Climate Change Impacts in the Caribbean

United Nations Climate Change Conference, COP 15

Bella Center, Copenhagen

Monday 14th December,2009

What makes the Caribbean Vulnerable to Climate Change?

- It consists of 28 insular and coastal states and ten territories bordering the Caribbean Sea and the Gulf of Mexico.
- The estimated population is 40 million people of which some 28 million live in coastal cities, towns and villages and 38% of the population can be classified as poor.
- Economic activities are frequently dominated by specialized agriculture such as sugar and/or tourism.
- It is already experiencing the early Impacts of current Climate Variability and Climate Change.

What are the projections of future Climate?

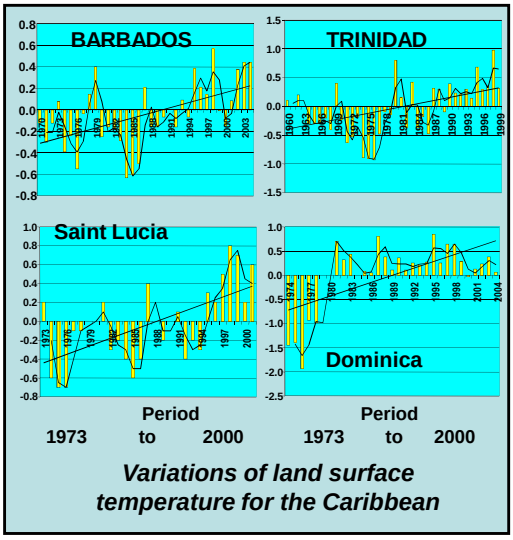
- **LATEST IPCC ESTIMATE – Feb. 2nd 2007**
  - 2-4.5 Degrees Centigrade (most likely 3 degrees centigrade)
- **INITIAL ESTIMATE - 2001**
  - **Temperature rise of between 1.5 to 5.8 degrees Centigrade by 2100 based on a decadal increment of 0.2°C**
  - **Initial global estimates of Sea level rise of 11-77cm**
  - **Increase in frequency? and intensity of storms**
  - Stern report estimates 50 % chance of Temp. rise of about 5 Degrees Centigrade by end of century under a BAU scenario.

Climate Change Trends in the Caribbean

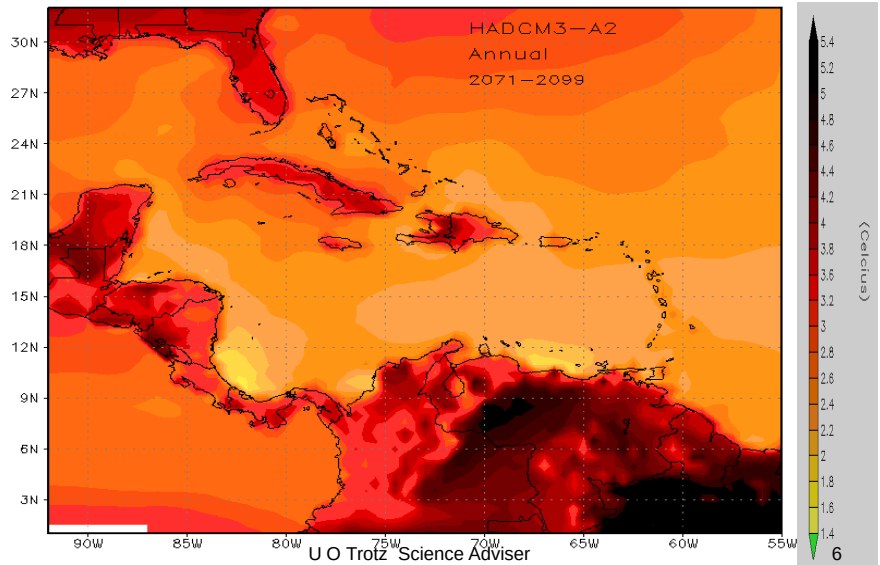
- **Past 3 decades trend of increasing mean temperature**
- **By end of 1970's a significant warming detected in lower part of atmosphere**
- **Significant >> in minimum temp.(1.4 deg. since 1960)**
- **No. of warm days in region >>, no. of cold nights <<.**
- **Frequency of droughts >> since 1960 (Cuba)**
- **Frequency of occurrence of extreme events changing- Flooding & hurricane passage > in 1990's**

