Storm clouds and silver linings: climate change and health in the Pacific

Walter Orr Roberts Memorial Public Lecture

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22 May 2018

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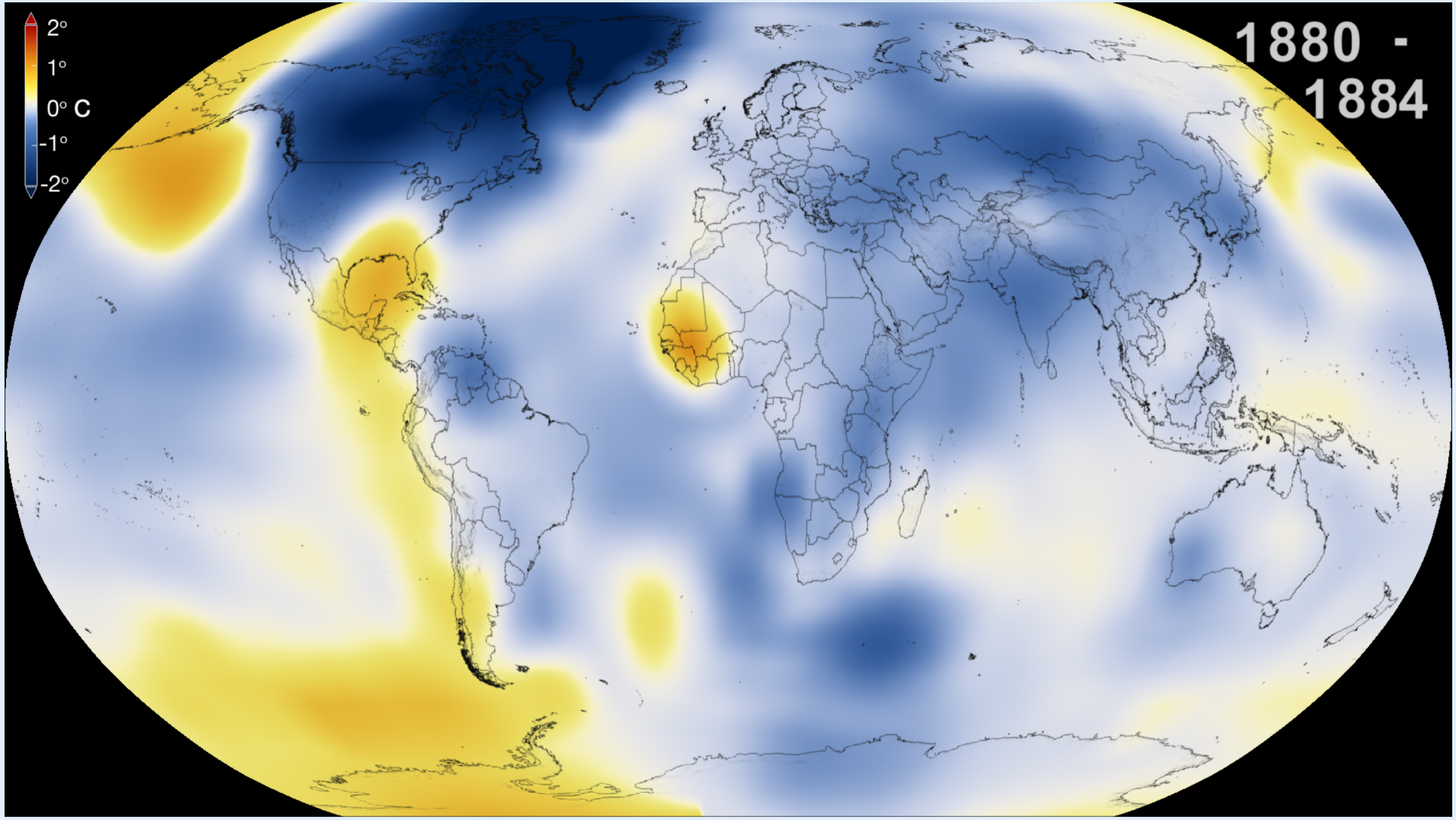
2°
1°
0° C
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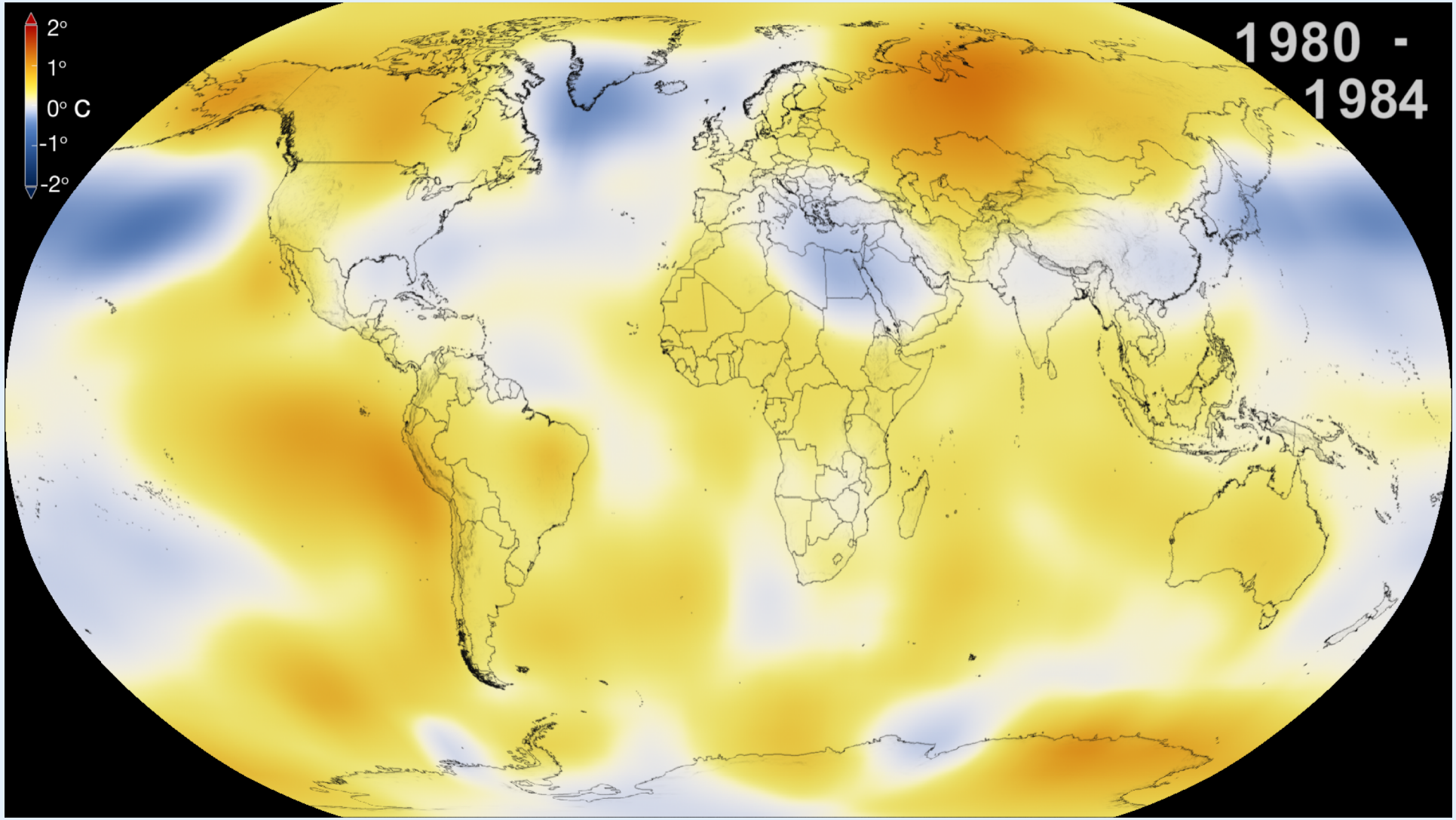
1880 -
1884


2°
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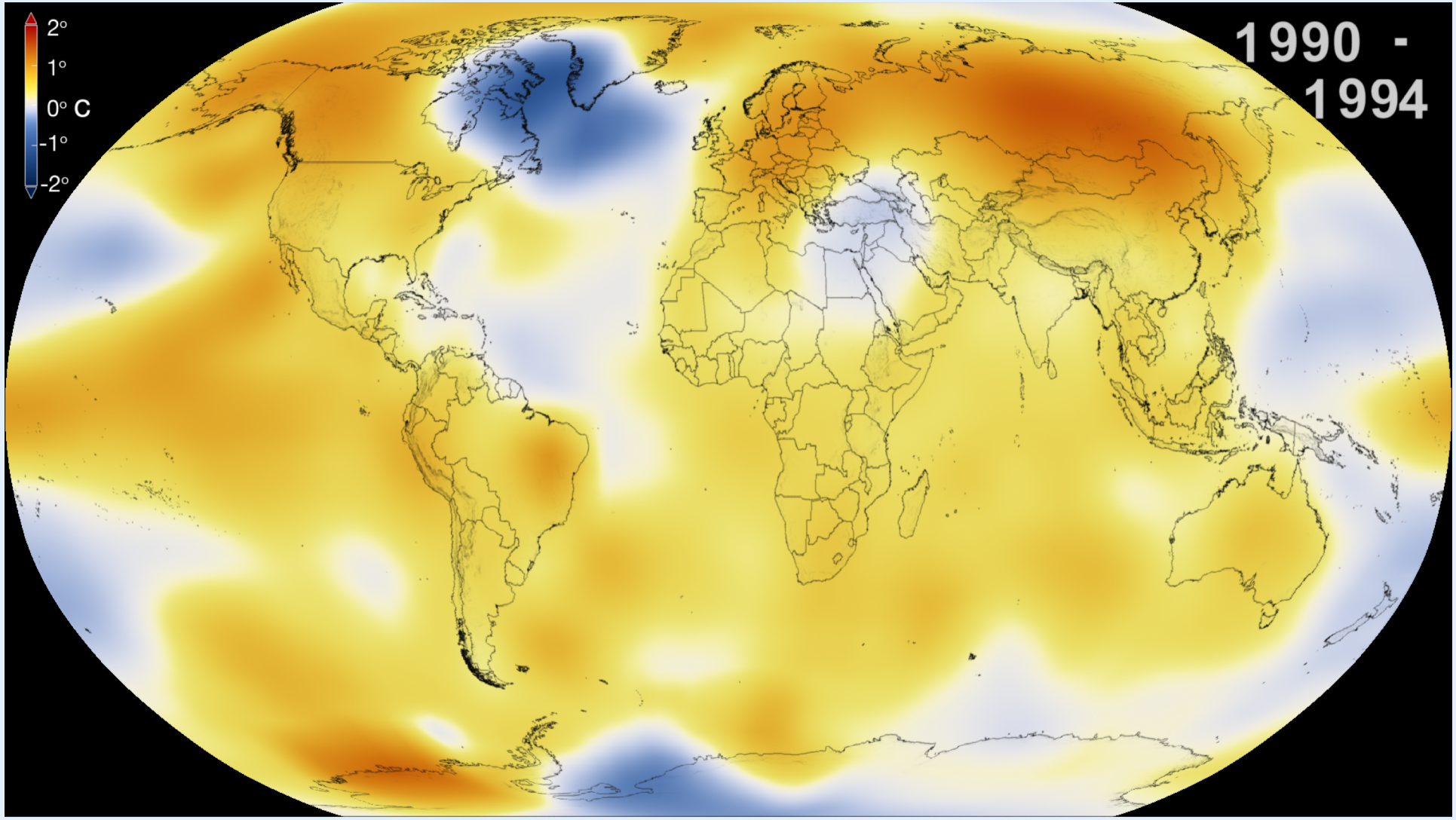
1980 -
1984


