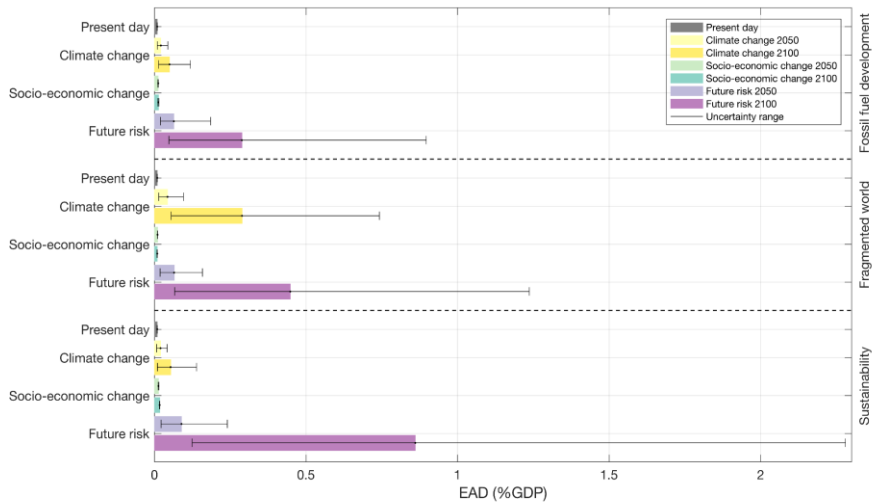


River floods: 0.04% GDP  $\Rightarrow$  0.1% GDP

Coastal floods: 0.01% GDP  $\Rightarrow$  0.29-0.86% GDP



## Physical vs socio-economic drivers



27

## Intangible/indirect impacts



[www.wikipedia.org](http://www.wikipedia.org)

	Coastline (km)	GDP	Expenses	GDPratio
Jamaica	894	14	0.7599	5.43%
NL	2000	752	1.7	0.23%



28

## Adaptation and social justice



James G. Titus and Michael Craghan (2009)



<http://porterbriggs.com>

- Need to acknowledge the challenging nature of coastal adaptation in view of climate change
- Urgency of moving towards the direction of a timely response, taking coordinated and fair measures

29



## Key conclusions

- ESLs rising with a faster pace along the century
- Increase of coastal losses by one or two orders of magnitude
- Climate change far more dominant than socio-economic development
- Coastal flooding becomes one of the prominent natural hazards in view of climate change
- A framework for impact assessment for SIDS in place and preliminary results available, but further work needs to be done

30





Thank you very much...

