Climate Change, Public Health and Well-being in the Caribbean

NOAA in the Caribbean

September 22, 2021

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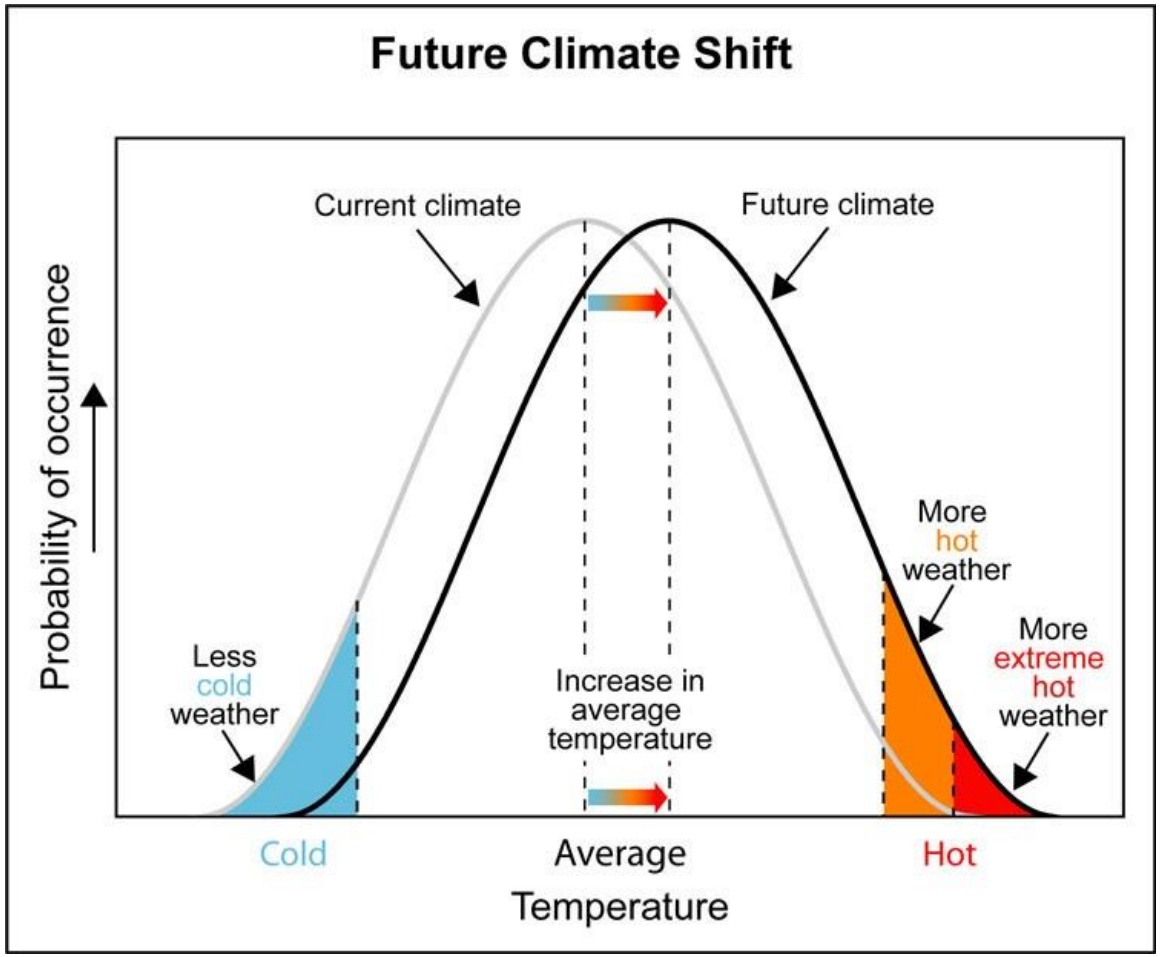
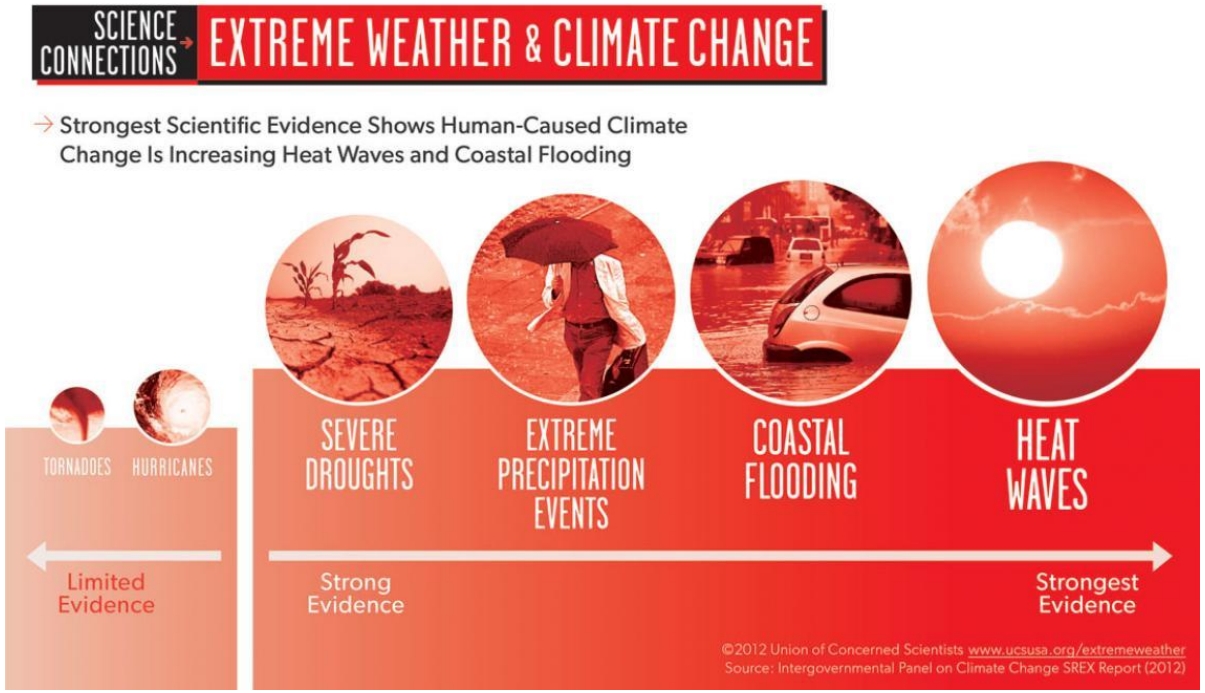
NASA Principal Investigator: Grant Number 80NSSC19K0194
NASA Principal Investigator: Grant Number 80NSSC20K1588



