The Climate Science Case for Adaptation

The premise…

*Extreme climate **sensitivity** which translates into **pervasive vulnerability***

Size, location and topography ensures climate influence always present & inescapable.

Caribbean: small islands surrounded by Caribbean Sea with hilly interior.

All major infrastructure located on limited coastal plains. Narrow economic zone.

The premise…

*Extreme climate **sensitivity** which translates into **pervasive vulnerability***

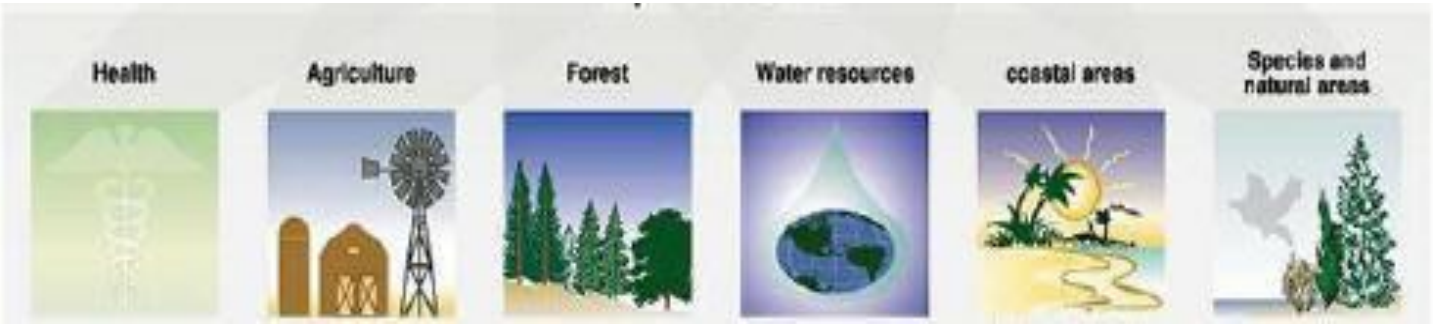
Extreme climate sensitivity i.e. climate is an integral part of everyday existence.

Economy (Agriculture including fisheries & Tourism) Health and Wellbeing (dengue and asthma) and Critical livelihood sectors (Water, Energy) bound up with climate

The premise…

*Extreme climate **sensitivity** which translates into **pervasive vulnerability***

Because the sensitivity is pervasive (across all sectors/areas of life) so is the vulnerability.



Why Science?

Science makes the case for:

1

Why we must act…

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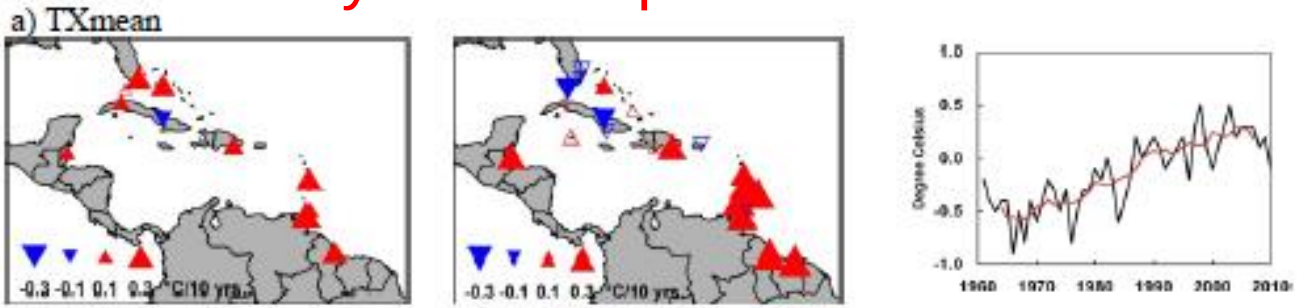
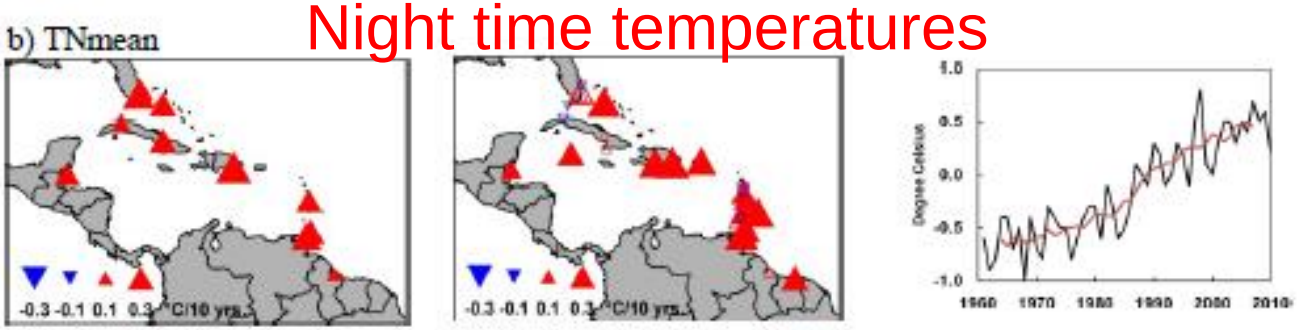
Because Caribbean temperatures are increasing

Day time temperatures



Night time temperatures



1961-2010 1986-2010

Stephenson et al (2014)

~ 0.8 degree rise since pre-industrialized times.

