# Climate Change and Marine environment

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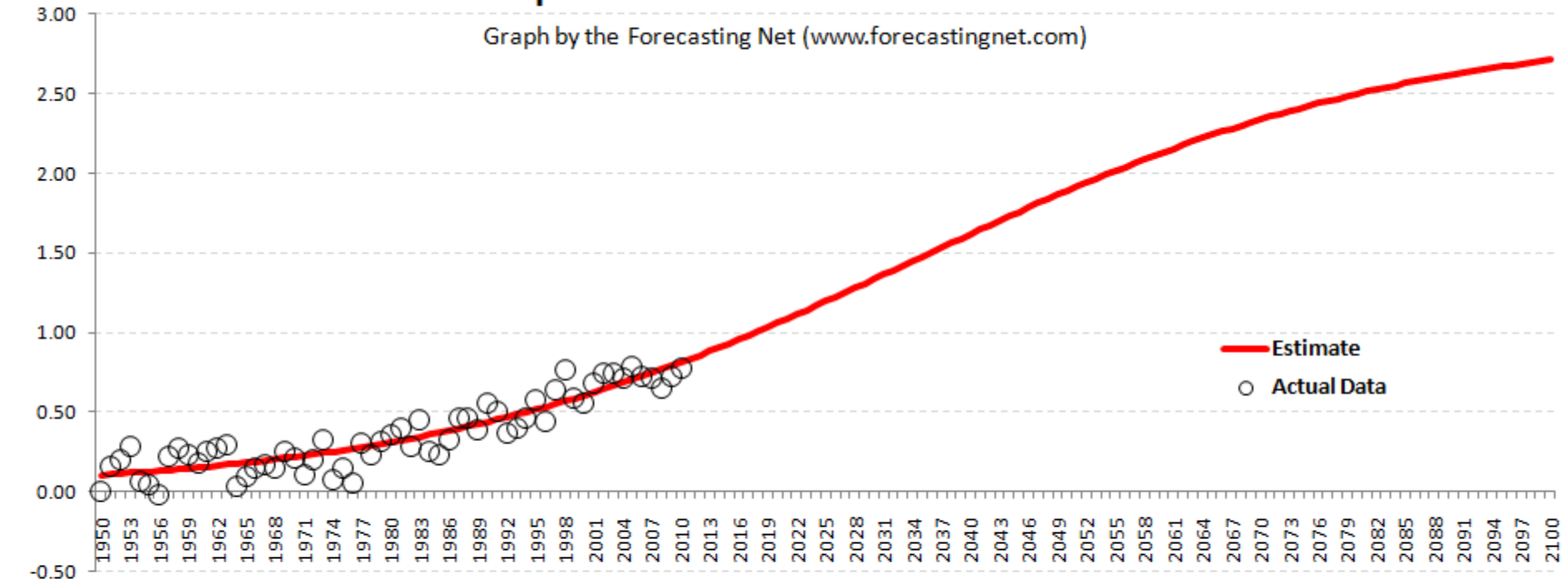
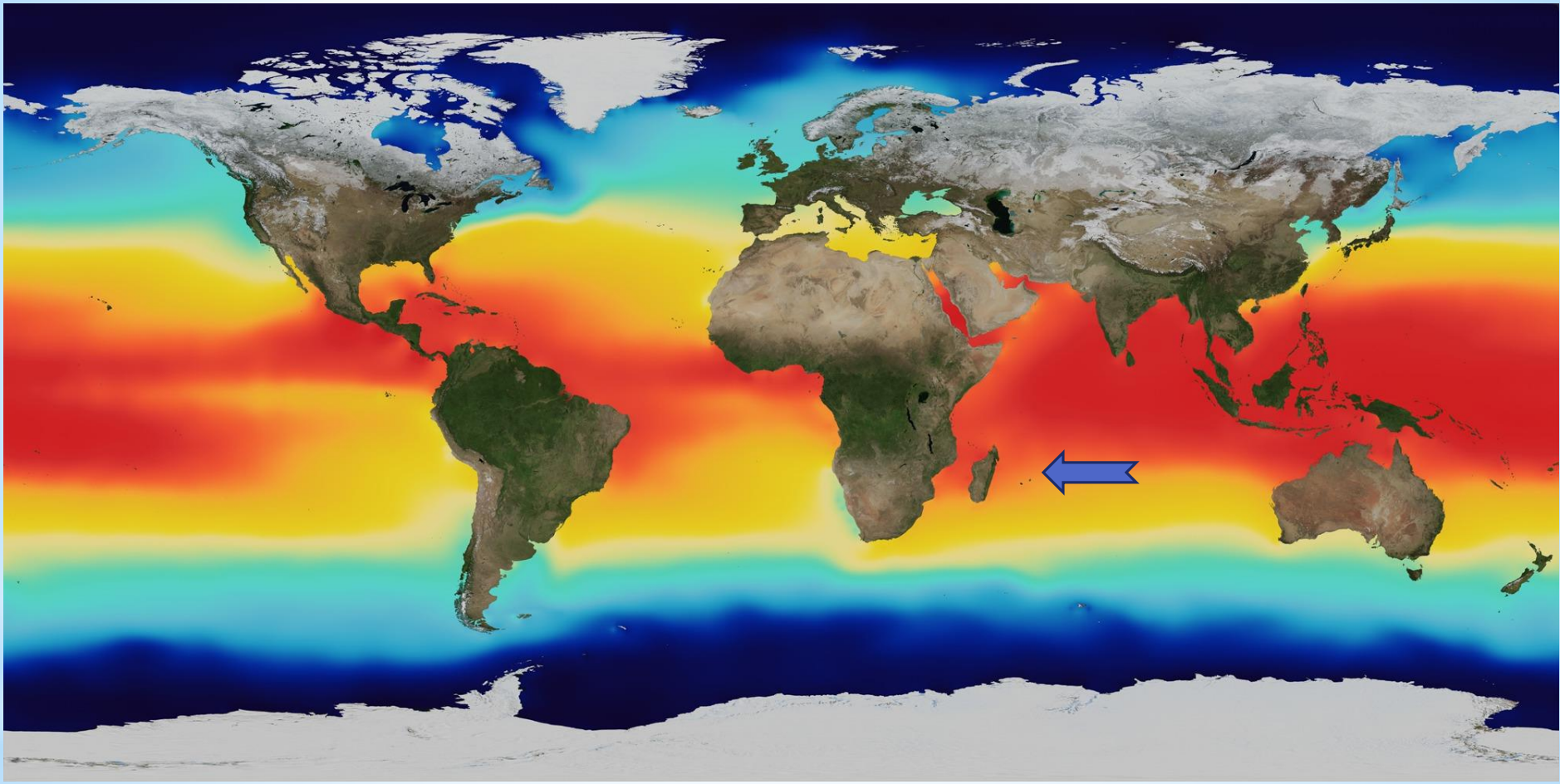
# *FACTS

