



EN-GB

Adults



CLIMATE FRESK

All the cards are in your hands!

How to play

You need one deck of cards per team (6 to 8 ppl), a paper roll or a 1 x 2 m piece of paper, pencils, rubbers, colour felt tip pens and some tape.

The aim 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 all about.

Deal the cards set by set and wait until all cards are down on the table before dealing the next set.

Time indications: one hour to place the cards, one hour to decorate the Fresk and one hour to sit down together and discuss what you have learned.



Reasoning



Creativity



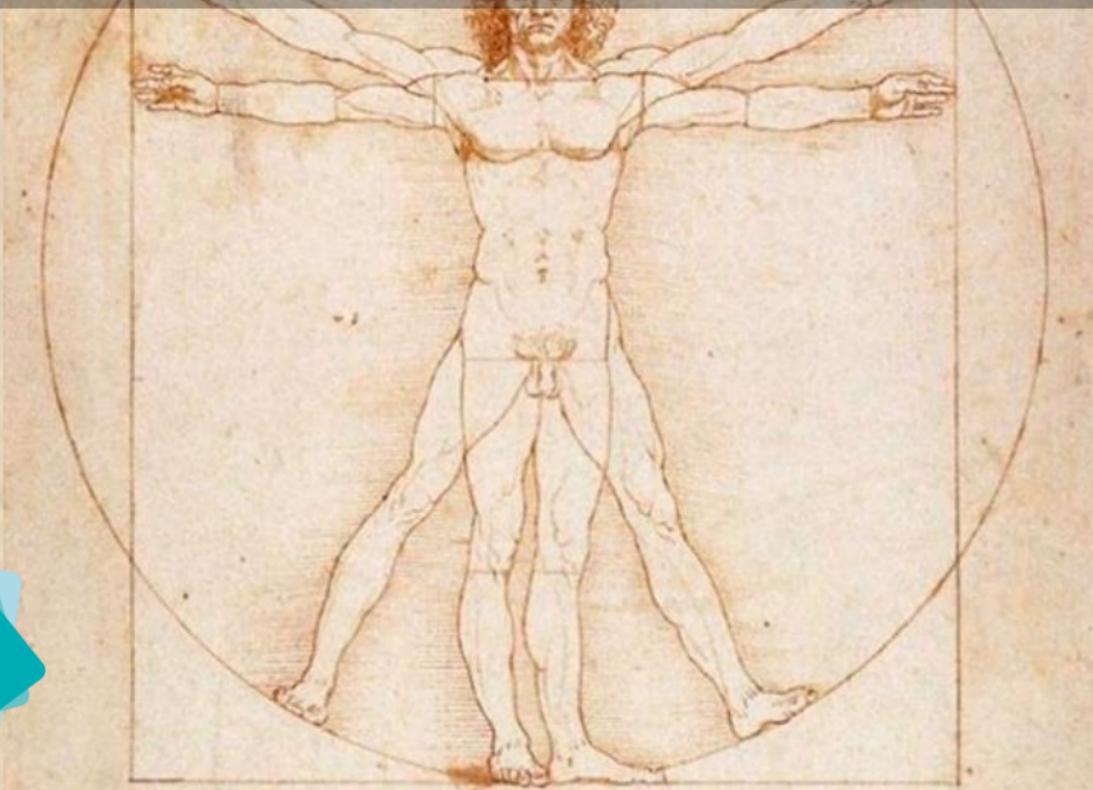
Review



Debrief

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

Human activities



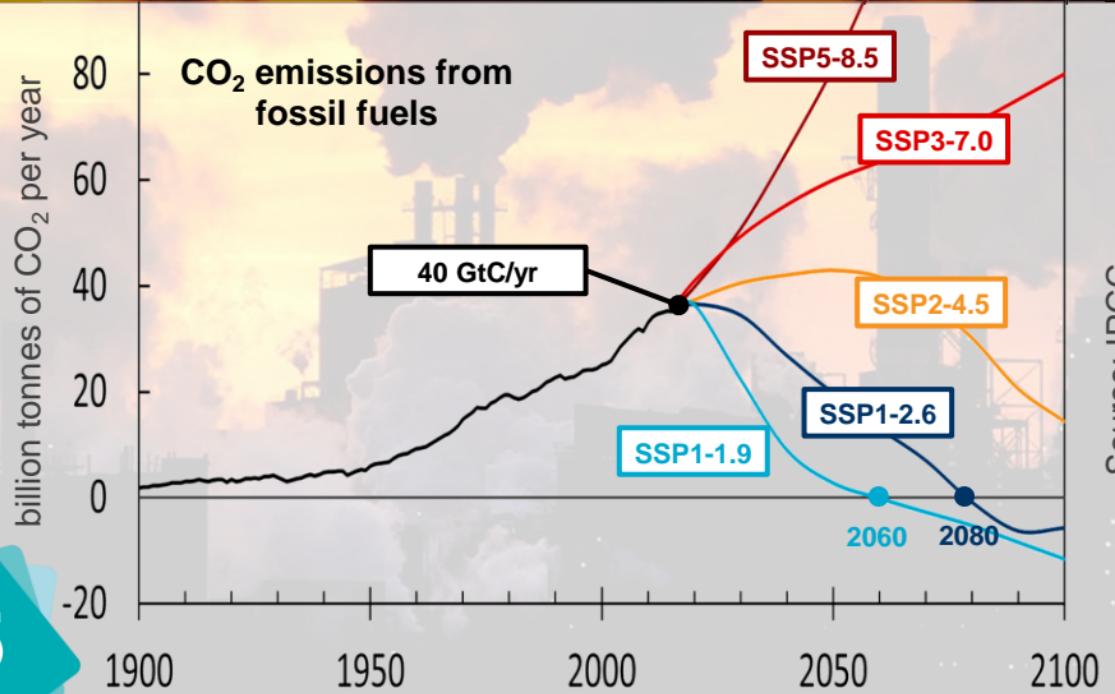
1



This is where it all begins...

