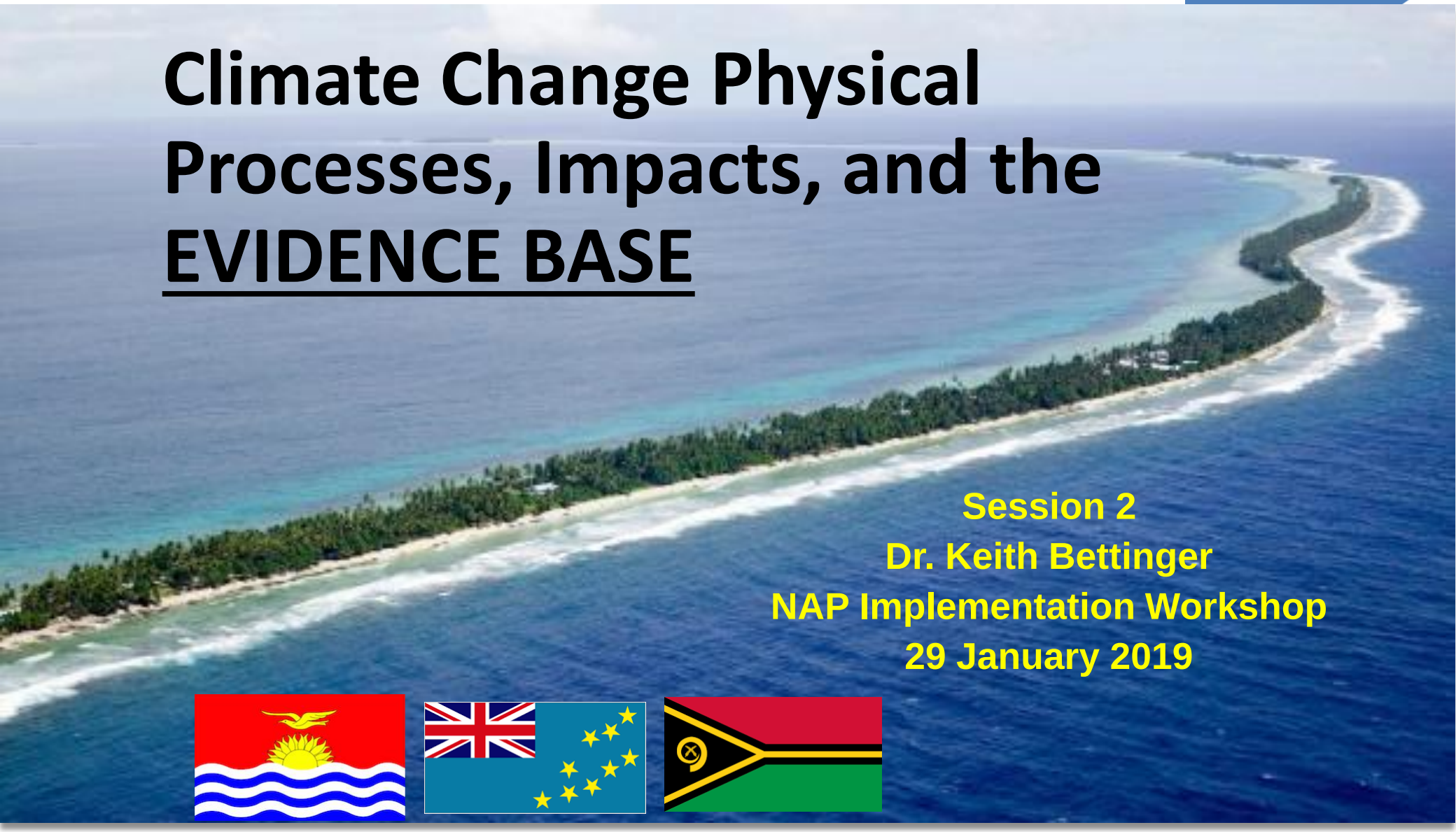
NAP-GSP
NATIONAL ADAPTATION PLAN GLOBAL SUPPORT PROGRAMME

Climate Change Physical Processes, Impacts, and the EVIDENCE BASE

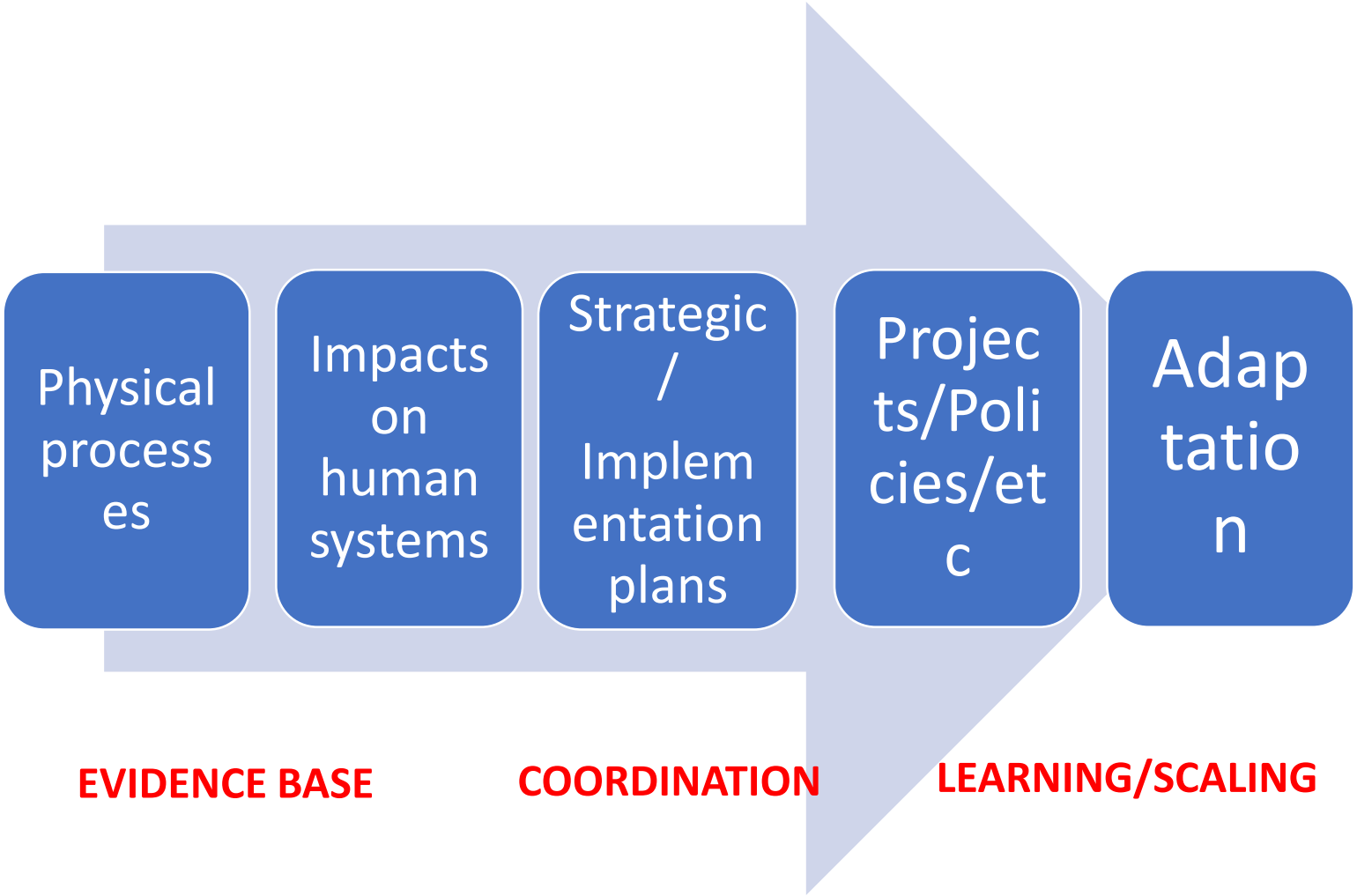


Session 2
Dr. Keith Bettinger
NAP Implementation Workshop
29 January 2019

The Key Takeaway…

- Climate change policies and projects need to be based on a **RIGOROUS EVIDENCE** base.
  - Facts, figures, data, information that demonstrates that climate change is happening, and what the impacts of climate change are on human systems
  - Important for bankability but more importantly…
  - EFFECTIVENESS.

