EN-US

Adults

CL!MATE FRESK

All the cards are in your hands!

Climate Fresk - EN-US - Adults – V8.1 – 15/06/2022

How to play

You need one deck of cards per team (6 to 8 ppl), a 36" x 80" piece of paper or a paper table cover, pencils, an eraser, markers and some tape.

The goal is for each team to place the cards in order on the table, find all the cause and effect relationships, and draw arrows between the cards to illustrate what climate change is.

Deal the cards set by set. Place all the cards in one set before moving on to the next set.

Time intervals: one hour to place the cards, one hour to decorate the Fresk and one hour to sit down together, debrief and brainstorm courses of action!

Reflective

Creativity

Review

Debrief

For a simpler (or quicker) version of the game, take out cards #10, #14, #15 and/or #41, #42.

Human activities

1

1

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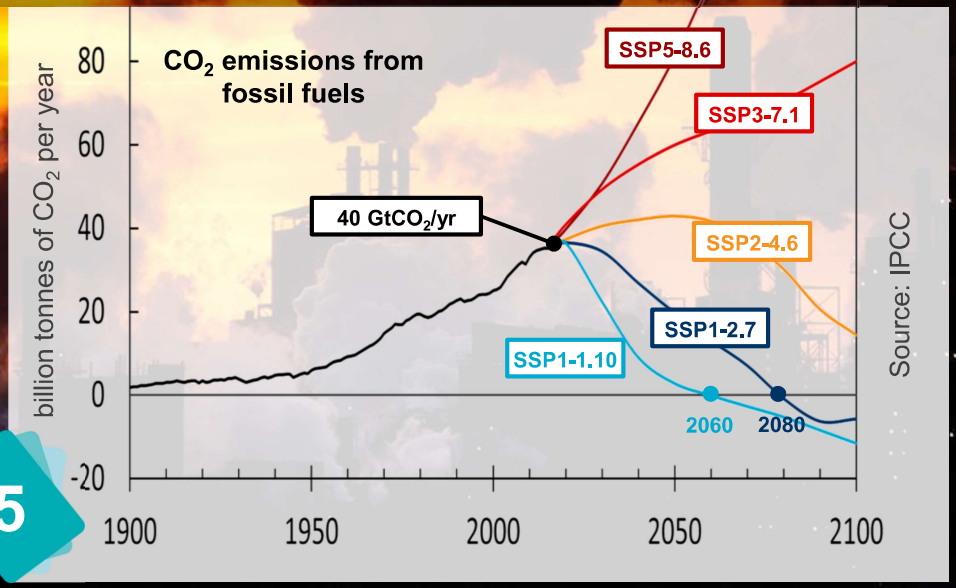
This is where it all begins…

Set 1

Fossil Fuels



5

5

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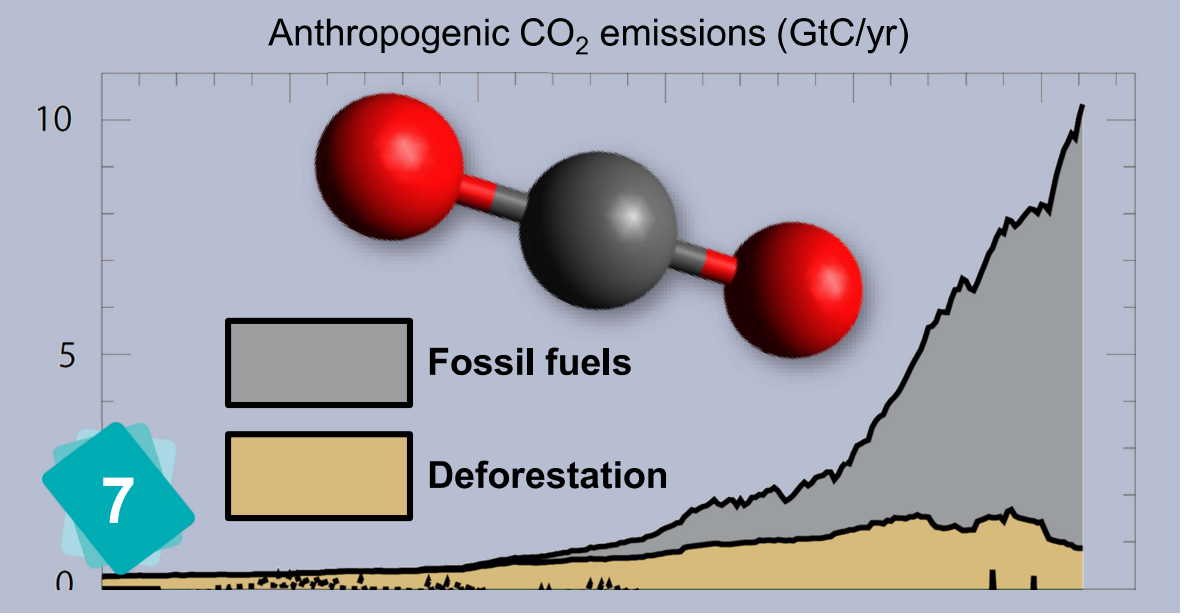
Fossil fuels are coal, oil and natural gas. They are used mainly in buildings, transportation and industry. They emit CO_2 when burned.

Set 1

CO_2 Emissions



7

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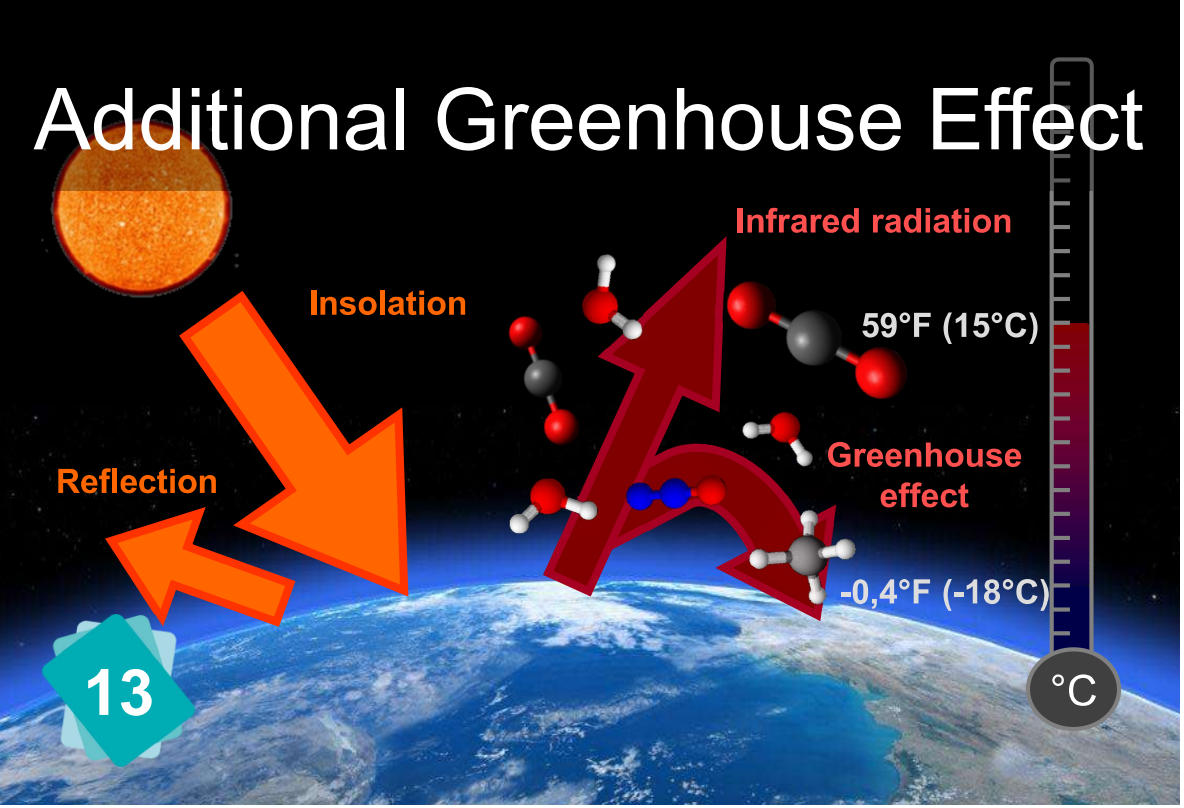
CO_2, or carbon dioxide, is the main anthropogenic (produced by human activities) greenhouse gas in terms of emissions. These emissions come from our use of fossil fuels and from deforestation.