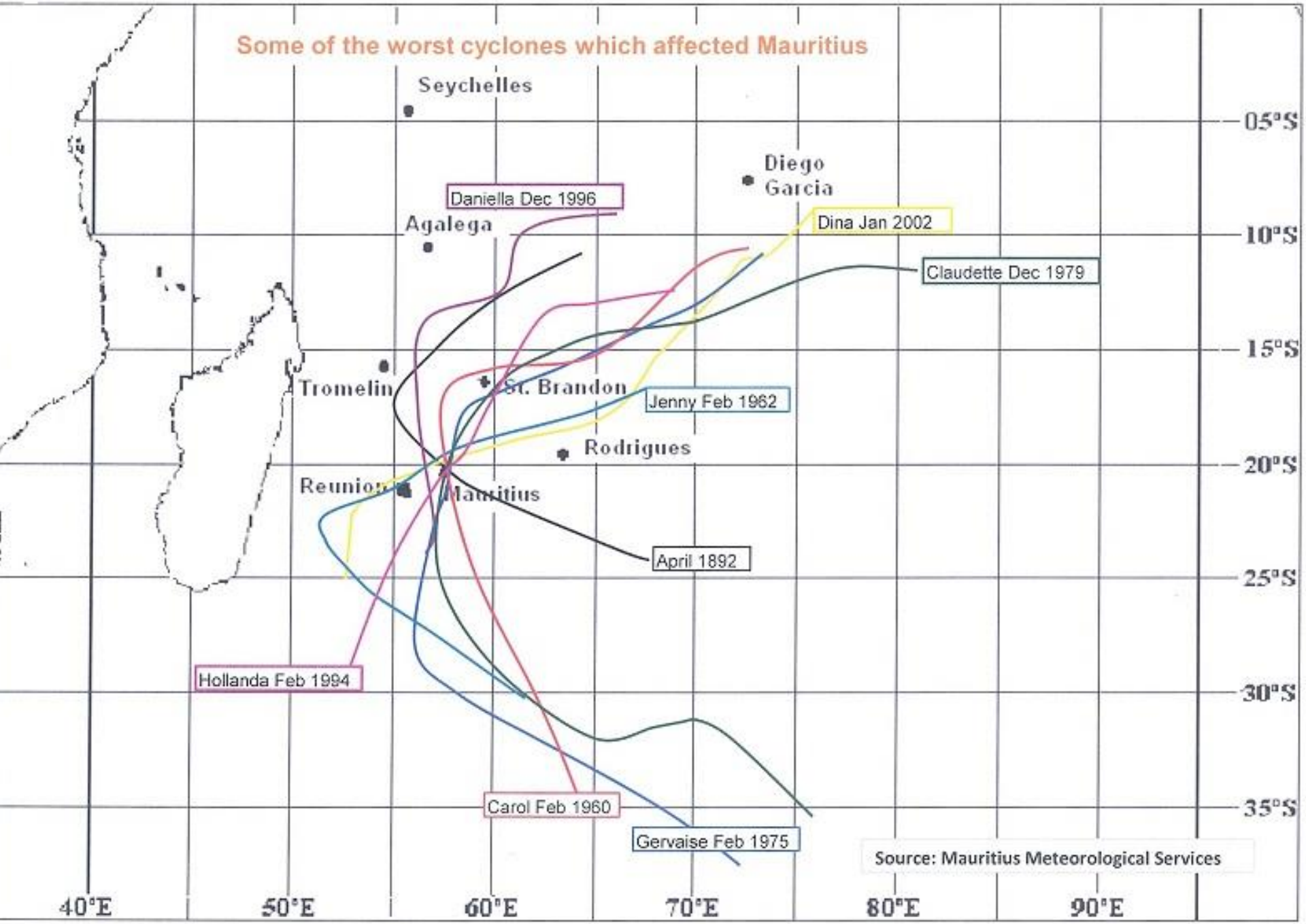
# Global temperature increase: Estimate vs Actual data

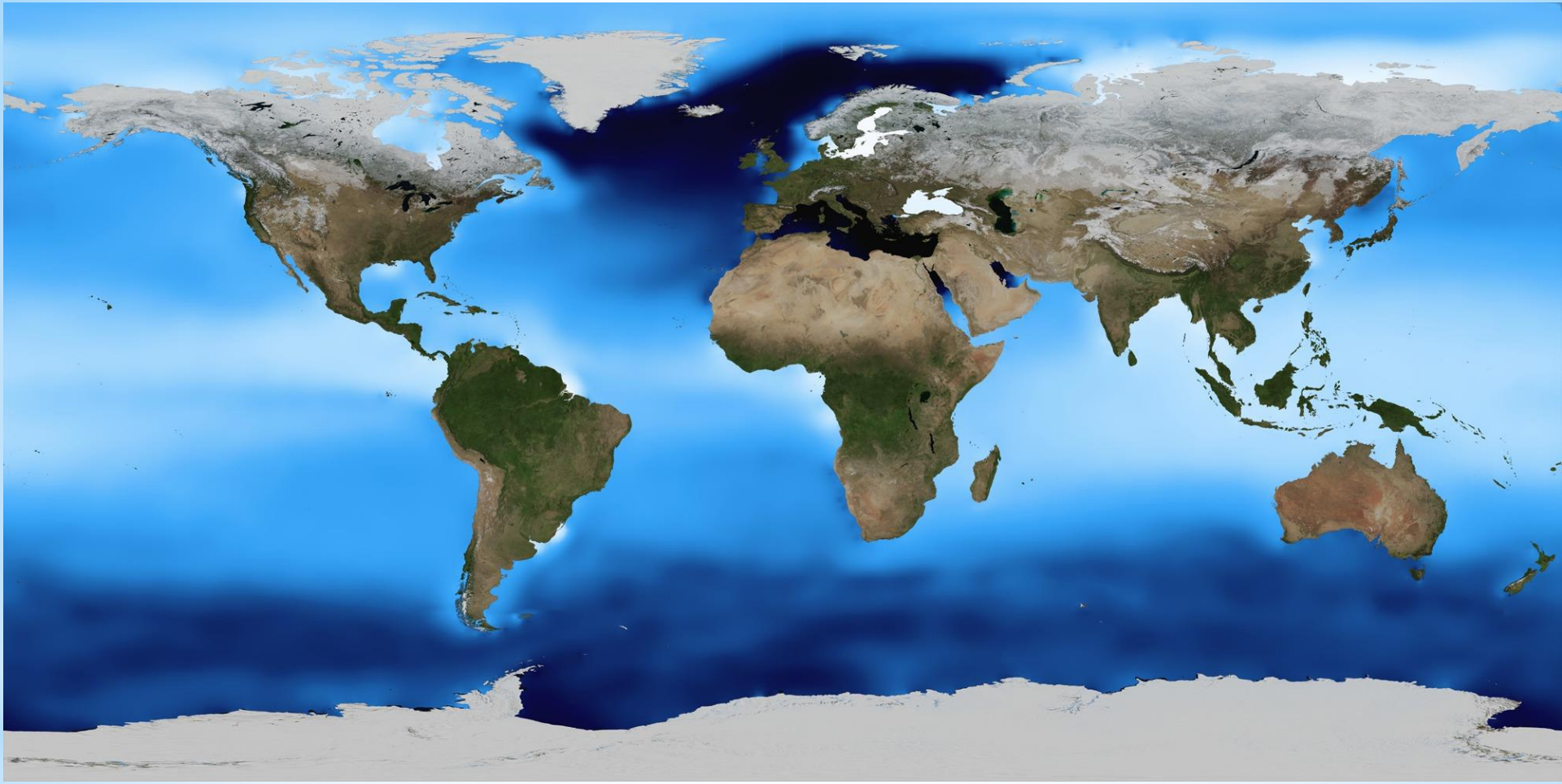



*Source of actual data (global temperature anomalies-degrees C):
National Oceanic and Atmospheric Administration, National Climatic Data Center, Global Surface Temperature Anomalies,
The Annual Global (land and ocean combined) Anomalies (degrees C)
http://www.ncdc.noaa.gov/cmb-faq/anomalies.html#mean
Final actual figures calculated as differences from base year 1950



SEA Surface Temperature:
Mauritius is more in the warmer belt


Some of the worst cyclones which affected Mauritius
Seychelles
Diego Garcia
Agalega
Tromelin
St. Brandon
Rodrigues
Reunion
Mauritius
Daniella Dec 1996
Dina Jan 2002
Claudette Dec 1979
Jenny Feb 1962
April 1892
Hollanda Feb 1994
Carol Feb 1960
Gervaise Feb 1975
05°S
10°S
15°S
20°S
25°S
30°S
35°S
40°E
50°E
60°E
70°E
80°E
90°E
Source: Mauritius Meteorological Services