2°
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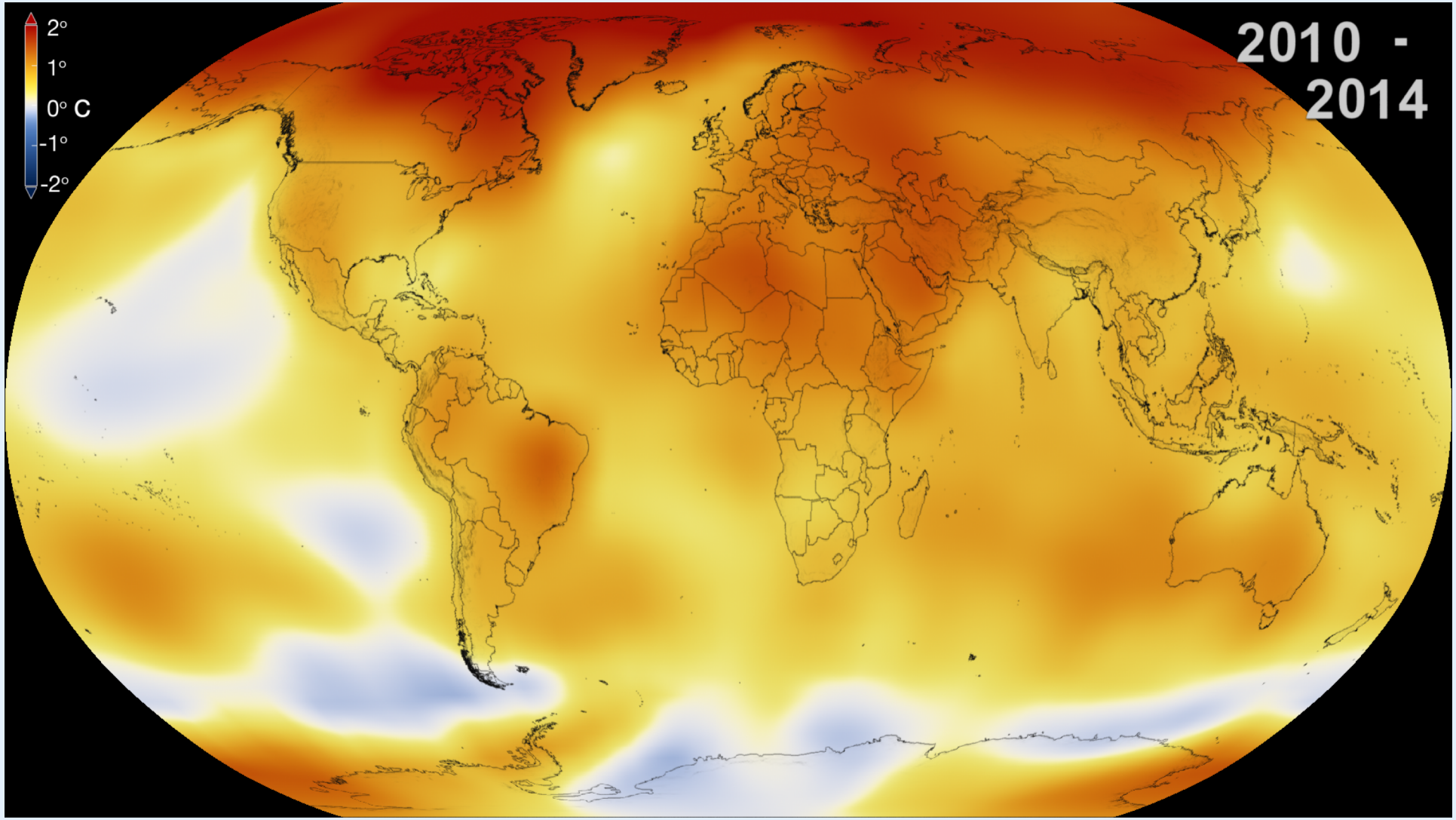
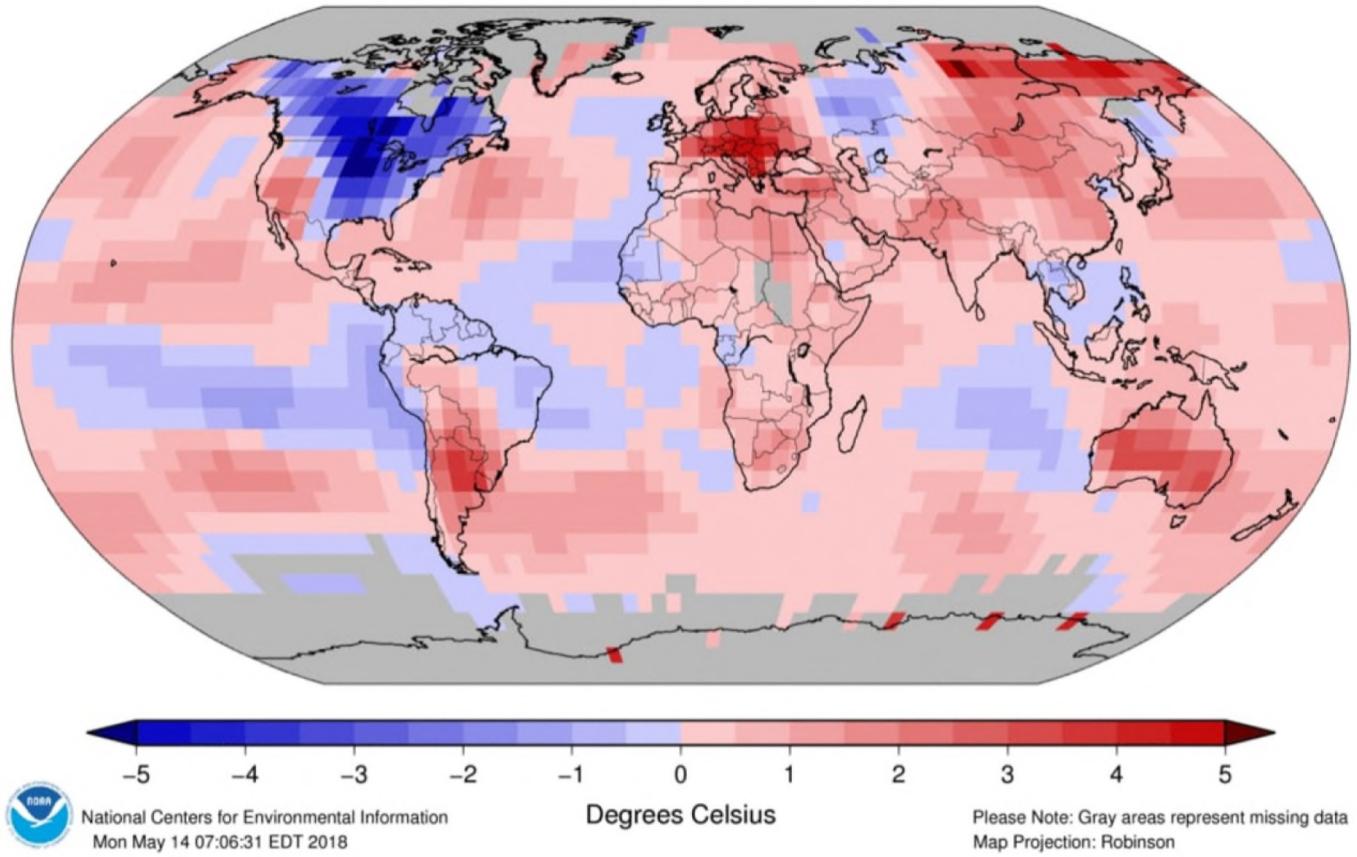
1990 -
1994

