Weather and Climatology
(207 E)

Second level / Environmental Sciences Students (Credit Hours)

Under supervision

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Climate Change

Outlines

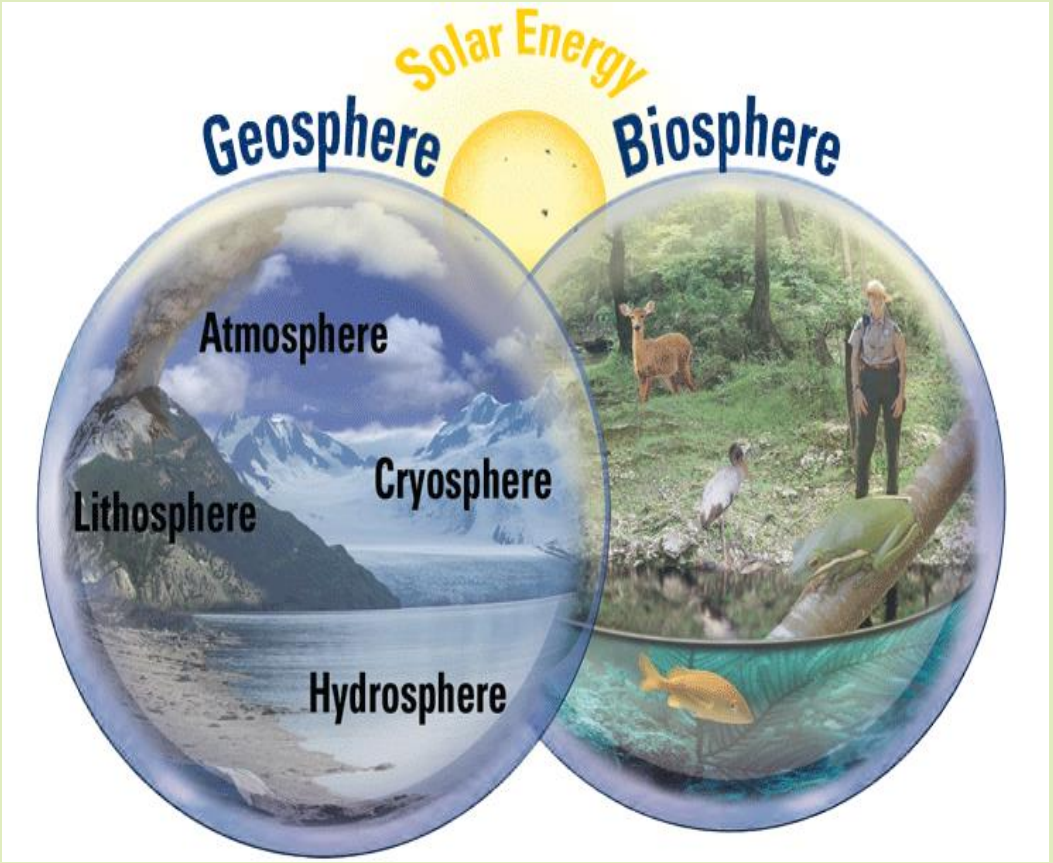
What is the Climate Change?

Causes

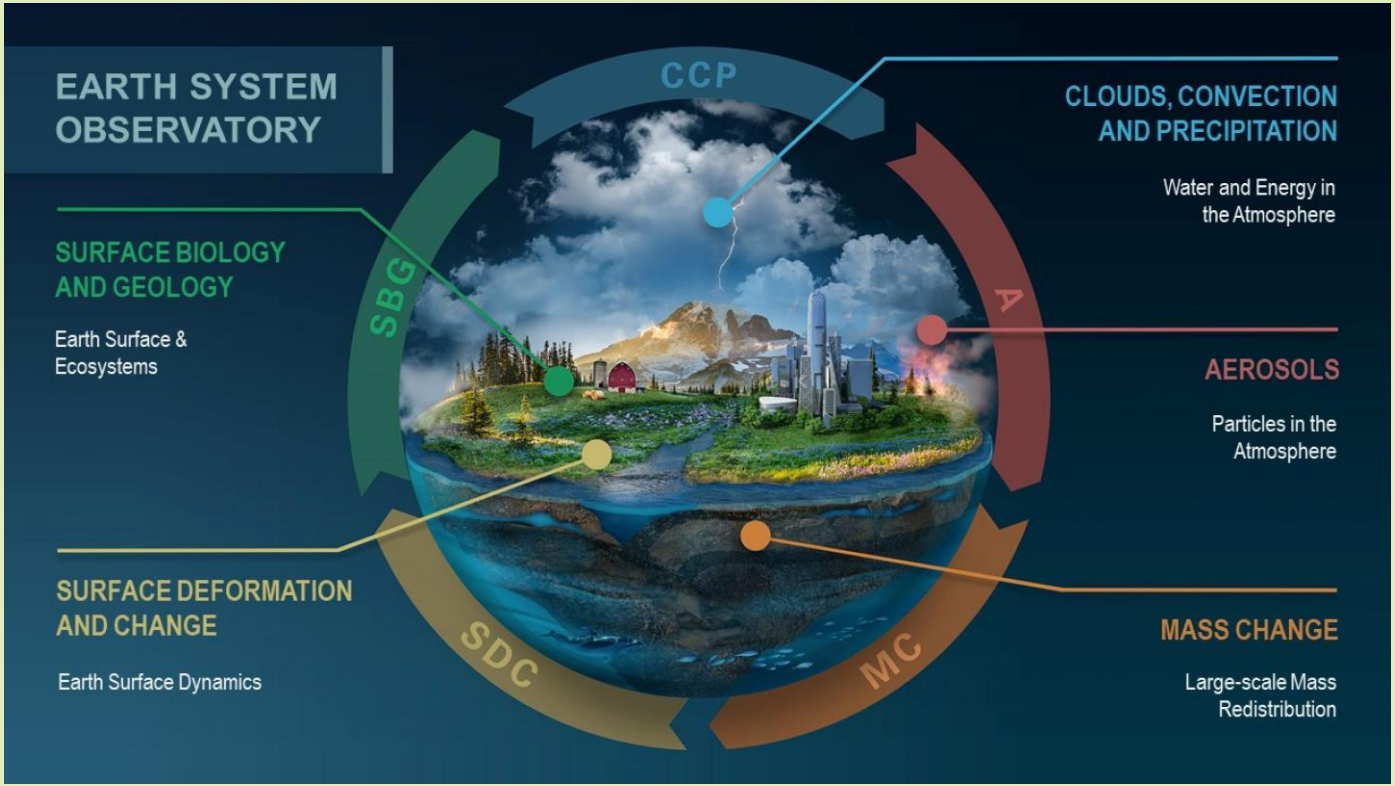
Impacts

Mitigation and Adaptation

Our planet


Solar Energy
Geosphere
Biosphere
Atmosphere
Cryosphere
Lithosphere
Hydrosphere

Our planet


EARTH SYSTEM OBSERVATORY
CCP
CLOUDS, CONVECTION AND PRECIPITATION
Water and Energy in the Atmosphere
SBG
SURFACE BIOLOGY AND GEOLOGY
Earth Surface & Ecosystems
A
AEROSOLS
Particles in the Atmosphere
SURFACE DEFORMATION AND CHANGE
Earth Surface Dynamics
SDC
MC
MASS CHANGE
Large-scale Mass Redistribution

Weather and Climate

Weather

The mix of events that happen each day in our atmosphere

Weather isn’t the same all around the world

It is different in different parts of the world and changes over minutes, hours, days, and weeks.

Most weather happens in the part of Earth’s atmosphere that is closest to the ground (the troposphere)

Weather and Climate

Weather

Factors that can change the atmosphere in a certain area

Air pressure,

Wind Speed and Direction

Humidity,

Temperature,

Together, they determine what the weather is like at a given time and location.

Weather and Climate

Climate

Describes what the weather is like over a long period of time in a specific area.

Different regions can have different climates

Looking at

averages of precipitation, temperature, humidity, sunshine, wind, and other measures of weather that occur over a long period in a particular place.

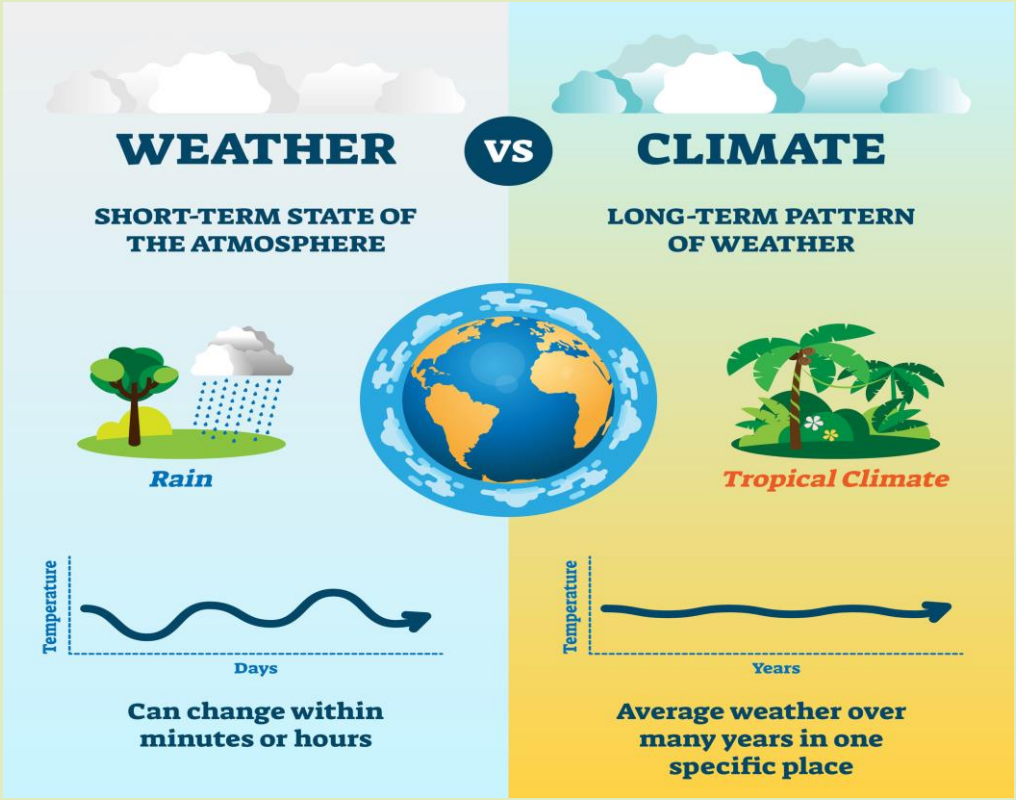
Weather and Climate

Weather

tells you what to wear each day.

Climate

tells you what types of clothes to have in your closet.