Set 1


Additional Greenhouse Effect
Infrared radiation
Insolation
59°F (15°C)
Reflection
Greenhouse
effect
-0,4°F (-18°C)
°C
13

13

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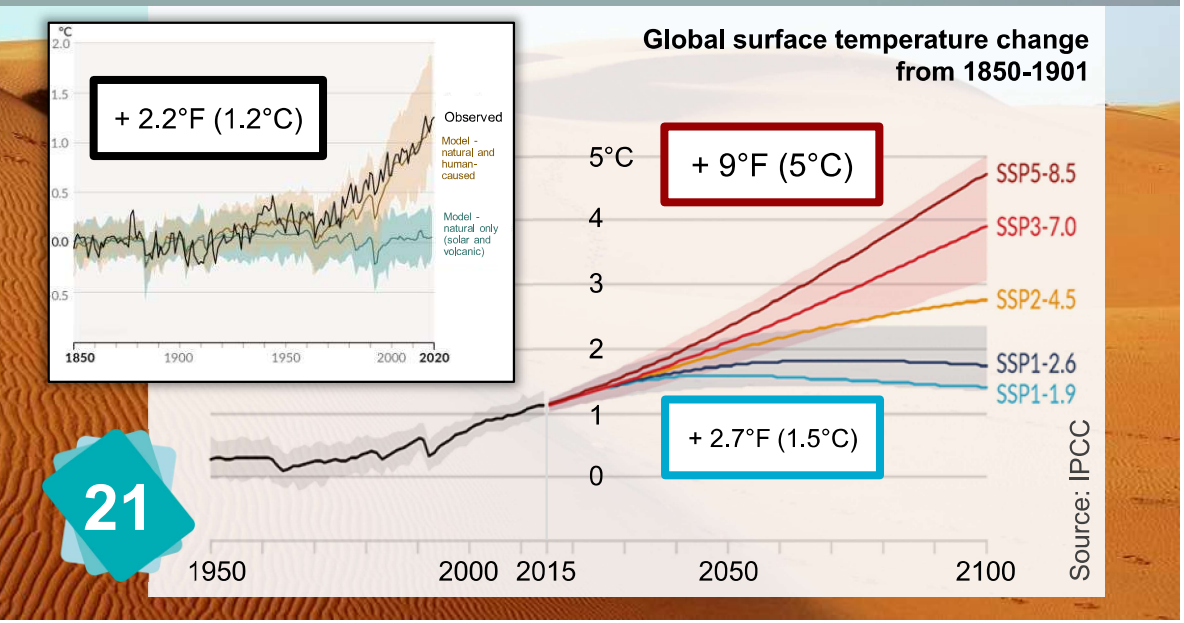
The greenhouse effect is a natural phenomenon - and incidentally, the most common GHG is water vapour. Without the greenhouse effect, the planet would be 59°F (33°C) colder and life as we know it would not be possible.
But CO_2 and other GHGs related to human activities amplify the greenhouse effect and unbalance the climate.

Set 1

Rising Temperatures



21

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The average air temperature at the surface of the Earth has increased by 2.2°F since 1900. Possible future emission scenarios predict that this increase will reach between 2.7°F (1.5°C) and 9°F (5°C) by 2100.

During the last ice age 20,000 years ago, the average air temperature was only 9°F (5°C) lower than today, and warming up took 10,000 years.

Set 1

Melting Sea Ice

18

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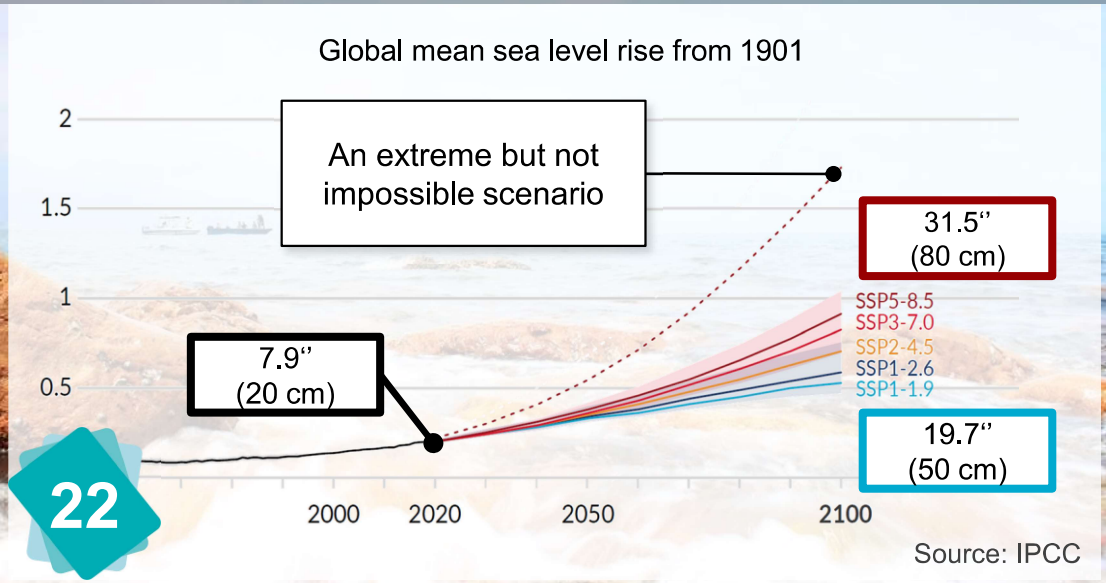
Sea ice melting does not make the sea level rise (just as a melting ice cube does not make a glass overflow). However, when it melts, it gives way to the darker surfaces of the water which absorb the sun's rays.

Set 1

Rising Sea Levels



22

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Since 1900, sea levels have risen by 7.9" (20 cm). This is caused by the thermal expansion of ocean waters and the melting of glaciers and ice sheets.

Set 1

Industry

2

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Industry uses fossil fuels and electricity. It accounts for 40% of greenhouse gas (GHG) emissions.

Set 2

Building Use

3

3

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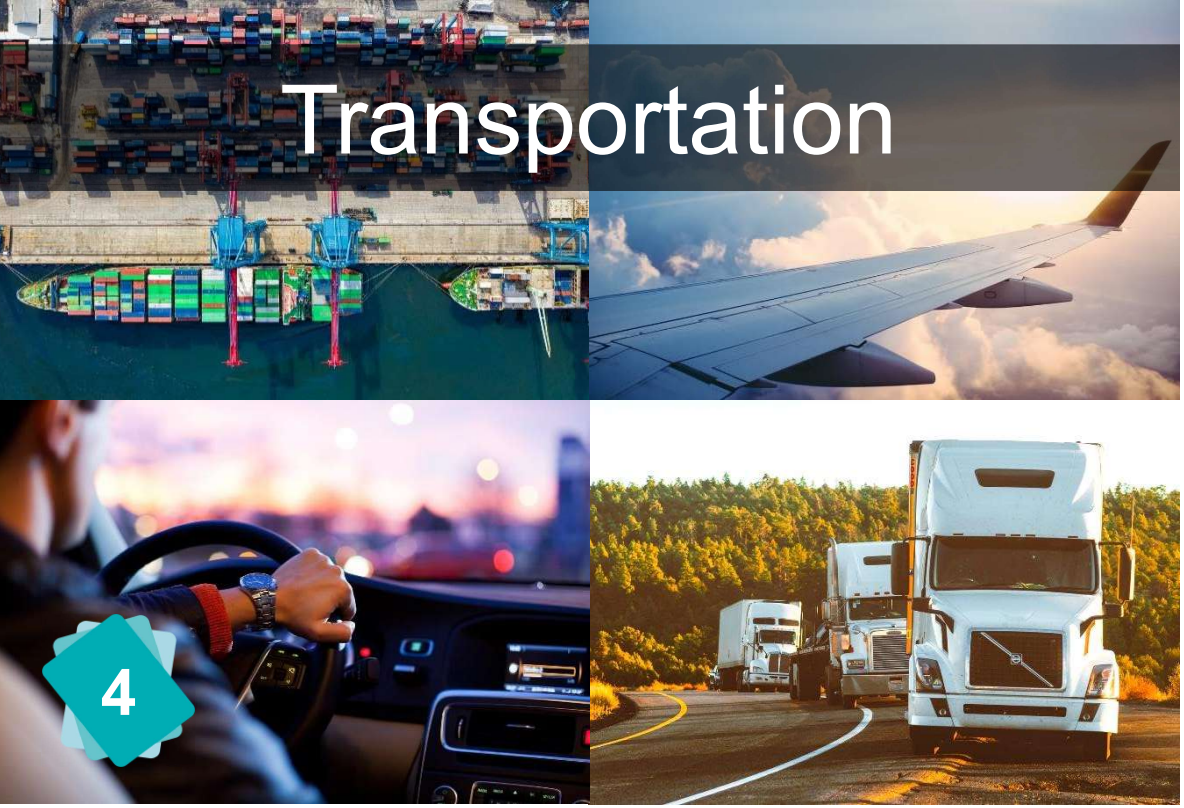
The building sector (housing and commercial) uses fossil fuels and electricity. It accounts for 20% of greenhouse gas (GHG) emissions.

