Mission

CFE-DM builds crisis response capacity in US and Partner militaries, enhances coordination and collaboration with civilian and foreign partners, and strengthens those relationships to save lives and alleviate human suffering before, during, and after humanitarian crises in a changing climate environment.

Vision

Resilient Joint Forces, Allies, and Partners that are fully prepared to respond across the spectrum of humanitarian crises.

Secretary of Defense

USINDOPACOM

Center for Excellence in Disaster Management and Humanitarian Assistance

Regional Organizations

Other Combatant Commands

US Military Universities and Colleges

UN and other International Humanitarian Organizations

US Civilian Universities and Colleges

Foreign Civilian Universities and Colleges

Foreign Military Universities and Colleges

DoD Foreign Disaster Response in the Indo-Pacific

2004	– Indian Ocean Earthquake/Tsunami
2005	-- Earthquake, Pakistan (CENTCOM)
2006	– Leyte Landslide, Philippines
	– Yogyakarta Earthquake, Indonesia
2007	– Cyclone Sidr, Bangladesh
2008	– Cyclone Nargis, Myanmar
	– Sichuan Earthquake, China
	– Typhoon Fengshen, Philippines
2009	– Typhoon Morakot, Taiwan (ROC)
	– Tropical Storm Ketsana, Philippines
	– Padang Earthquake, Indonesia
2011	– Earthquake/Tsunami, Japan
	– Floods, Thailand
2012	– Typhoon Bopha, Philippines
2013	– Typhoon Haiyan, Philippines
2014	– Typhoon Hagupit, Philippines
2015	– Earthquake, Nepal
2016	– Kumamoto Earthquake, Japan*
	– Kaikoura Earthquake, New Zealand*
2017	– Floods, Sri Lanka
2018	– Cave diving rescue, Thailand
2018	– Sulawesi EQ/Tsunami, Indonesia
2022	– Volcano and tsunami, Tonga
2023	-- Volcano, Papua New Guinea
2024	-- Typhoon / Flooding, Philippines

CFE-DM
CENTER FOR EXCELLENCE IN DISASTER MANAGEMENT & HUMANITARIAN ASSISTANCE

USINDOPACOM Foreign Disaster Response in the Indo-Asia-Pacific June 1991 – June 2019

WWW.CFE-DMHA.ORG

* Not an Embassy Declared Disaster; Mil-to-Mil only

Cascading Impacts

| Climate Science	Environmental Impacts	Human Security Impacts	State Security Impacts	Military Impacts
• Greenhouse gas emissions • Increased air temperatures • Increased land temperatures • Increased ocean temperatures	• Glacier/ ice cap melting • Change in weather (wind, temp, precipitation) • More intense storms • Sea level rise • Ocean acidification	• Water scarcity • Food security • Livability • Health & disease • Infrastructure & utilities • Critical services • Displacement, migration & mobility	• Increasing need for HADR • Resource competition • Internal and external migrations • Increased stress on fragile governments • Exclusive Economic Zones	• Increase in HADR response • Effects on personnel • Risks to steady state operations • Loss of training time / locations • Risk to Forward Locations • Potential for Conflict

Understand Climate Change: Future Projections

Projections for different SSP Scenarios

This graph shows global surface temperature change increase relative to the period 1850-1900.
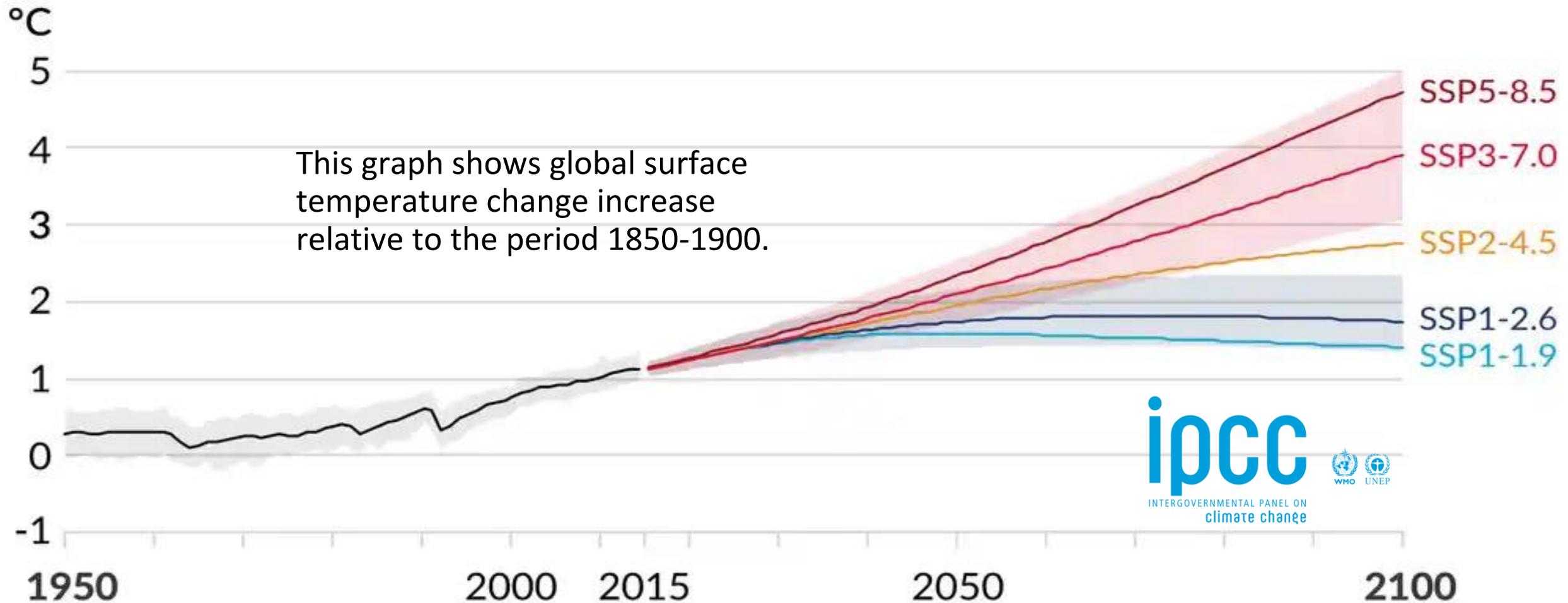
A depiction of global surface temperature changes (relative to pre-industrial levels) under SSP based emissions scenarios. Note that the uncertainties associated with each projection are represented by the highlights around the bold lines.

