



THE CLIMATE CRISIS  
AND ITS SOLUTIONS  
TRUTH IN TEN



Source: NASA

**1. Must we change?**

**2. Can we change?**

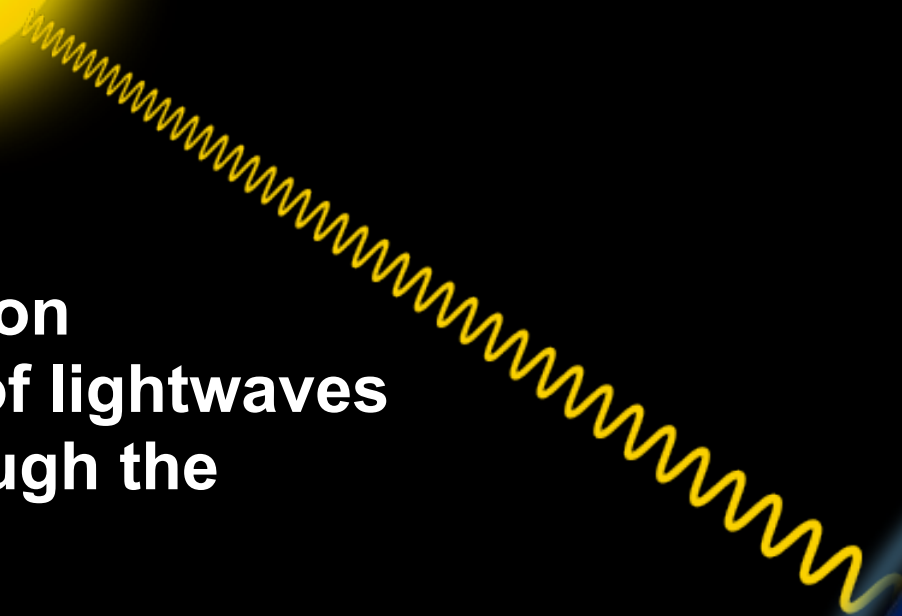
**3. Will we change?**

**1. Must we change?**



Source: NASA

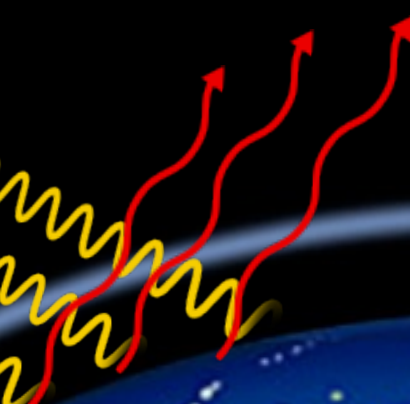
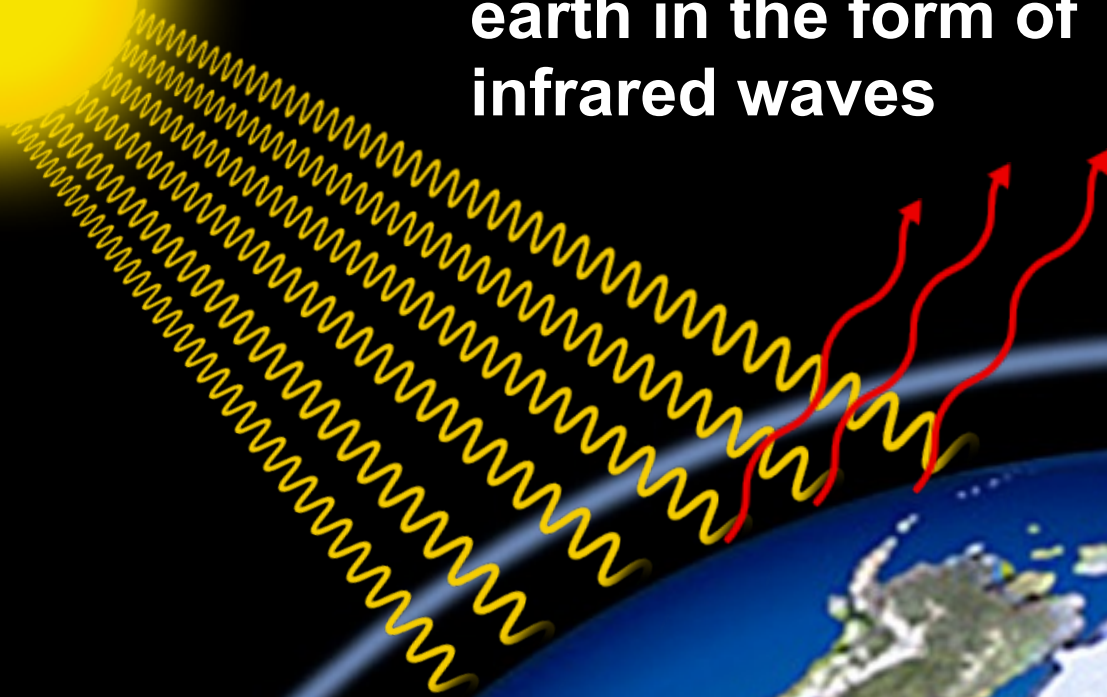
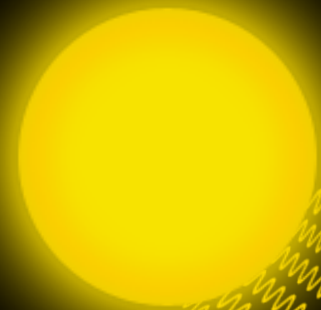
**Solar radiation  
in the form of lightwaves  
passes through the  
atmosphere**



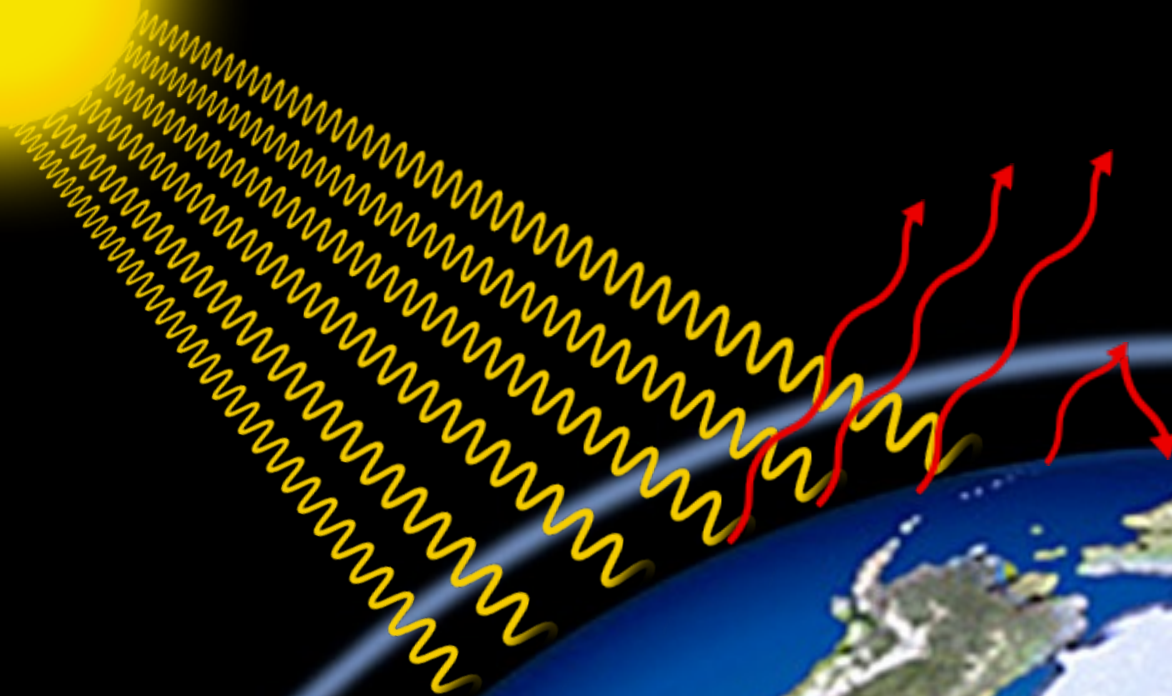
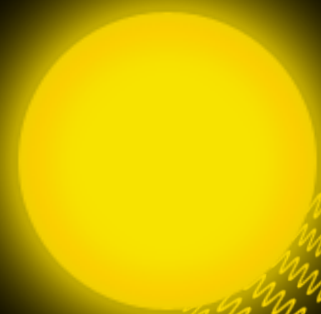
A diagram illustrating the process of solar radiation. A bright yellow sun is positioned in the upper left quadrant. From the sun, several parallel wavy lines representing electromagnetic radiation extend towards the right. These lines are shown striking the curved surface of the Earth, which is depicted in the lower right quadrant. The Earth's surface is shown with green landmasses, blue oceans, and white ice sheets. The background is a solid black color, representing space. The text 'Most of this radiation is absorbed by the Earth and warms it' is located in the lower left area of the image.

**Most of this radiation  
is absorbed by the  
Earth and warms it**

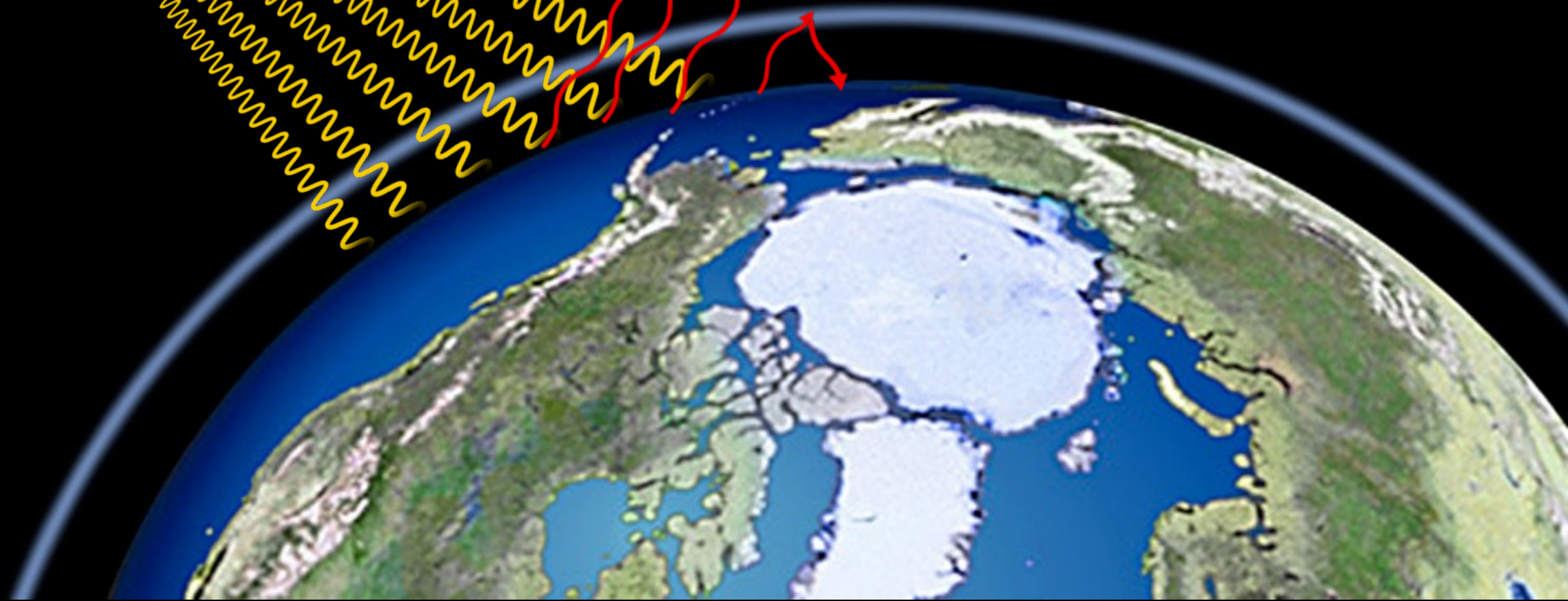
**Some energy is radiated  
back into space by the  
earth in the form of  
infrared waves**

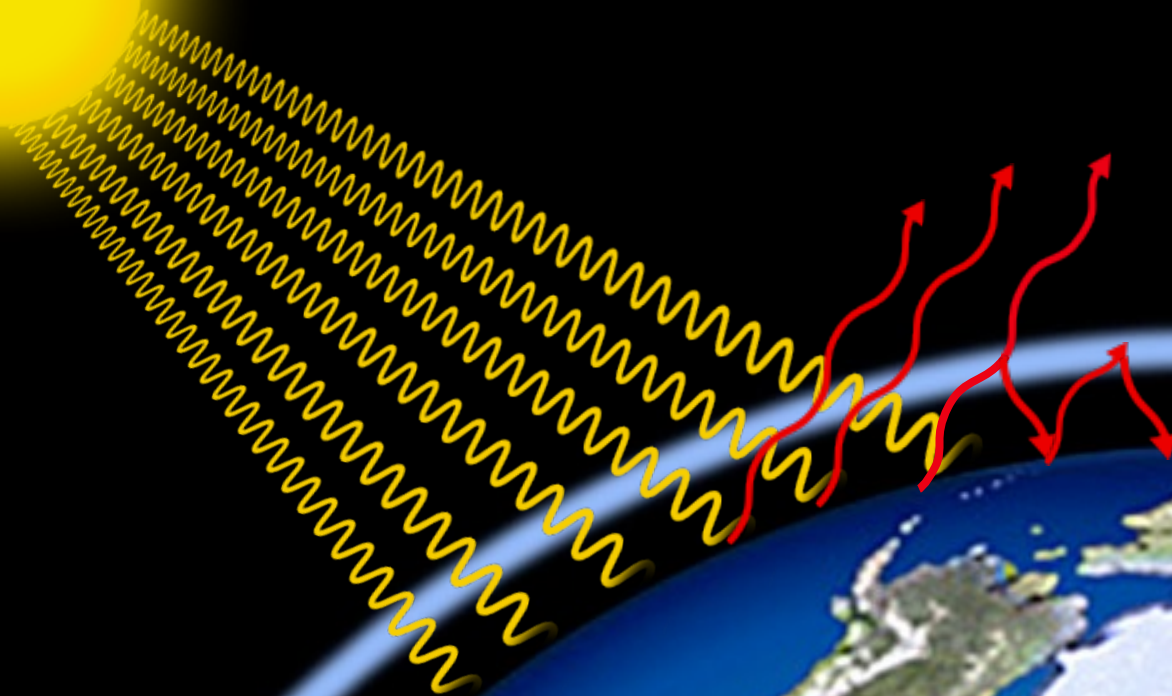
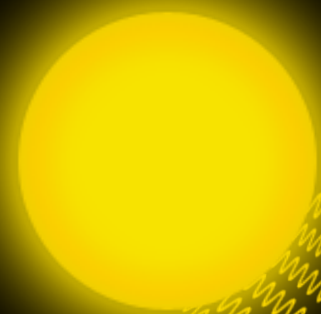






**Some of this outgoing infrared radiation is trapped by the earth's atmosphere and warms it**





**As the CO<sub>2</sub> concentration increases, more of the outgoing infrared radiation is trapped.**



A dramatic sunset or sunrise sky with a factory emitting smoke. The sky is filled with large, billowing clouds in shades of orange, yellow, and red. In the foreground, the silhouettes of palm trees and industrial structures are visible against the bright sky. A tall chimney in the center is emitting a thick plume of dark smoke that rises into the air.

We are spewing **152 million tons** of manmade global warming pollution into the thin shell of our atmosphere **every 24 hours** — as if it were an open sewer.