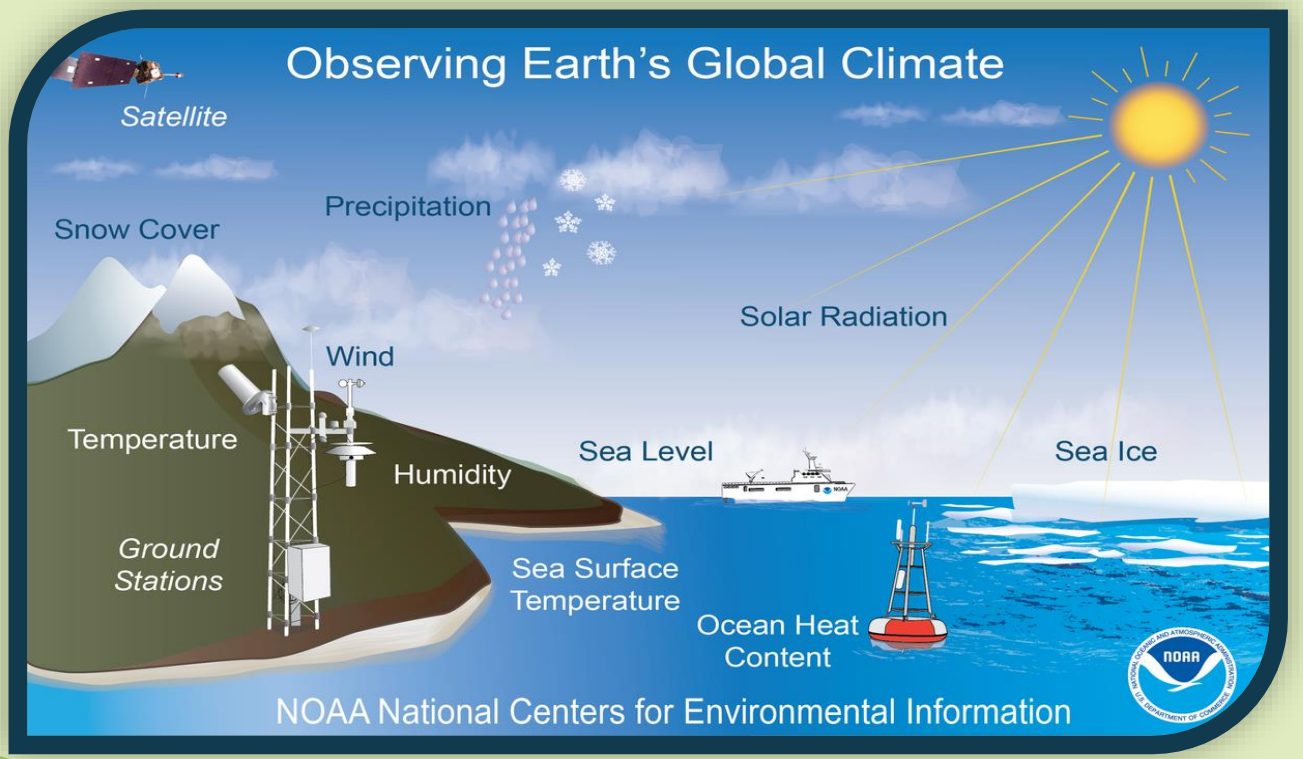


Global climate

Global climate is a description of the climate of a planet as a whole, with all the regional differences averaged

It depends on the amount of energy received by the sun and the amount of energy that is trapped in the system and, these amounts are different for different planets.

Scientists who study Earth's climate look at the factors that affect our planet as a whole.



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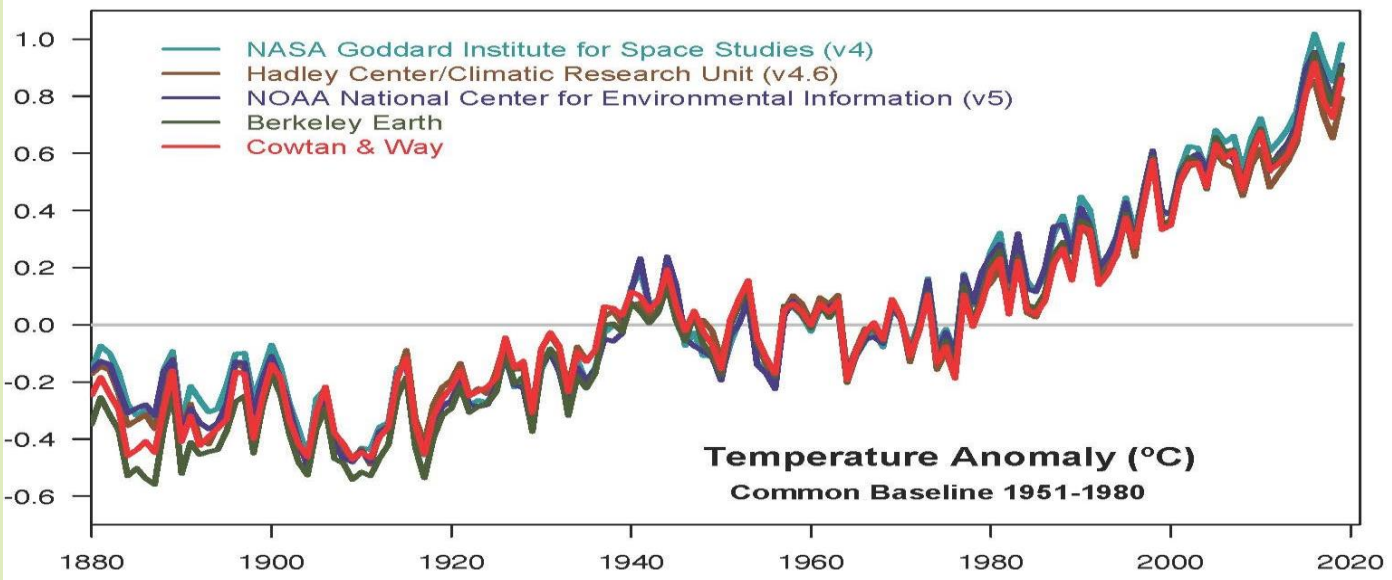
What is the Climate Change?

What is the Climate Change?

Climate change is a change in the average temperature and cycles of weather over a long period of time.



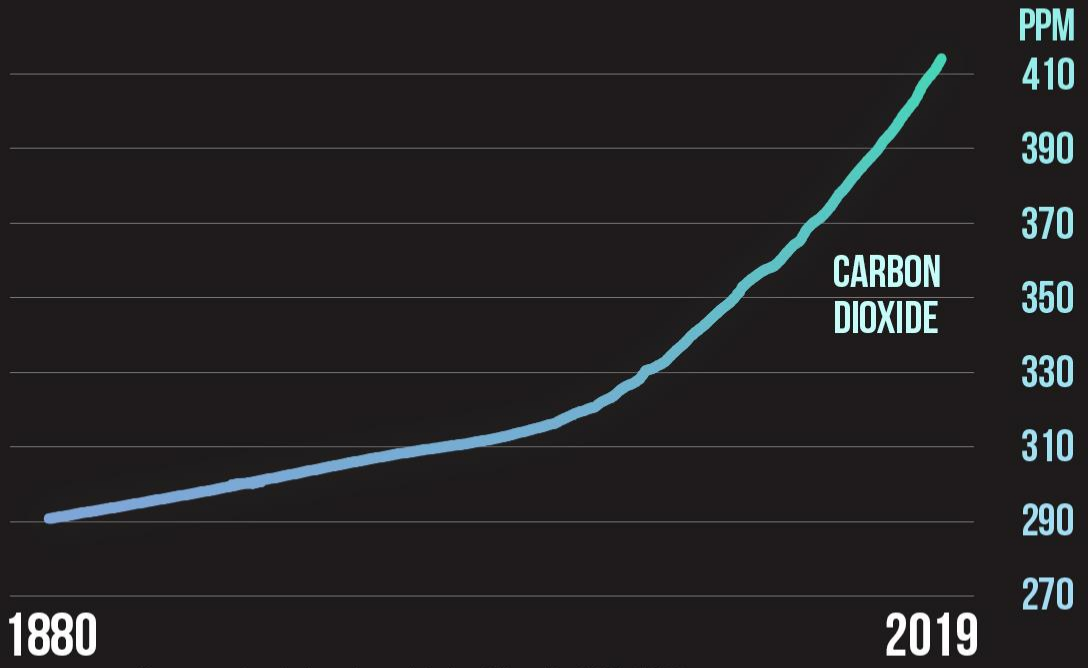
Potter, Sean; Cabbage, Michael; McCarthy, Leslie (19 January 2017). "NASA, NOAA Data Show 2016 Warmest Year on Record Globally" (Press release). NASA. Retrieved 20 January 2017.

What is the Climate Change?

- Carbon dioxide (CO_2), methane (CH_4) and water vapour (H_2O) are **greenhouse gases** that are found in the atmosphere.
- Energy travels from the Sun to the Earth as short wave radiation. It does not interact strongly with the greenhouse gas molecules so it reaches the Earth's surface.
- The Earth's surface emits long wavelength radiation which interact with the greenhouse gas molecules.
- The greenhouse gas molecules absorb some of the energy, trapping it in the atmosphere.
- This process keeps the Earth warm and is essential for life.
- The higher the proportion of greenhouse gases in the atmosphere, the more radiation is absorbed.
- This causes a rise in the temperature of the Earth and is known as the **greenhouse effect.**
- This increase in temperature drives **climate change.**

The Greenhouse Effect

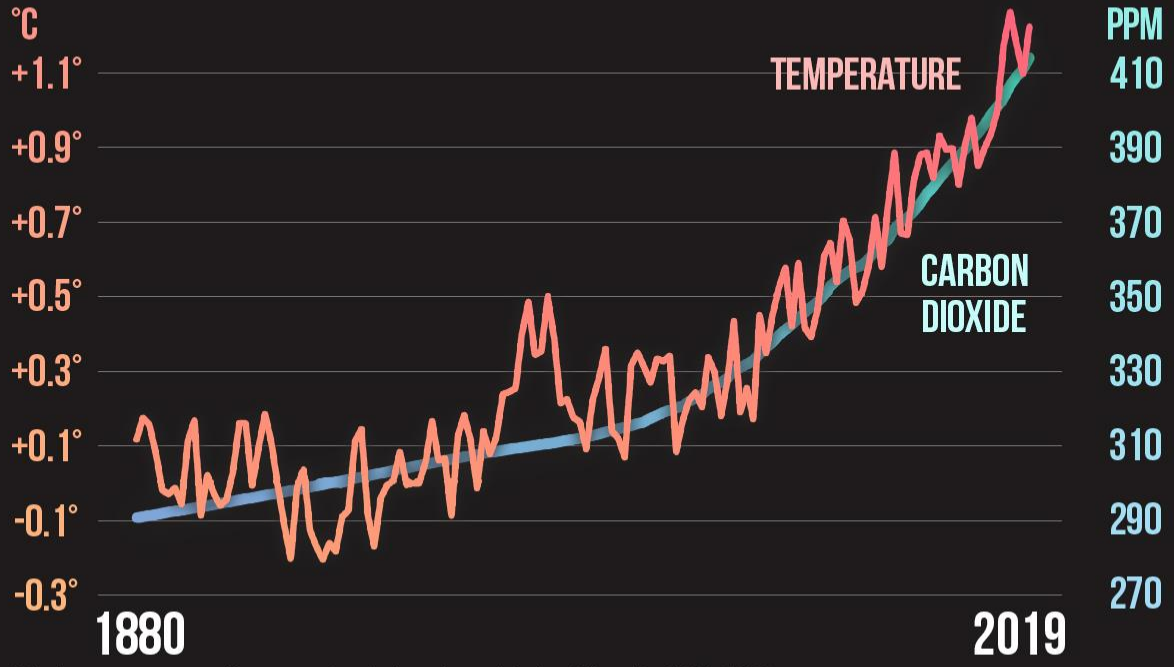
GLOBAL
TEMPERATURE & CARBON DIOXIDE



Global temperature anomalies averaged and adjusted to early industrial baseline (1881-1910)
Global annual average carbon dioxide
Source: NASA GISS, NOAA NCEI, ESRL

