Global Climate Change, Disaster Preparedness & the Telecommunications Sector

by
John C. Caesar
Senior Lecturer, University of Guyana &
Commissioner, Public Utilities Commission of Guyana
jccaesar@yahoo.com

Global Climate Change

Global Climate Change is everybody's business – including utility regulators and utilities

- My personal plea

What is Climate?

Defined simply as:

"average weather … over a 30-year period"

– World Meteorological Organization

Key elements:

- Precipitation – rainfall, snow
- Temperature
- Relative humidity
- Wind speed

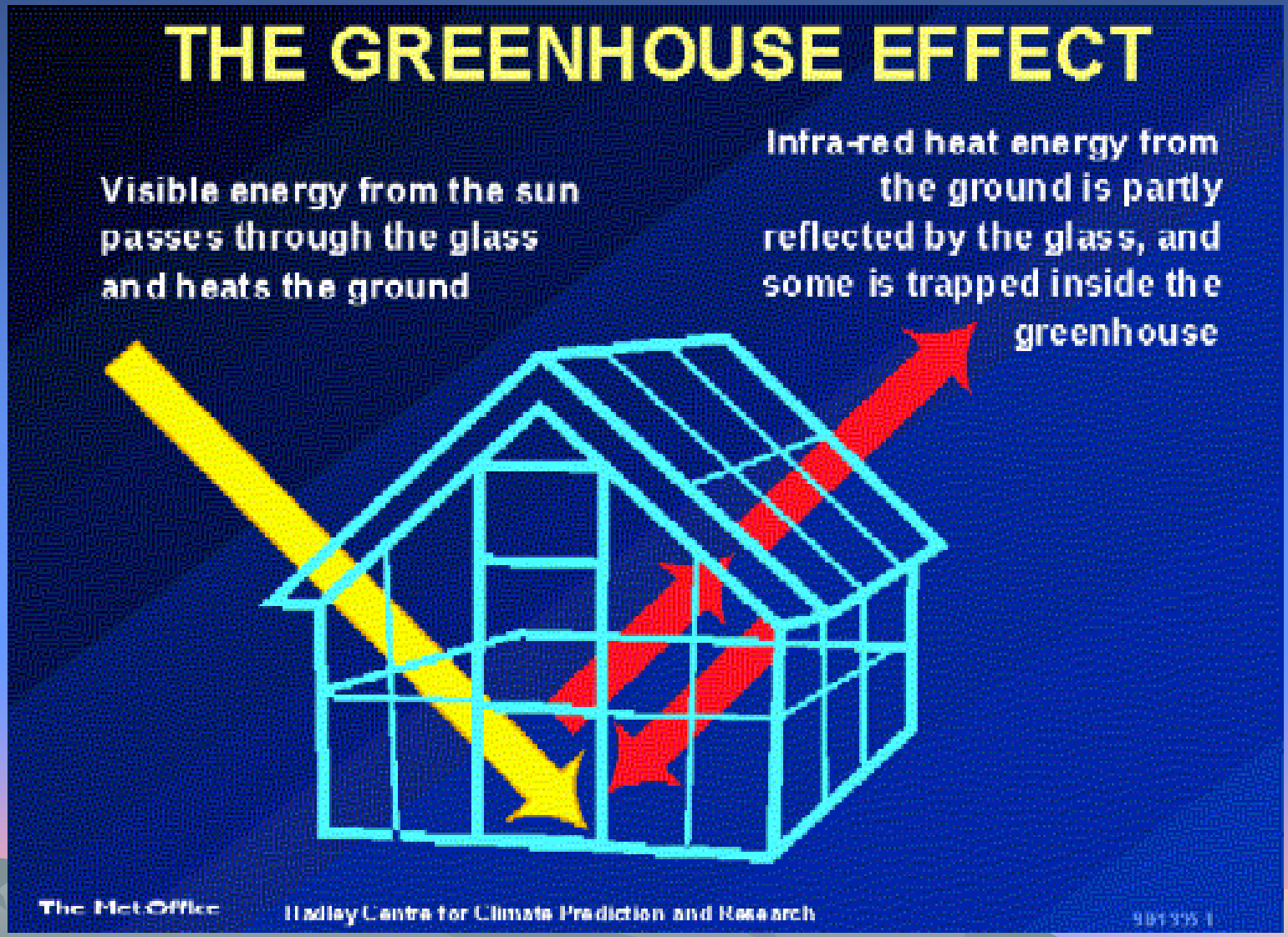
What is Climate Change?

"A change of climate which is attributed directly or indirectly to human activity that alters the composition of the global atmosphere and which is in addition to natural climate variability observed over comparable time periods"

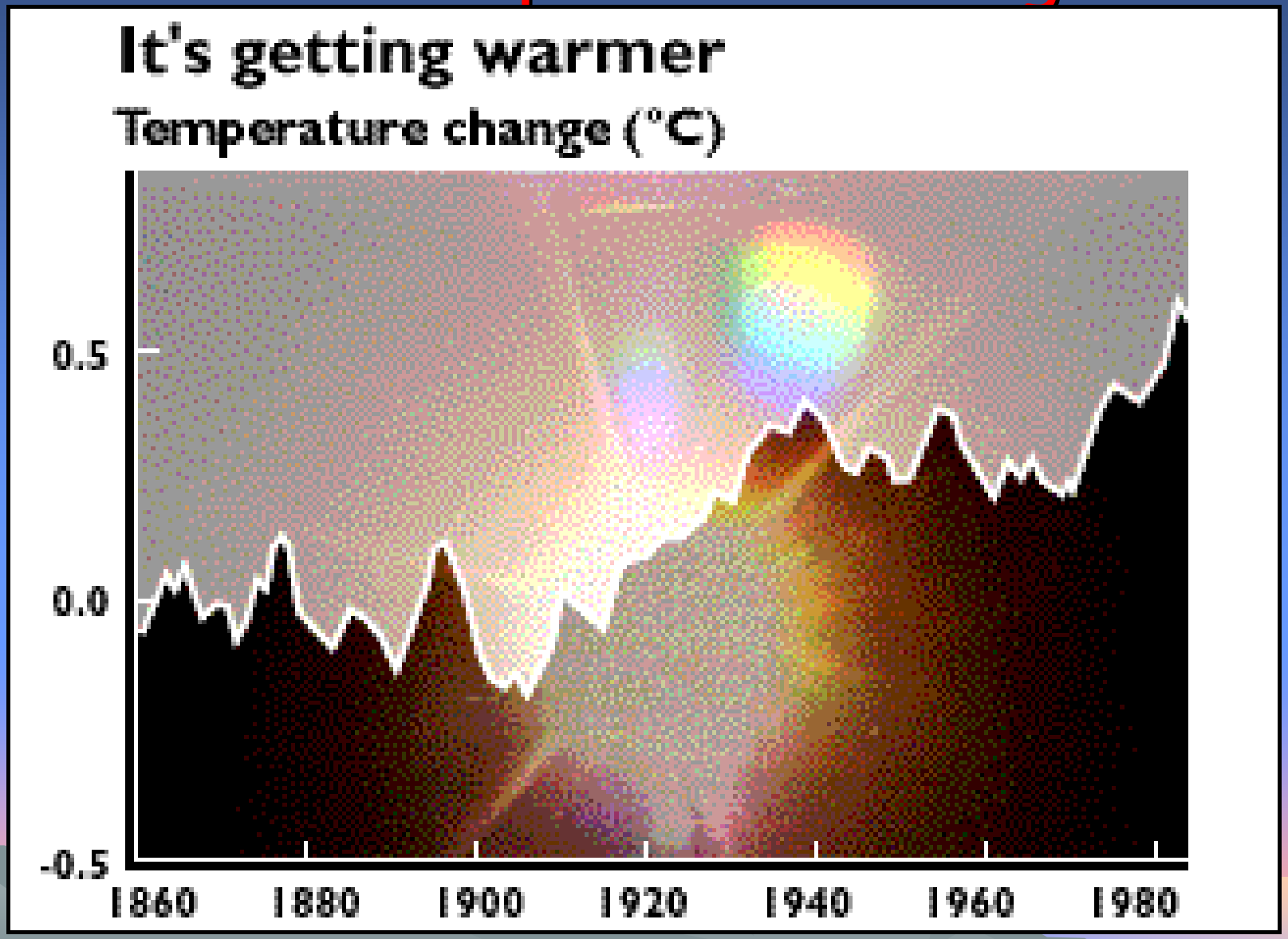
– UN Framework Convention on Climate Change