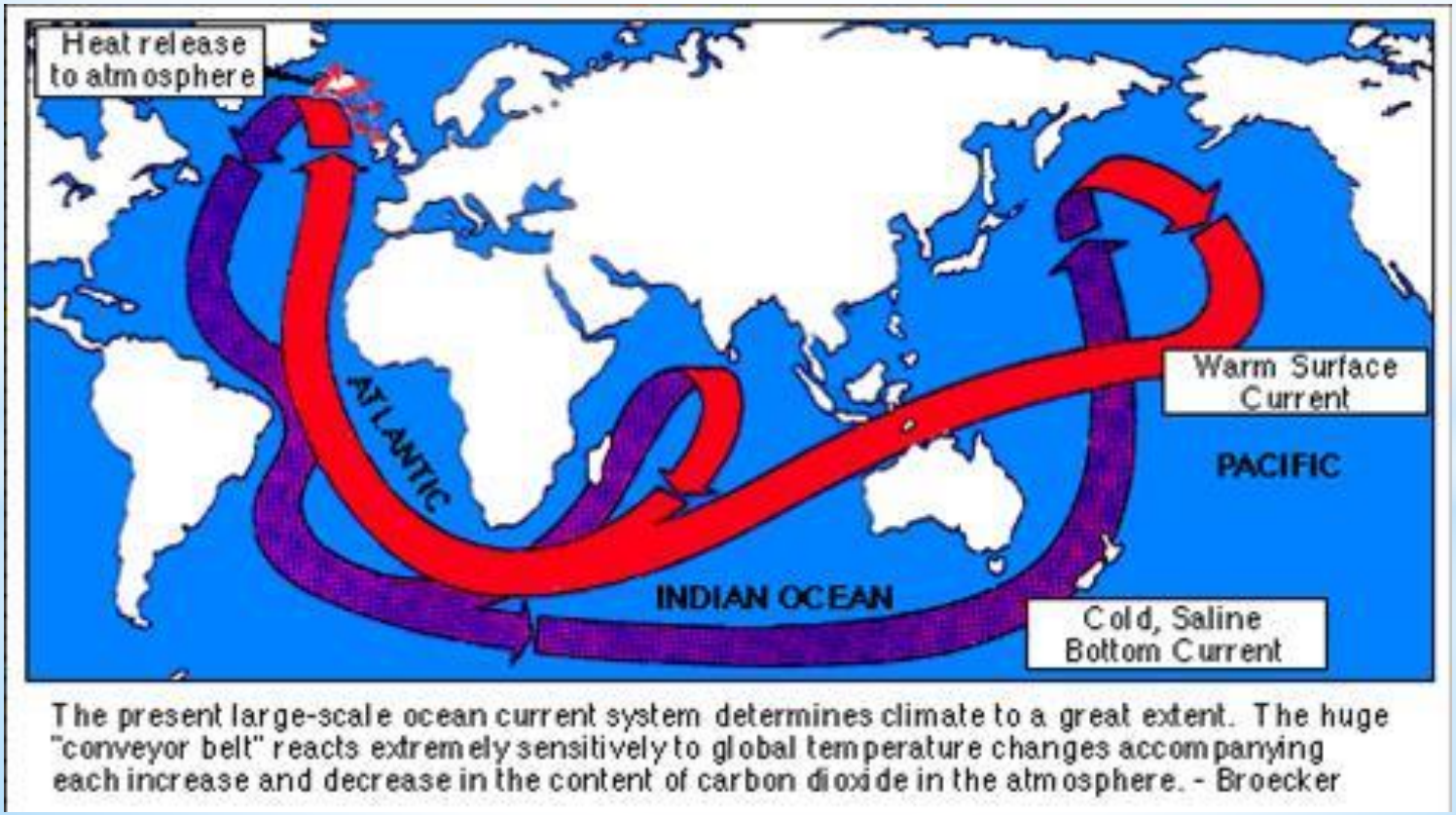
* Global map of average Sea Surface Density
Source: NASA

Dense regions:

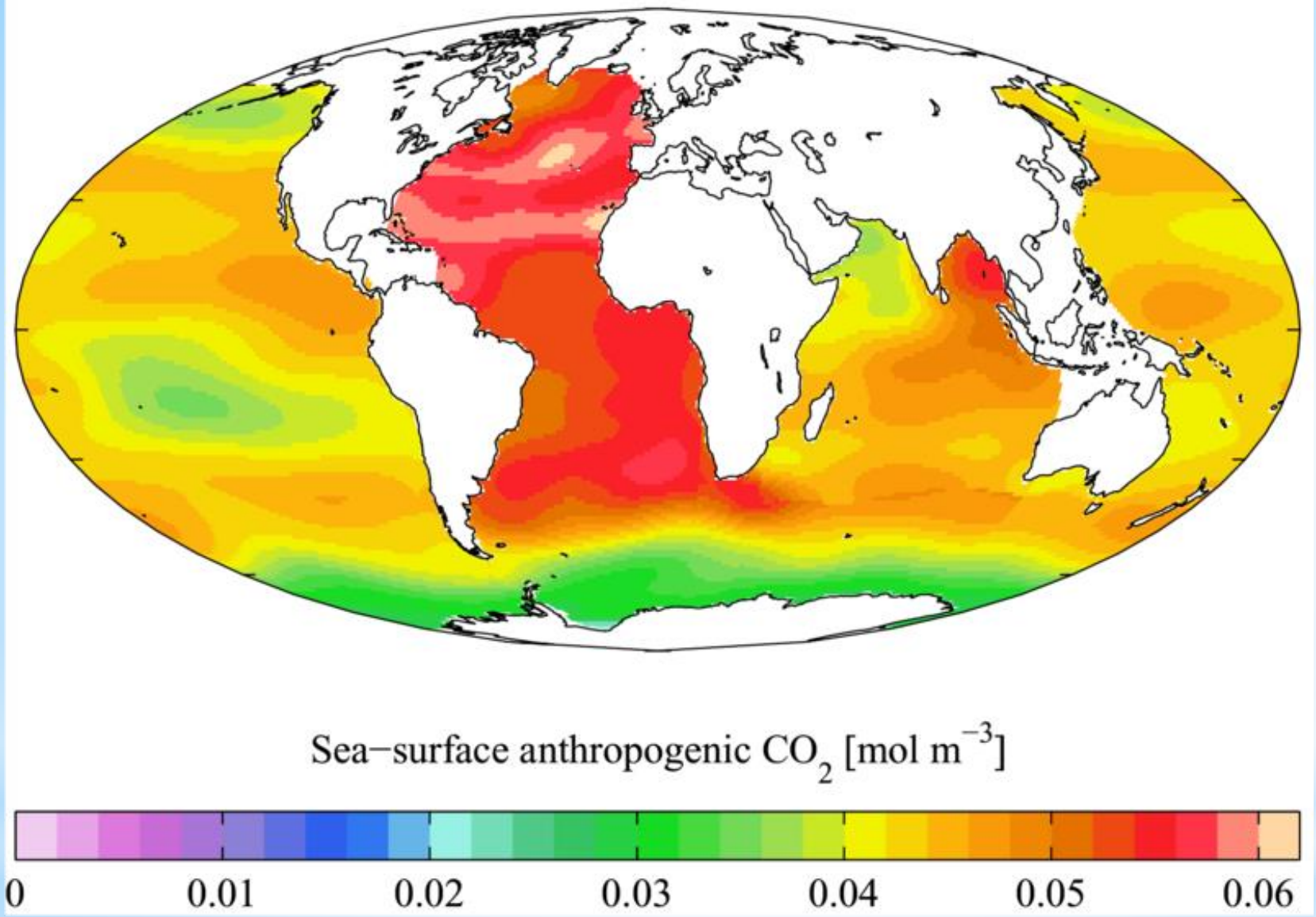
The surface water becomes dense enough to sink and join the deep ocean currents

In fact, this sinking is thought to drive these deep currents as part of a system called the Thermohaline Circulation/ **The Great Conveyor Belt**

This circulation has a strong effect on the Earth's climate, influencing the Gulf Stream, El Niño events, and both past and future Climate Shifts