The regions Rainfall Patterns are changing

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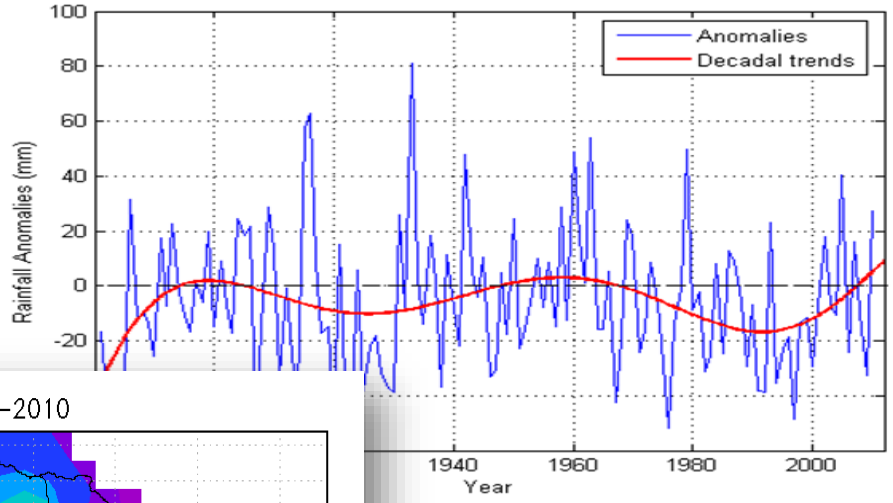

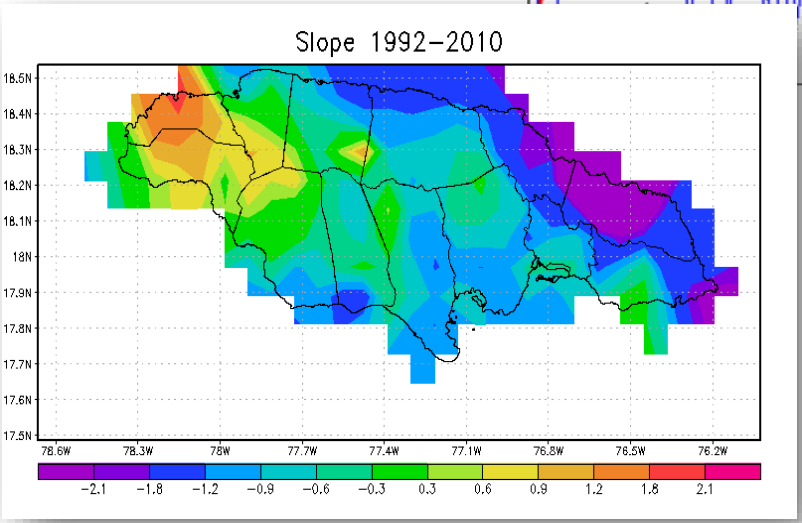

CSGM (2012)

Nature of Caribbean rain is changing (variable). Some places getting wetter, some getting drier.

The region has seen an increased occurrence of Extreme Events

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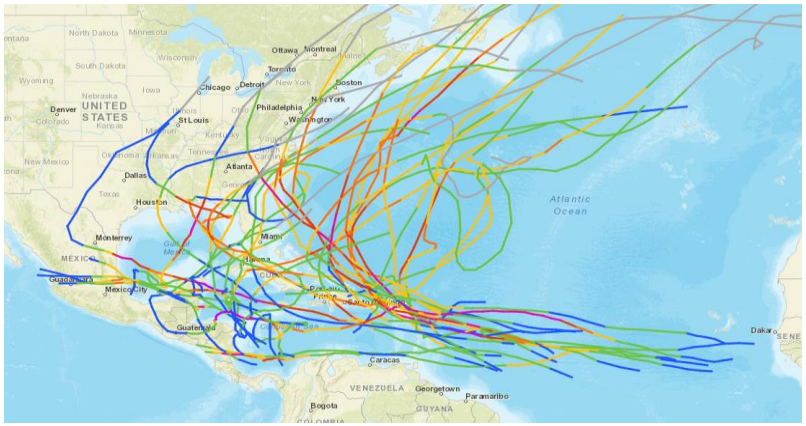
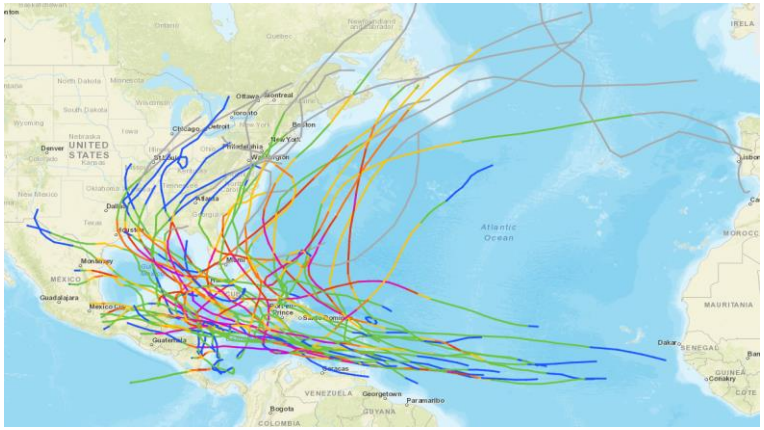


1981-2000

2001-2016



Changing climate leads to changing weather and extreme events.