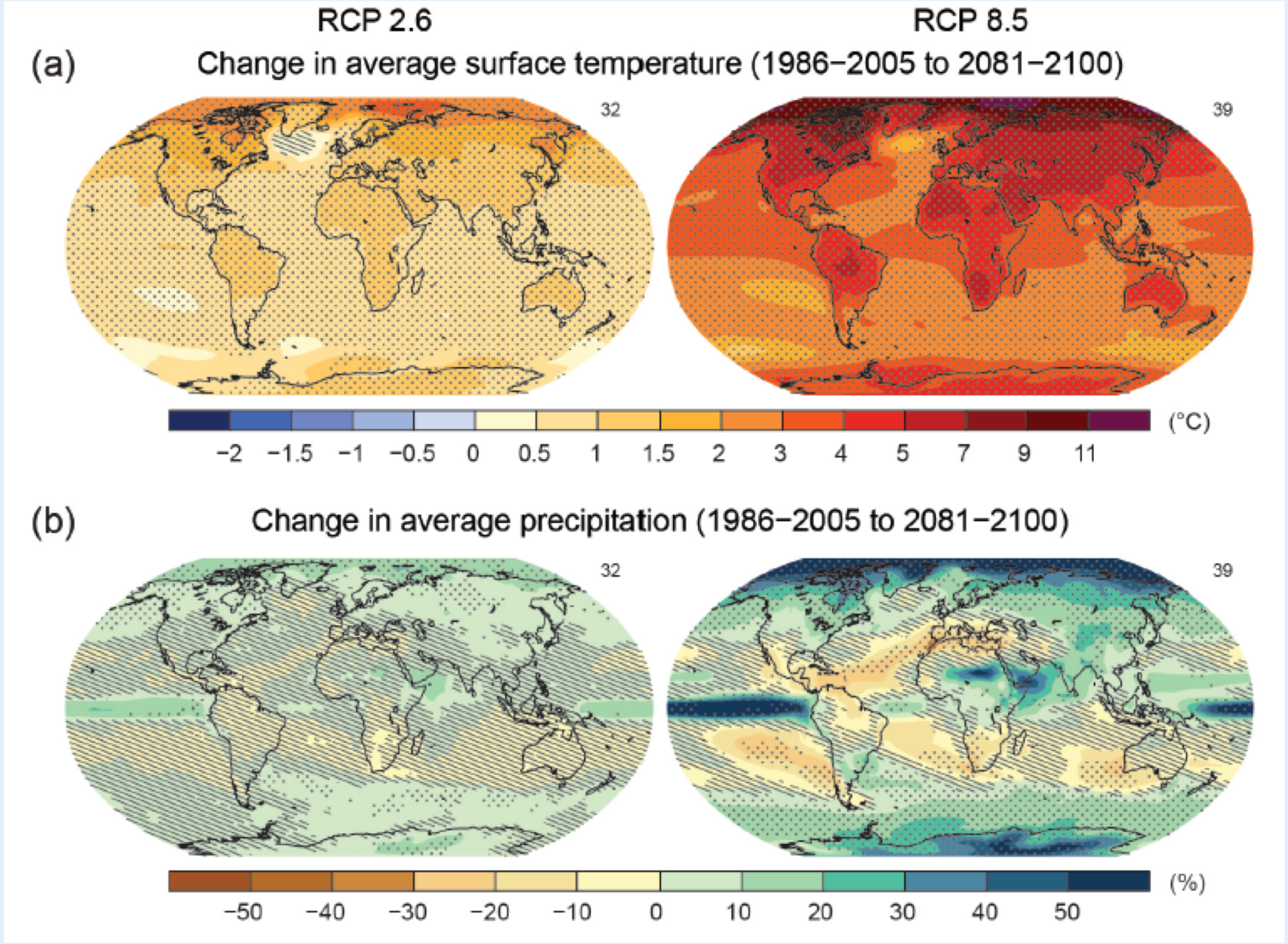

2°
1°
0° C
-1°
-2°
2010 -
2014

Capital Weather Gang

April was Earth's 400th warmer-than-normal month in a row

By Angela Fritz May 18 Email the author

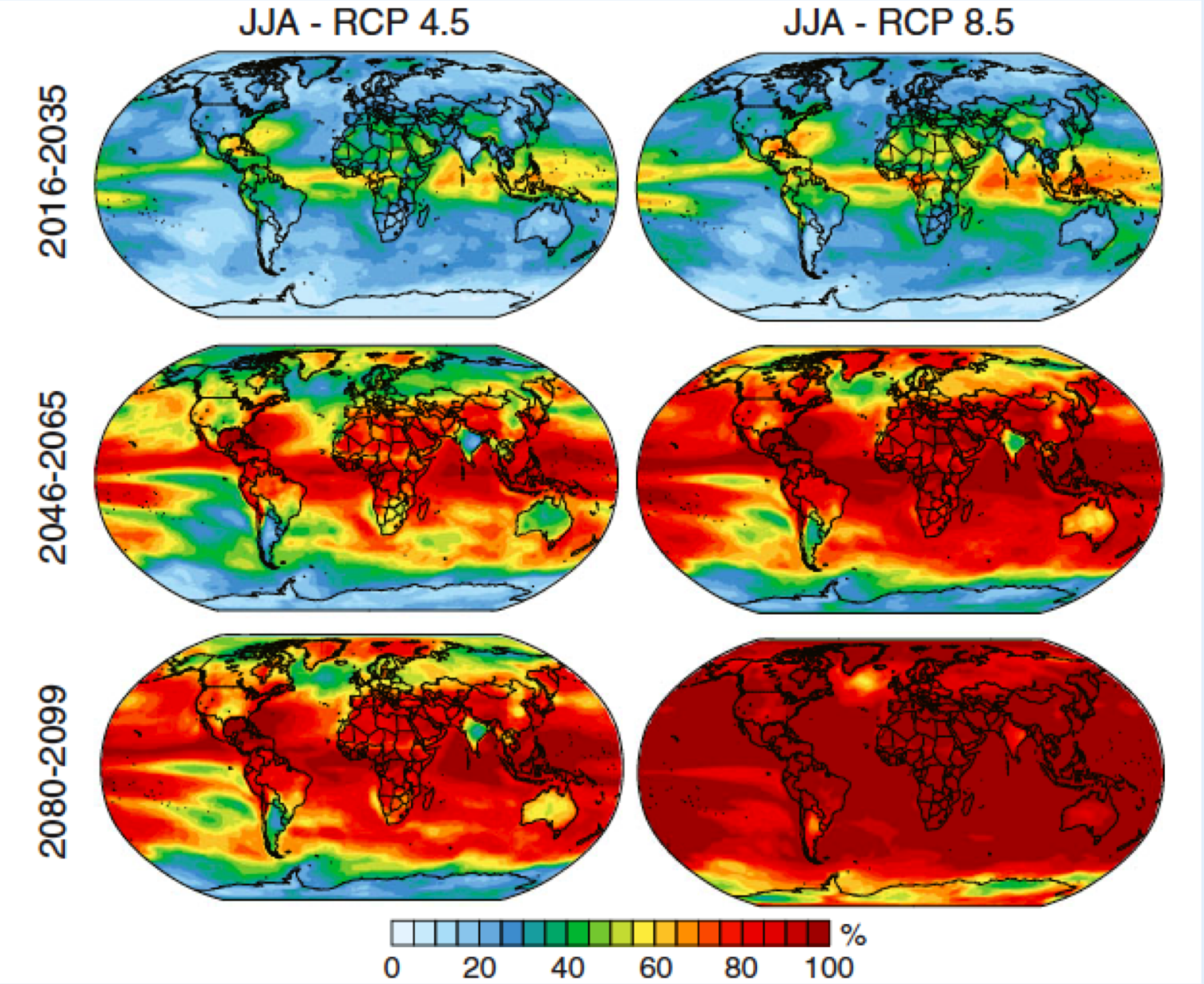



RCP 2.6
RCP 8.5
(a)
Change in average surface temperature (1986–2005 to 2081–2100)
32
39
−2 −1.5 −1 −0.5 0 0.5 1 1.5 2 3 4 5 7 9 11
(°C)
(b)
Change in average precipitation (1986–2005 to 2081–2100)
32
39
−50 −40 −30 −20 −10 0 10 20 30 40 50
(%)