Set 2



Transportation

4

4

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The transportation sector is highly dependent on oil. It accounts for 15% of greenhouse gas emissions.

Set 2

Deforestation

6

6

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Deforestation is defined as cutting down or burning trees beyond the ability of the forest to regrow. 80% of deforestation is driven by agricultural expansion.

Set 2

Agriculture

8

8

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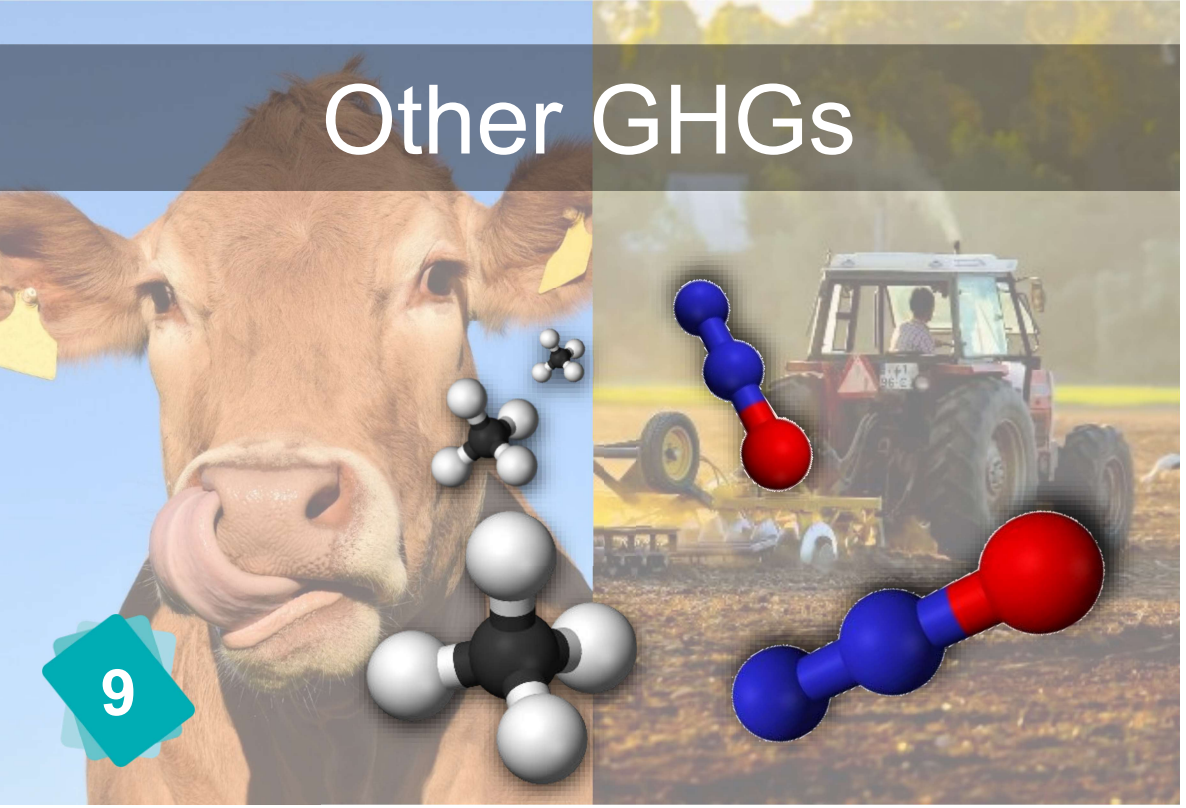
Agriculture does not emit much CO_2 but does emit large quantities of methane (from cattle and rice fields) and nitrous oxide (from fertilizers).
In all, agriculture accounts for 25% of GHGs if we include the induced deforestation.

Set 2

Other GHGs



9

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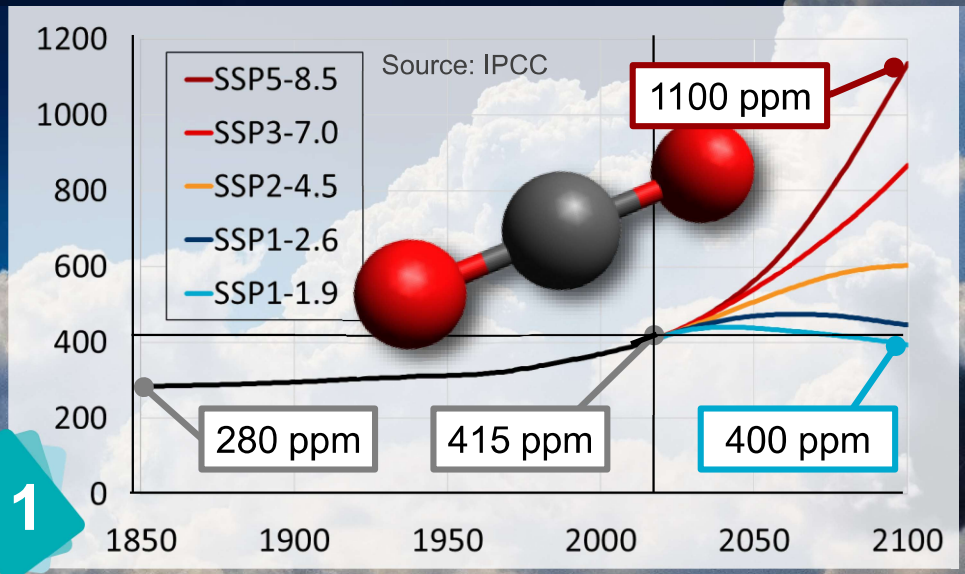
CO_2 is not the only greenhouse gas (GHG). Among others are methane (CH_4) and nitrous oxide (N_2O), both of which mainly come from agricultural activities.

Set 2

Concentration of CO_2



11

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About half of our CO_2 emissions are captured by natural carbon sinks. The other half remains in the atmosphere. The concentration of CO_2 in the air has increased from 280 to 415 ppm (parts per million) over the past 150 years. This is higher than at any point over the last three million years.