Set 1

Fossil Fuels



5

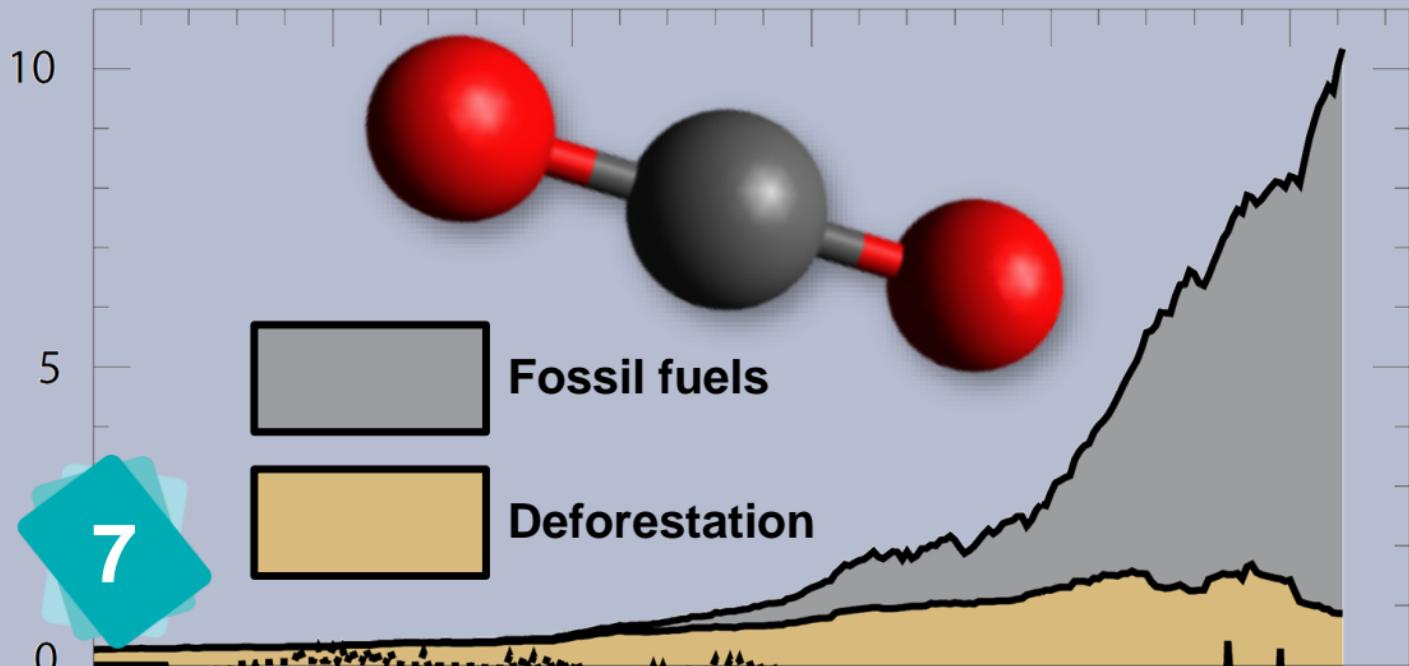
Source: IPCC

5

Fossil fuels are coal, oil and natural gas. They are used mainly in buildings, transportation and industry. They emit CO₂ when burned.

CO_2 Emissions

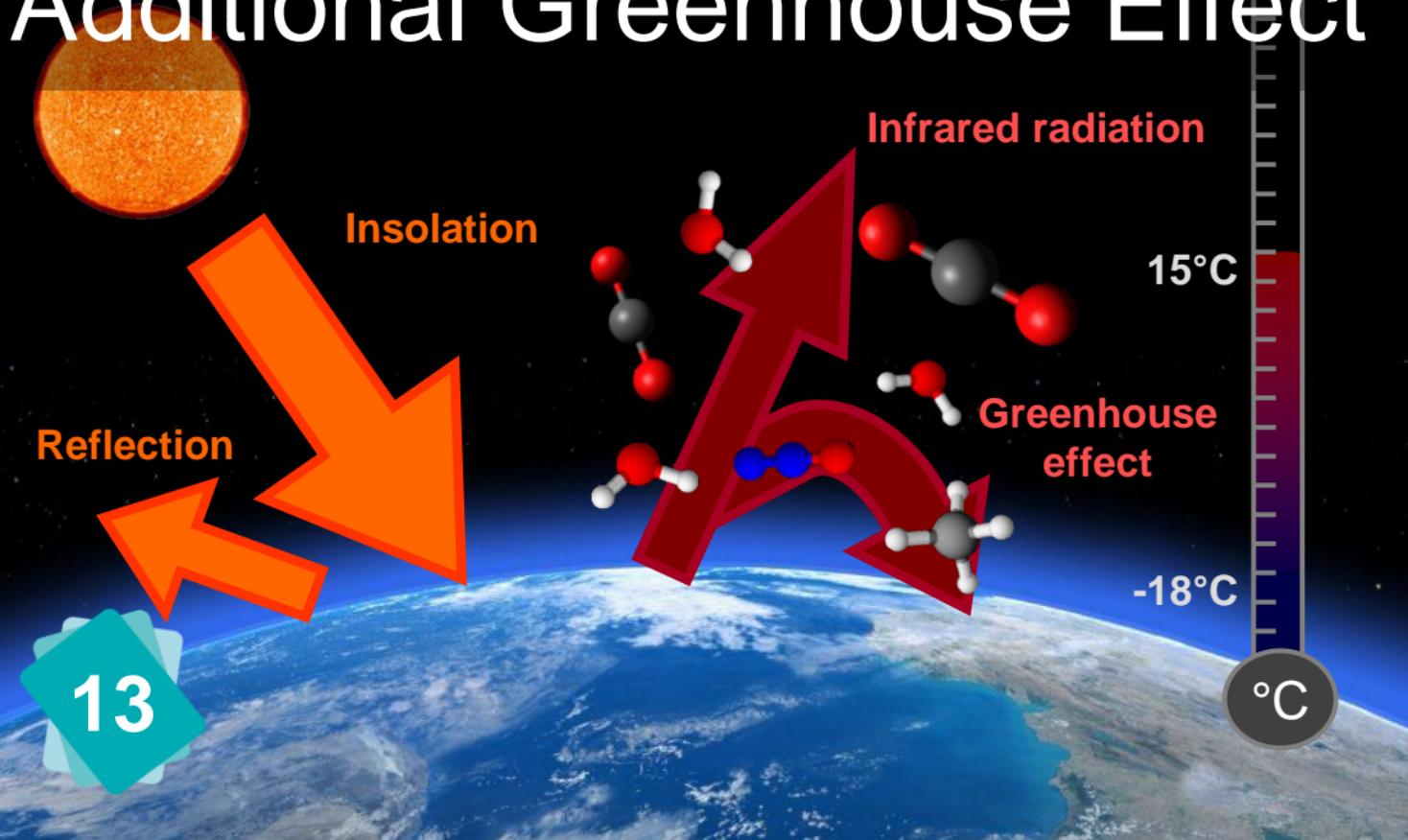
Anthropogenic CO_2 emissions (GtC/yr)



7

CO₂, 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.

Additional Greenhouse Effect

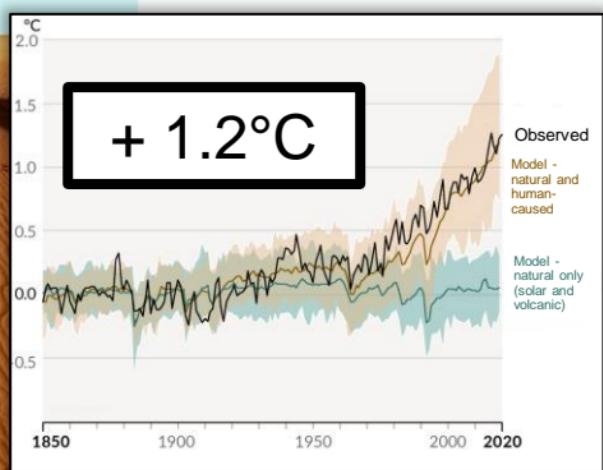


13

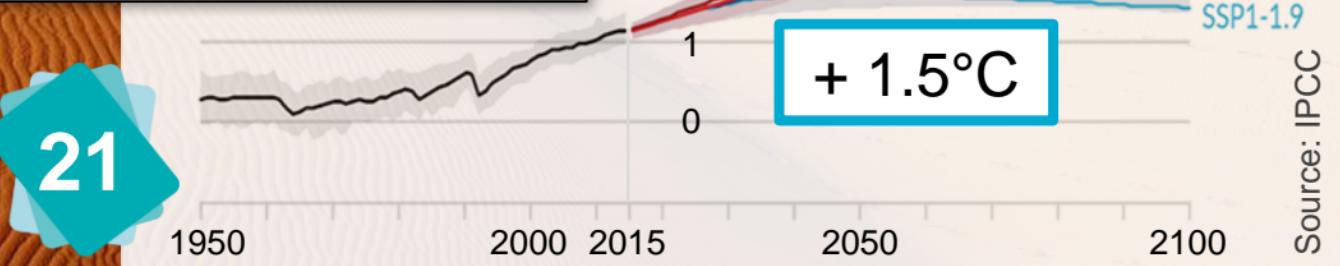
The greenhouse effect is a natural phenomenon - incidentally, the most common GHG is water vapour. Without the greenhouse effect, the planet would be 33°C colder and life as we know it would not be possible.

But CO₂ and other GHGs related to human activities amplify the greenhouse effect and unbalance the climate.

Rising Air Temperatures



Global surface temperature change
from 1850-1900



21

The average air temperature at the surface of the Earth has increased by 1.2°C since 1900. Future emission scenarios predict that this increase will reach between 2 and 5°C by 2100.