Intensity-Duration-Frequency



AGU PUBLICATIONS

Earth's Future

RESEARCH ARTICLE
10.1002/2017EF000686

Defining Extreme Events: A Cross-Disciplinary Review

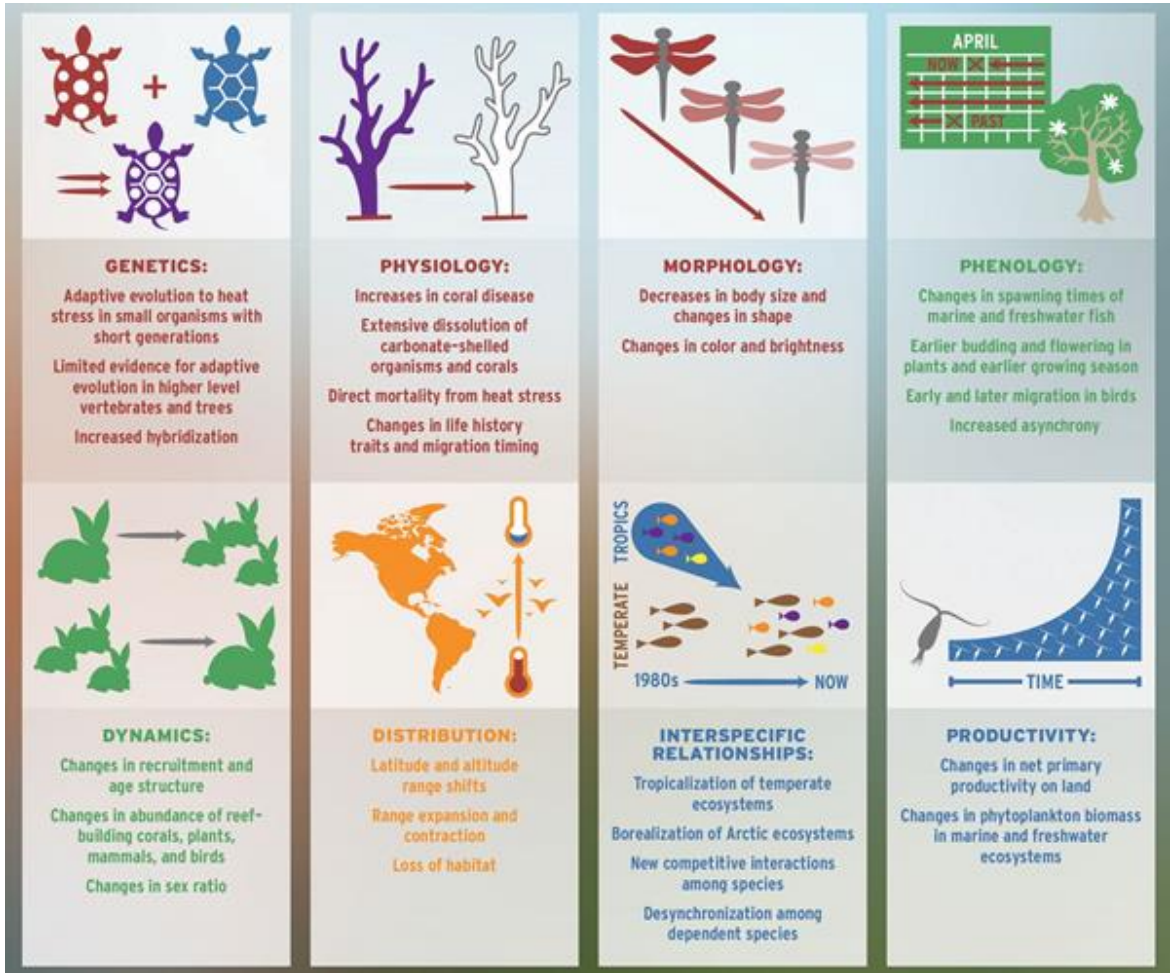
Lauren E. McPhillips[1], Heejun Chang[2], Mikhail V. Chester[3], Yaella Depietri[4], Erin Friedman[5], Nancy B. Grimm[6], John S. Kominoski[7], Timon McPhearson[4,8], Pablo Méndez-Lázaro[9], Emma J. Rosi[8], and Javad Shafiei Shiva[10]

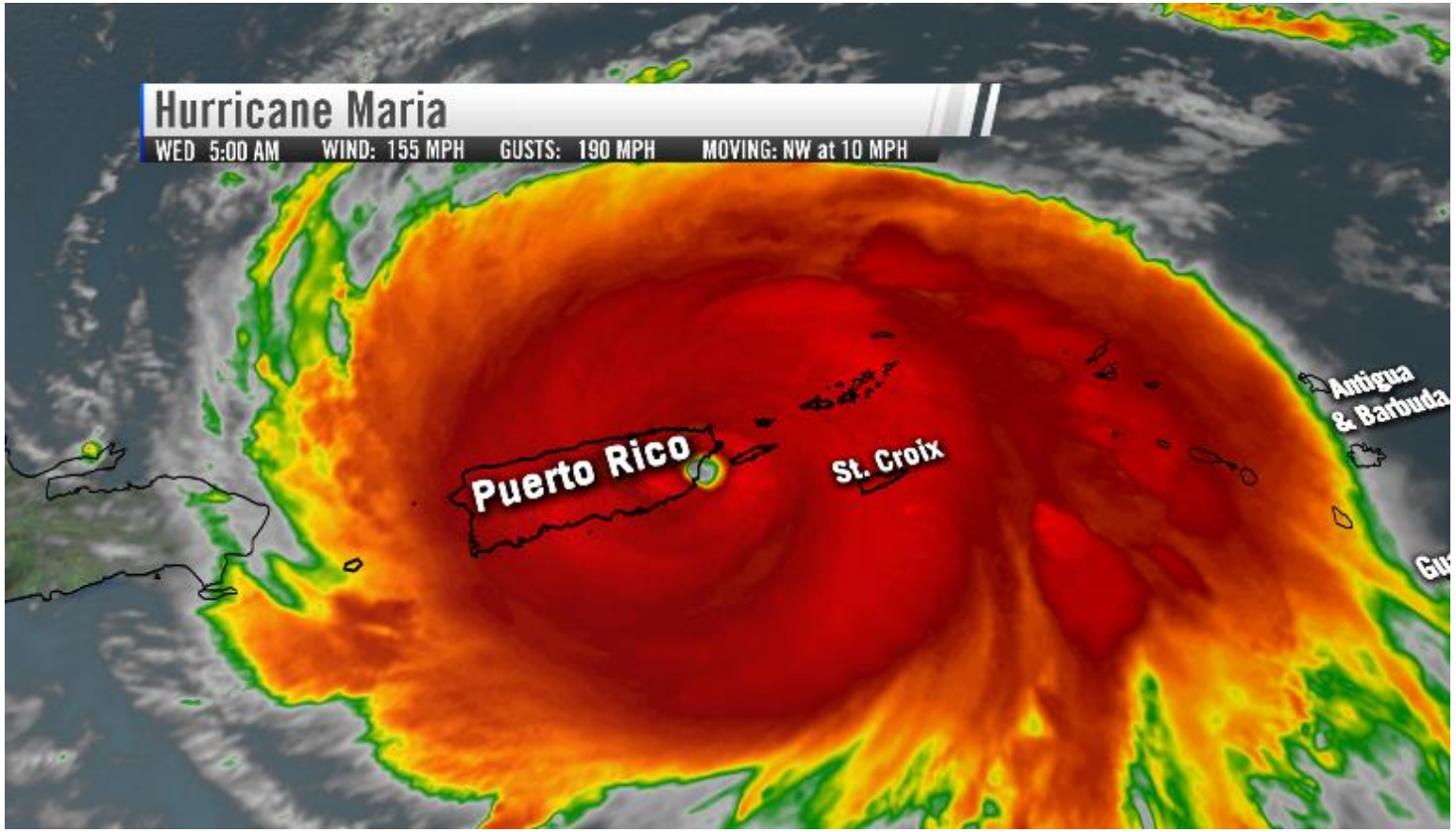
[1]Global Institute of Sustainability, Arizona State University, Tempe, AZ, USA, [2]Department of Geography, Portland State University, Portland, OR, USA, [3]School of Sustainable Engineering and the Built Environment, Arizona State University, Tempe, AZ, USA, [4]Urban Systems Lab, The New School, New York, NY, USA, [5]Earth and Environmental Sciences, The Graduate Center, City University of New York, New York, NY, USA, [6]School of Life Sciences and Global Institute of Sustainability, Arizona State University, Tempe, AZ, USA, [7]Department of Biological Sciences, Florida International University, Miami, FL, USA, [8]Cary Institute of Ecosystem Studies, Millbrook, NY, USA, [9]Environmental Health Department, Graduate School of Public Health, University of Puerto Rico—Medical Sciences Campus, San Juan, PR, USA, [10]Department of Civil and Environmental Engineering, Syracuse University, Syracuse, NY, USA

Key Points:

- What constitutes an extreme event varies by study and discipline; thus we must be explicit in how we define extreme events
- Extreme events are often conflated with their impacts, but this will inhibit future recognition of resilience
- Bridging across disciplinary differences in communication and definitions is critical for holistic management of extreme events

Socio-ecological Systems & Ecosystem Services

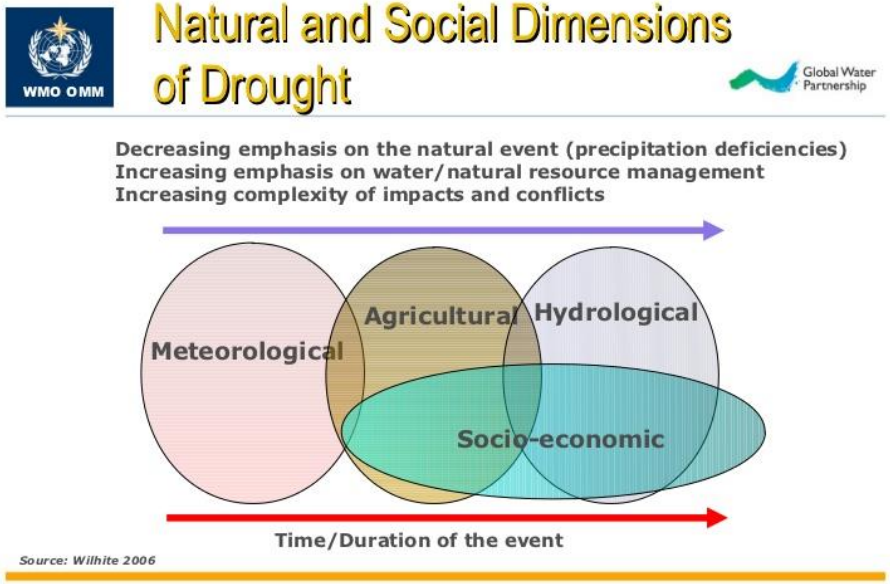




- **Powerful Hurricanes**
- 2017 Hurricane Season

- The Caribbean Region experienced major disruptions in essential services (e.g. potable water and electric power, telecommunications, transportation –roads and bridges) and environmental health issues (e.g. water sanitation, contaminant exposure, vector borne diseases, food hygiene, carbon monoxide poisoning and exposure to mold).

