EN-GB

Adults

CL!MATE FRESK

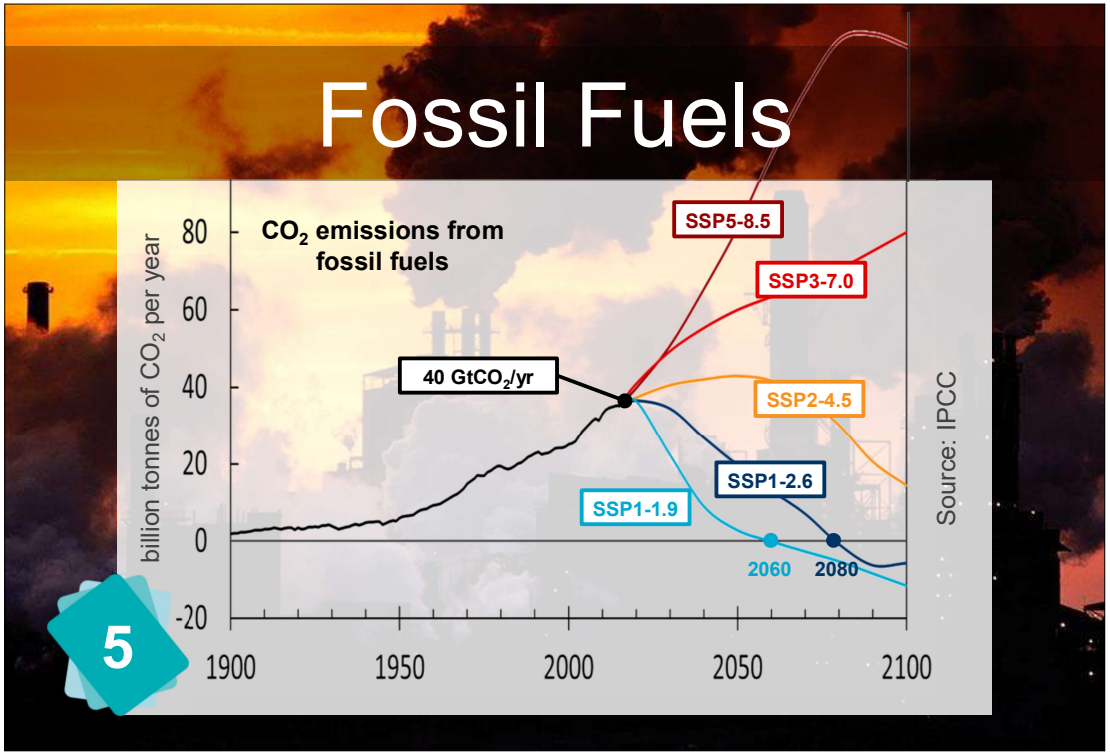
All the cards are in your hands!