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

Melting Sea Ice

An aerial photograph capturing the vast expanse of the Arctic Ocean under a dramatic sky. The horizon is visible in the distance, where the icy surface meets a sky filled with wispy clouds colored in shades of orange, pink, and purple, suggesting either a sunrise or sunset. The ocean below is a complex pattern of white sea ice floes of various sizes, some appearing as small, isolated patches while others form larger, more continuous areas. The lighting creates strong shadows on the darker parts of the ice, emphasizing its three-dimensional texture and the scale of the frozen landscape.

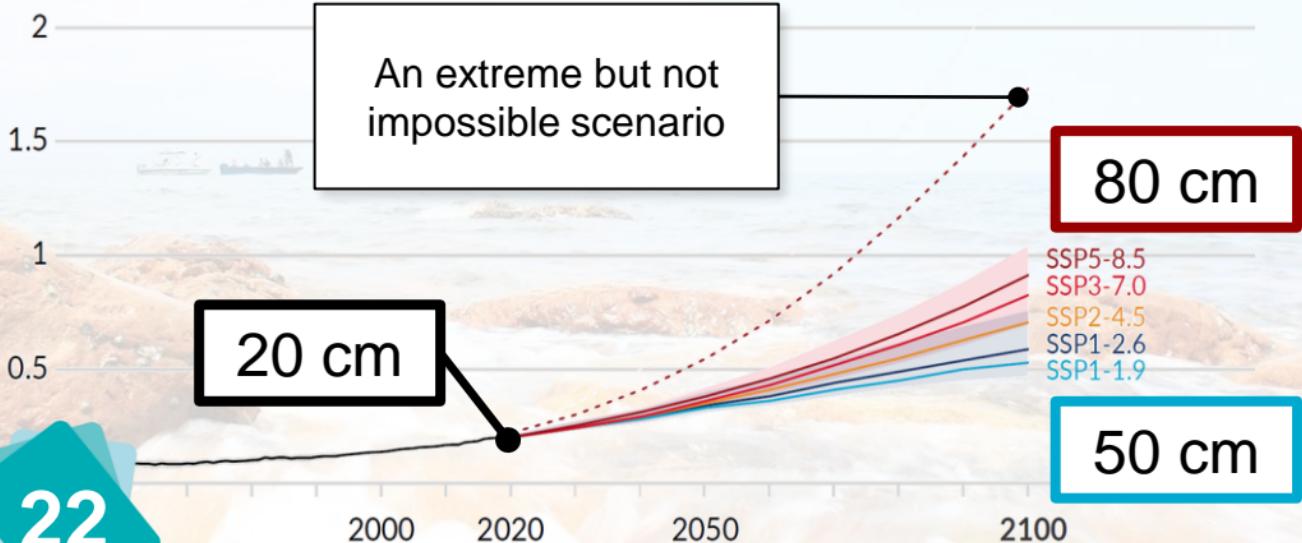
18

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, the white ice gives way to much darker sea, which absorbs more sun rays.

Rising Sea Levels

Global mean sea level rise from 1900



22

Source: IPCC

22

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



Industry





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

Building Usage





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



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

Deforestation

6



6

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

Set 2

Agriculture

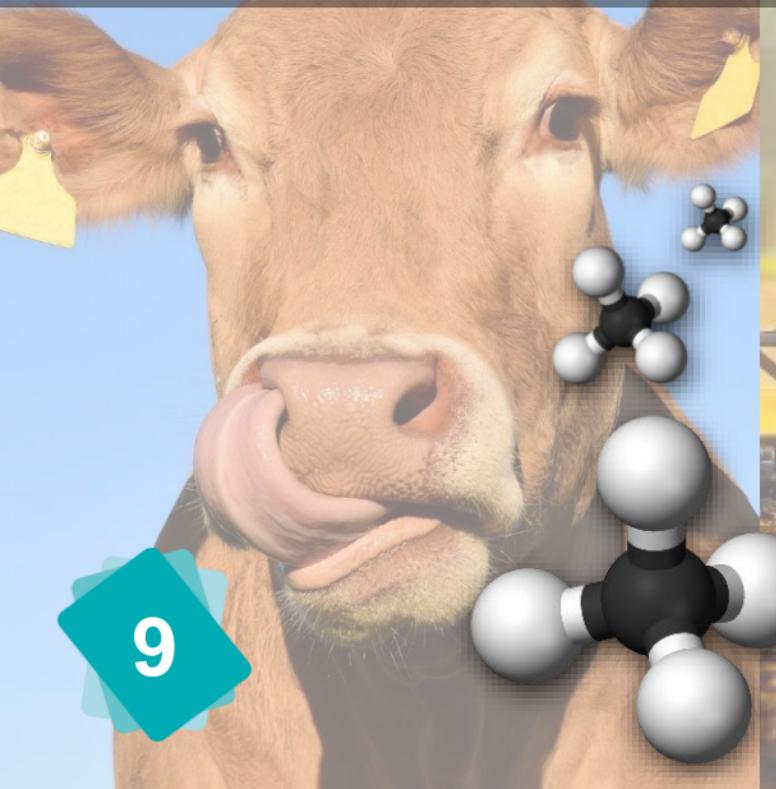


8

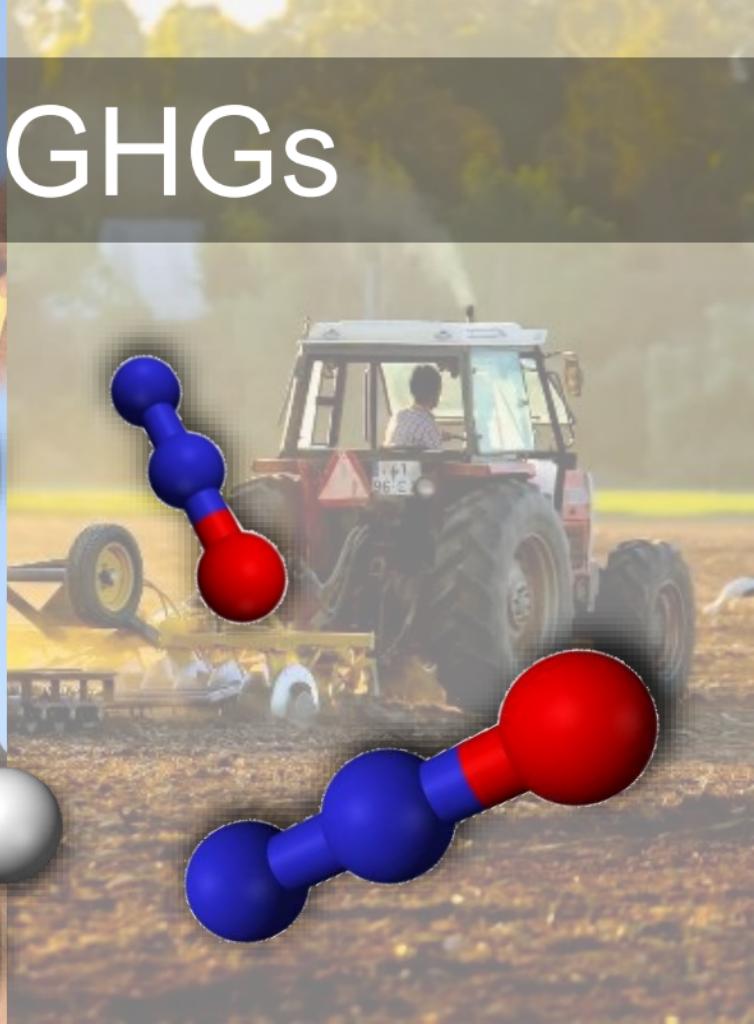
Agriculture does not emit much CO₂ but does emit large quantities of methane (from cattle and rice paddies) and nitrous oxide (from fertilizers).

In all, agriculture accounts for 25% of GHGs if we include the induced deforestation.