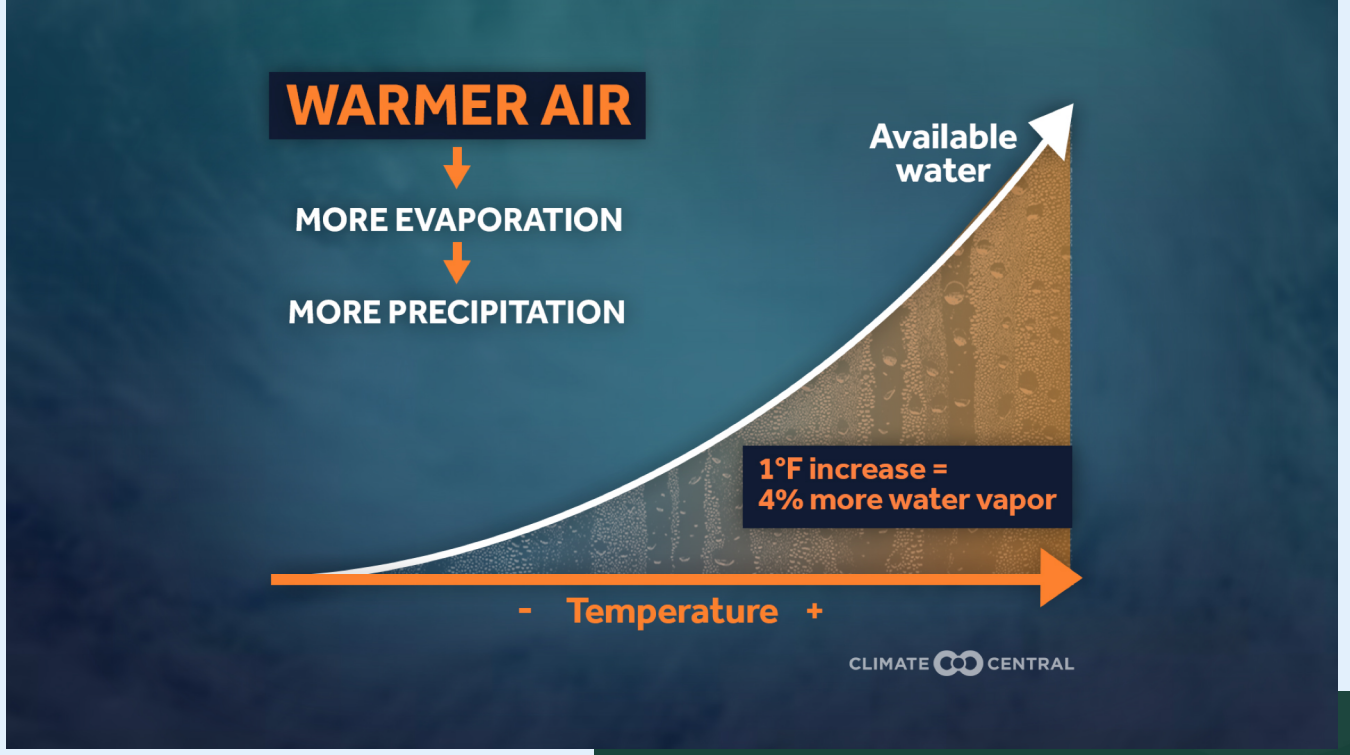
IPCC 2013

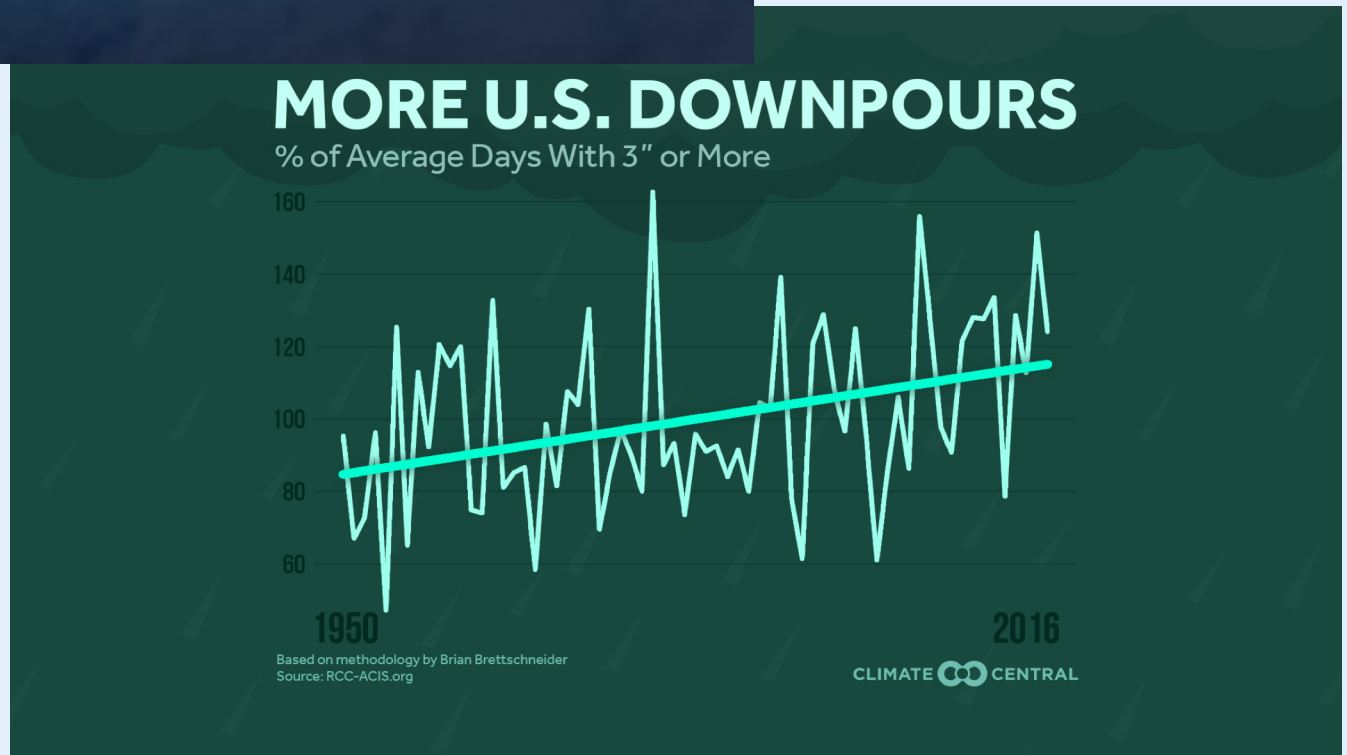
Occurrence of 1985-2005 T Max

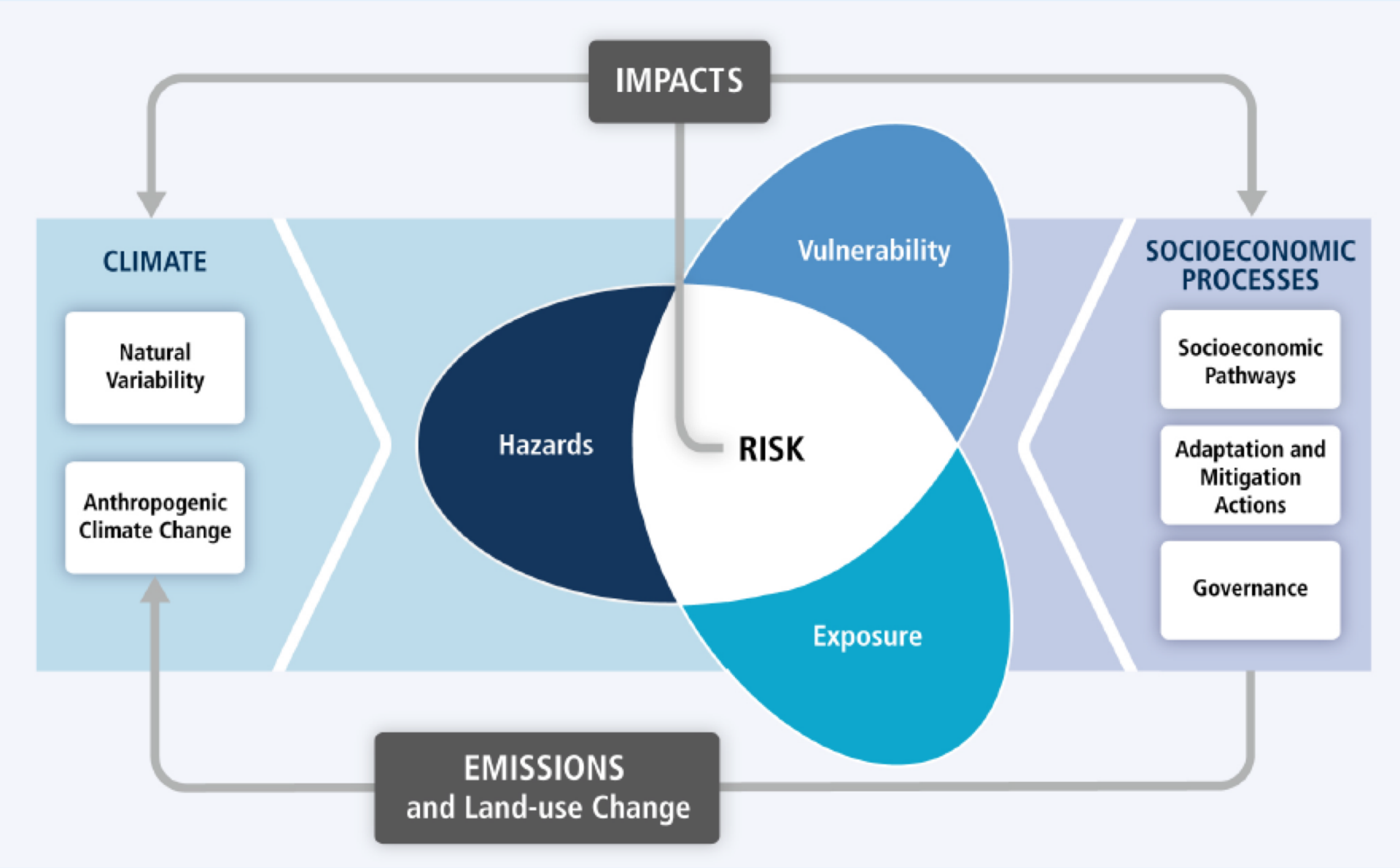
% of Years in Each Period



Diffenbaugh 2012


WARMER AIR
MORE EVAPORATION
MORE PRECIPITATION
Available water
1°F increase = 4% more water vapor
- Temperature +
CLIMATE CENTRAL


MORE U.S. DOWNPOURS
% of Average Days With 3" or More
160
140
120
100
80
60
1950
2016
Based on methodology by Brian Brettschneider
Source: RCC-ACIS.org
CLIMATE CENTRAL


IMPACTS
CLIMATE
Natural Variability
Anthropogenic Climate Change
Hazards
Vulnerability
RISK
Exposure
SOCIOECONOMIC PROCESSES
Socioeconomic Pathways
Adaptation and Mitigation Actions
Governance
EMISSIONS and Land-use Change

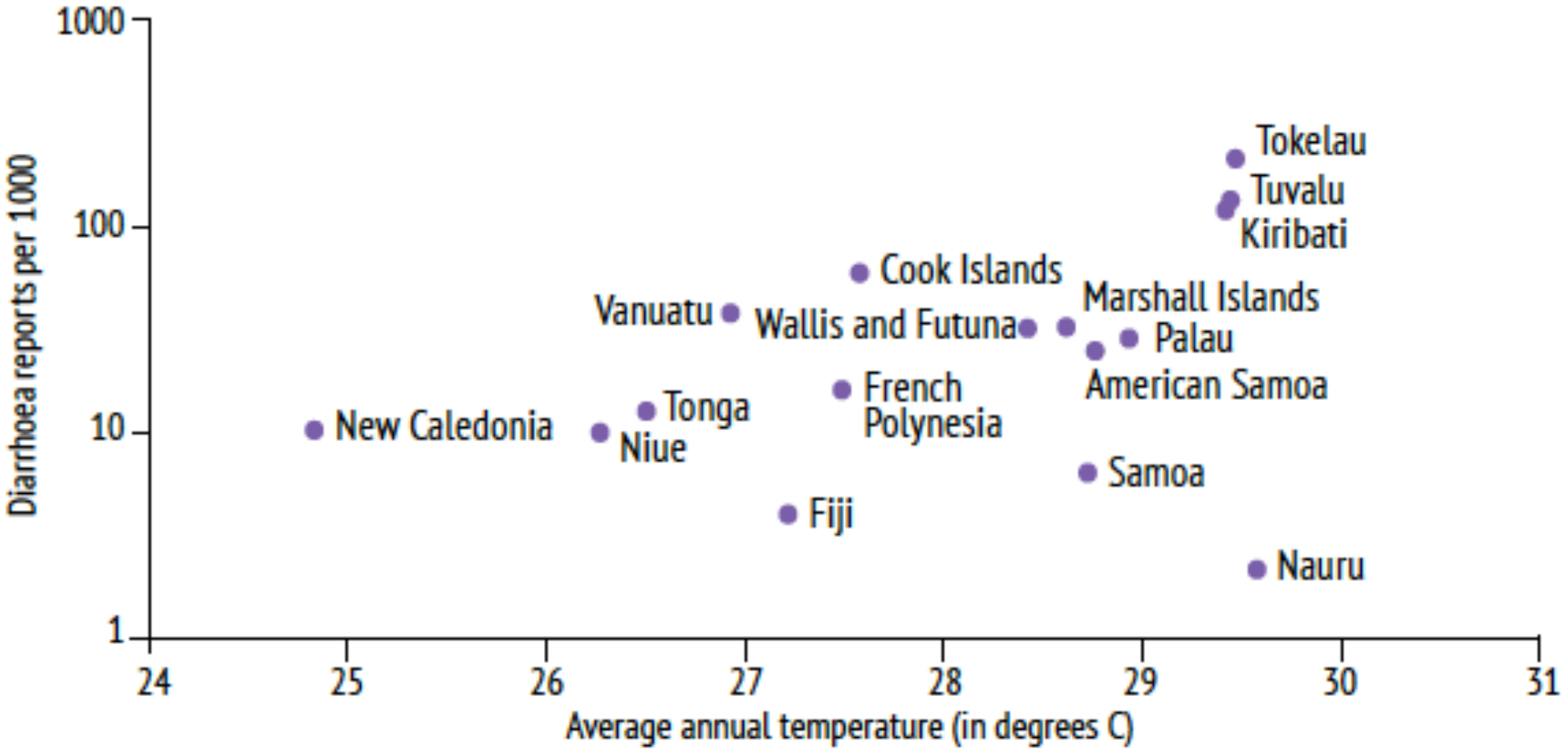
IPCC 2014

WHAT EACH COUNTRY LEADS THE WORLD IN

MOST COUNTRIES LEAD THE WORLD IN SOMETHING--SOMETIMES GOOD THINGS, SOMETIMES NOT SO GOOD THINGS, AND SOMETIMES FUNNY THINGS. THIS MAP SHOWS WHAT EACH COUNTRY DOES BEST COMPARED TO ALL OTHER COUNTRIES. DATA SOURCES: HTTP://THEDOGHOUSEDIARIES.COM/MAPLESYRUP.

DOGHOUSEDIARIES / 2013

Figure 9. **Annual average temperature and average reporting rates for diarrhoeal disease, Pacific islands (1986–1994)**