Climate Fresk - EN-GB - Adults – V8.3 – 23/07/2022

Human activities

1

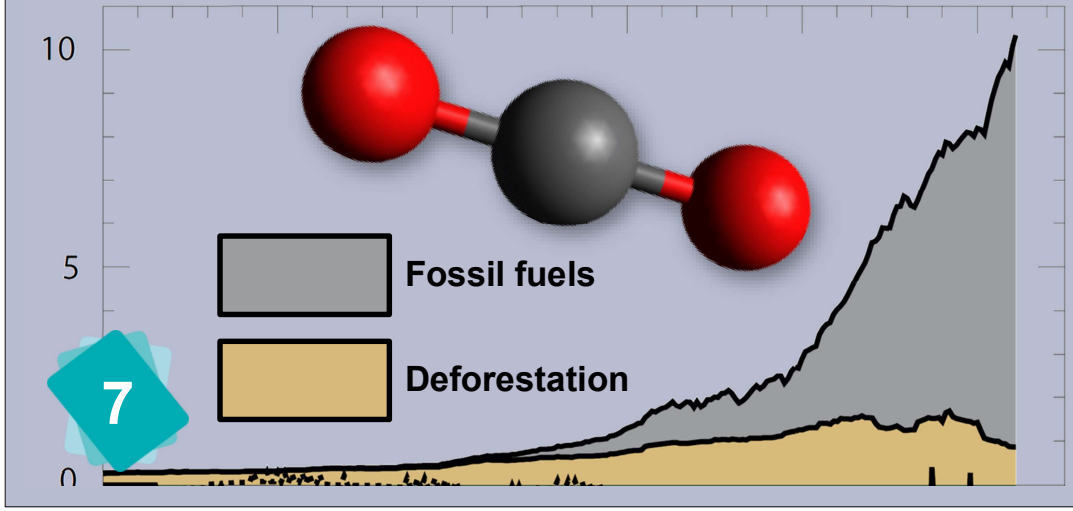
Fossil Fuels



5

CO_2 Emissions

Anthropogenic CO_2 emissions (GtC/yr)



7

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

7

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

Set 1

How to play