Other GHGs



9

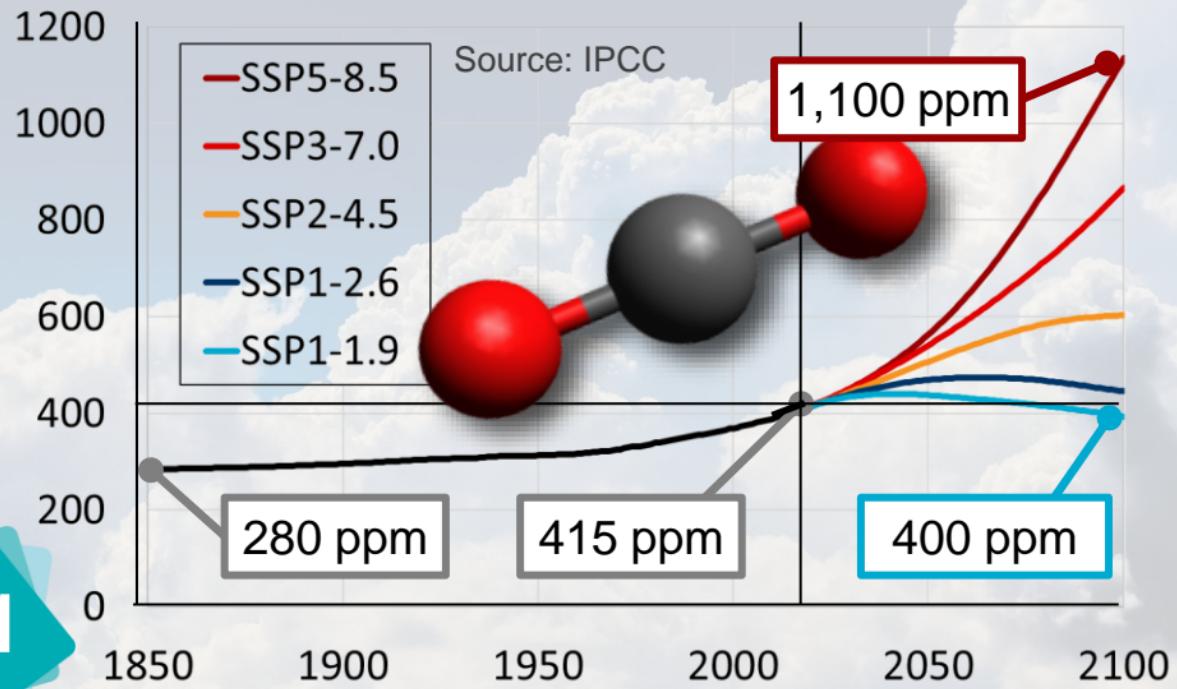


9

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 CO₂

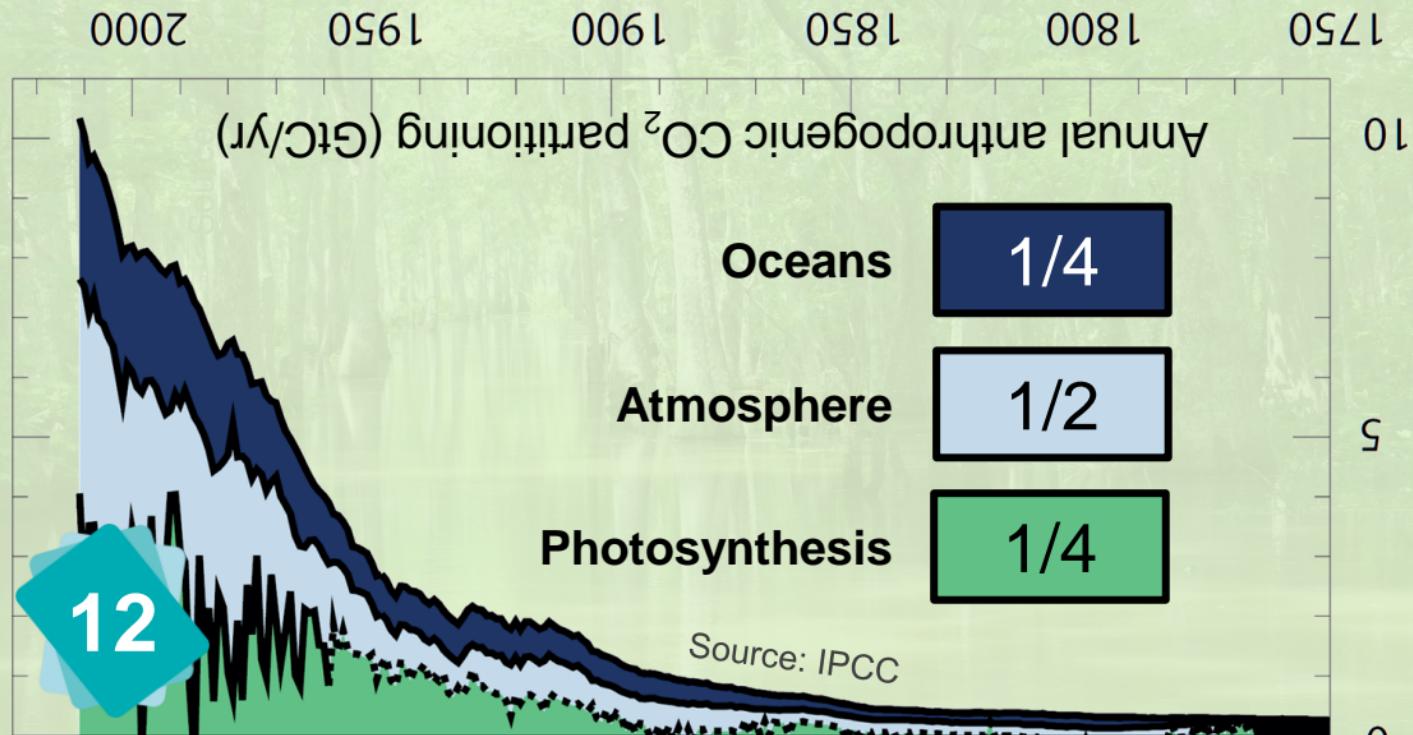


11

About half of CO₂ emissions are captured by natural carbon sinks. The other half remains in the atmosphere. The concentration of CO₂ 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



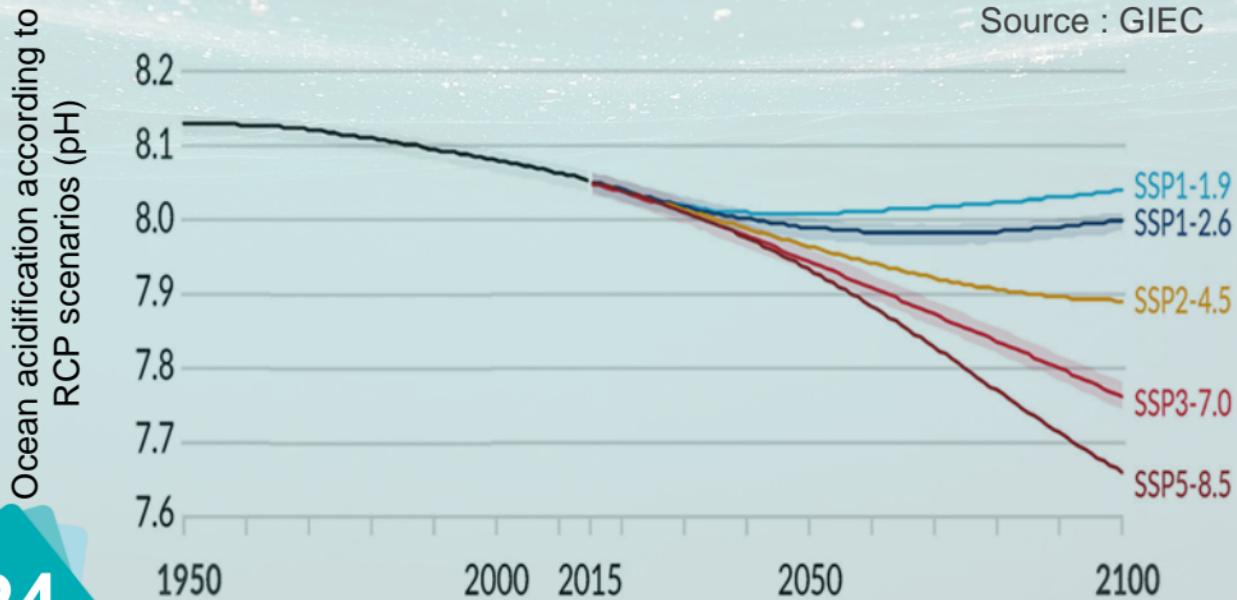
12

Half of the CO₂ 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.