CLIMATE CENTRAL

GLOBAL
TEMPERATURE & CARBON DIOXIDE



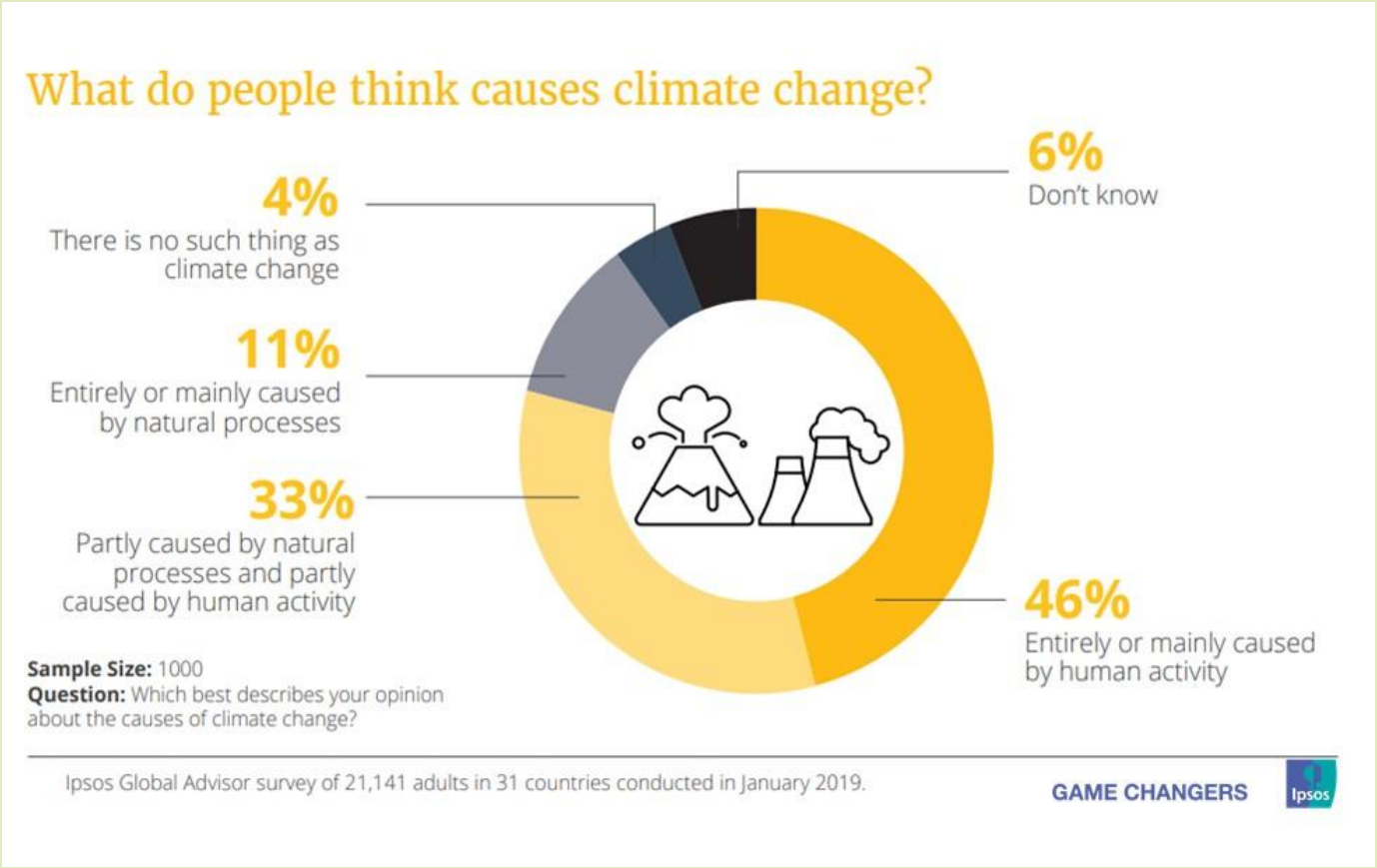
Global temperature anomalies averaged and adjusted to early industrial baseline (1881-1910)
Global annual average carbon dioxide
Source: NASA GISS, NOAA NCEI, ESRL

CLIMATE CENTRAL

2

What are the Causes of Climate Change?

Causes of Climate Change



Causes of Climate Change

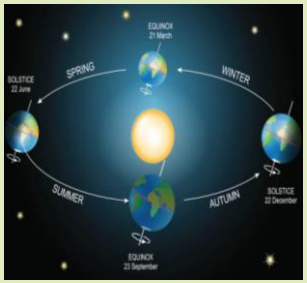
Natural

Artificial/ Anthropogenic

Causes of Climate Change

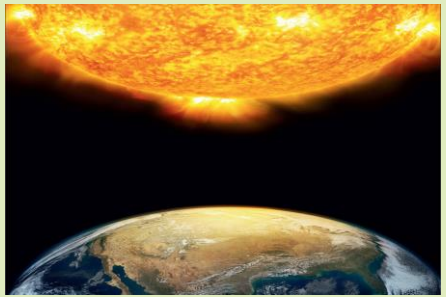
Natural

Changes in the Earth's Orbit and Rotation



Volcanic Activity

Variations in Solar Activity



Changes in the Earth's Reflectivity

Changes in Naturally Occurring Carbon Dioxide Concentrations

Causes of Climate Change

Artificial / Anthropogenic

Waste

Deforestation

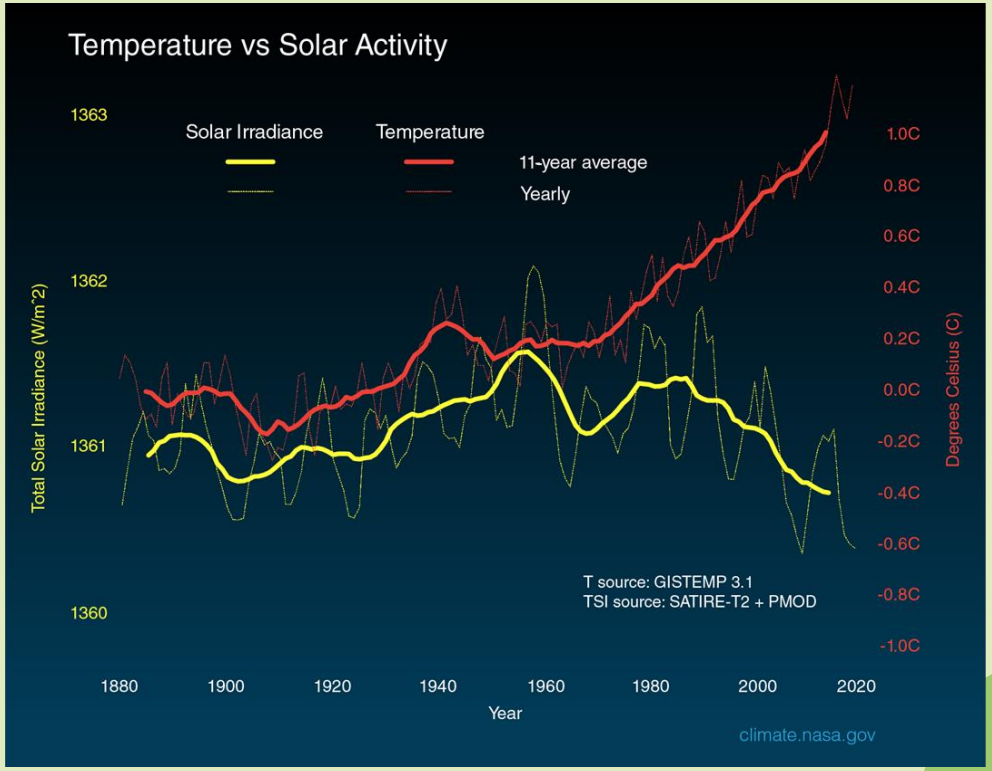
Breeding

Industry

Causes of Climate Change

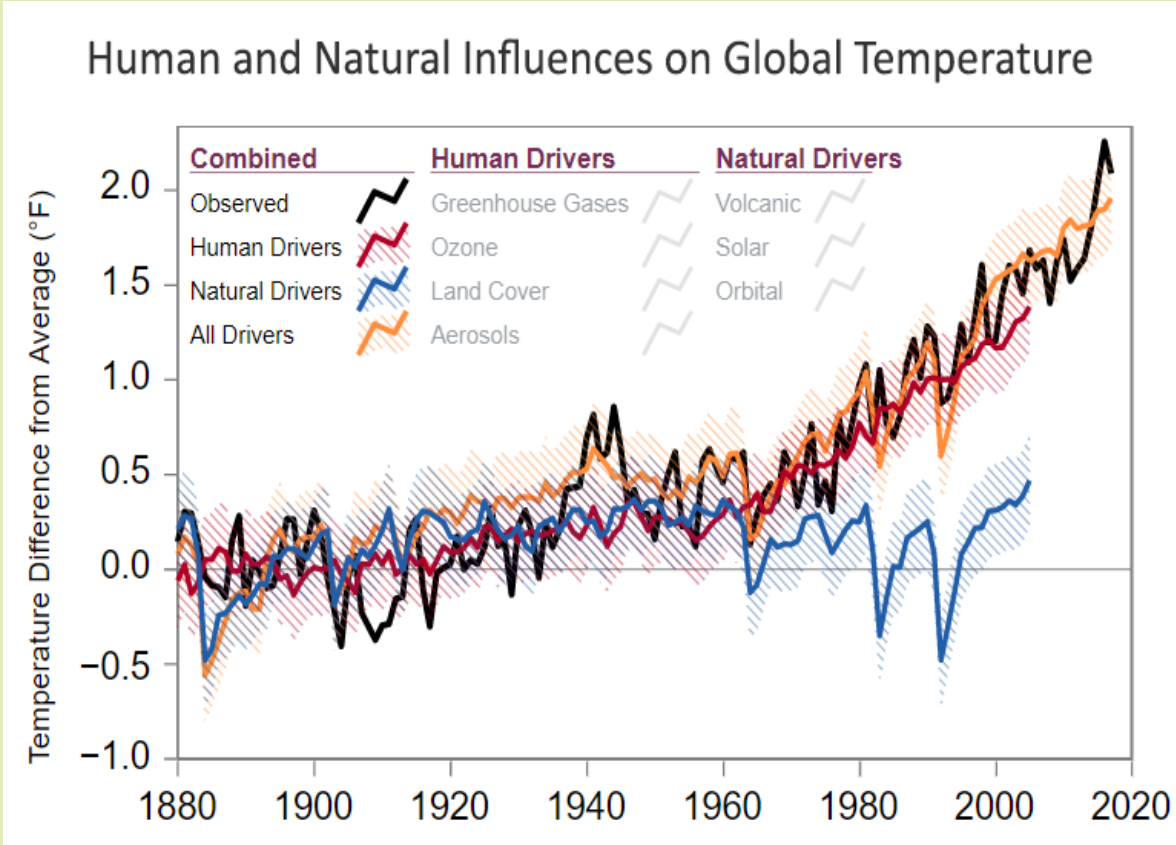
Recent warming is not from the sun
Solar output has
stalled and dropped since the 1970s

Global temperature has continued to rise



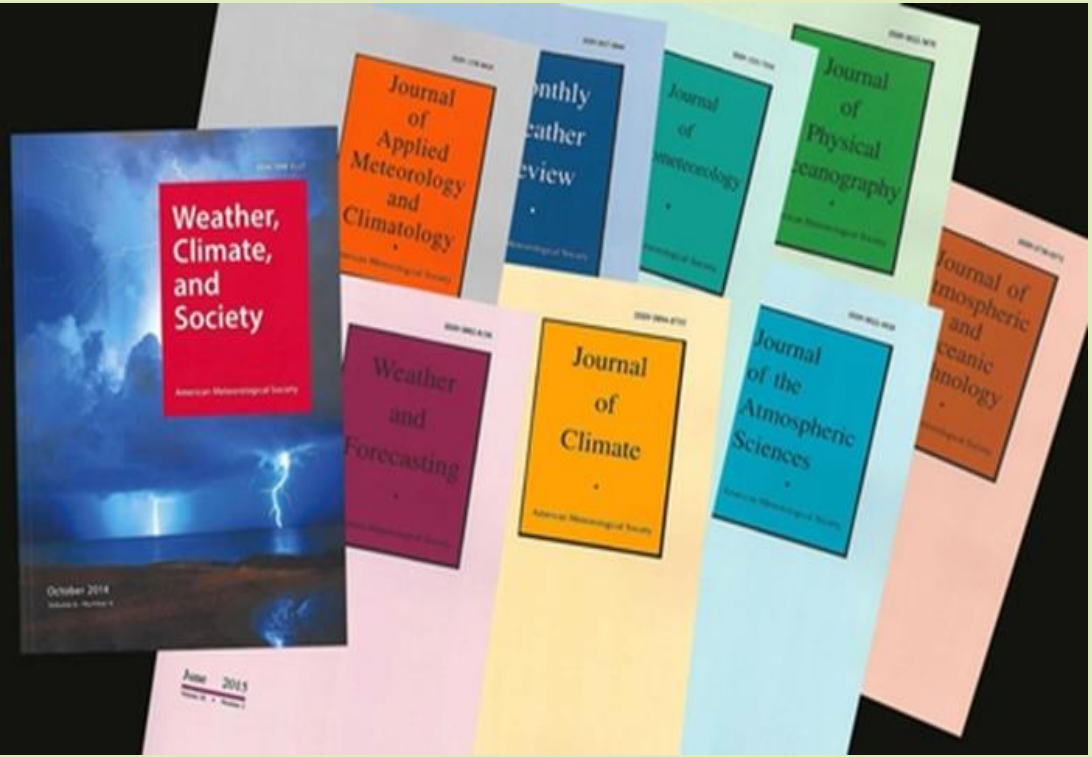
Causes of Climate Change

Human and natural factors both influence the earth's climate, but the long-term trend observed over the past century can only be explained by the effect of human activities on climate.