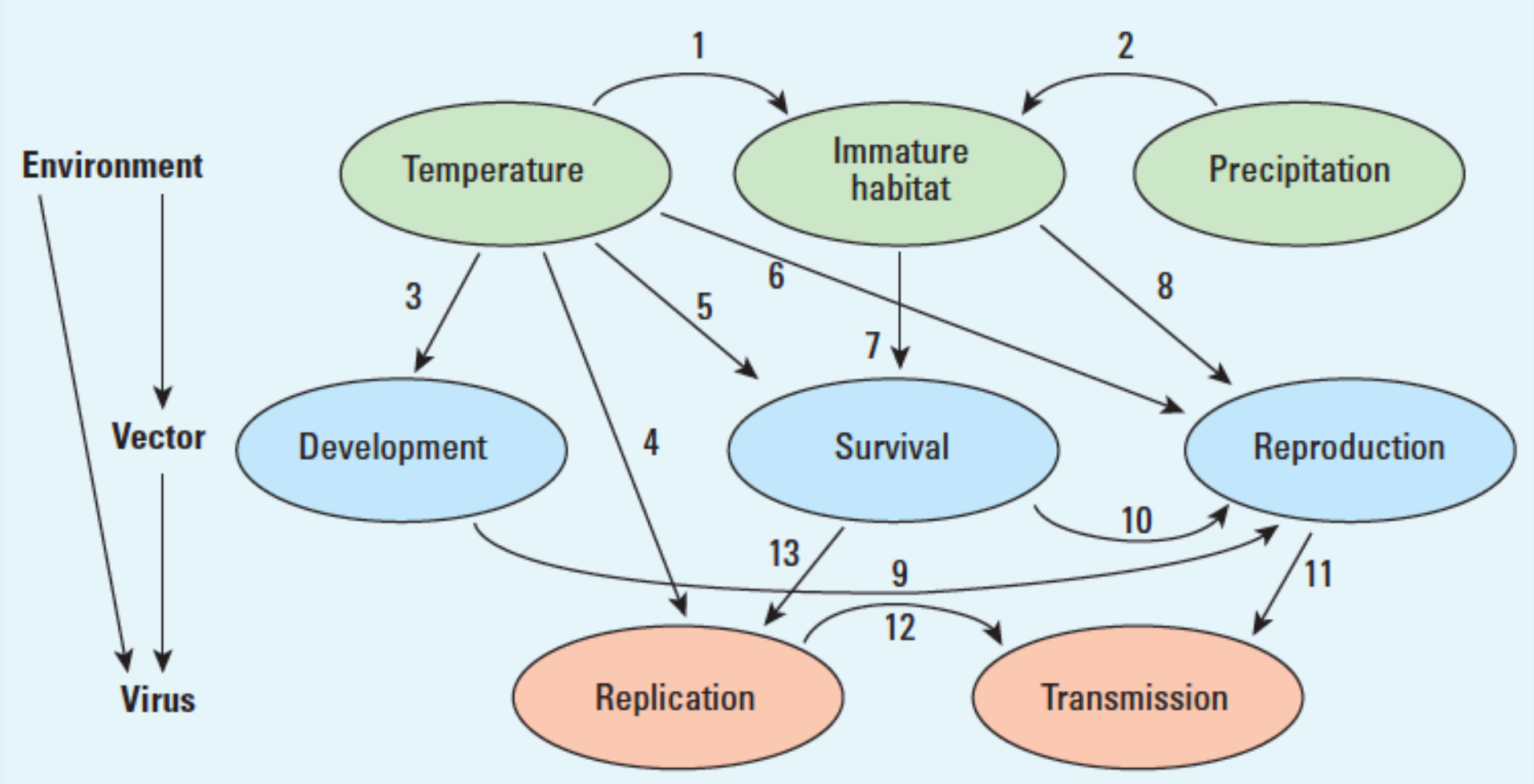


Note: $r^2 = 0.49$; $P < 0.05$

Source: Singh et al., 2001

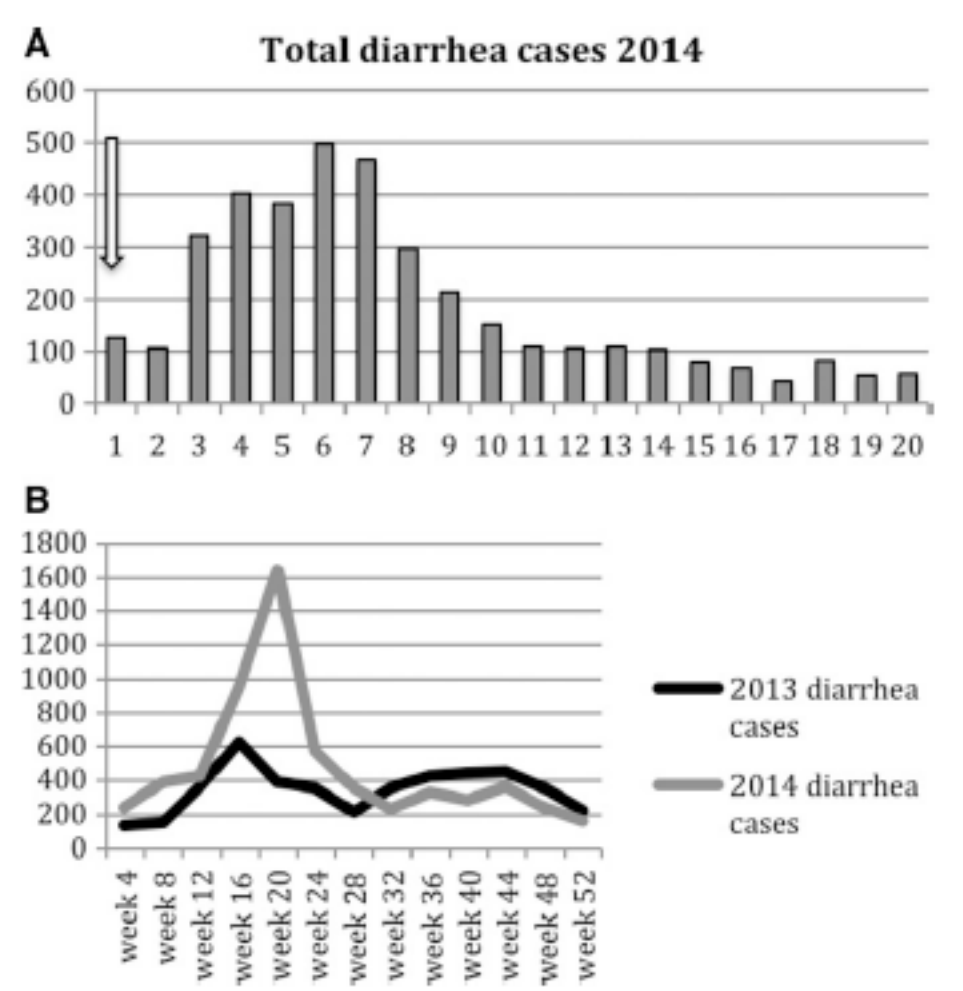
WHO 2015

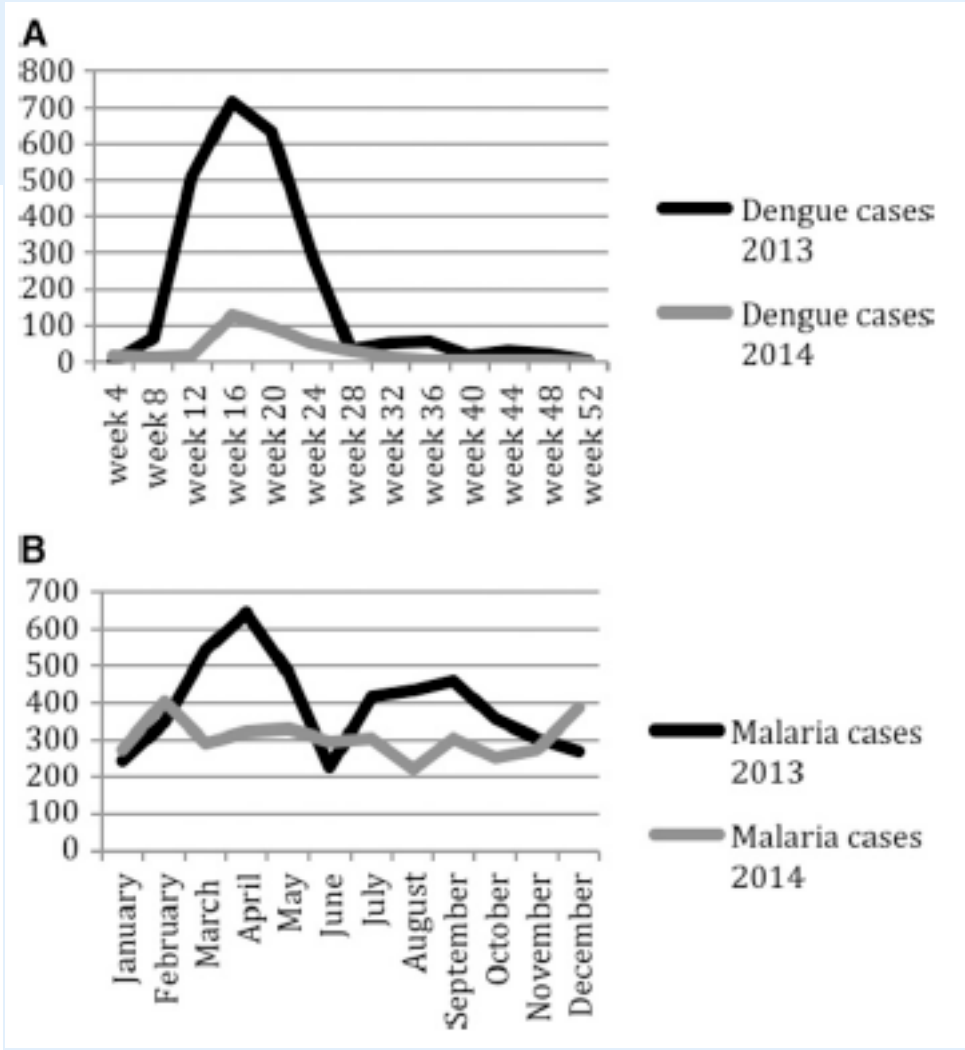
Biophysical influences on dengue ecology showing the interactions between climate variables, vectors, and the virus



Morin et al. 2013

4 April 2014 Honiaria

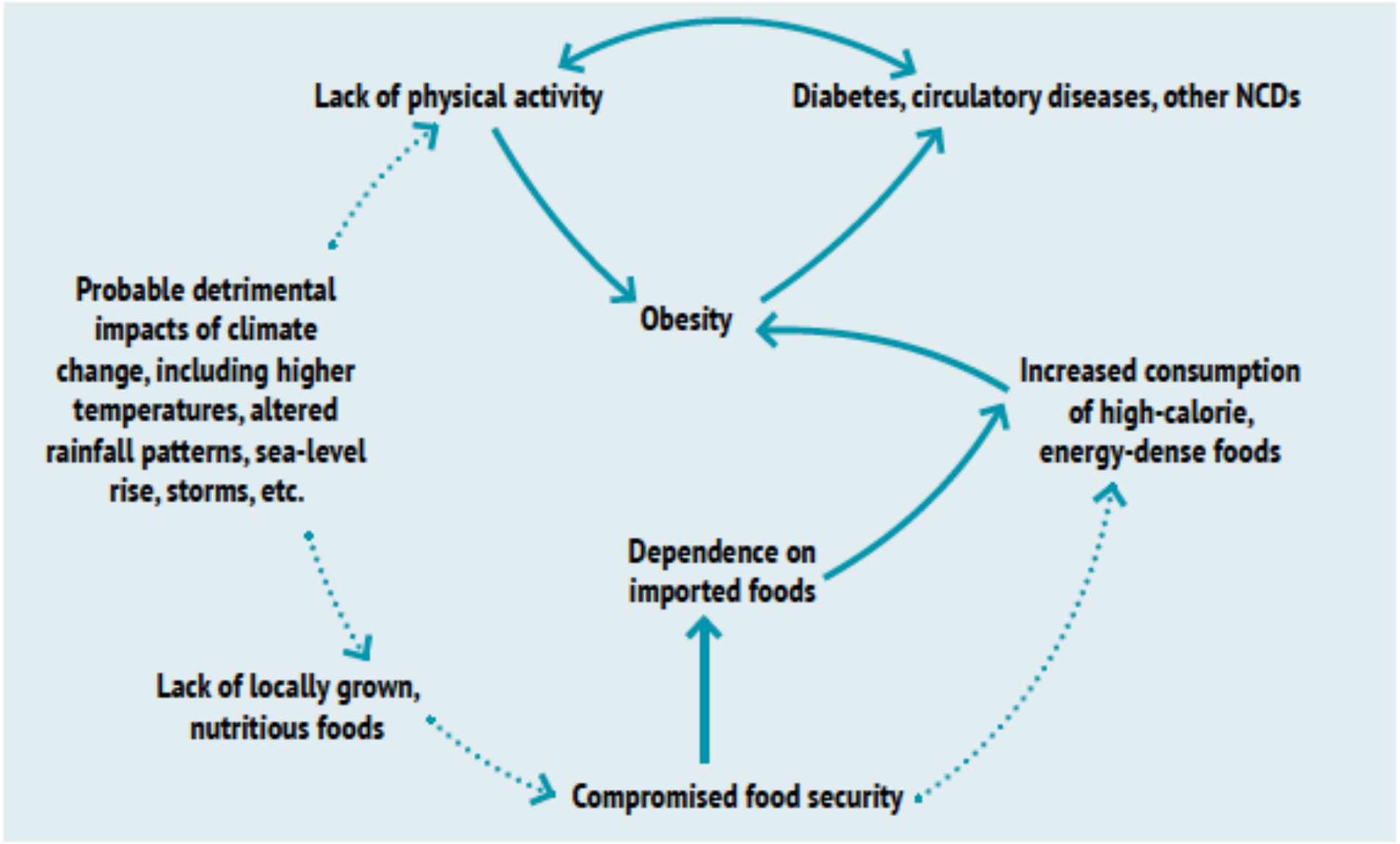




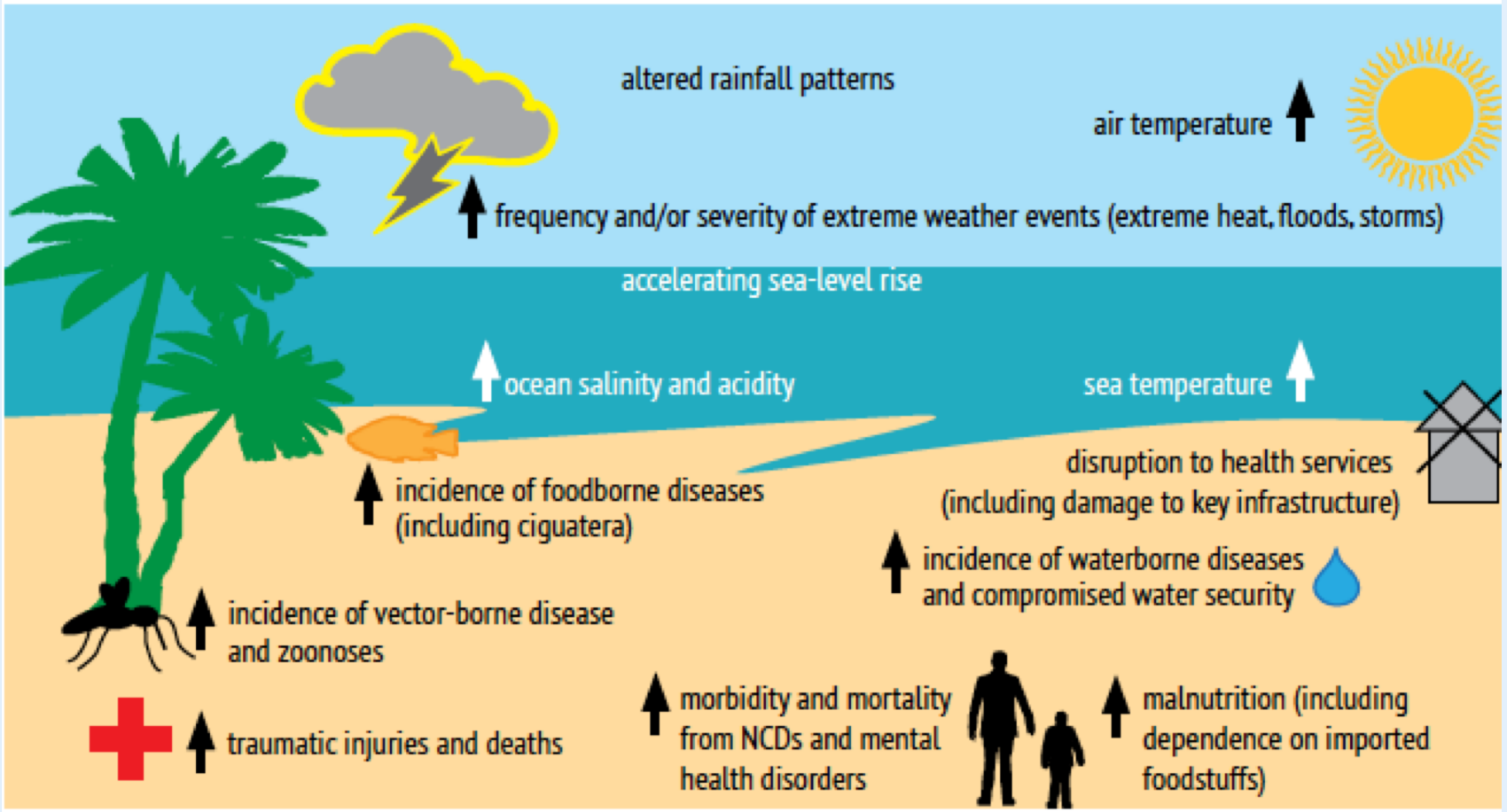
Flooding event caused 31 deaths (7.7 deaths / 100,000), 33 acute injuries, and a diarrheal disease outbreak