Extreme Heat Days 2000 and 2050
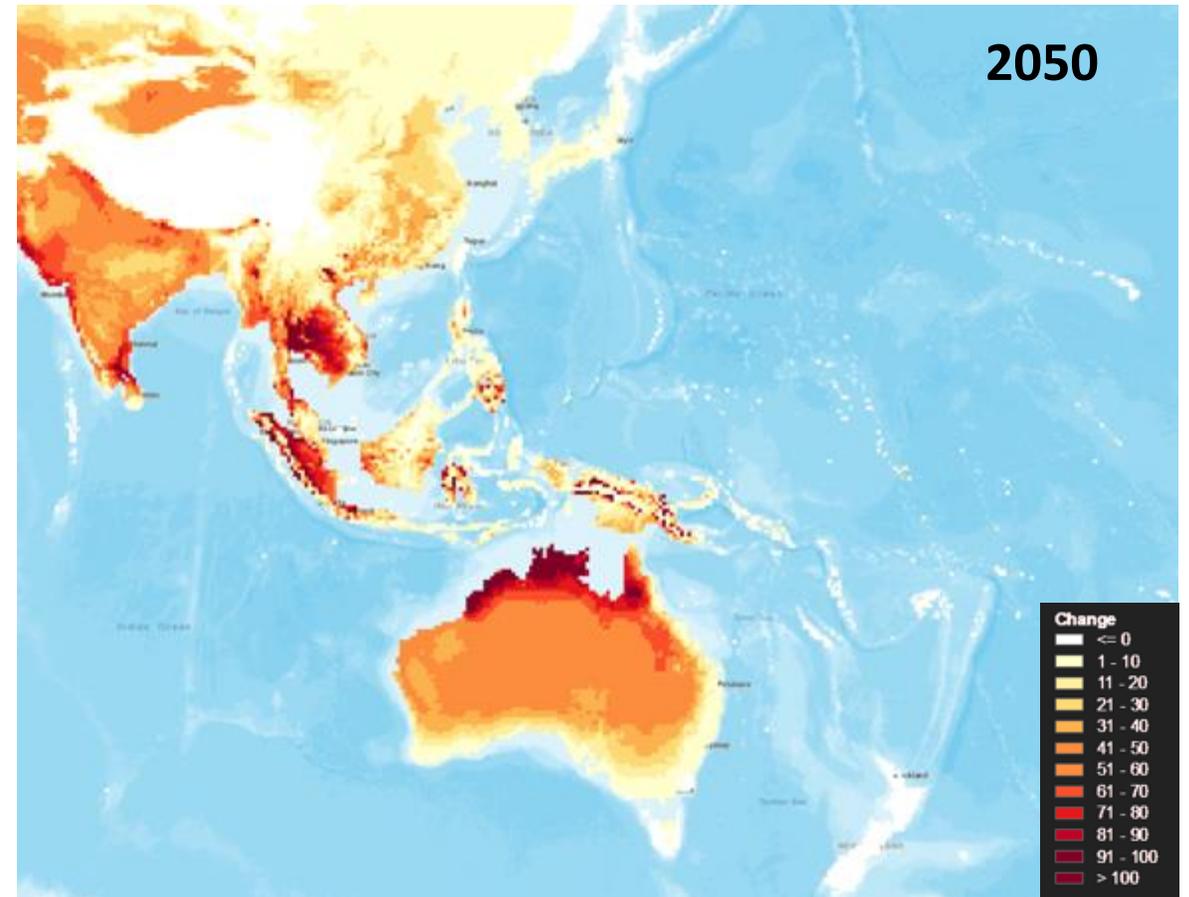
Extreme Heat Days: Projected change in the number of days with maximum temperatures above 95F/35C

Inland Flooding

Aerial view of flooding in Port Arthur, Texas following landfall of Hurricane Harvey in 2017
Source: Support during Hurricane Harvey, Texas, Public domain photo by South Carolina National Guard, via Wikimedia Commons. https://toolkit.climate.gov/image/328

Sea Level Rise

Sea level rise is caused by added water from melting ice sheets and glaciers and the expansion of seawater as it warms. Mean global sea levels have been rising for decades and that rise appears to be accelerating.