In this session we learn about the rigorous evidence base.


Physical processes
Impacts on human systems
Strategic / Implementation plans
Projects/Policies/etc
Adaptation
EVIDENCE BASE
COORDINATION
LEARNING/SCALING

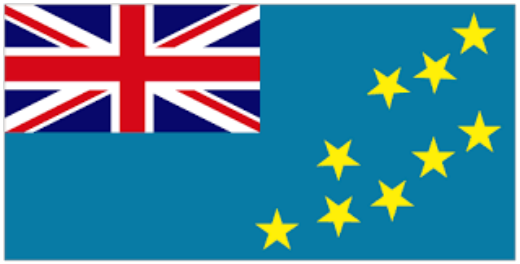
Something to think about

- **WORST PRACTICE: Start with a project you already know what you want to do, then work backwards and connect it to climate change…**

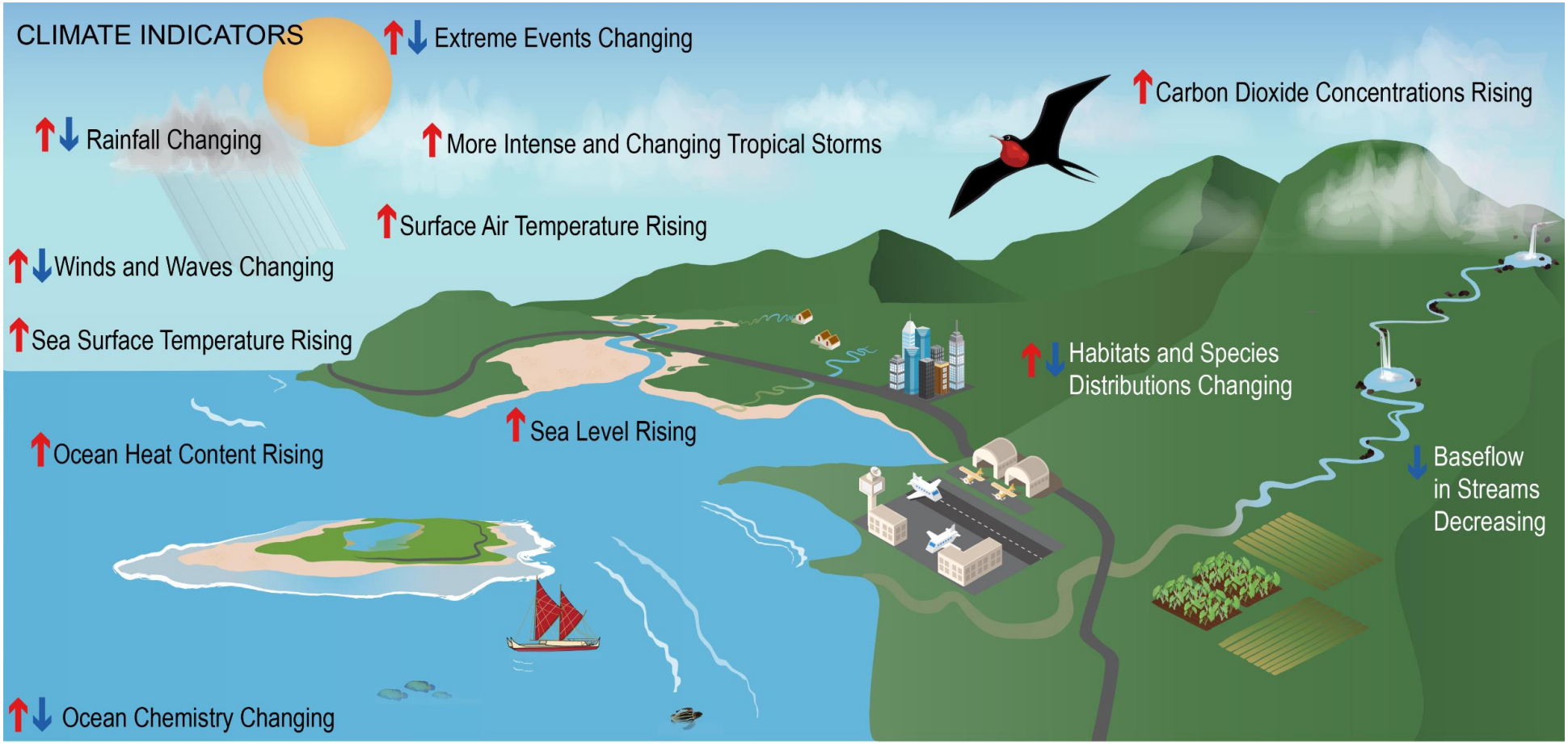
- **BEST PRACTICE: Rigorous evidence base on climate change processes and impacts informs strategy and policy, which then directs investment.**

Outline

1. Describe the physical drivers that shape climate in Tuvalu, Vanuatu, and Kiribati
2. Discuss the Observed changes in climate found in these countries.
3. Present projections for future climate scenarios.
4. Discuss the impacts that these changes have on pacific island communities.



Part 1
Observed Changes In Physical Processes



Policy/Project Description of Climate Change

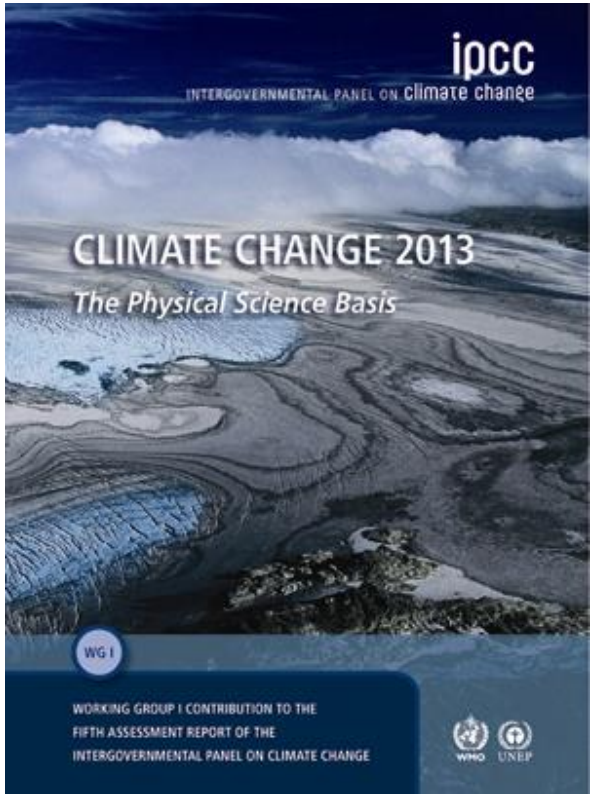
- *How do you construct your description of climate change processes?*

- GLOBAL: General processes
  - Sources of information?
- NATIONAL: Regional processes
  - Agencies and reports?
- SUBNATIONAL: If available
  - Universities? NGOs?

- *Remember that information is evolving*

How Do We Know: Global

"Assess…the scientific, technical and socio-economic information relevant to understanding…human-induced climate change, its potential impacts and options for adaptation and mitigation."