U.S. Global Change Research Program, Fourth National Climate Assessment, Chapter 2: Our Changing Climate, 2017.

Causes of Climate Change



97 - 99.9%

Actively publishing climate scientists

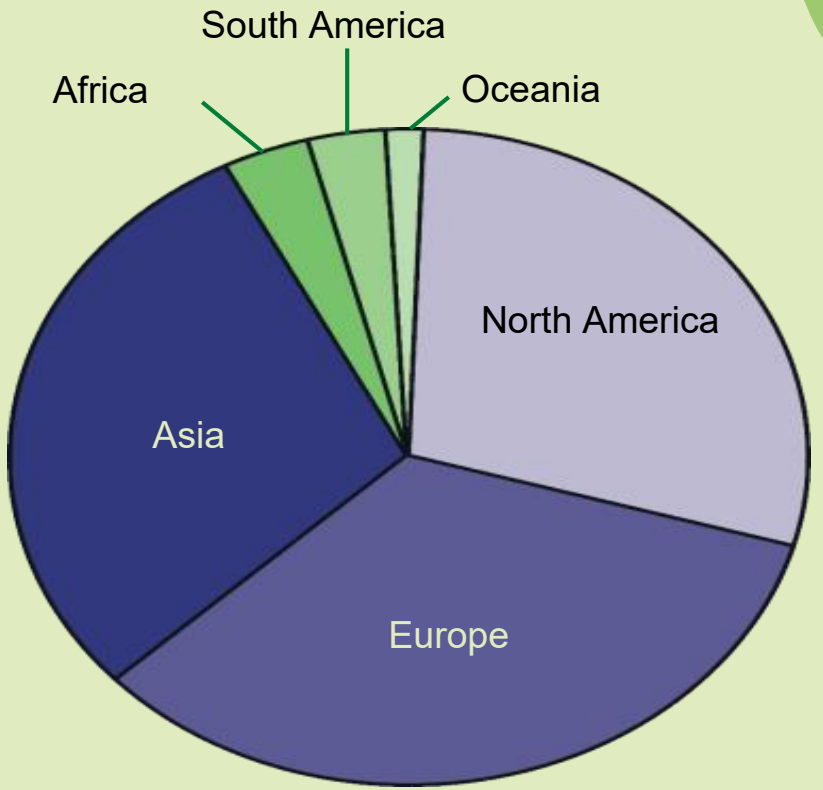
Scientific research studies published in peer-reviewed scientific journals find that

human-caused climate change is happening.

Causes of Climate Change

The USA, the EU and China alone have contributed around 60%.

The 50 least developed countries are thought to have contributed 1% of the greenhouse gases that have caused global warming.



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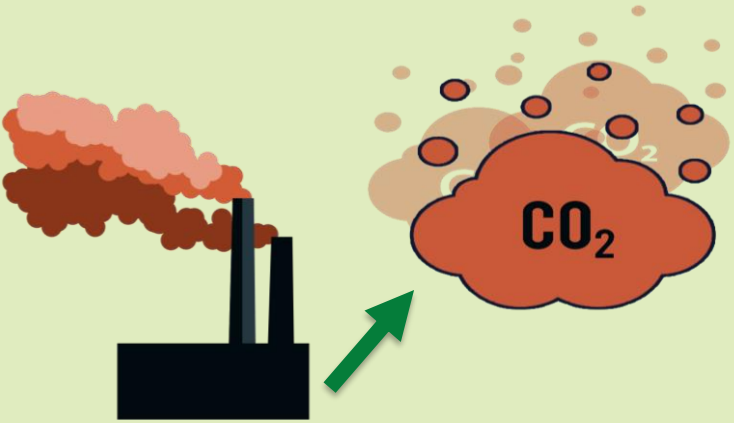
What are the Impacts and Consequences?

Consequences



Rising seas

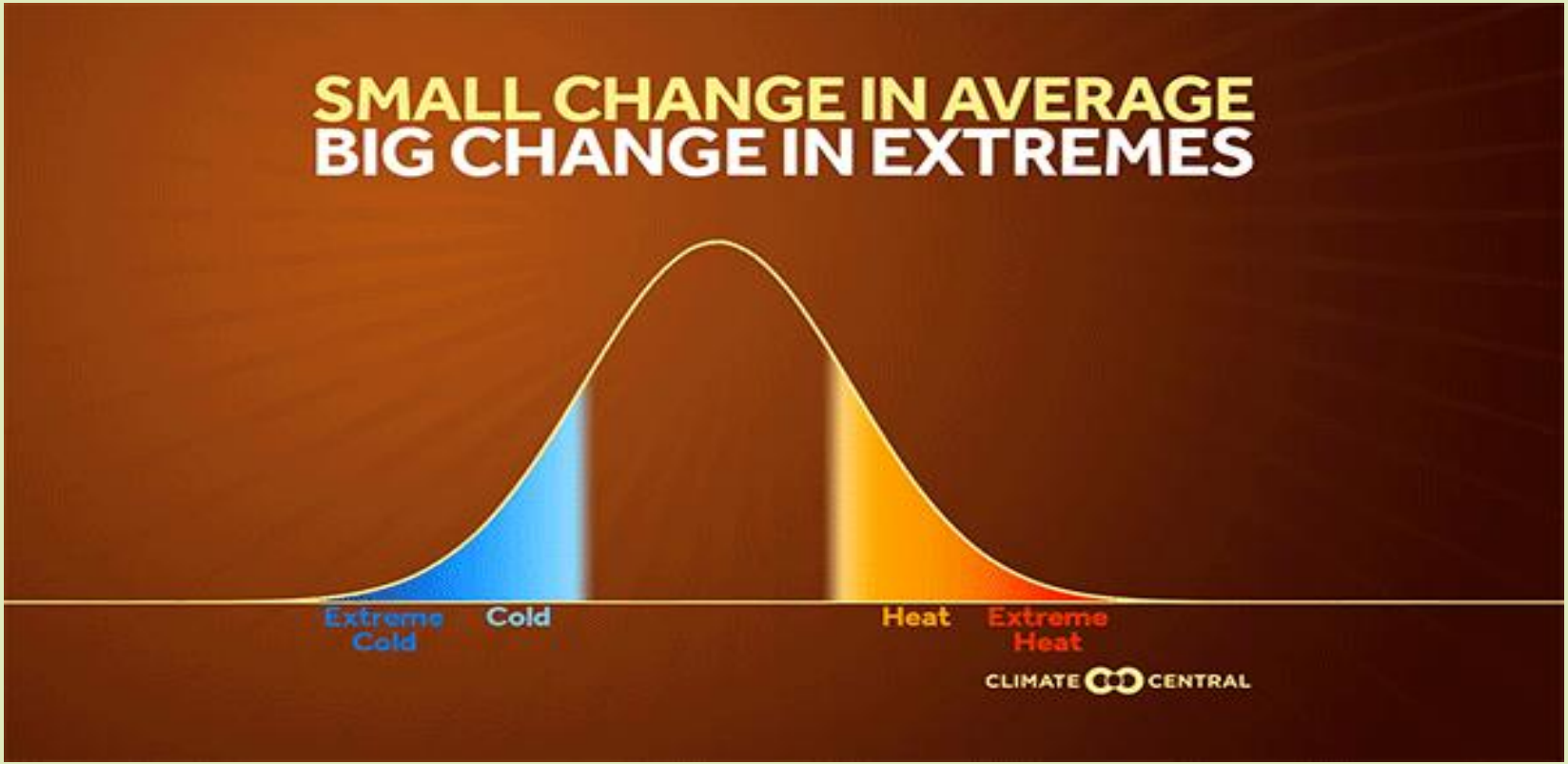
Wild weather

Environment

Health

Economy

Consequences



Consequences

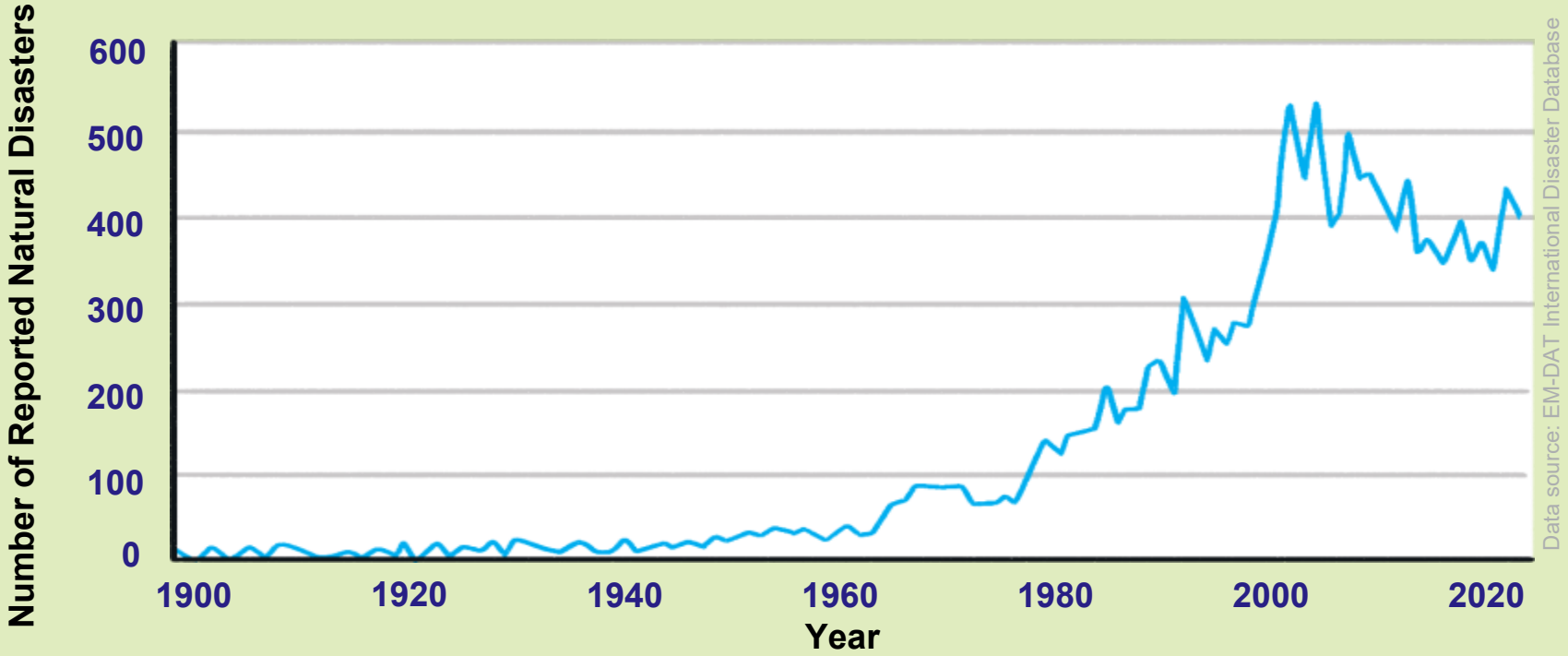
Climate change disrupts weather patterns and causes extreme weather events to become more common.
These include

hurricane activity, Droughts & forest fires and floods.



Consequences

As the global temperature has increased, so has the number of reported natural disasters.