The region has seen an increased occurrence of Extreme Events

1

Category	5	4	3	2	1	TS	Total
1981-2000	3	9	10	7	16	21	66
2001-2016	7	13	10	7	10	39	86

Changing climate leads to changing weather and extreme events.

Because the regions sea Levels are rising

1

	Trend mm/year	Gauge corrected
P. Limon	1.76±0.8	2.16±0.9
Cristobal	1.96±0.1	2.86±0.2
Cartagena	5.36±0.3	5.46±0.3
Riohacha	4.86±1.1	4.86±1.1
Amuay	0.26±0.5	0.26±0.5
La Guaira	1.46±0.3	1.56±0.3
Cumana	0.96±0.5	0.76±0.6
Lime Tree	1.86±0.5	1.56±0.5
Magueyes	1.36±0.2	1.06±0.2
P. Prince	10.76±1.5	12.26±1.5
Guantanamo	1.76±0.4	2.56±0.6
Port Royal	1.66±1.6	1.36±1.6
Cabo Cruz	2.26±2.8	2.16±2.8
South Sound	1.76±1.5	1.26±1.5
North Sound	2.76±0.9	2.26±0.9
C. San Antonio	0.86±0.5	0.36±0.5
Santo Tomas	2.06±1.3	1.76±1.3
P. Cortes	8.66±0.6	8.86±0.7
P. Castilla	3.16±1.3	3.26±1.3

'...Caribbean's rate of sea level rise appears to follow the global mean.'

Sea levels are rising at ~3.5 mm/yr (post 1993)

Example from Jamaica's sea Levels are rising

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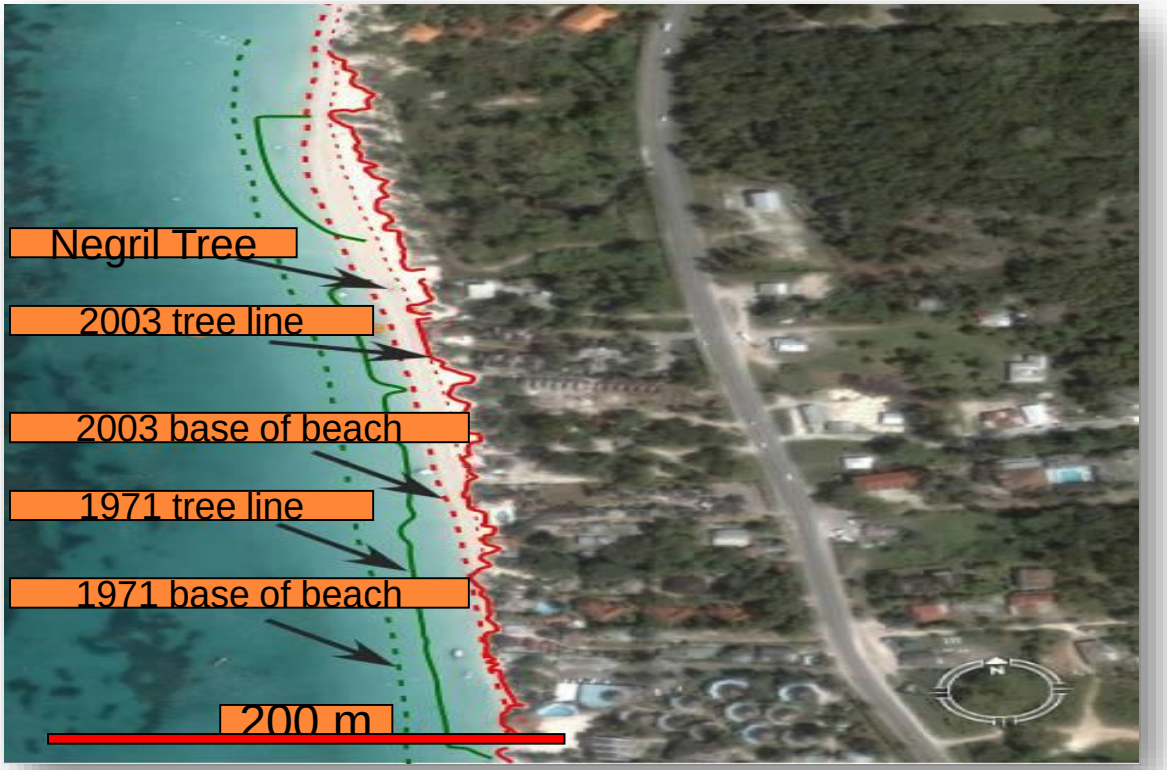


Marine Geology Unit, UWI:

Sea levels are rising at ~3.5 mm/yr (post 1993)

Why Science?