Set 2

Carbon Sinks

12

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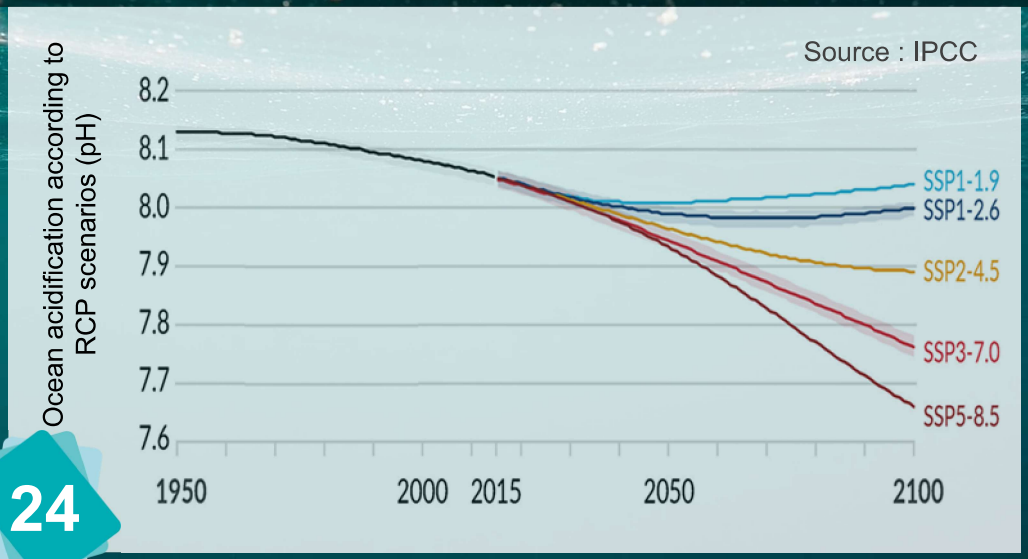
Half of the CO_2 we emit every year is absorbed by carbon sinks:
- 1/4 by vegetation via photosynthesis
- 1/4 by the oceans
The remaining half stays in the atmosphere.

Set 2

Ocean Acidification



24

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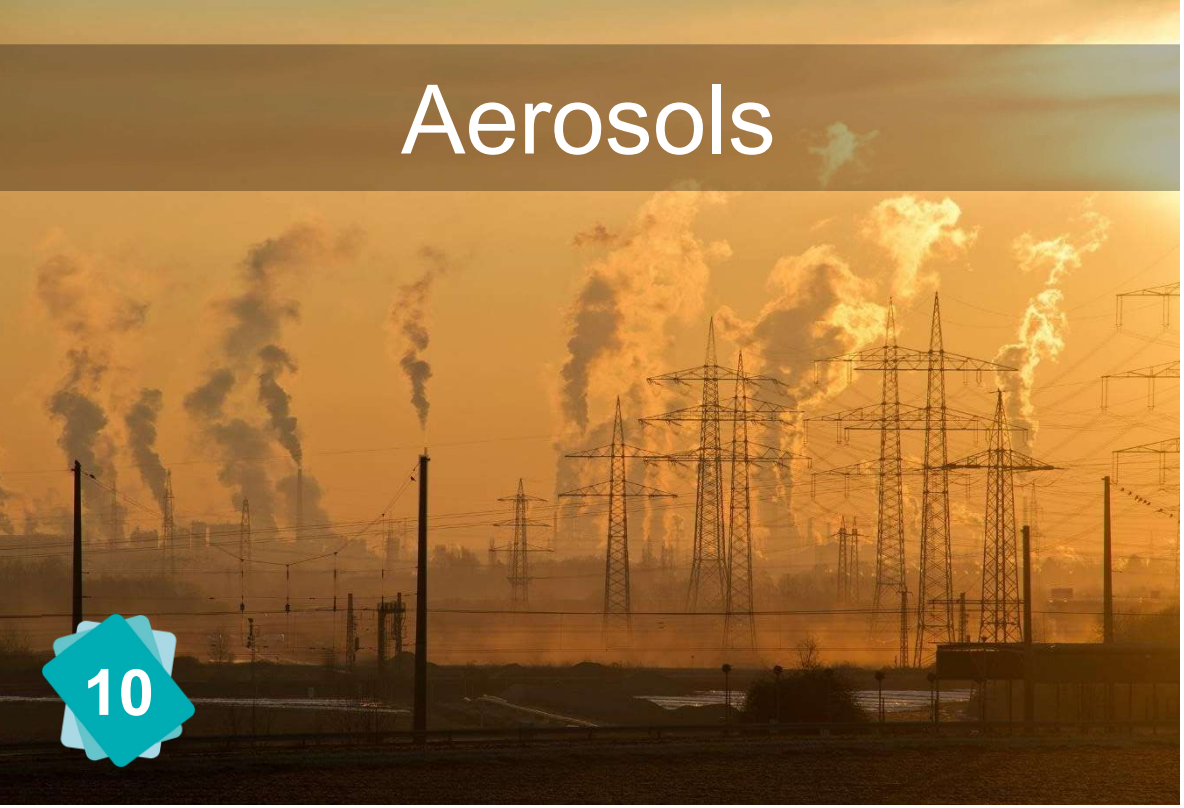
When CO_2 dissolves in the ocean, it turns into acid ions (H_2CO_3 and HCO_3-). This makes the oceans more acidic and the pH drops.

Set 2

Aerosols



10

10

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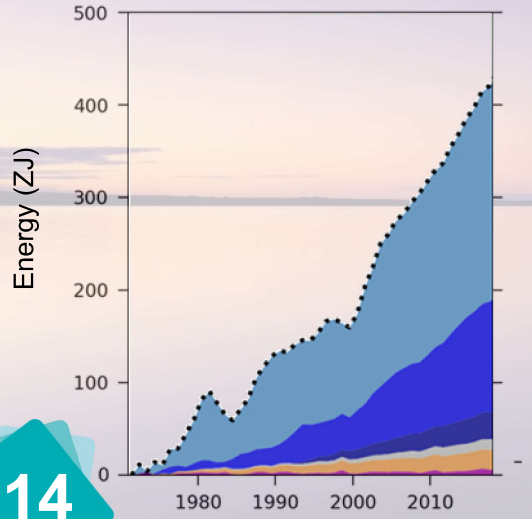
Nothing to do with aerosol spray cans. Aerosols are a type of local pollution that comes from the incomplete combustion of fossil fuels. They are bad for human health and they negatively contribute to radiative forcing, meaning that they have a cooling effect on the climate.

Set 3

Energy Budget



91% Ocean

3% Melting ice

5% Soil

1% Atmosphere

Source: IPCC

14

14

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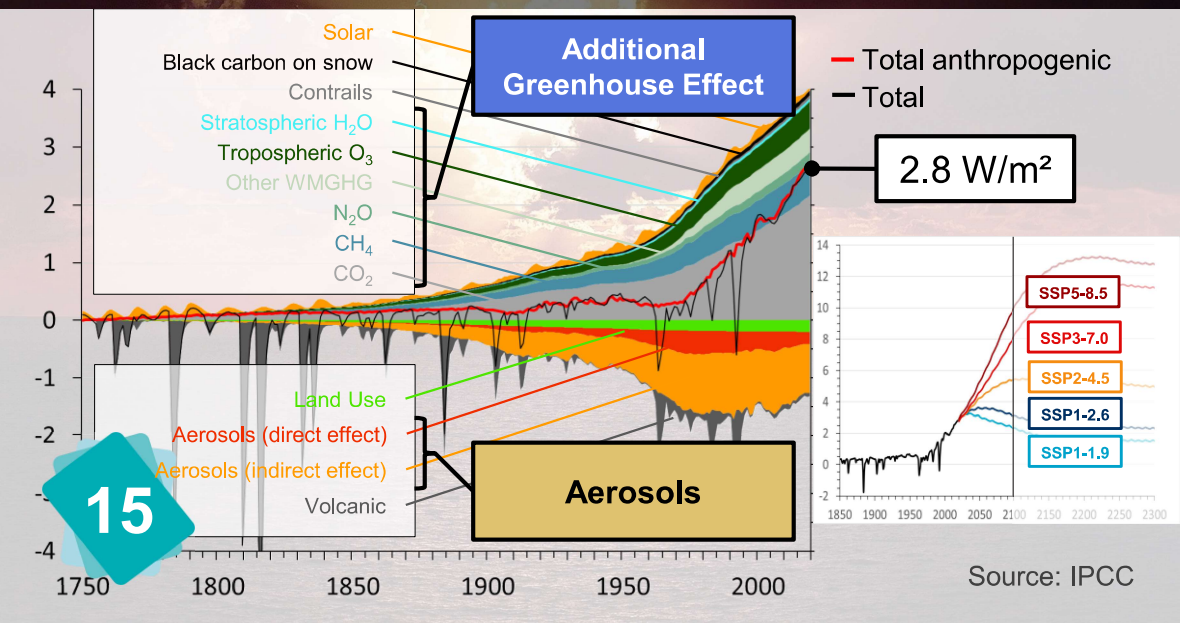
This graph explains where the energy accumulated on Earth due to radiative forcing goes. It warms up the ocean, melts ice, dissipates into the ground and warms up the atmosphere.