Across the Indo-Pacific, sea levels are modeled to rise by 0.75m to 1.5m by the end of the century. *Oceania, Southeast Asia, and South Asia are particularly affected.*
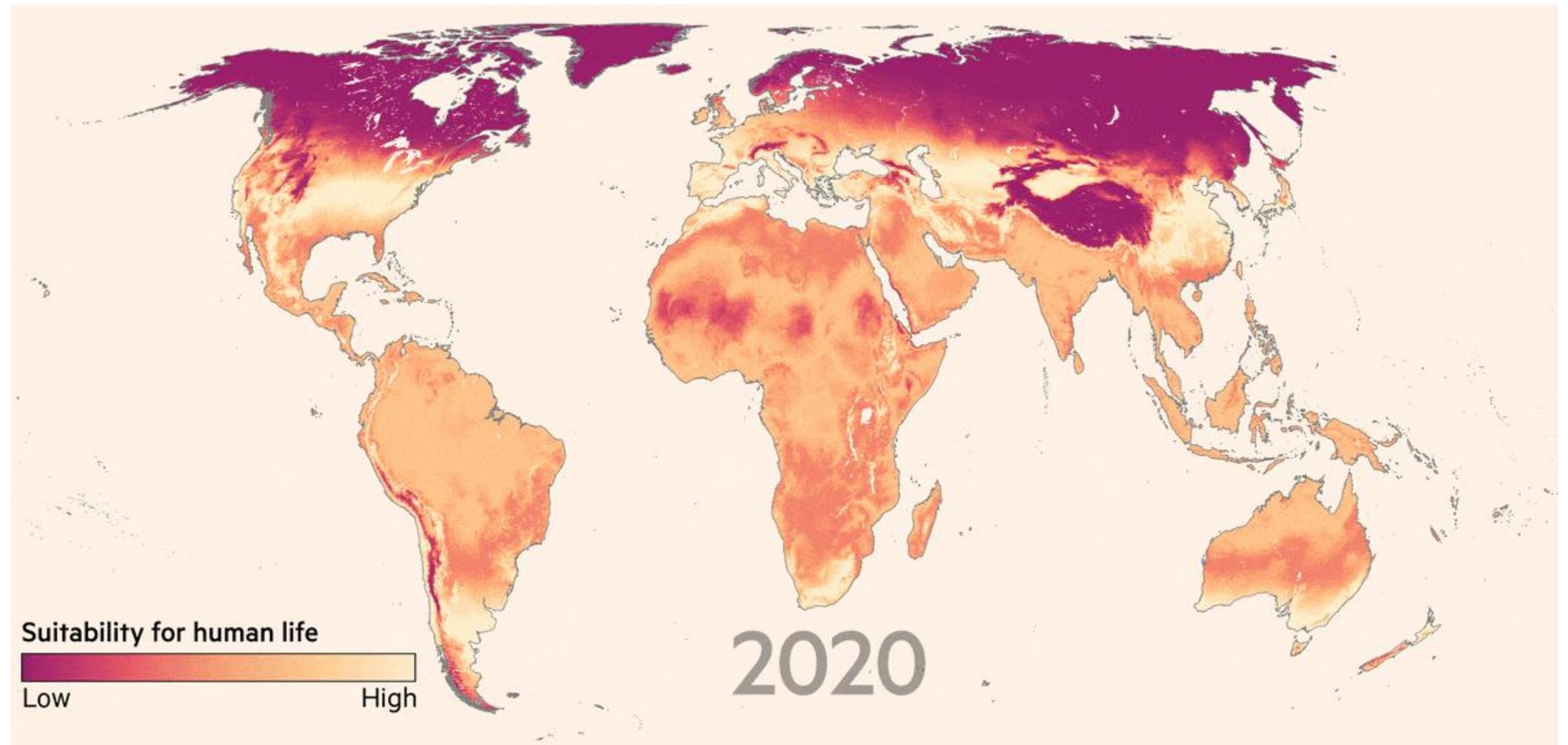

Contributors to global sea sea level rise (1993-2018)

added water + thermal expansion

added water (mostly meltwater)

global sea level (from satellite)

thermal expansion

NOAA Climate.gov
Adapted from *SOTC 2018*

meters of SLR

Source: Kopp et al, 2014. https://doi.org/10.1002/2014EF000239
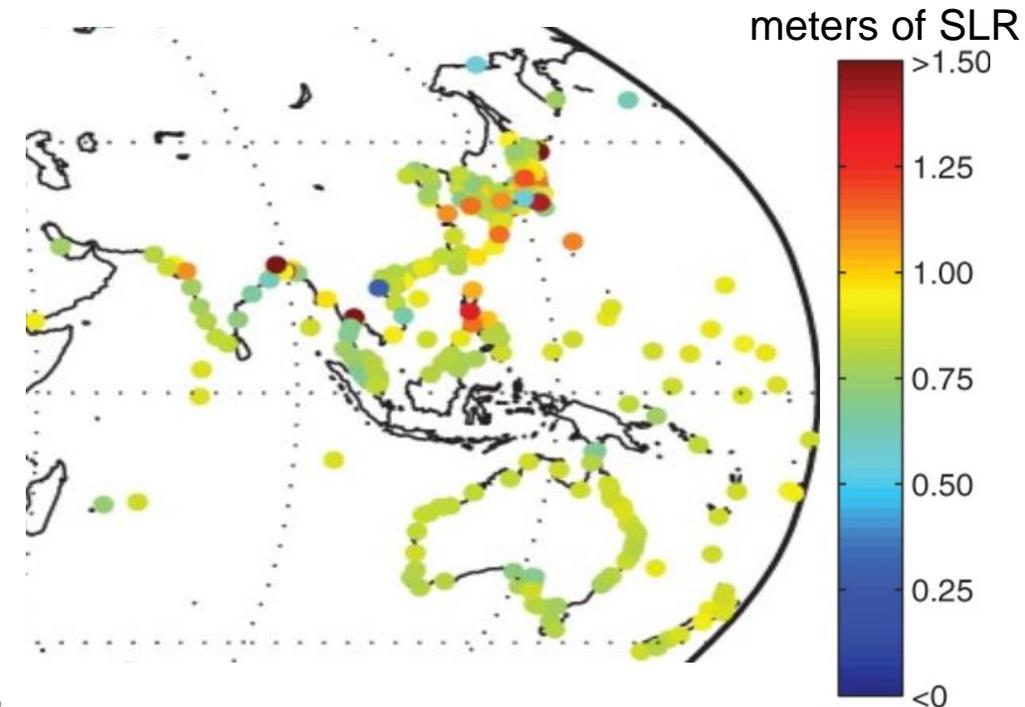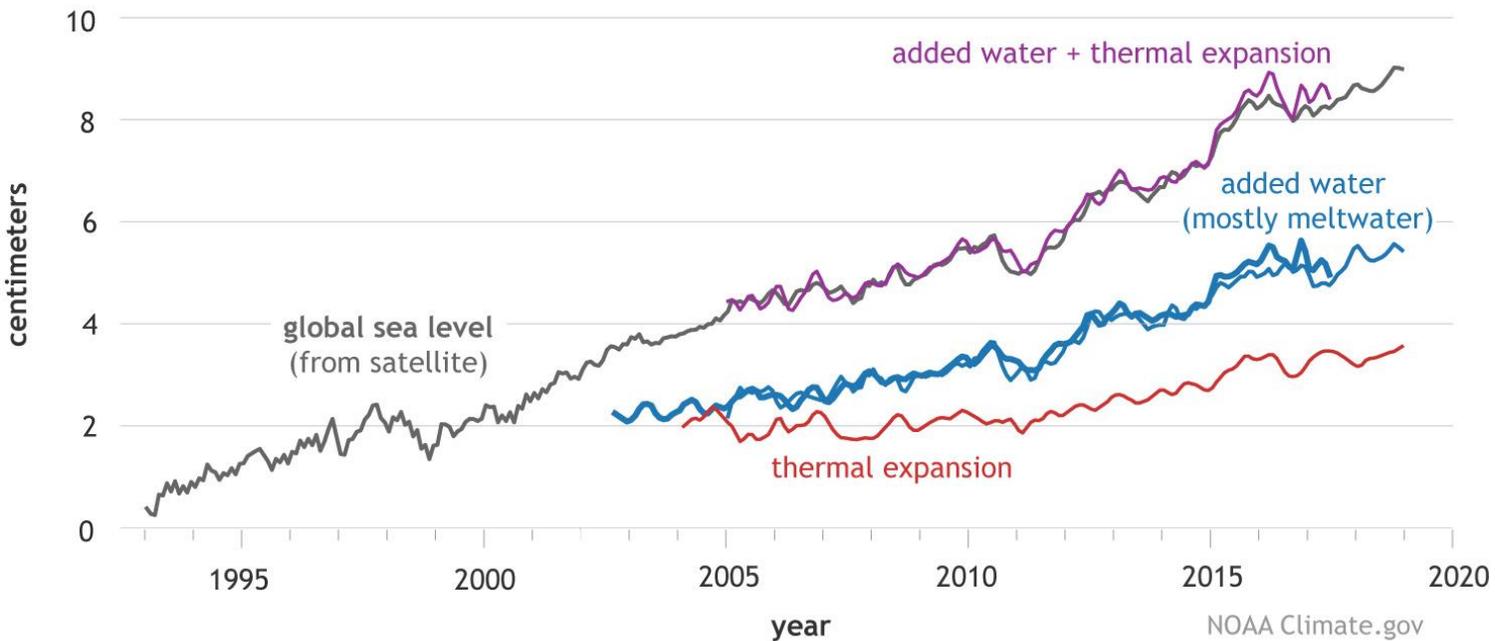
Water Scarcity & Insecurity