AIR TRANSPORT

THAWING PERMAFROST

COAL MINING

OIL PRODUCTION

COAL PLANTS

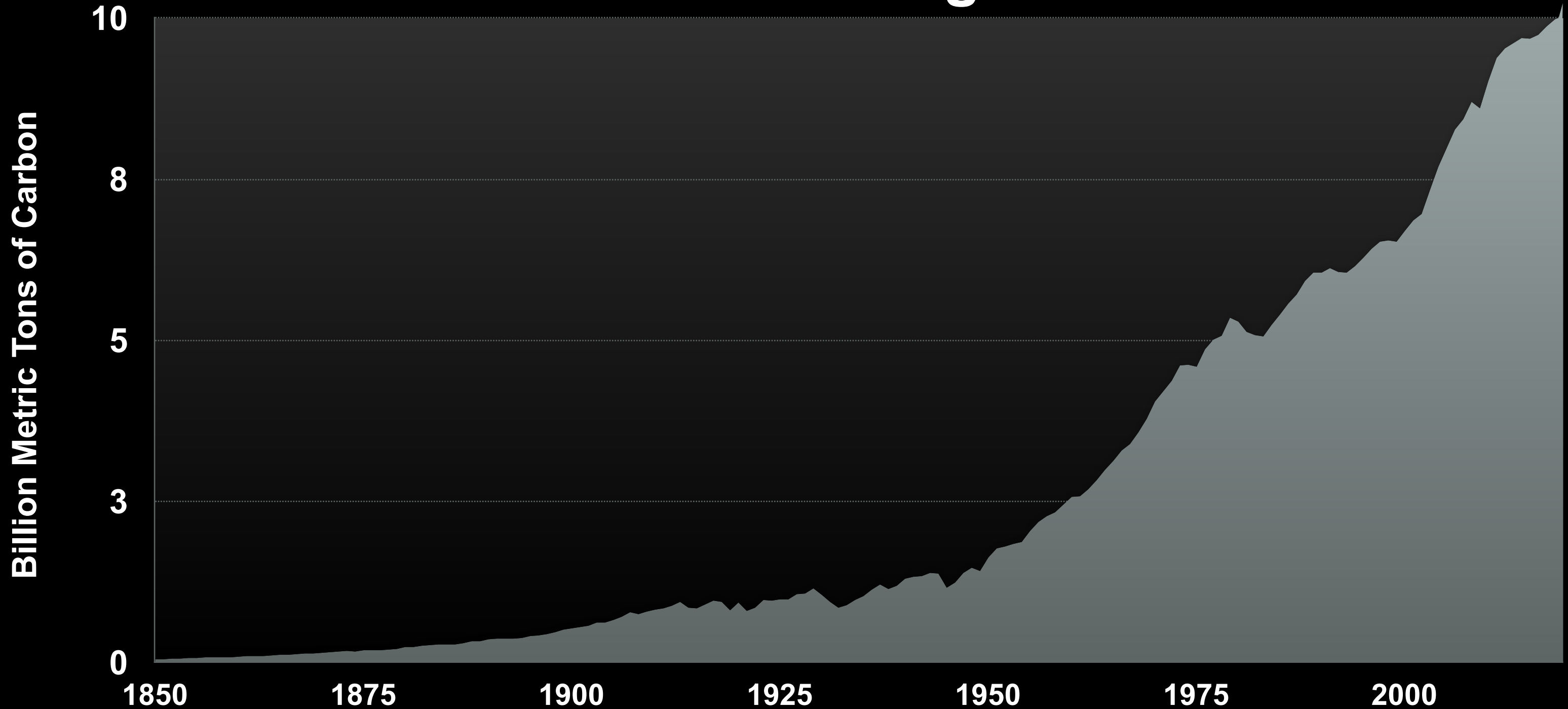
FERTILIZATION

INDUSTRIAL PROCESSES

LAND TRANSPORT

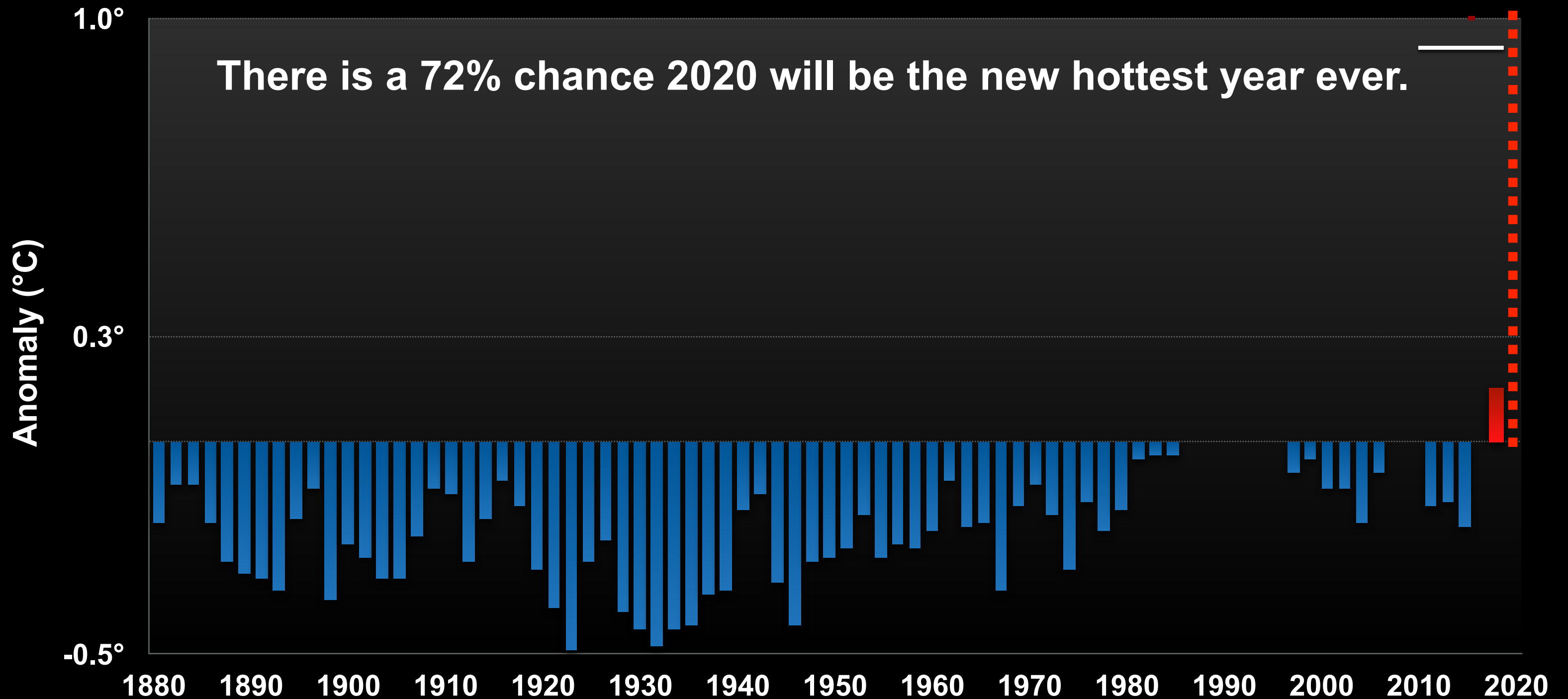
LANDFILLS

# The Largest Source of Global Warming Pollution Is the Burning of Fossil Fuels

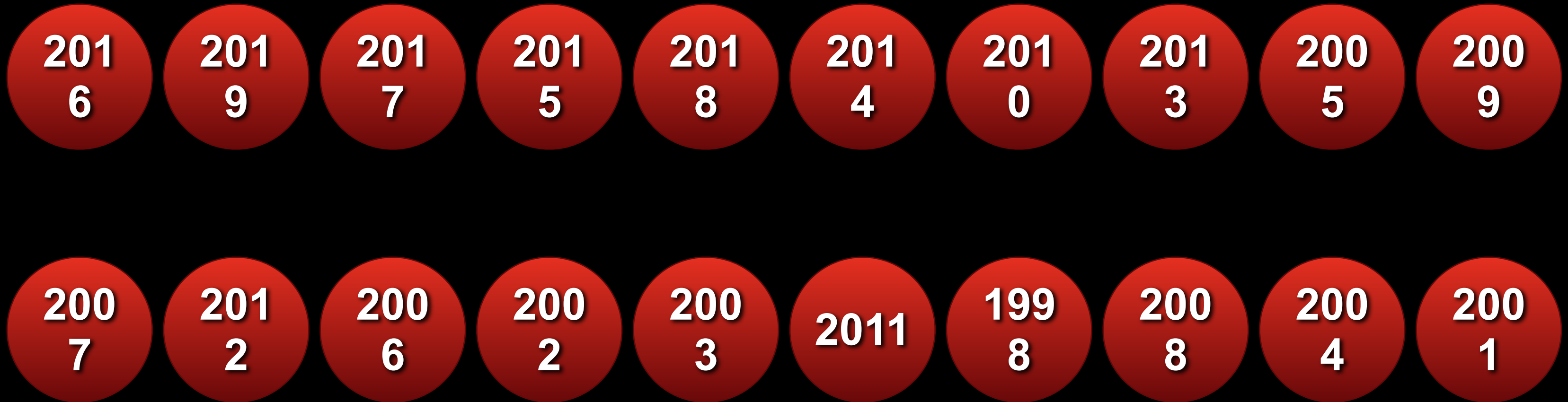


# Global Surface Temperature – Departure from Average

1880 – 2019



# The Hottest 20 Hottest Years the Record Has Ever Occurred Since the Year 2001



**Miami, Florida**

**June 29, 2020**

**Miami just  
recorded its hottest  
week ever.**





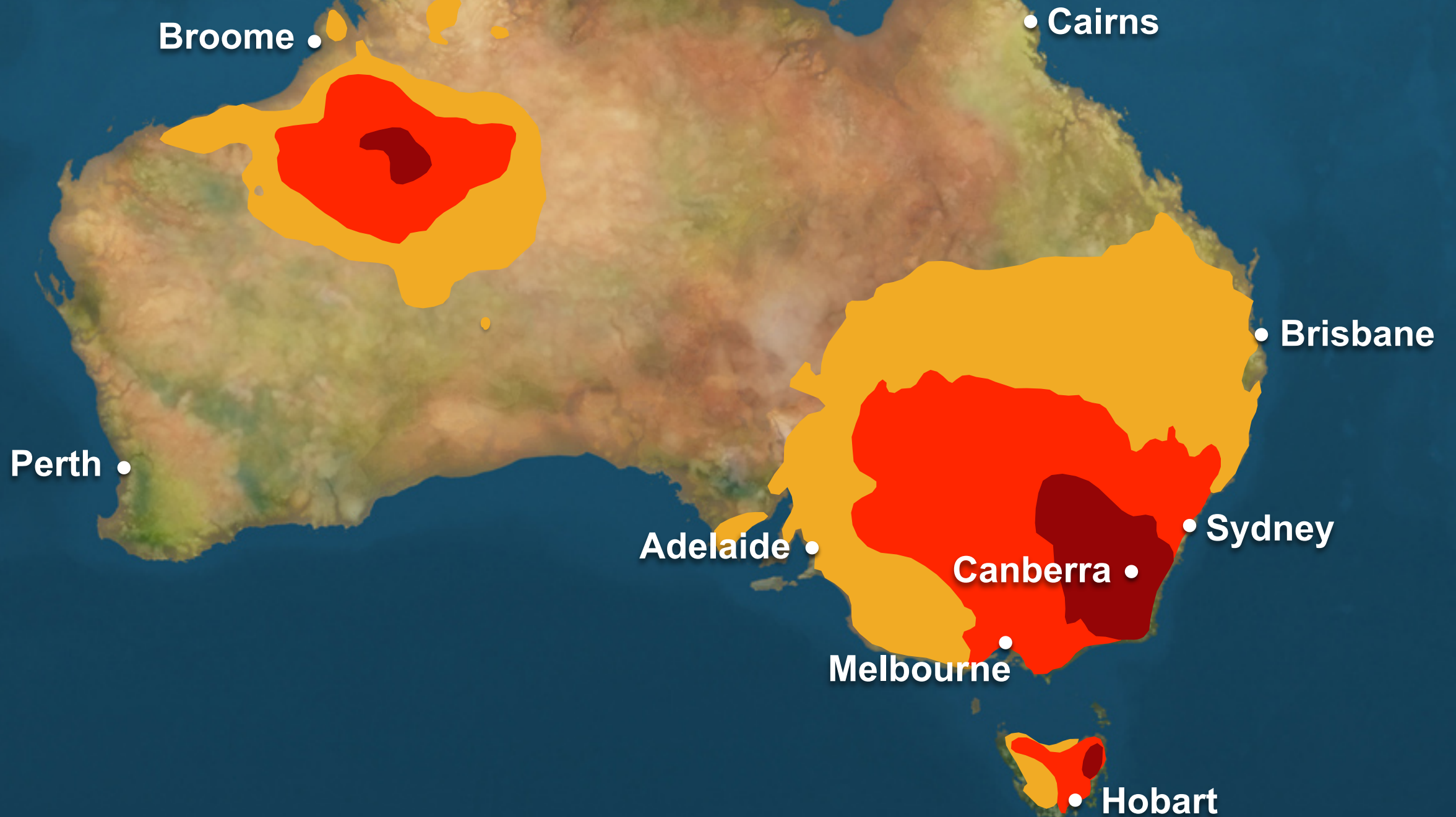
# Australia Heatwave

January 30 – February 1, 2020

Extreme Heatwave

Severe Heatwave

Low-intensity Heatwave



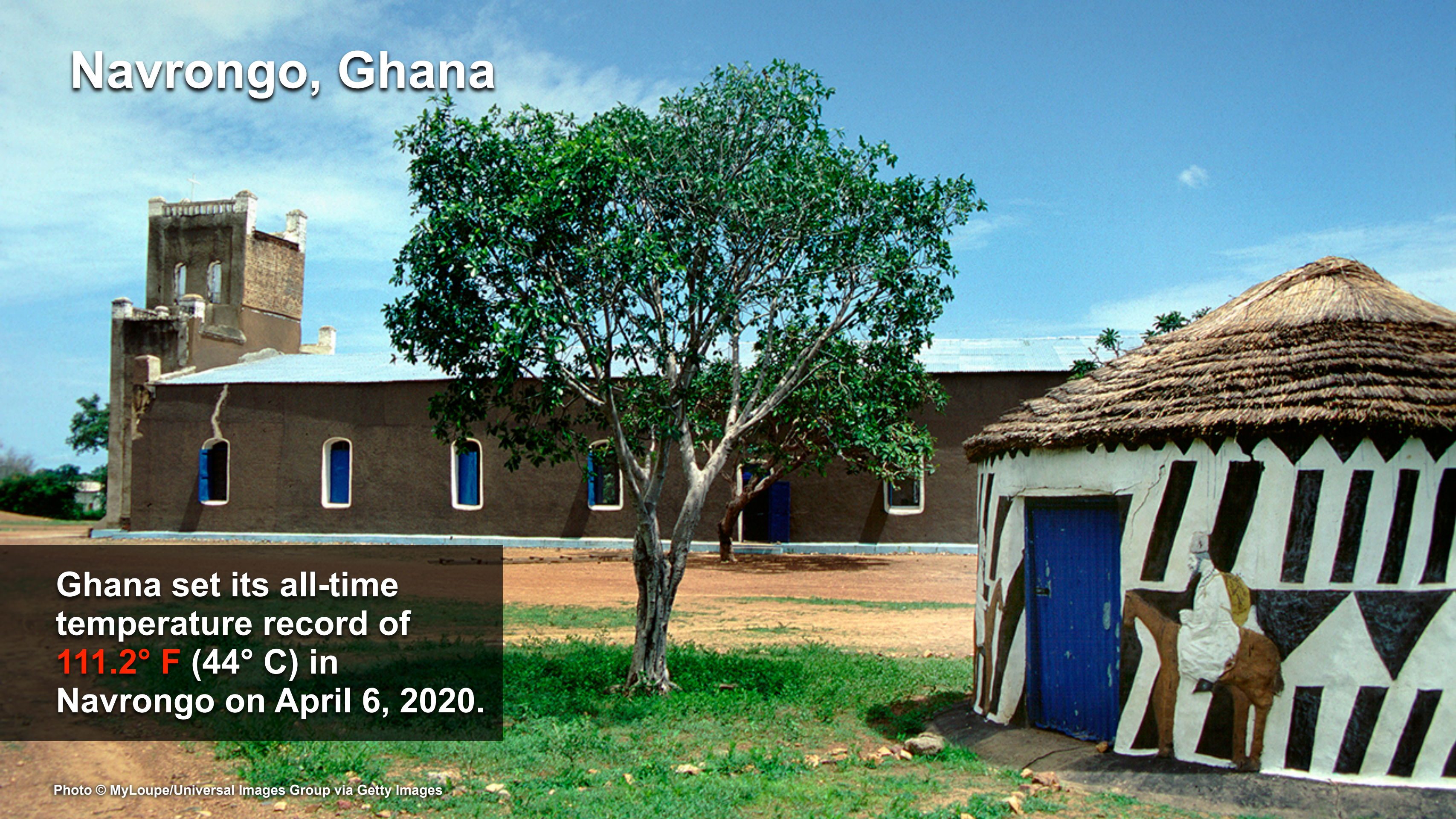
# Canberra, Australia

January 5, 2020

Canberra set a new, all-time high temperature record of **111.2° F** (44° C) on January 4.