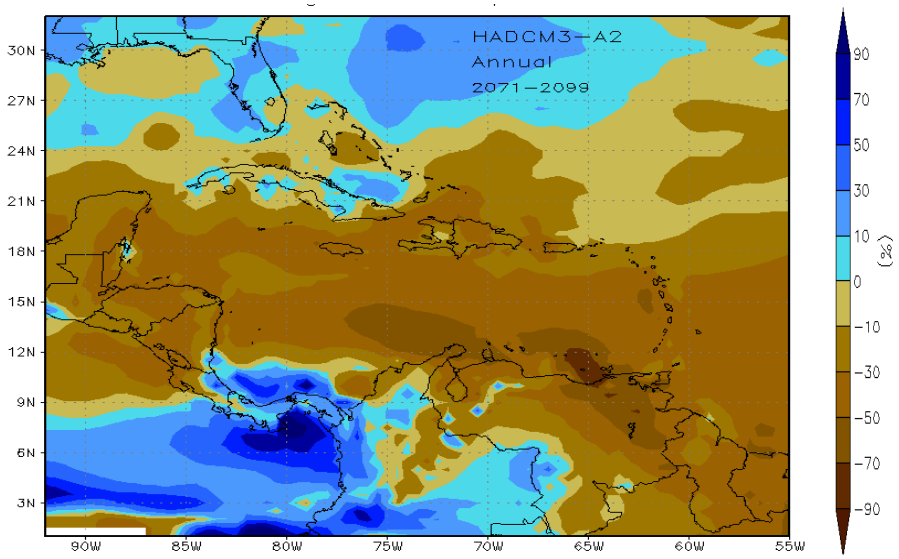
Temperature Trends in the Caribbean

- **Temperatures in the Caribbean region are changing in a manner consistent with the observed variations at global and northern hemisphere levels.**
- **Temperature records have shown an increase in the last century, with the 1990s being the warmest decade since the beginning of the 20th century.**



Variations of land surface temperature for the Caribbean





OBSERVED CHANGES ASSOCIATED WITH WARMER TEMPERATURES

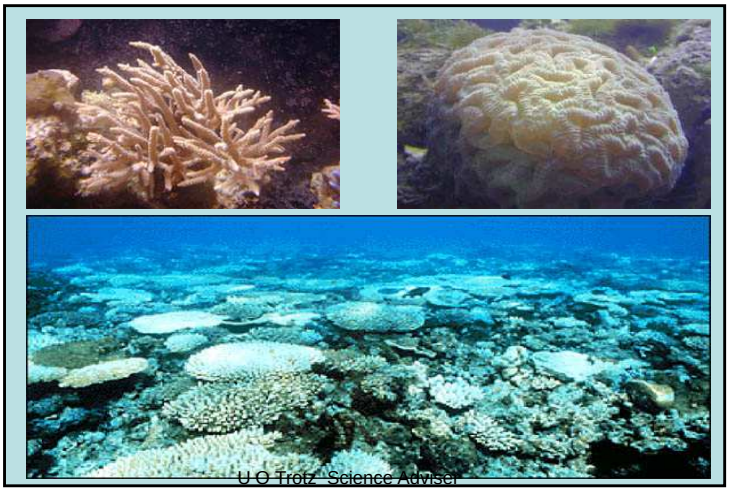
- **Lower diurnal temperature variation and much warmer nights**
- **More prevalent coral bleaching**
- **Hurricanes developing at lower latitudes and becoming more intense in shorter periods of time**
- **More frequent outbreaks of pest infestation**
- **More extreme droughts and rainfall**
- **More incidences of extreme temperature-related stress events to humans, animals, and plants**

Likely Consequences of a Warmer Climate in the Caribbean

- **Will pose significant, and in some cases insurmountable challenges to the region's Economic and Social Vulnerability**
- **Expected Areas of Negative Impact**
  - Agriculture/Fisheries
    - Food security threat
  - Tourism
    - Economic sustainability
  - Health
    - Increase in vector borne diseases and other heat related diseases
  - Water
  - Human Settlements