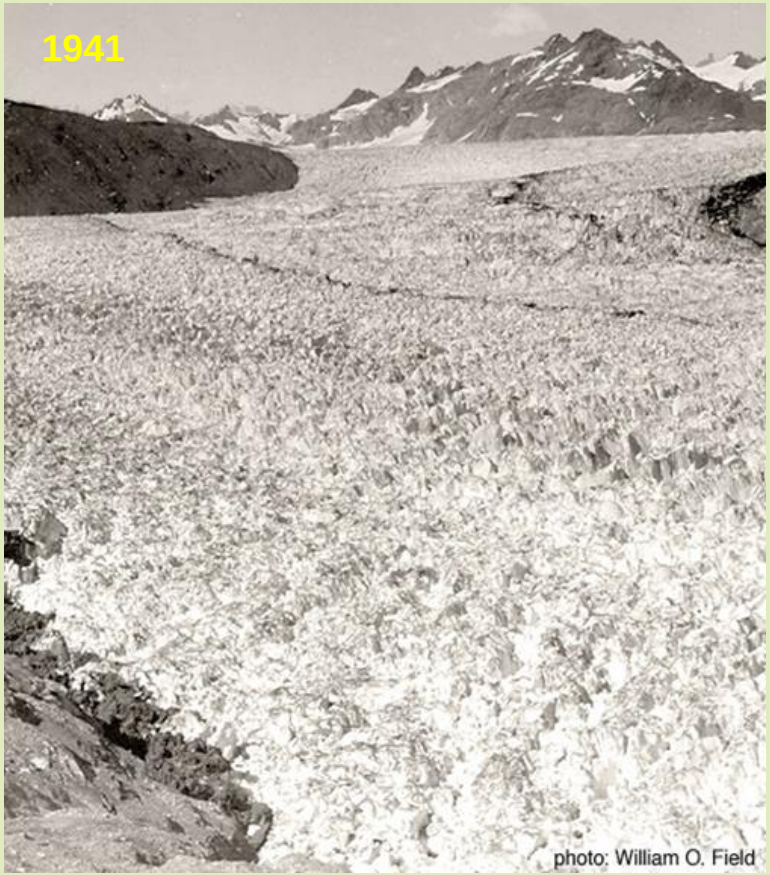
Consequences

Ice melting

https://www.nps.gov/articles/bear-glacier-retreat-article.htm

Consequences

Muir Glacier



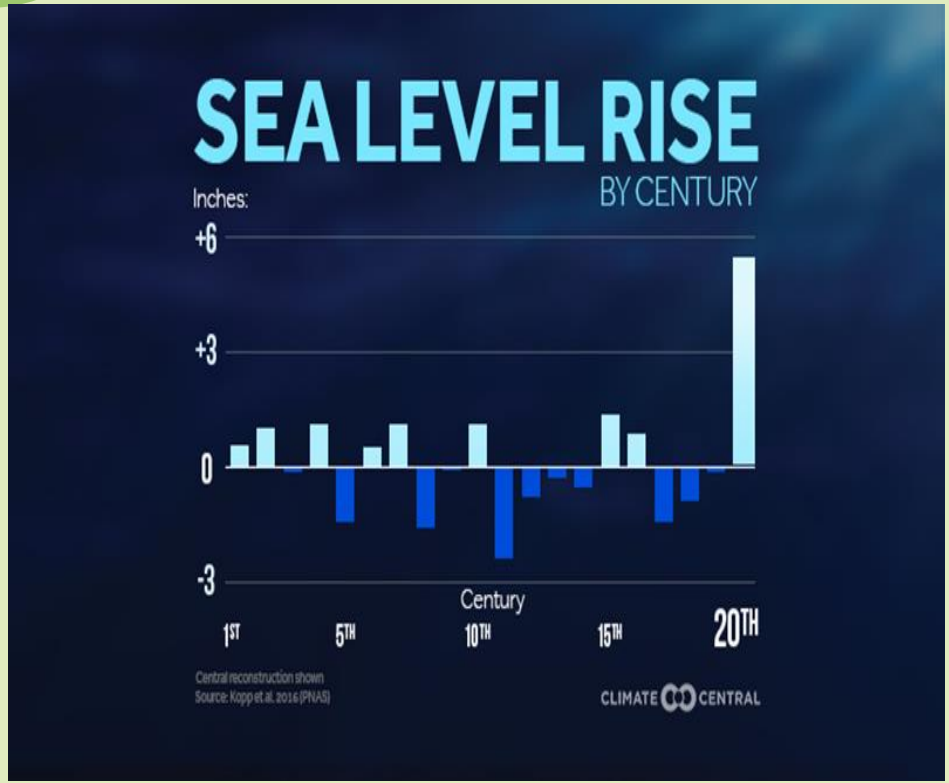
https://nsidc.org/the-drift/2014/01/glacier-photographs-past-and-present/

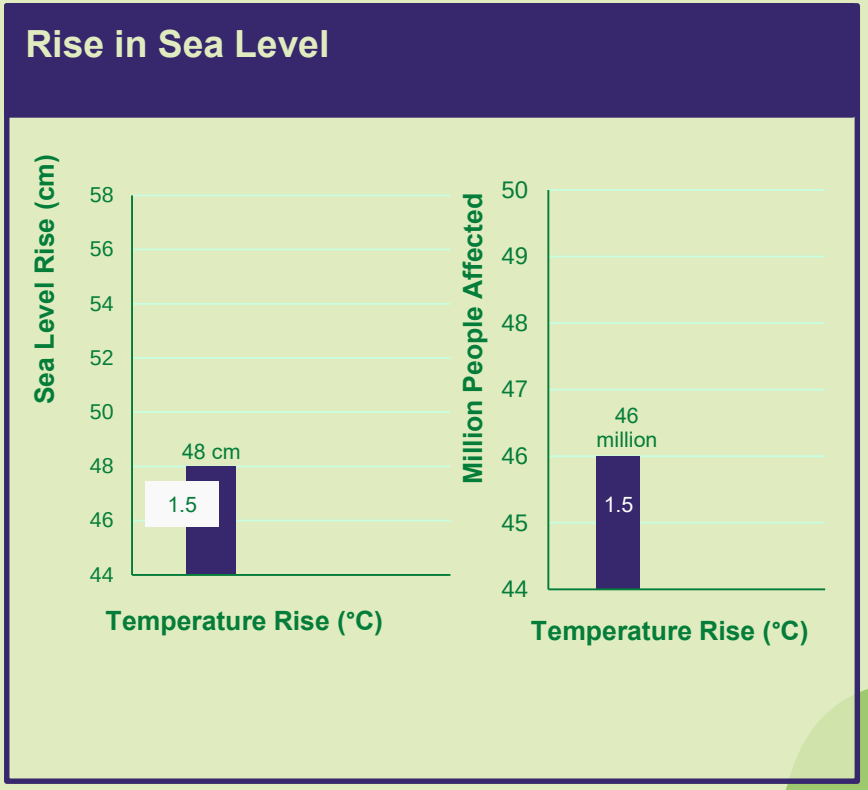
Consequences

Pedersen Glacier

https://nsidc.org/the-drift/2014/01/glacier-photographs-past-and-present/

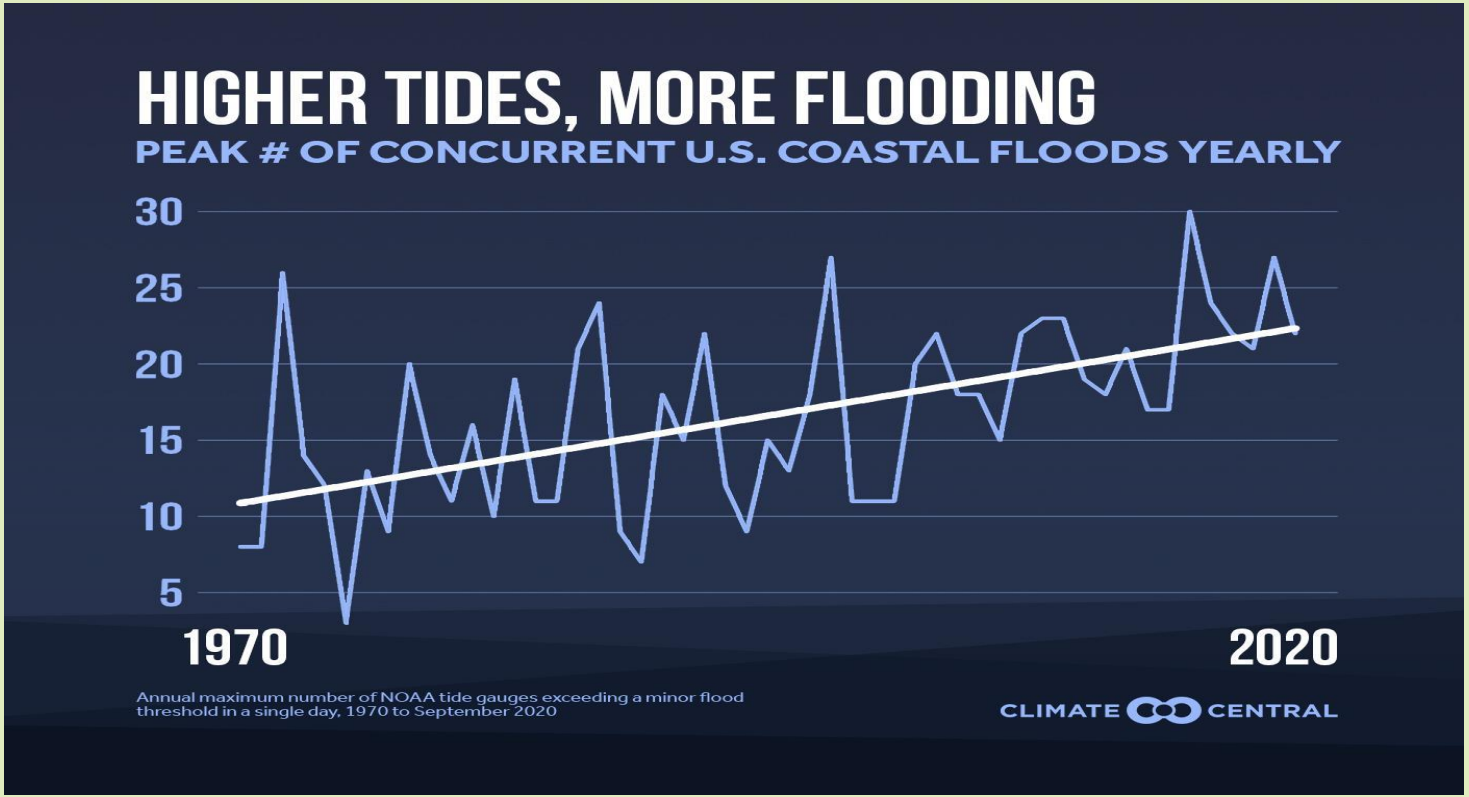
Consequences





https://www.climatecentral.org/outreach/alert-archive/2016CoastalFloodDays.php?market=NYC

Consequences

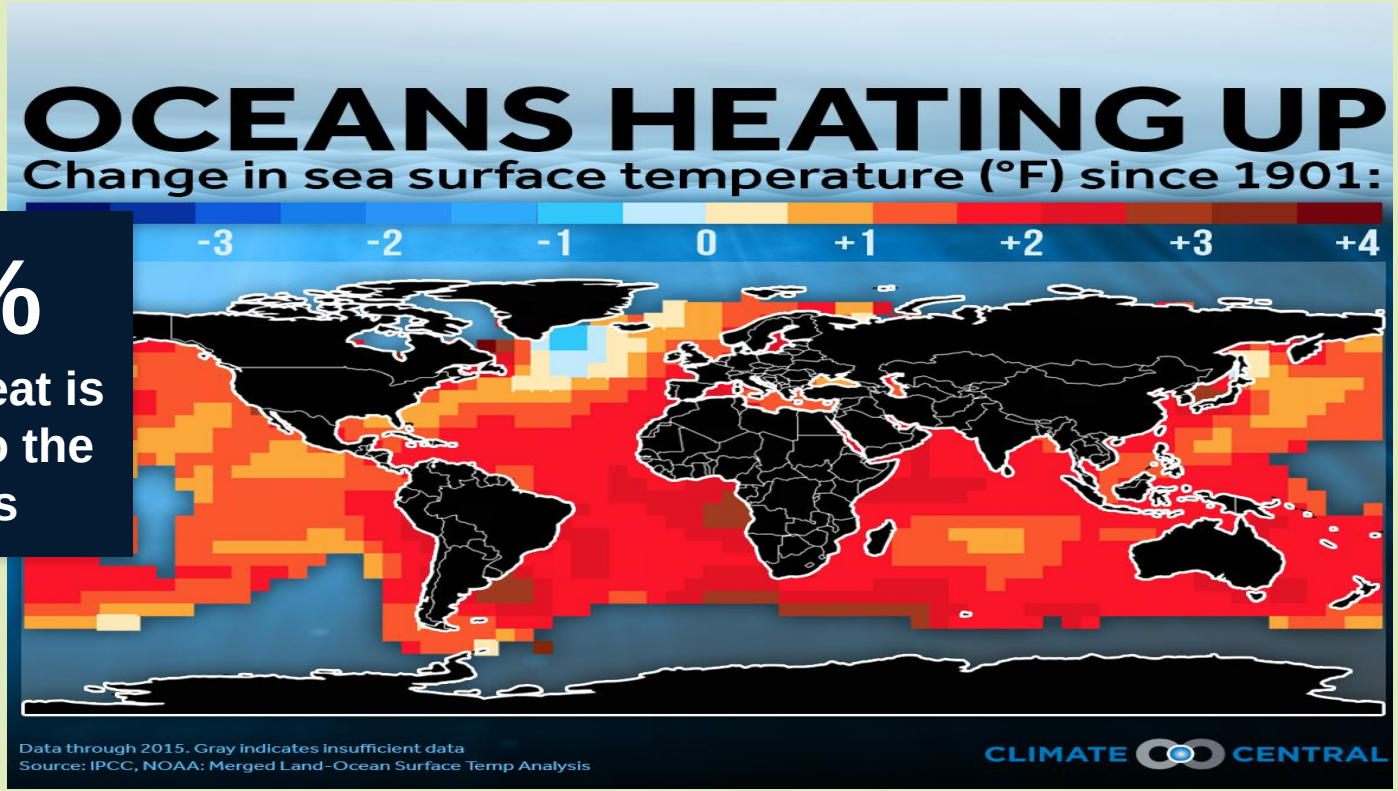


https://medialibrary.climatecentral.org/resources/more-frequent-and-pervasive-coastal-flooding