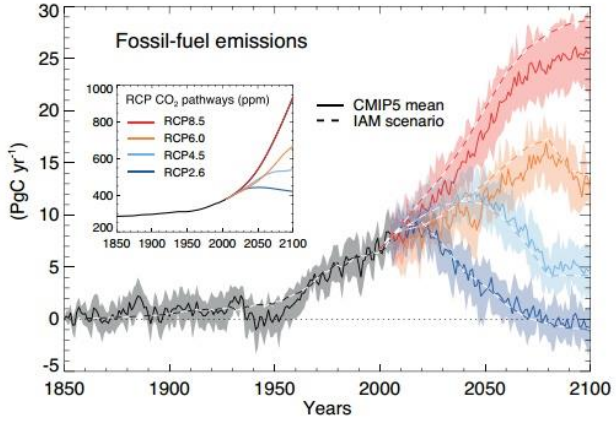
To download:
http://www.ipcc.ch/report/ar5/wg1/

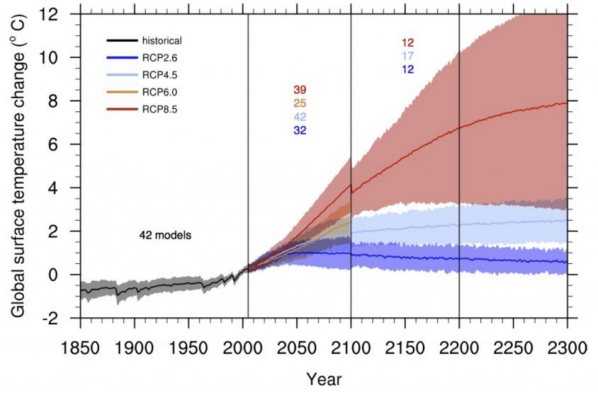
What Will Happen in the Future?

- It depends!

- Future emissions
- Carbon dioxide uptake in the oceans
- Feedbacks & tipping points

- *We are already committed to some degree of climate change.*





Why is the last point important?

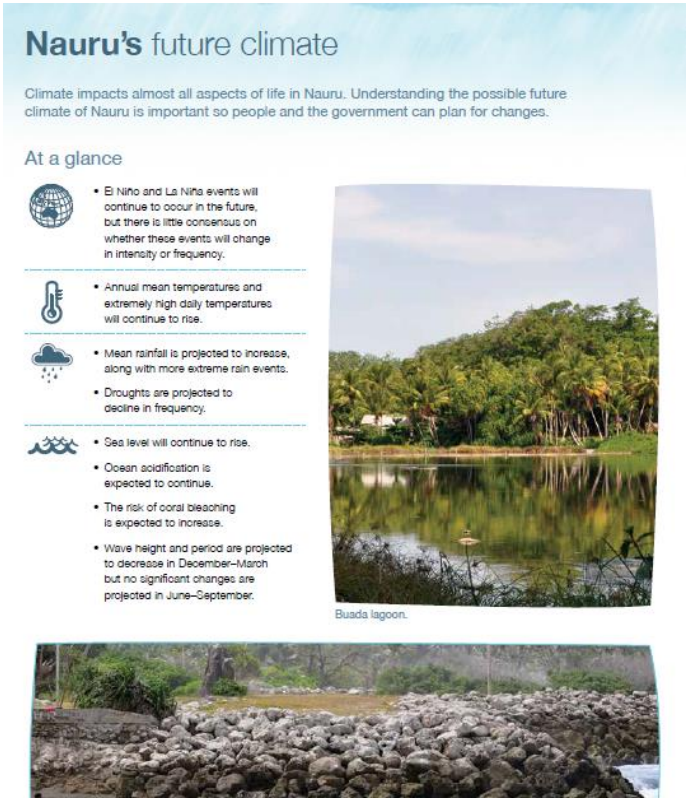
***In general*, policies and projects should be ROBUST across a range of possible futures!!!**

E.G. Worst case scenario, best case scenario.

Your policy/project should provide benefits no matter what happens.

Additional Sources of Climate Information

- Hadley Centre (UK) projections on Asia
- AusAID projections on Pacific
- UNEP/UNDP country reports
- World Bank Climate Change Knowledge Portal
- ADB country reports
- **Tip: Be familiar with sources of climate information relevant to your country!**
- **Tip: Periodically review the information that is available**



Driving Mechanisms of Rainfall in the Region

- Inter-tropical Convergent zone (ITCZ)
- South Pacific Convergent Zone (SPCZ)
- West Pacific Monsoon (WPM

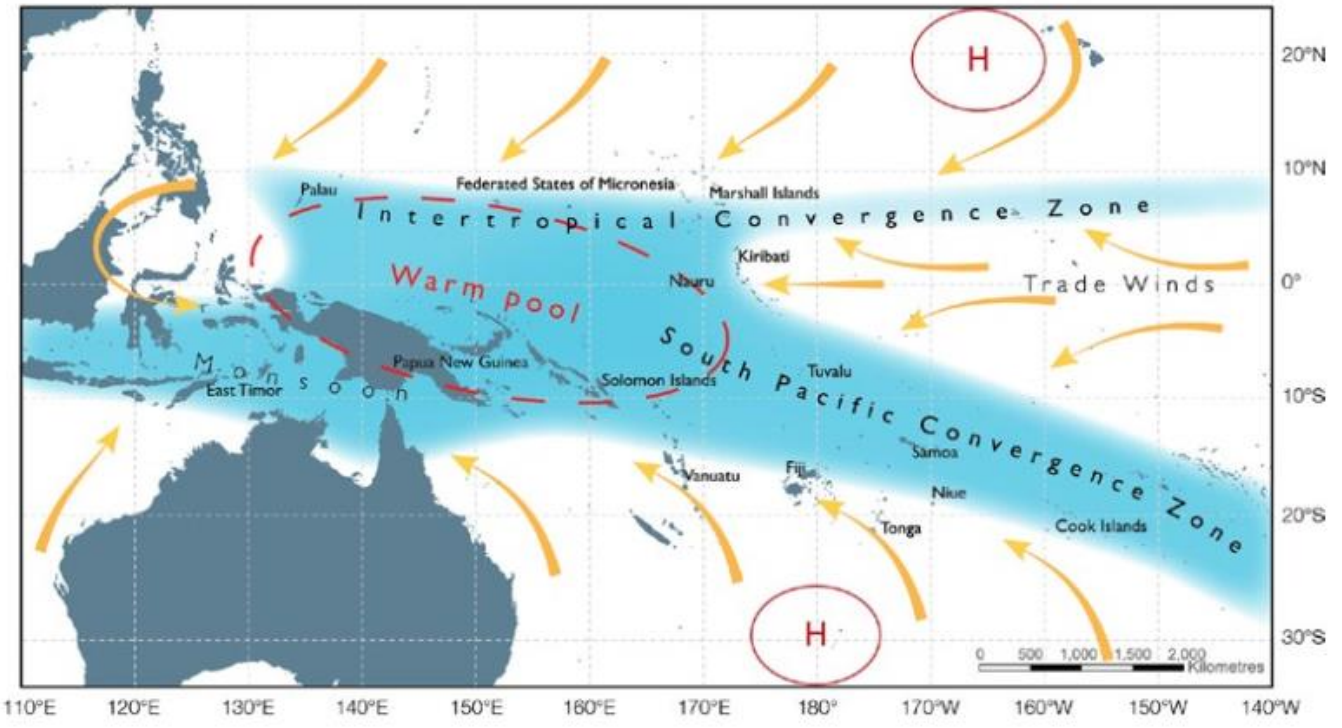


Figure ES.2: The average positions of the major climate features of the PCCSP region in November to April. The yellow arrows show near surface winds, the blue shading represents the bands of rainfall (convergence zones with relatively low pressure), and the red dashed oval indicates the West Pacific Warm Pool. H represents the typical positions of moving high pressure systems.

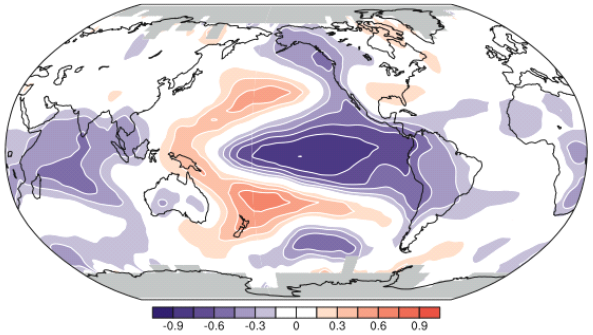
Australian Bureau of Meteorology & CSIRO (2011).