Science makes the case for:

1

Why we must act…

…Climate change is real for Caribbean and therefore so is our vulnerability

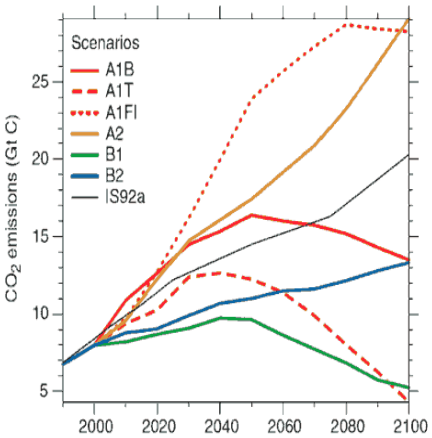
2

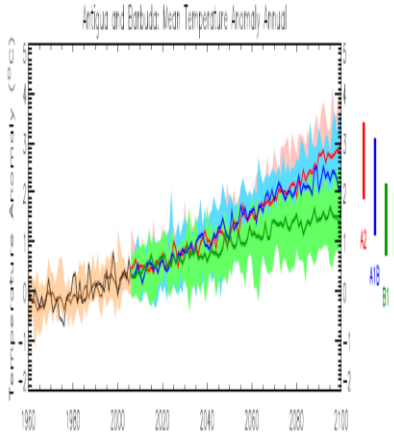
When we must act…

Projecting future climate…

1

2





Storylines

Models

Future Climates

Now, because the regions temperatures will continue to get hotter…

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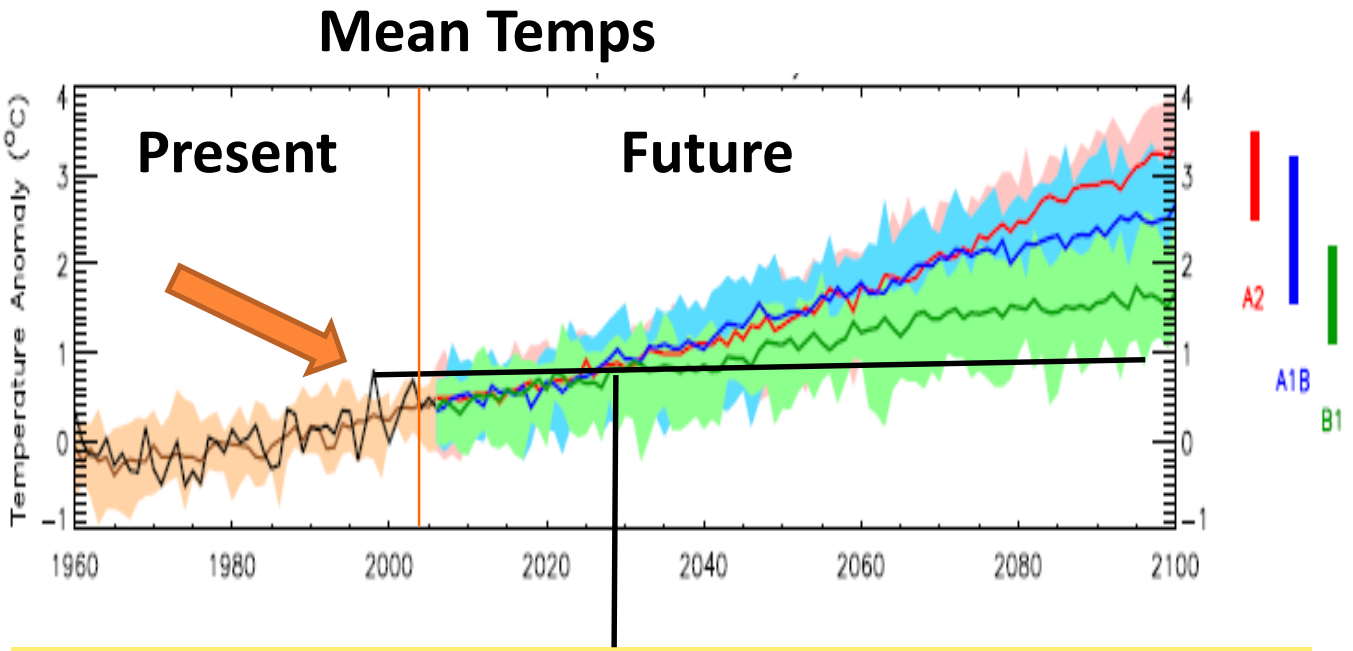

- By mid 2020s- mid 2030 every year (in the mean) will be warmer than hottest year felt to date. ← **Climate departure!!**
- Mora et al. (2013) puts it at 2023