Basic Climate Change Science

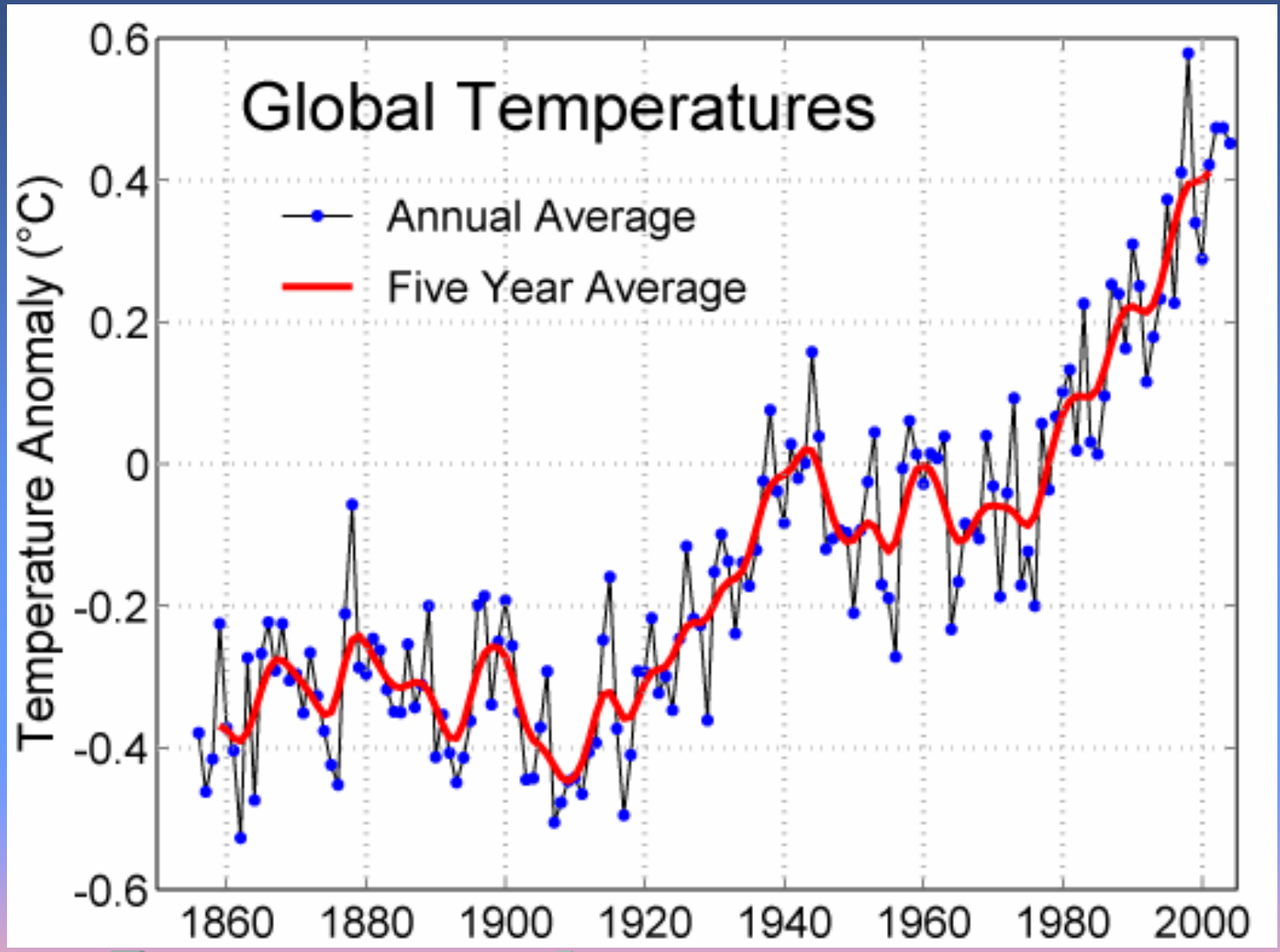
[©Hadley Centre for Climate Prediction & Research]



Global Temperature Changes

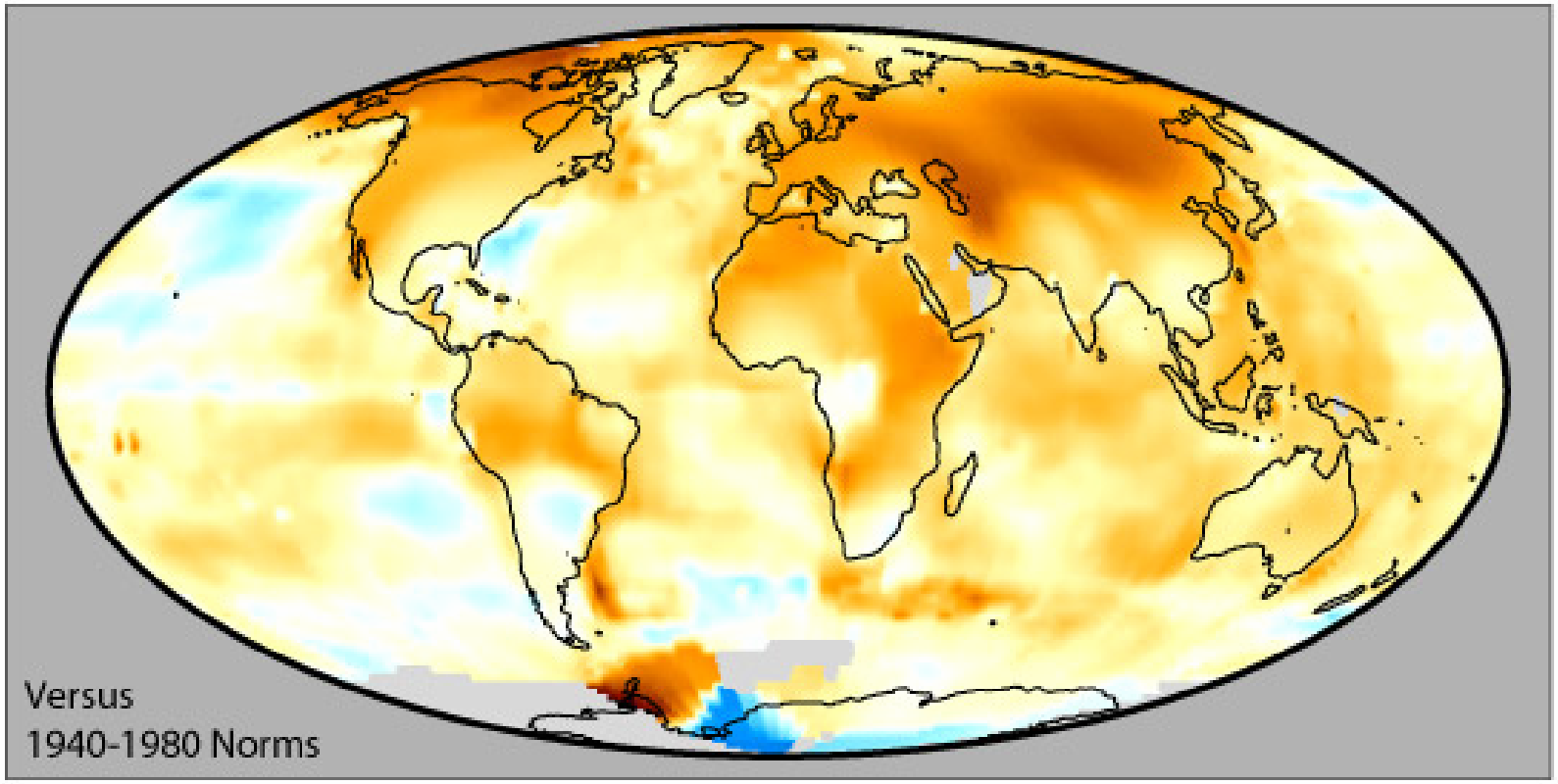


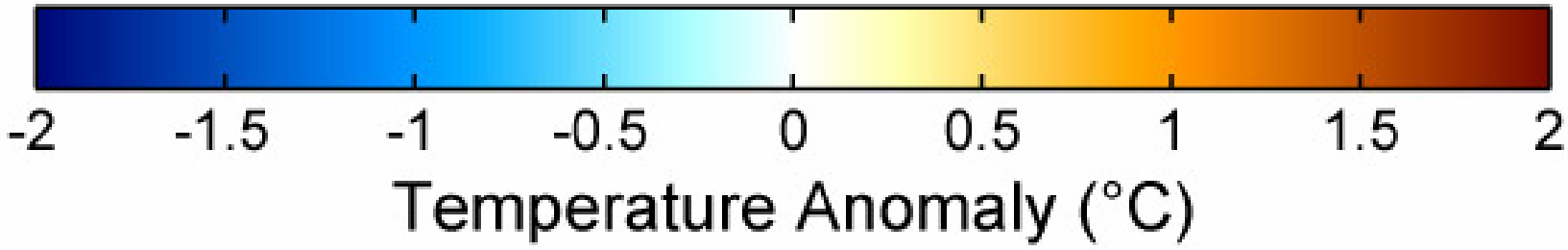
University of East Anglia Global Temperatures data 2004



Some areas are warming up more than others;
Other areas are cooling!

1995-2004 Mean Temperatures





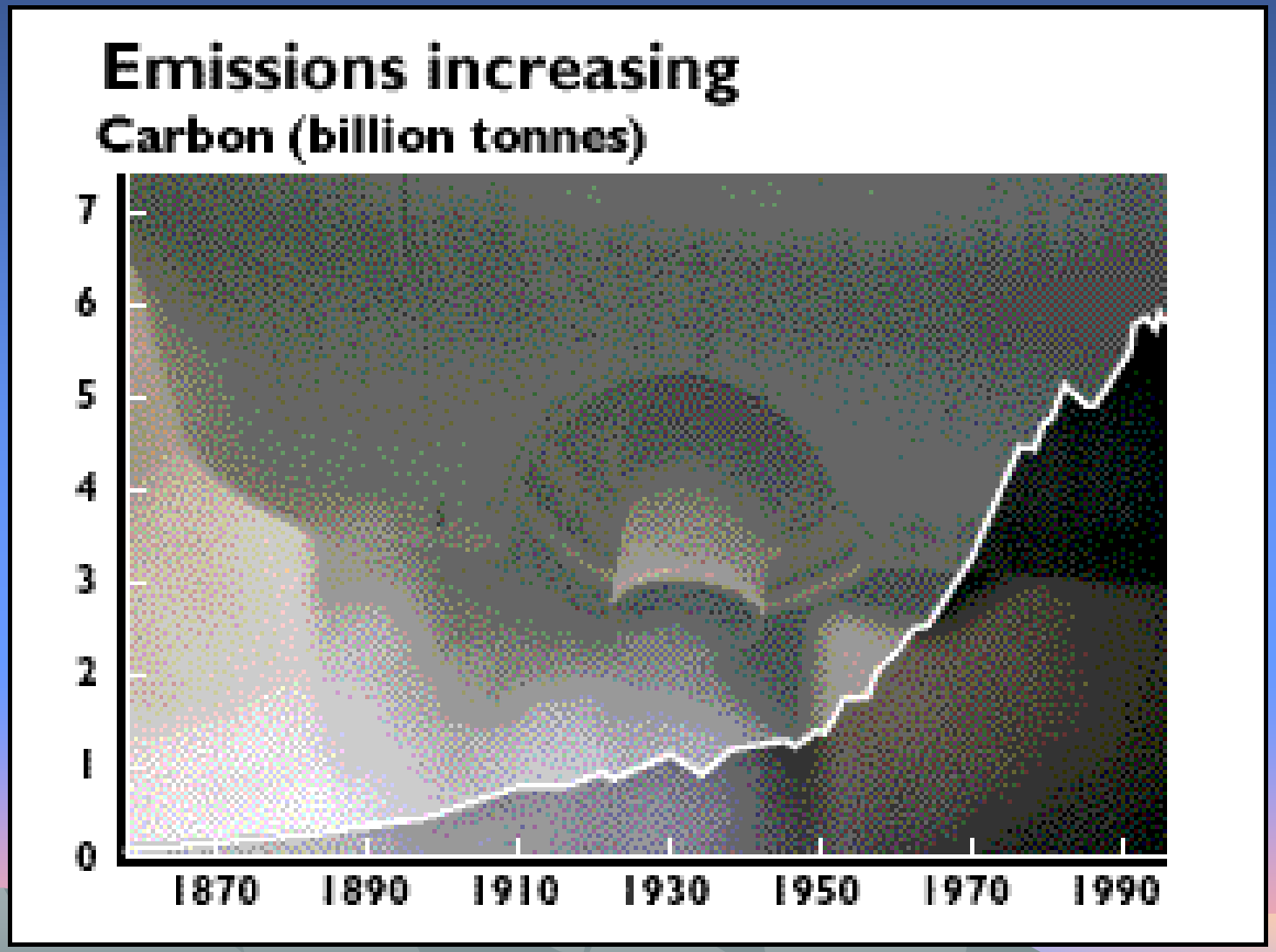
Costly Environmental Price of Industrialization