# Navrongo, Ghana

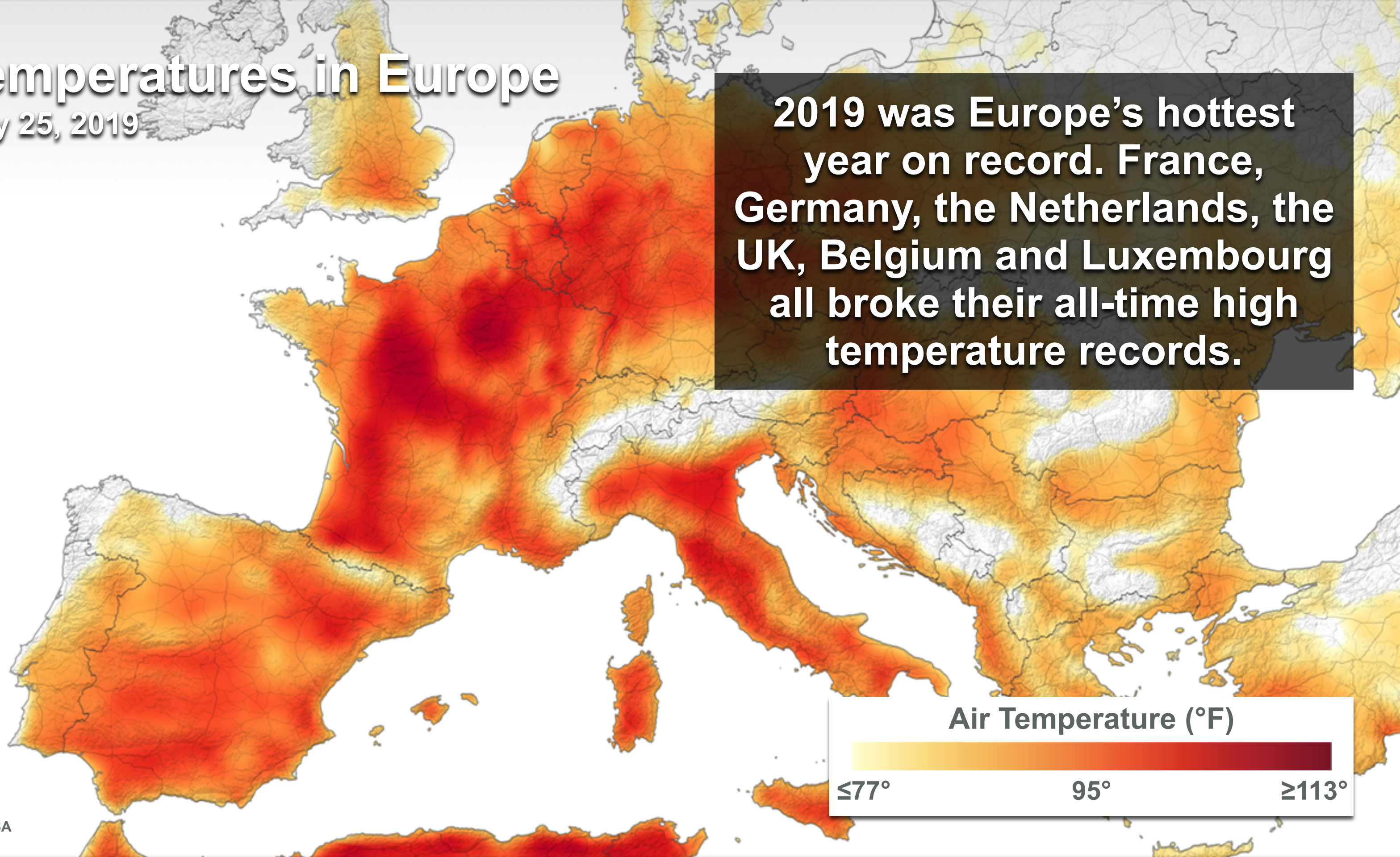
Ghana set its all-time temperature record of **111.2° F (44° C)** in Navrongo on April 6, 2020.



# Temperatures in Europe

July 25, 2019

2019 was Europe's hottest year on record. France, Germany, the Netherlands, the UK, Belgium and Luxembourg all broke their all-time high temperature records.

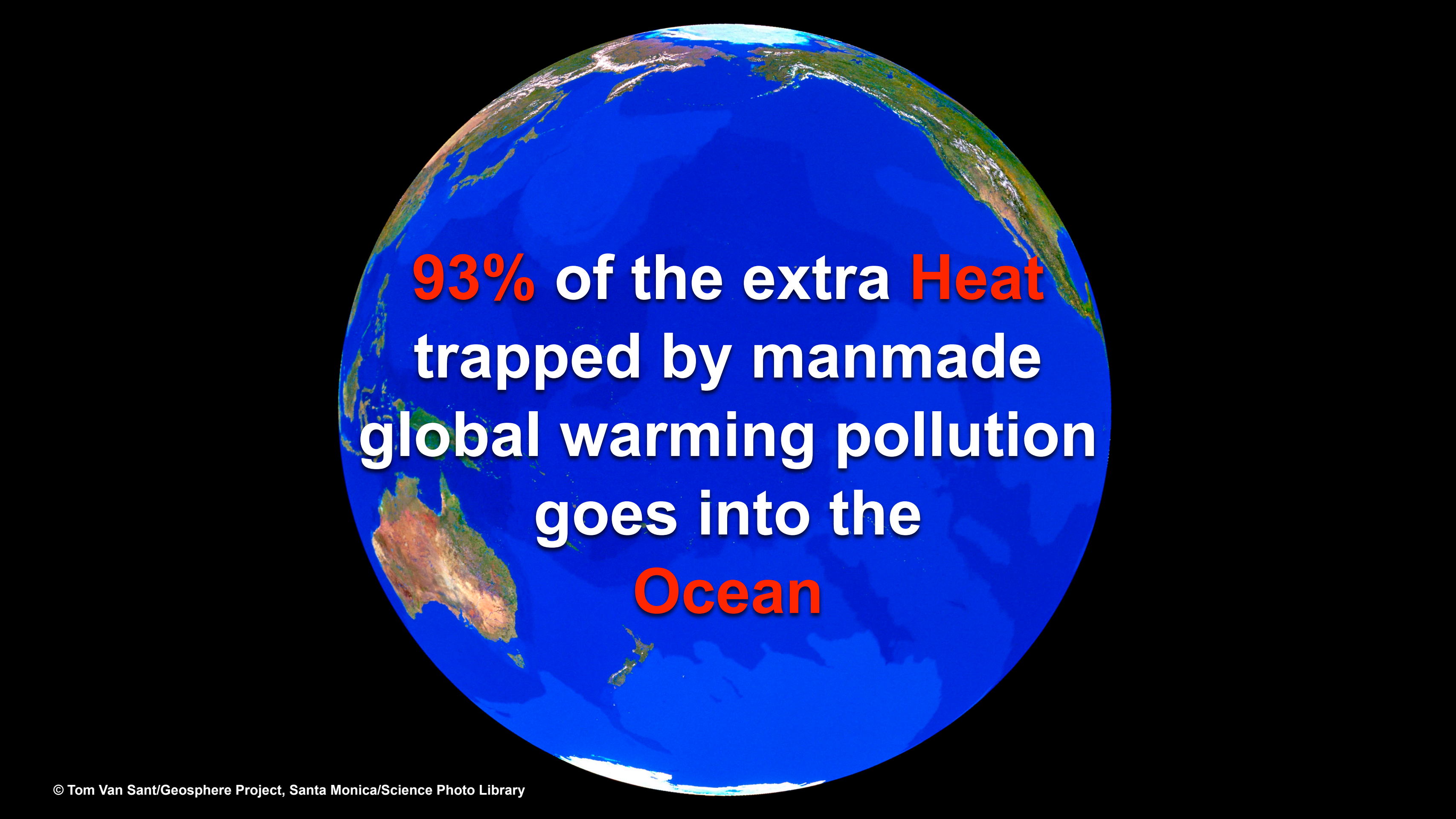


# Siberia, Russia

June 21, 2020

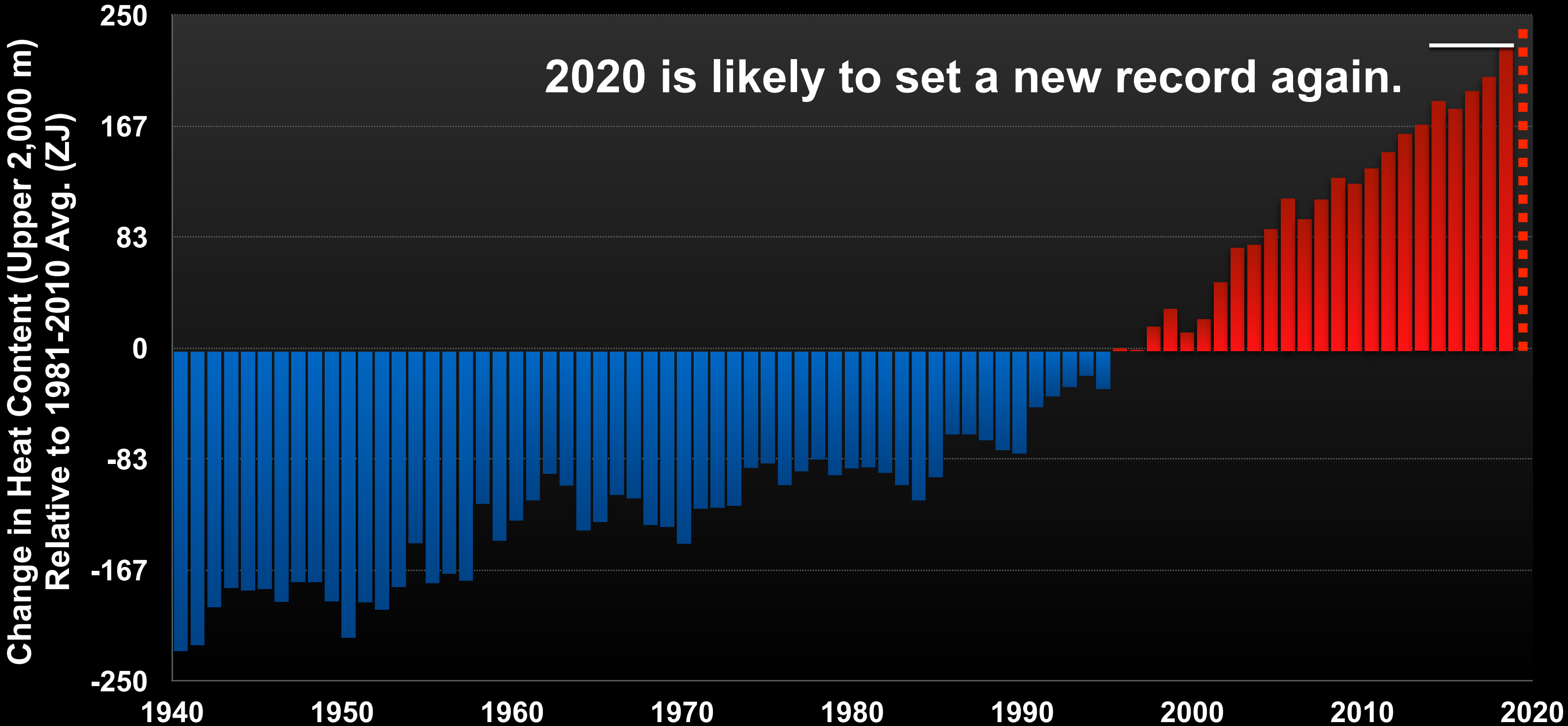
Verkhoyansk

The temperature in Verkhoyansk, Siberia reached **100.4° F** (38° C) on June 20, 2020. This is the northernmost 100° temperature ever recorded, and the highest temperature on record in the Arctic.



**93%** of the extra **Heat**  
trapped by manmade  
global warming pollution  
goes into the  
**Ocean**

# Ocean Temperatures Set a New Record in 2019

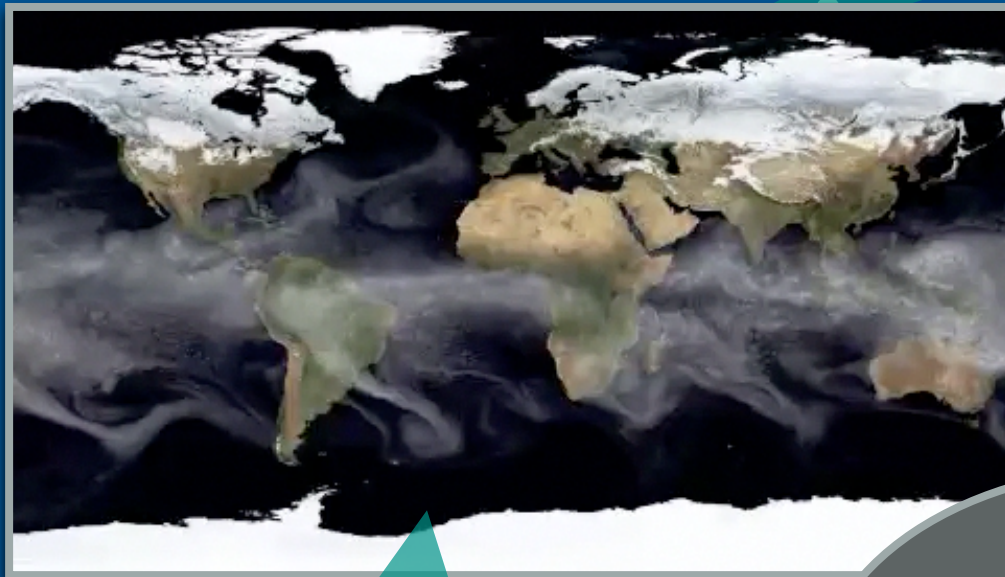


Data: Cheng, L. J., and J. Zhu, 2018: "2017 was the warmest year on record for the global ocean," *Advances in Atmospheric Sciences*, 34(3)

# **As Temperatures Increase, the Oceans Evaporate More Moisture into the Sky**



**Evaporation**



**Precipitation**



**The  
Hydrological  
Cycle**



**Water Returns to the Sea**

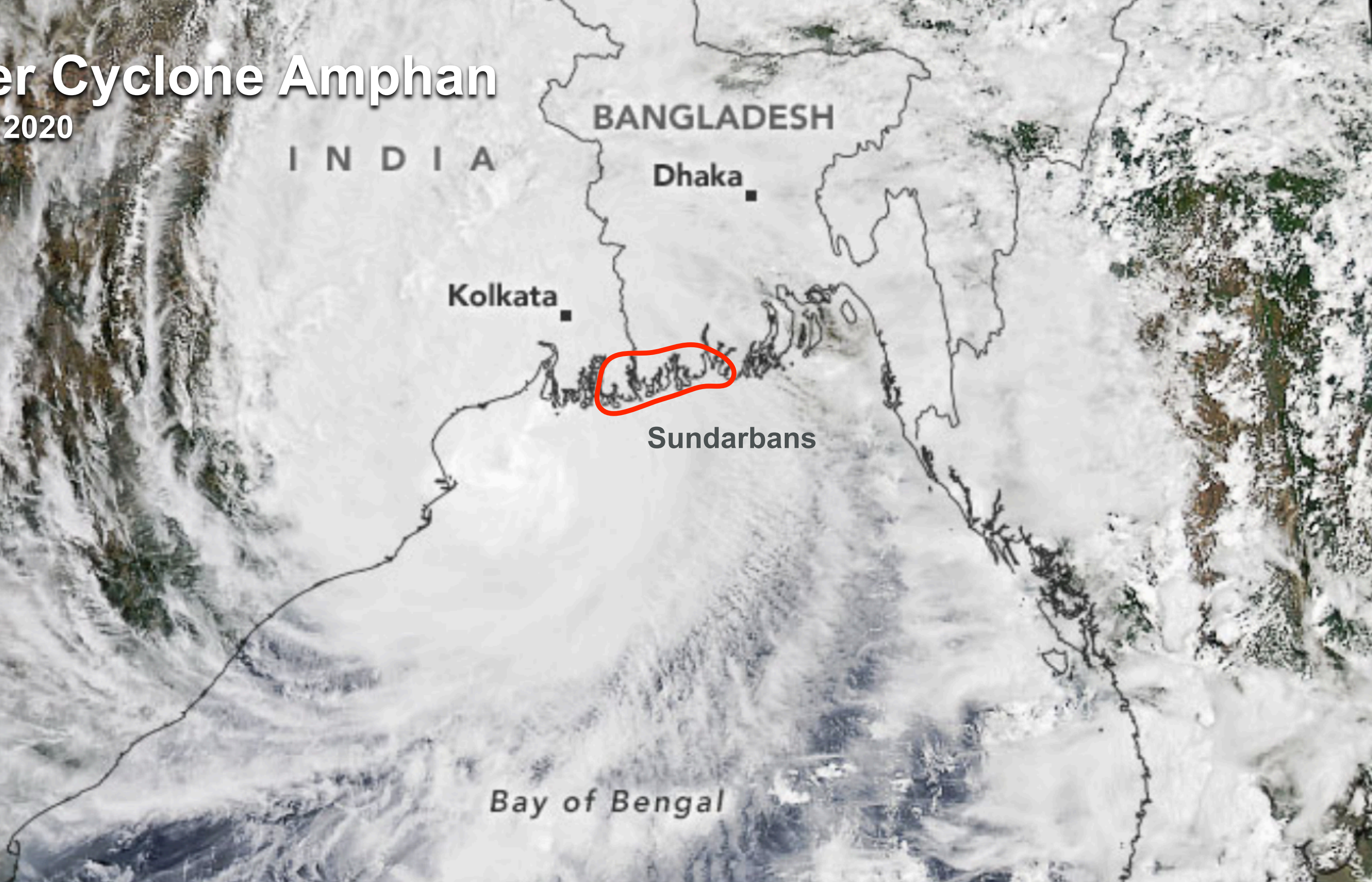
# Catbalogan City, Philippines

May 14, 2020

**At least 578,000 people  
were affected by  
Typhoon Vongfong.**

# Super Cyclone Amphan

May 20, 2020



INDIA

BANGLADESH

Dhaka

Kolkata

Sundarbans

Bay of Bengal

# Satkhira, Bangladesh

May 21, 2020

**“The Sundarbans is finished. Amphan has killed it. All our crops, even our trees have been destroyed. What will we do?”**