Now, because regions rainfall will become more variable and less…

1

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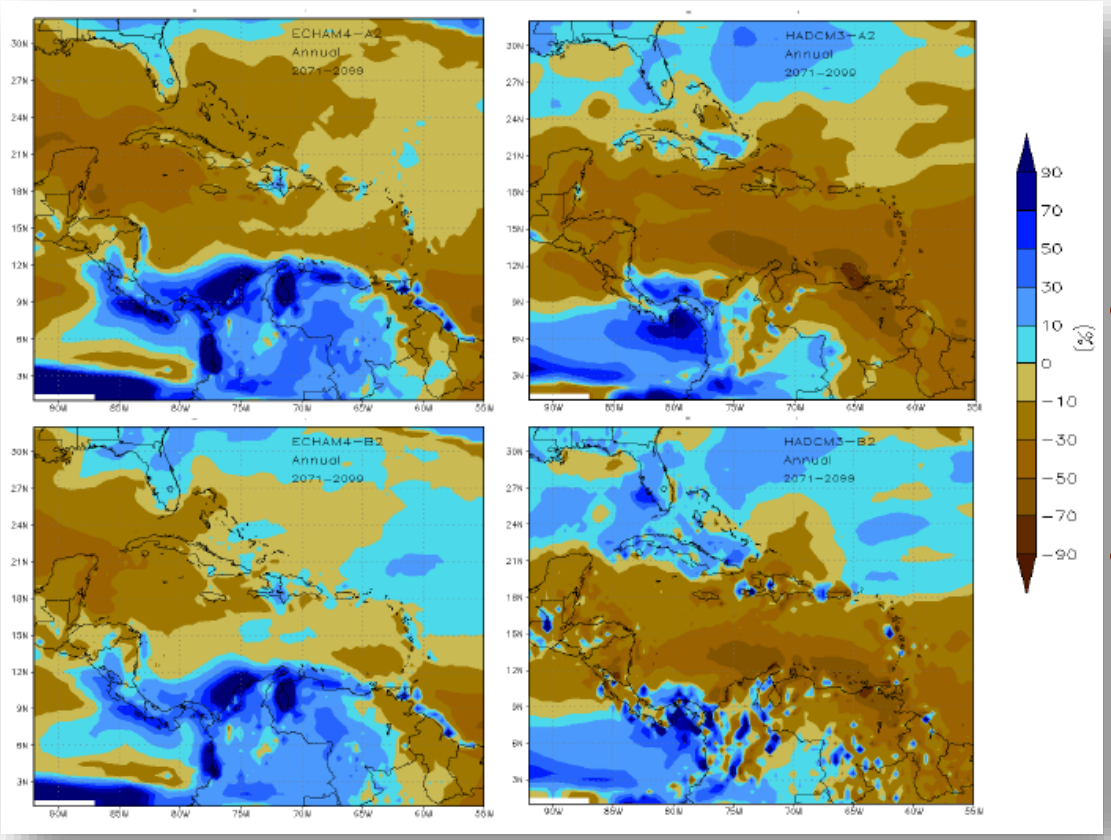

- Drying : 25% -30% by 2100
- Still variable!

McSweeney et al (2008) & Campbell et al. (2010):

Now, because regions rainfall will become more variable and less…

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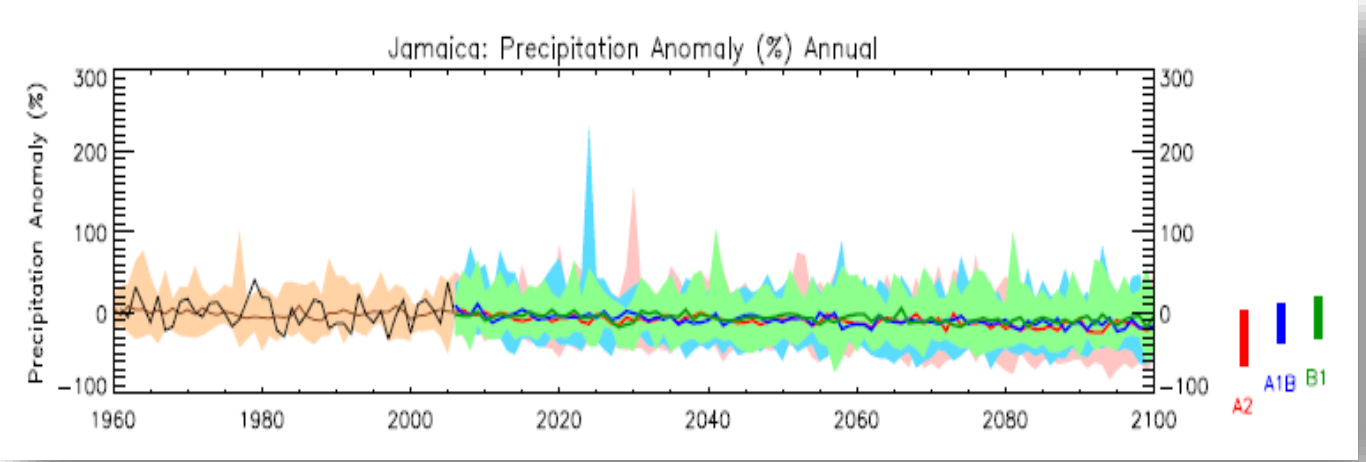

McSweeney et al (2008) & Campbell et al. (2010):