Consequences

93%

of extra heat is going into the oceans



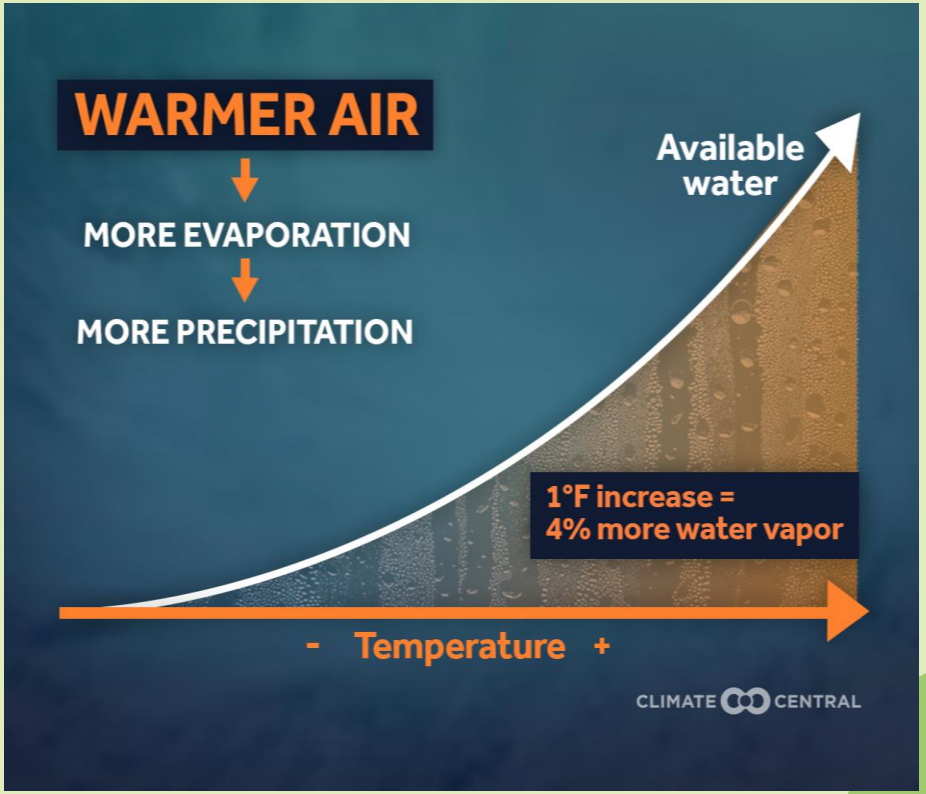
https://www.climatecentral.org/outreach/alert-archive/2017/2017_6.06_WorldOceansDay.php

Consequences

A warmer atmosphere holds more water vapor

Increase in temperature allows more evaporation into the atmosphere from surfaces (oceans, lakes, soils, plants), so more water is available in storms

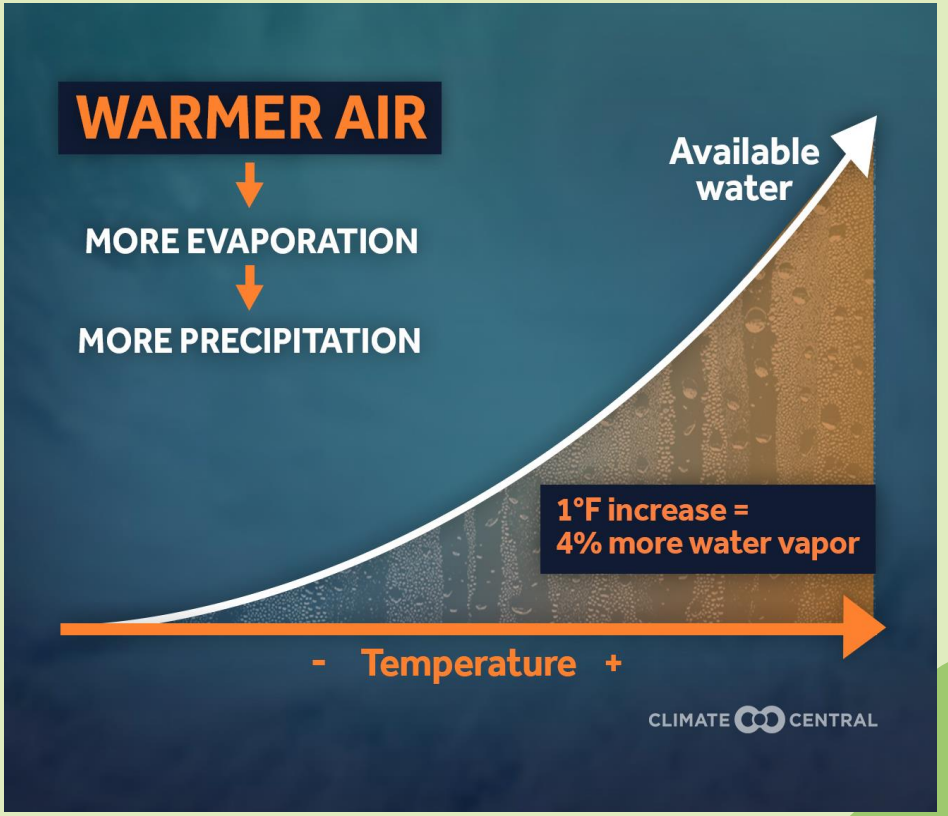
This effectively supercharges the water cycle, increasing the amount of rain and snow in heavy precipitation events but also leading to larger, longer droughts in certain regions



Consequences

Wet areas or wet seasons get wetter, dry areas or dry seasons get drier.

Increased potential for extremes in both directions

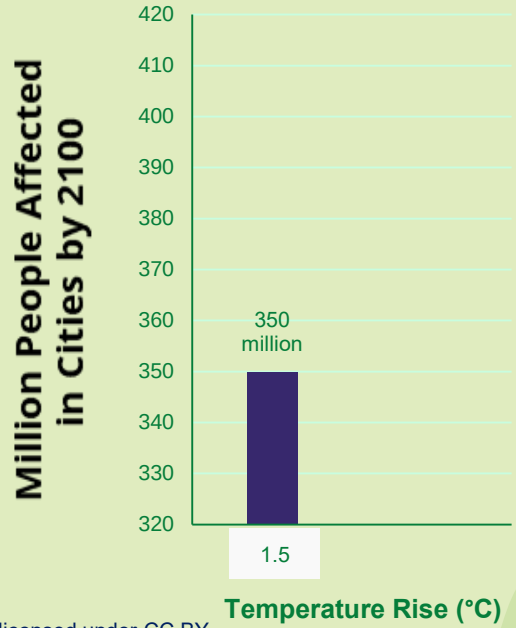


Consequences

Drought

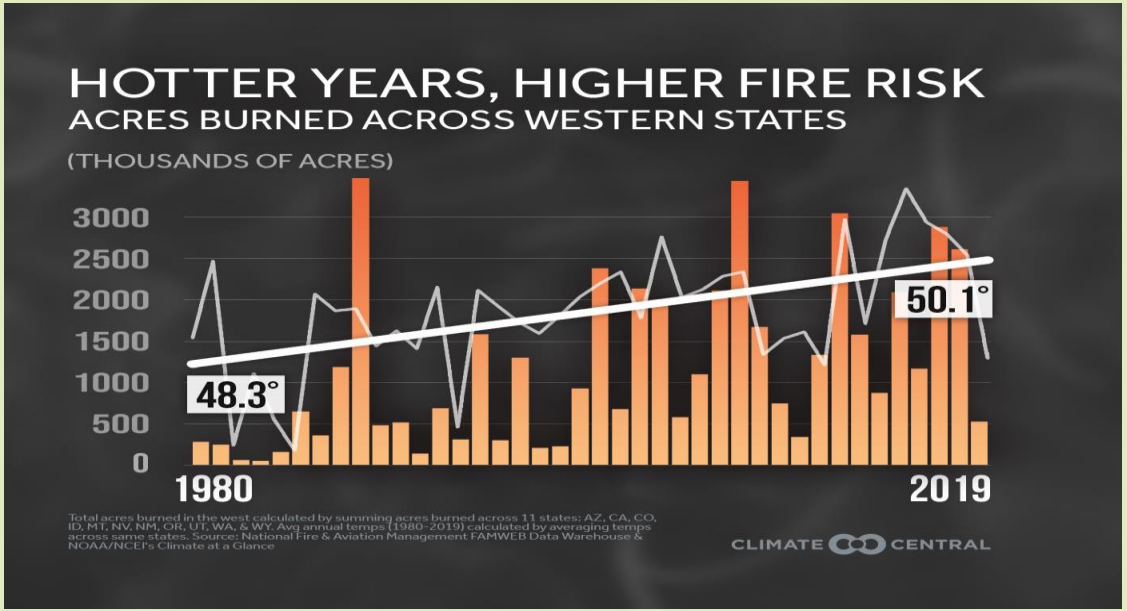
The flip side of a super-charged water cycle is more evaporation from land making dry areas drier, and we're seeing an increase in extreme droughts

Dried up fishing pans in Liuwa plain National Park by © Jasper Doest / WWF licensed under CC BY



Consequences

A warming climate, especially in areas susceptible to drought, allows vegetation to dry out more quickly, creating fuel to burn, so fires spread faster and further.