Shelter & Livability

Suitability for human life
Low — High

2020

Source: Xu, C et al. *Future of the human climate niche*
© FT

Health and Disease

Climate Change Impacts on Human Health:

- Heat exhaustion, heatstroke, and other heat-related illnesses
- Respiratory allergies, asthma, cardiovascular diseases
- Disease-carrying vectors spreading malaria, dengue, Lyme disease, West Nile, etc.
- Increased risk of water-borne diseases such as cholera and typhoid fever
- Stress, anxiety, and other mental health impacts

Impact of Climate Change on Human Health
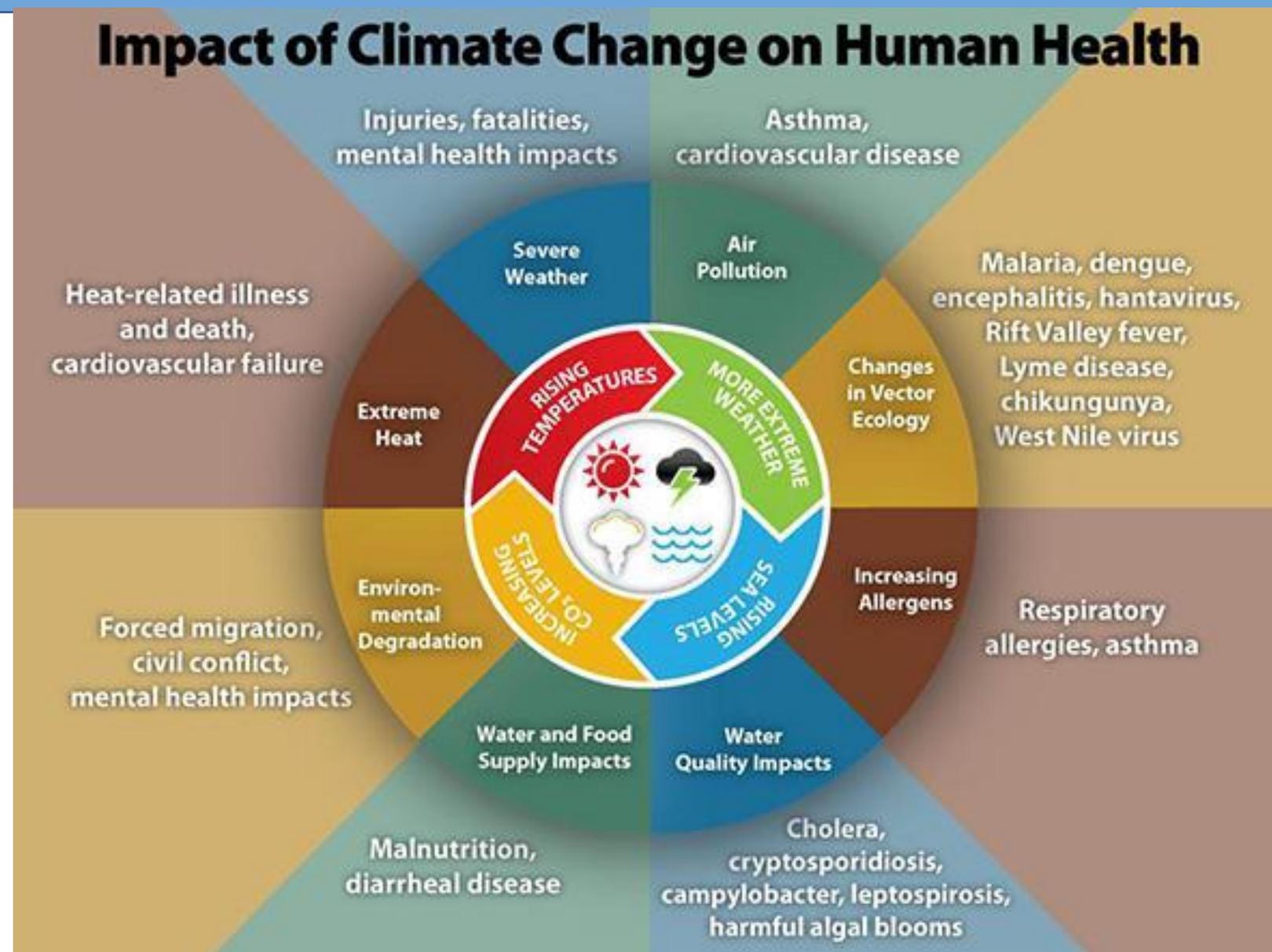
Infrastructure and Utilities
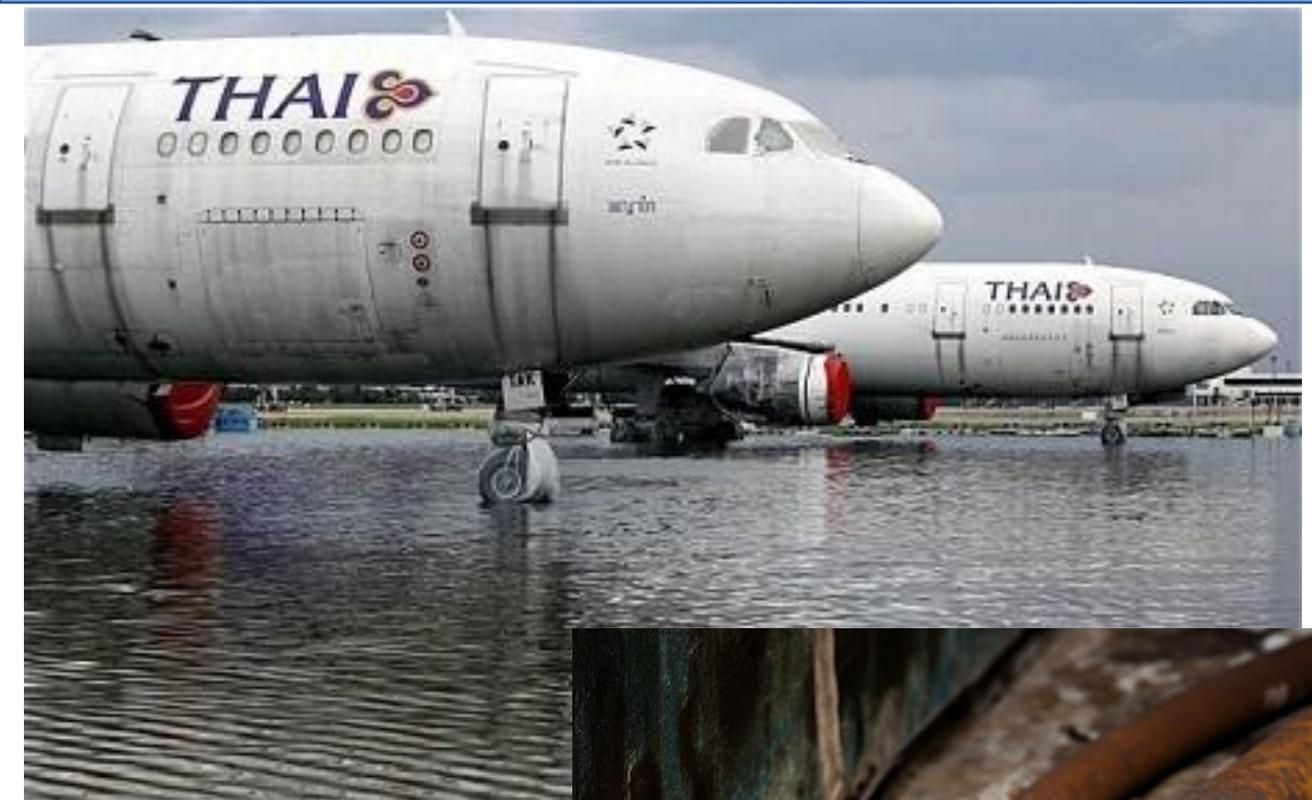
Increasing Need for HADR

Photo: National Disaster Response Force via AP

Photo: Red Cross

Photo by: Eloisa Lopez/REUTERS

Mobility, Displacement, and Migration

https://www.rand.org/pubs/commentary/2021/03/climate-change-migration-developing-a-security-strategy.html

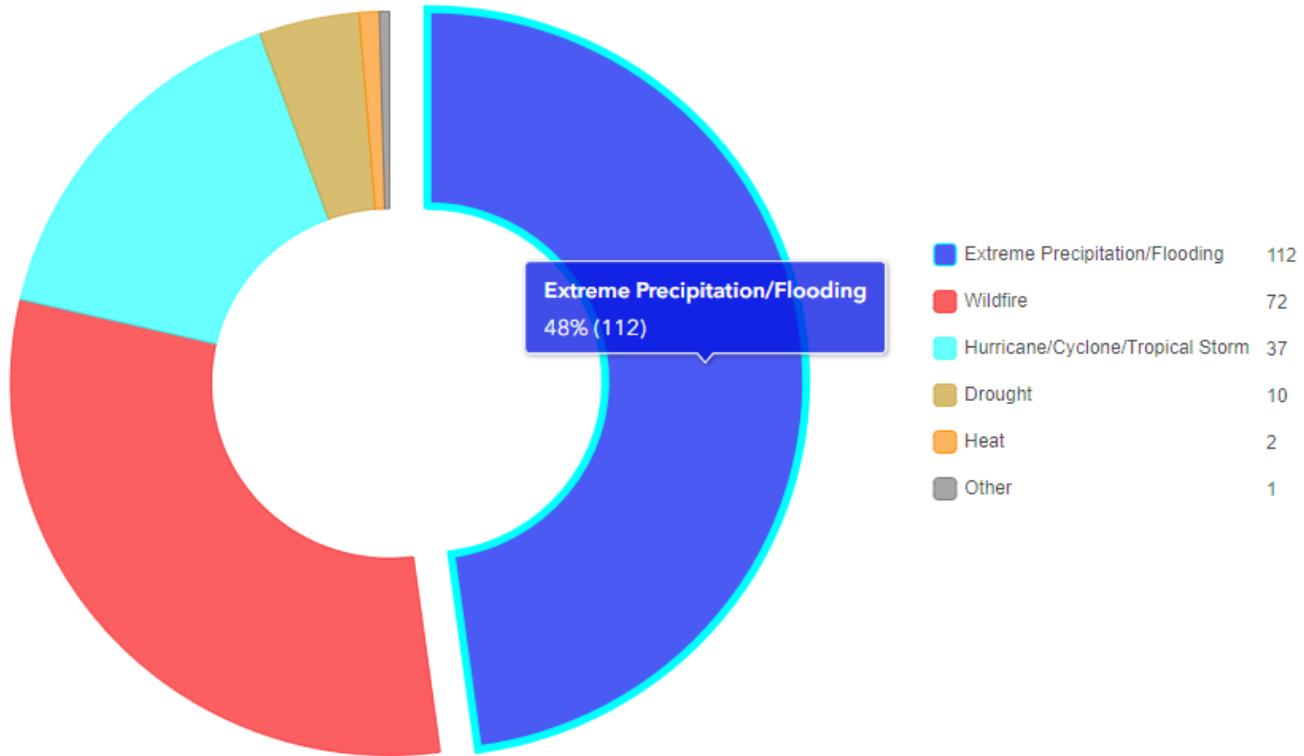Climate change is driving people's decision to move in dynamic and complex ways, interwoven with more traditional drivers of migration.