Now, because hurricanes will likely be more intense…

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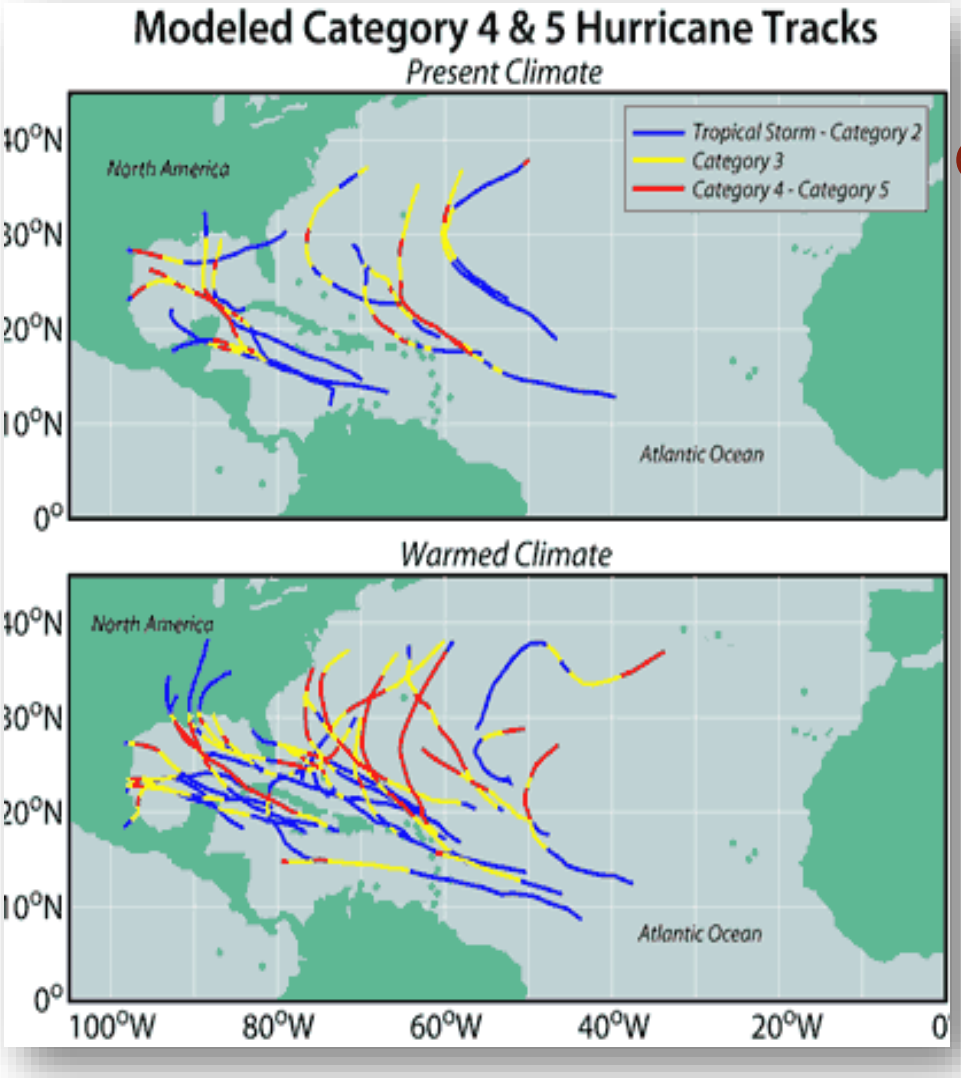

- Number of simulated storms remains the same but more intense, with higher rainfall rates and increased maximum winds.

Bender et al (2010):

Now, because sea levels will continue to rise…

1

2

Table 3: Summary of Global Sea Level Rise Projections for 21st Century [63,64,65,66,67]

	2050*	2100		
		Low Range	Central Estimate	High Range
Continuation of current trend (3.4mm/yr)	13.6 cm	-	30.6 cm	-
IPCC AR4 (2007)	8.9 cm to 23.8 cm	18 cm	-	59 cm
Rahmstorf (2007)	17cm to 32 cm	50 cm	90 cm	140 cm
Horton et al. (2008)	~ 30 cm		100 cm	
Vermeer and Rahmstorf (2009)	~40 cm	75 cm	124 cm	180 cm
Grinstead et al. (2009)	-	40 cm	125 cm	215 cm
Jevrejeva et al (2010)	-	60 cm	120 cm	175 cm

Example from Bahamas

- **Bahamas**
- 22 per cent of the population is at risk of flooding.
-
- Annual costs to the Bahamas GDP will predominately be tourism losses of between US$869m and $946m in 2050 and $2.2bn and US $2.6bn in 2080
-
- **Antigua and Barbuda**
- Under 1m sea level rise
- 2% of land lost with 1m rise in sea level
- 12% of population at risk
- 100% of airports at risk from flooding
- Threatens 50% of Tourist resorts

Why Science?