Water Resources



Apps Gmail YouTube Maps

Forbes

Feb 12, 2019, 07:41pm EST | 11,107 views

In Search Of A Solution For Water Scarcity In The Caribbean

Apps Gmail YouTube Maps

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World Leaders' Lack of Urgency to Fight Climate Crisis Hangs Over UN General Assembly

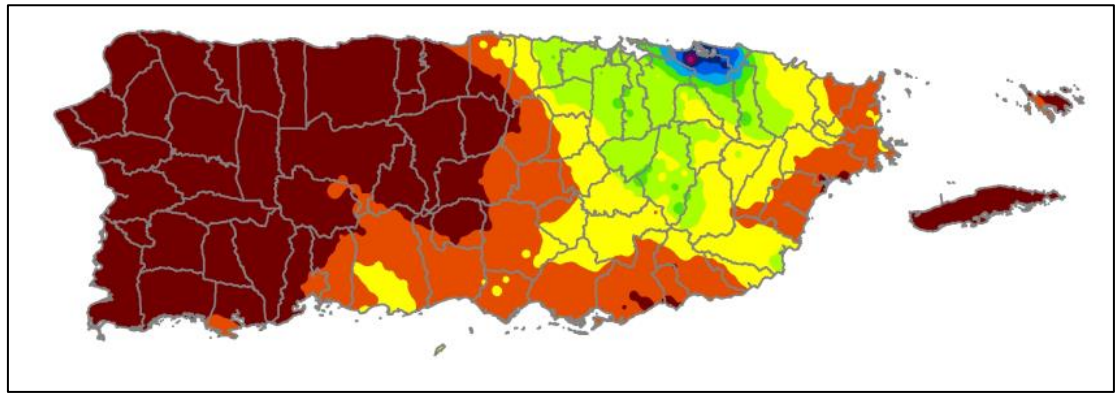
CLIMATE ACTION 47 minutes ago

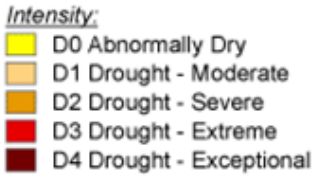
Meet 'Sponge Bobbie,' the Marine Biologist Using Sponges to Save Coral Reefs

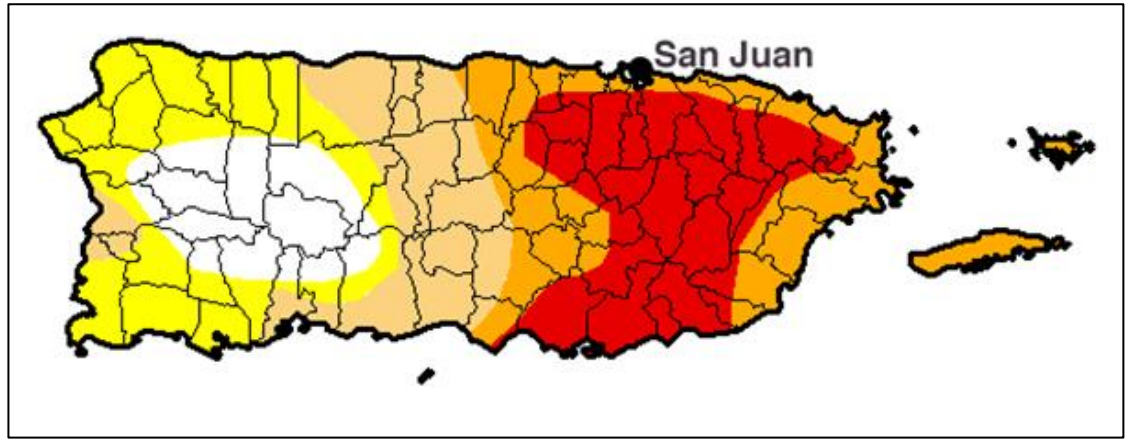
Climate Change Is Increasing Caribbean Water Shortages

By Deutsche Welle | Jan. 26, 2021 01:36PM EST

CLIMATE







SCIENCE ADVANCES | RESEARCH ARTICLE

CLIMATOLOGY

The emergence of heat and humidity too severe for human tolerance

Colin Raymond[1,2]*, Tom Matthews[3], Radley M. Horton[2,4]

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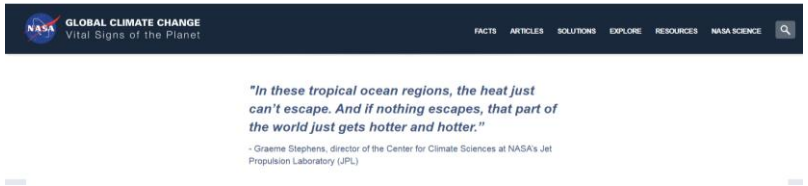
Humans' ability to efficiently shed heat has enabled us to range over every continent, but a wet-bulb temperature (TW) of 35°C marks our upper physiological limit, and much lower values have serious health and productivity impacts. Climate models project the first 35°C TW occurrences by the mid-21st century. However, a comprehensive evaluation of weather station data shows that some coastal subtropical locations have already reported a TW of 35°C and that extreme humid heat overall has more than doubled in frequency since 1979. Recent exceedances of 35°C in global maximum sea surface temperature provide further support for the validity of these dangerously high TW values. We find the most extreme humid heat is highly localized in both space and time and is correspondingly substantially underestimated in reanalysis products. Our findings thus underscore the serious challenge posed by humid heat that is more intense than previously reported and increasingly severe.

INTRODUCTION

Humans' bipedal locomotion, naked skin, and sweat glands are constituents of a sophisticated cooling system (*1*). Despite these thermoregulatory adaptations, extreme heat remains one of the most dangerous natural hazards (*2*), with tens of thousands of fatalities in exceed 35°C in parts of South Asia and the Middle East by the third quarter of the 21st century (*14*–*16*).

Here, we use quality-assured station observations from HadISD (*17*, *18*) and high-resolution reanalysis data from ERA-Interim (*19*, *20*), verified against radiosondes and marine observations (see

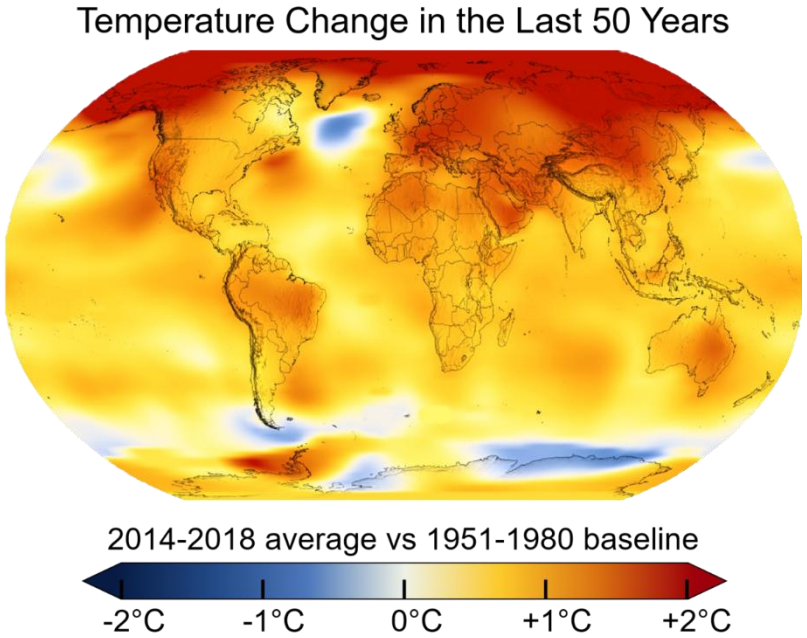


GLOBAL CLIMATE CHANGE
Vital Signs of the Planet

FACTS ARTICLES SOLUTIONS EXPLORE RESOURCES NASA SCIENCE

"In these tropical ocean regions, the heat just can't escape. And if nothing escapes, that part of the world just gets hotter and hotter."