Set 3

Radiative Forcing



15

Source: IPCC

15

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Radiative forcing represents the difference between the energy that reaches the Earth each second and the energy that is released. It is rated at 2.8 W/m² (Watt per metre squared), 3.8 W/m² from the greenhouse effect and -1 W/m² from aerosols.

Set 3

Melting Glaciers

16

16

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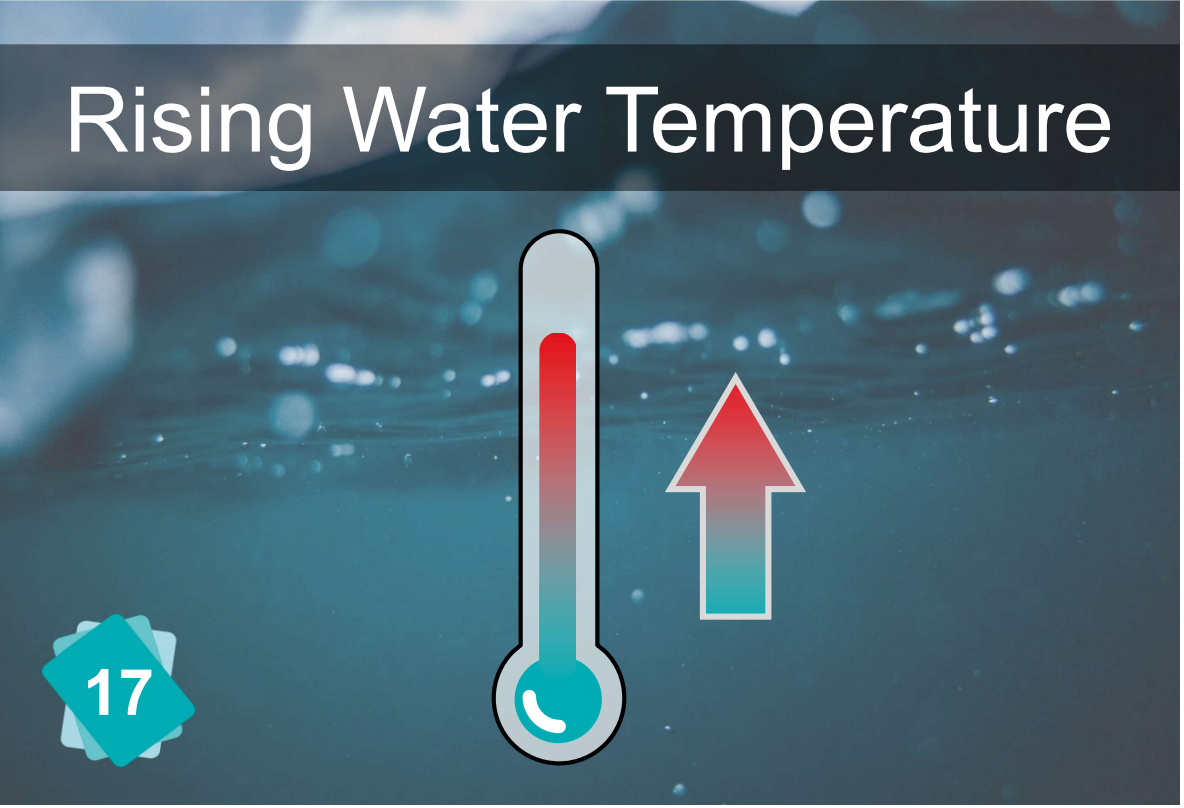
Almost all glaciers have receded, and hundreds of them have already disappeared. Glaciers are important because they regulate and provide freshwater.

Set 3

Rising Water Temperature



17

17

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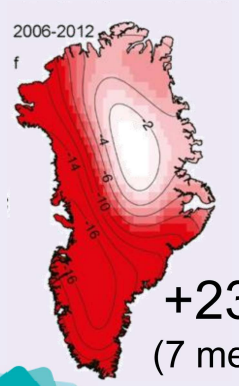
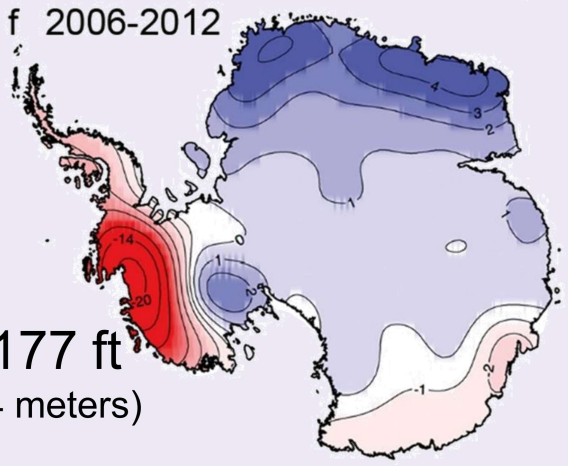
Oceans absorb 91% of the energy accumulated on Earth. The water temperature has therefore increased, especially close to the surface. Water expands as it warms.

Set 3

Melting Ice Sheets



+23 ft
(7 meters)



+177 ft
(54 meters)

19

Source: IPCC

19

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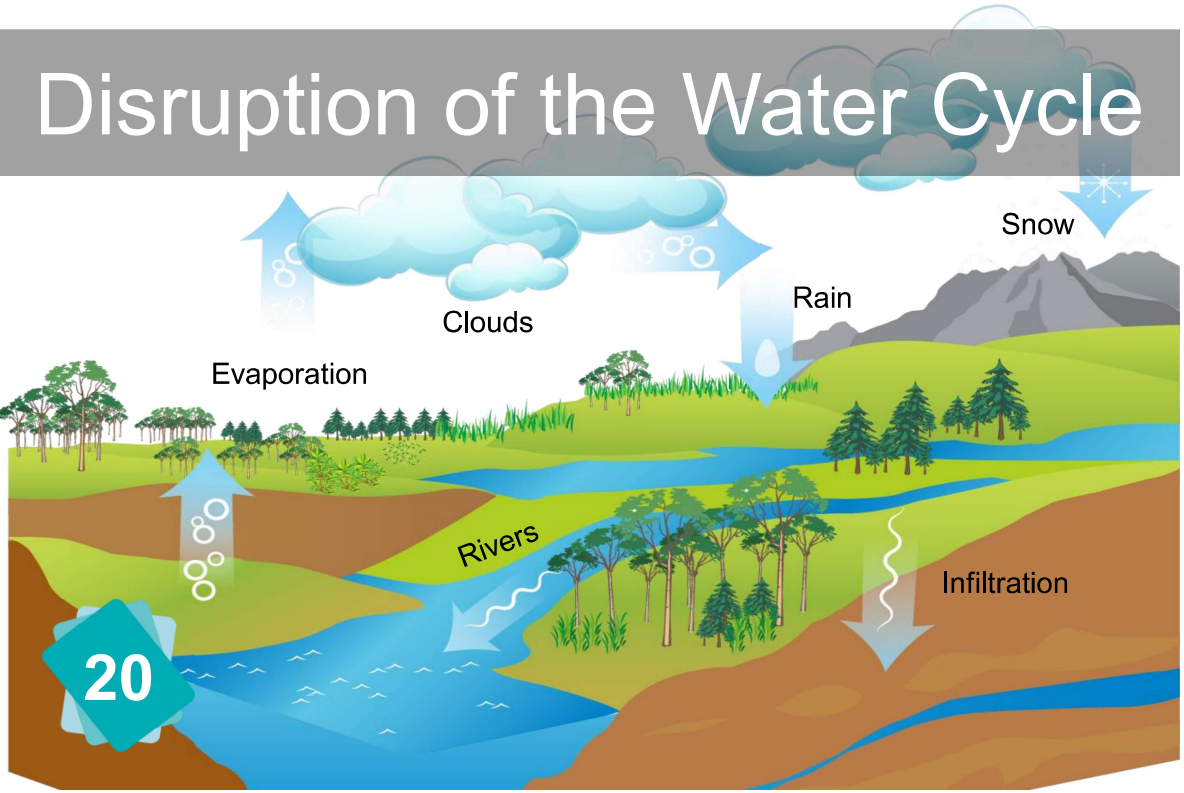
Greenland and Antarctica are ice sheets (or continental glaciers). If they were to completely melt, they will cause the sea level to rise by 23 feet (7 meters) for Greenland and 177 feet (54 meters) for Antarctica. During the last ice age, ice sheets were so much larger that the sea level was 390 feet (120 m) lower than today.