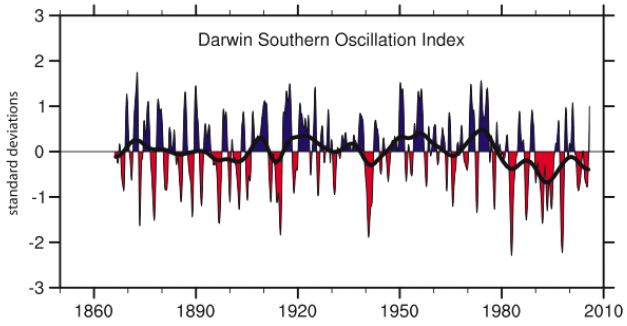
Year-to-Year Climate Variability

- Large year-to-year variations in rainfall
- Much of this variability is linked to the El Niño Southern Oscillation ENSO
- ENSO has different effects across the Pacific

ENSO

El Niño Southern Oscillation



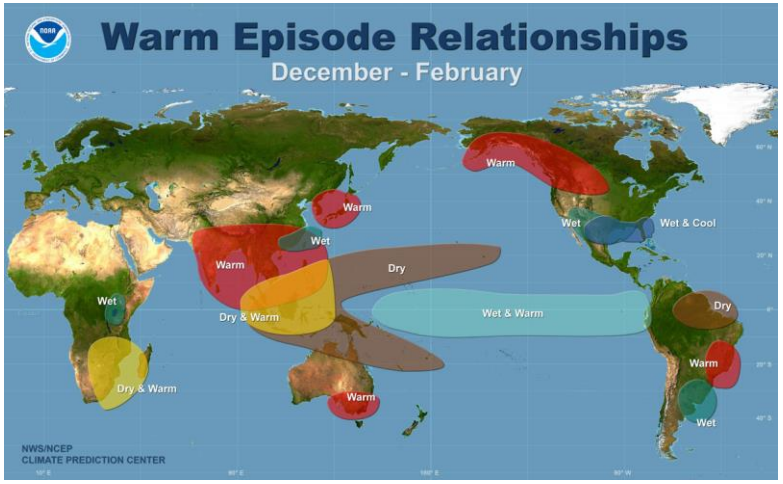


El Niño (Warm)