Natuzzi et al. 2016

Figure 15. **Conceptual model summarizing the pathways between climate change and NCDs (dotted arrows represent hypothetical links)**



WHO 2015



Pathways for health impacts

- direct and indirect exposures
- social disruption
- detrimental impacts on economic and human developments

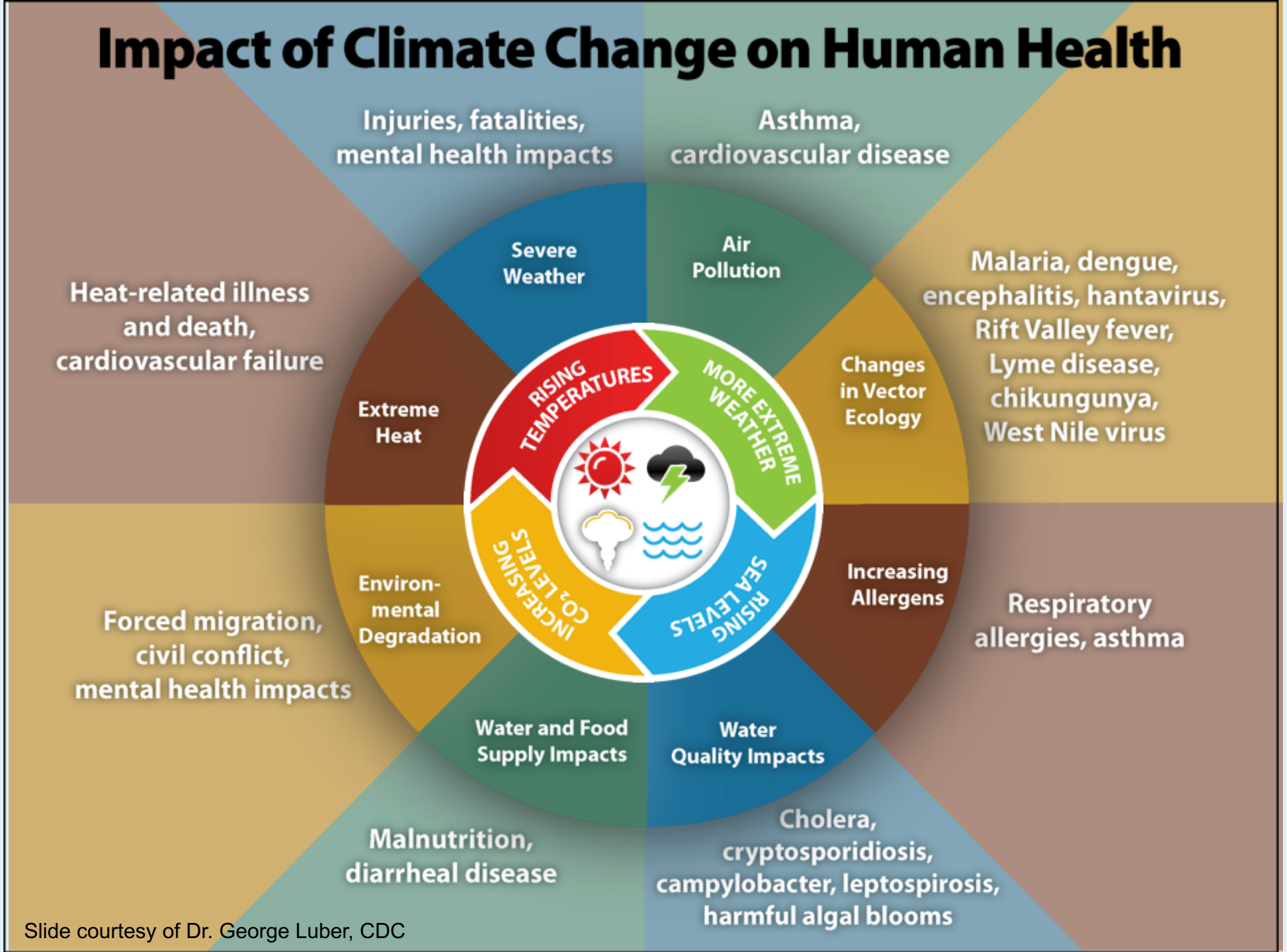
Mediators of health impacts

- sociopolitical strategies
- environmental measures
- health systems resilience
- economic development

WHO 2015

CLIMATE-SENSITIVE HEALTH RISK	COUNTRY												
	Cook Islands	Fiji	Kiribati	Marshall Islands	Micronesia (Federated States)	Nauru	Niue	Palau	Samoa	Solomon Islands	Tonga	Tuvalu	Vanuatu
Direct effects													
Health impacts of extreme weather events[1]	x	x		x	x	x	x	x	x	x	x	x	x
Heat-related illness[2]	x					x	x			x			x
Indirect effects													
Water security & safety (including waterborne diseases)[3]	x	x	x	x	x	x	x	x	x	x	x	x	x
Food security & safety (including malnutrition & foodborne diseases)[4]	x	x	x	x	x	x	x		x	x	x	x	x
Vector-borne diseases[5]	x	x	x	x	x	x	x	x	x	x	x	x	x
Zoonoses[6]		x			x			x					
Respiratory illness[7]	x			x	x	x	x	x		x		x	x
Disorders of the eyes, ears, skin and other body systems[8]		x		x			x			x		x	x
Diffuse effects													
Disorders of mental/ psychosocial health[a,9]		x		x	x	x		x		x		x	x
Noncommunicable diseases (NCDs)[a,10]		x		x	x		x	x		x	x	x	x
Health systems problems[a,11]		x	x										
Population pressures[12]			x										

WHO 2015



Slide courtesy of Dr. George Luber, CDC

High priority health adaptation measures

- Ensuring health & safety considerations incorporated into adaptation across sectors
- Improving safety & security of food & water sources
- Improving sanitation & hygiene facilities
- Increasing resources for emergency risk management
- Developing early warning systems
- Climate-proofing health & safety infrastructure
- Enhancing surveillance
- Conducting environmental epidemiological research
- Developing new and improving current communication

WHO 2015

Epidemic and emerging disease alerts in the Pacific region as at 29 February 2016

for the Pacific Public Health Surveillance Network (PPHSN)

Legend

- Cases reported are increasing or peaking.
- Cases reported are decreasing or circulation is ongoing.
- Awaiting confirmation of aetiology.
- ★ No update provided for at least two weeks.