**– Chandan Das,  
Bangladeshi Farmer**

# Cyclone Evacuation Camp, Orissa, India

May 19, 2020



**“We are facing a dual challenge of ‘cyclone in the time of COVID-19.’”**

**– Satya Narayan Pradhan,  
Chief of India’s National  
Disaster Response Force**

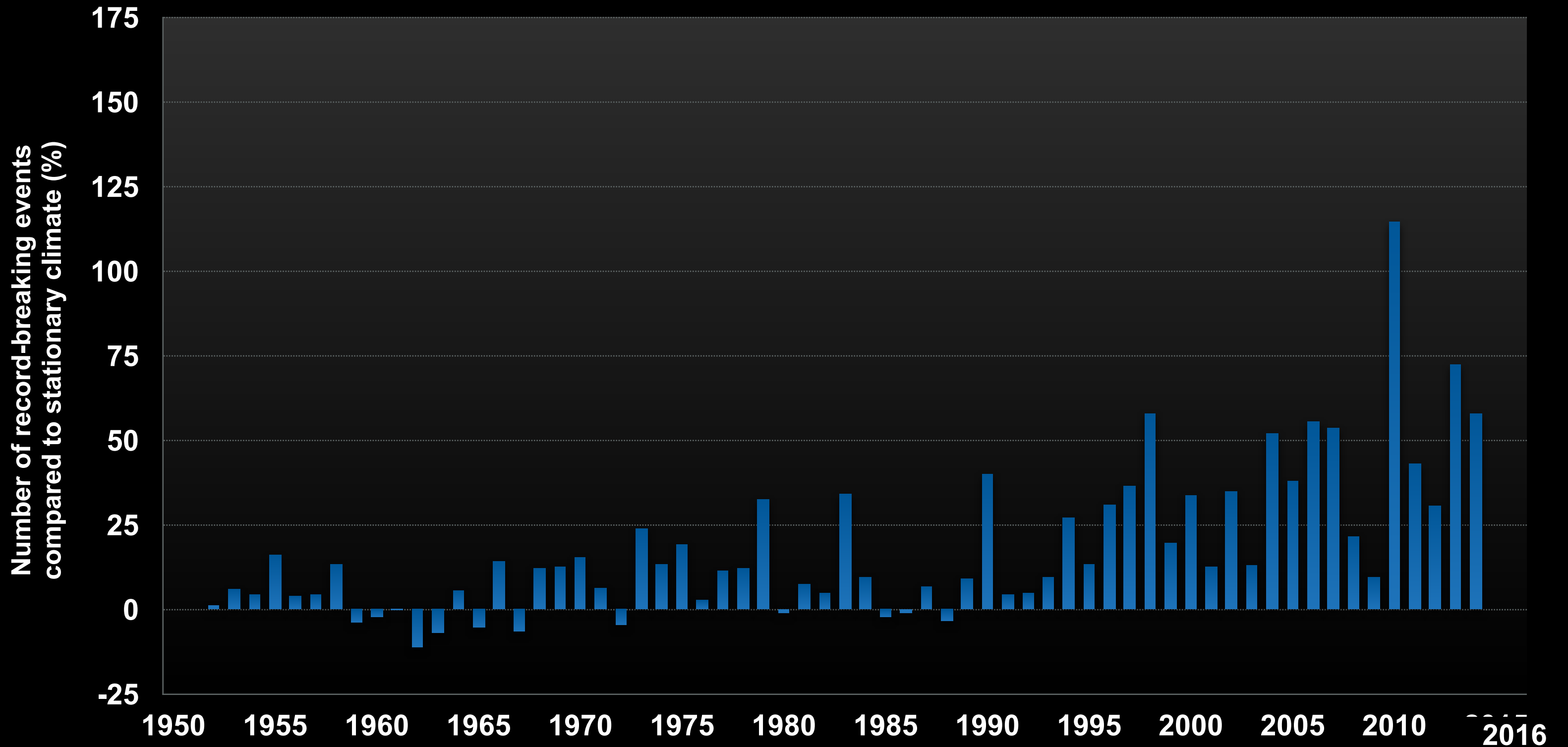
**“...the gravest effects of all attacks on the environment are suffered by the poorest.”**

**Encyclical Letter of  
His Holiness, Pope Francis  
On Care for our Common Home  
June 18, 2015**



The Poor People's Campaign lists  
**“ecological devastation”**  
as one of the primary “evils.”

# Global Record-Breaking Precipitation Anomalies







# Savannah, Tennessee

February 15, 2020

**Torrential rains caused severe flooding in parts of Tennessee and Mississippi in February.**

# Westville, New Jersey

June 20, 2019



# New Orleans, Louisiana

July 10, 2019



**Flooding in the U.S. disproportionately impacts Black neighborhoods.**

# U.S. Counties Most Vulnerable to Disaster

Brooks, TX	Dimmit, TX	Duval, TX	Luna, NM	Zavala, TX
Cibola, NM	Presidio, TX	Imperial, CA	Evangeline, LA	Culberson, TX

The population in the 10 U.S. counties rated most vulnerable to disasters by the Centers for Disease Control and Prevention is **81% minority**, on average.

**U.S. farmers were prevented from planting on 20 million acres in 2019, mainly due to heavy rainfall and flooding.**

# Orchard, Nebraska

May 5, 2019

**The U.S. spring 2019 flooding caused \$20 billion in damages, including \$6.4 billion in federal crop insurance payouts.**

**Globally, floods and  
extreme rainfall events  
now occur  
four times more often  
than in 1980.**



# Assam, India

July 17, 2020



**Nearly four million people in India and Nepal have been displaced by flooding and mudslides.**

# Qingyuan, Guangdong Province, China

June 8, 2020



700,000 people were affected by flooding in several Chinese provinces.

# Nakuru, Kenya

April 29, 2020

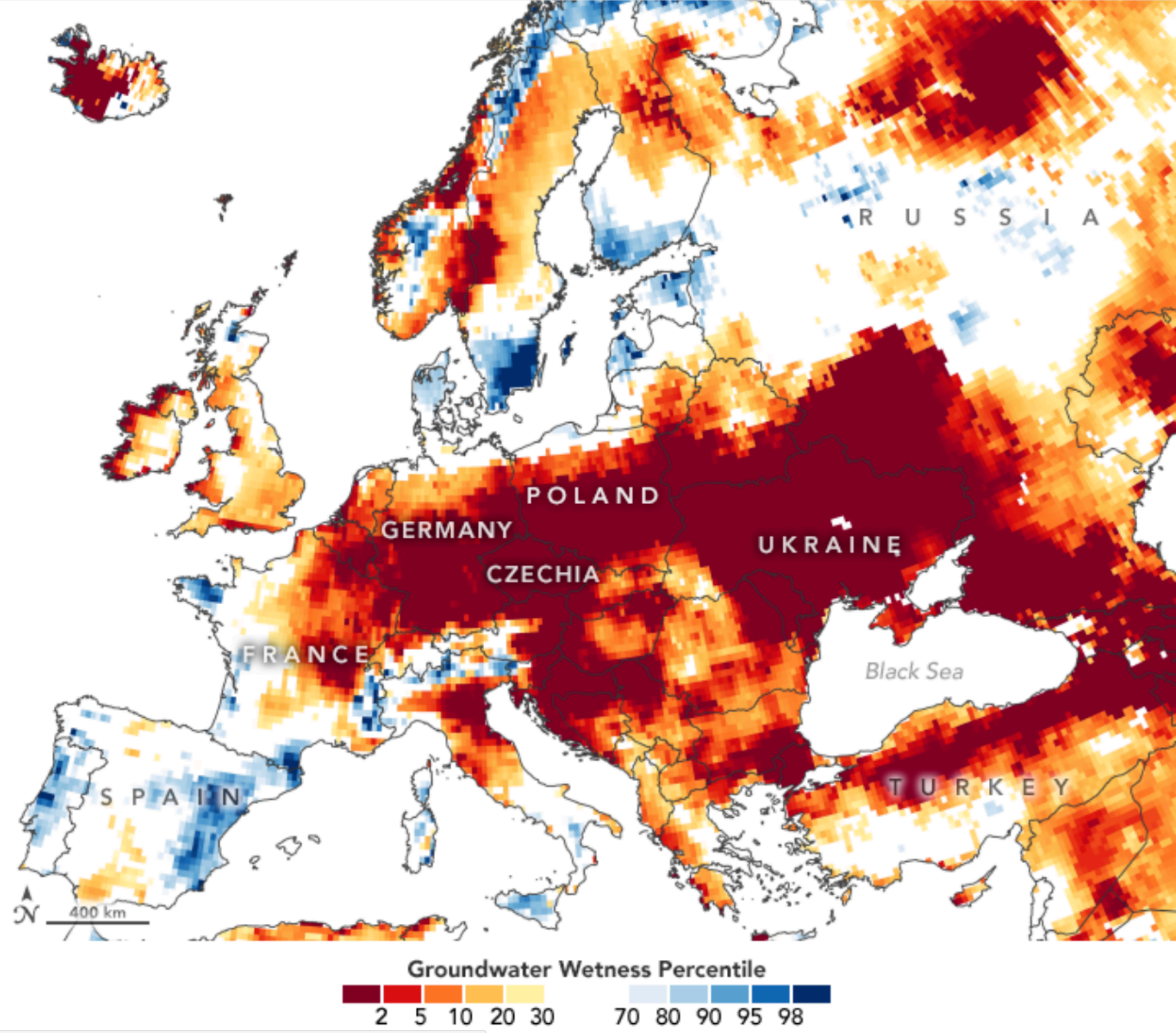
**100,000 families  
were displaced by  
flooding in Kenya.**

**The same extra heat that evaporates more water from the ocean, causing bigger downpours and floods...**

**...pulls moisture even more quickly from the soil, causing longer and deeper droughts.**

June 22, 2020

Groundwater levels in Europe are alarmingly low this summer.



# Krakow am See, Poland

June 3, 2020

**In parts of Poland and Romania, the drought is the worst in a century. In the Czech Republic it's the worst in 500 years.**