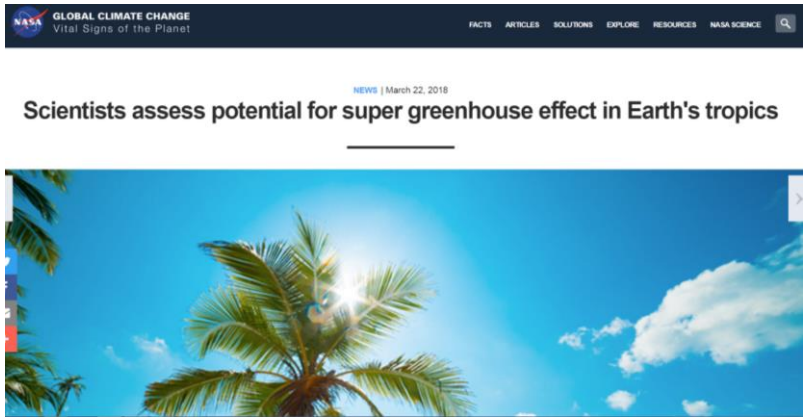
- Graeme Stephens, director of the Center for Climate Sciences at NASA's Jet Propulsion Laboratory (JPL)



Puerto Rico Climate & Health Research Group

PR-CLIMAH

THIS IS PUBLIC HEALTH



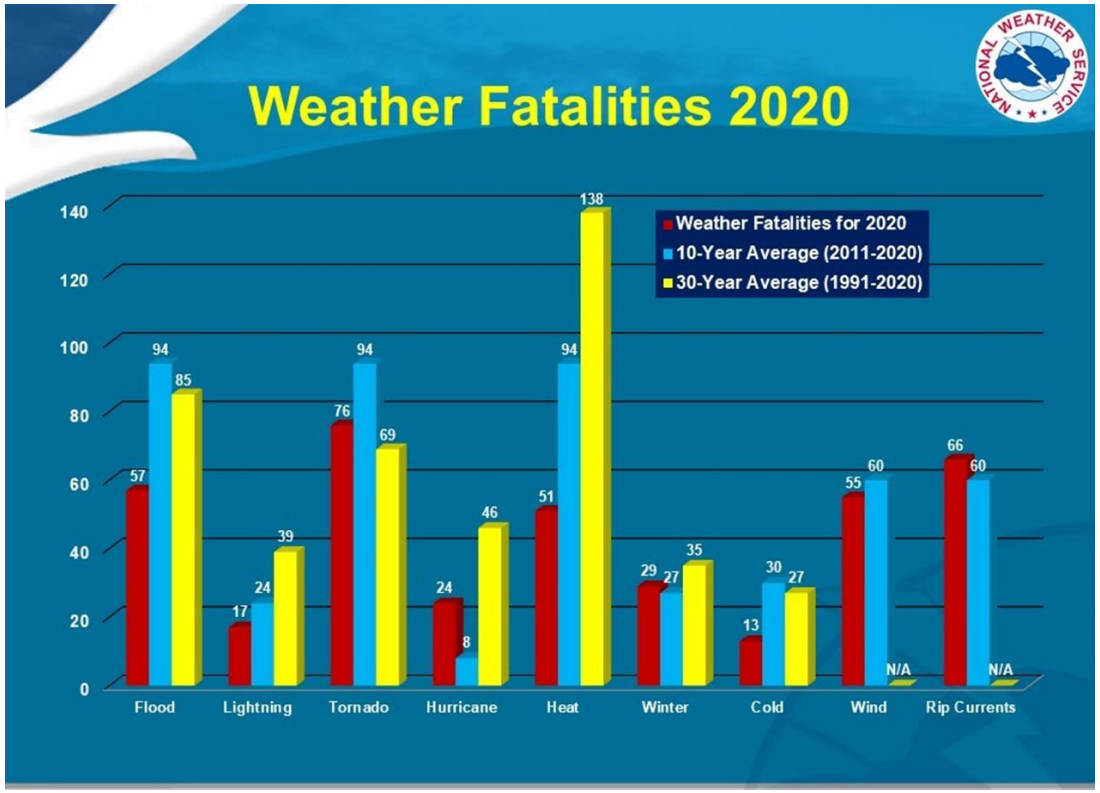
GLOBAL CLIMATE CHANGE
Vital Signs of the Planet

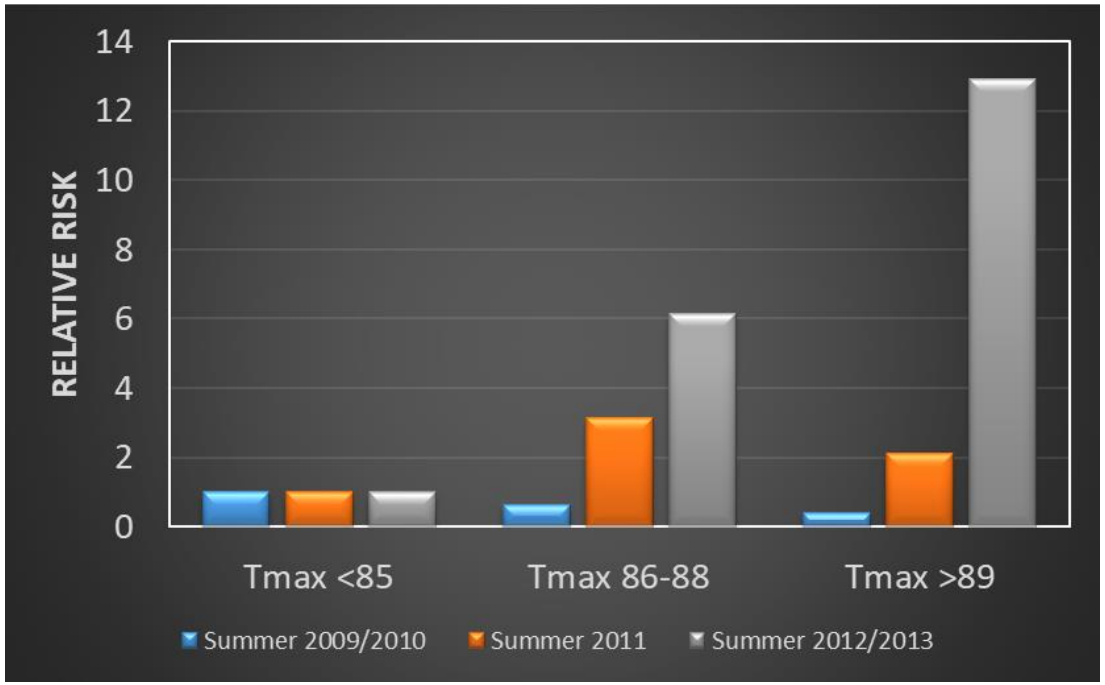
FACTS ARTICLES SOLUTIONS EXPLORE RESOURCES NASA SCIENCE