IMPACT OF WARMER SEA TEMPERATURE

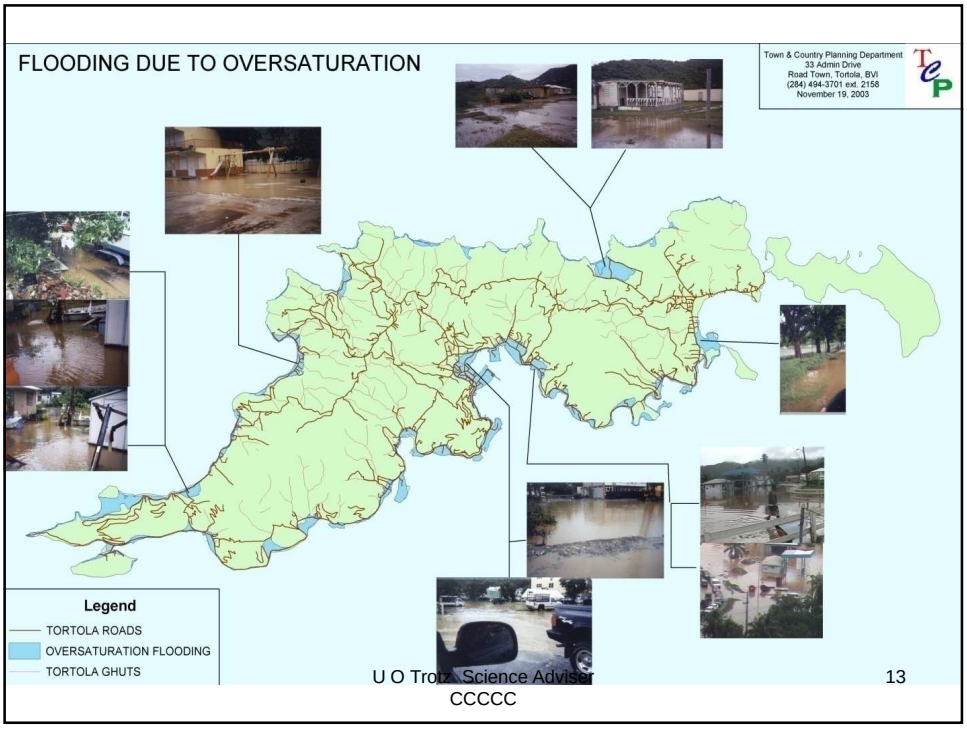
More frequent episodes of Coral Bleaching since the 1980s



Increase incidences of unusually heavy rainfall

One of many flood events in Georgetown, Guyana (2005, 2006 and 2007)

August 31, 2007 Belize City, Belize Tropical wave dumped over 11 inches of rain in less than 9 hours



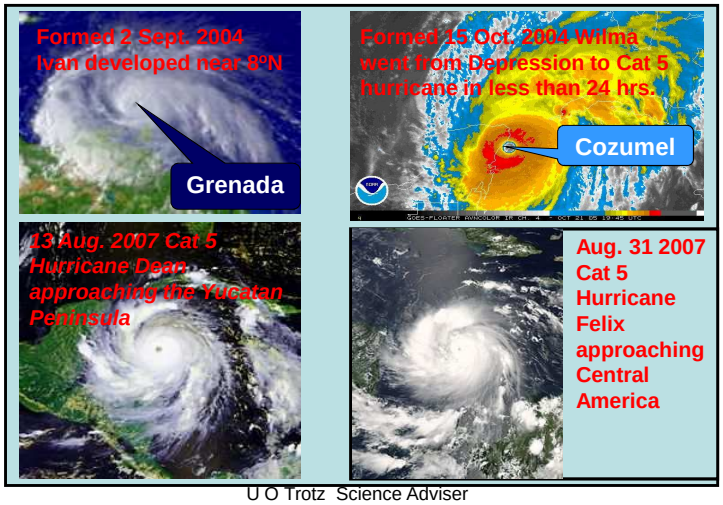
Caribbean Sea Temperature Much Warmer

- **Warmer sea temperatures support:**
  - **Development of stronger hurricanes at lower latitudes**
  - **More rapid transition to category 4 and 5**
  - **Increases the likelihood of coral bleaching**

April sea temperature near 80°F/27°C

Another Impact of Warmer Sea Temperature

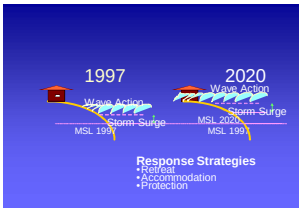
Hurricanes developing at lower latitudes and becoming more intense in a shorter period of time



INSURED LOSSES

Storm	Class	Year	Estimated 1990 Insured Losses (000's)	Estimated 1990 Insured Losses if Maximum Wind Speed Increases by		
				5%	10%	15%
Hugo	4	1989	$3,658,887	$4,902,705 34%	$6,514,172 78%	$8,542,428 133%
Alicia	3	1983	$2,435,589	$3,382,775 39%	$4,312,884 77%	$5,685,853 133%
Camille	5	1969	$3,086,201	$4,120,733 34%	$5,438,332 76%	$7,095,008 130%
Source: Clark, 1997.						