The Major Culprits

The four major greenhouse gases:

- Carbon dioxide
- Methane
- Nitrous oxide [oxide of nitrogen gas]
- Chlorofluorocarbons = chlorinated hydrocarbons [gases used in air-conditioning systems, spray cans]

The Major Culprits



Historic Atmospheric CO_2 concentration in Mauna Loa, Hawaii

Source : Scripps Institution of Oceanography (SIO), University of California, 1998.

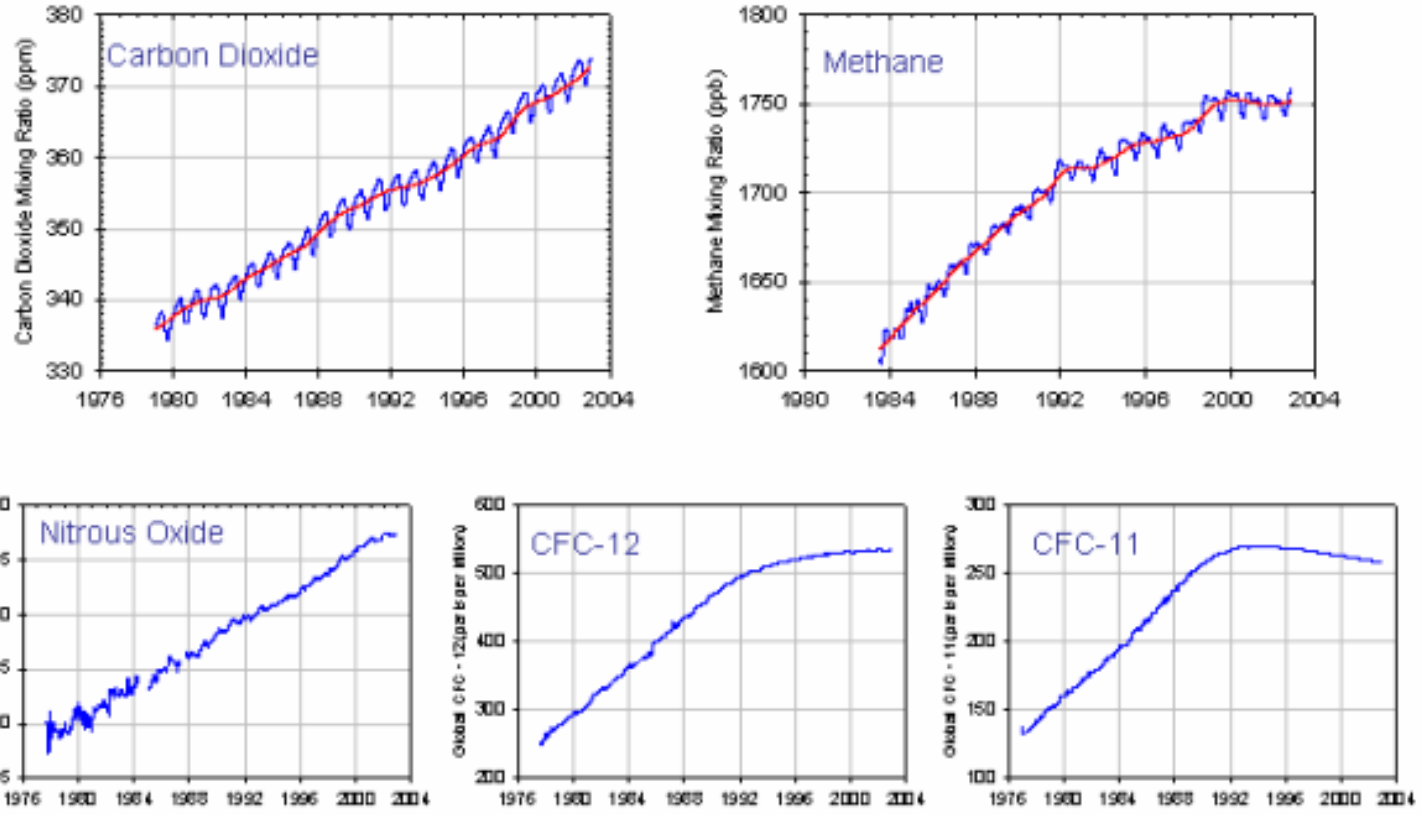
Frightening trends

- Atmospheric carbon dioxide has increased 31% since 1750!
- Atmospheric methane has increased 149% since 1750!
- Ten hottest years on record occurred in 1990's
- Earths' temperature warmed 0.6°C over last century
- Arctic circle has warmed 5.5 °C in last 30 yrs

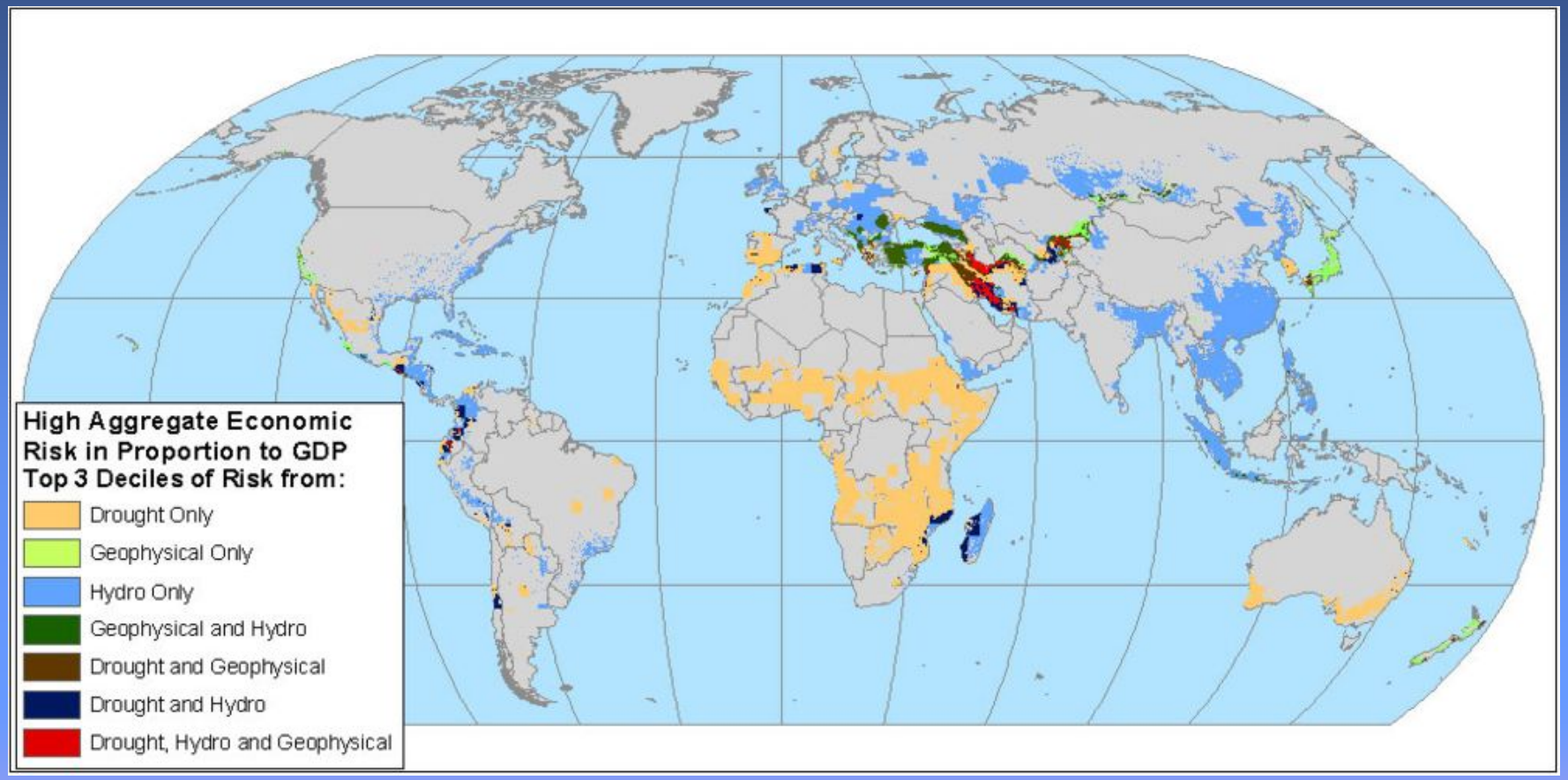
Joint Academies Statement June 2005; Paul Epstein (2004) *Encyclopedia of Energy* Vol.1