You need one deck of cards per team (5 to 7 people), 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.

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1

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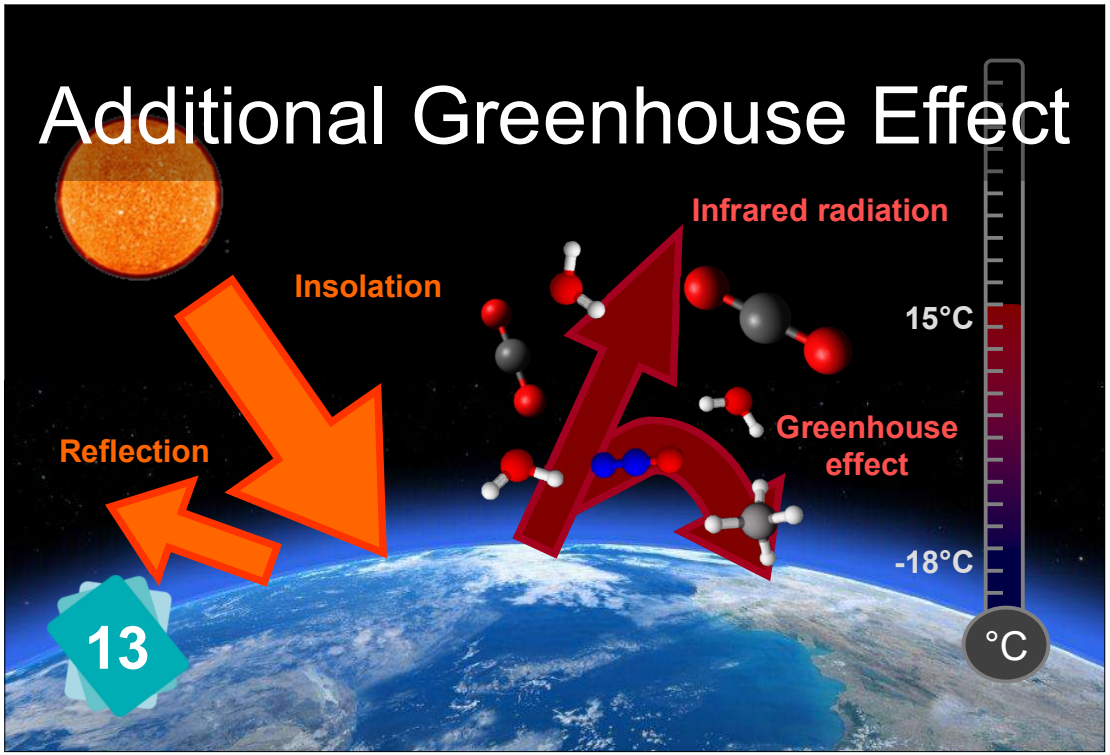
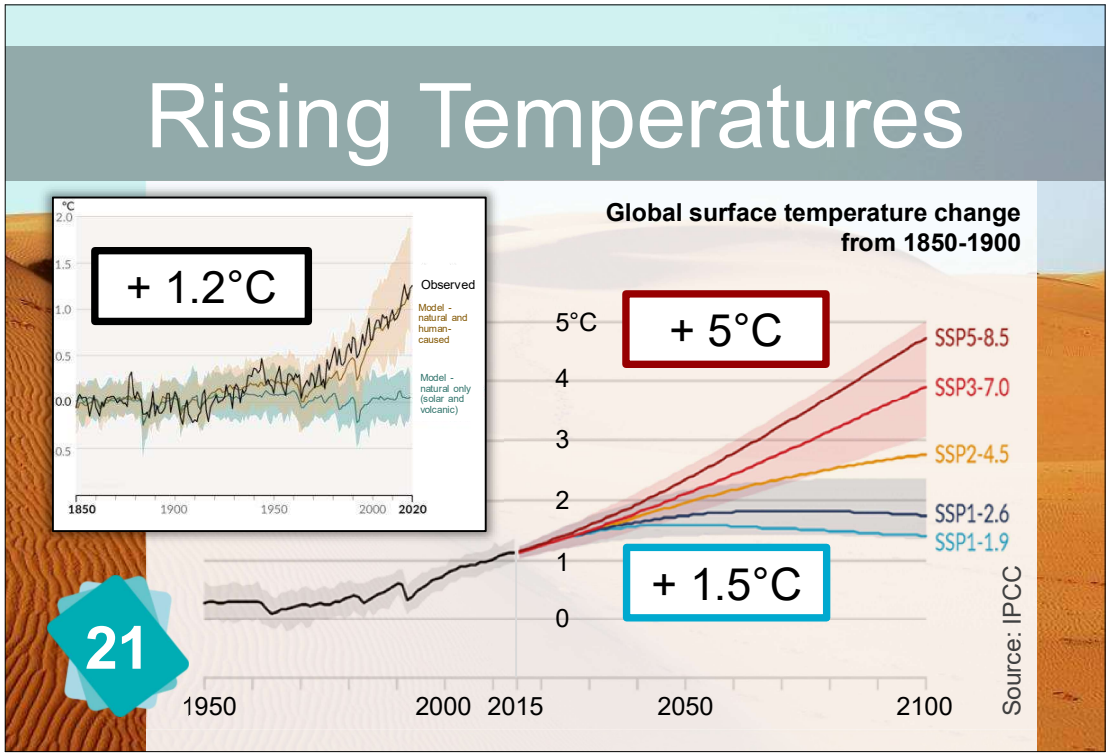
This is where it all begins…