Science makes the case for:

1. **Why we must act…**
   …Climate change is real and therefore so is our vulnerability
2. **When we must act…**
   …Now! Climate will continue to change and therefore our vulnerability will grow
3. **How we must act…**

As if we know climate change will Impact our Agriculture

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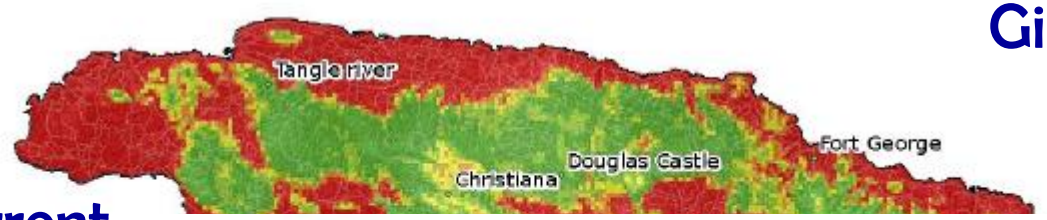
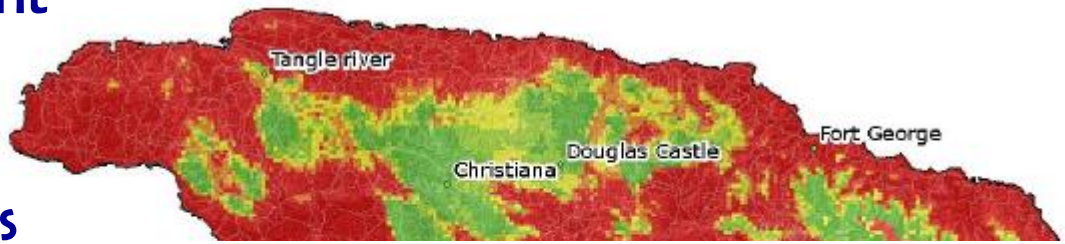
Suitability Maps

Ginger

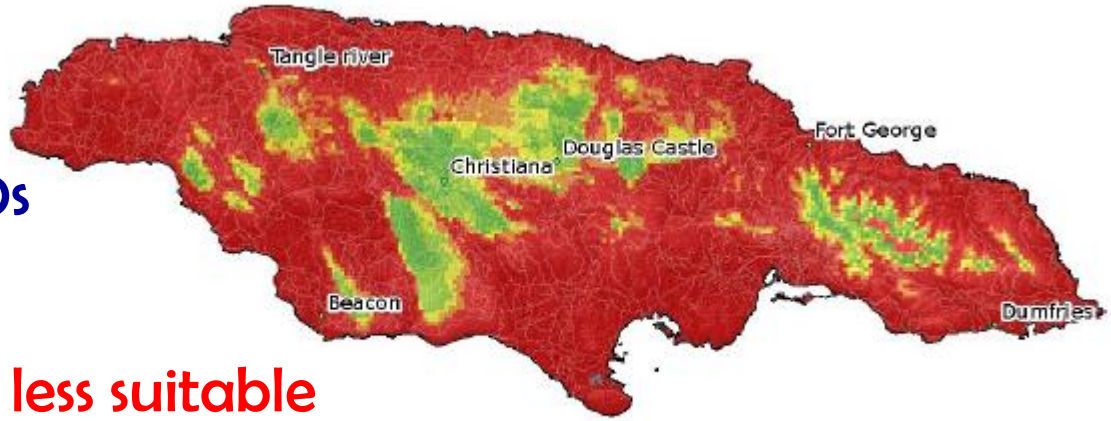
Current



2030s



2050s



27% less suitable

Barely suitable | Marginal | Suitable | Very good | Excellent

CIAT (2011)

As if we know it will impact our coastal infrastructure and settlements

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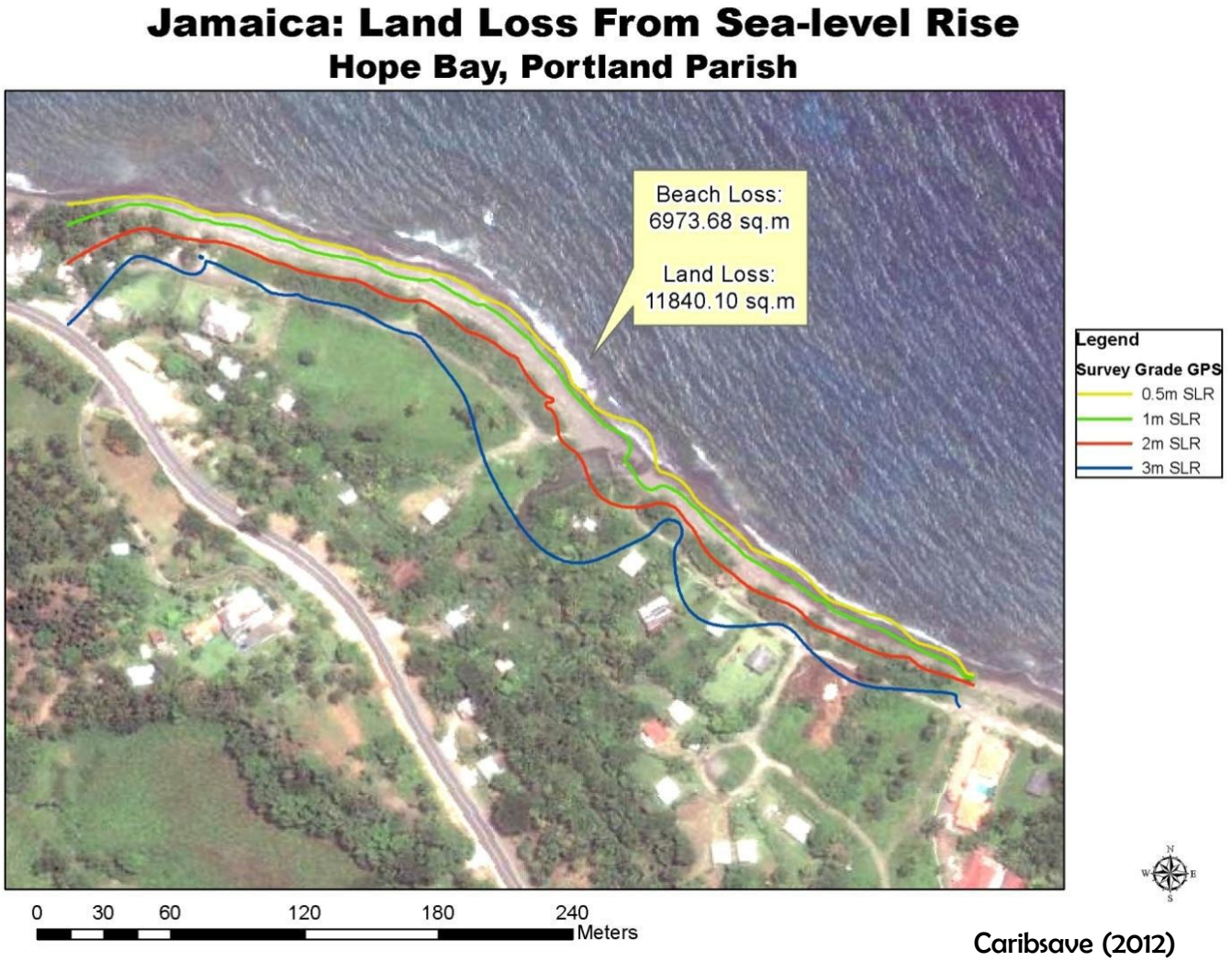