Major Culprits – Increasing Global trends

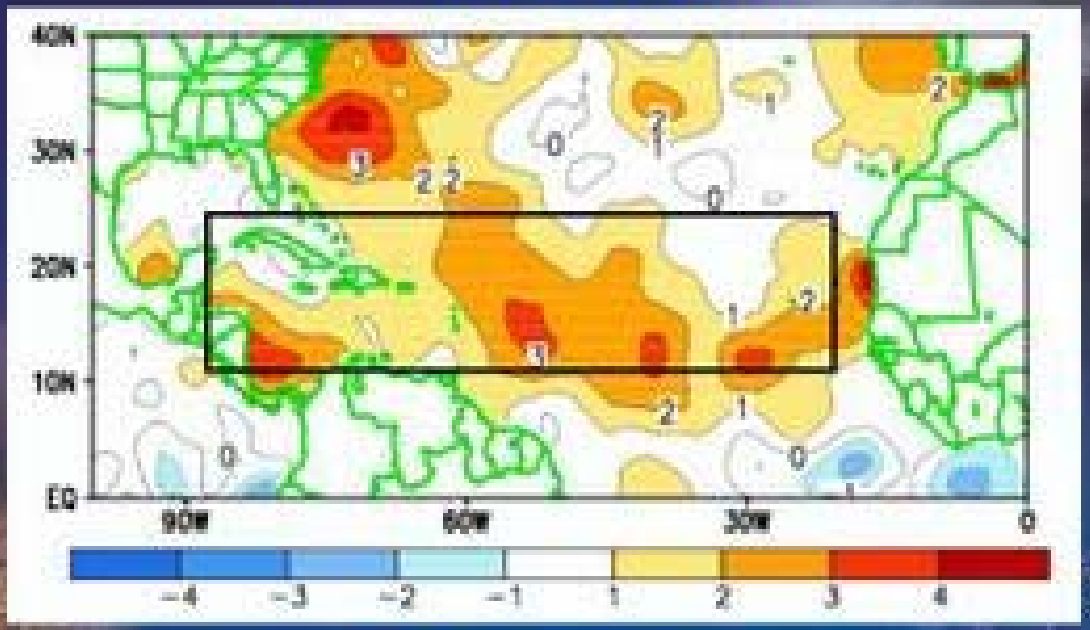
Global Trends in Major Greenhouse Gases to 1/2003



Global trends in major long-lived greenhouse gases through the year 2002. These five gases account for about 97% of the direct climate forcing by long-lived greenhouse gas increases since 1750. The remaining 3% is contributed by an assortment of 10 minor halogen gases, mainly HCFC-22, CFC-113 and CCl_4.

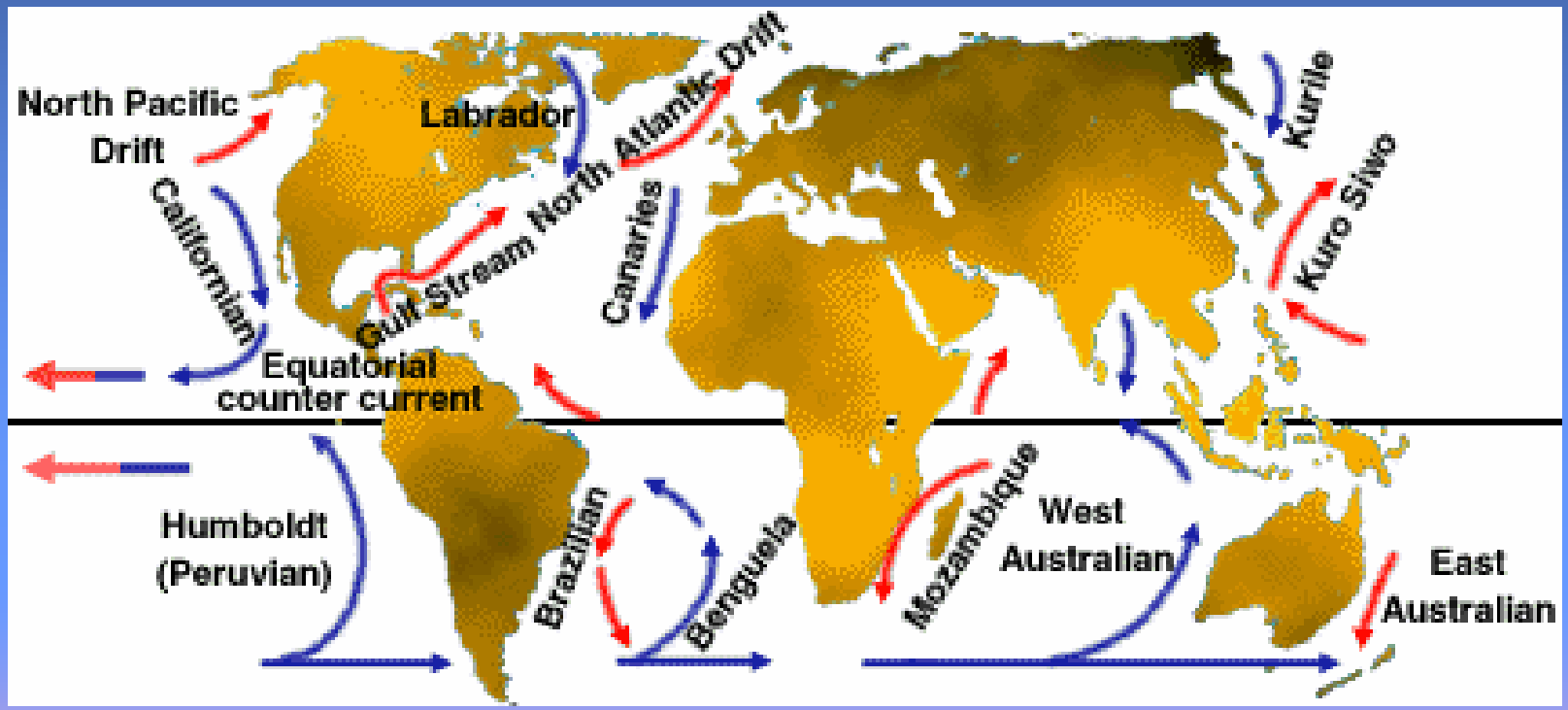

High Aggregate Economic Risk in Proportion to GDP
Top 3 Deciles of Risk from:
Drought Only
Geophysical Only
Hydro Only
Geophysical and Hydro
Drought and Geophysical
Drought and Hydro
Drought, Hydro and Geophysical

Atlantic Sea-Surface Temperatures Well Above Normal

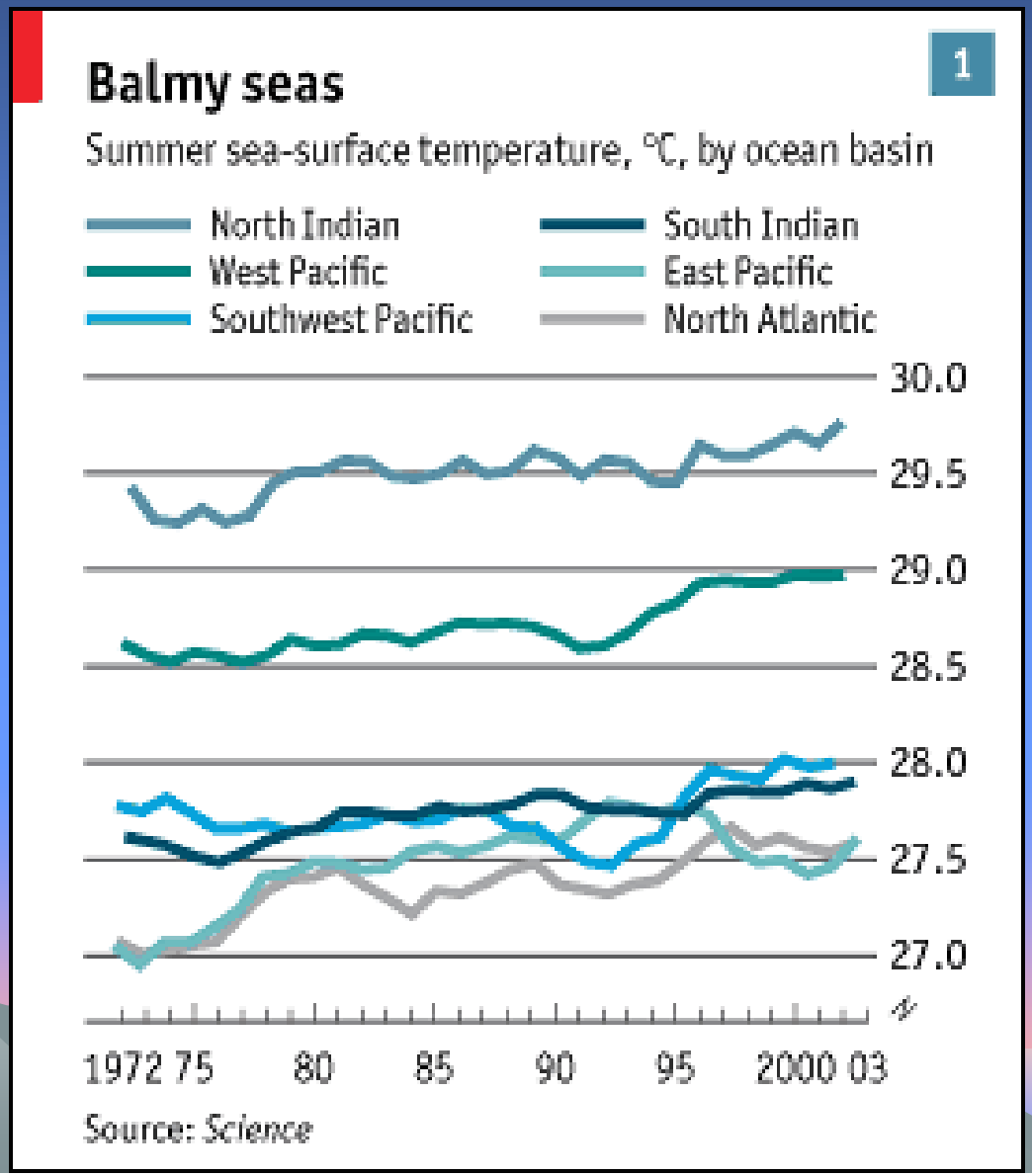


Water temperatures in the main hurricane development region (black box) are well above normal for the third straight hurricane season.