Ocean Acidification



24

When CO₂ dissolves in the ocean, it turns into acid ions (H₂CO₃ and HCO₃-). This makes the oceans more acidic and the pH drops.

Set 2

Aerosols



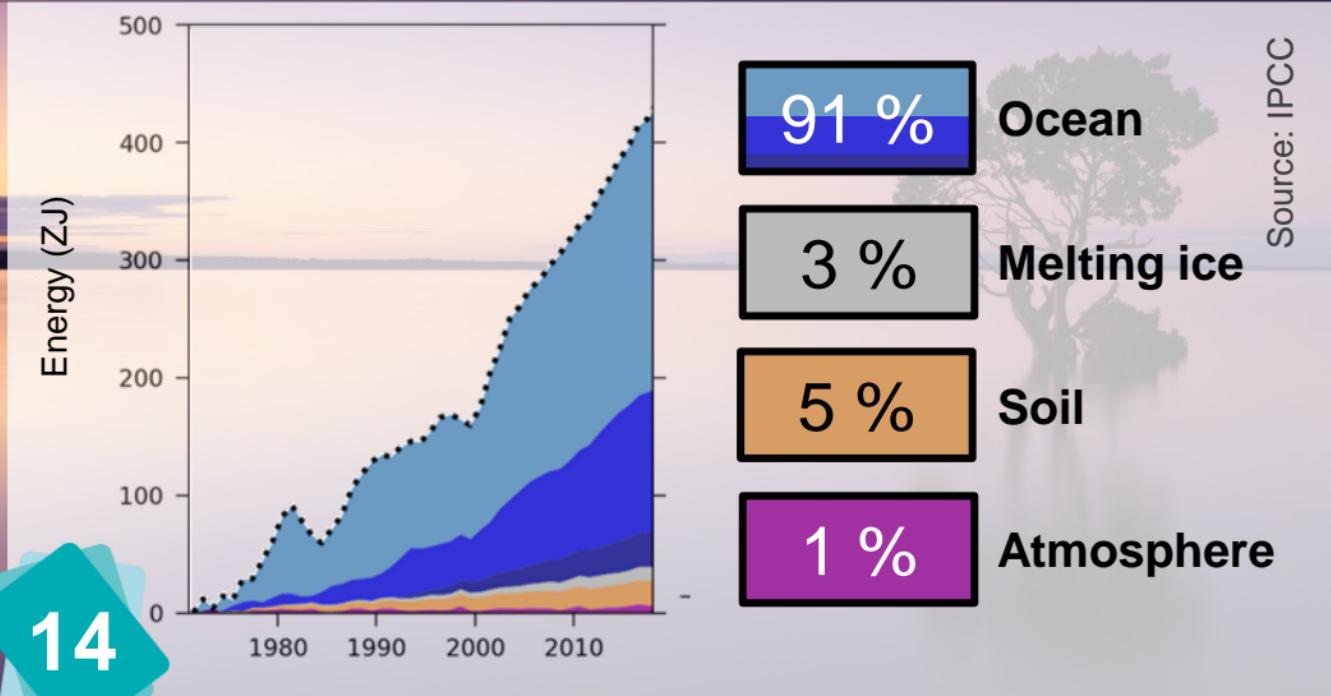
10

10

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

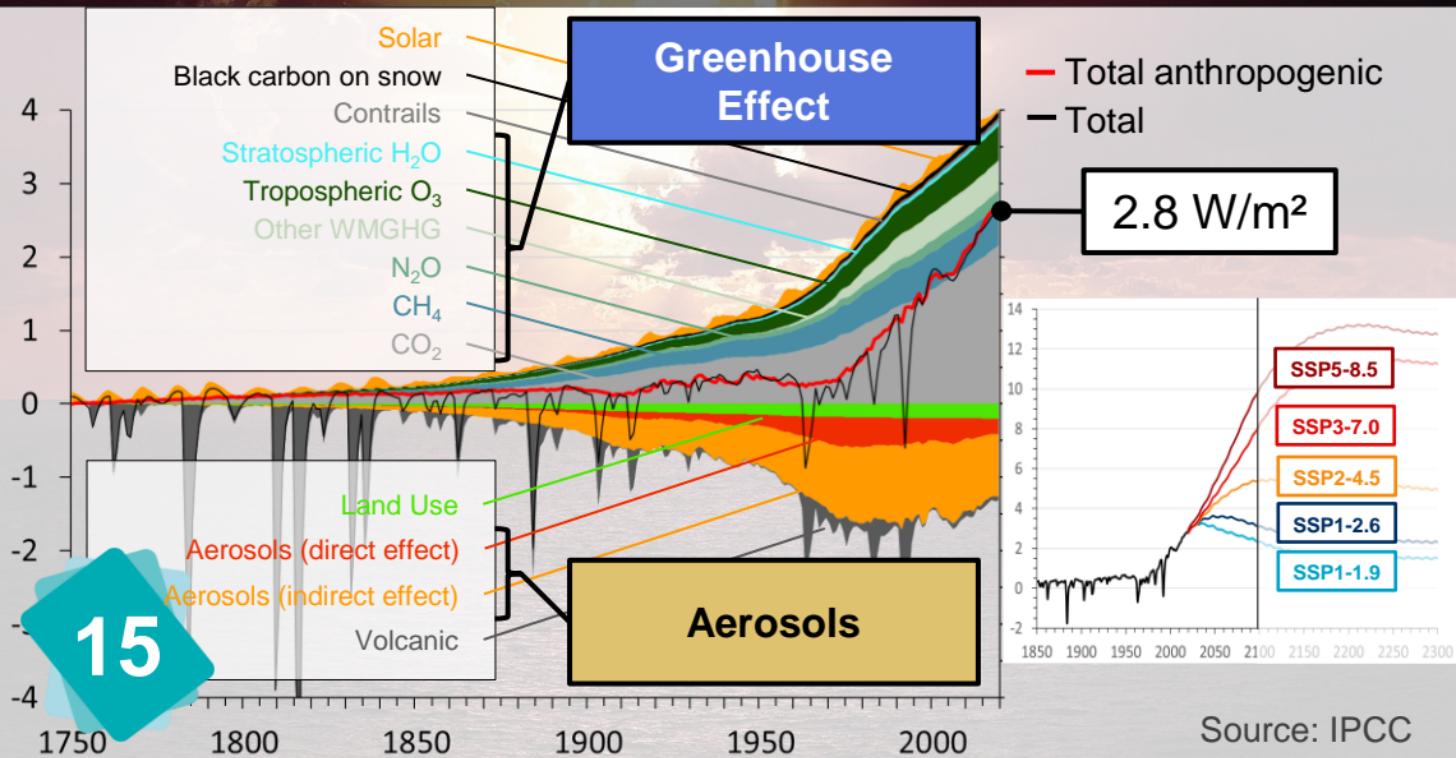


14

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

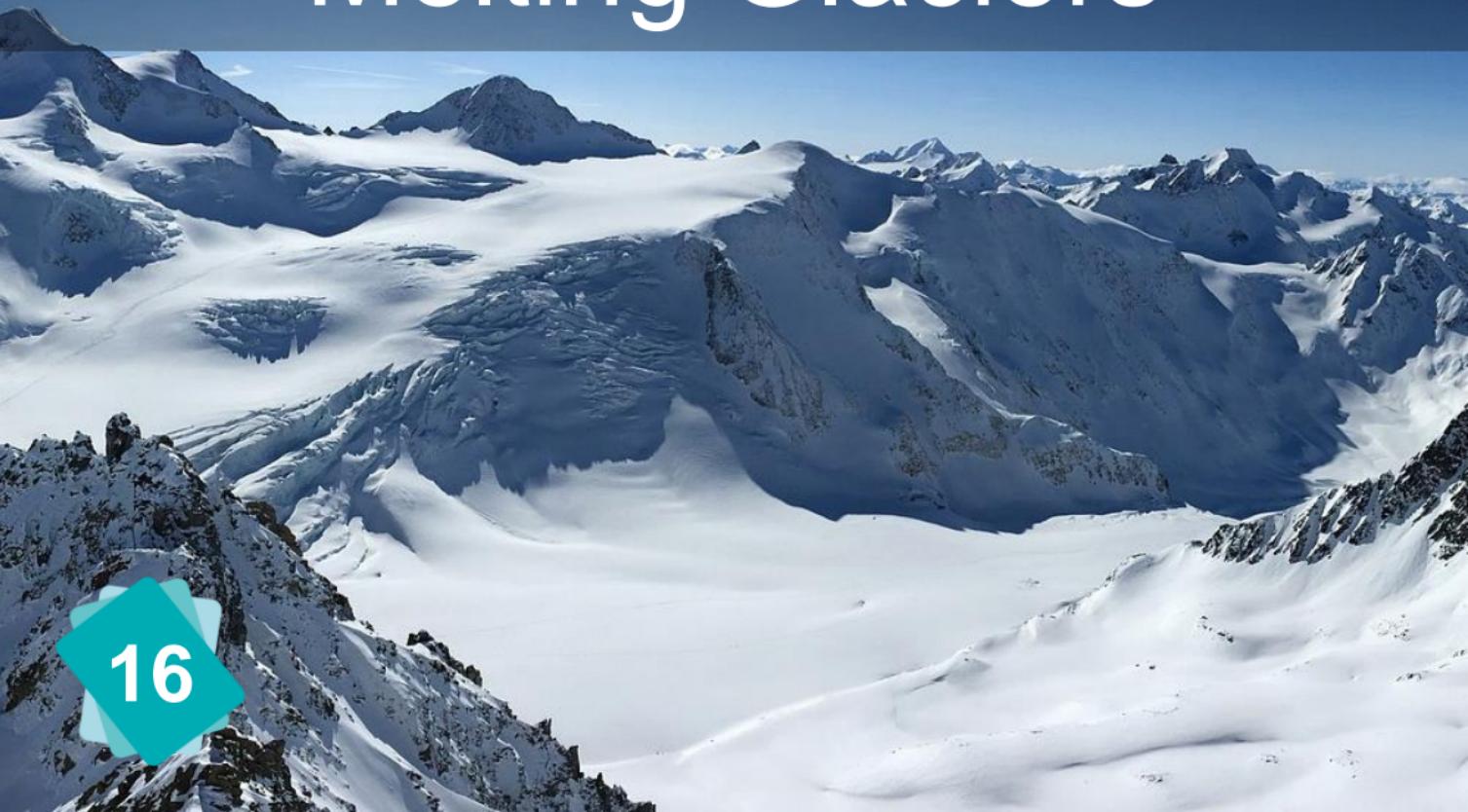
Radiative Forcing