Consequences

Species Loss

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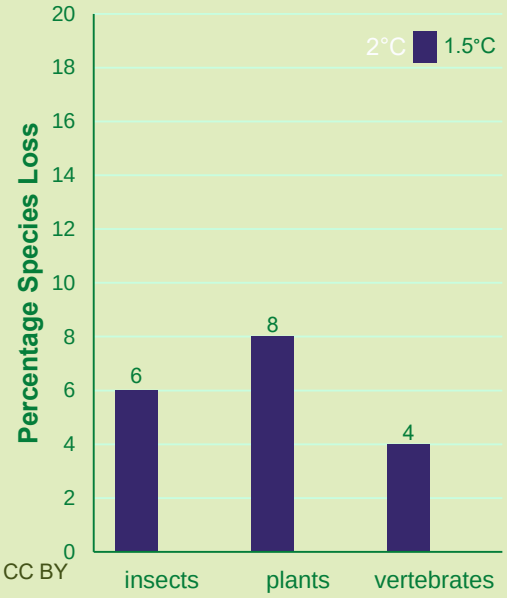
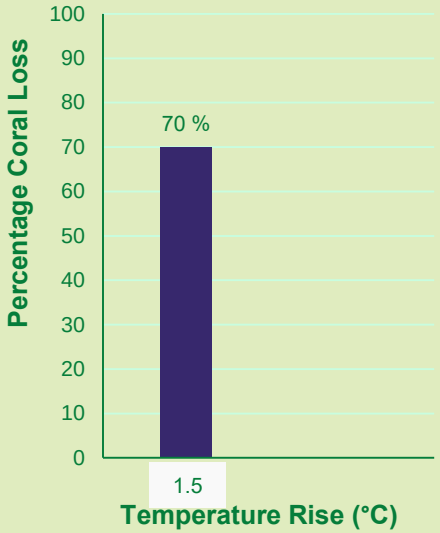


Coral Bleaching

Bleached coral, Maldives by © naturepl.com / Peter Scoones / WWF licensed under CC BY



Egypt

ahramonline

Egypt's heatwave death toll reaches 110

Governorates in Upper Egypt have been particularly hard hit by searing temperatures this August

Ahram Online , Thursday 20 Aug 2015

ahramonline

Egypt's flood death toll rises to 26: Health Ministry

Ahram Online , Saturday 29 Oct 2016

Egypt – Deadly Flash Floods in Red Sea and Sohag Areas

Health Impacts

Climate change is hurting our health

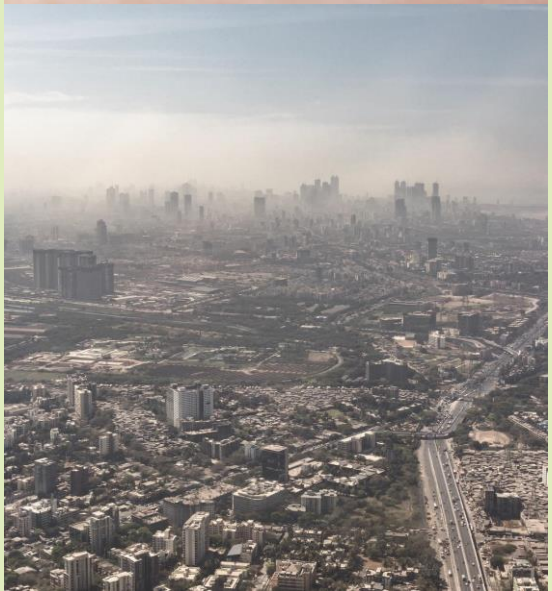
Worsening air quality

More heat-related illnesses

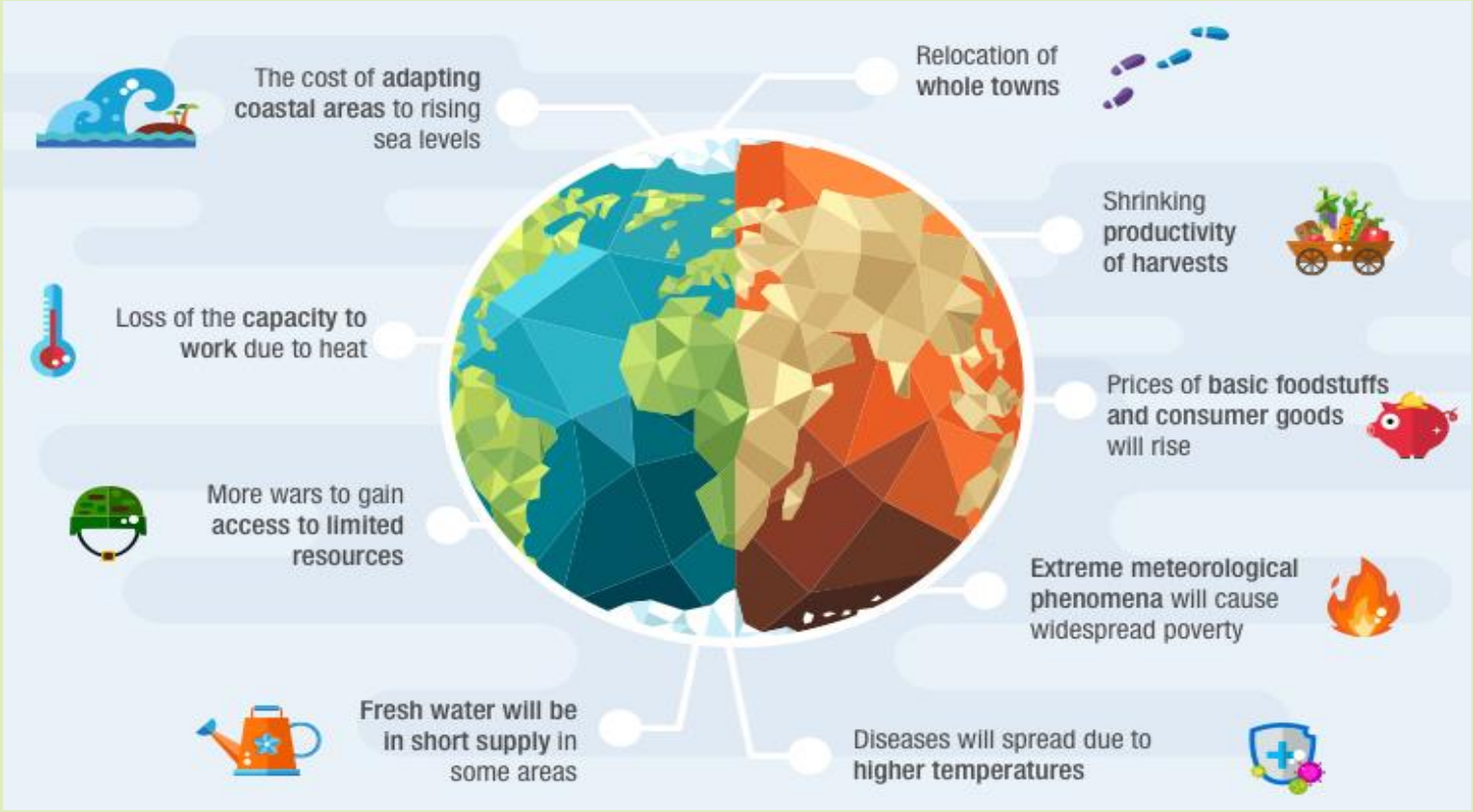
Longer, stronger allergy seasons

Increasing risk of insect and food-borne diseases

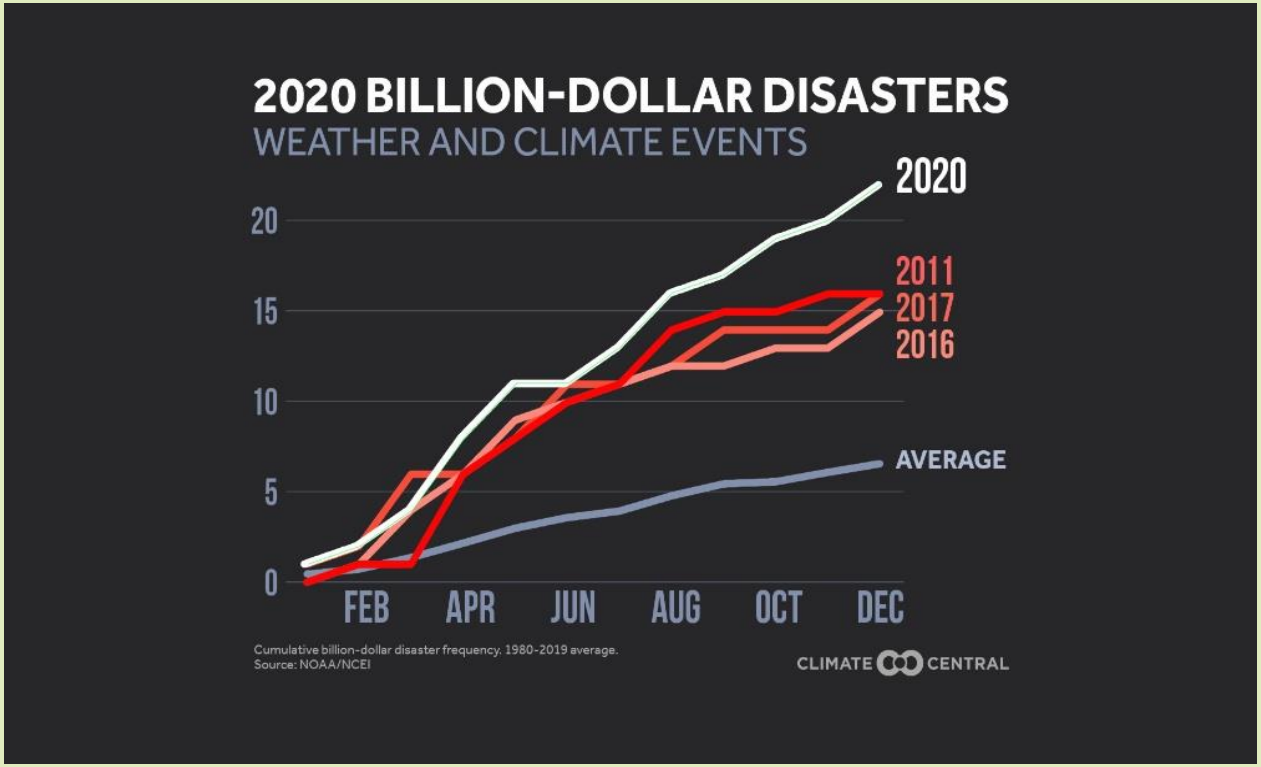
Climate change is impacting how we live our lives