Global Ocean Currents



Global Sea Surface Temperatures are rising – in some cases at a higher rate



Impacts & Possible linkages

- Intensity & frequency of hurricanes
  - **Categories 4 & 5 hurricanes have been occurring more frequently, with impunity, in recent years!!!**
    - *Journal of Climate 2004*

    Prof. Paul Epstein & the Harvard Centre for Health and Global Environment concur with IPCC 3rd Assessment report 2001.
- A few disagree with the link and even resign from IPCC panel! – Dr. Chris Landsea versus Dr. Kevin Trenberth saga over latest IPCC report

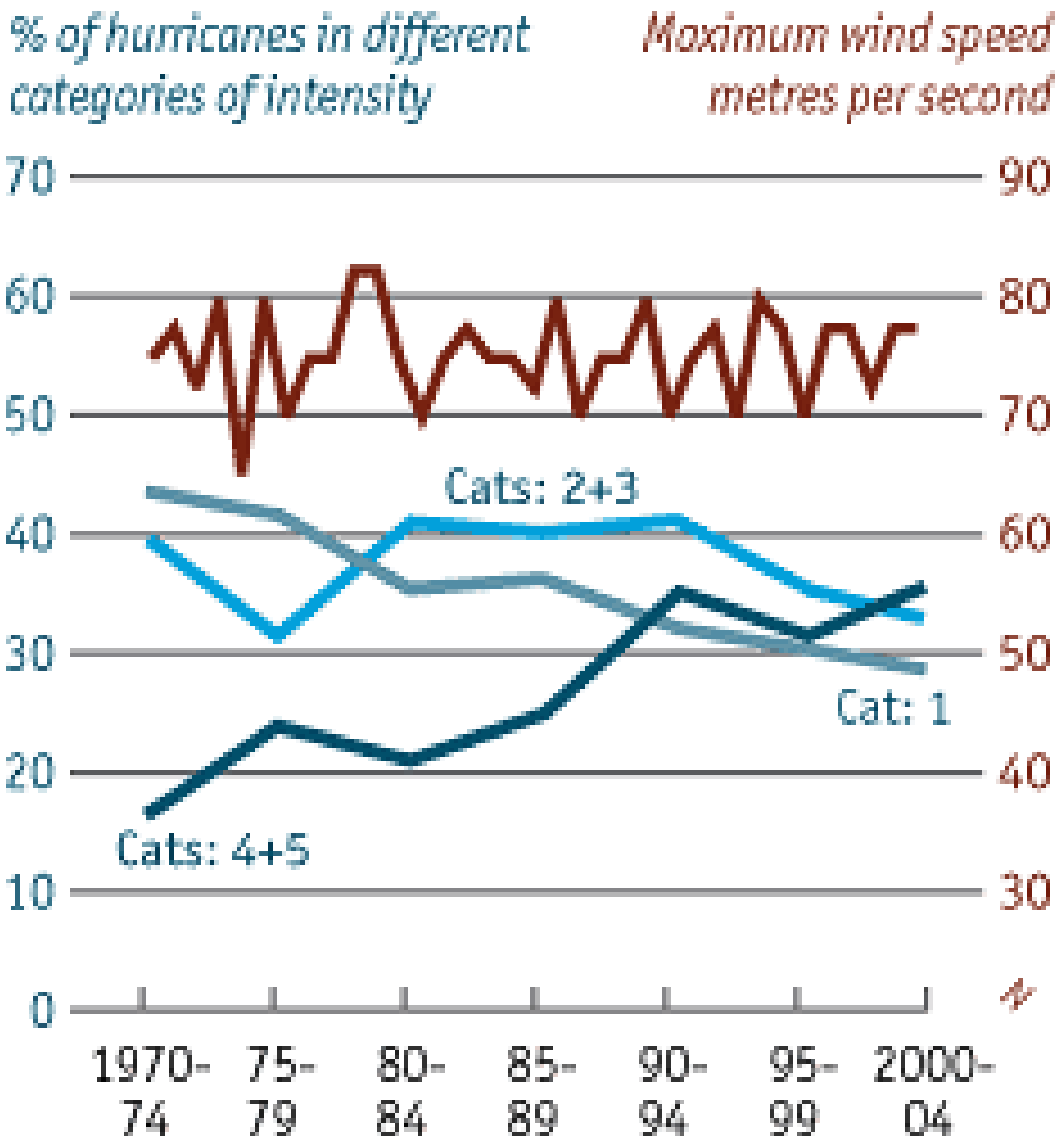
“Global warming may well be causing bigger and more powerful hurricanes”

-Prof. James J. McCarthy

Harvard University

Stormy weather

2



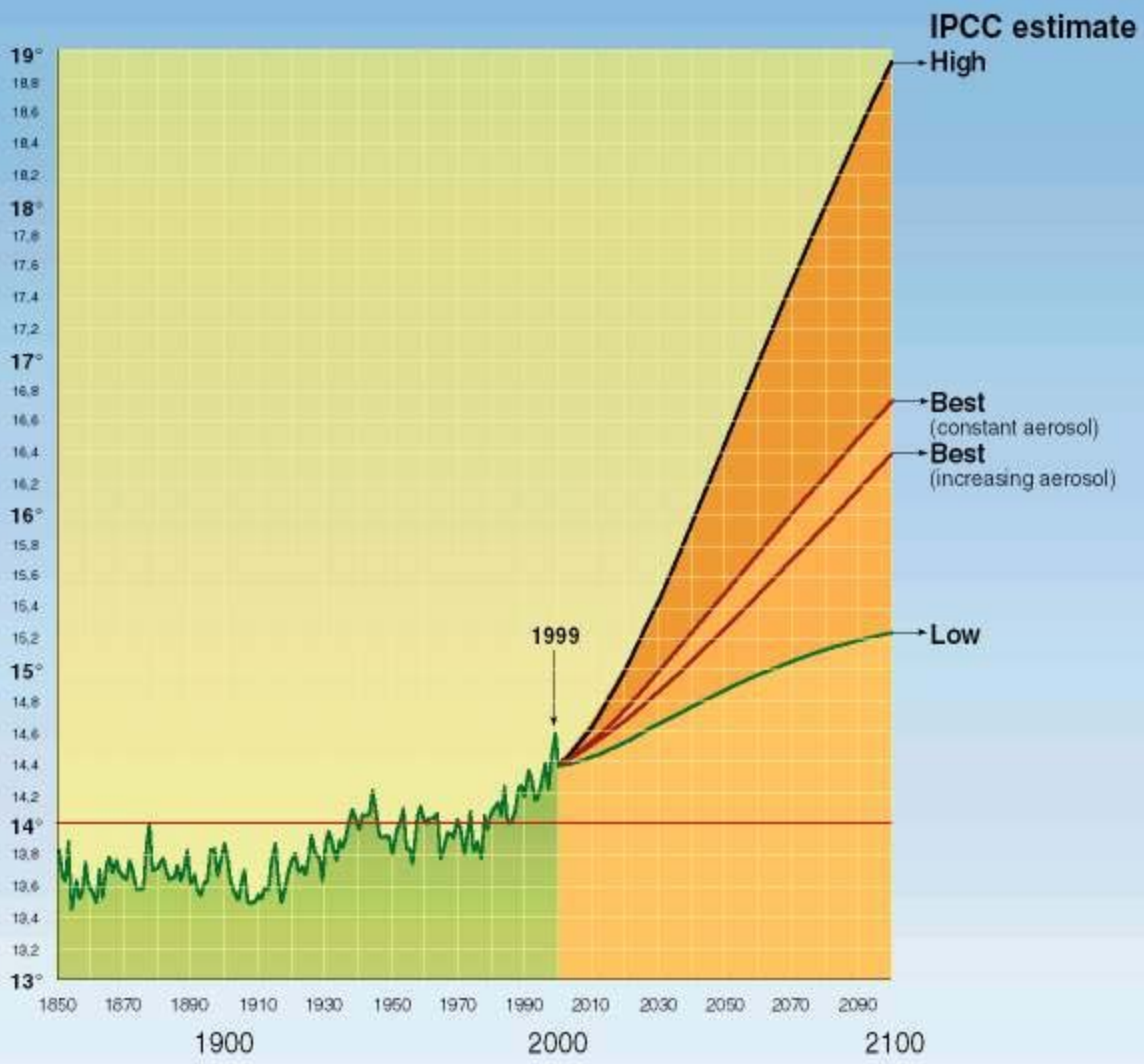
Source: *Science*

"The environment in which hurricanes form is changing. The result was a hurricane in late March 2004 in the South Atlantic, off the coast of Brazil: the first and only such hurricane in that region"

Centre for Health & Global Environment – Harvard Medical School

Best forecasts paint a gloomy picture!
Immediate Action needed;
Hence Kyoto Protocol