DEN: Dengue
ZIKV: Zika virus
CHIK: Chikungunya
ILI: Influenza-like-illness

Singapore Dengue Early Warning System

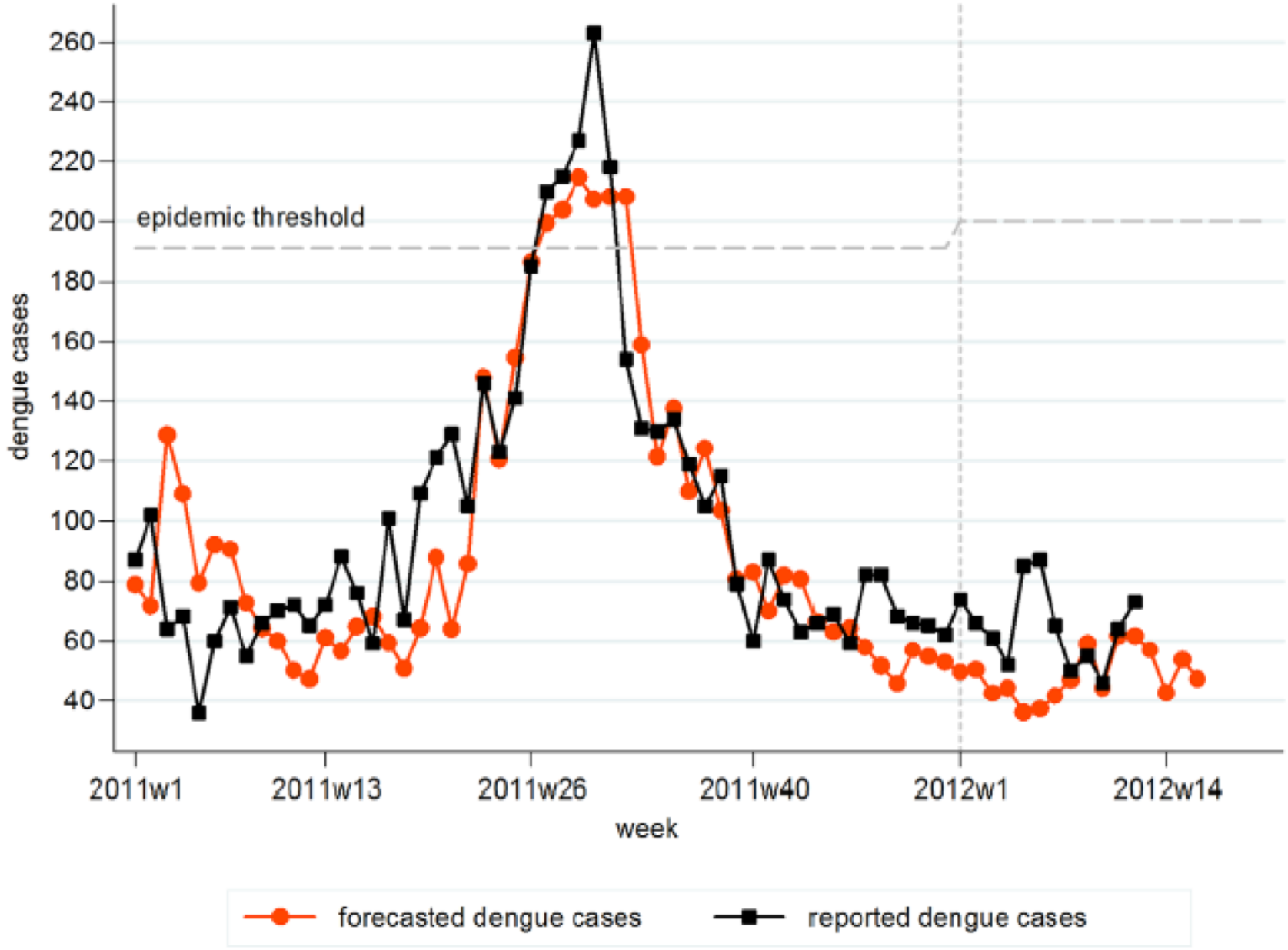
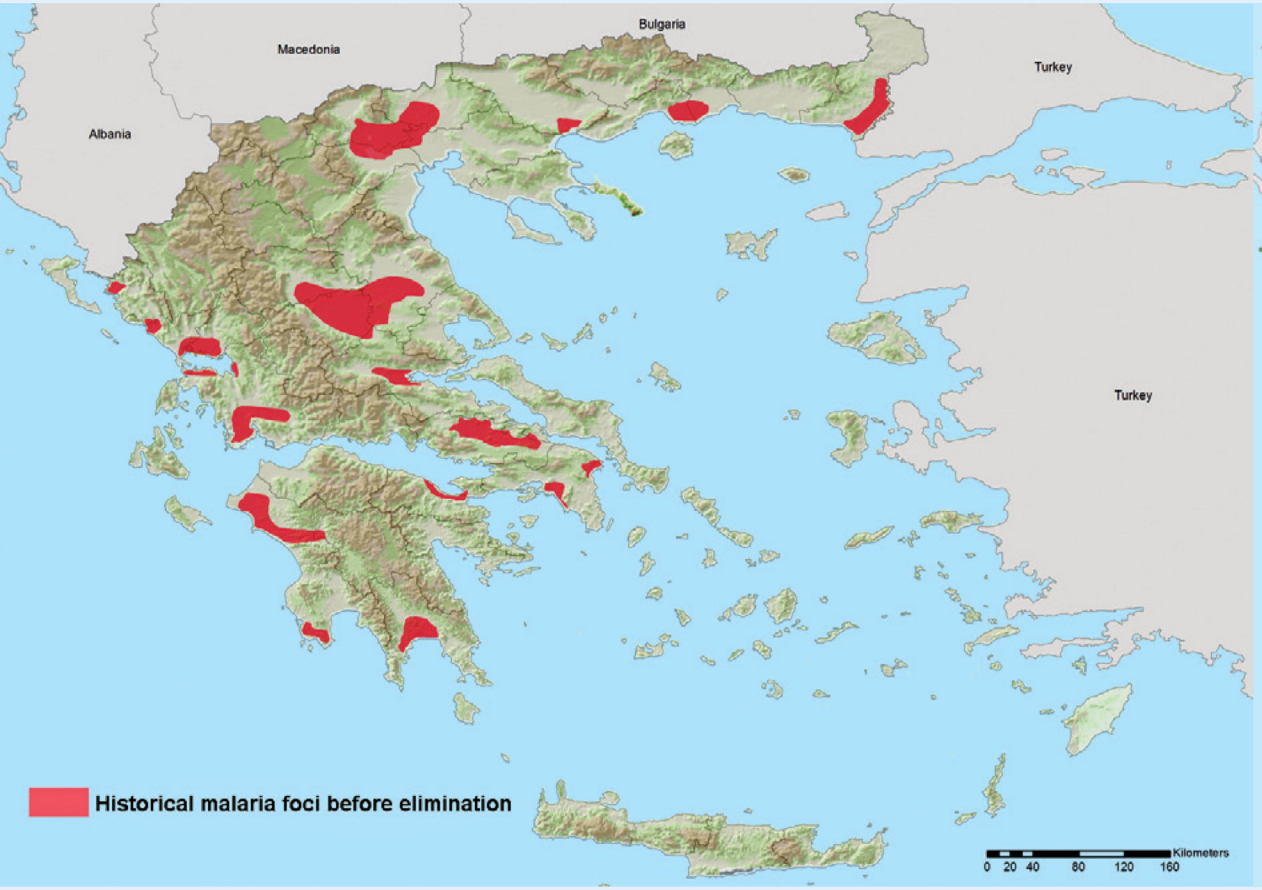


Figure 3. Forecasted dengue cases versus reported dengue cases in 2011–2012. Weekly forecasted dengue cases compared with reported cases during the validation period from 2011 week 1 to 2012 week 16. Epidemic threshold was 191 cases for 2011 and 200 cases for 2012.
doi:10.1371/journal.pntd.0001908.g003

Hii et al. 2012

Environmental suitability for malaria transmission in Greece



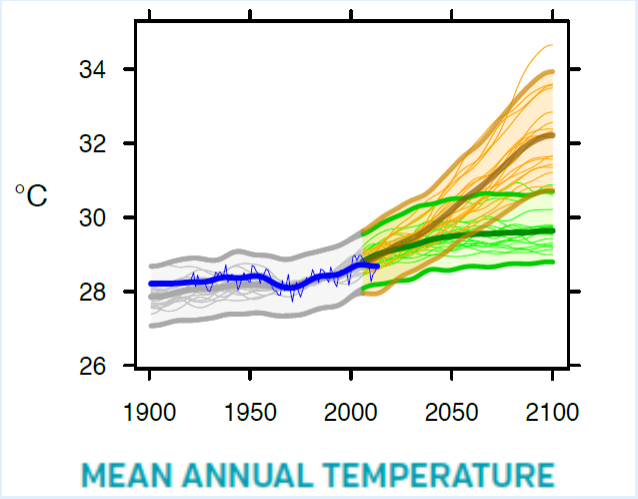
Historic malaria foci before elimination

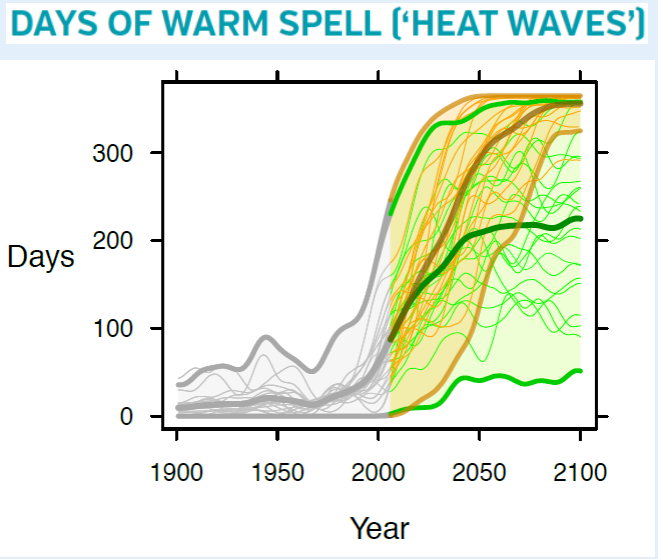
Environmentally permissive areas for malaria transmission, 2009-2012

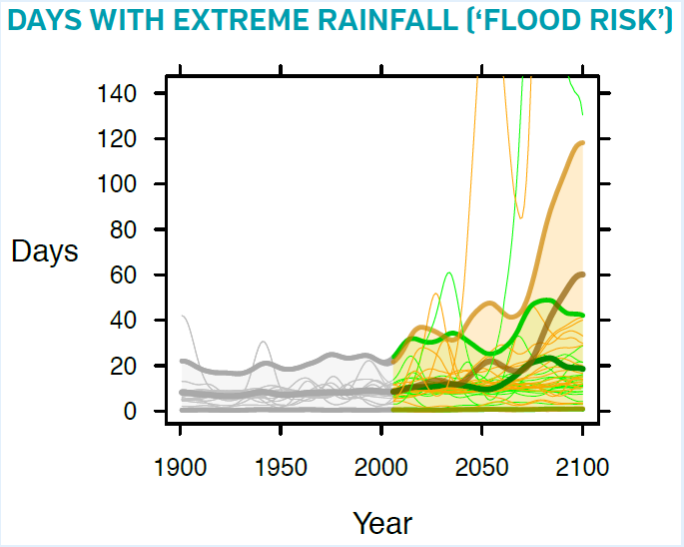
Sudre et al. 2013

Pohnpei 1997-98

Temperature increase, heatwaves, and flooding in Kiribati







Ciguatera fish poisoning and climate change

- Monthly calls to National Poison Centers for ciguatera in the contiguous US and Caribbean associated with
  - Warm sea surface temperatures
    - Strongest lag was 18 months
  - Increased storm frequency
- If climate change increases sea surface temperature in the Caribbean 2.5-3.5◦C over the coming century, then the incidence of ciguatera could increase 200-400%

Gingold et al. 2014

Ra Province Health Facility, Fiji Hurricane Winston

40% of population affected, with 131,000 people needed of immediate shelter; 88 of 214 health care facilities damaged

National Referral Hospital, Honiara, Solomon Islands

Hospital Safety Index Assessment of Pohnpei State - FSM

February 2015

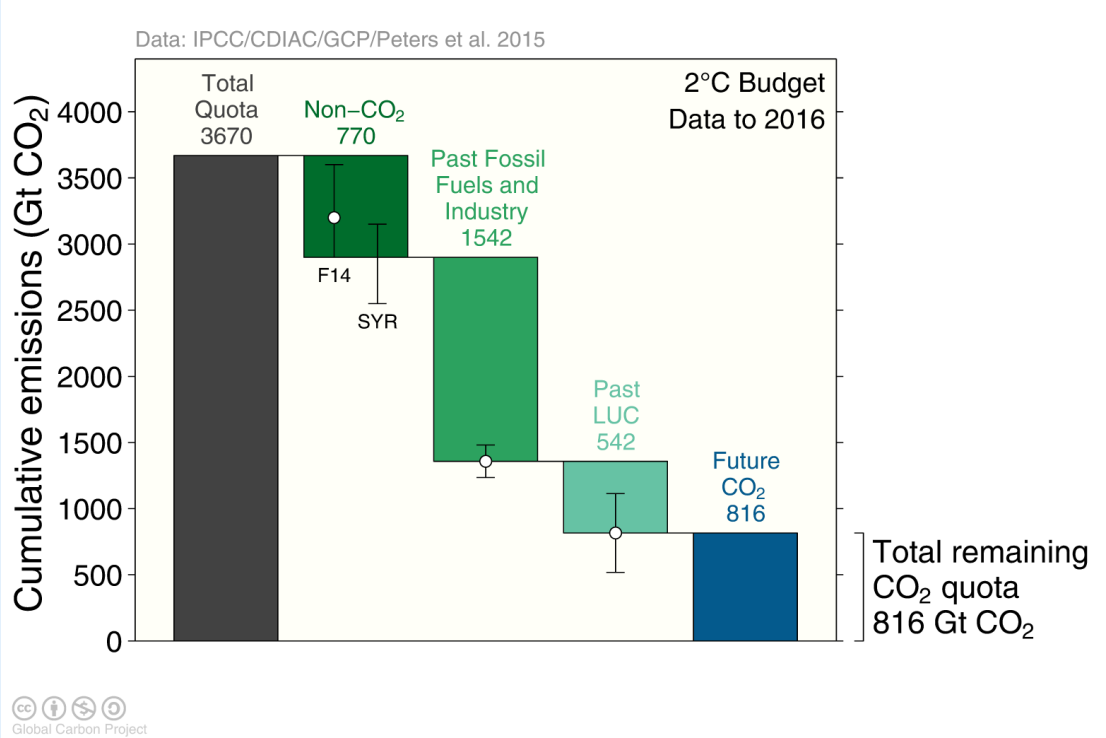
An assessment carried out under the direction of the FSM Ministry of Health office of Public Health & Hospital Emergency Preparedness (PHHEP), with technical support provided by the WHO Western Pacific Regional Office and the Directorate of Pacific Technical Support.