Increase in HADR Response

A U.S. Army CH-47 Chinook helicopter assigned to the 25th Infantry Division delivers essential medical supplies and logistical equipment for the Lahaina National Guard Role I facility, supporting Maui County authorities to provide immediate security, safety, and well-being to those affected by the wildfires to ensure unwavering support for the community of Maui and first responders. (U.S. Army photo by Spc. Abreanna Goodrich)

Airfield Statistics

🟩	Runway Length (ft):	8,004
🟩	Elevation (ft):	238
🟥	Parking MOG:	2 x C-130
🟩	Parallel Taxiway:	Yes
🟥	Warehouse (sf):	15,780
🟧	Supply Staging Area:	Limited
🟧	Fuel Storage (gal):	44,115

HA/DR Capabilities 🟩 Sufficient 🟧 Partial 🟥 Limited - None

Projected Change in Climate

⬇️ **Consecutive dry days** — Based on analysis between 2000 and 2050 the change for projected dry days will decrease by less than 1% to an estimated maximum of 12 consecutive dry days.

⬆️ **Extreme heat days** — Based on analysis between 2000 and 2050 change for projected extreme heat days will increase by 25% to an estimated maximum of 90 days above 95°F/35°C.

⬆️ **Extreme precipitation** — Based on analysis between 2000 and 2050 the change for projected extreme precipitation will increase seven-fold. Extreme precipitation is projected to increase by a maximum of 15 mm the rainiest 1% of days.

Tropical cyclone — Based on basin wide analysis, by the year 2100:

⬆️ Tropical cyclone intensity is expected to increase approximately 2%

⬆️ Rain rate from tropical cyclones is expected to increase approximately 12%

⬇️ Frequency of tropical cyclones is expected to decrease approximately 20%

Sea level rise — Less than 1% of Population resides in areas potentially affected by SLR in 2050. Very low risk to airfield and supporting infrastructure.

Lae Nadzab Airport
Papua New Guinea

Lae Nadzab Airport

Population

6.8 Million

Built Environment

$39.3 Billion

Population and built environment within 400-mile radius of operating location

Estimated Vulnerable Population

2.8 Million
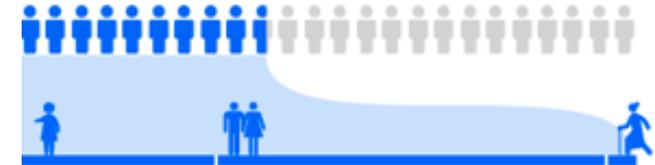
32%	63%	5%
882,161	1,736,753	137,838
CHILDREN AGE 0-14	ADULTS Age 15-64	ELDERLY Age 65+

Critical Infrastructure

Critical Infrastructure within 400 Miles of Lae Nadzab Airport

Airports	Seaports	EOCs	Hospitals and Clinics	Fire Stations	Schools
473	14	--	141	--	146

Airports
1 Large
17 Medium
454 Small
1 Seaplane Base

Seaports
14 Small / Very Small

Hospitals and Clinics
74 Hospitals
67 Clinics

VIEW IN DISASTERAWARE

Tropical Cyclones
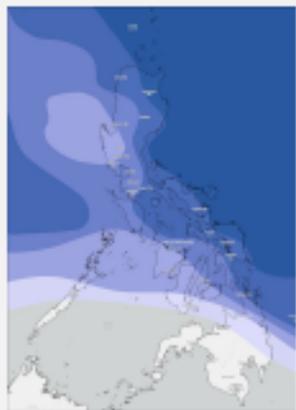An area exposed to tropical cyclone wind intensity based on past storm activity and projected storm paths.

2000

250+ km/hour · 170-209 km/hour · 118-153 km/hour

2050 Projected

In 2000 there were **79.5 million people** exposed to tropical cyclones.

It is projected that the exposed population to tropical cyclones will increase to **99.1 million** by 2050.

Extreme Precipitation
An area exposed to 30 or more days where daily precipitation exceeds 20mm

2000

Low: < 30 Days · High: > 30 Days

2050 Projected

In 2000 there were **7.2 million people** exposed to extreme precipitation.

It is projected that the exposed population to extreme precipitation will increase to **75.8 million people** by 2050.

◆ INDOPACOM Average ■ Region Average ▶ Country Score

Ranked 6 of 46 countries and territories assessed

Climate Exposure
Country Score: 0.726

Climate Exposure represents the population, economic and critical infrastructure present in climate exposure zones and thereby subject to potential losses. It considers climate change hazard exposures to sea-level rise, consecutive dry days, extreme heat, extreme precipitation, and tropical cyclone hazard zones.