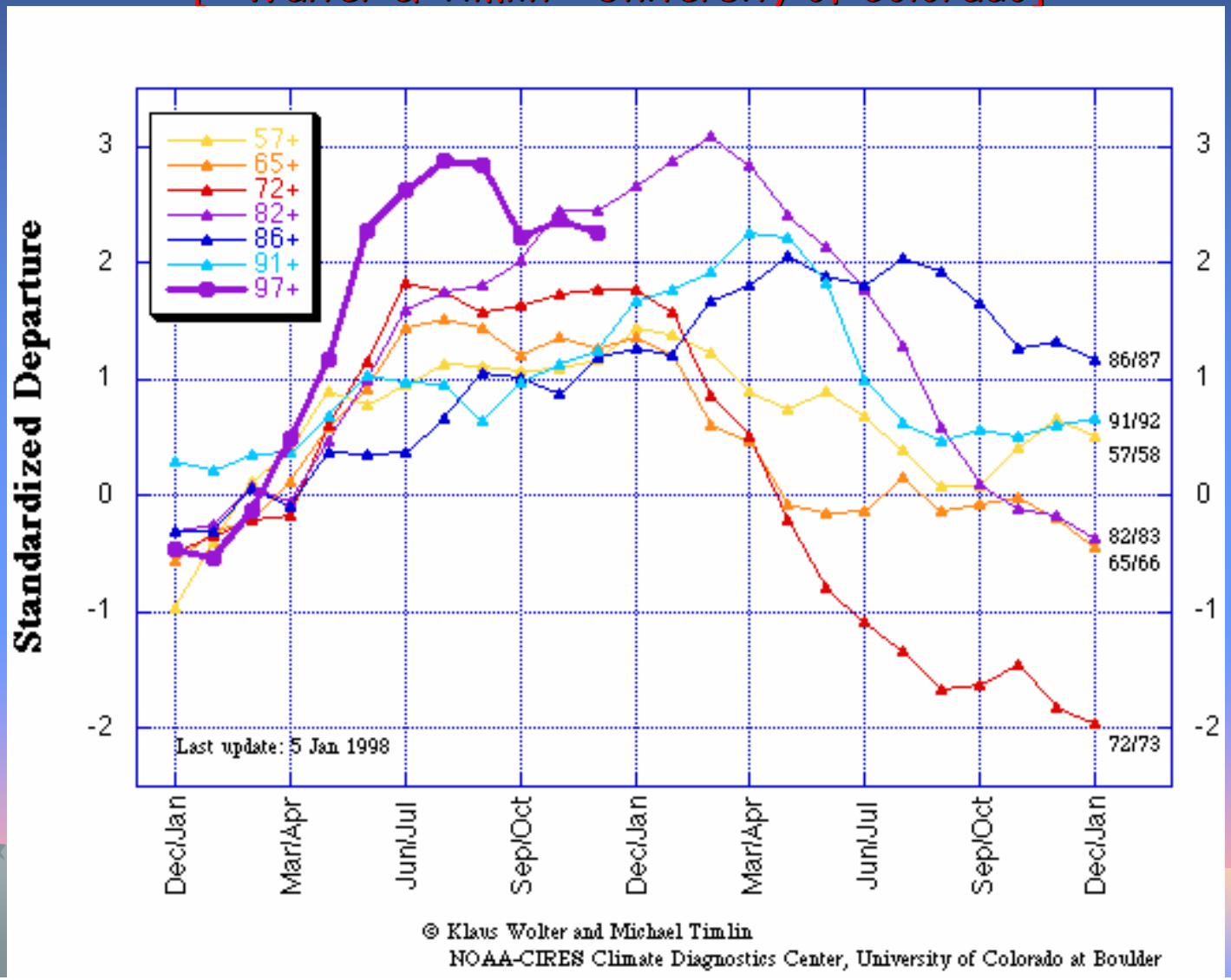
Global average temperature 1856-1999 and projection estimates to 2100



Source : Temperatures 1856 - 1999: Climatic Research Unit, University at East Anglia, Norwich UK.
Projections: IPCC report 95

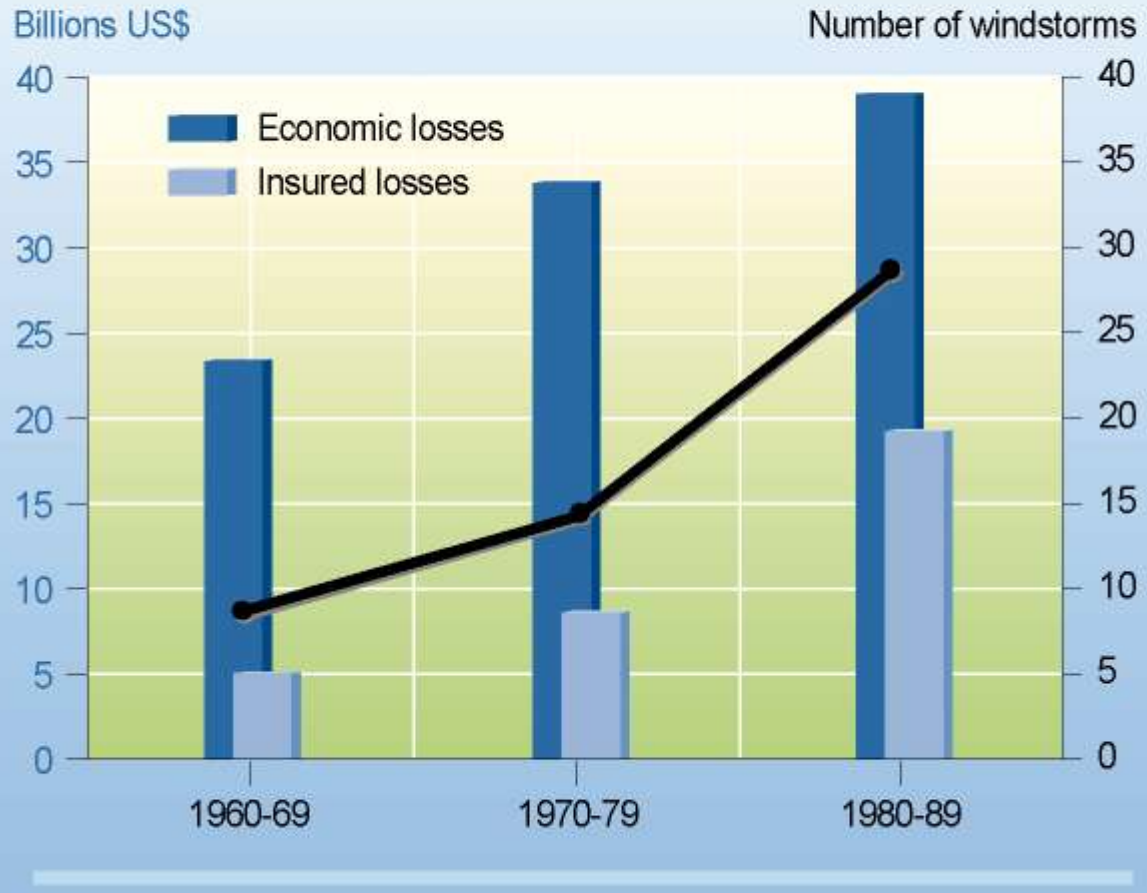
Frequency & Intensity of *El Nino* phenomenon

[©Walter & Timlin - University of Colorado]



Losses in windstorm catastrophes

(billions US$ 1982 prices)