NEWS | March 22, 2018

Scientists assess potential for super greenhouse effect in Earth's tropics

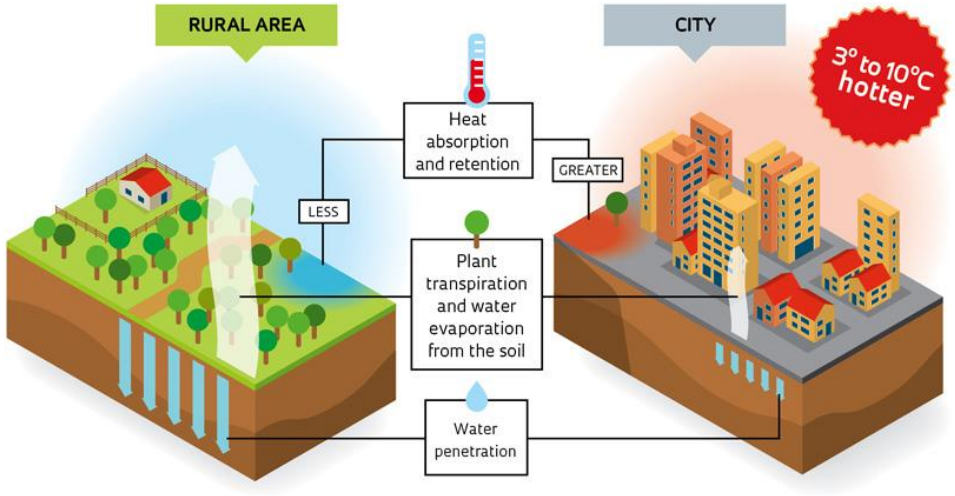
Extreme Heat

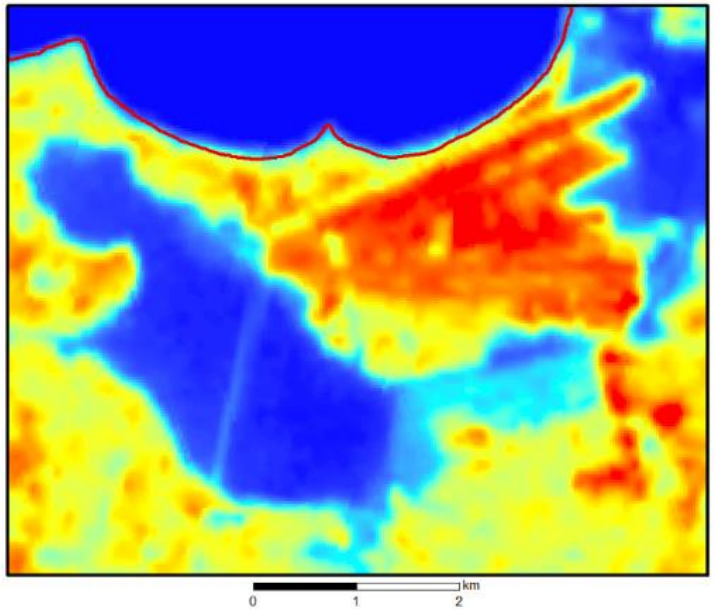




Extreme Heat

Why the urban heat island effect occurs





Towards improved heat early warning information systems in the Caribbean: Research and Applications

AGENDA

Friday May 28, 2021
10:00 am - 12:15 pm AST

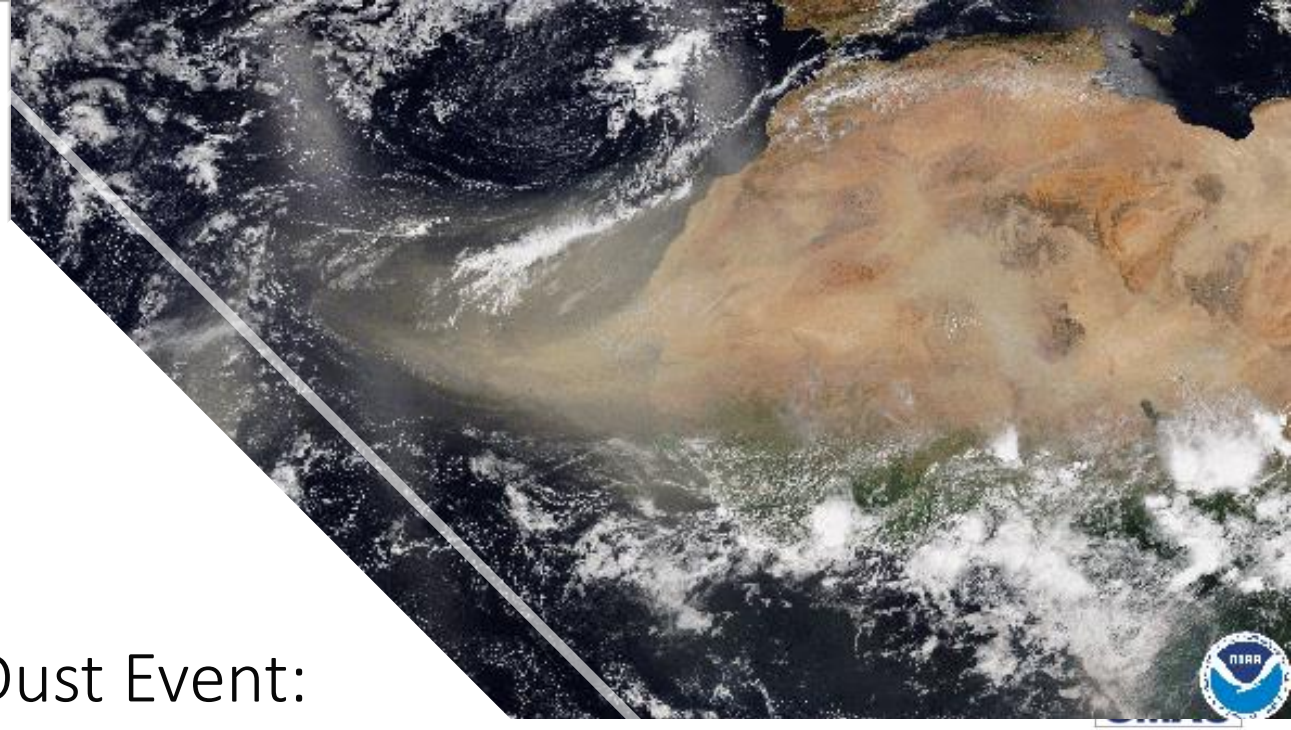
MEETING OBJECTIVES:

1. To highlight research and experience in heat early warning and implications for sectoral response in the Caribbean;
2. To advance the regional discussion on climate-informed health early warning systems.

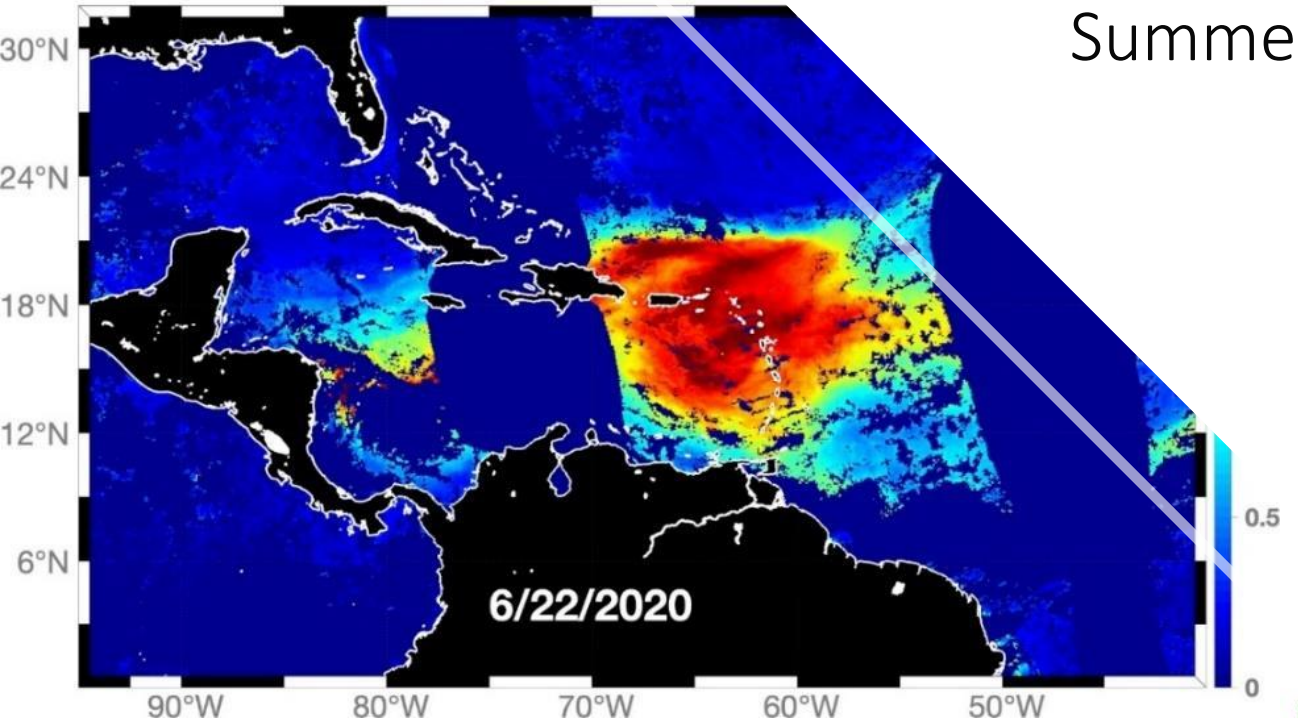
MEETING AGENDA:

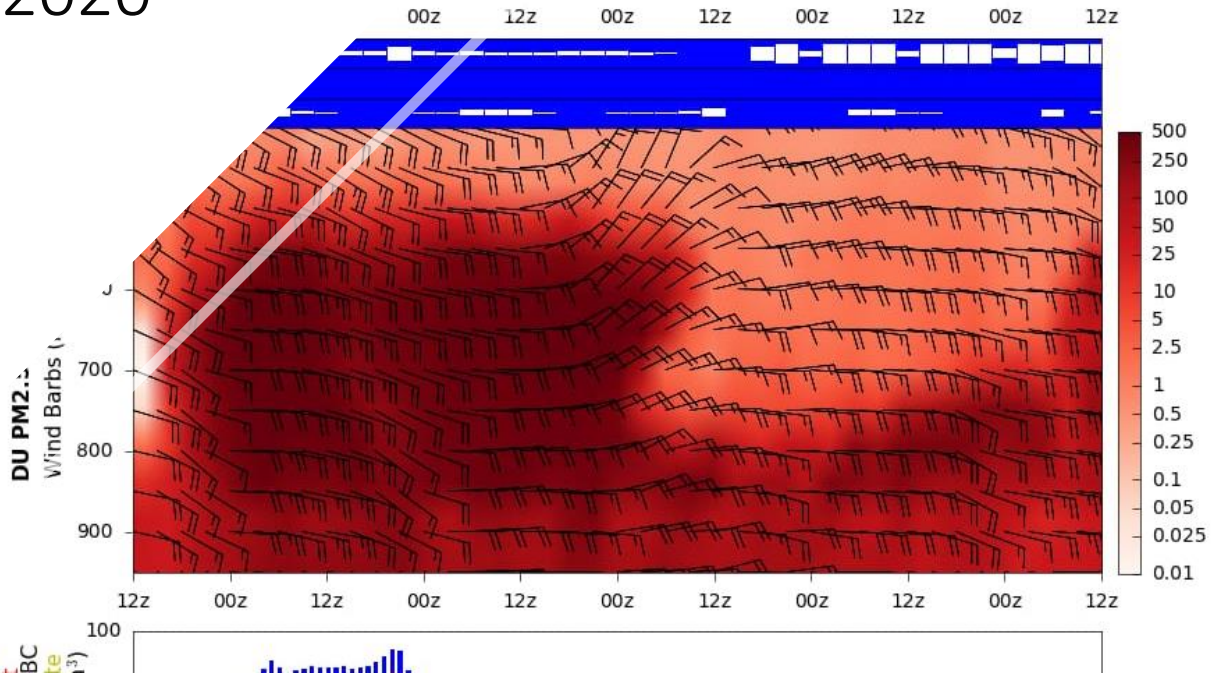
TIME	SESSION	RESOURCE PERSON/AGENCY
1000 – 1005	Welcome remarks	Dr. David Farrell, CIMH
1005 – 1025	The Caribbean Heat Season: Improving early warning information for decision-making	Dr. Roché Mahon/Dr. Cédric Van Meerbeeck, CIMH
1025 – 1040	Caribbean heat events during the Atlantic Hurricane Season: the hurricane heat trail effect	Dr. Theodore Allen, CIMH
1040 – 1050	Q&A	All
1050 – 1110	Recent experiences of cascading extreme events in the Caribbean: Lessons from Puerto Rico	Dr. Pablo A. Méndez Lázaro, University of Puerto Rico - Medical Sciences Campus
1110 – 1120	Q&A	All
11:20–11:35	Enabling heat-health early warning in Africa	Dr. Wassila Thiaw, NOAA
1135 – 1145	Impact based threshold development for heat-health in Grenada	Ms. Sally Edwards, PAHO
11:45–11:55	Strengthening Climate Resilience in the Caribbean: Early Warning Systems for Health	Dr. Laura-Lee Boodram, CARPHA
1155 - 12:05	Q&A	All
12:05–12:15	Summary and Close-Out	Mr. Adrian Trotman, CIMH

International Research Institute for Climate and Society
EARTH INSTITUTE | COLUMBIA UNIVERSITY



Godzilla Dust Event: Summer 2020





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PLoS NEGLECTED TROPICAL DISEASES

Larval Development of *Aedes aegypti* and *Aedes albopictus* in Peri-Urban Brackish Water and Its Implications for Transmission of Arboviral Diseases

Ranjan Ramasamy[1]*, Sinnathamby N. Surendran[2]*, Pavilupillai J. Jude[2], Sangaralingam Dharshini[3], Muthuladchumy Vinobaba[3]

1 Institute of Health Sciences, Universiti Brunei Darussalam, Gadong, Brunei Darussalam, 2 Department of Zoology, Faculty of Science, University of Jaffna, Jaffna, Sri Lanka, 3 Department of Zoology, Faculty of Science, Eastern University, Chenkaladi, Sri Lanka

Vol. 19: 35–43, 2001 | CLIMATE RESEARCH Clim Res | Published November 22

Dengue epidemics and the El Niño Southern Oscillation

Alexandre S. Gagnon[1,*], Andrew B. G. Bush[2], Karen E. Smoyer-Tomic[2]

[1]Department of Geography, University of Toronto, Rm 5047, 100 St. George St., Toronto, Ontario M5S 3G3, Canada
[2]Department of Earth and Atmospheric Sciences, 1–26 Earth Sciences Building, University of Alberta, Edmonton, Alberta T6G 2E3, Canada

Effects of Extreme Precipitation to the Distribution of Infectious Diseases in Taiwan, 1994–2008

Mu-Jean Chen[1], Chuan-Yao Lin[2], Yi-Ting Wu[3], Pei-Chih Wu[4], Shih-Chun Lung[2], Huey-Jen Su[1]*

1 Department of Environmental and Occupational Health, Medical College, National Cheng Kung University, Tainan, Taiwan, 2 Research Center for Environmental Changes, Academia Sinica, Taipei, Taiwan, 3 Department of Occupational Safety, Foundation of Taiwan Industry Service, Taipei, Taiwan, 4 Department of Occupational Safety and Health, Chang Jung Christian University, Tainan, Taiwan

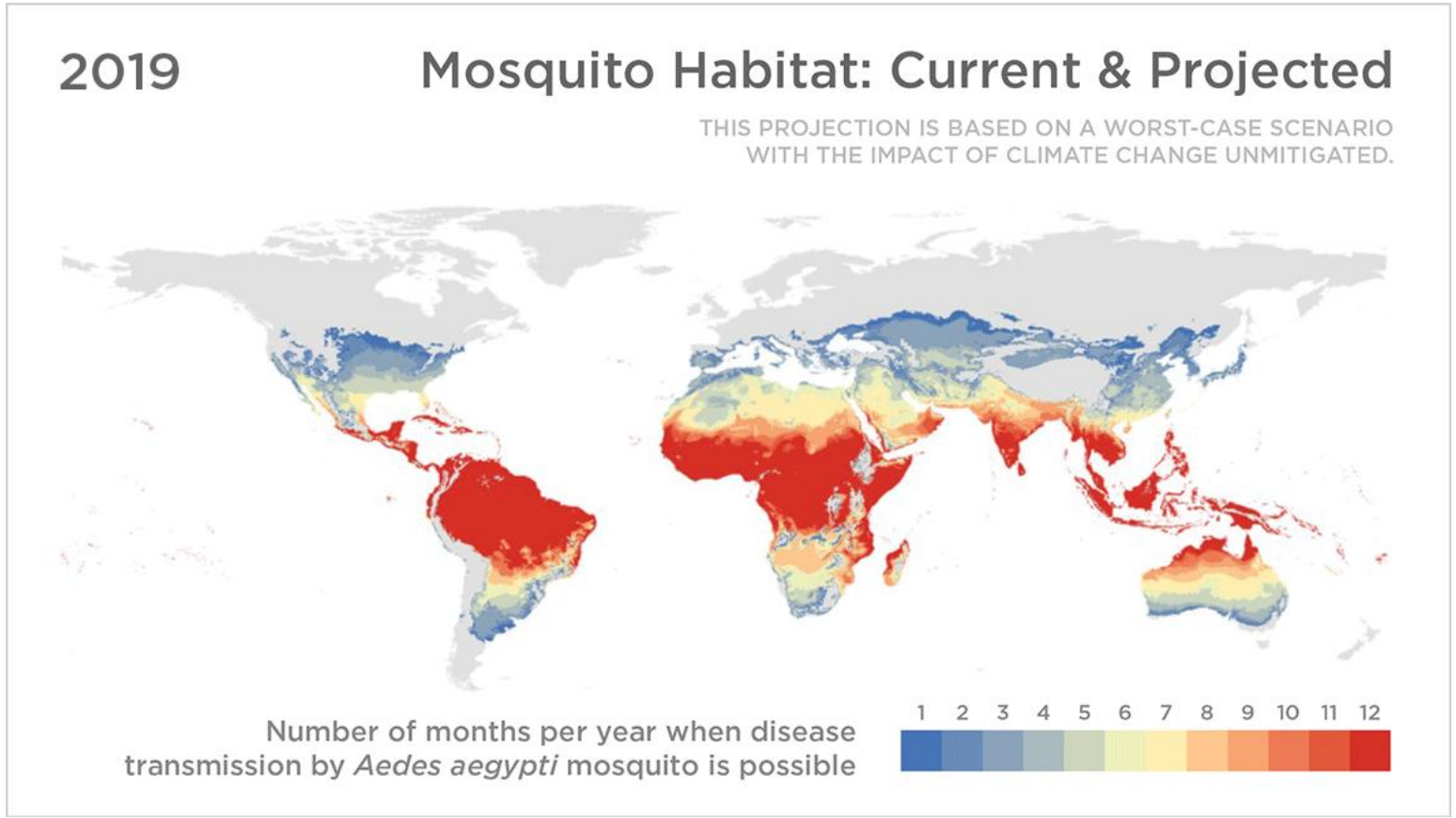
Ramasamy and Surendran *BMC Infectious Diseases* 2011, **11**:18
http://www.biomedcentral.com/1471-2334/11/18