Ranked 6 of 43

Sea-level Rise
Country Score: 0.722

Population Exposure **5.7 Million (6%)**
Capital Exposure **$21.4 Billion**

Infrastructure Exposed:
- ✈ **7** of 164 Airports
- ⚓ **32** of 185 Seaports
- 🏥 **2%** Hospitals
- 🏫 **2%** Schools

Ranked 10 of 12

Consecutive Dry Days
Country Score: 0.232

Population Exposure **323,000 (<1%)**
Capital Exposure **$2.1 Billion**

Infrastructure Exposed:
- ✈ **1** of 164 Airports
- ⚓ **0** of 185 Seaports
- 🏥 **1%** Hospitals
- 🏫 **<1%** Schools

Ranked 12 of 21

Extreme Heat
Country Score: 0.549
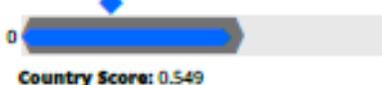
Population Exposure **26.3 Million (27%)**
Capital Exposure **$184.1 Billion**

Infrastructure Exposed:
- ✈ **30** of 164 Airports
- ⚓ **39** of 185 Seaports
- 🏥 **25%** Hospitals
- 🏫 **24%** Schools

Ranked 8 of 41

Extreme Precipitation
Country Score: 0.687

Population Exposure **75.8 Million (76%)**
Capital Exposure **$482.6 Billion**

Infrastructure Exposed:
- ✈ **118** of 164 Airports
- ⚓ **150** of 185 Seaports
- 🏥 **73%** Hospitals
- 🏫 **79%** Schools

Ranked 4 of 41

Tropical Cylones
Country Score: 0.876

Population Exposure **99.1 Million (100%)**
Capital Exposure **$596.3 Billion**

Infrastructure Exposed:
- ✈ **163** of 164 Airports
- ⚓ **184** of 185 Seaports
- 🏥 **100%** Hospitals
- 🏫 **100%** Schools

Case Study: Mekong River Delta
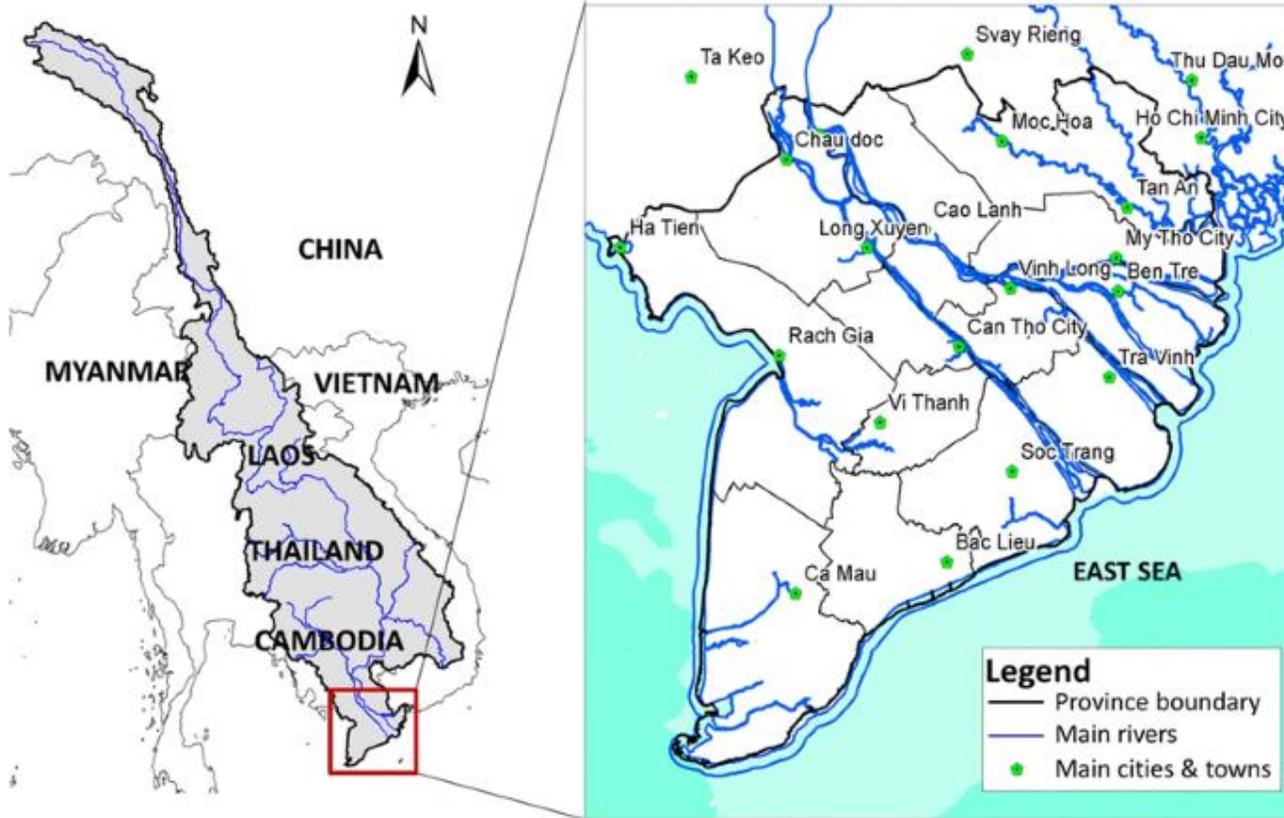
Mekong Delta Climate Issues
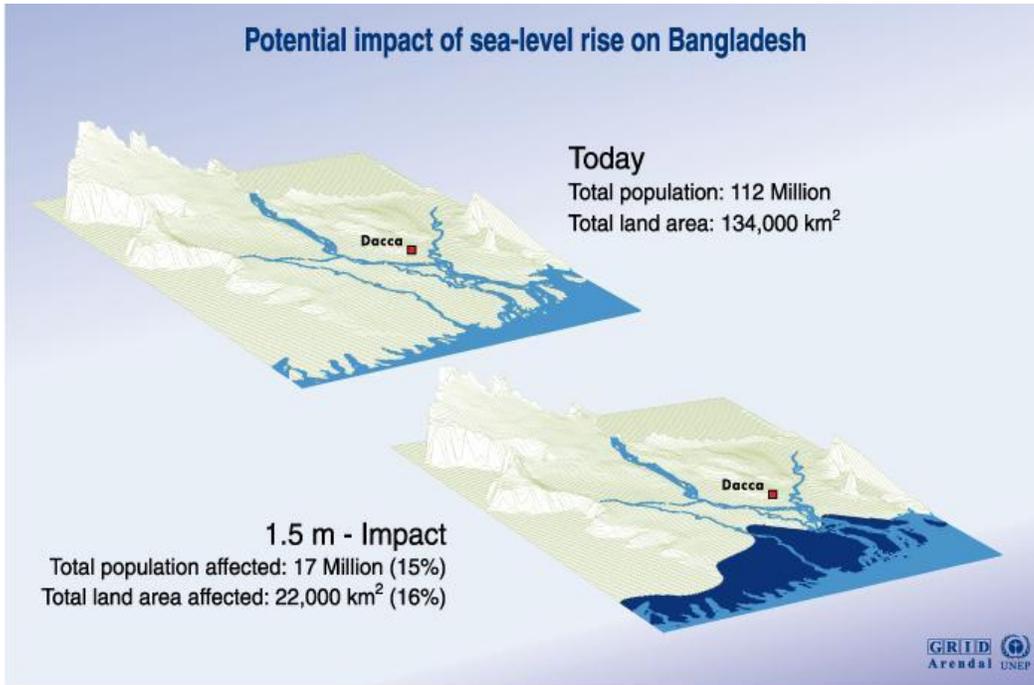- Sea-Level rise
- Salt-water inundation