Source : Berz & Conrad

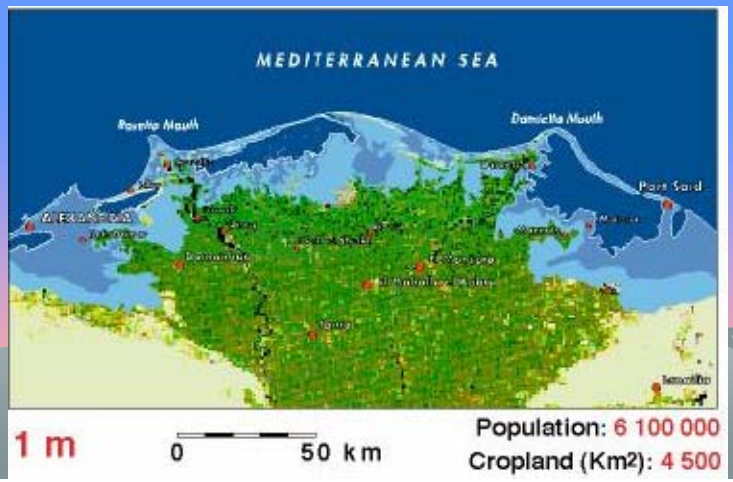
Impacts of Global Sea level rise

Major impacts in some areas

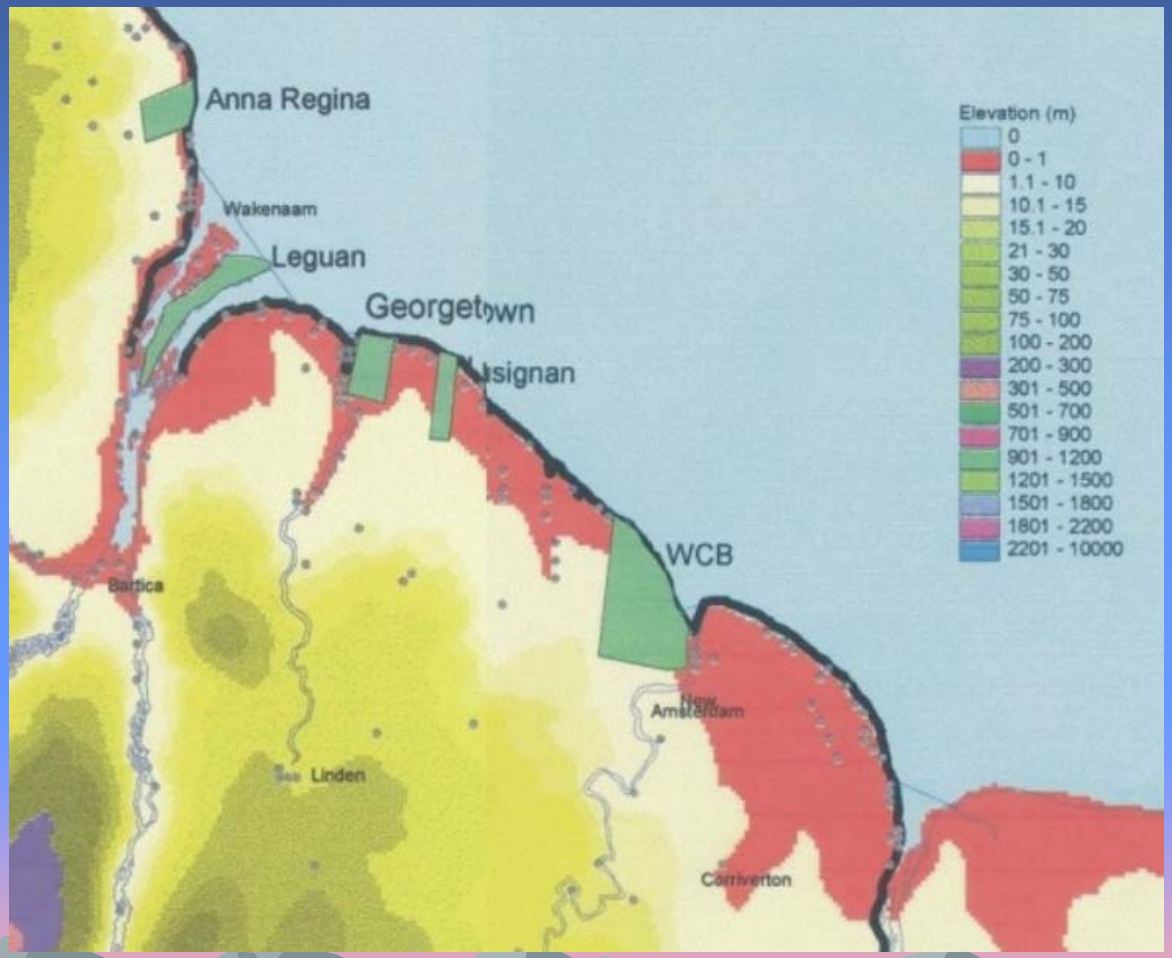
- Social dislocation
- Cultural dislocation
- Biodiversity loss
- Infrastructural dislocation
- Economic dislocation
- Historical dislocation
- Poverty exacerbation
- Diminished human dignity


MEDITERRANEAN SEA
Rosetta Mouth
Damietta Mouth
Port Said
Today
0
50 km


MEDITERRANEAN SEA
Rosetta Mouth
Damietta Mouth
Port Said
0.5 m
0
50 km
Population: 3 800 000
Cropland (Km²): 1 800


MEDITERRANEAN SEA
Rosetta Mouth
Damietta Mouth
Port Said
1 m
0
50 km
Population: 6 100 000
Cropland (Km²): 4 500

Reality at Home!
Georgetown and sea level rise



Residents of Good Hope squatting area, already prone to flooding, marooned in more misery. This Ken Moore photo was taken on Thursday.

Better Hope Squatting Area resident, Somintra Paul called 'Manan' moving her clothes on Thursday to her landlord's quarters on the floor above. This area has been badly hit by the floods. (Photo by Ken Moore)

A half of a barrel - a means of transportation at Coldingen on the flood-hit East Coast. (Photo by Jules Gibson)

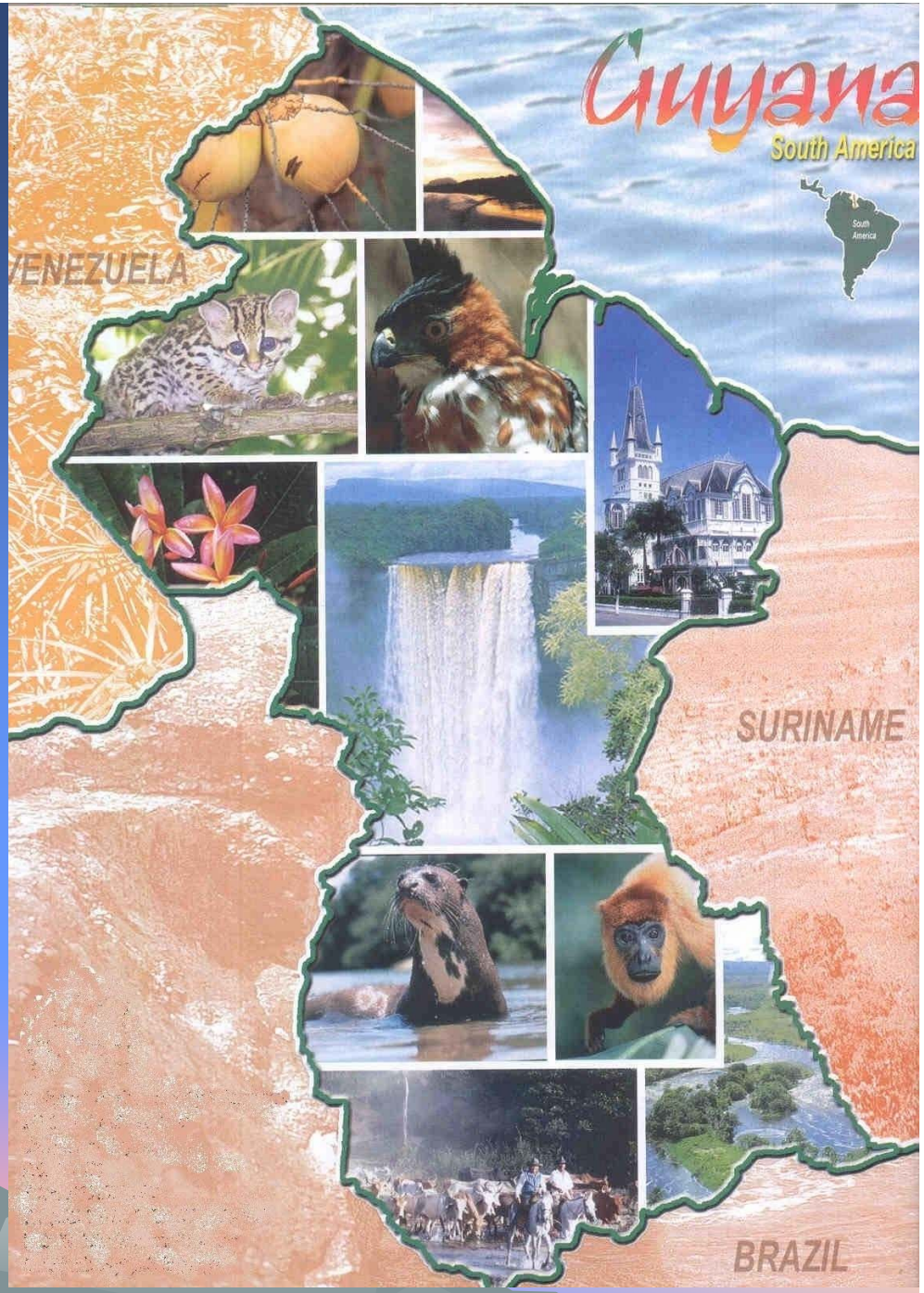
A section of Caneview Avenue, close to National Avenue, under several inches of water yesterday. Not sure of the street from the parapet, a motorcyclist parked his bike closer to the road's edge.

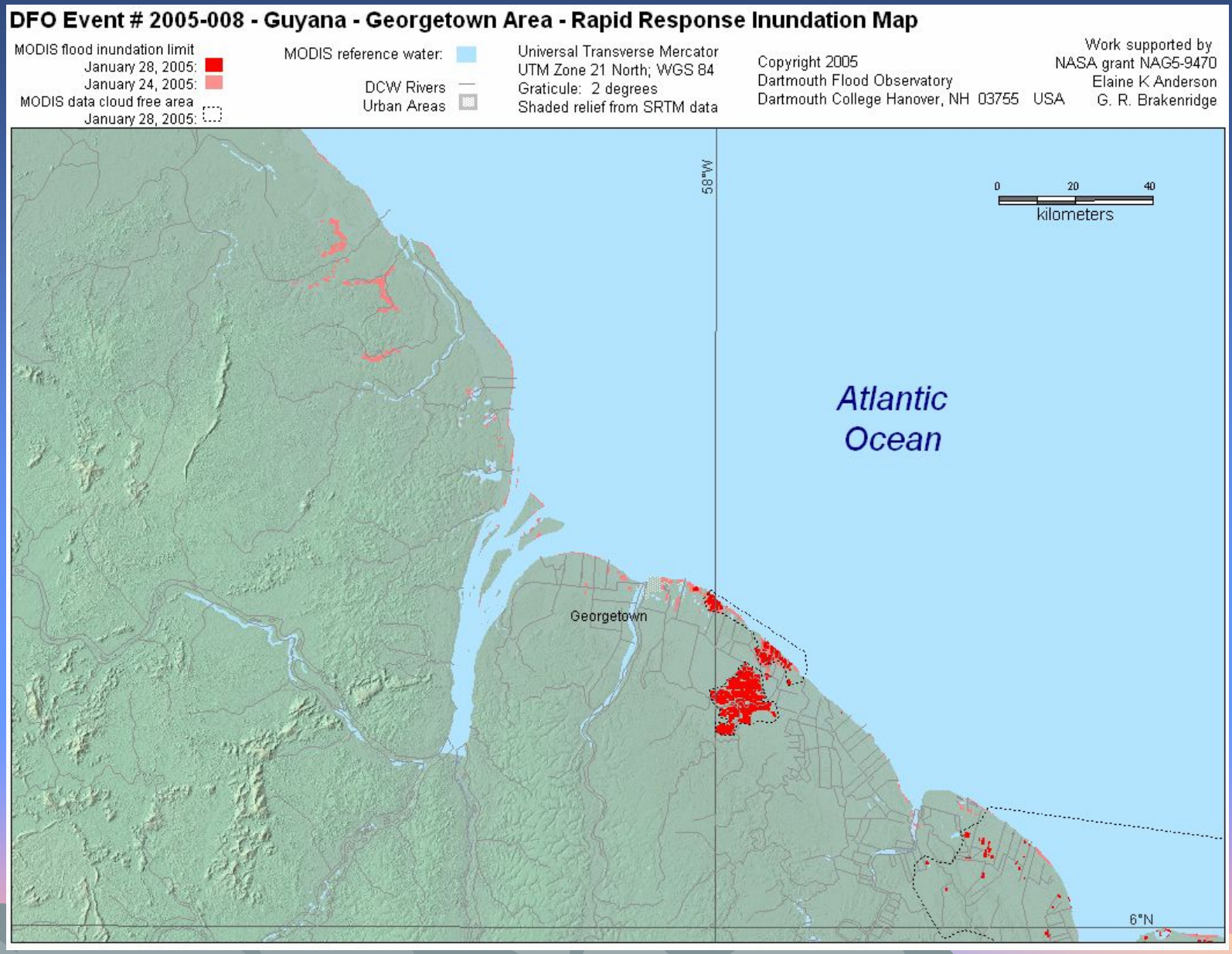
The fridge boats: A new mode of transportation for residents of South Plaisance. The asking price is $100 per person for a "short drop" and $500 with groceries. (Photo by Jules Gibson)