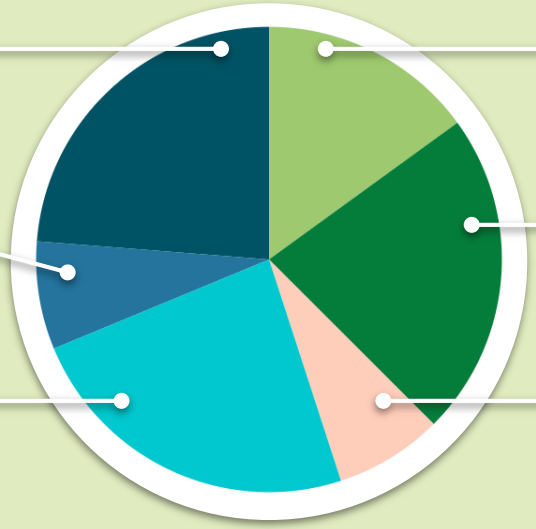
Social and Economic Impact



Social and Economic Impact



Expenditures in the World Economy



Asia
23,8%

Europe
15,0%

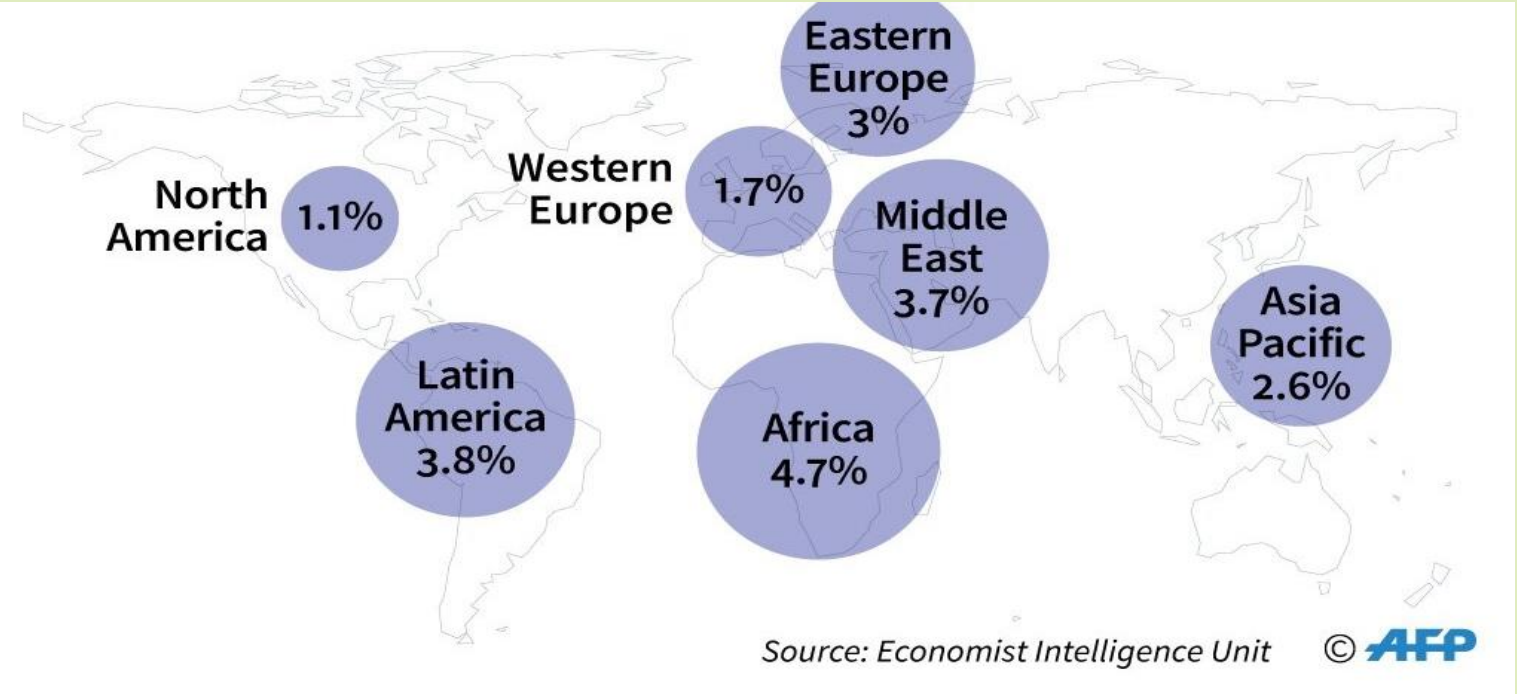
Africa
7,5%

North America
22,5%

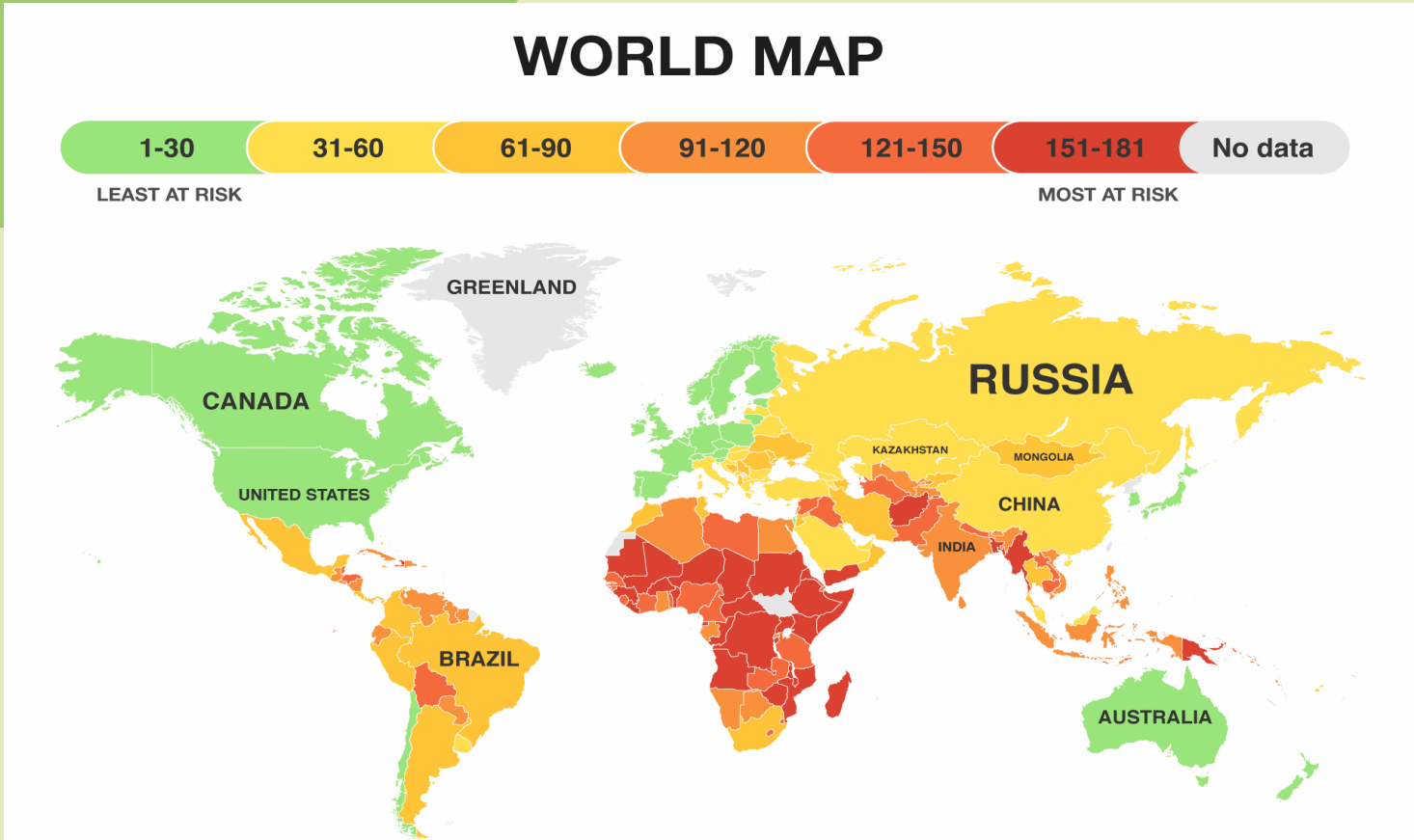
South America
23,8%

Oceania
7,5%

Avrage Real GDP Loss by 2050 in the World Economy



At the world



https://www.intelligentliving.co/maps-countries-survive-climate-change/

What are drastic impacts ?

1.5°C (2.7°F)	VS	2°C (3.6°F)
8.5-30 inches of sea level rise by 2100	**Sea Level Rise**	Additional 4 inches of sea level rise and 10.4 million more people exposed
Loss of **70-90%** of coral reefs	**Ecosystems**	Loss of **99%** of coral reefs
350 million people in urban areas exposed to severe drought	**Extreme Weather**	**410 million people** in urban areas exposed to severe drought
At least one sea-ice-free Arctic summer **after 100 yrs**	**Arctic Ice**	At least one sea-ice-free Arctic summer **after 10 yrs**

4

Recommendations

Recommendations

Electrifying Transport

Better Buildings

Recommendations

Grasslands

Coastal Wetlands

Peatlands

Forests

Maintain Natural Carbon Sinks & Flood Buffers

Who Can Save the planet

Governments

make laws and policies that reduce the amount of greenhouse gas emissions.

Businesses

change their processes to run more sustainably

We

make choices in our own lives that reduce our carbon footprint

use our voices to let businesses and governments know that we want them to act quickly to reduce their impact on climate change.

COP27

197 countries (parties) have signed up to the United Nations Framework Convention on Climate Change (UNFCCC).

The UNFCCC aims to prevent human activity from causing dangerous levels of climate change

Every time the member nations meet it is called a COP, which stands for Conference of the Parties. They look at the current state of the climate and discuss the actions they will take to address climate change.

This November will see the 27th of these meetings taking place, so you will hear the event being described as COP27 as well as the UN Climate Change Conference 2022. It will be hosted by Egypt in Sharm El-Sheikh

COP27

In 2015, at COP21 in Paris, the nations signed an agreement that set out an ambitious plan to tackle climate change. In the Paris Agreement, nations agreed to act together to restrict global temperature increases to 2°C and begin efforts to limit warming to 1.5°C.

To do this we will need to reach ‘net zero’ by 2050. This means that any carbon emissions will need to be balanced by removing carbon dioxide from the air.

Paris Agreement & Sustainable Development Goals

In the same year that the Paris Agreement was signed, 17 Sustainable Development Goals (SDGs) were adopted by all United Nations Member States.

Achieved to protect the planet and ensure that all people enjoy peace and prosperity.

Sustainable Features Matrix

Sustainable Development

The development that meets the needs of the present without compromising the ability of future generations to meet their own needs

Promote

Favors

Health

state of complete physical, mental and social wellbeing and not merely the absence of disease and infirmity and enjoyment of the highest attainable level

Environment

at least as good as the one we currently enjoy, if not better

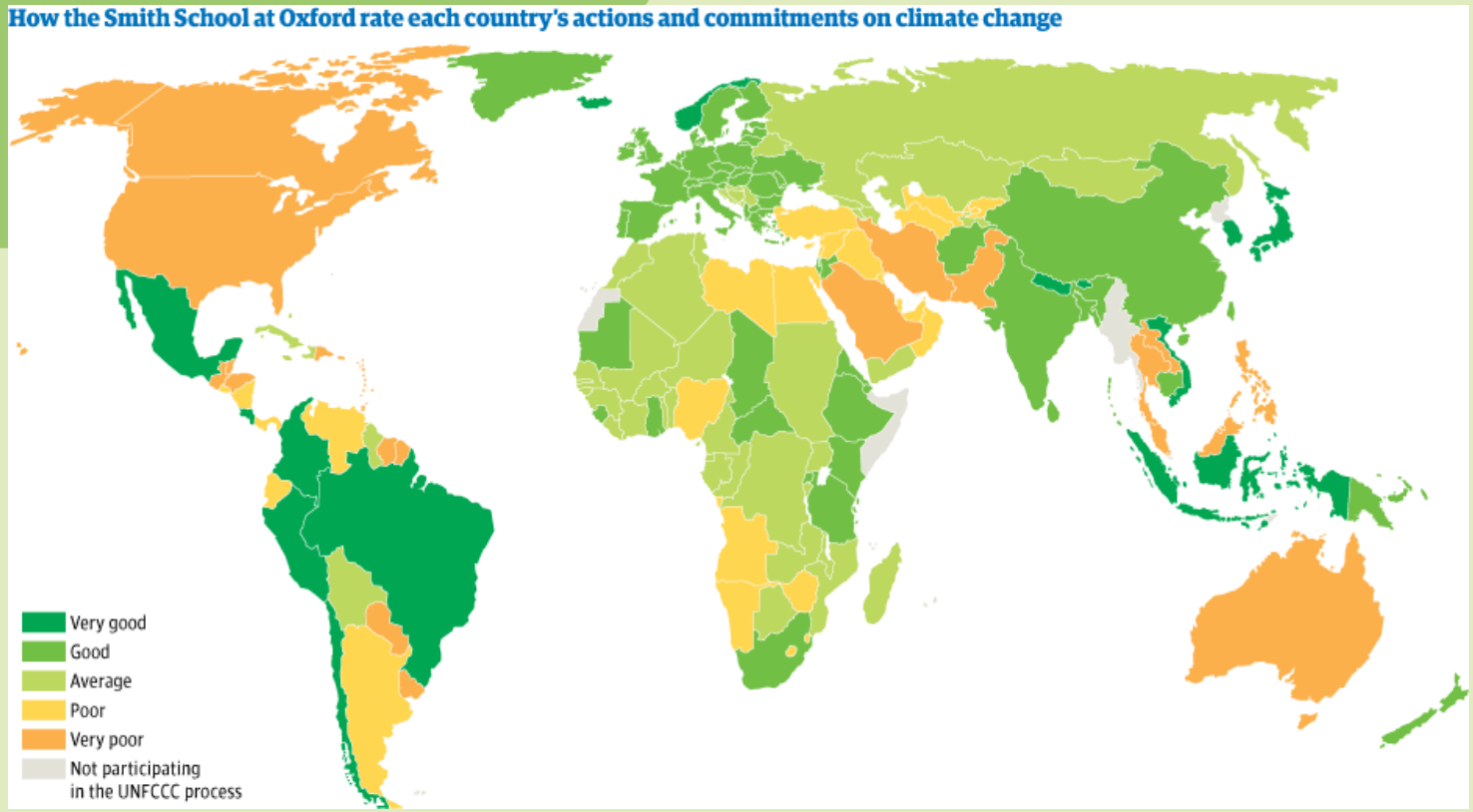
Improvement

Values

social and ethical dimensions

Stimulates

At the world (Action & Inaction)



https://www.theguardian.com/environment/graphic/2011/jul/15/smith-school-action-climate-change

Think Green

A Picture Is Worth A Thousand Words!

Recommendations

Eco Light

Bio Fruits

No Plastic

"What you do makes a difference, and you have to decide what kind of difference you want to make."

Dr. Jane Goodall

Thank You!

Do you have any questions?

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