SUMMARY REPORT

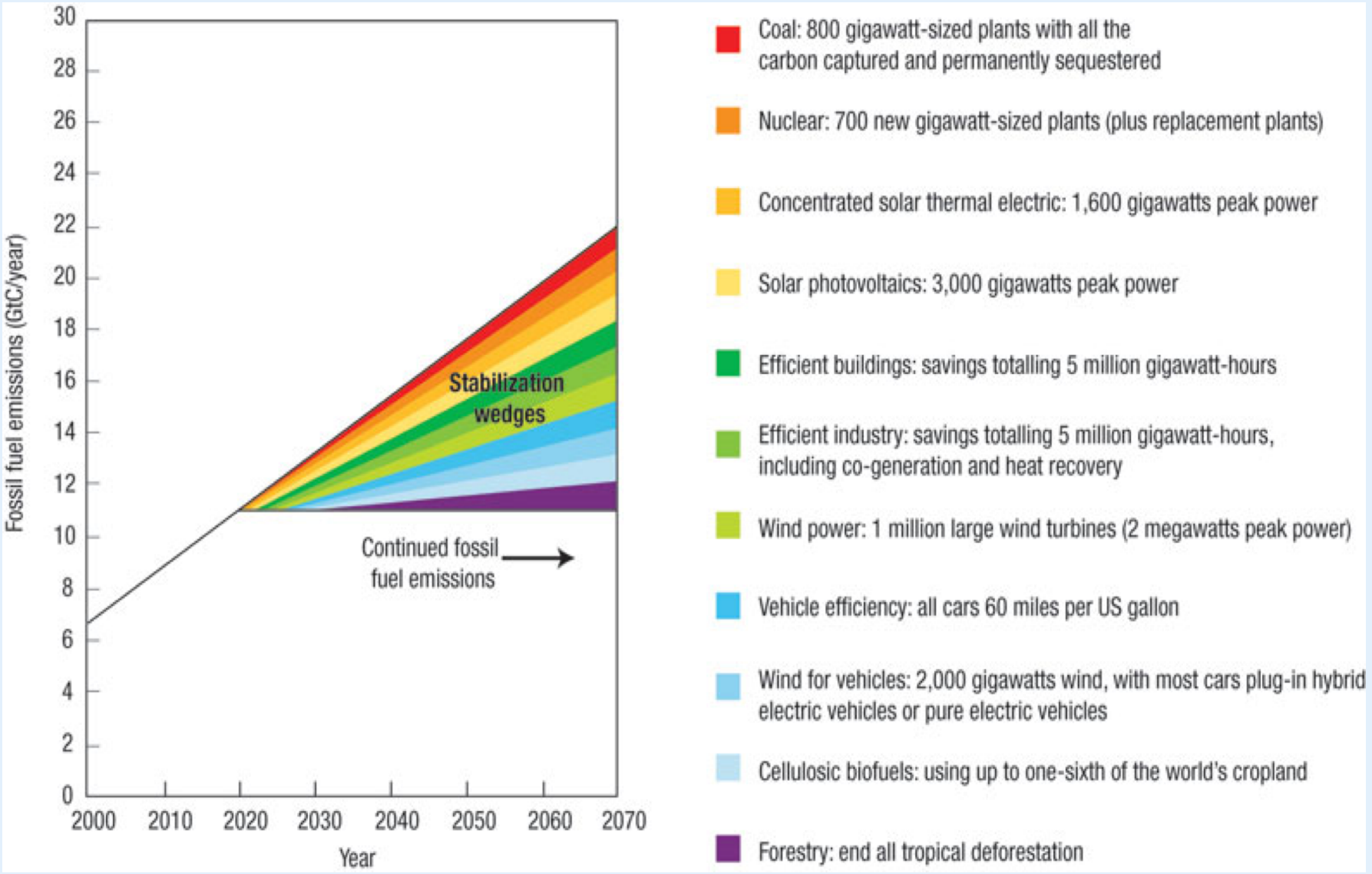
Carbon quota for a 66% chance to keep below 2° C

- The total remaining emissions from 2017 to keep global average temperature below 2° C
-
- 800GtCO_2 will be used in around 20 years at current emission rates

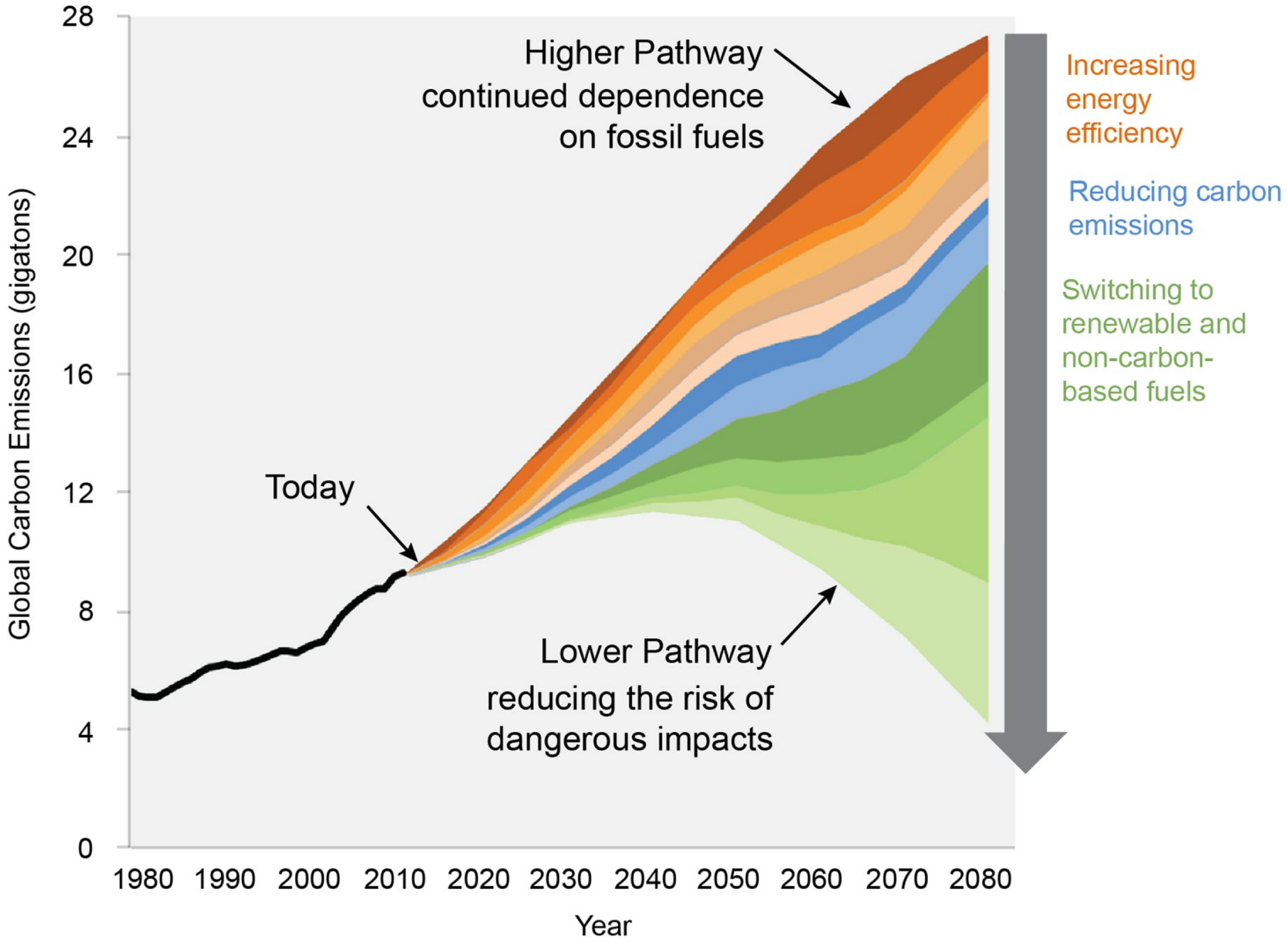
  - Grey: Total CO_2-only quota for 2° C with 66% chance. Green: Removed from CO_2 only quota. Blue: Remaining CO_2 quota.
  - The remaining quotas are indicative and vary depending on definition and methodology
    Source: Peters et al 2015; Global Carbon Budget 2016



Stabilization wedges



How to Cut Global Warming Emissions in Half



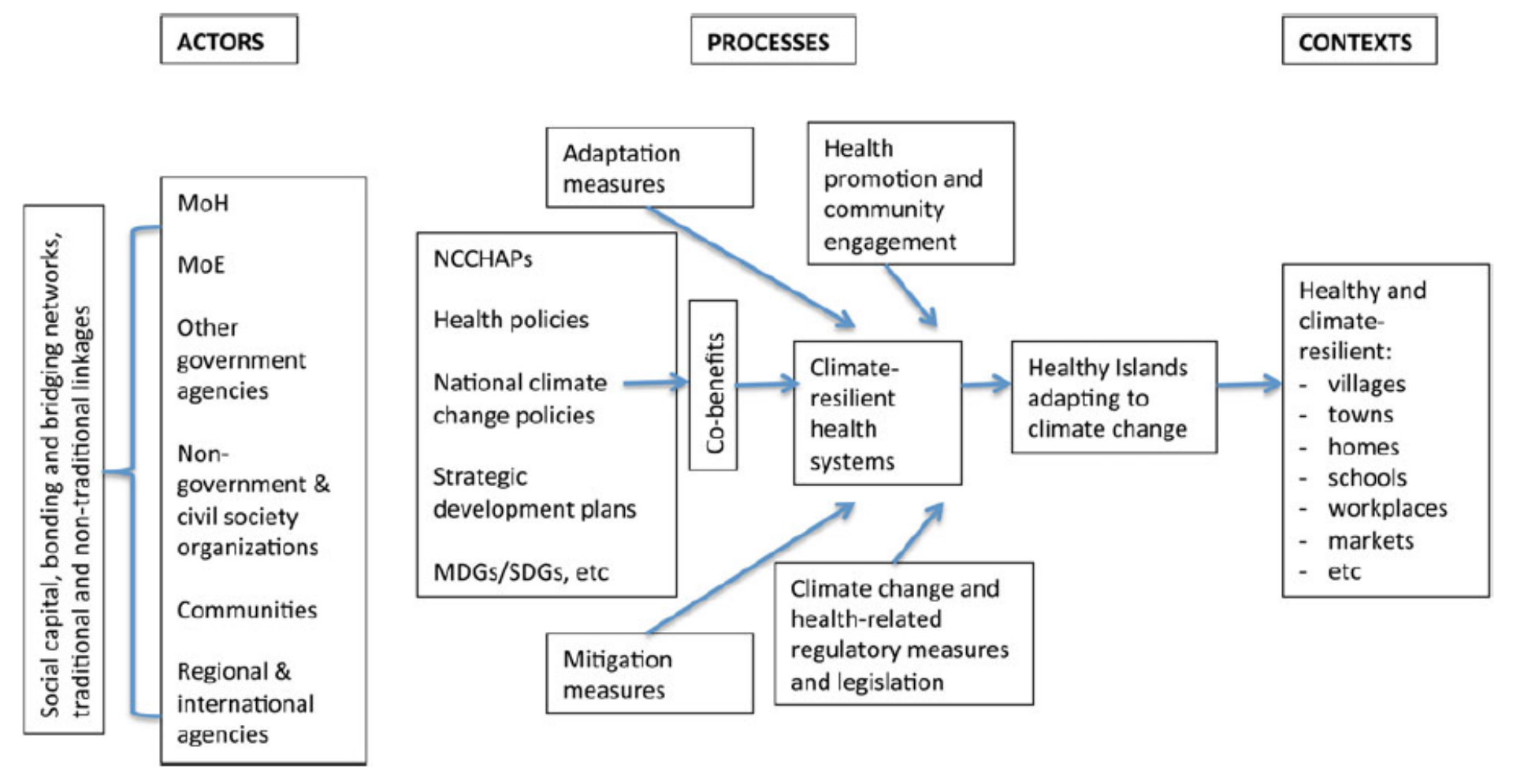
Co-benefits – early health gains from wise climate moves

Shifting 5% of short urban car trips to bicycles in New Zealand would save annually

- 22 million liters of fuel
- 116 deaths due to increased physical activity (vs. 5 extra road crash deaths)
- $200 million in health costs

ANZJPH 2011

Healthy islands framework for climate change adaptation



McIver et al. 2015