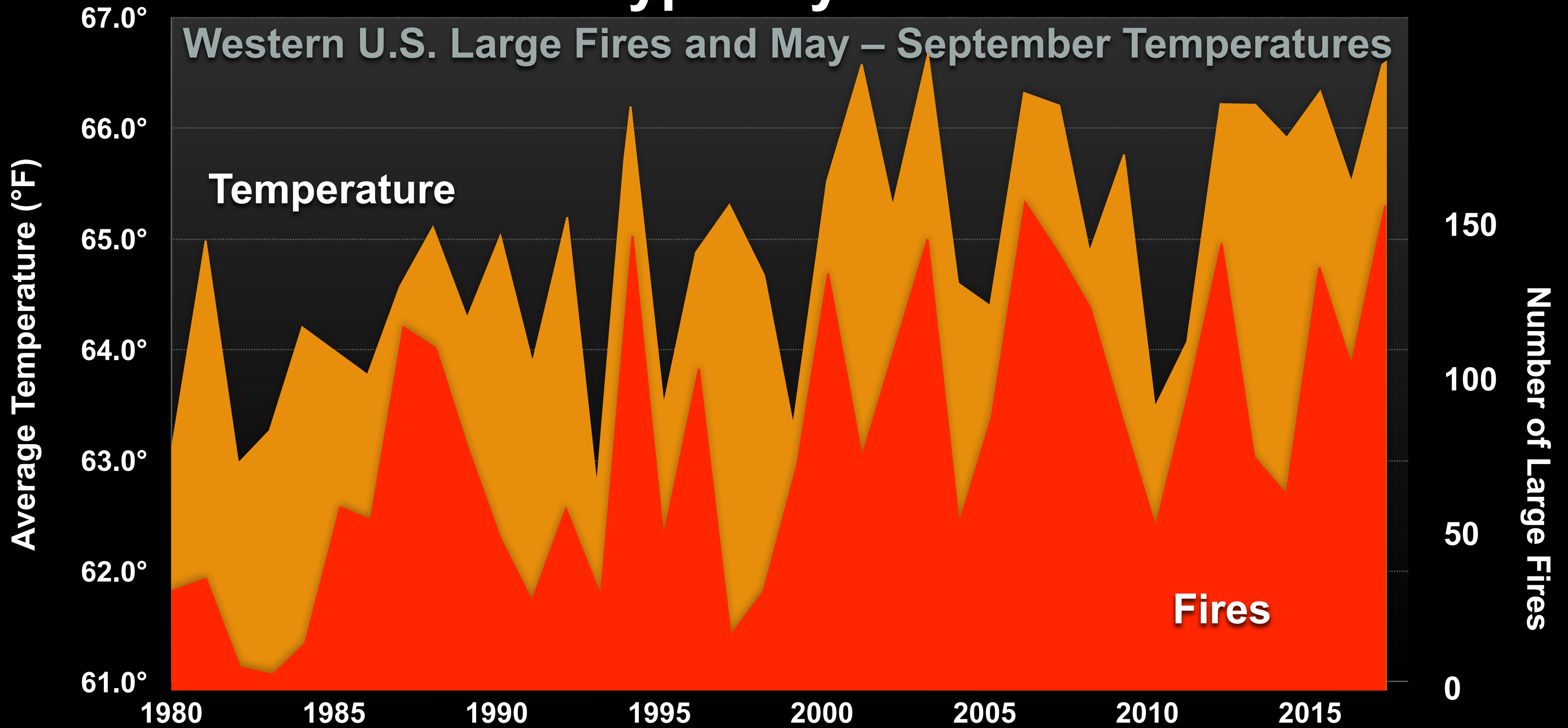
# Chembarambakkam Lake, Chennai, India

May 21, 2019



**Chennai, India's sixth largest city, nearly ran out of water as its reservoirs dried up.**

# Hotter Years Typically Have More Fires





# Tucson, Arizona

June 19, 2020

**Wildfires have already burned hundreds of square miles in Arizona this year.**

# Kincade Fire, Jintown, California

October 24, 2019



**The Kincade fire grew to over 16,000 acres within 24 hours.**

# Lake Conjola, NSW, Australia

December 31, 2019



# Active Fires in South America

August 15 – 22, 2019

● Cities and Towns

● Fires



**Makrimali, Evia, Greece**

**August 13, 2019**

**“Climate change is taking its  
toll on southern Europe.”**

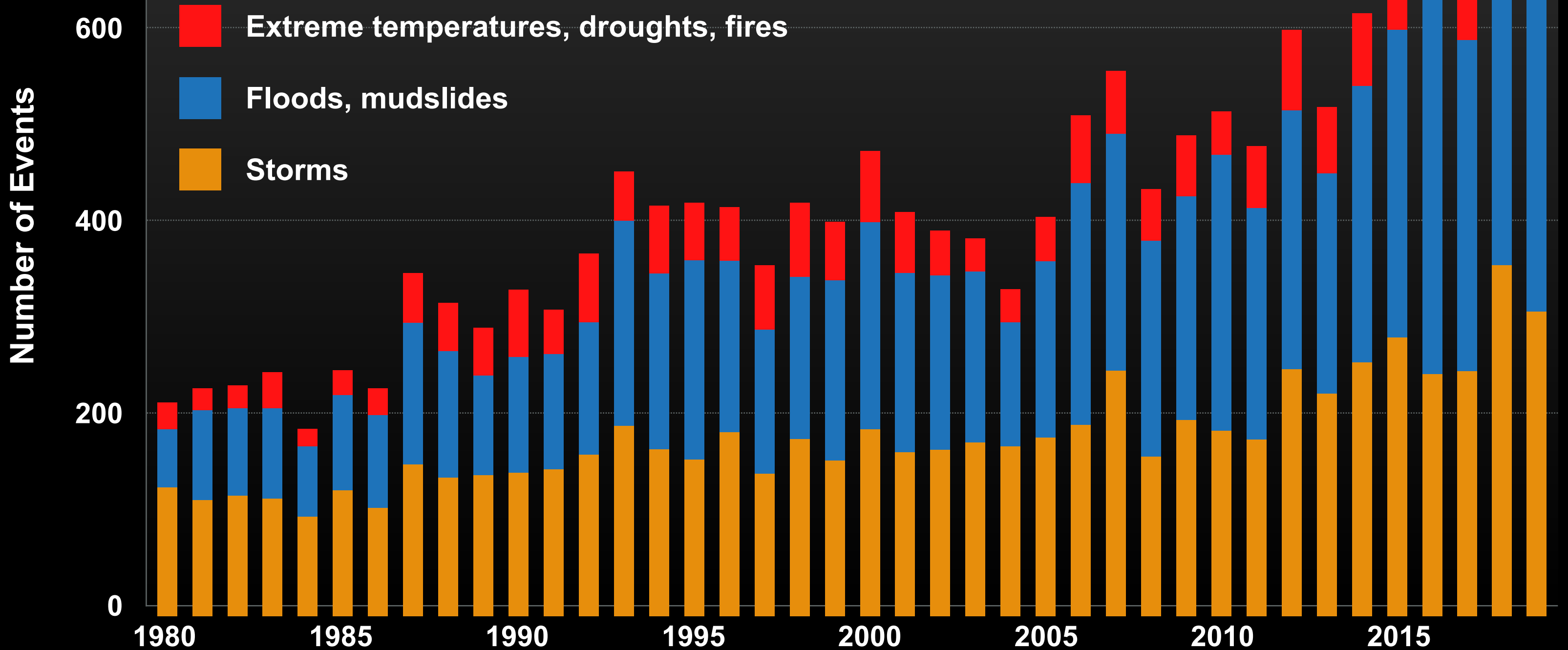


**Greek Prime Minister Kyriakos Mitsotakis**

**August 14, 2019**

# Worldwide Extreme Weather Catastrophes

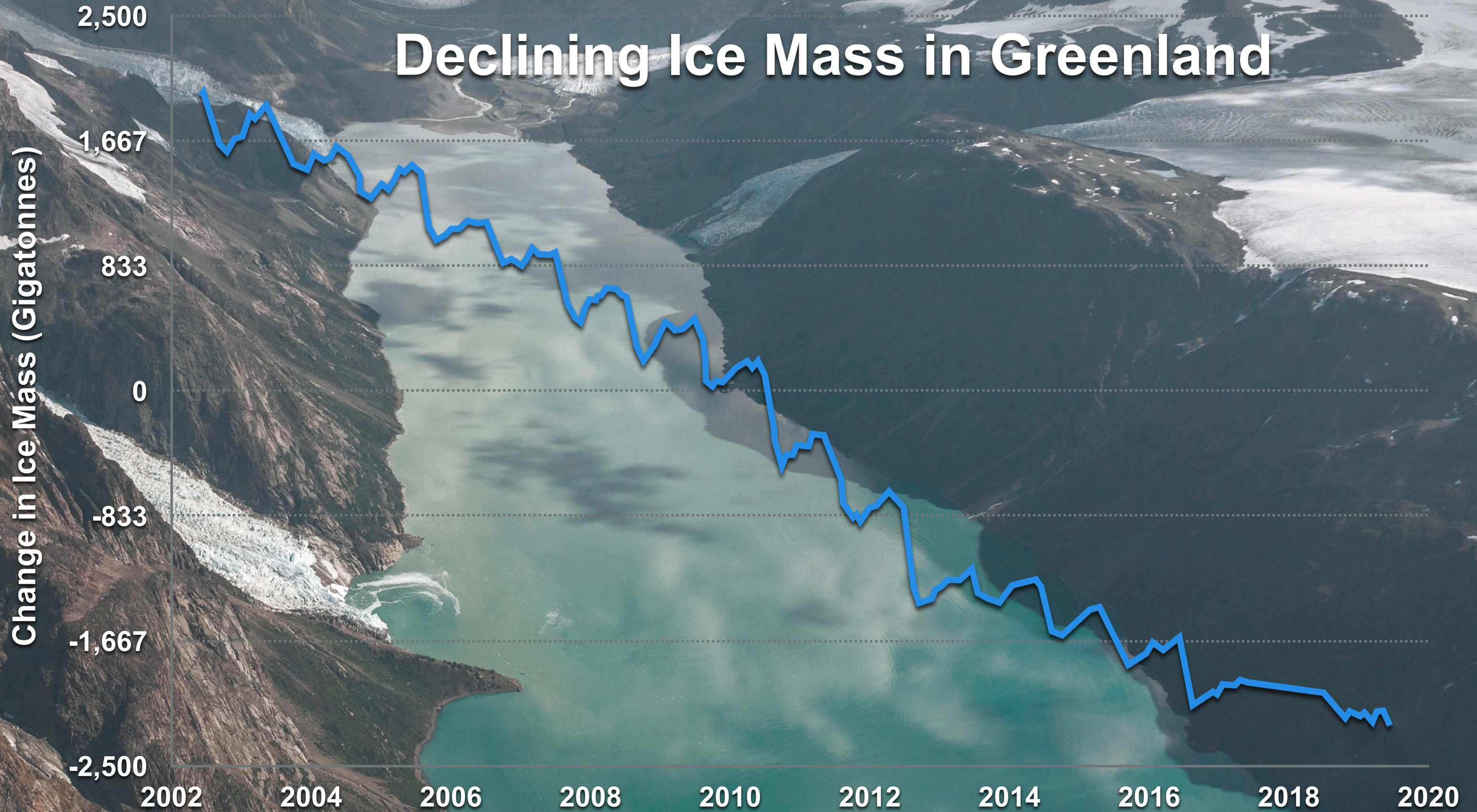
1980 – 2019



# Unnamed Glacier, Southwest Greenland

Summer 2013

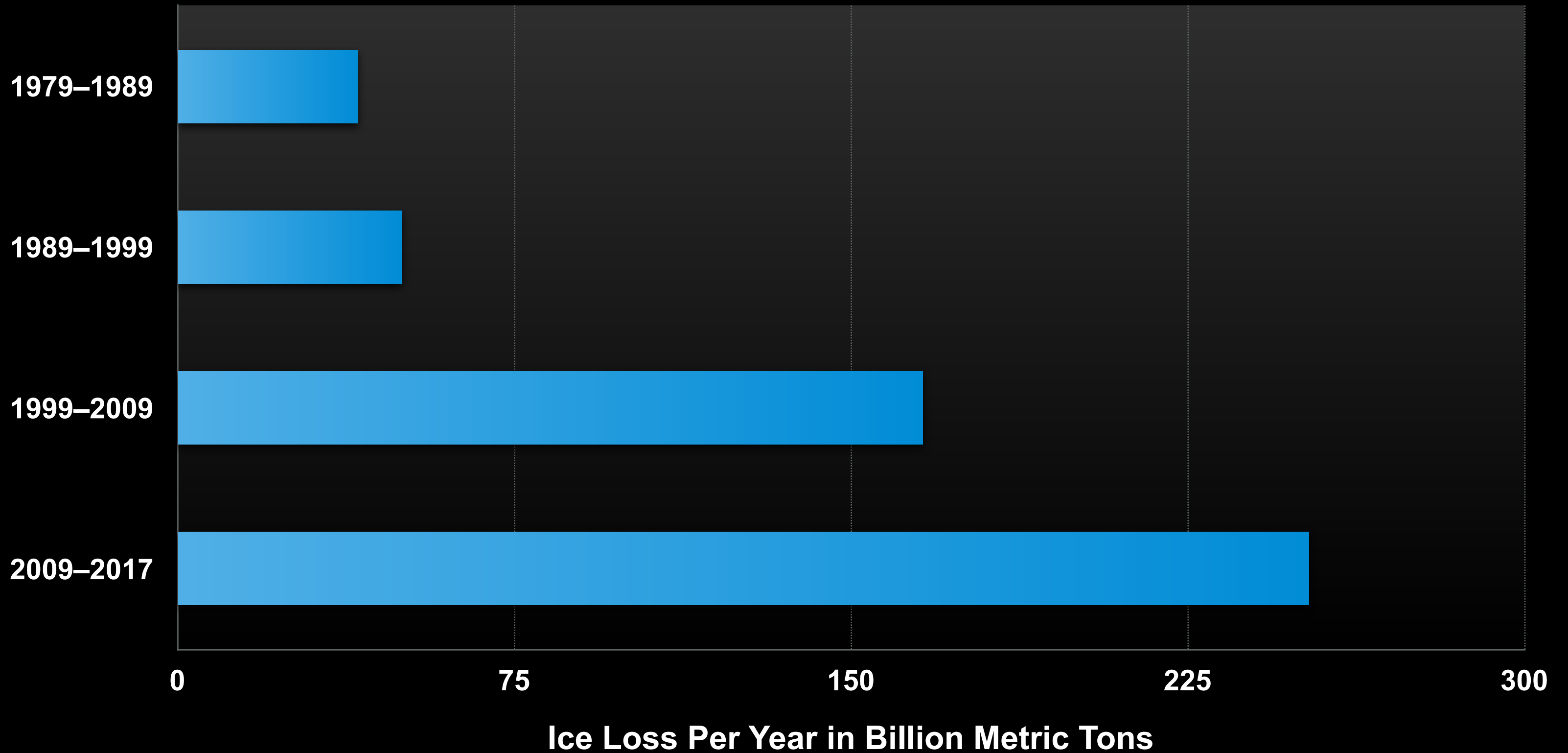
# Declining Ice Mass in Greenland



Data: NASA  
Images courtesy Anders Bjørk, © Natural History Museum of Denmark/Tholstrup (2013) and Danish Geodata Agency (1935)

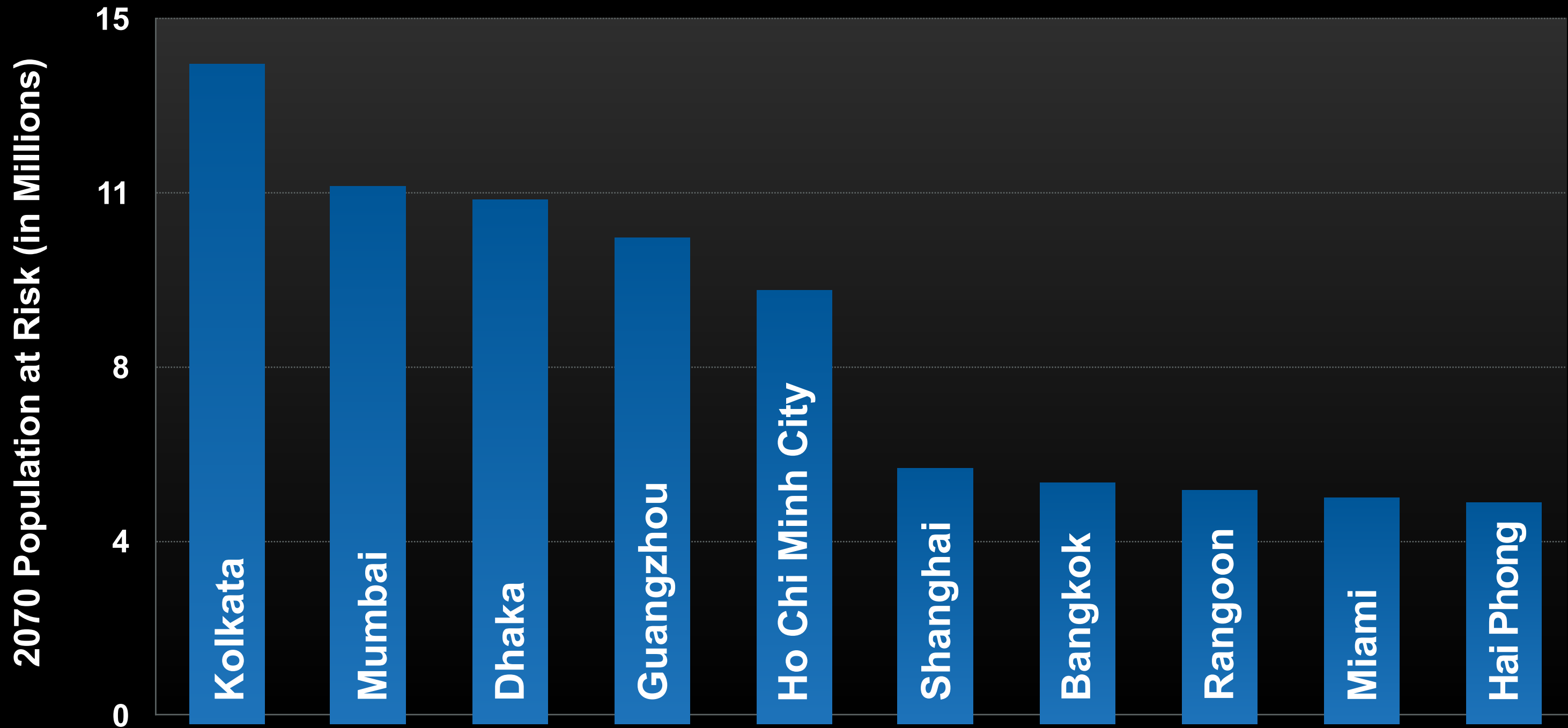


# Antarctic Ice Loss



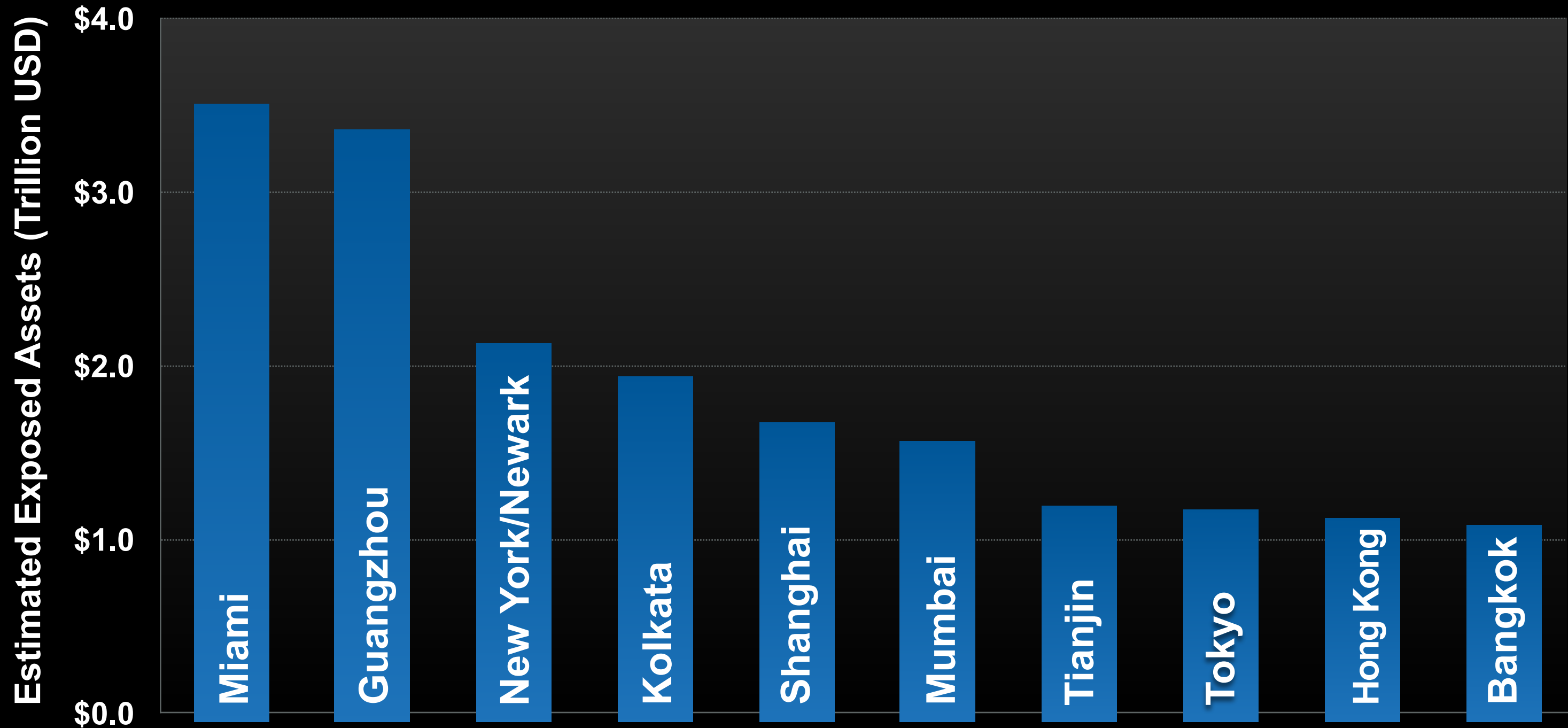
# Top 10 Cities at Risk from Sea Level Rise in 2070

## By Population at Risk



# Top 10 Cities at Risk from Sea Level Rise in 2070

By Assets at Risk



# Miami Beach, Florida

November 14, 2016





# **\$129 Billion Worth Of New York City Real Estate Now Lies In Flood Zones**

Photo: Getty Royalty Free  
Source: Business Insider, 2014

A photograph of a person standing on a stone pier or breakwater, looking out at the ocean. The sky is filled with soft, white clouds, and the water is a deep blue-green. The person is silhouetted against the bright sky. The pier is made of large, rough-hewn stones.