Caribsave (2012)

As if we know it will Impact our Tourism and biodiversity.

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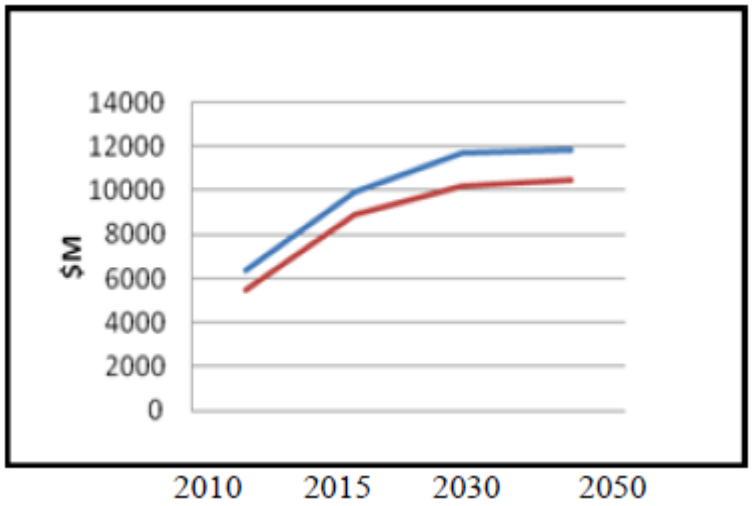
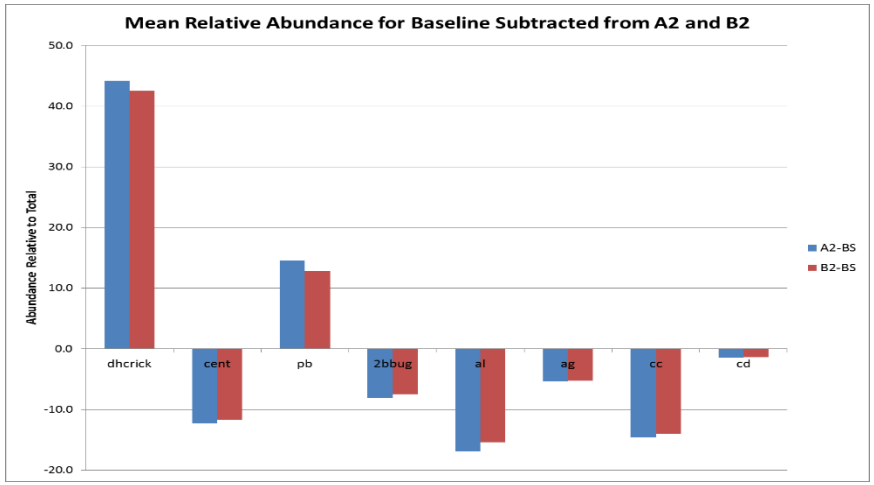


Aggregate cost of sea level rise and acidification: blue – A2; red- B2

Boxill et al. (2011)



Change in relative abundance of specie in Hellshire Hills

Stephenson et al. (2014)

1

2

3

Act in targeted ways informed by the science:

Mitigation

‘…efforts to reduce the amount of greenhouse gases in the atmosphere, either by reducing them at source or by creating sinks for the gases.’

Adaptation

‘…recognizes the inevitability of present and upcoming change and advocates pursuing options to facilitate living with the changed climate’

Education

‘…providing information and engendering behavioural change”

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When we must act…

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3

How we must act…

…In a targeted, evidenced based manner so that the real, growing challenges are addressed

Thank you