Set 1

Additional Greenhouse Effect

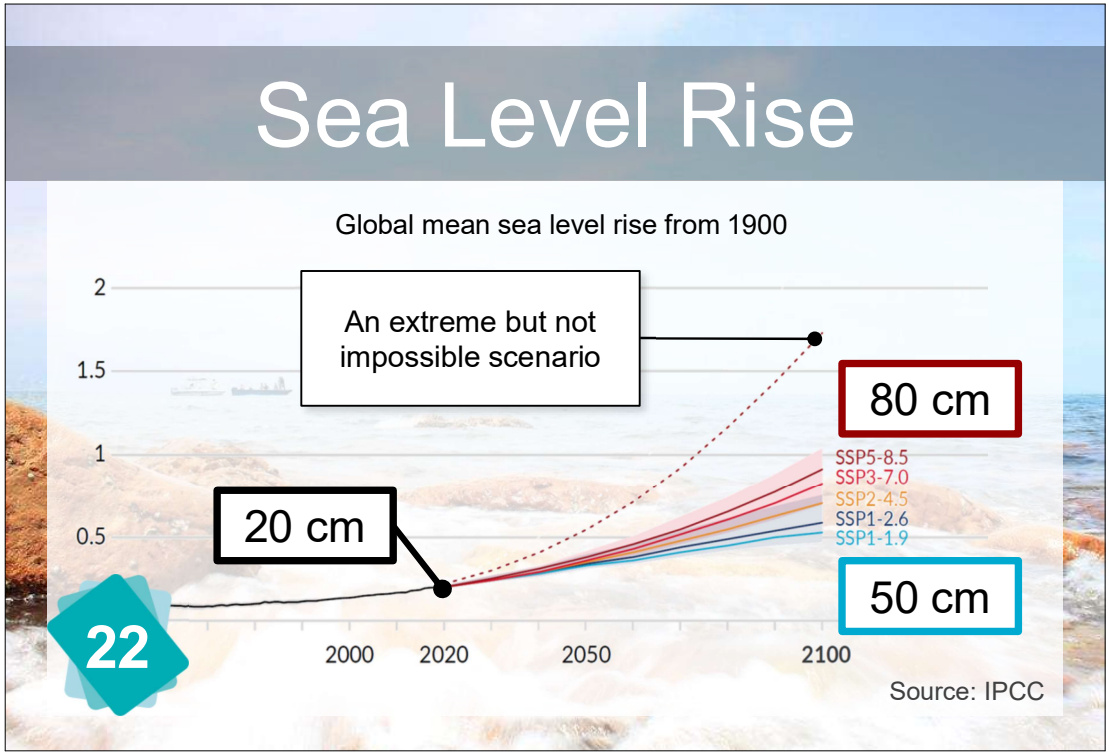


Rising Temperatures



Melting Sea Ice

Sea Level Rise



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).

Set 1

22

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

Set 1

13

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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 CO_2 and other GHGs related to human activities amplify the greenhouse effect and unbalance the climate.

Set 1

21

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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.

Set 1

Industry
2

Building Usage
3

Transportation
4

Deforestation
6

4

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

Set 2

6

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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