The Impact of more intense hurricanes & Sea Level Rise



- Higher and stronger storm surge
- More severe damage to mangrove & corals
- Increase in coastal damage and beach erosion

Rogue's Bay BEFORE and AFTER erosion due to the March 2008 "Big Swell Event"

2.3 | Critical Infrastructure & Human Settlements

Stretch of main road between West End and the capital, Road Town, severely damaged after the passage of hurricane Georges in 1998, a category 2 storm. (Photo credit: Department of Disaster Management).

Hurricane damage to Long Bush, a flat inland community on the outskirts of Road Town. (Photo credit: Department of Disaster Management).

2008 Atlantic hurricane season	
Season summary map	
First storm formed:	May 30, 2008
Last storm dissipated:	November 10, 2008
Strongest storm:	Ike - 935 mbar (hPa) (27.62 inHg), 145 mph (230 km/h)
Total depressions:	17
Total storms:	16
Hurricanes:	8
Major hurricanes (Cat. 3+):	5
Total fatalities:	836 direct, 104 indirect
Total damage:	~ $45 billion (2008 USD)
Atlantic hurricane seasons 2006, 2007, **2008**, 2009, Post-2009	

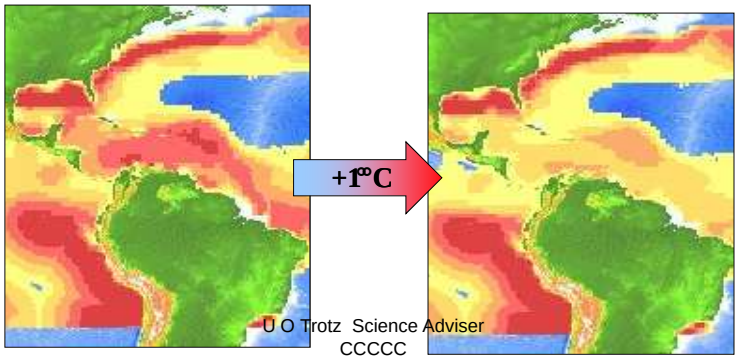
•Timeline of the 2008 Atlantic hurricane season

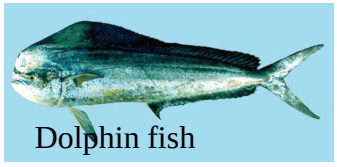
2008 Atlantic hurricane season

- Tropical Storm Arthur caused the season to start two days early. – 9 deaths ,$78M US damage in Belize.
- Third most costly season on record, behind only the 2004 and 2005 seasons, with up to $45 billion in damage (2008 USD).
- the only year on record in which a major hurricane existed in every month from July through November in the North Atlantic.[1]
- particularly devastating for Haiti, where over 800 people were killed by four consecutive tropical cyclones (Fay, Gustav, Hanna, and Ike) in August and September.[1]