Set 3

Disruption of the Water Cycle



20

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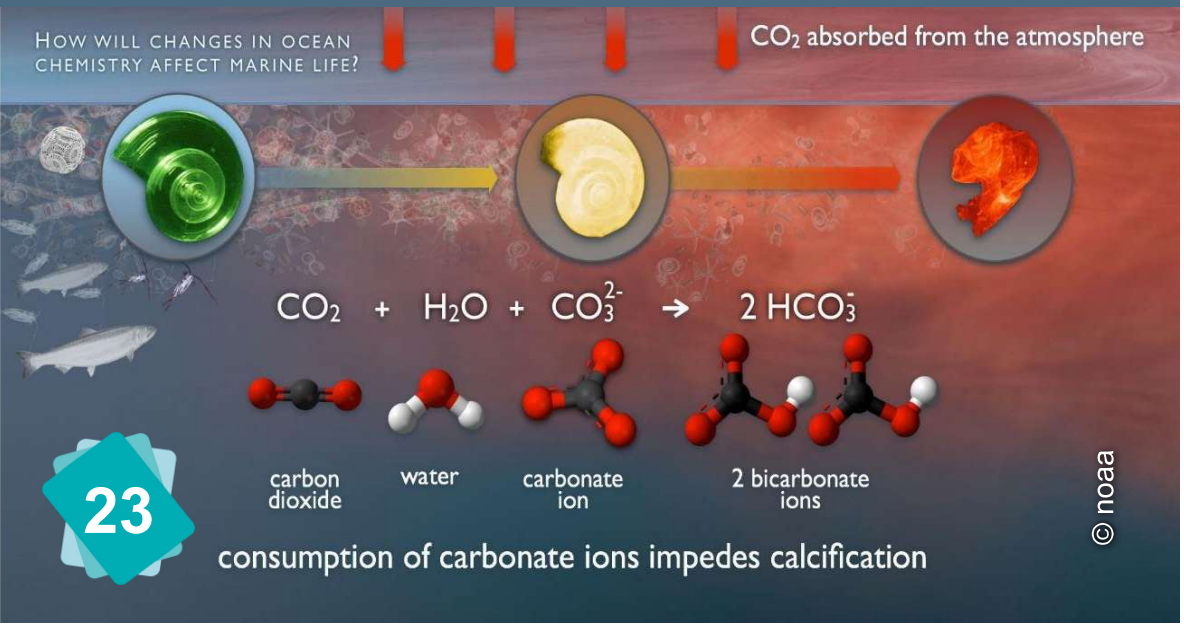
Hotter oceans and a hotter atmosphere lead to stronger evaporation, causing rainclouds and rainfall. Hotter land and a hotter atmosphere also lead to stronger evaporation, this time causing the ground to dry out.

Set 3

Calcification difficulties



23

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When the pH drops, it becomes harder for calcium carbonate seashells to grow.

Set 4

Terrestrial Biodiversity

25

25

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Animals and plants are affected by the changes in temperature and the disruption of the water cycle. They may migrate or go extinct. Some may thrive and proliferate.

Set 4

River Flooding

26

26

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The disruption of the water cycle can both increase and decrease rainfall. More rain can lead to river flooding. If the soil is very dry, it makes matters worse because the water runs off it.

Set 4

Marine Biodiversity

27

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Pteropods and coccolithophores are at the base of the ocean food chain. If they are driven to extinction, all marine biodiversity will be threatened. Warming ocean waters also threaten marine biodiversity.

Set 4

Cyclones

34

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Cyclones draw on the energy from warm water at the ocean surface. They are getting stronger because of global warming.

Set 4

Pteropods and Coccolithophores

29

29

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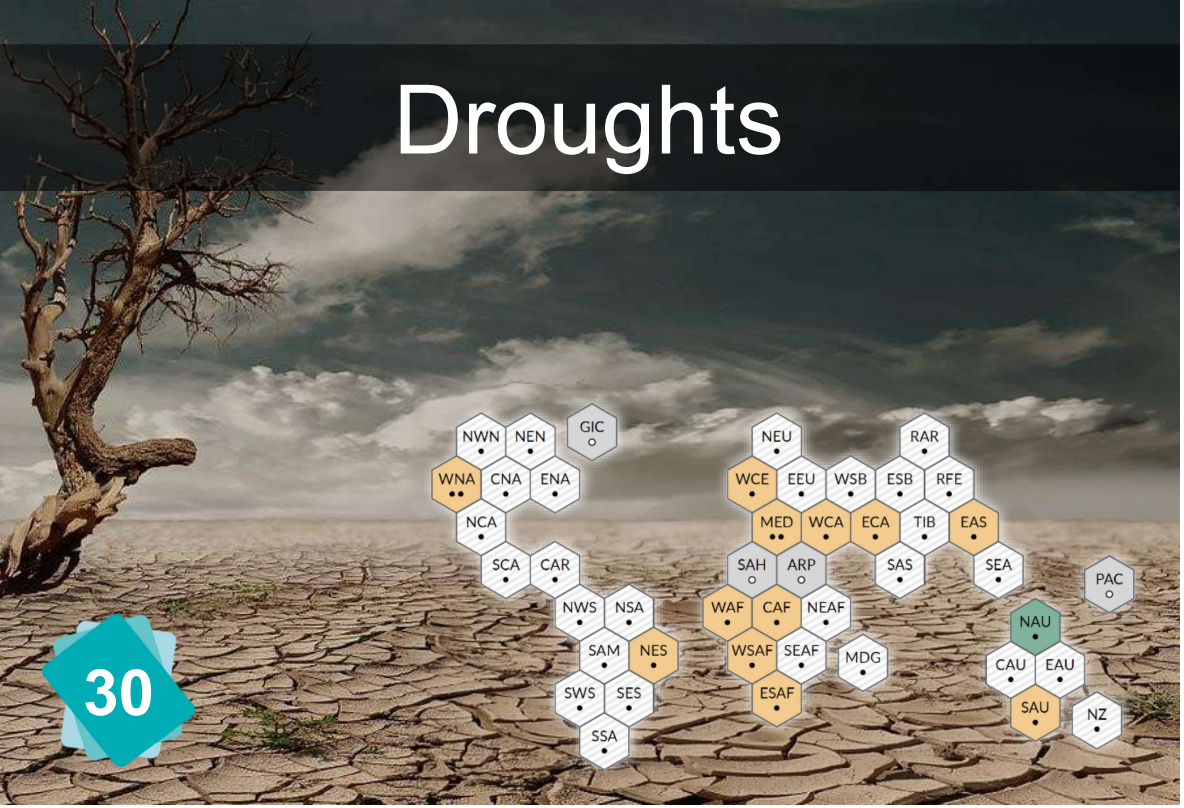
Pteropods are a type of zooplankton and coccolithophores a type of phytoplankton. These organisms have a calcified shell.