2

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

Set 2

3

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

Set 2

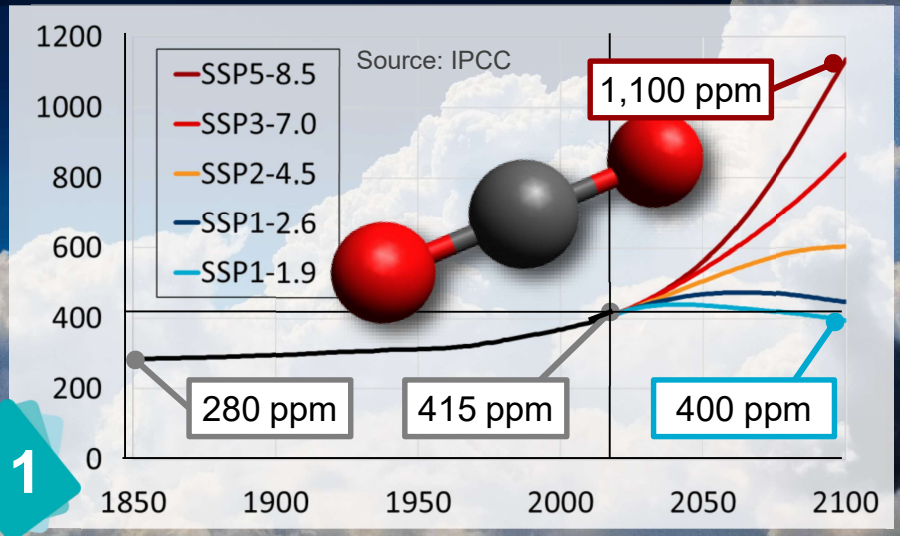
Agriculture

8

Other GHGs

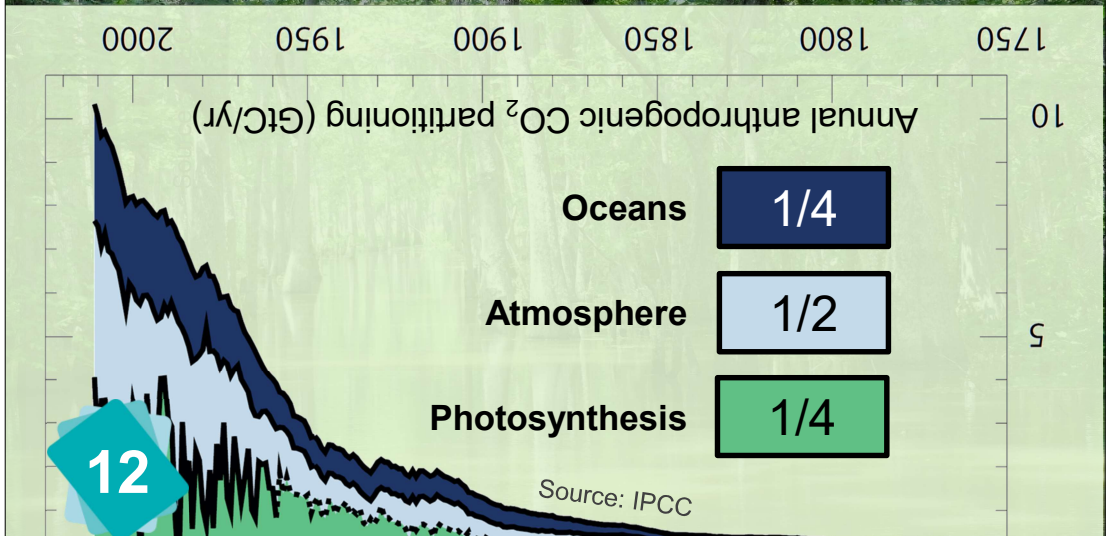
9

Concentration of CO_2



11

Carbon Sinks



12

11

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About half of 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

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

8

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Agriculture does not emit much CO_2 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.

Set 2

9

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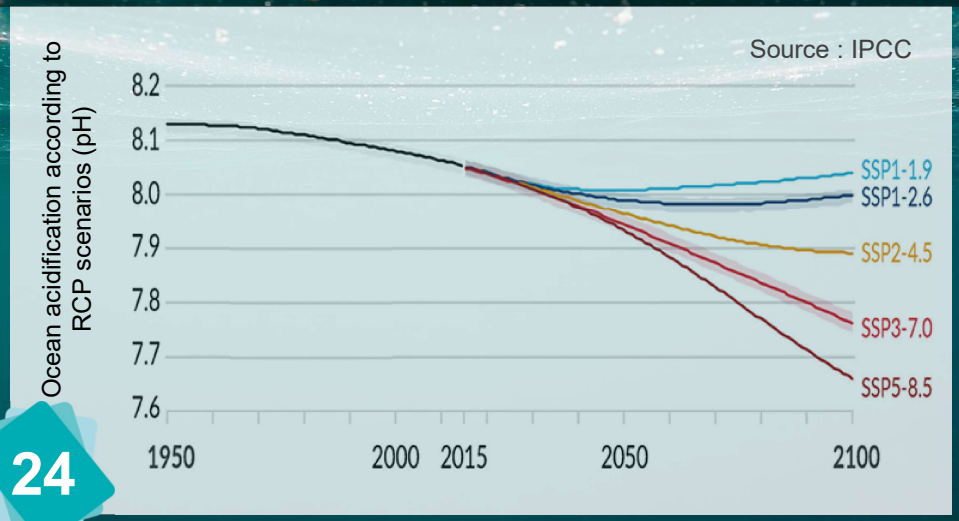
CO_2 is not the only greenhouse gas (GHG). Among others are methane (CH_4) and nitrous oxide (N_2O), both of which mainly come from agricultural activities.