Impact of 1°C further rise in sea temperature on Artisan and Commercial Fishing

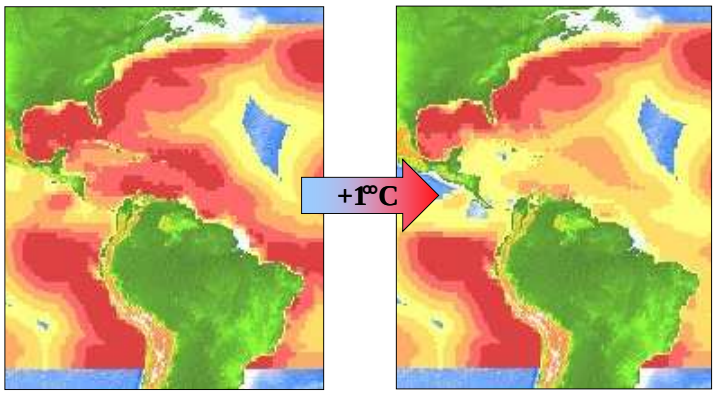
Habitat becomes less favourable





Dolphin fish

Habitat becomes less favourable



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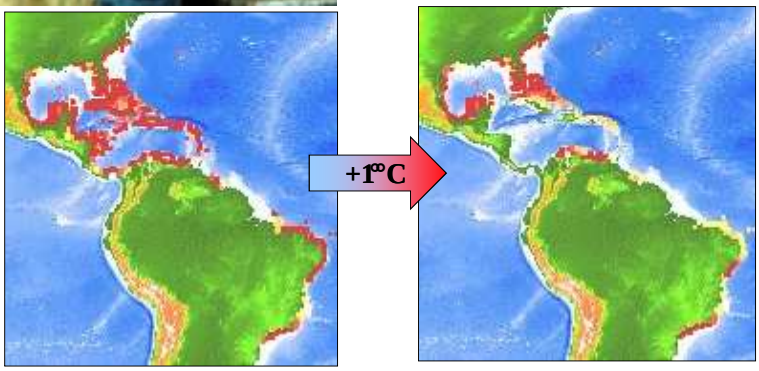
23

Green parrot fish

Habitat becomes less favourable



24

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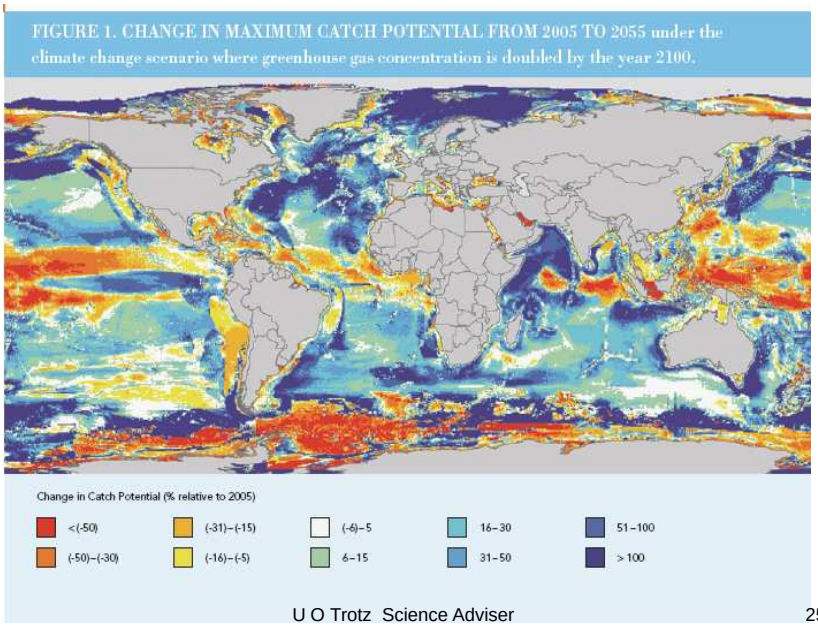
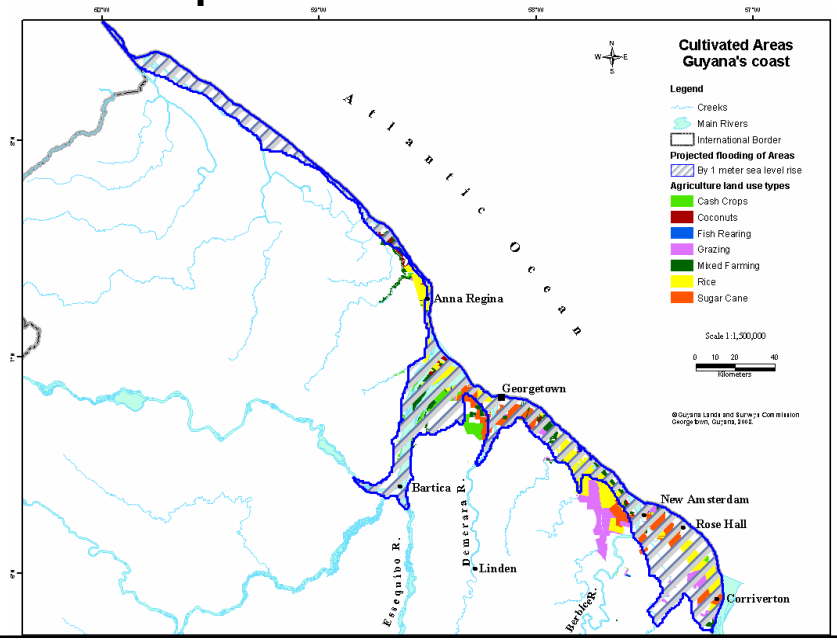