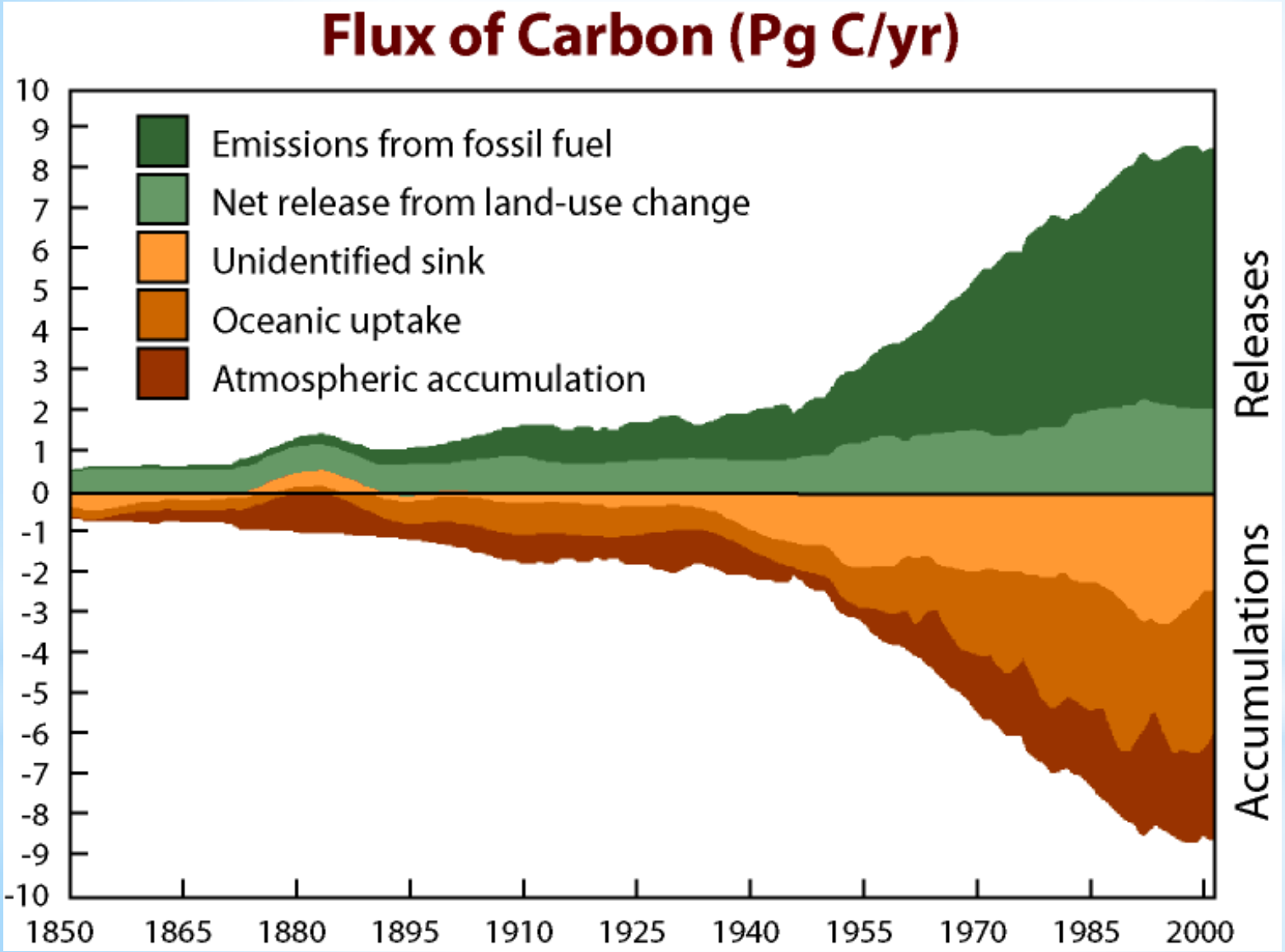

The present large-scale ocean current system determines climate to a great extent. The huge "conveyor belt" reacts extremely sensitively to global temperature changes accompanying each increase and decrease in the content of carbon dioxide in the atmosphere. - Broecker



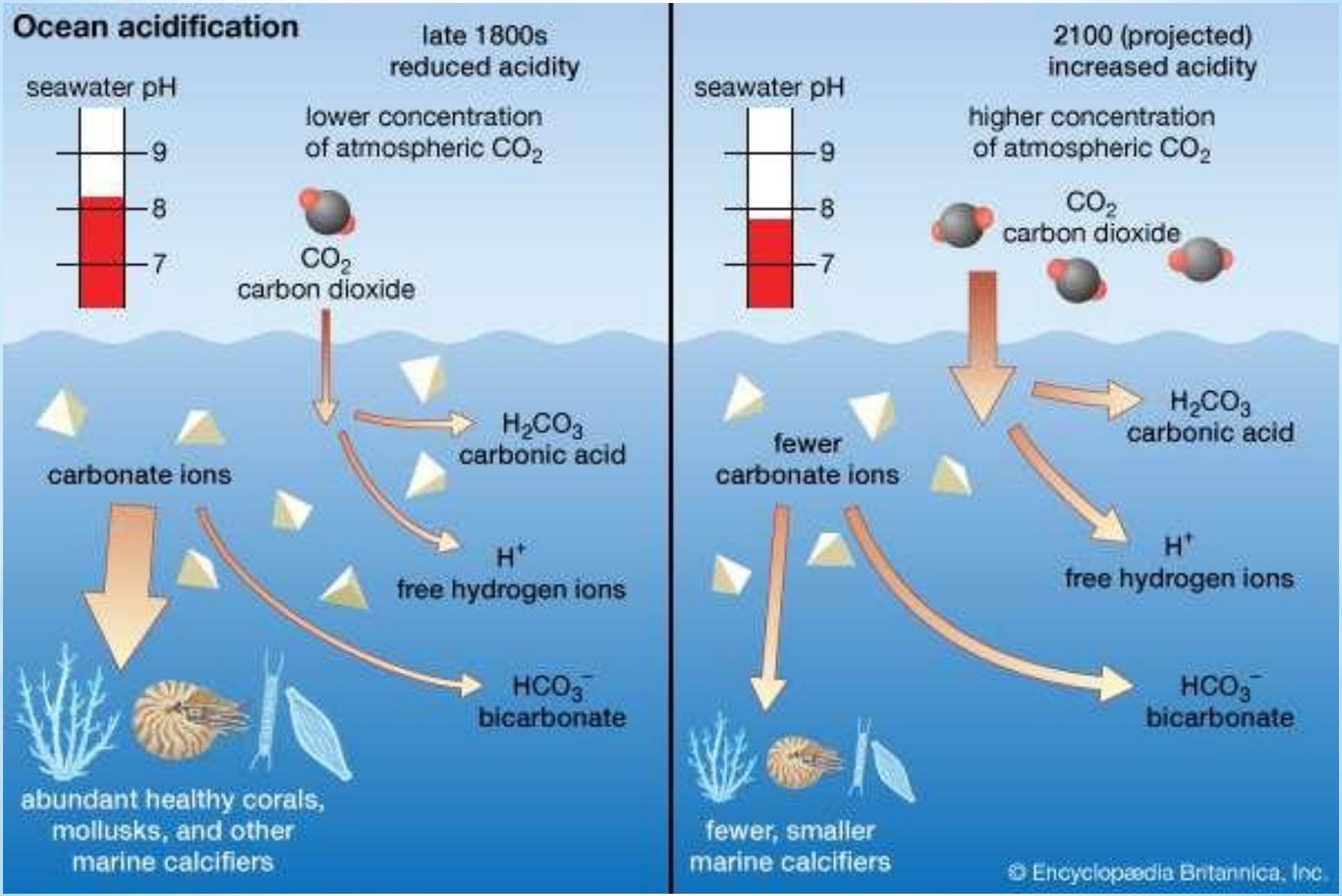

# *Anthropogenic $CO_2$ in seawater

Gruber, N., Sarmiento, J.L. and Stocker, T.F. (1996). An improved method for detecting anthropogenic $CO_2$ in the oceans, *Global Biogeochemical Cycles* **10**:809– 837