Mekong Delta Impacts
- 17M people / 80% involved in rice cultivation
- Upstream water – Flows through 5 countries

Case Study: Bangladesh

Potential impact of sea-level rise on Bangladesh

Today
Total population: 112 Million
Total land area: 134,000 km^2

1.5 m - Impact
Total population affected: 17 Million (15%)
Total land area affected: 22,000 km^2 (16%)

Source : UNEP/GRID Geneva; University of Dacca; JRO Munich; The World Bank; World Resources Institute, Washington D.C.

India- Bangladesh Border Fence
Source: The Hindu Feb 27, 2021

Bangladesh Diaspora (2017)
Source: Meghan Darby. 2017. "What will become of Bangladesh's climate migrants?" *Climate Home News* (Aug 14).

Bangladesh Impacts
- Sea Level Rise -- 1.5 meters?
- Human migration – 17 million?
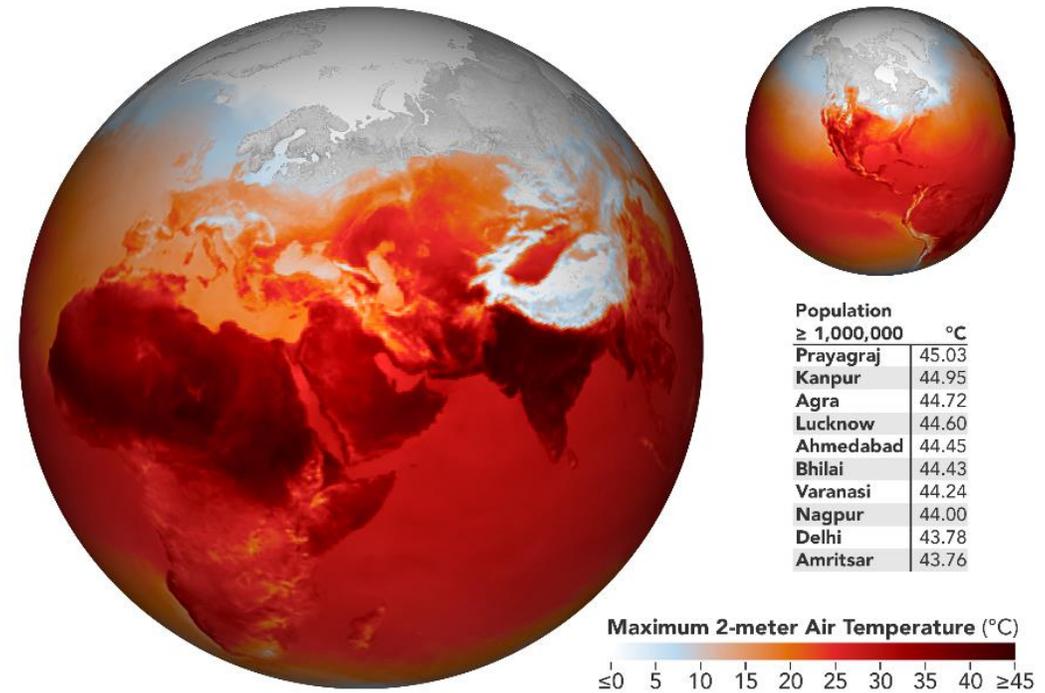- Salinity and food security

Case Study: South Asia Heatwave

- India and Pakistan experienced a record-breaking heatwave in April – May 2022
- Increased dust and ozone levels, leading to spikes in air pollution
- Exacerbated other hazards:
  - Glacial Lake Outburst Flood (GLOF)
  - Wildfires

Vulnerabilities and Secondary Effects:
- **Food: Pakistan recent need to import wheat**
- **Food: India banned wheat exports this year**
- **Public health: Cholera outbreak due to lack of clean water**
- **Socio-economic: lost workdays, less productivity, more cost for cooling**

Population ≥ 1,000,000	°C
Prayagraj	45.03
Kanpur	44.95
Agra	44.72
Lucknow	44.60
Ahmedabad	44.45
Bhilai	44.43
Varanasi	44.24
Nagpur	44.00
Delhi	43.78
Amritsar	43.76

Maximum 2-meter Air Temperature (°C)

≤0 5 10 15 20 25 30 35 40 ≥45

Mahalo!

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