**Kiribati is the first nation to purchase land in another country to house its climate refugees.**

**U.S. Department of Defense**  
*2014 Climate Change Adaptation Roadmap*

**Climate change**  
**“will likely lead to**  
**food and water shortages,**  
**pandemic disease,**  
**disputes over refugees and resources,**  
**and destruction by natural disasters in**  
**regions across the globe.”**

# Tovarnik, Croatia

September 20, 2015



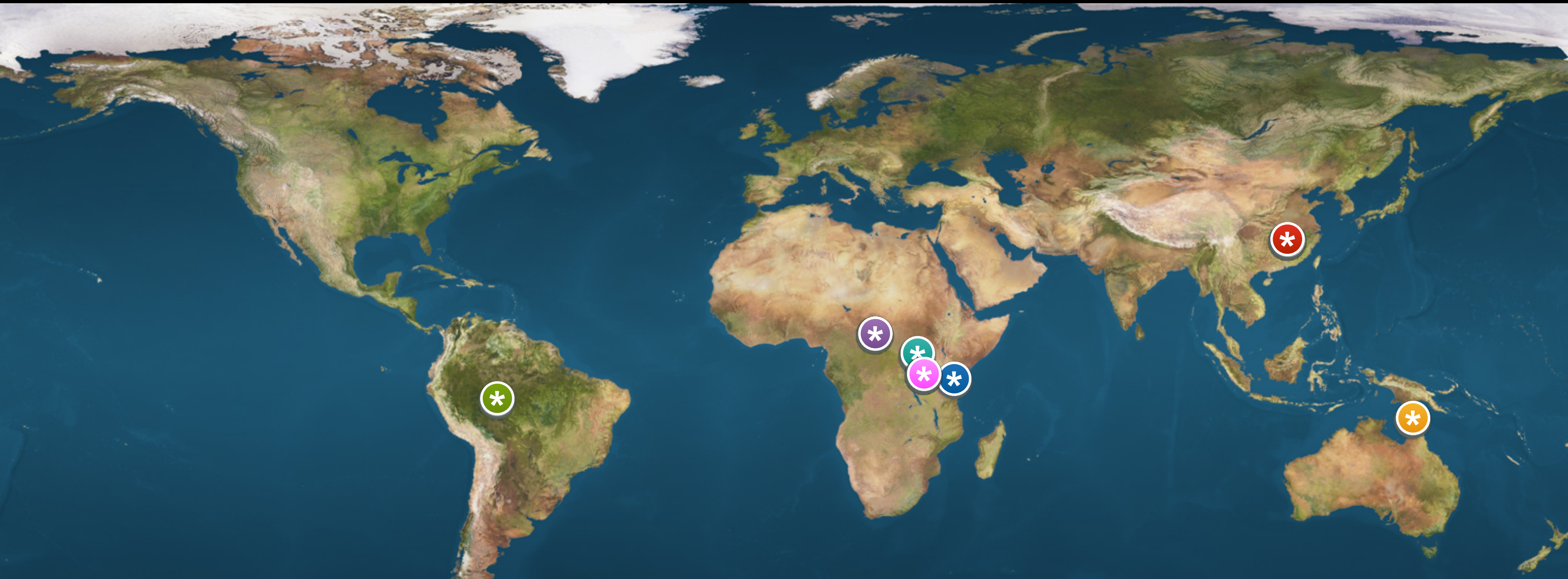


**“Climate Change  
is a  
Medical Emergency.”**

**Professor Hugh Montgomery, Co-Chair,  
The 2015 Lancet Commission on  
Health and Climate Change**

**June 2015**

# Tropical Diseases on the Move



West Nile Virus

Chikungunya

Cryptococcus Gattii Fungus

Zika Virus

Rift Valley Fever

Chagas Disease

Dengue Fever

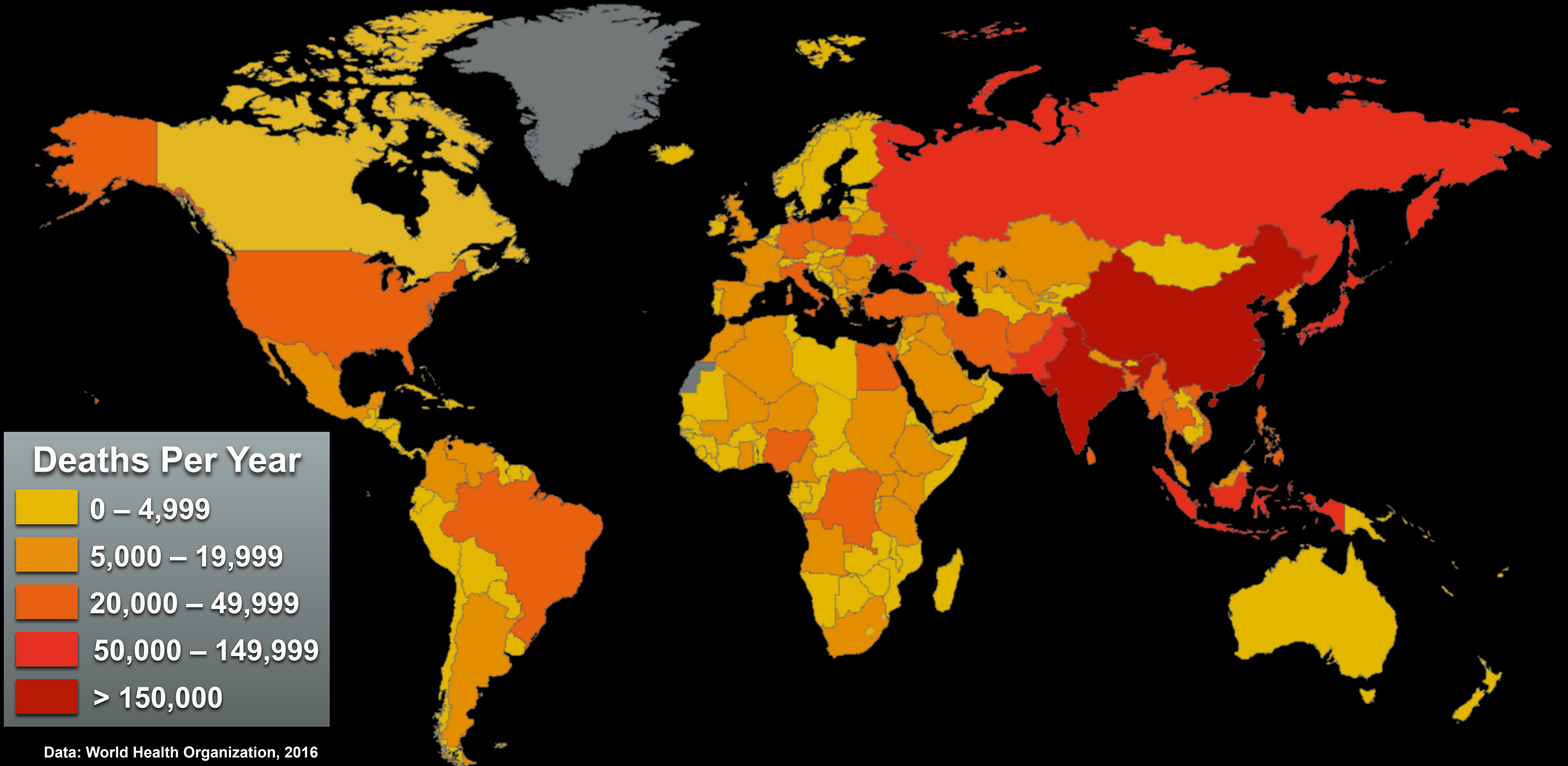
# Yunnan Province, China

April 28, 2020



As the climate changes and humans expand further into Earth's remaining wild places, **five new infectious diseases** are emerging, on average **each year.**

# Deaths Attributable to Ambient Air Pollution



Data: World Health Organization, 2016

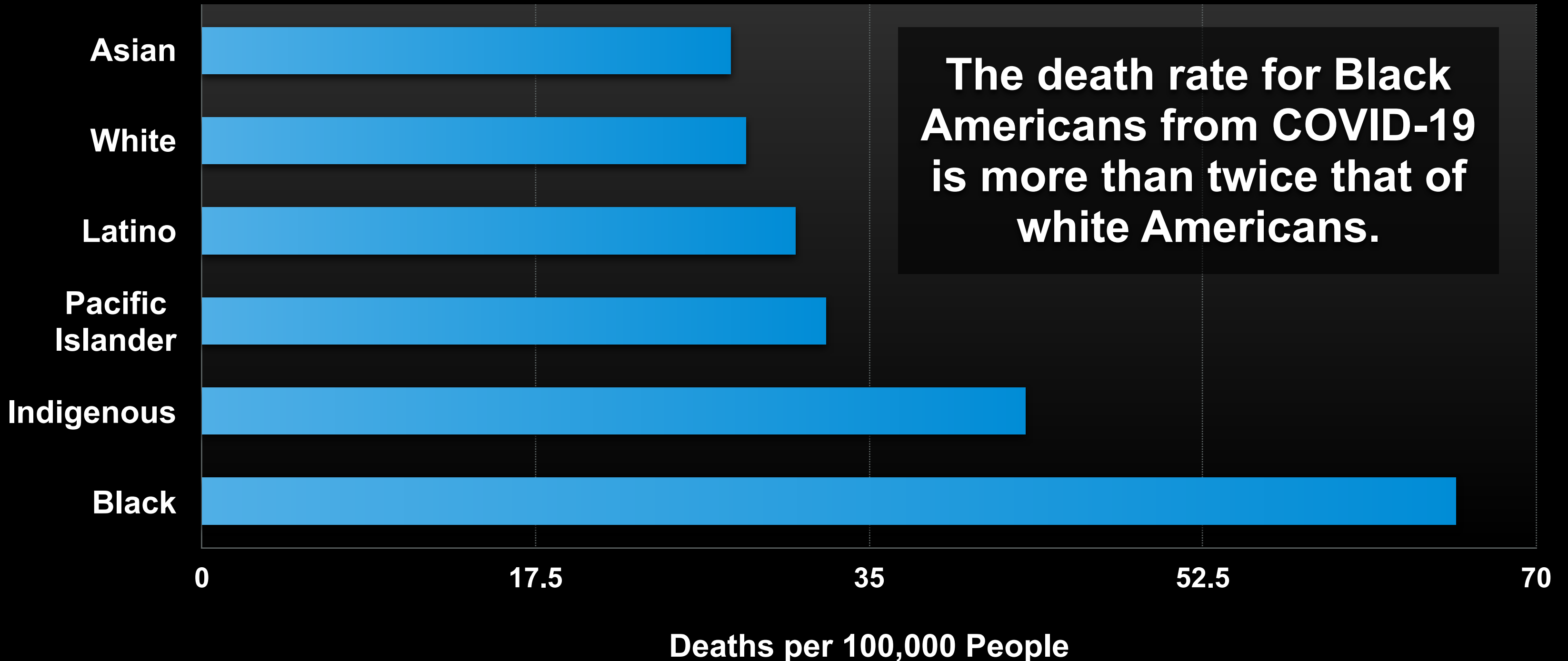
# Changchun, Jilin Province, China

April 15, 2020

**A study of 324 cities in China found a 15 – 22% increase in COVID-19 cases in areas with elevated levels of NO<sub>2</sub> and PM 2.5 particulate pollution.**

# U.S. COVID-19 Deaths, by Race

Through June 23, 2020



**We now risk  
losing up to  
50% of all  
land-based  
species  
in this century**



# The Cost of Carbon

\$ *Political Instability*

\$ *Floods & Mudslides*

\$ *Wildfires*

\$ *Drought*

\$ *Storm Damage*

\$ *Ocean Acidification*

\$ *Infrastructure Loss*

\$ *Climate Refugees*

\$ *Species Extinction*

\$ *Melting Glaciers*

\$ *Famine*

\$ *Water Scarcity*

\$ *Ecosystem Loss*

\$ *Our Way of Life*

\$ *Infectious Diseases*

\$ *Sea Level Rise*



... *And much, much more*  
"The Threat to the  
Global Economy"



**So...!**  
**Yes!**  
**Must we change?**

**2. Can we change?**

**We have  
the solutions  
at hand...**

# Green Energy Progress

## How Do Projections Compare With Reality?

### 2000 Projection

Worldwide  
wind capacity  
will reach 30  
GW by 2010

### Reality

By 2019 that goal  
was exceeded by  
a factor of

**22 x**

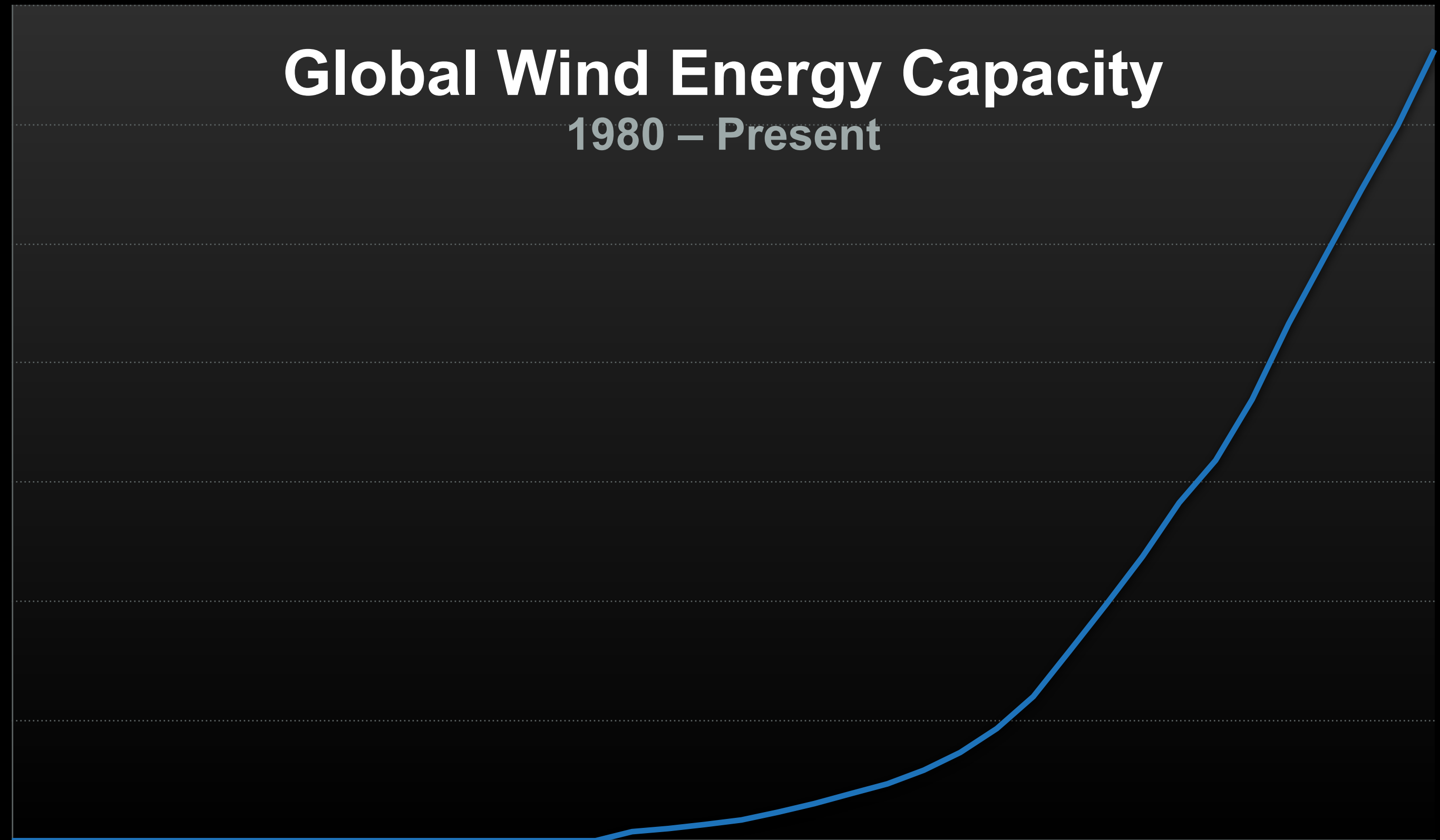
# Global Wind Energy Capacity

1980 – Present

Wind Capacity (Megawatts)

700,000  
600,000  
500,000  
400,000  
300,000  
200,000  
100,000  
0

1980 1985 1990 1995 2000 2005 2010 2015



# Solar Energy Progress

How Do Projections Compare With Reality?