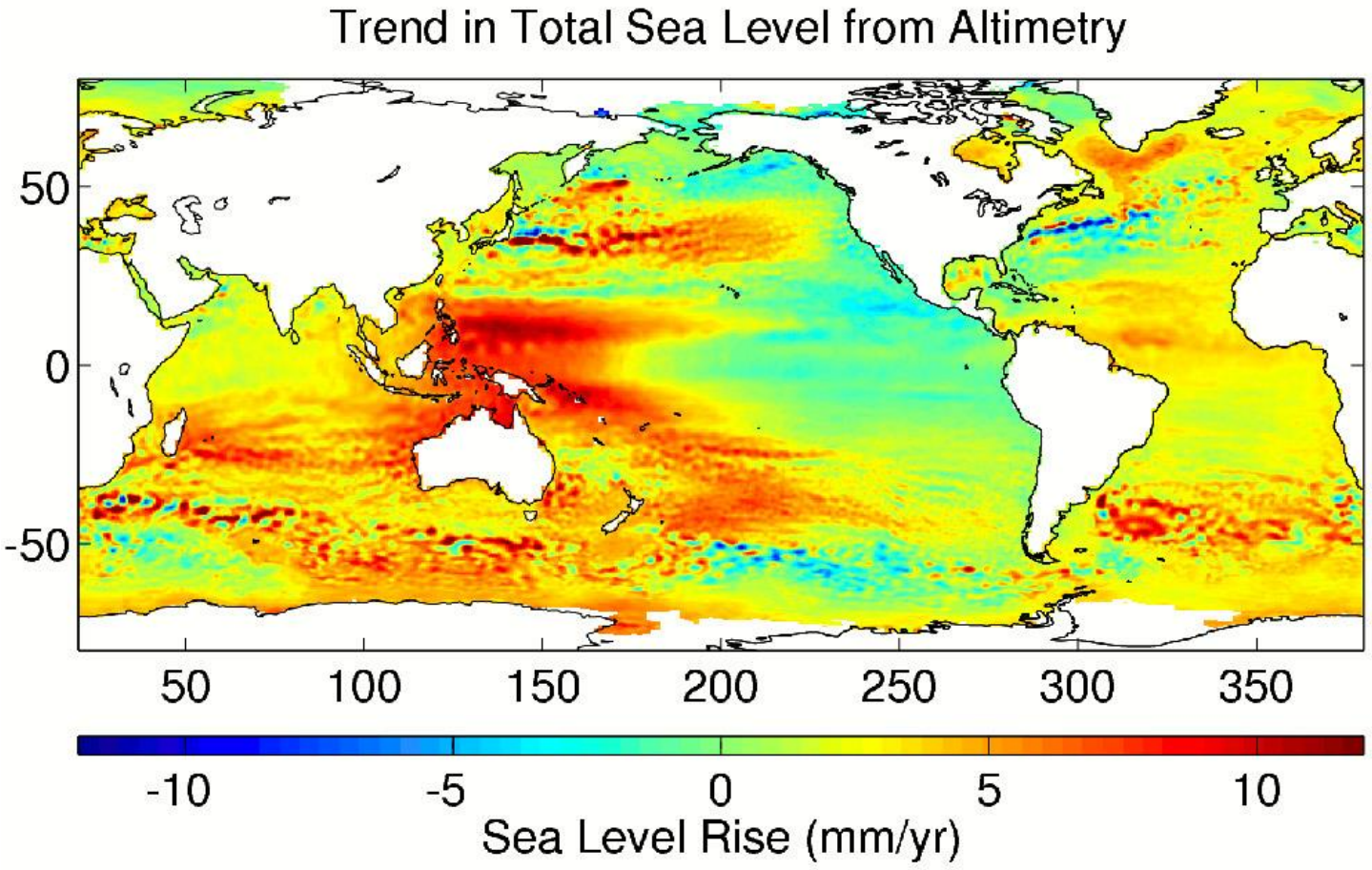
Tuvalu – Dry

Vanuatu –Dry

Kiribati - Wet

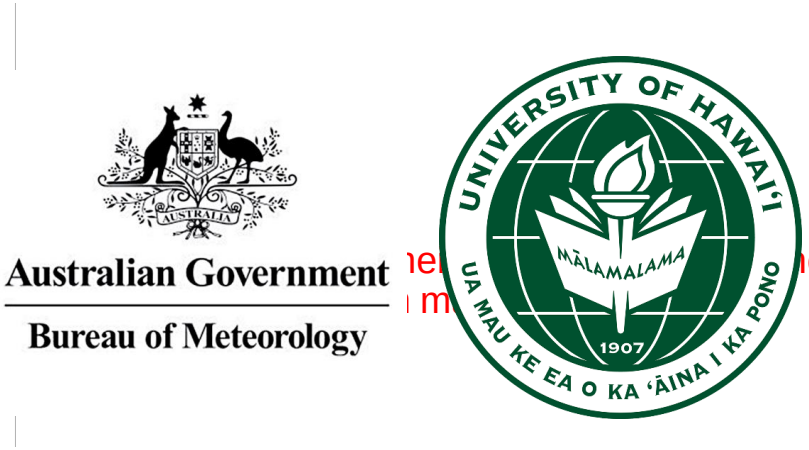


Observed Sea Level Rise



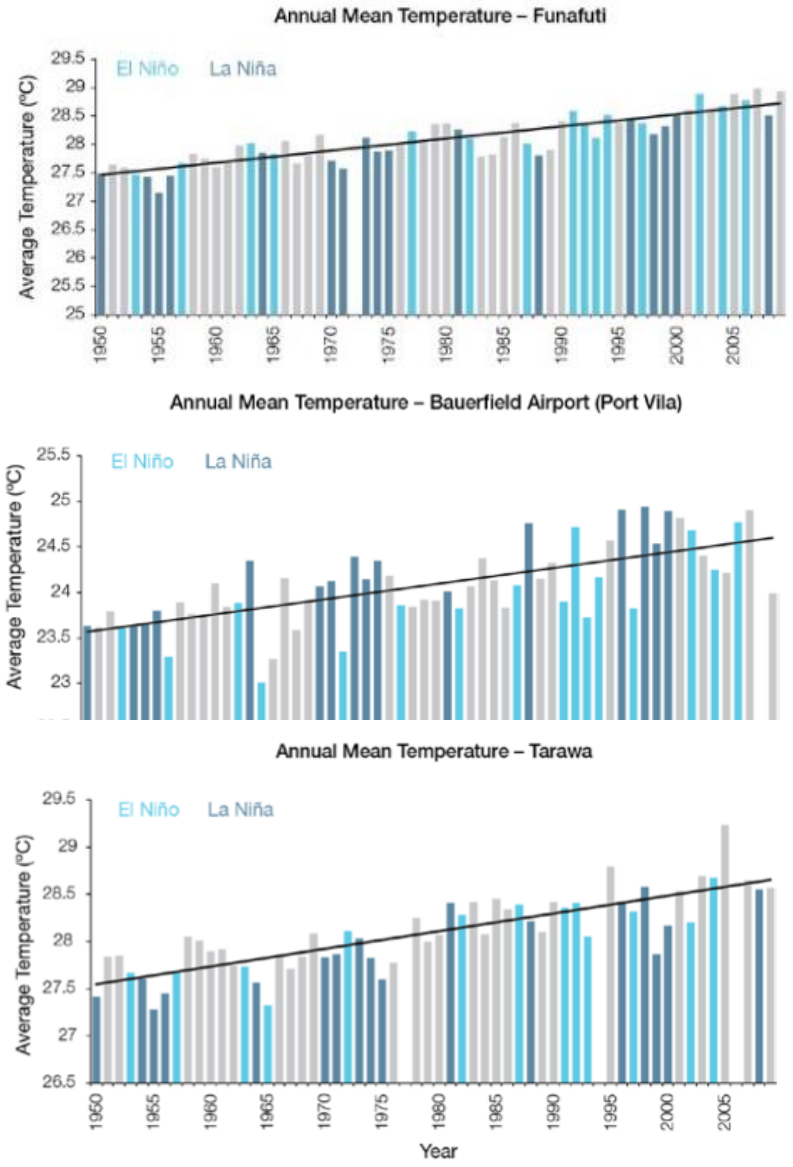
NEXT: National-level sources of information

- Know the relevant agencies/ministries/institutions related to climate change, scientific research, and atmospheric/oceanic processes



Observed Temperature 1950-2010

- Statistically significant increasing annual trends in surface air temperature have been reported in all three nations.
- **Tuvalu** – Funafuti (+0.21°C per decade)
- **Vanuatu** – Port Vila (+0.17°C per decade)
- **Kiribati** – Tarawa (+0.19°C per decade)



NEXT: Subnational Sources of Information

- Are there subnational plans in place?
- Research/Downscaled projections/vulnerability assessments?

✓ University studies
✓ International NGOs
✓ Local NGOs

Global Environmental Change 30 (2015) 43–55

Contents lists available at ScienceDirect

Global Environmental Change

journal homepage: www.elsevier.com/locate/gloenvcha

Where does climate fit? Vulnerability to climate change in the context of multiple stressors in Funafuti, Tuvalu

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ABSTRACT

This paper examines vulnerability to climate change in the context of multiple stressors through a case study of Funafuti, Tuvalu. Climate change research in Pacific Islands has largely focused on biophysical changes such as sea-level rise. Less is known about how livelihoods are affected and what adaptation options are realistic. The research employs a vulnerability framework to identify where climate fits in the suite of forces (socioeconomic, cultural, environmental) already affecting livelihoods. The participatory approach includes semi-structured interviews with community members, initially without reference to

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Epidemiological Investigation of a Diarrhea Outbreak in the South Pacific Island Nation of Tuvalu during a Severe La Niña–Associated Drought Emergency in 2011

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Abstract. The association between heavy rainfall and an increased risk of diarrhea has been well established but less is known about the effect of drought on diarrhea transmission. In 2011, the Pacific island nation of Tuvalu experienced a concurrent severe La Niña–associated drought and large diarrhea outbreak. We conducted a field investigation in Tuvalu to identify factors that contributed to epidemic transmission in the context of a drought emergency. Peak case numbers coincided with the nadir of recorded monthly rainfall, the lowest recorded since 1930. Independent factors associated with increased risk of diarrhea were households with water tank levels below 20% (odds ratio [OR] = 2.31; 95% confidence interval = 1.16–4.60) and decreased handwashing frequency (OR = 3.00 [1.48–6.08]). The resolution of the outbreak occurred after implementation of a hygiene promotion campaign, despite persistent drought and limited water access. These findings are potentially important given projections that future climate change will cause more frequent and severe droughts.

INTRODUCTION

The health impacts of drought are poorly understood despite droughts affecting up to 50 million persons annually.[1] Tropical Pacific island nations are particularly susceptible to drought, in part due to the El Niño Southern Oscillation (ENSO) cycle, a natural climate event characterized by the cyclical warming (El Niño) and cooling (La Niña) of the Pacific Ocean.[2] Such variability affects global climate

vated rates of diarrheal disease, likely through an impact on hygiene practices.

Given that droughts are projected to become increasingly severe in many regions, and given that the role of drought on diarrheal disease is poorly described, our objectives were to 1) document the outbreaks in relation to the prevailing drought conditions, 2) present the findings of an epidemiological investigation including a case-

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Marine Policy

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Economic impacts of climate change and climate change adaptation strategies in Vanuatu and Timor-Leste

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Timor-Leste

ABSTRACT

The fisheries sectors in Vanuatu and Timor-Leste are important sources of food and income. Similar to other developing countries and those in the Pacific, they are vulnerable to the impacts of climate change more so because of their geographic location, socioeconomic conditions and political instability. Nonetheless, there are approaches to alleviate the damaging effects of climate change in the region's fisheries sector. Using economic modeling, this paper estimates the economic costs of potential climate change adaptation strategies for the fisheries sector in Vanuatu and Timor-Leste through assessment of alternative future scenarios. Strategies include aquaculture development, natural resource management through establishment and/or expansion of marine protected areas, and deployment of low-cost inshore fish aggregating devices. Modeling results demonstrate that the above innovations will enable the two countries to significantly improve coastal and freshwater fish production in the medium-term (2035) and long-term (2050). Fish consumption is projected to grow due to population and income improvements; yet considerable increases in production will augment demand. Furthermore, national-level gains are projected from these adaptation strategies through fish exports. Improved production under climate change will require significant investments from the national governments of Vanuatu and Timor-Leste and/or private sectors.