# Carbon Dioxide and the Ocean



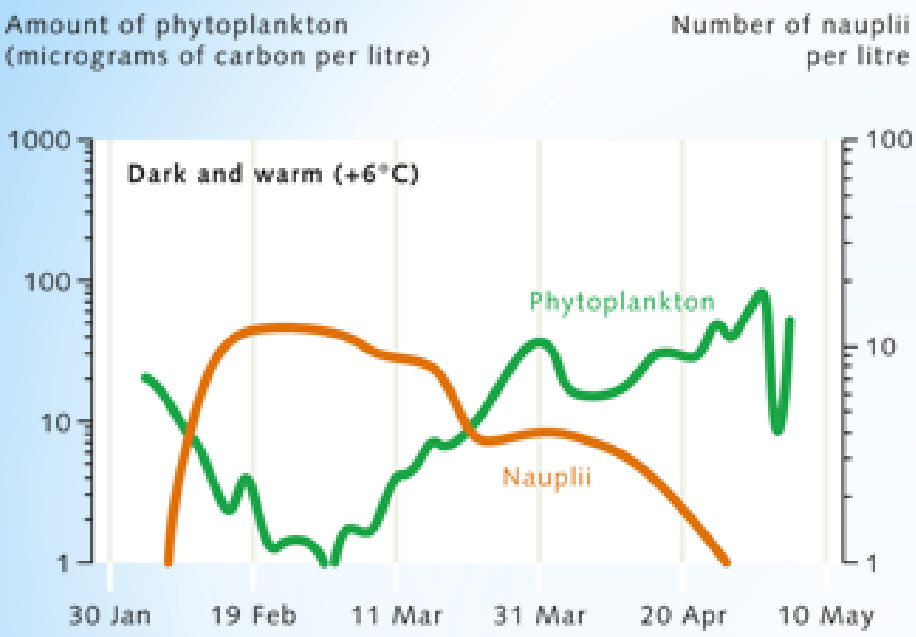
*The Ocean remain the largest sink of Carbon dioxide.. And this leads to a phenomenon known as ocean acidification.

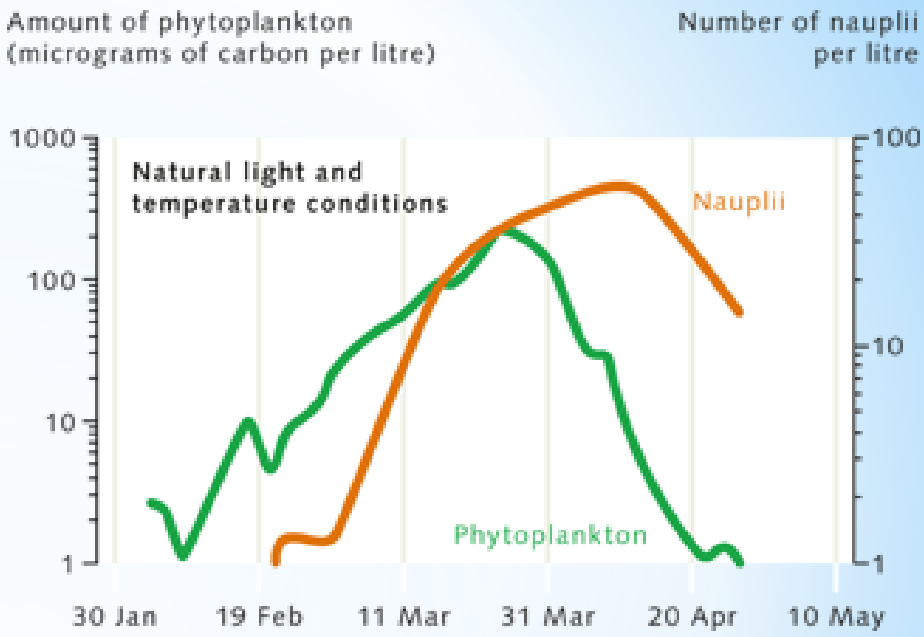


# OCEAN ACIDIFICATION
## Impacts on Sea Life


Source: David Littschwager/National Geographic Society

CLIMATE CENTRAL

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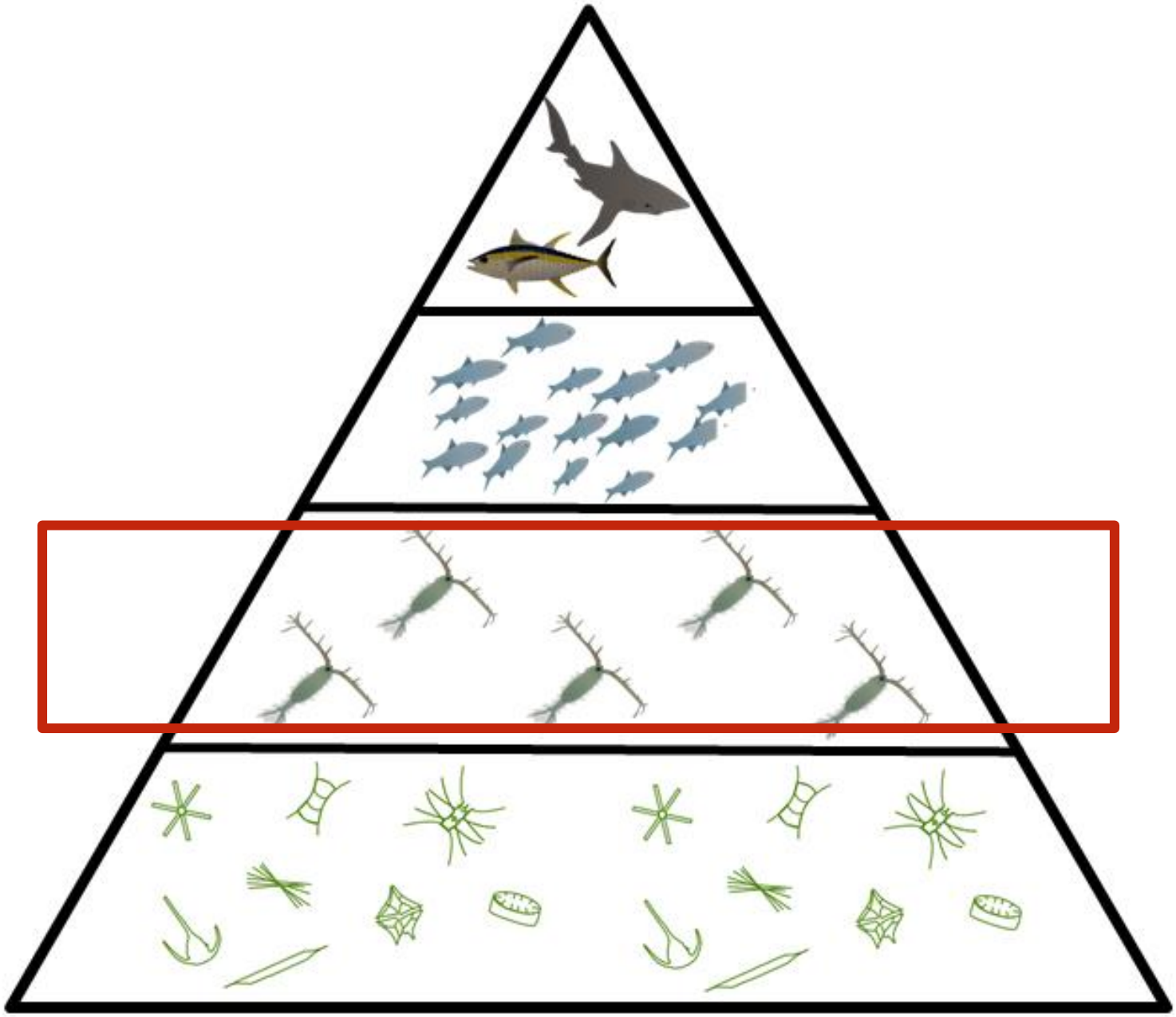
# Aquatic systems: the basics

## conclusion: zooplanktons are heat sensitive

# *Zooplanktons



* Effects on zooplanttons have a direct effect on all other invertebrates and vertebrates

Aquatic ecosystems can easily collapse because:

Zooplanktons lies at the bottom of every vertebrate life cycle: feeding the larval stages of fish

Marine ecosystems at higher risks than terrestrial ecosystems:

Main stressors: Temperature and ocean acidification

# *Coral Bleaching

- The World Wide Fund for Nature (WWF) calculates the total global asset of reefs at US$800 billion

- 850 million people dependent on reef-based ecosystems for food security and livelihood

- Close to 100 countries benefit from coastline protection, tourism and fisheries, supported by the biodiversity hosted by coral reefs.