BMC Infectious Diseases

HYPOTHESIS Open Access

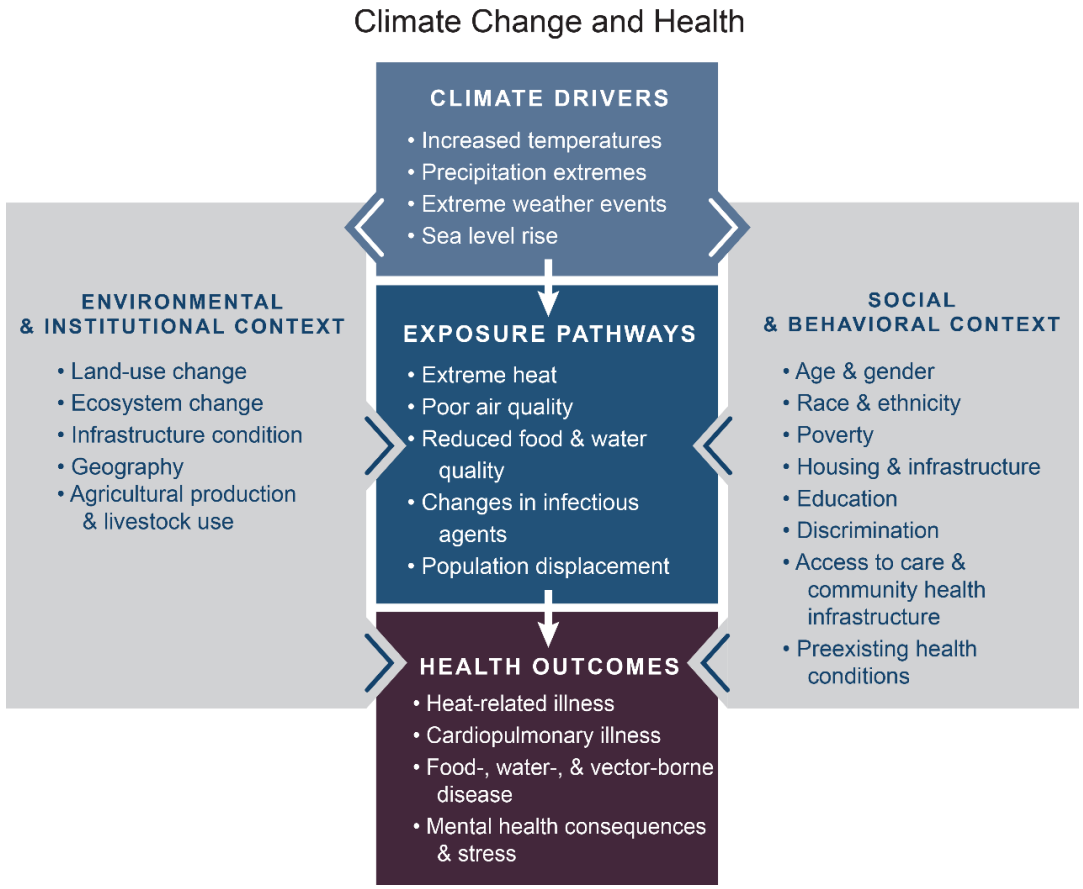
Possible impact of rising sea levels on vector-borne infectious diseases

Ranjan Ramasamy[1*], Sinnathamby N Surendran[2]



Source: Sadie J. Ryan, Colin J. Carlson, Erin A. Mordecai, and Leah R. Johnson
Credit: Koko Nakajima/NPR

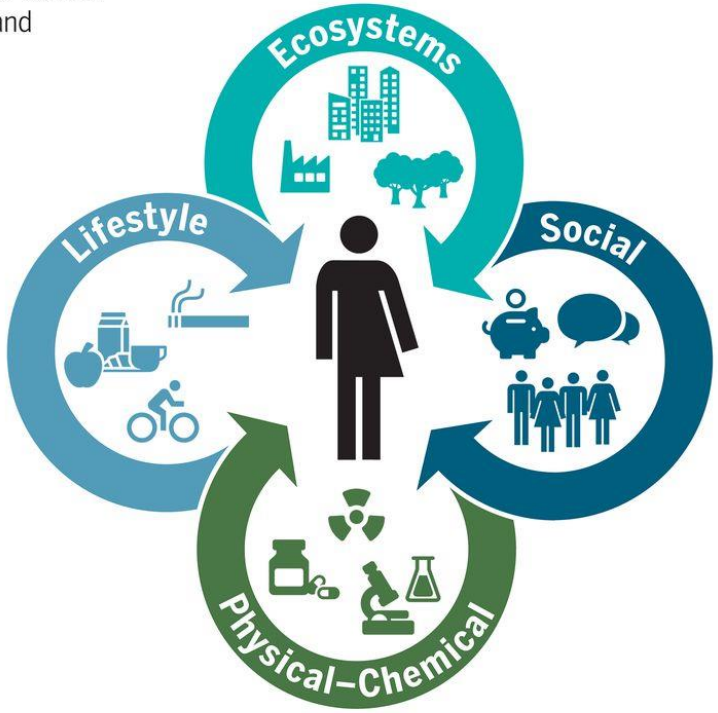
https://nca2018.globalchange.gov/chapter/14/



Ecosystems
Food outlets, alcohol outlets
Built environment and urban land uses
Population density
Walkability
Green/blue space

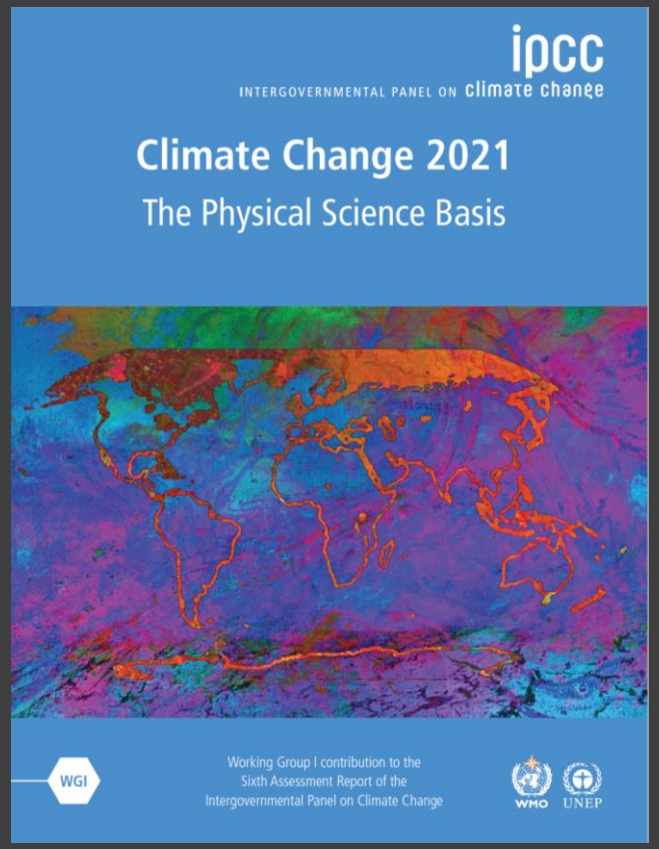
Lifestyle
Physical activity
Sleep behavior
Diet
Drug use
Smoking
Alcohol use

Social
Household income
Inequality
Social capital
Social networks
Cultural norms
Cultural capital
Psychological and mental stress