15

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/m^2 (Watt per square metre), 3.8 W/m^2 from the greenhouse effect and -1 W/m^2 from aerosols.

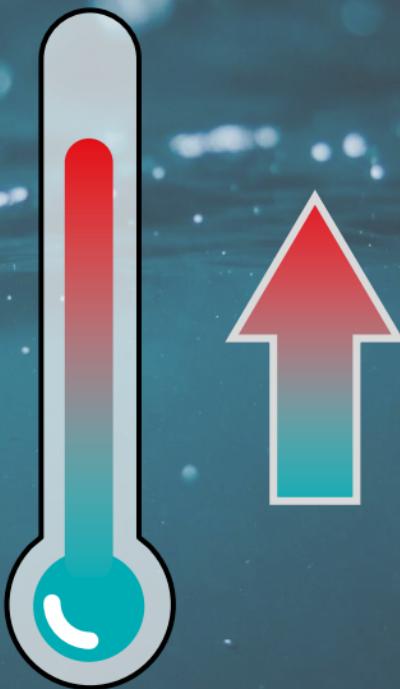
Melting Glaciers



16

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

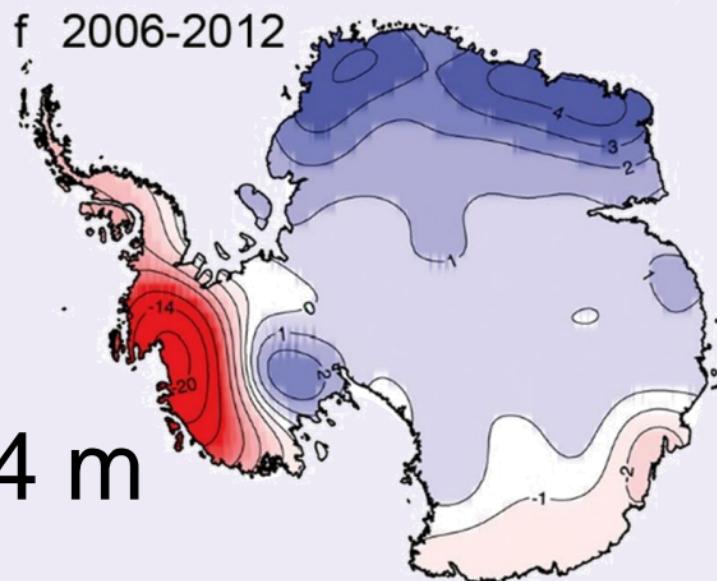
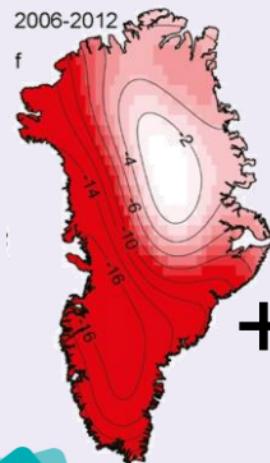
Rising Water Temperatures



17

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.