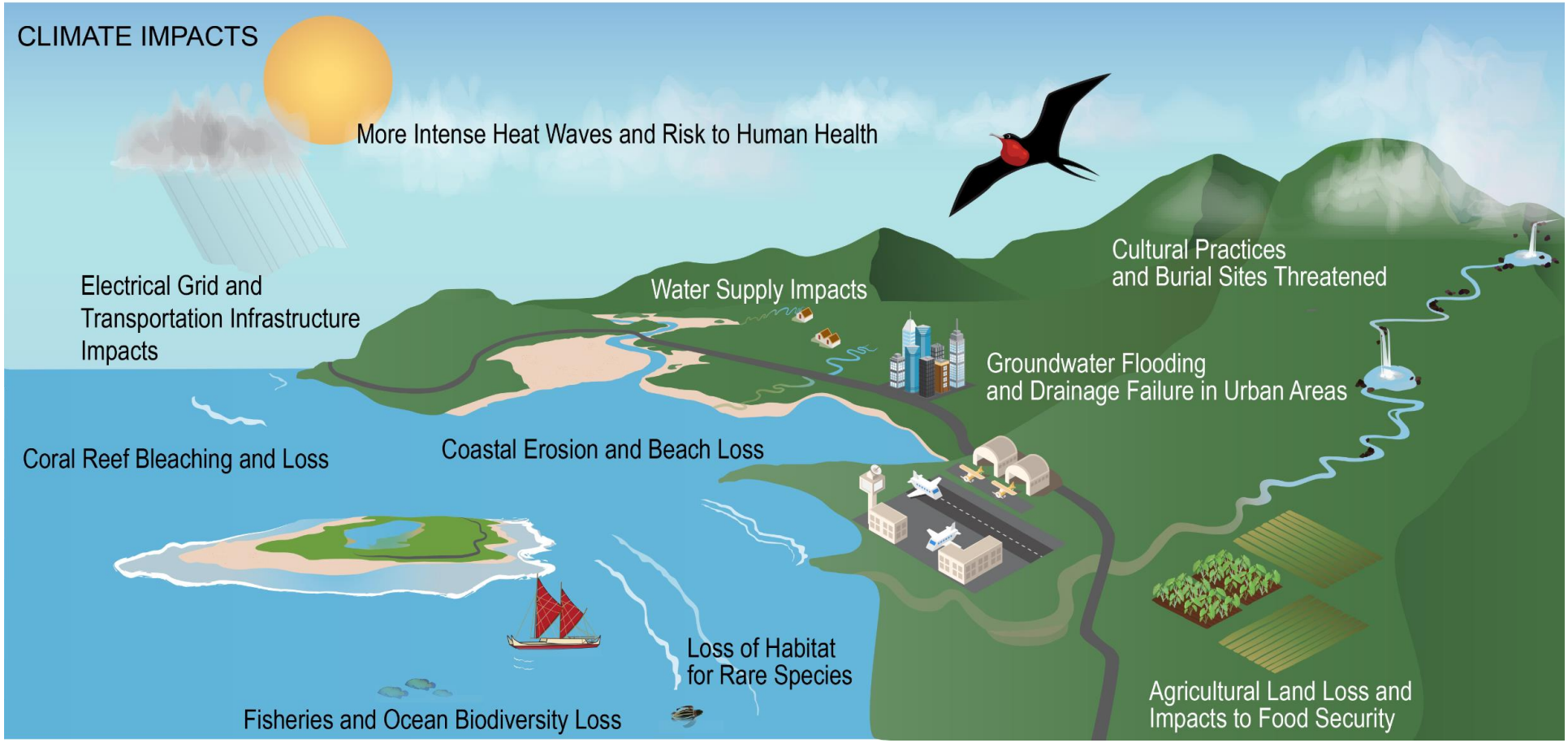
1. Introduction

adaptive strategies are available to alleviate vulnerability in the region's fisheries sector to the damaging effects of climate change.

Quiz: Climate Change in Vanuatu/Kiribati/Tuvalu

- What are the physical changes expected in your country?
- What data are these projections based on?
- Where do you go to find more information?
- *Answering these questions will help prepare you to develop relevant policy and adaptation projects!*

Part 2
Projected Changes and Impacts



Projected Changes in Surface Air Temperature

Tuvalu

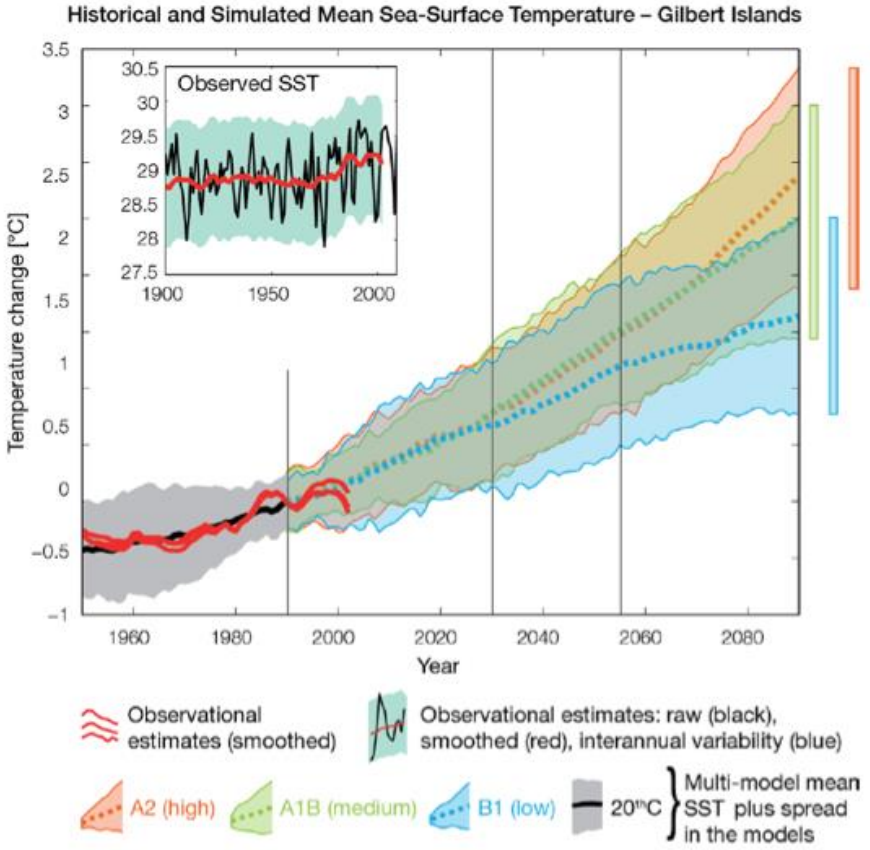
Emission Scenario	2030	2055	2090
Low: B1	+0.7 ± 0.4	+1.1 ± 0.4	+1.5 ± 0.6
Medium: A1B	+0.8 ± 0.4	+1.5 ± 0.5	+2.3 ± 0.8
High: A2	+0.7 ± 0.4	+1.4 ± 0.4	+2.7 ± 0.6

Vanuatu

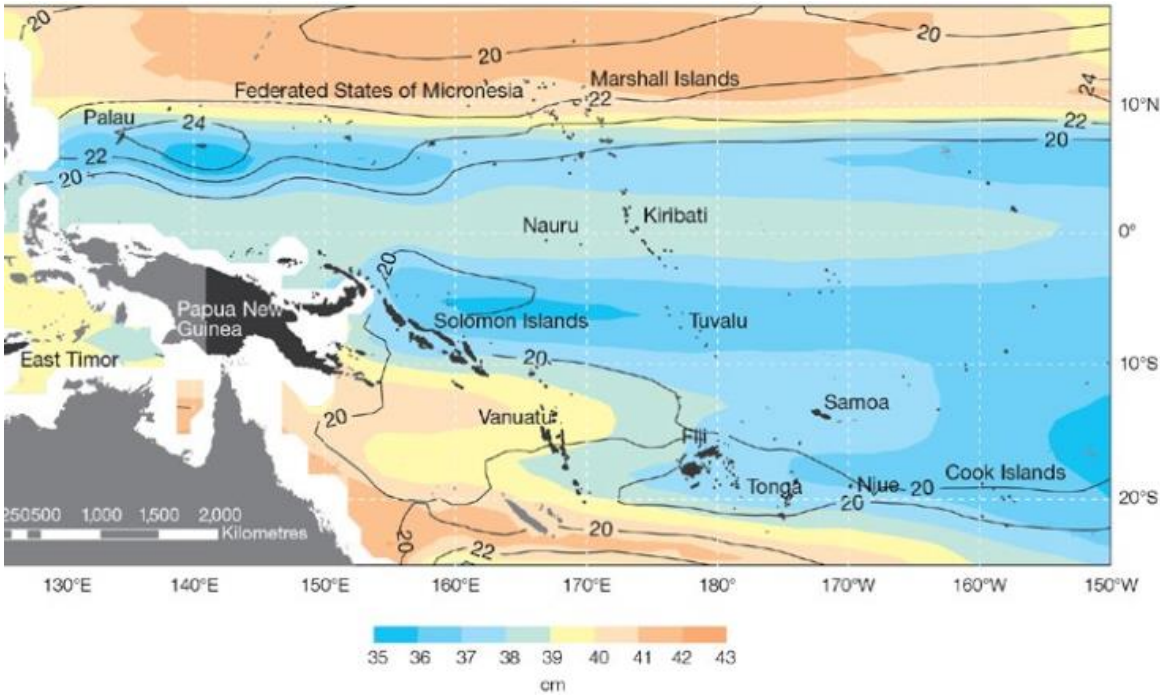
Emission Scenario	2030	2055	2090
Low: B1	+0.6 ± 0.4	+1.0 ± 0.5	+1.4 ± 0.7
Medium: A1B	+0.7 ± 0.4	+1.4 ± 0.6	+2.2 ± 0.9
High: A2	+0.7 ± 0.3	+1.4 ± 0.3	+2.6 ± 0.6