Set 2

Ocean Acidification

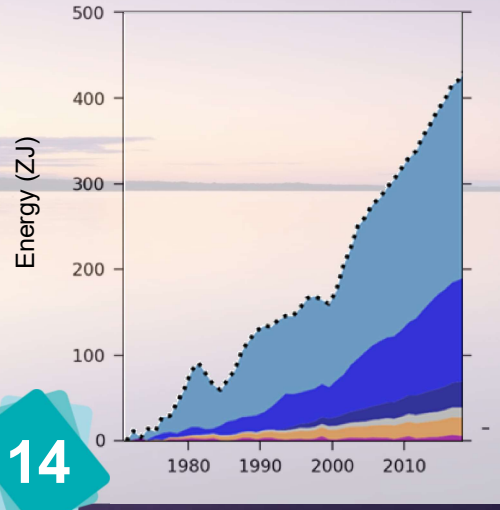


24

Aerosols

10

Energy Budget

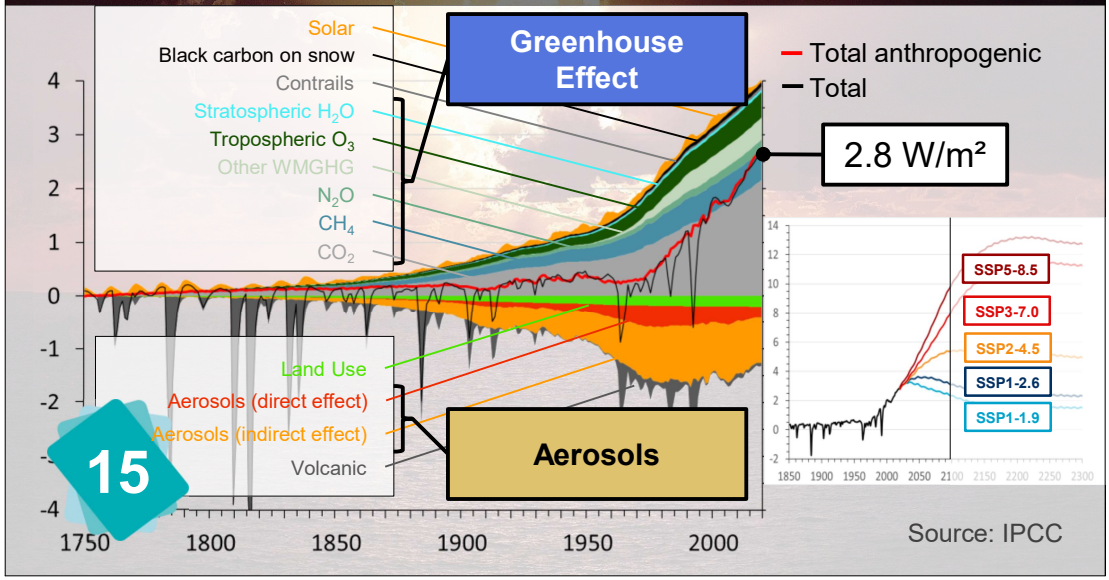


91 %	Ocean
3 %	Melting ice
5 %	Soil
1 %	Atmosphere

Source: IPCC

14

Radiative Forcing



15

Source: IPCC

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

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 square meter), 3.8 W/m² from the greenhouse effect and -1 W/m² from aerosols.

Set 3

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

10

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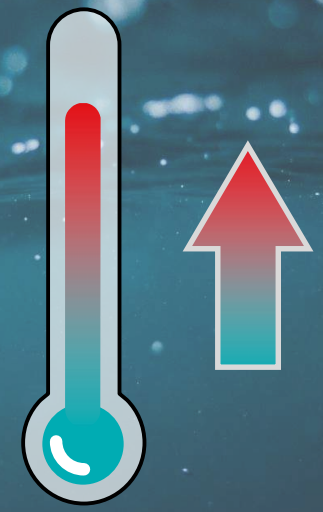
Nothing to do with aerosol spray cans. Aerosols are a type of local pollution that comes from the incomplete combustion of fossil fuels. They are bad for human health and they negatively contribute to radiative forcing, meaning that they have a cooling effect on the climate.