## 2002 Projection

The solar energy market will grow one gigawatt per year by 2010

## Reality

The reality is that in 2019 it was exceeded by

**1271x**

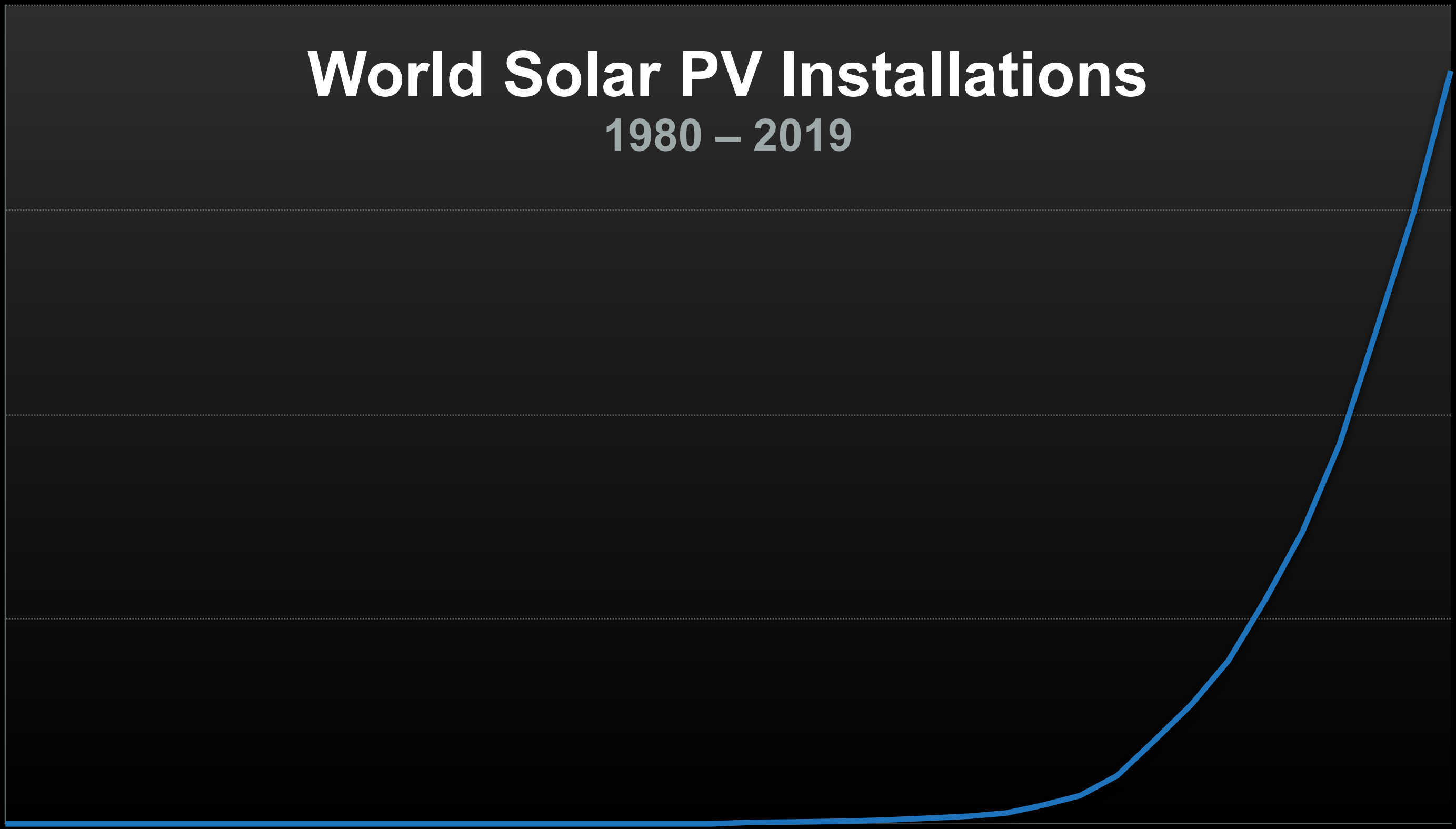
# World Solar PV Installations

1980 – 2019

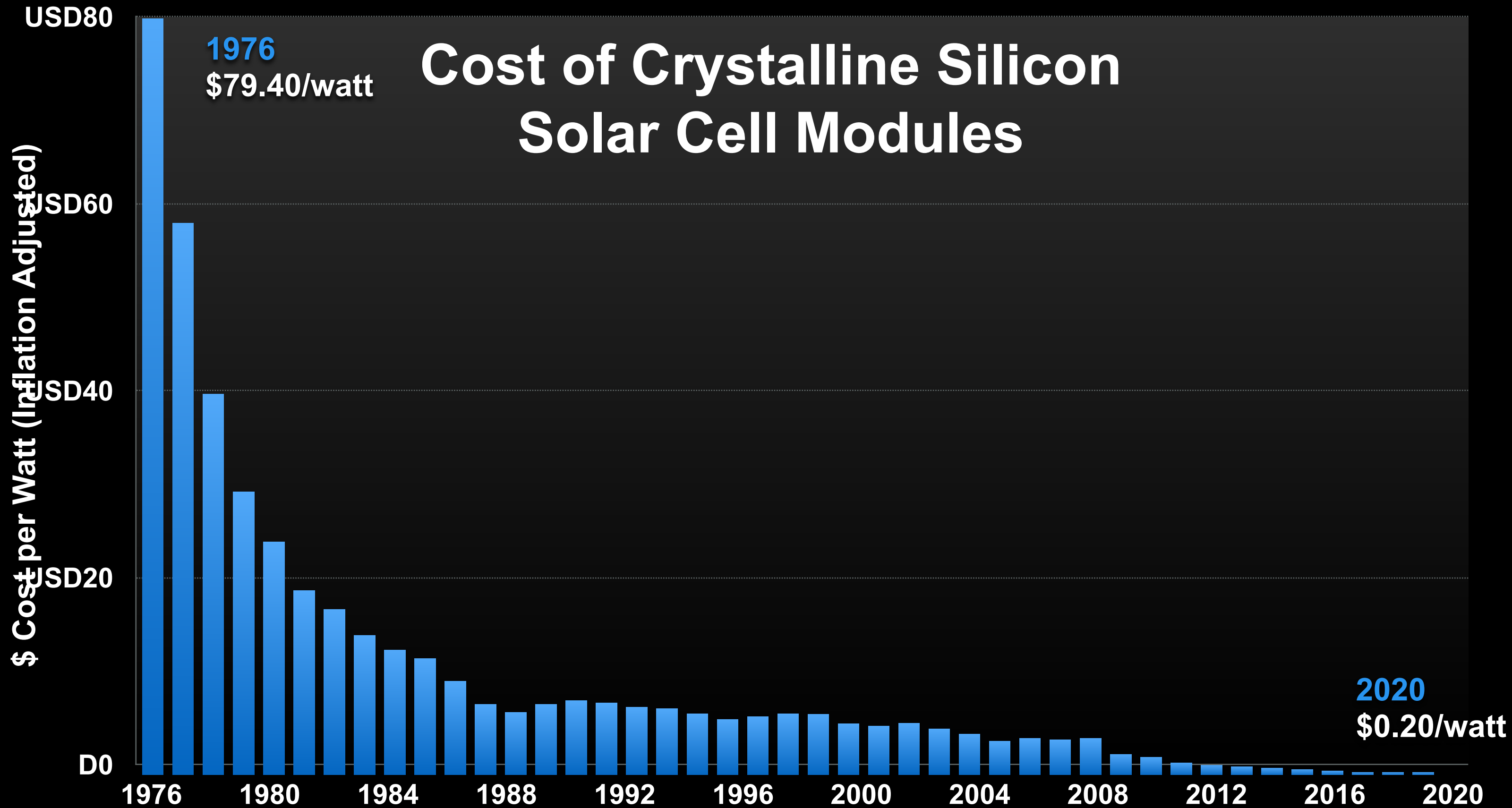
Gigawatts (Cumulative)

700  
525  
350  
175  
0

1980 1985 1990 1995 2000 2005 2010 2015



# Cost of Crystalline Silicon Solar Cell Modules





# The Chilean Solar Market

Installed Capacity (GW)

2.25  
2.00  
1.75  
1.50  
1.25  
1.00  
0.75  
0.50  
0.25  
0.00

11 MW

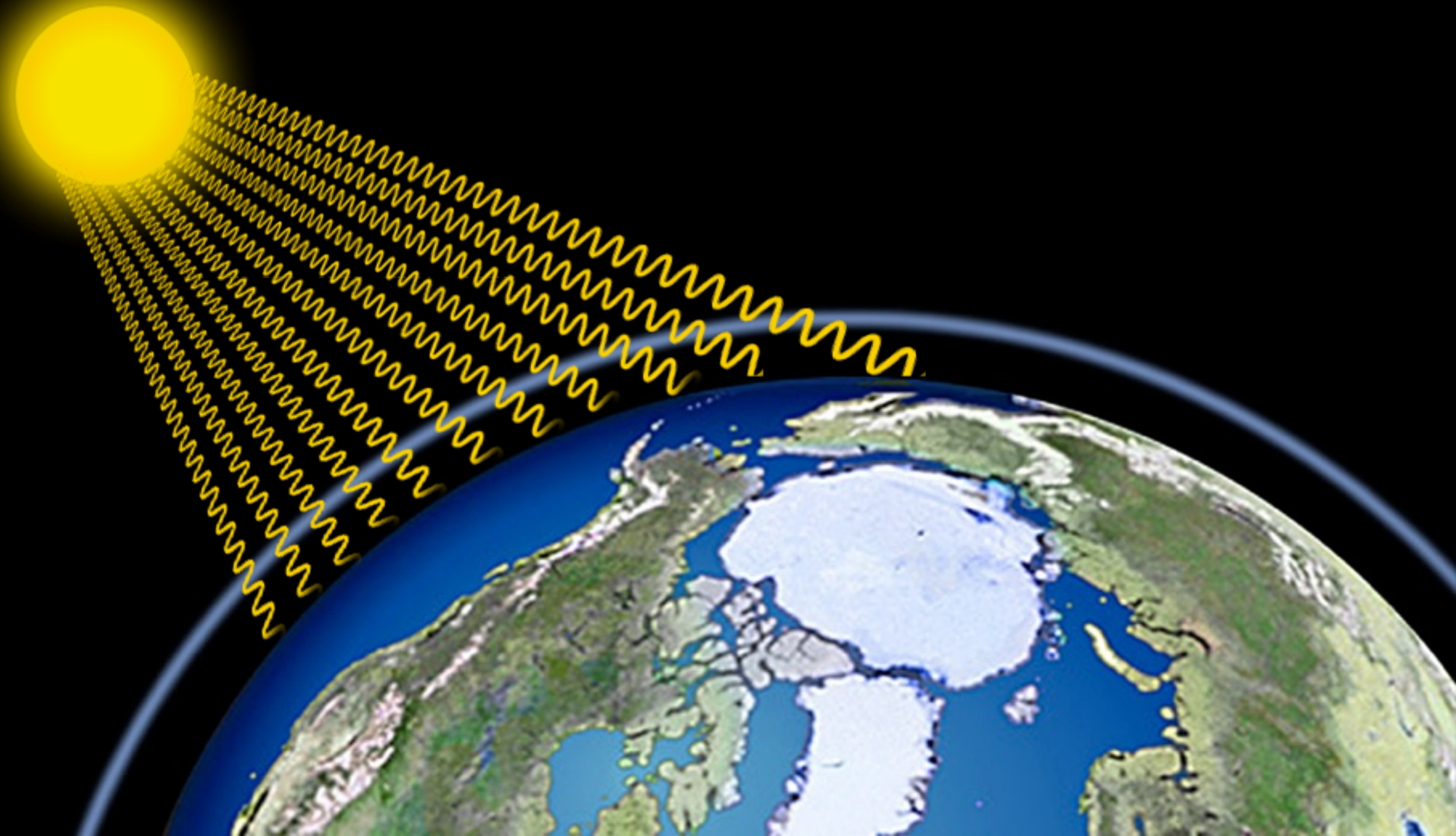
1.1 GW

2.3 GW

Chile has an additional **16.67 GW** of solar projects approved or under construction.

2.25  
1.50  
1.25  
1.00  
0.75  
0.50  
0.25  
0.00

Enough solar energy reaches Earth **every hour**  
to fill all the world's energy needs **for a full year**



# Global Cumulative Storage Capacity

## Historical

Gigawatts

3.0  
2.3  
1.5  
0.8  
0.0

2011

2012

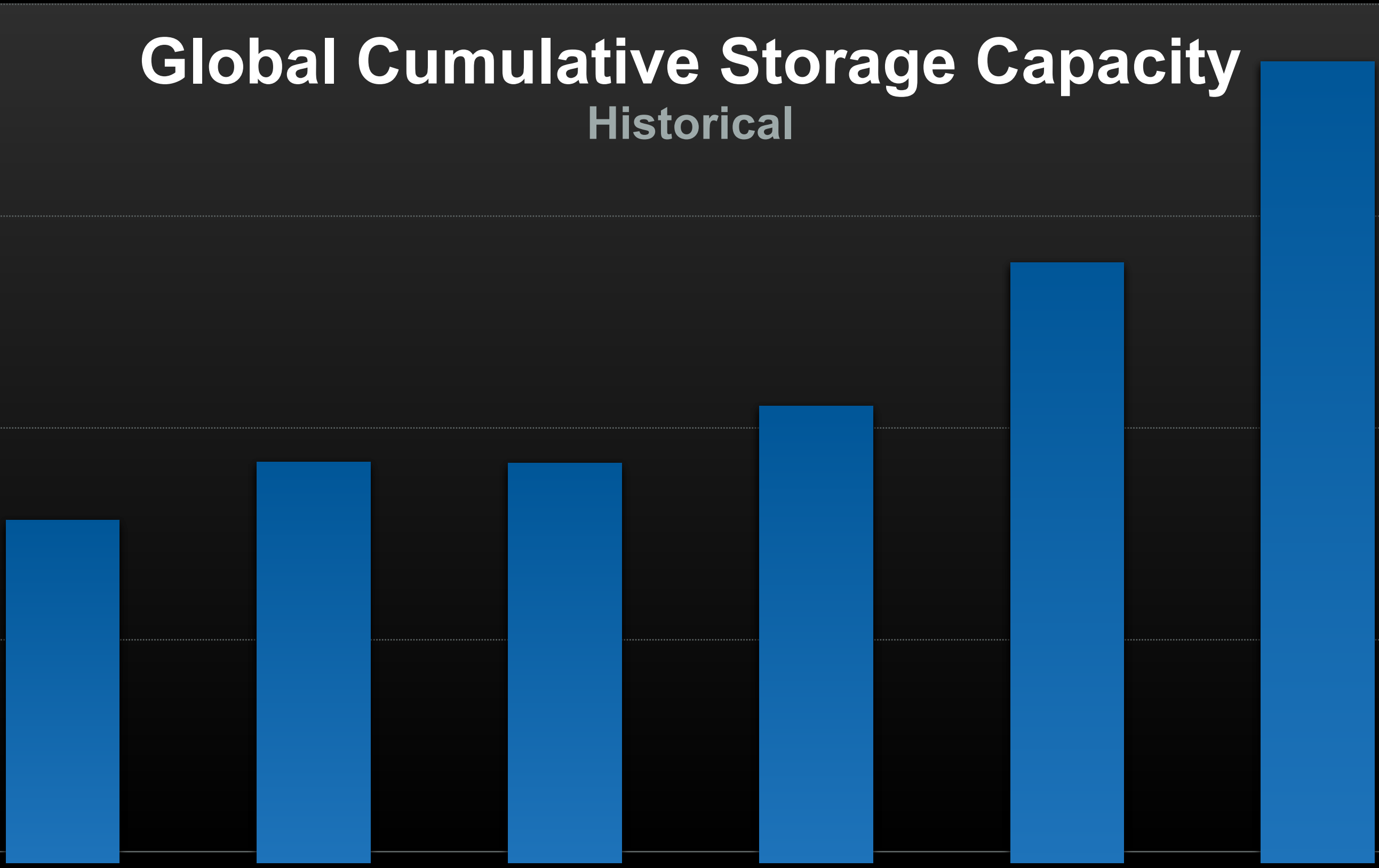
2013

2014

2015

2016

Data: Bloomberg New  
Energy Finance



# Global Cumulative Storage Capacity

Projected to 2040

Gigawatts

Energy storage deployments doubled from 2017 to 2018 and are projected to have doubled again in 2019.