- And a quarter of the 100 countries benefitting from coral reefs depend on tourism for more than 15 per cent of their GDP

- Temperature threshold for coral survival: 29° C


# coral bleaching report 2014-2017

# Stormy weather

* Kerr (1999) suggests that tropical cyclones could become more intense.
* Hurricanes Hugo and Marilyn hit the US Virgin Islands National Park in 1989 and 1995, respectively, and did massive damage to coral ecosystems.
* Knutson et al. (1998) and Knutson and Tuleya (1999) showed increases in hurricane wind strength of 5–10% are possible with a 2.2°C warmer sea surface.
* Destroying marine ecosystems:
  * Corals
  * Mangroves
  * Seagrasses

* As the oceans warm, stenothermal ( narrow temperature range) organisms may be forced migrate.

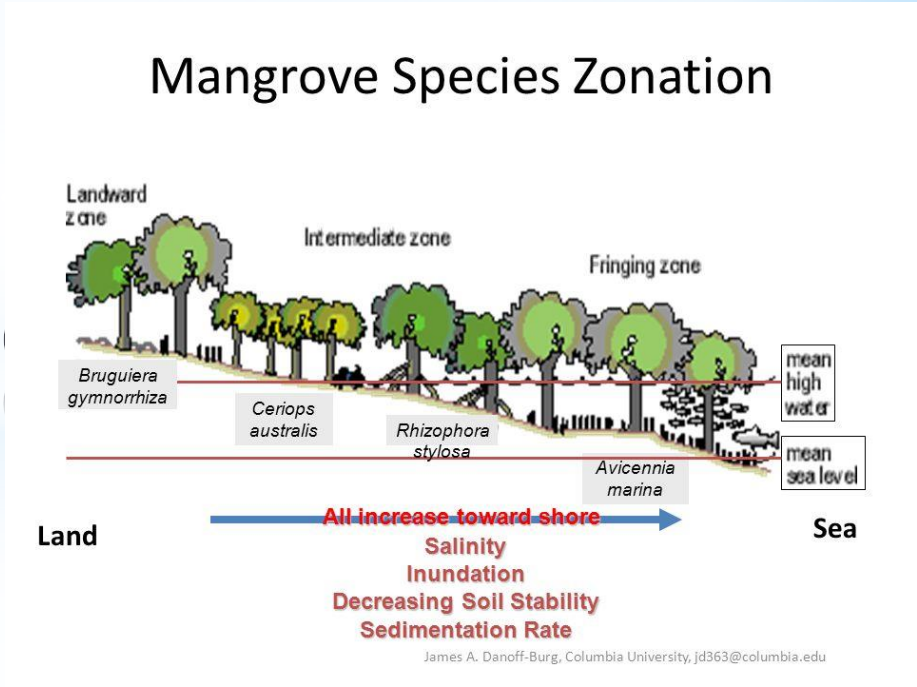
* Mangroves moving landward

* The distribution of penguin species in the Antarctic Peninsula region, for example, is changing with reductions in sea ice due to global warming.

Magroves:

Breeding ground and nursery for reef fish, crustaceans such as praans and shrimps

Direct impact on coastal fisheries



- During the last 100 years, globally **averaged sea level has risen approximately 10-20 cm** (IPCC 1996).

- (IPCC 2001) model projections spans **from 9 to 88 cm rise in global sea level by 2100.**

* Rapid sea level rise will likely be the greatest climate change challenge to mangrove ecosystems, which require stable sea levels for long-term survival.

*Panama

Warming water temperature

- Increase productivity
- Harmful algae usually bloom during the warm summer season or when water temperatures are warmer than usual.


**Impacts:**

Aquaculture

Artisanal fisheries

# *Harmful Algal Blooms

# Climate Change: The Youth Perspective

# *Introduction

* Climate change is one a major global challenges of the 21st century.
* Developing countries have been found to be more prone to the impacts of climate change.
* There are many mitigation and adaptation measures that have been designed to tackle the growing threats of climate change.
* Communication is a key area. (Moser, 2010)
* Maurititus: SIDS **( Small island** developping State)

* Educating, informing and raising awareness about climate change.

* ensures greater public understanding (Ockwell, Whitmarsh & O'neil,2009; Pew Center,2009),

* increases the cognitive capacity for adaptation and mitigation purposes (Pruneau, Khattabi & Demers, 2010),

* Encourages people to changes in terms of energy consumption and environmental practices (Leiserowitz, Maibach, Roser-Renouf & Smith, 2010),

* bridges the gap between science and society (Fischhoff, 2007).

# * Communication

* Understanding public knowledge on climate change is a crucial.

* Understanding the views, attitudes, and beliefs of the public on climate change is instrumental in the climate adaptation and mitigation process (Shome and Marx, 2009).

* this study examines the level of awareness of the problem among youngsters.

# METHODOLOGY

* 120 respondents aged between 13 and 25 years

* This study employed a survey strategy and questionnaire design method to empirically test the knowledge of youngsters on climate change.

* The primary goal of this research was to capture the understanding, views, beliefs, attitudes of the youth in Mauritius, and the action they take to tackle the impacts of climate change.

# Results

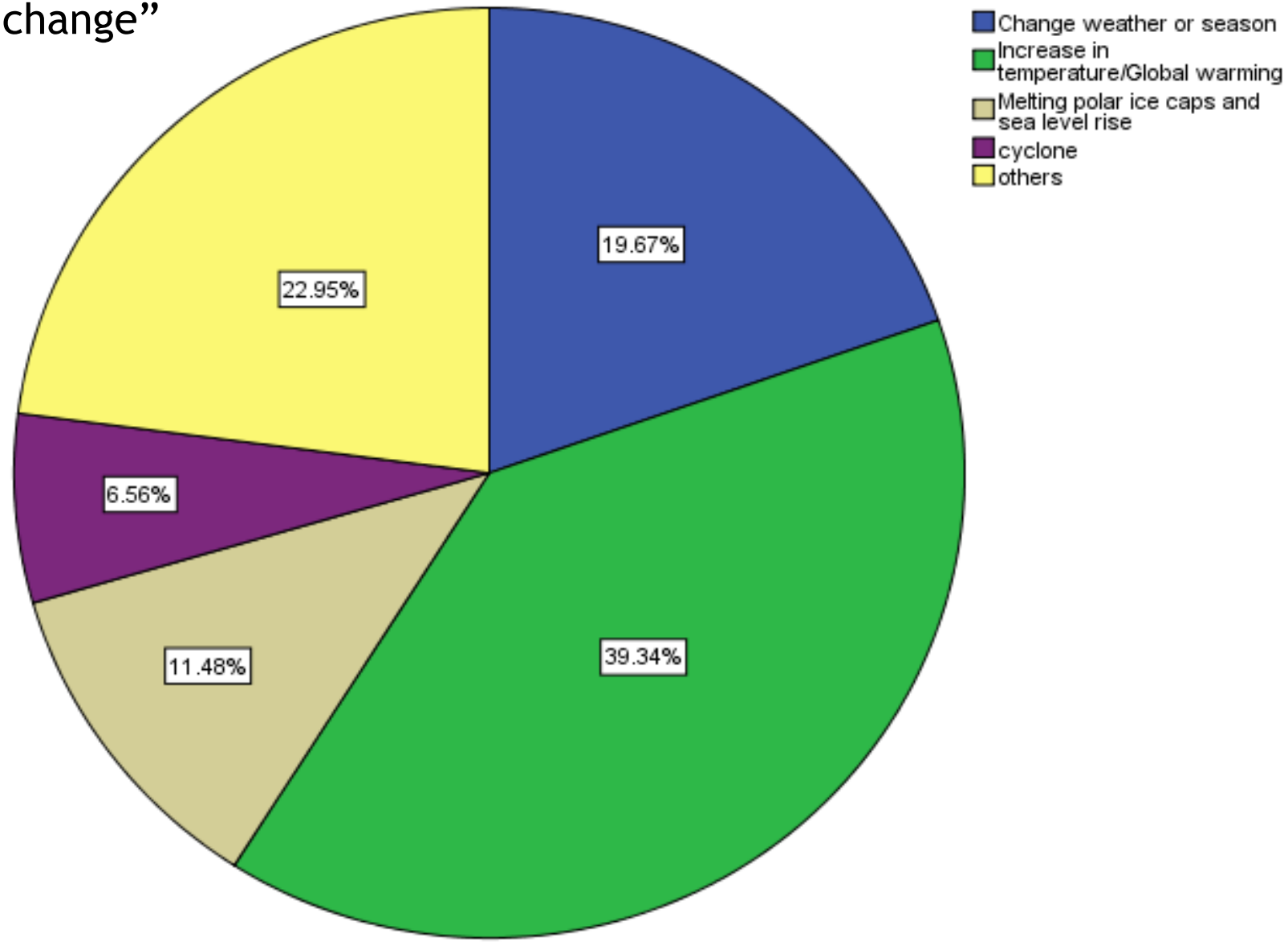
* 95.08% of the candidates acknowledged that climate change is happening