Impact OF 2°C rise on Agriculture

Preliminary studies on the impact on the staples - corn, beans and rice for 2°C warmer and +/- 20% change in precipitation

Crop	Scenario Name	Season Length (days)	Temperature Change (°C)	% Change in precipitation	Yield (kg/ha)	% change in Yield
Dry beans	Baseline	87	0	0	1353.6	
C3	Carib A	85	+2	+20	1163.7	-14%
		85	+2	-20	1092.6	-19%
Rice	Baseline	124	0	0	3355.5	
C3	Carib A	113	+2	+20	3014.4	-10%
		113	+2	-20	2887.5	-14%
Maize	Baseline	104	0	0	4510.6	
C4	Carib A	97	+2	+20	3736.6	-22%
		97	+2	-20	3759.4	-17%

Impacts of 1m rise in sea level



27

Climate change impacts on the agricultural sector

Climate factor	Direction of change	Consequences and threats to agricultural production and food security
Sea level rise	Increase (0.2m-0.5m).	- Flooding; saltwater intrusion and salinisation of major rivers. - Reduction in aquaculture production. - Susceptibility of mangroves to decline.
Rainfall	Increased intensity, but of a shorter duration.	- Increased run off and possibly greater erosion of soil. - Increased leaching of nutrients and agricultural chemicals into groundwater and surface water. - Greater overtopping of conservancies. - More flooding and water logging - Increase in some pests and diseases. - Wetter conditions at harvest time could increase the potential for decreasing quality of many crops.

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Agricultural lands highly vulnerable to 1 metre sea level rise

Region No.	Total area highly vulnerable to 1 metre sea level rise	Area used for Agricultural activities	Agricultural lands within the highly vulnerable zone	% of agriculture lands in the highly vulnerable zone
Region 2	28,910	31,667	14,440	46%
Region 3	148,203	65,107	47,365	73%
Region 4	51,489	30,006	28,119	94%
Region 5	52,182	89,285	36,913	41%
Region 6	180,708	74,003	72,719	98%
TOTAL	**461,492**	**290,068**	**199,556**	**69%**

29

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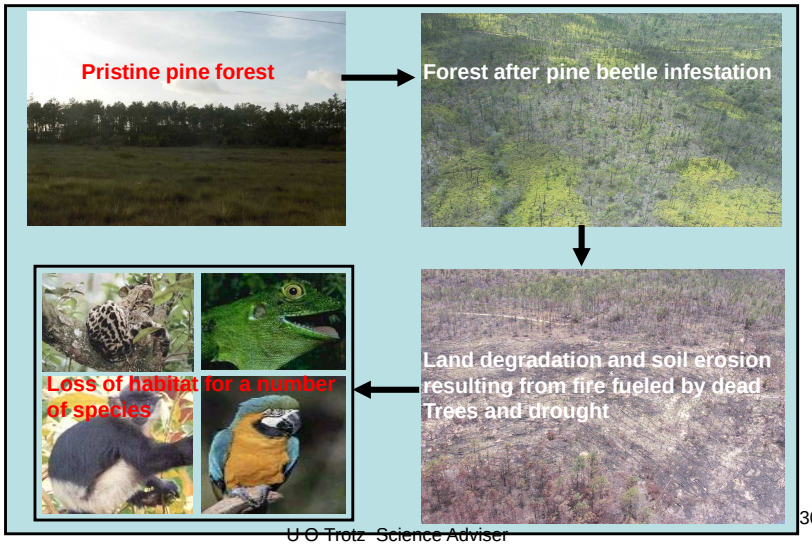
Impact of increases in Drought and Higher Temperatures on biodiversity and land degradation



30

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ADAPTATION AN IMPERATIVE

- **The IPCC, the world premier scientific advisory body on climate change concluded that Small Island Developing States (SIDS) and low lying coastal States of the Caribbean are among the most vulnerable to the adverse impacts of climate change.**
- **The presentation highlights some of the evidence leading to the IPCC conclusion.**
- **For the Caribbean basin it is therefore recognized that adaptation is an imperative for coping with the projected impacts associated with current and future climatic conditions.**
- **Appropriate Adaptation Policies in all sectors will be required for addressing:**
  - **Sea Level Rise**
  - **Water resources**
  - **Renewable energy**
  - **Agriculture**
  - **Land use**

For further information please contact us at:

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