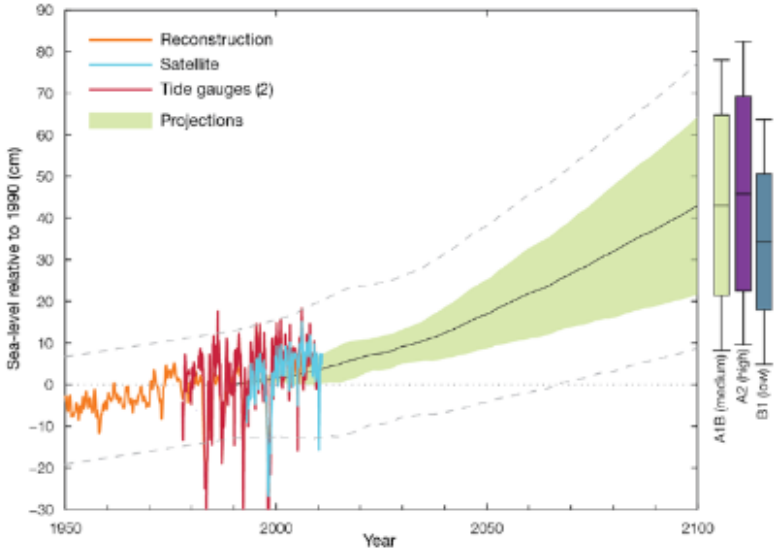
Kiribati

Emission Scenario	2030	2055	2090
Low: B1	+0.7 ± 0.5	+1.3 ± 0.6	+1.7 ± 0.7
Medium: A1B	+0.8 ± 0.6	+1.6 ± 0.7	+2.6 ± 0.9
High: A2	+0.8 ± 0.5	+1.6 ± 0.6	+3.0 ± 0.8



Sea Level Rise Will Continue to Rise





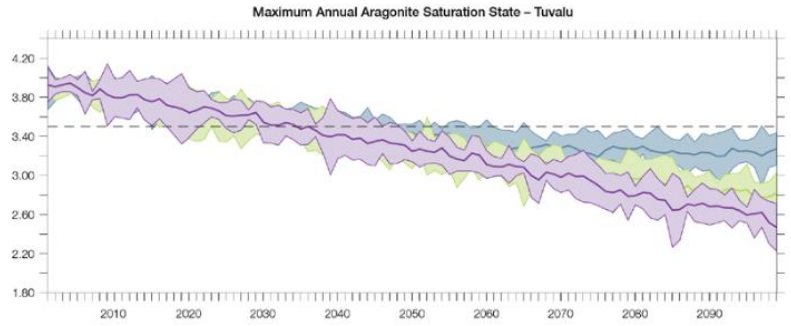
Changes in Rainfall

- Annual rainfall projected to increase
- Wet-season increase
- Dry season decrease
- Intensity & frequency of extreme rainfall events expected to increase

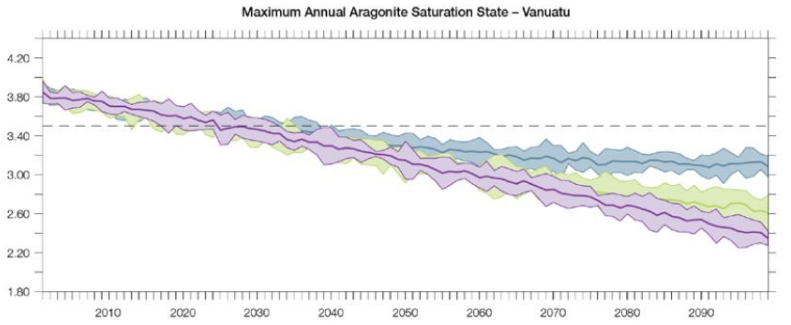
Ocean Acidification

- Due to the ocean uptake of atmospheric CO_2.
- Aragonite saturation state has declined
- This decreases the pH of the Ocean
- Is to marine organisms including corals
- Can cause bleaching.
- Expected to continue to decline over the next century.

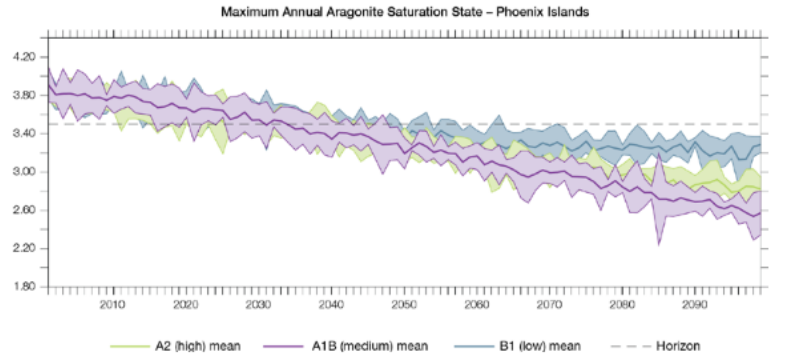
Tuvalu



Vanuatu



Kiribati



Other Projected Changes

- Elevated Sea Surface Temperatures
- Increase in Extreme heat days
- Tropical cyclone intensity increases
- Health of reefs decline