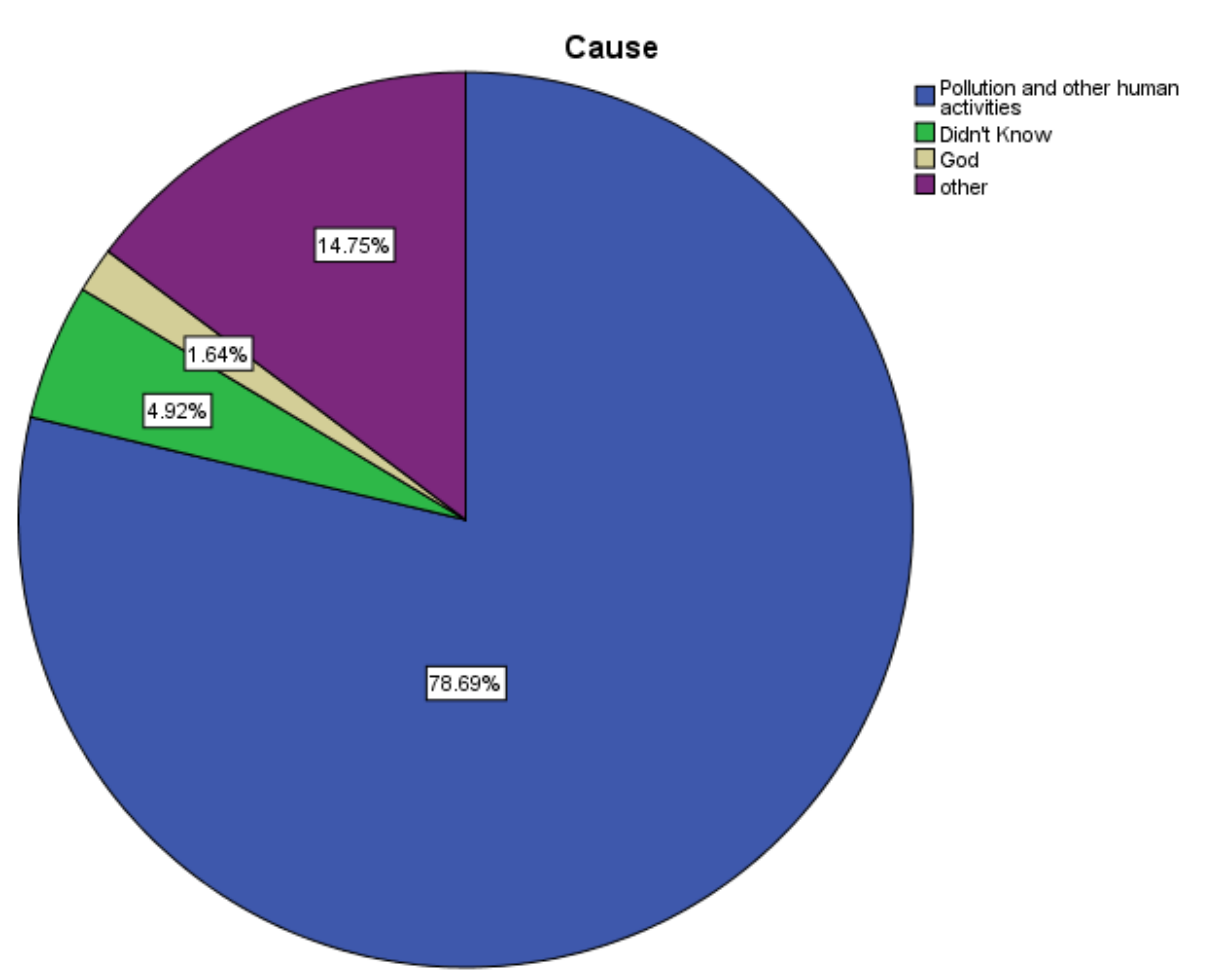
* What comes to your mind when you hear the term “climate change

* 77.05% showed an understanding of the term “climate change”

*”

- What comes to your mind when you hear the term “climate change”