A four-wheel drive vehicle making its way out of Montrose, East Coast yesterday. Note the water level. (Photo by Jules Gibson)

Beautiful Guyana

- Rich biodiversity
- Architectural heritage
- 90% population are on coastland
- 75% of national infrastructure in vulnerable zone
  - Commercial centre
  - Seat of government
  - Major industrial centre




DFO Event # 2005-008 - Guyana - Georgetown Area - Rapid Response Inundation Map
MODIS flood inundation limit
January 28, 2005:
January 24, 2005:
MODIS data cloud free area
January 28, 2005:
MODIS reference water:
DCW Rivers
Urban Areas
Universal Transverse Mercator
UTM Zone 21 North; WGS 84
Graticule: 2 degrees
Shaded relief from SRTM data
Copyright 2005
Dartmouth Flood Observatory
Dartmouth College Hanover, NH 03755 USA
Work supported by
NASA grant NAG5-9470
Elaine K Anderson
G. R. Brakenridge
58°W
0 20 40
kilometers
Atlantic Ocean
Georgetown
6°N

Impacts of Global Sea level rise

Health impacts

- 50 – 80 million more malaria cases expected

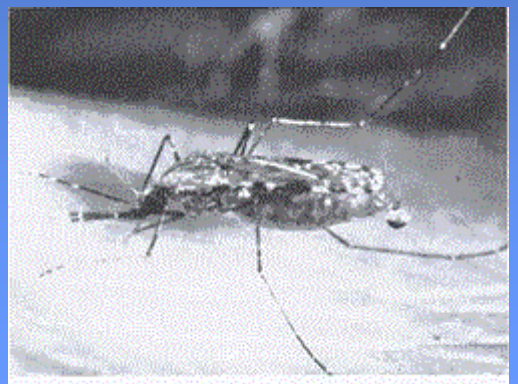
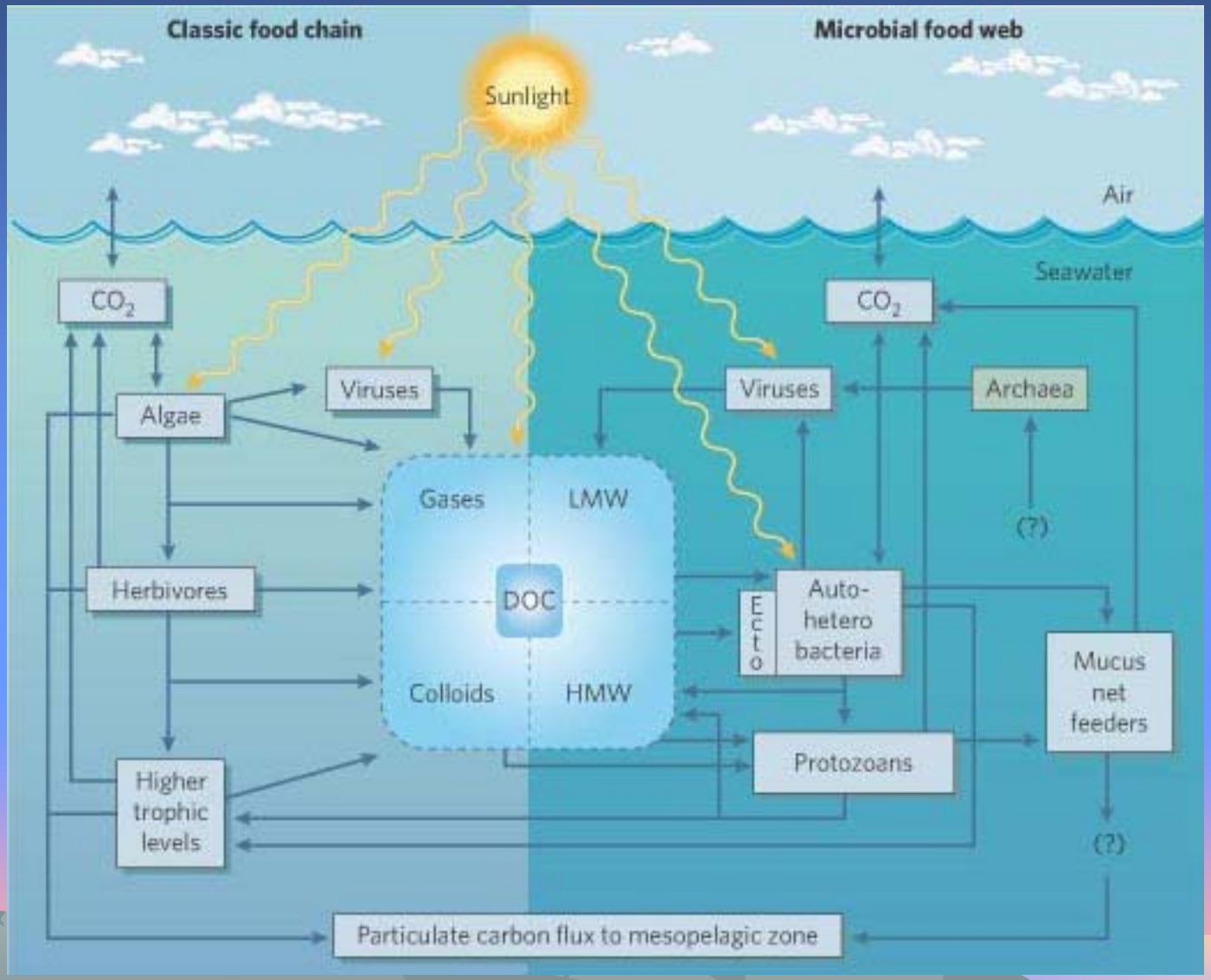


FIGURE 2-4 Female *Anopheles gambiae* during a blood meal. (Photo courtesy of Dr. Robert Gwadz, NIAID, NIH)

Hurricane Katrina Arriving in Alabama

Microbial Oceanography [Nature 2005]



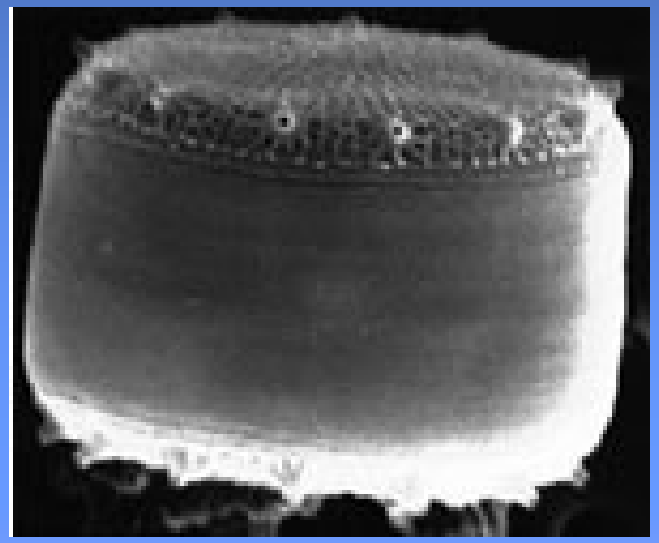
The Promise of the Oceans

While new research indicates the oceans hold some promise for climate change mitigation, I believe pollution of our oceans must be of concern as it may well cause the loss of vital marine biodiversity!

Potential Mitigation

Thalassiosira pseudonana

- Marine diatom
- Has immense capacity to fix carbon dioxide
- High photosynthesis
- High productivity
- Major oceanographic carbon sink



Natural Disasters

[International Council for Science, 2005]

- Earthquakes
- Tsunamis
- Floods
- Hurricanes
- Landslides
- Tornadoes
- Volcanic eruptions
- Other geophysical phenomena

Preparing for Natural Disasters

Preparing for Natural Disasters

[ICSU, 2005]

Role of the Telecommunications Sector

- Link with national ICT infrastructure
- Importance of communication in disaster preparedness & management
- Vulnerability assessment for telecom infrastructure
- Leveraging mobile phone infrastructure & service in disaster preparedness and management communication
- Need for cost-benefit analysis

Guyana Case scenario
January 2005 Flood disaster

- About 60% of entire population affected
- About 75% of critical national infrastructure threatened/vulnerable
- Flood damage cost to GT&T infrastructure

  = G$42 million = US$210,000

Telecommunications Sector & Disaster preparedness/management

- Mobile phone service leveraging for communication
- SMS service in disaster preparedness communication
- SMS service in public education on mitigating through environmental lifestyles
  - In Guyana, Messaging cost for 130,000 mobile phone subscribers = US$3900 per message
- ICT applications in natural disaster reduction essential in climate change mitigation

We all have a duty to safeguard our beloved Earth for the future.

Thank you