Melting Ice Sheets



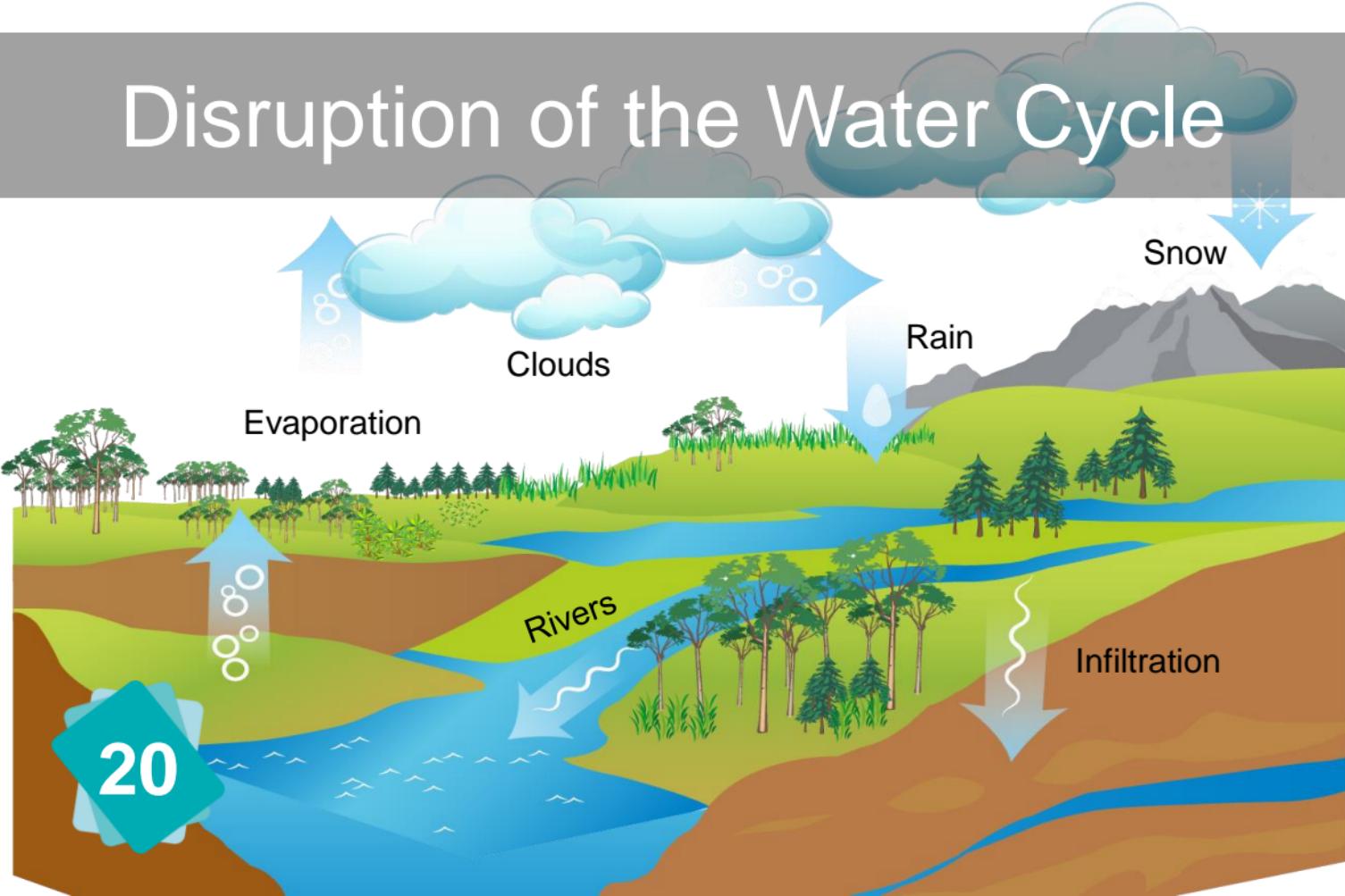
19

Source: IPCC

19

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

Disruption of the Water Cycle



20

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.

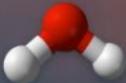
Calcification difficulties

HOW WILL CHANGES IN OCEAN CHEMISTRY AFFECT MARINE LIFE?

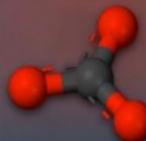
CO₂ absorbed from the atmosphere



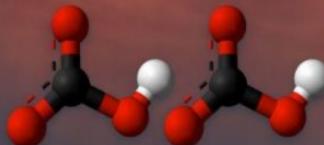
carbon
dioxide



water



carbonate
ion



2 bicarbonate
ions

23

consumption of carbonate ions impedes calcification

23

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

Set 4

Terrestrial Biodiversity

25



25

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.

River Flooding



26



26

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.

Marine Biodiversity



27

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

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

Set 4

Pteropods and Coccolithophores

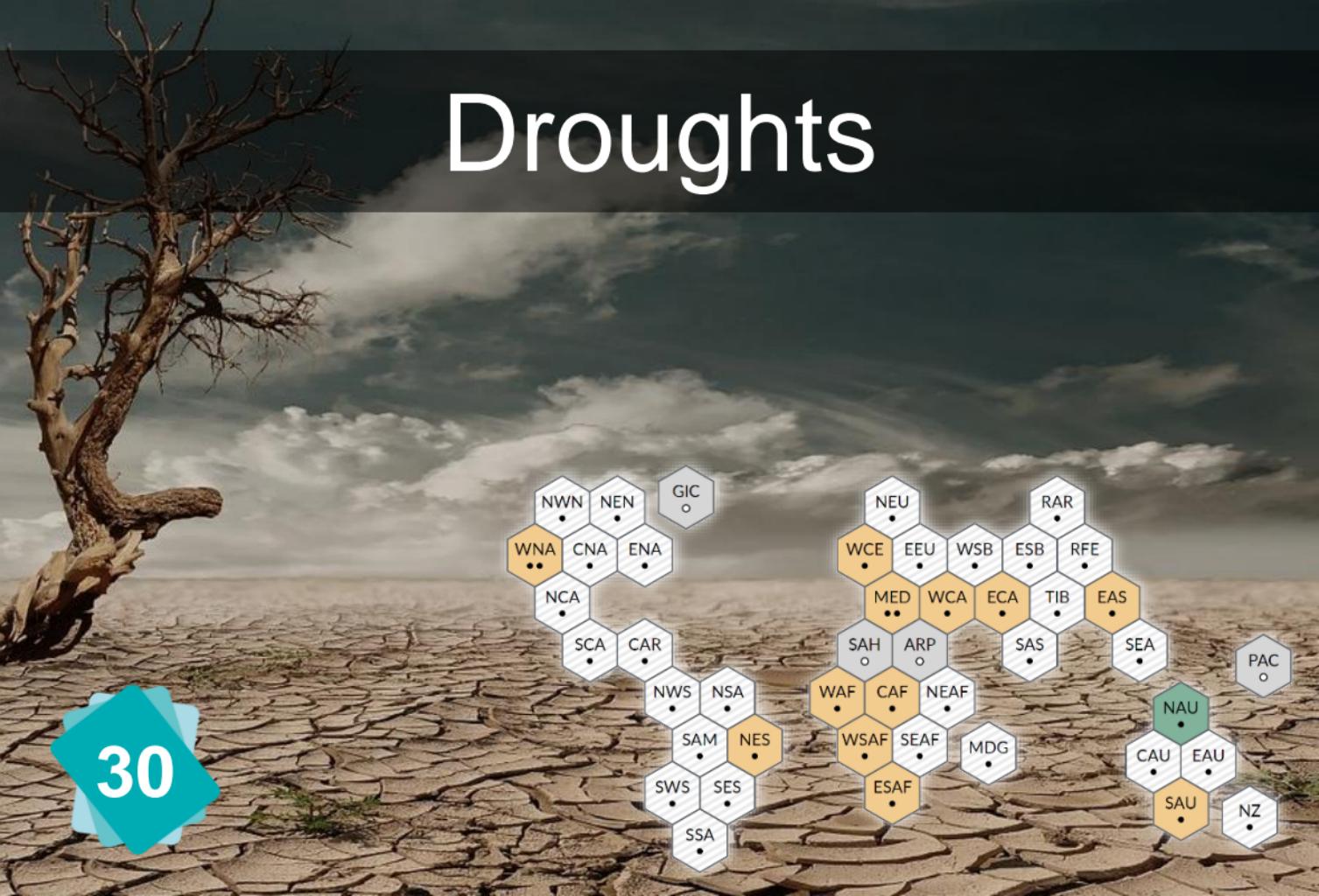


29

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

Set 4

Droughts



30

30

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.

Marine Submersion



33

33

Cyclones and other extreme weather events bring strong winds, waves and low pressure conditions. A 1-hPa (hectopascal) drop in atmospheric pressure causes a 1-cm sea level rise. Therefore cyclones can cause marine submersions (coastal flooding), on top of the sea level rise already caused by global warming.