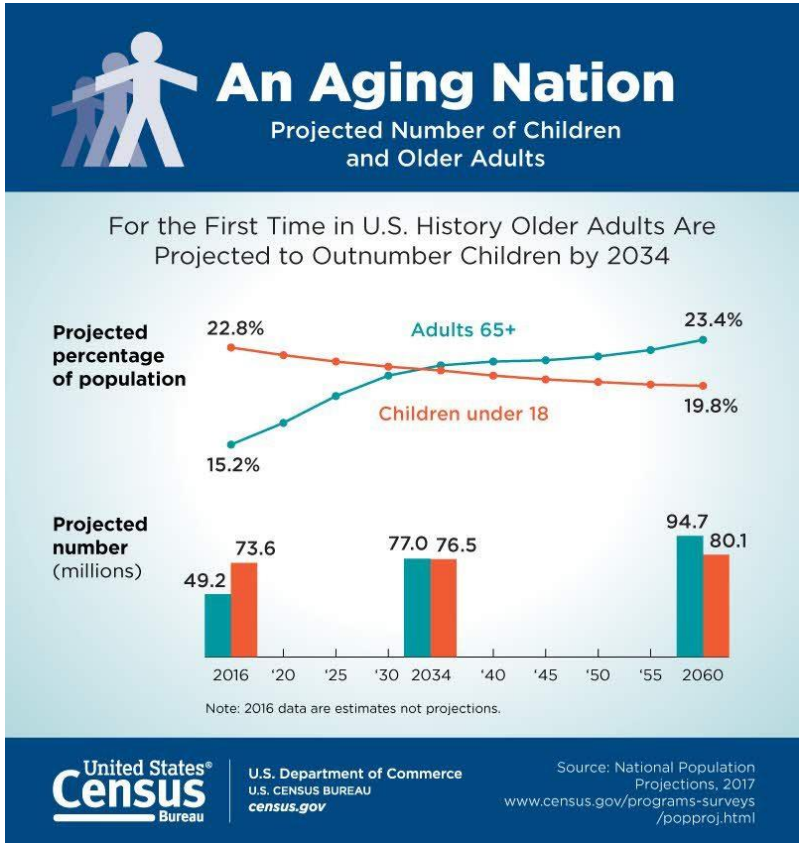


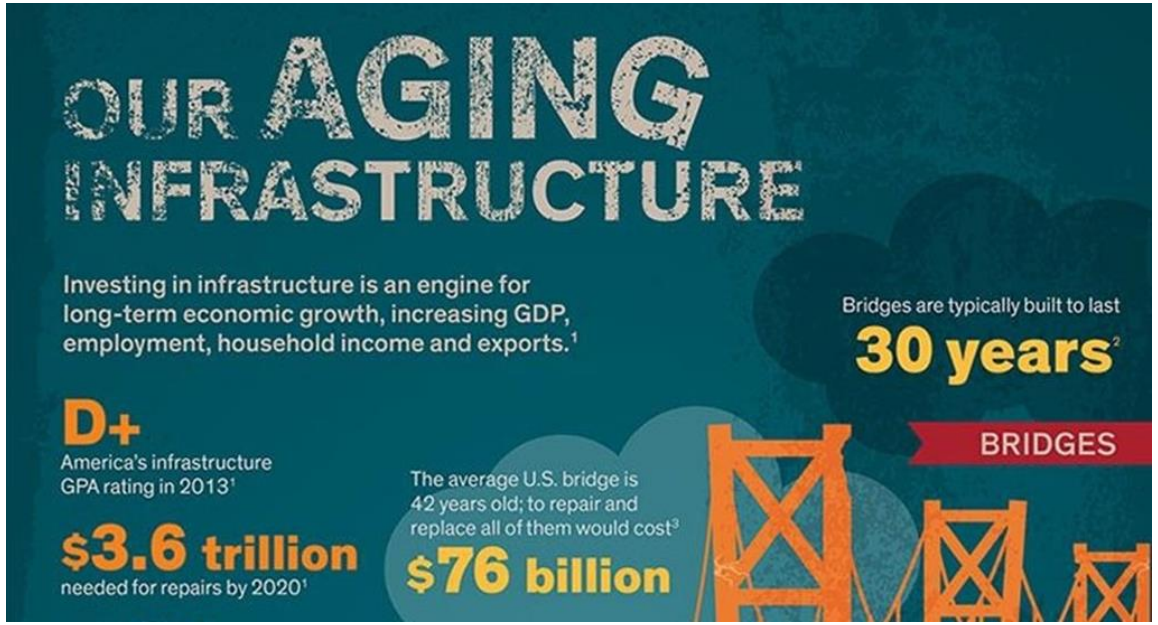
Physical–Chemical
Temperature/humidity
Electromagnetic fields
Ambient light
Odor and noise
Point, line sources, e.g, factories, ports
Outdoor and indoor air pollution
Agricultural activities, livestock
Pollen/mold/fungus
Pesticides
Fragrance products
Flame retardants (PBDEs)
Persistent organic pollutants
Plastic and plasticizers
Food contaminants
Soil contaminants
Drinking water contamination
Groundwater contamination
Surface water contamination
Occupational exposures

Adaptive Capacity, Sensitivity, Exposure, Capacity to Cope



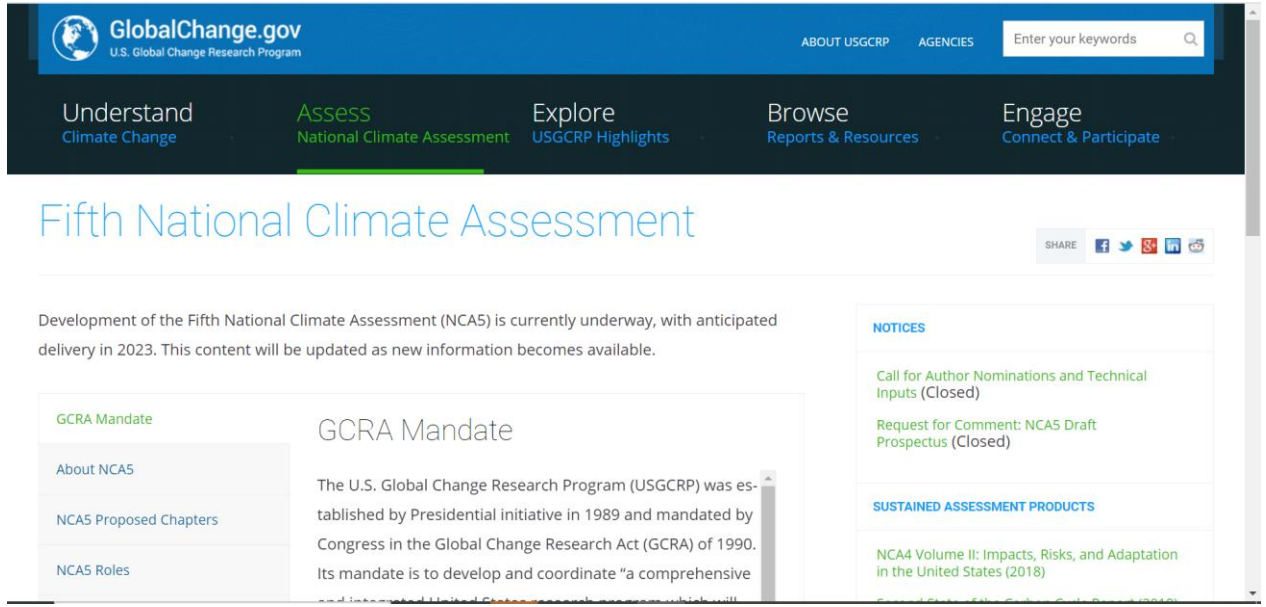
- Many of the changes observed in the climate are **unprecedented** in thousands, if not hundreds of thousands of years, and some of the changes already set in motion—such as continued *sea level rise*—are **irreversible** over hundreds to thousands of years.





Socio-ecological and Technological

US 5th National Climate Assessment



- The U.S. Global Change Research Program (USGCRP) was established by Presidential initiative in 1989 and mandated by Congress in the Global Change Research Act (GCRA) of 1990.

- Its mandate is to develop and coordinate "a comprehensive and integrated United States research program which will assist the Nation and the world to understand, assess, predict, and respond to human-induced and natural processes of global change."

Gracias!

Pablo A. Méndez Lázaro, Ph.D.
pablo.mendez1@upr.edu

Principal Investigator: NASA--Early Warning of Synoptic Air Quality Events to Improve Health and Well Being in the Greater Caribbean Region: Grant Number 80NSSC19K0194

Principal Investigator: NASA Imminent Risks due to Interactions between SARS-CoV-2 (COVID-19) and Environmental Factors in Puerto Rico, summer 2020: Grant Number 80NSSC20K1588

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