Set 4

Droughts


NWN
NEN
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NES
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SSA
NEU
RAR
WCE
EEU
WSB
ESB
RFE
MED
WCA
ECA
TIB
EAS
SAH
ARP
SAS
SEA
PAC
WAF
CAF
NEAF
WSAF
SEAF
MDG
ESAF
NAU
CAU
EAU
SAU
NZ
30

30

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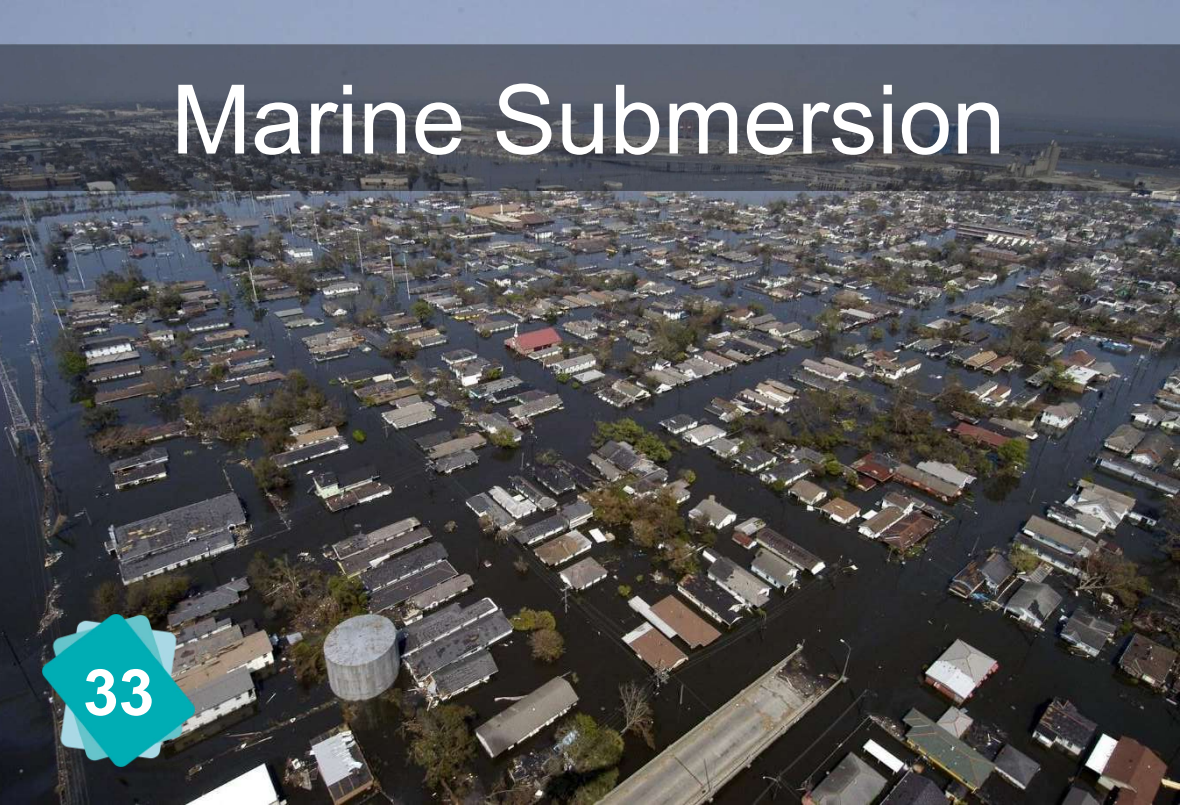
The disruption of the water cycle can both increase and decrease rainfall. A lack of rain can cause drought. Droughts are likely to become more frequent in the future.

Set 4

Marine Submersion



33

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Cyclones and atmospheric waves bring wind, waves and low pressure conditions. A 1 hectopascal pressure drop causes a 0.4 inches sea level rise. Therefore cyclones can cause marine submersions (or coastal flooding), amplified by the sea level rise already caused by sea level rise.

Set 4

Vectors of Disease

28

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Some animals carry diseases. Global warming causes them to migrate, possibly reaching populations that have no immunity against these diseases.

Set 5

Freshwater Resources

31

31

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Freshwater resources are affected by changes in rainfall and by the melting of glaciers that regulate the flow of rivers.

Set 5

Decline in Agricultural Yields

32

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Food production can be affected by temperature, droughts, extreme weather events, floods and marine submersion (e.g. the Nile Delta).

Set 5

Forest Fires

35

35

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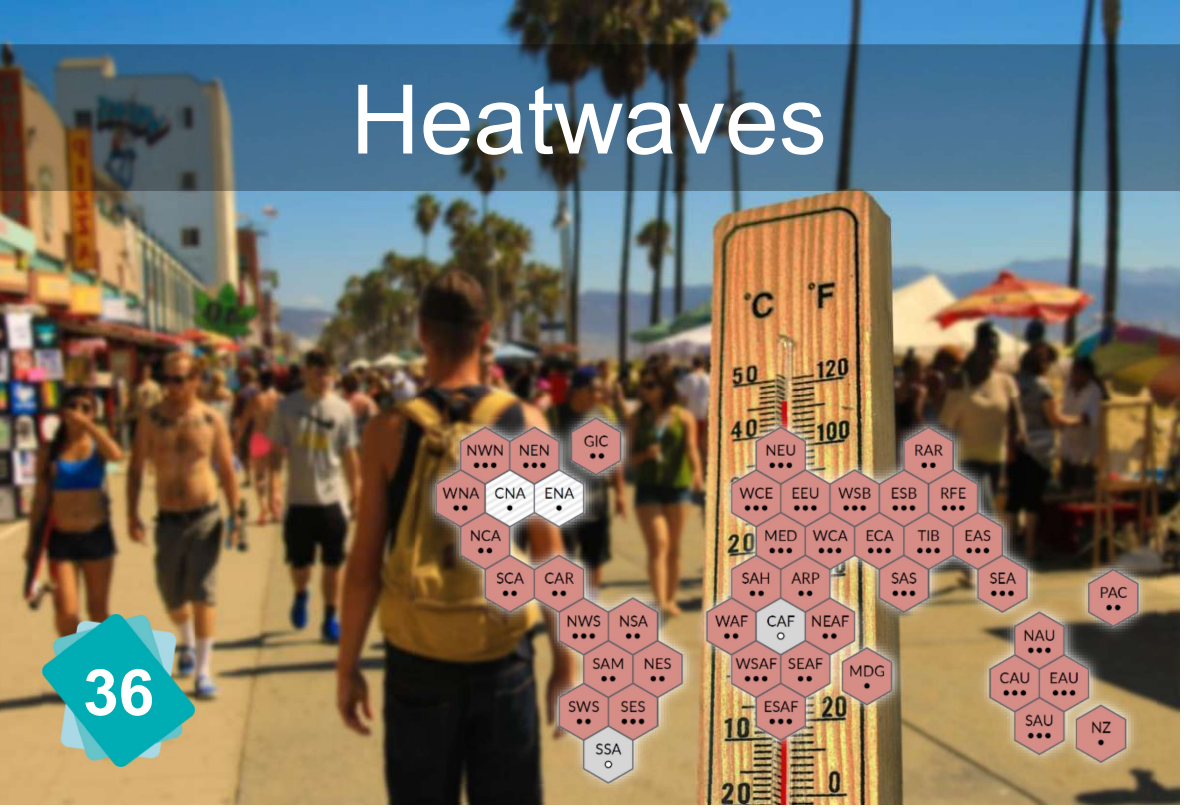
Forest fires start and spread more easily during droughts and heatwaves.

Set 5

Heatwaves


°C °F
50 120
40 100
20
10
20 0
NWN NEN GIC
WNA CNA ENA
NCA
SCA CAR
NWS NSA
SAM NES
SWS SES
SSA
NEU
WCE EEU WSB ESB RFE
MED WCA ECA TIB EAS
SAH ARP
WAF CAF NEAF
WSAF SEAF
ESAF
MDG
RAR
SAS
SEA
PAC
NAU
CAU EAU
SAU
NZ

36

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One consequence of higher temperatures is more frequent heatwaves.

Set 5

Hunger

37

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Hunger can be caused by lower agricultural yields and by the loss of marine biodiversity.

Set 5

Human Health

38

38

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Hunger, new vectors of disease, heatwaves and armed conflicts can have a negative effect on human health.

Set 5

Climate Refugees

39

39

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Imagine that you live in a place that has been miraculously spared by climate change. Several billions of human beings might want to share this space with you.