Set 4

Vectors of Disease



28

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

Freshwater Resources



31

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

Decline in Agricultural Yields



32

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

Forest Fires



35

35

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

Set 5

Heatwaves

36



36

One consequence of higher temperatures is more frequent heatwaves.

Hunger



37

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

Set 5

Human Health



38

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

Set 5

Climate Refugees



39

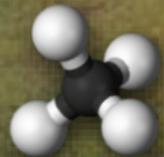
Imagine that you live in a place that has been miraculously spared from climate change. Several billion people may wish to share this space with you.

Armed Conflicts

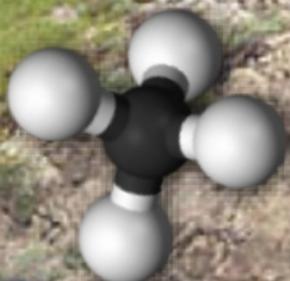




We shouldn't let it come to this...



Permafrost



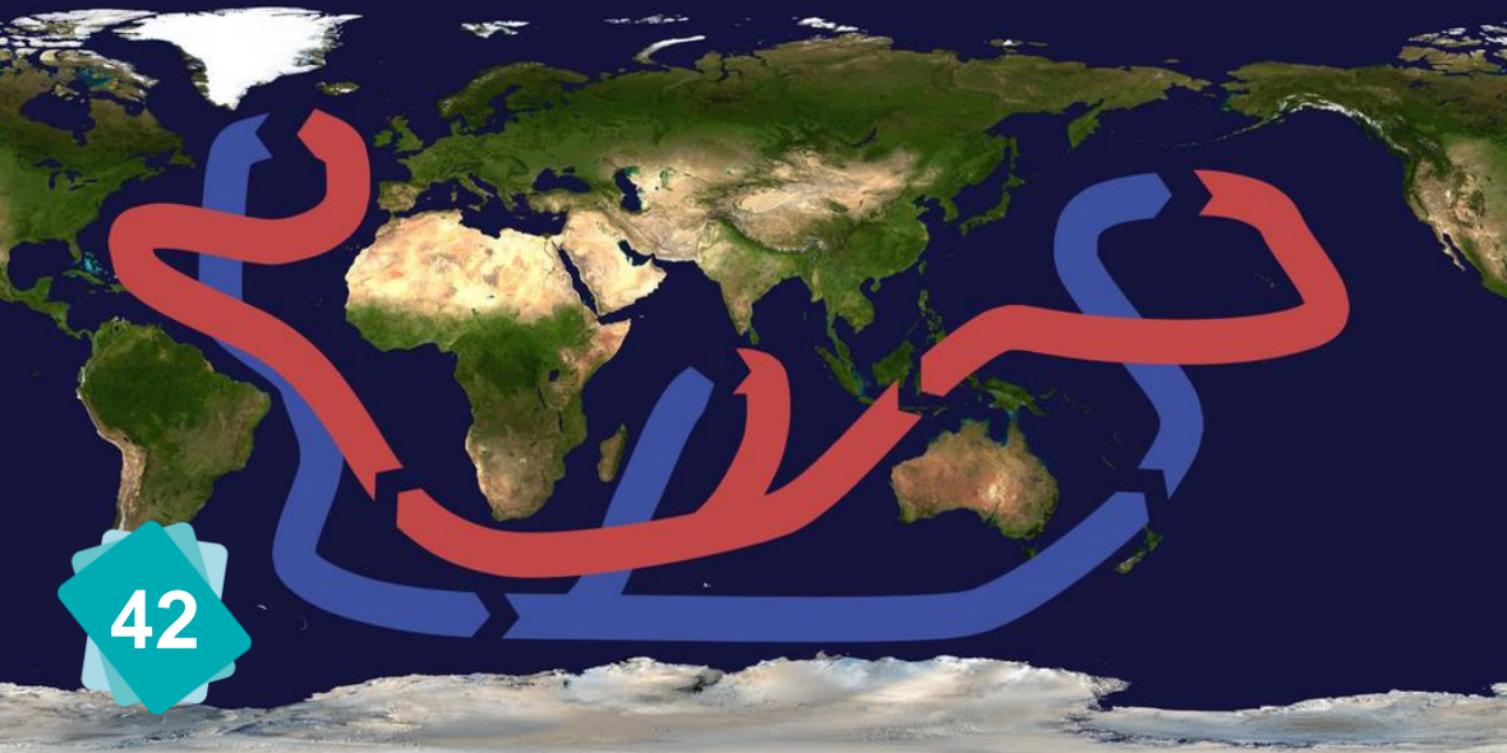
A teal diamond-shaped graphic in the bottom left corner contains the white text "41".



41

Permafrost is permanently frozen ground. It is starting to melt, releasing into the atmosphere previously locked-in methane and CO₂ from decomposed biomass. This creates a negative feedback loop, just like forest fires and albedo changes due to melting sea ice.

Weakening Gulf Stream

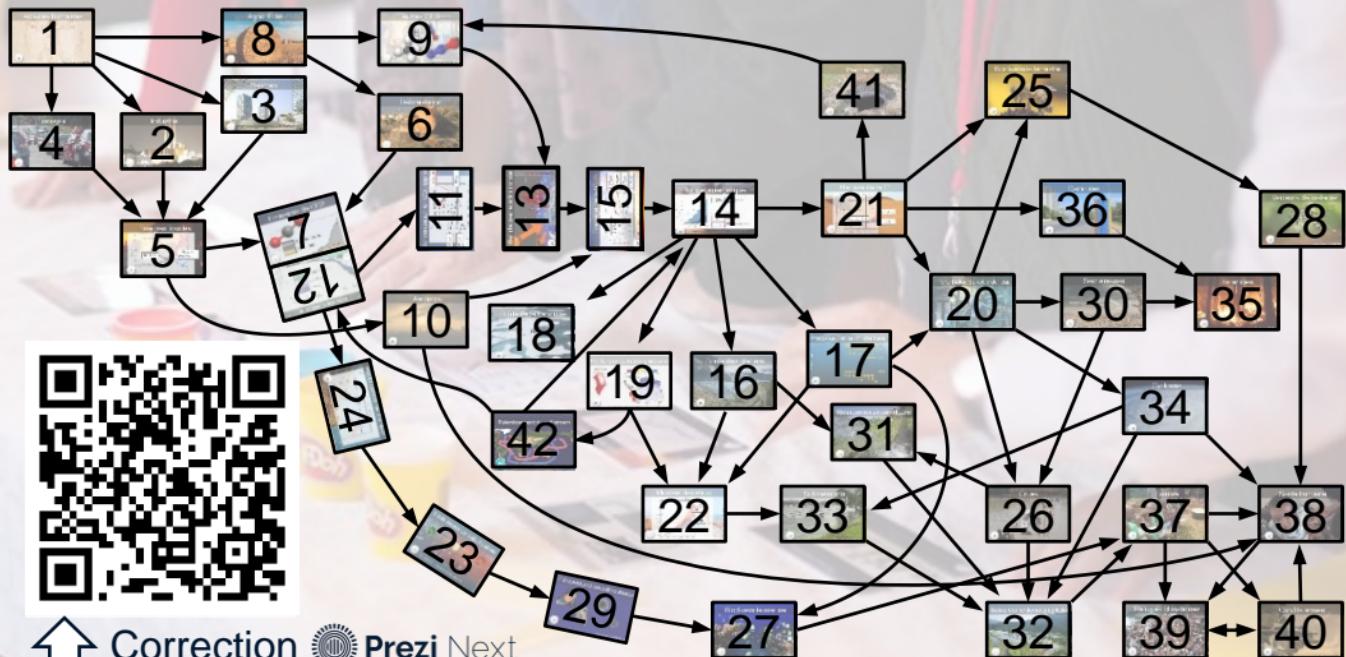


42

42

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.

Key



Correction



Prezi Next

The 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!



English



Scan to join us!