1,000

750

500

250

0

2011

2013

2015

2017

2019

2021

2023

2025

2027

2029

2031

2033

2035

2037

2039

# Auto Manufacturers Are Moving to Electric Vehicles

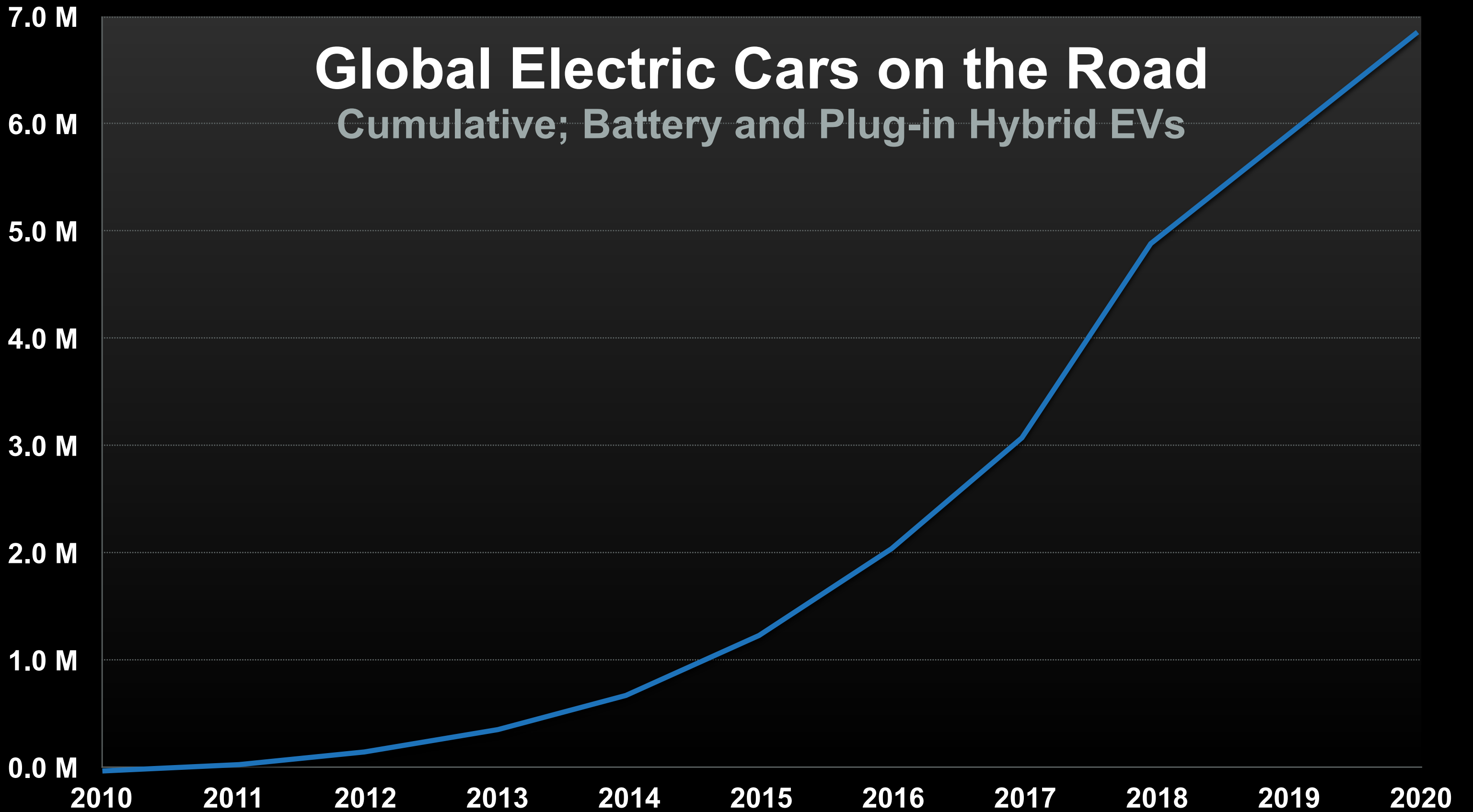
Companies with Electric Models in Production

<b>Aixam</b>	<b>Chevy</b>	<b>GM</b>	<b>Mercedes-Benz</b>	<b>\$mart</b>
<b>Aston Martin</b>	<b>Citroën</b>	<b>Goupil</b>	<b>Mitsubishi</b>	<b>Subaru</b>
<b>Audi</b>	<b>Citydom GmbH</b>	<b>Honda</b>	<b>Mullen</b>	<b>Tata</b>
<b>BAIC</b>	<b>CODA</b>	<b>Hyundai</b>	<b>NIO</b>	<b>Tesla</b>
<b>BMW</b>	<b>Daimler</b>	<b>JAC</b>	<b>Nissan</b>	<b>Toyota</b>
<b>Bolloré</b>	<b>Exagon</b>	<b>Kandi</b>	<b>Opel</b>	<b>Trumpchi</b>
<b>Buddy Electric</b>	<b>Fiat</b>	<b>Kantanka</b>	<b>Peugeot</b>	<b>Venturi</b>
<b>BYD</b>	<b>Fisker</b>	<b>Kia</b>	<b>Qiantu</b>	<b>Volkswagen</b>
<b>ChangAn</b>	<b>Ford</b>	<b>Kyburz</b>	<b>Rayttle</b>	<b>Zotye</b>
<b>Chery</b>	<b>Geely</b>	<b>Mahindra</b>	<b>Renault</b>	

# Global Electric Cars on the Road

Cumulative; Battery and Plug-in Hybrid EVs

Electric Car Stock (Millions)



So...!  
Yes!  
Can we change?

**3. Will we change?**

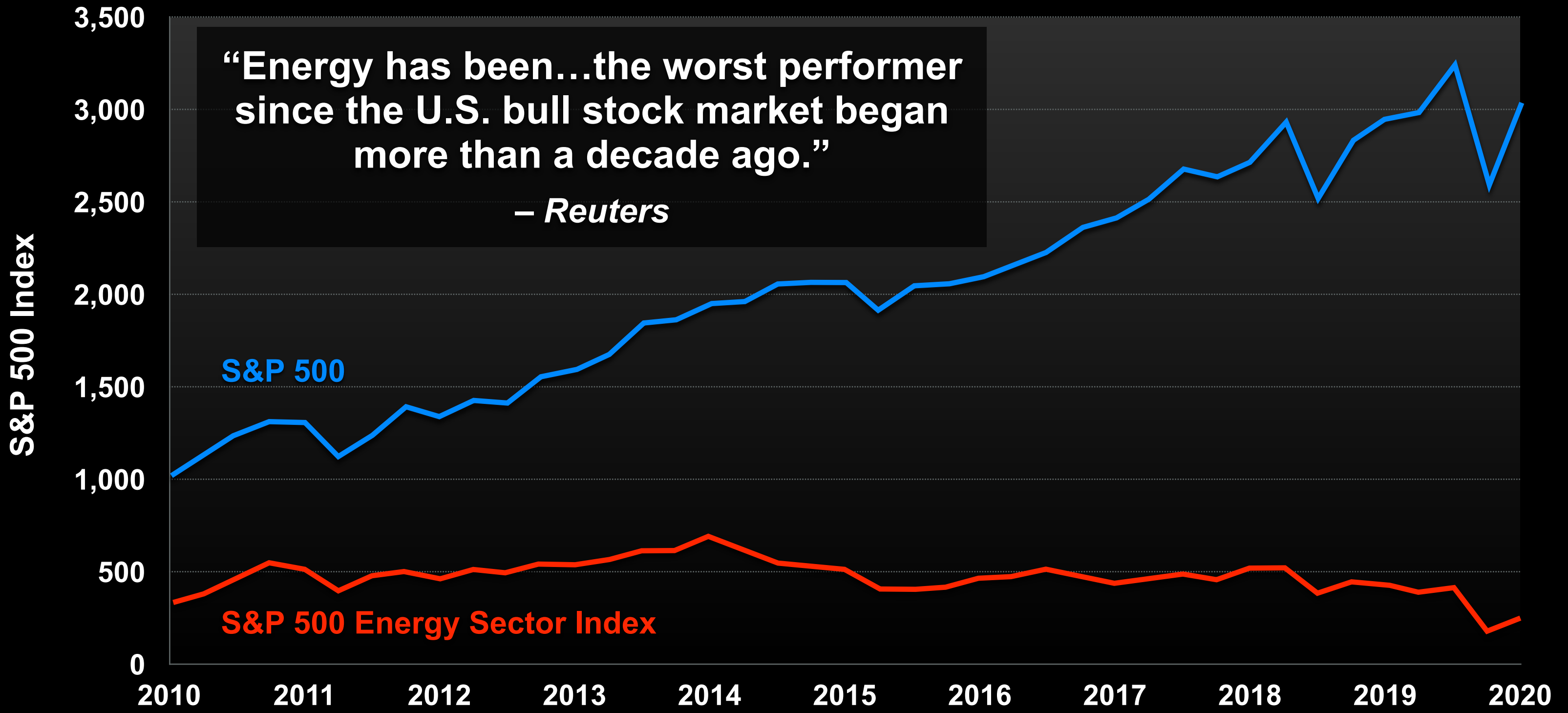


A nighttime photograph of the Eiffel Tower in Paris, France, illuminated with golden lights. The tower stands on the left side of the frame. In the foreground, the Seine River flows, with several boats, including a large white cruise ship, on the water. The background shows the city lights and the Pont Neuf bridge. The sky is a deep blue with some clouds.

In the 2015 Paris Agreement,  
**every nation in the world agreed**  
to work together to achieve net zero  
greenhouse gas emissions by mid-century.

The U.S. cannot legally  
withdraw until the day after  
the 2020 Presidential election.

# Conventional Energy Stocks Are the Worst Investments



**“Energy has been...the worst performer since the U.S. bull stock market began more than a decade ago.”**  
– *Reuters*

# Twenty-four states representing 55% of the American people have formed the United States Climate Alliance

Founding Members	<b>California</b>	<b>New York</b>	<b>Washington</b>
Additional States	<b>Connecticut</b>	<b>Delaware</b>	<b>Hawaii</b>
	<b>Massachusetts</b>	<b>Oregon</b>	<b>Minnesota</b>
	<b>Rhode Island</b>	<b>Vermont</b>	<b>Virginia</b>
	<b>North Carolina</b>	<b>Colorado</b>	<b>Maryland</b>
	<b>New Jersey</b>	<b>Illinois</b>	<b>New Mexico</b>
	<b>Michigan</b>	<b>Wisconsin</b>	<b>Maine</b>
	<b>Nevada</b>	<b>Pennsylvania</b>	<b>Montana</b>
	<i><b>and Puerto Rico</b></i>		



Over 240 global companies have made a commitment to go 100% renewable



# Nashville, Tennessee

September 20, 2019

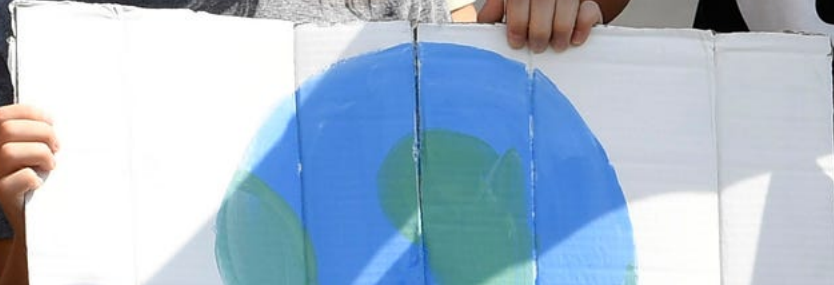


Climate Change is  
Real!  
In Other News  
Water is Wet



RESPECT

You will  
Die  
of Old  
Age.  
Will Die



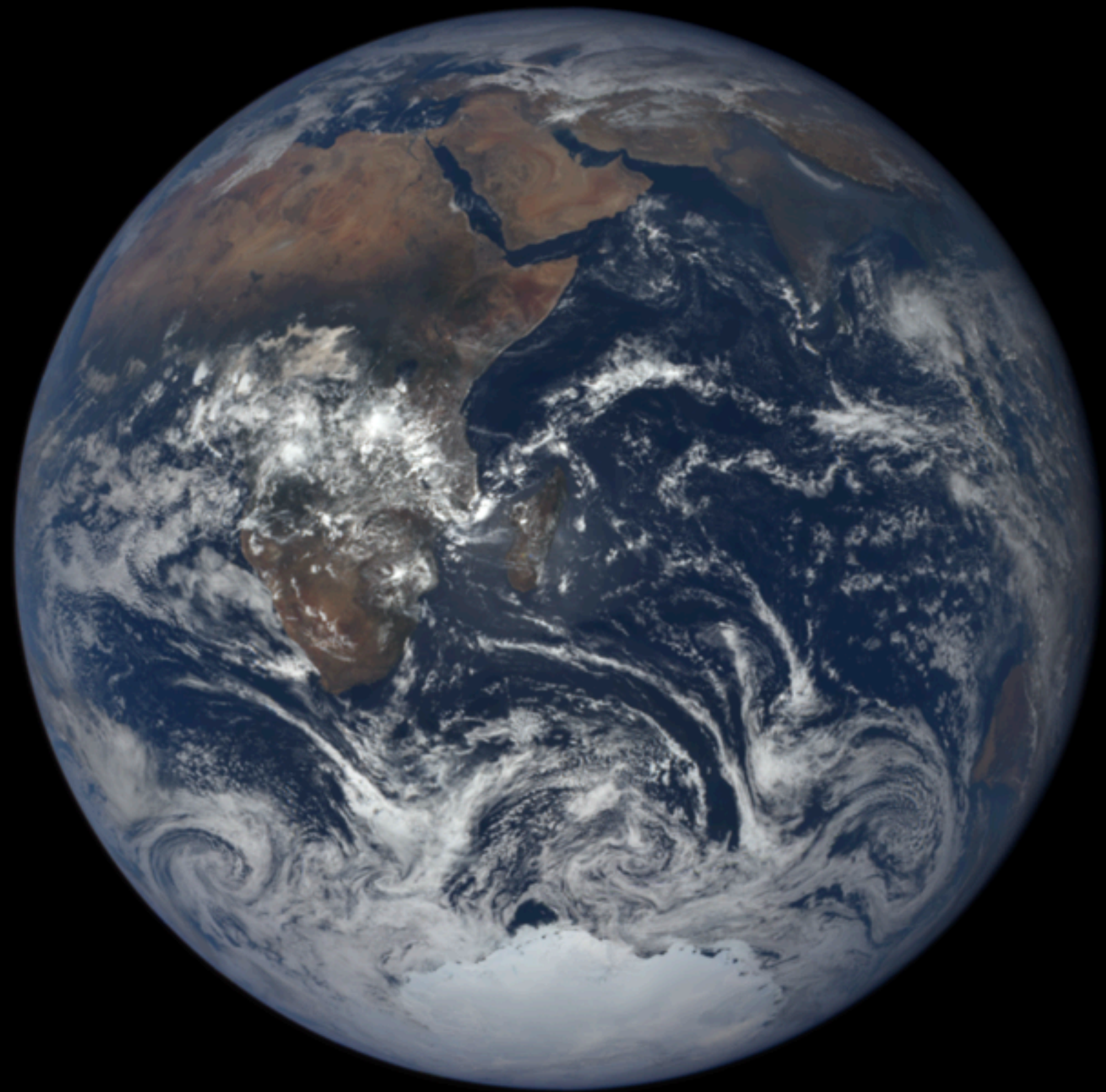
WHI  
DO

**Join those who are using  
their **voices**  
their **votes**  
their **choices**  
to fight for their future, their  
community, and their world.**

Use your **voice**  
your **vote**  
your **choices**

**Speak Truth to Power**

**like your world depends on it.**



**Your world depends on it.**