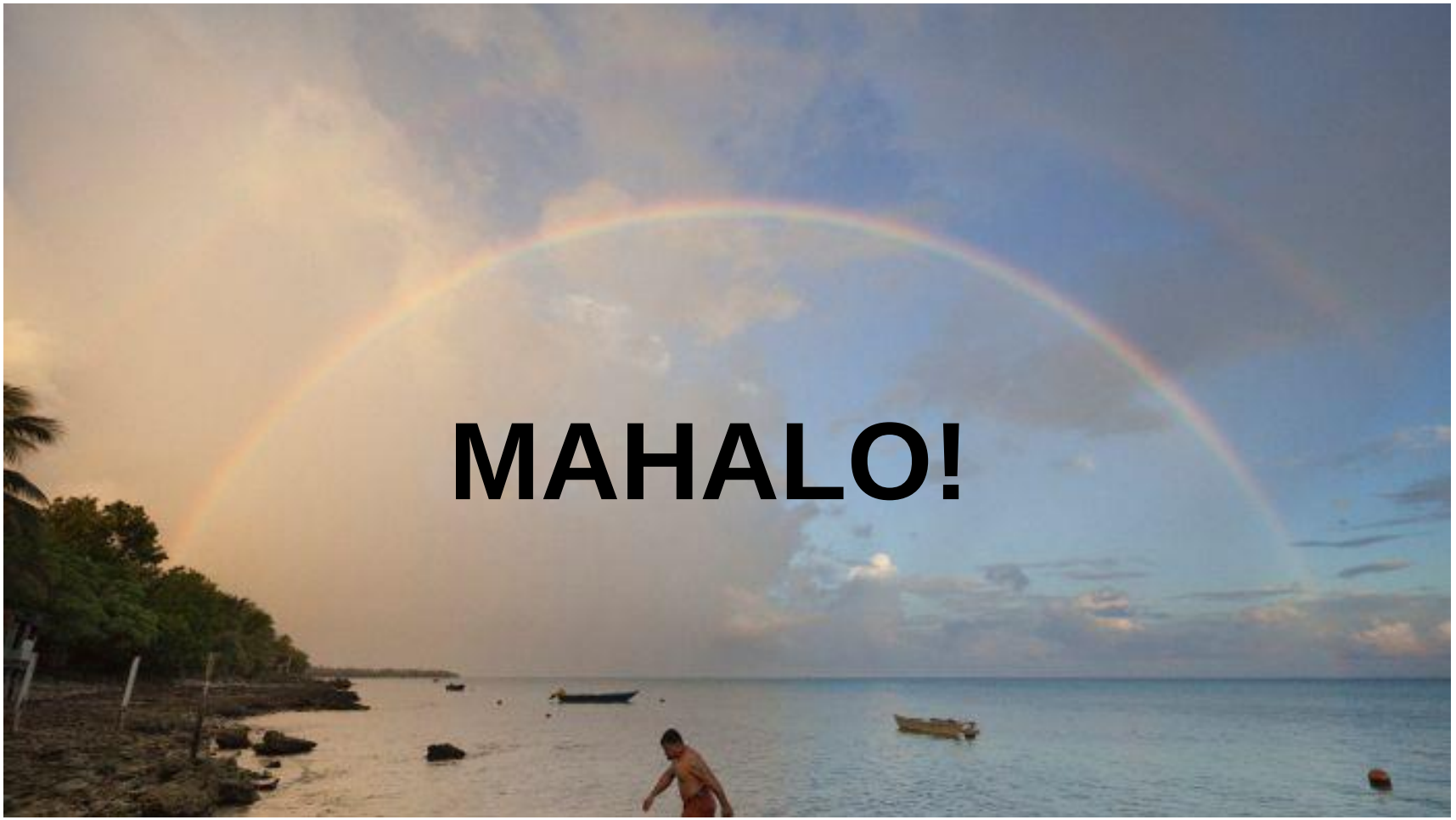
Impacts on People

Physical, biological, and human elements necessary for Pacific Island cultures to sustain their way of life will be threatened by climate change.

- Decline in fisheries
- Decline in fresh water resources
- Decline in agriculture
- Spread of infectious disease
- Loss of settlements and infrastructure,
- Decrease Ecosystem health
- Increase in Human migration

Where to go for help/support…

- **UNDP-UN Environment: NAP-GSP**
- **SPREP**
- **USAID Climate Ready…provides support for institutional strengthening, policy development, project development, assessing potential accredited entities, etc**
- **USP PACE…establishing Readiness and Support unit to assist with capacity development and other policy/project tasks**

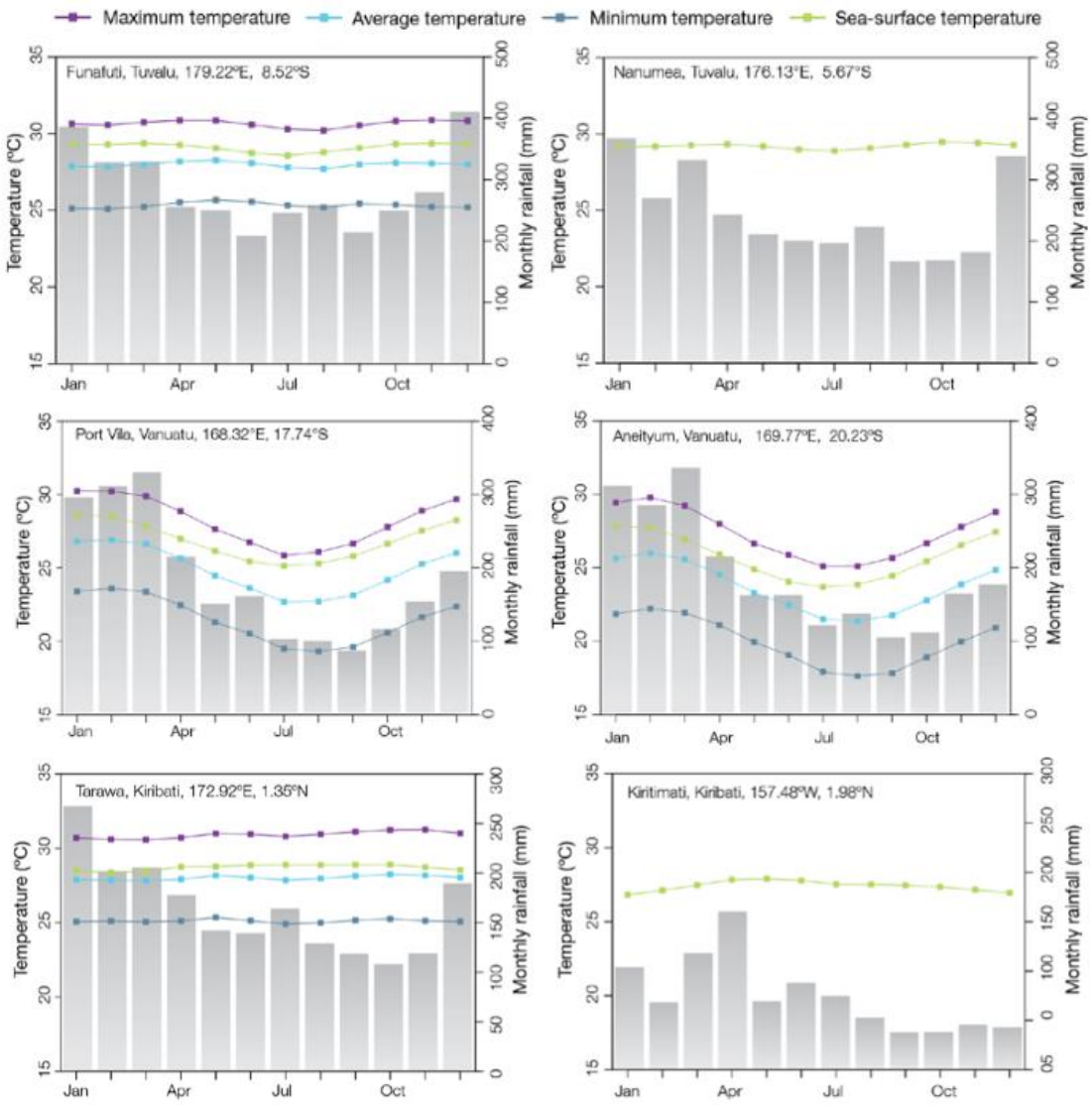

MAHALO!

Temperature & Rainfall

Tuvalu
- Funafuti
- Namumea

Vanuatu
- Port Vila
- Aneityum

Kiribati
- Tarawa
- Kiritimati



How hot was 2018 around the globe?

National Oceanic and Atmospheric Administration

U.S. Department of Commerce

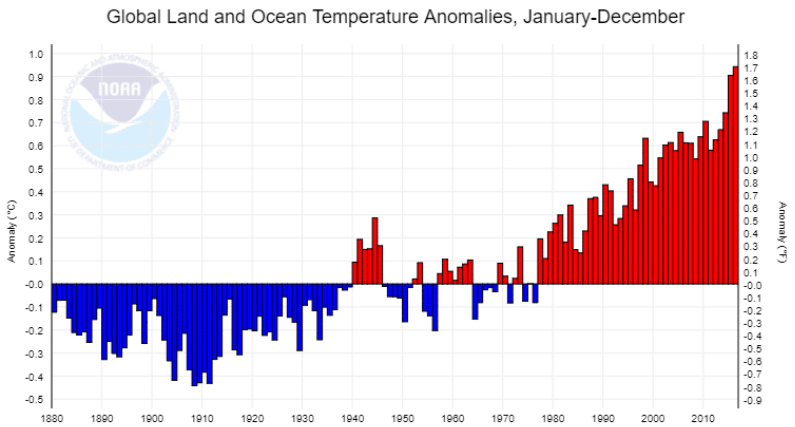
The website you are trying to access is not available at this time due to a lapse in appropriation.

NOAA.gov and specific NOAA websites necessary to protect lives and property are operational and will be maintained during this partial closure of the U.S. Government.

See weather.gov for forecasts and critical weather information.

NOAA Federal Employees: Go to the NOAA Furlough information page for information, forms and other resources related to the shutdown.

2018: 4th Warmest on Record



Warmest Years	
1st	2016
2nd	2015
3rd	2017
4th	2018
5th	2014

Does anyone see a pattern here?