Set 5

Armed Conflicts

40

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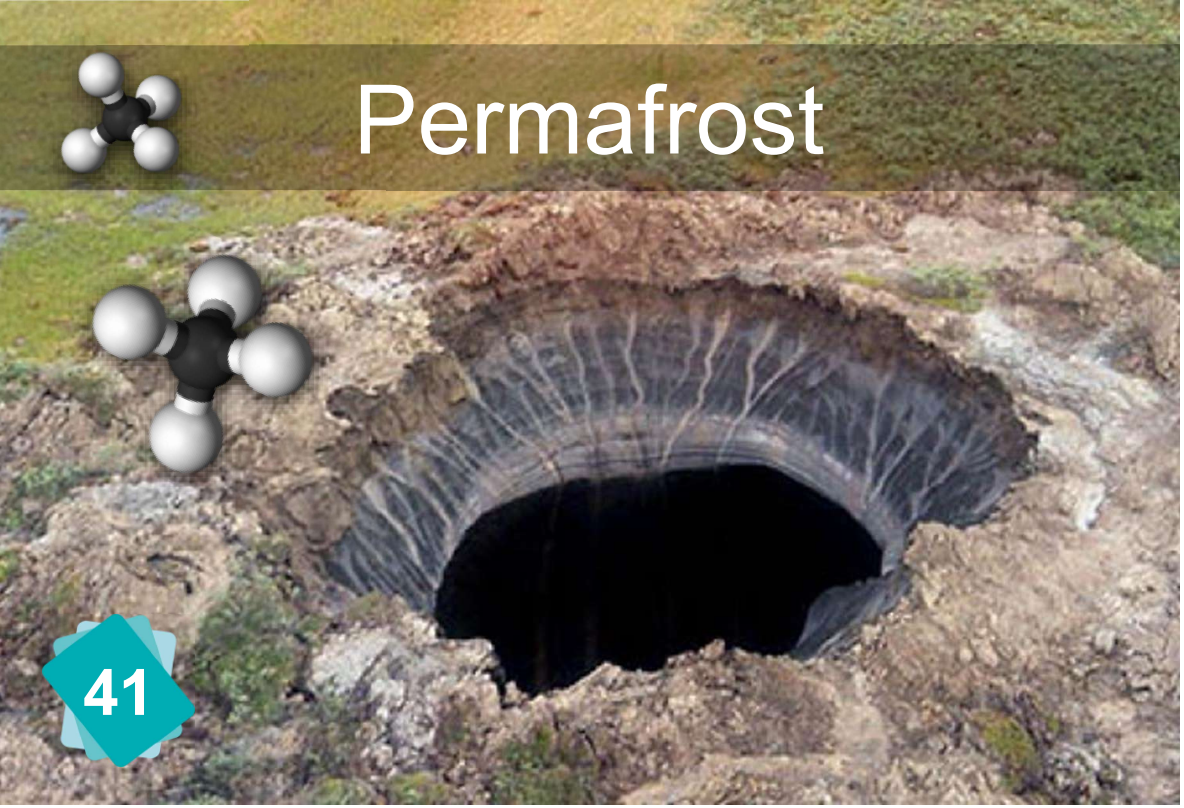
This is how we shouldn't let it end…

Set 5


Permafrost
41

41

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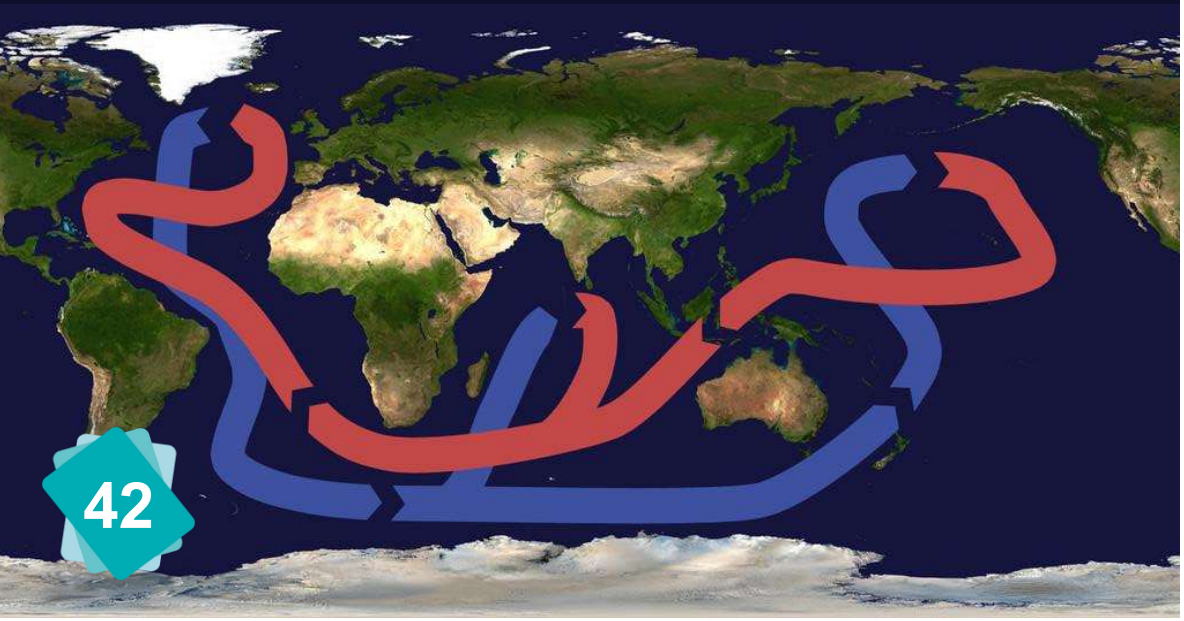
Permafrost is permanently frozen ground. It is starting to thaw, releasing into the atmosphere previously locked in methane and CO_2 from decomposed biomass. This creates a positive feedback loop, just like forest fires and albedo changes due to melting sea ice.

Set 5

Weakening Gulf Stream



42

42

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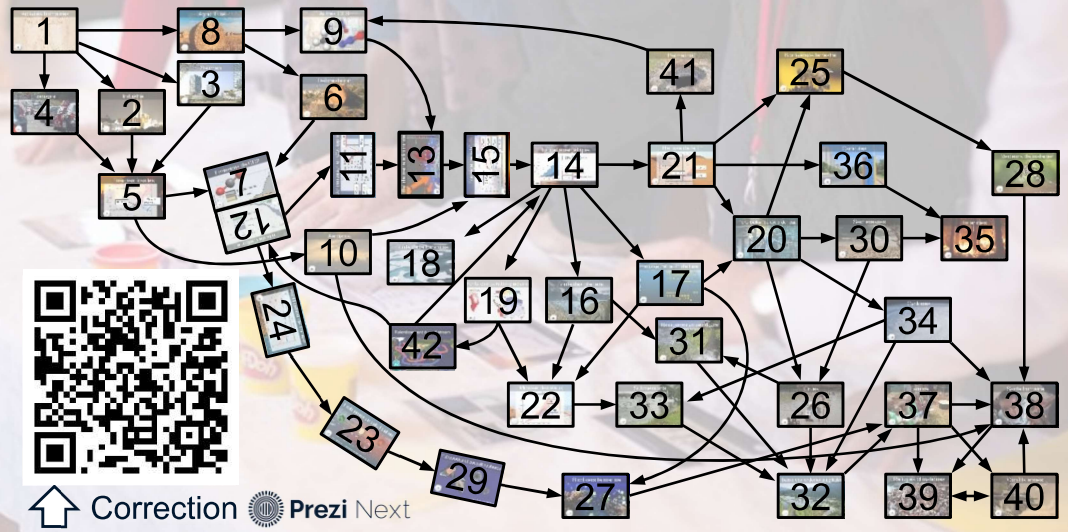
The Gulf Stream is part of the ocean's thermohaline circulation. It could weaken in response to freshwater input from Greenland's melting ice sheet. This could disrupt the water cycle even more and reduce the ocean's capacity to absorb more carbon and heat.

Set 5

Key



Correction Prezi Next

Climate Fresk was developed by Cédric Ringenbach.
Its distribution is managed by the non-profit association "La Fresque du Climat".

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All the cards are in your hands!

EN-US

American English

Scan to join us!

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