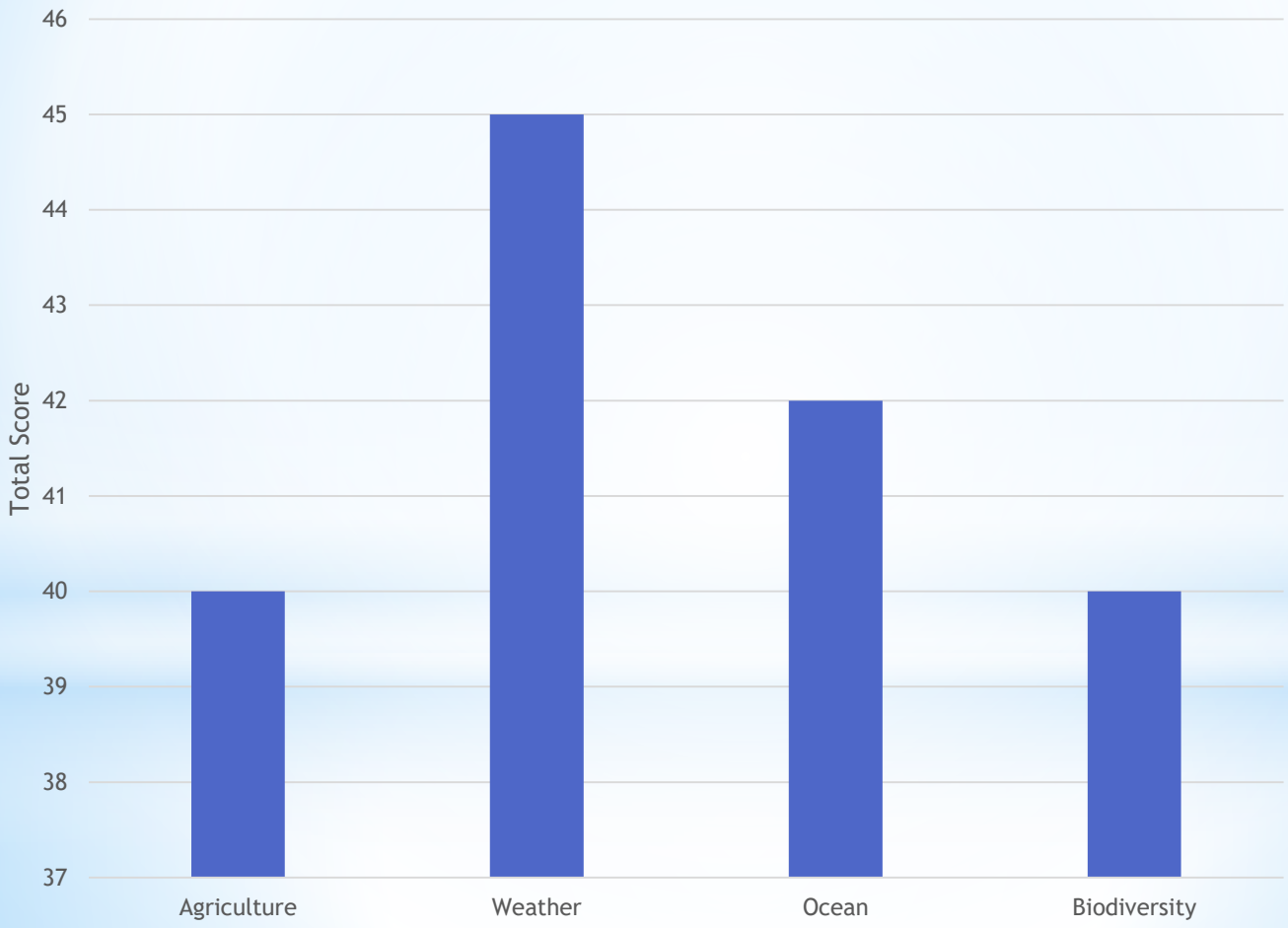





* Out of 78.69% respondents only 2.88% identified C02 and other greenhouse gases as the main cause of climate change

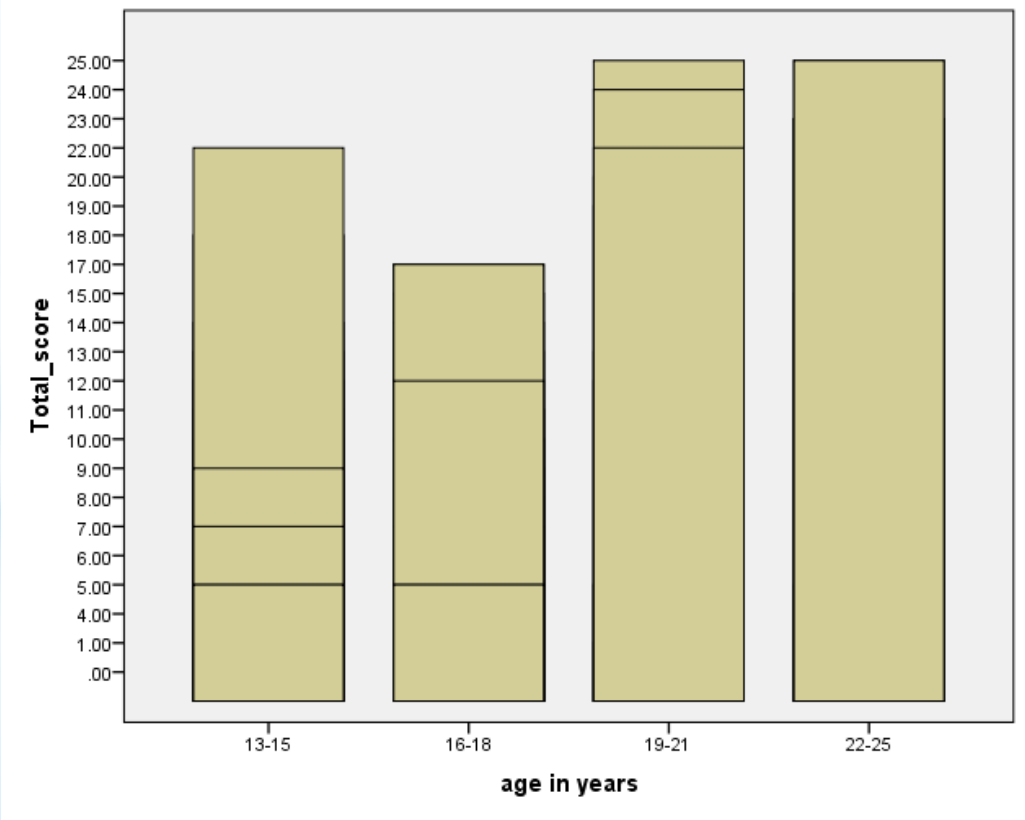
# Knowledge on the impacts of climate change

* Average score: 44%



- Knowledge on the impacts of climate change showed a weak positive correlation with age

- Knowledge on the impacts of climate change showed no significant correlation with gender and academic qualification



* Question ( open ended): “what have you done to reduce the impacts of climate change”

* Answer: “nothing yet” ( most of them do not know what to do)

* 11% are not aware of the mitigation measures for climate change

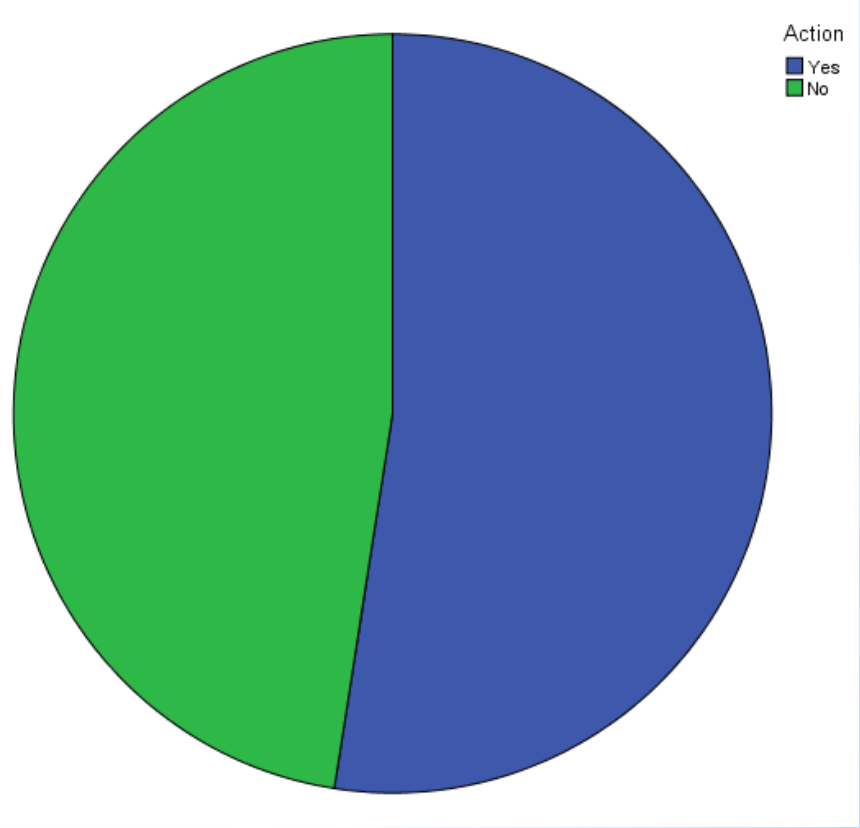
* Some common answers by the yougsters on mitigation:

* Reduce pollution and emissions
* Less fossil fuel or opt for renewable energy
* 3 Rs ( Reduce, re-use & re-cycle)
* Planting trees
* Clean up ( though irrelevant)
* Gardening
* composting

* Conclusion: some confusion with pollution as the main cause of climate change

* No correlation between action taken and effects on personal life

* 52.46% have taken action



# Conclusion

- Mauritian youth is aware of the phenomenon of climate change
- Pollution to be the main cause  of Climate change  according to them
- Lack of knowledge on mitigation measures

* Pimm, S. (2009). Climate Disruption and Biodiversity. Current Biology, 19(14), pp.R595-R601.
* Hansen, J., Sato, M., Ruedy, R., Lo, K., Lea, D. and Medina-Elizade, M. (2006). Global temperature change. Proceedings of the National Academy of Sciences, 103(39), pp.14288-14293.
* https://oceanservice.noaa.gov/facts/acidification.html

# *Thank you