Set 3

Melting Glaciers

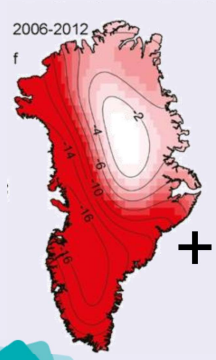
16

Rising Water Temperatures

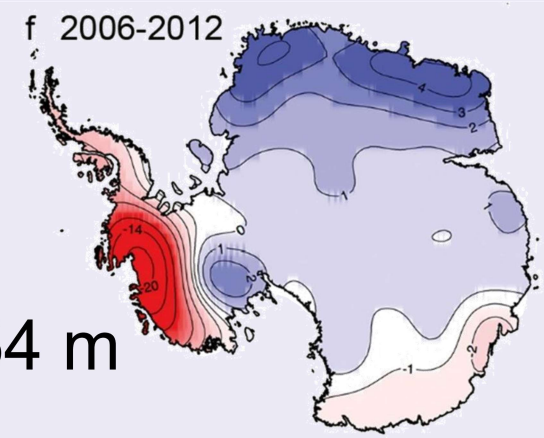


17

Melting Ice Sheets



+ 7 m

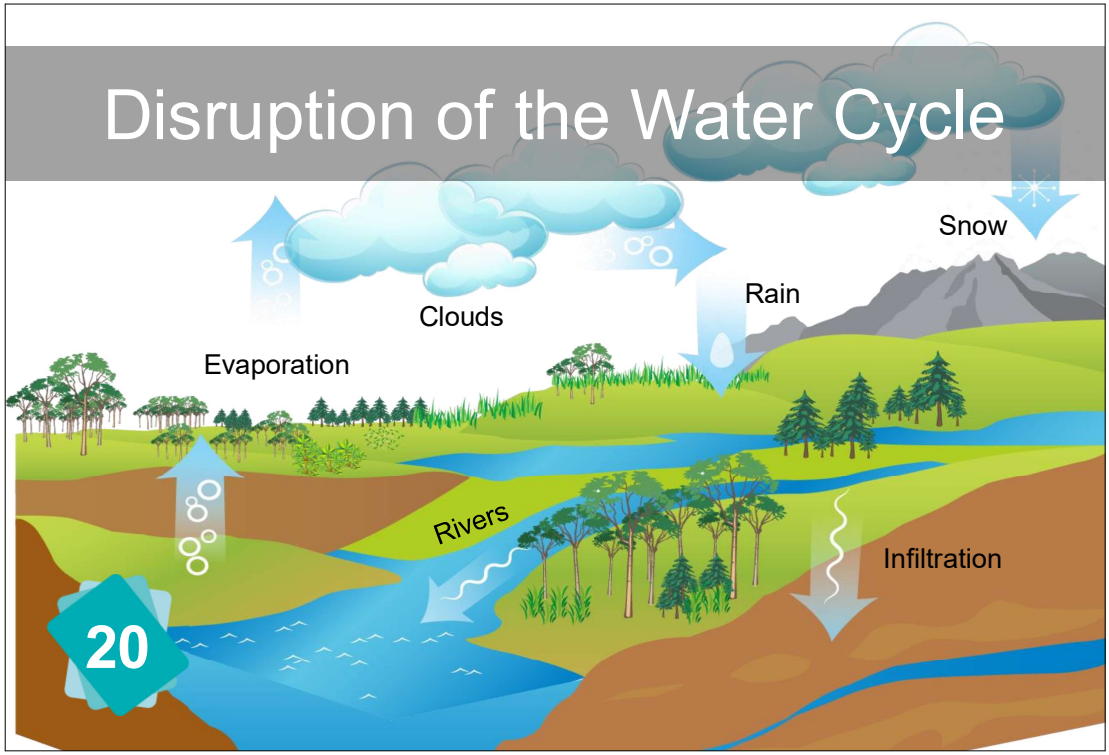


+ 54 m

19

Source: IPCC

Disruption of the Water Cycle



20

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 7 meters for Greenland and 54 meters for Antarctica. During the last ice age, ice sheets were so much larger that the sea level was 120 meters lower than today.

Set 3

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

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

17

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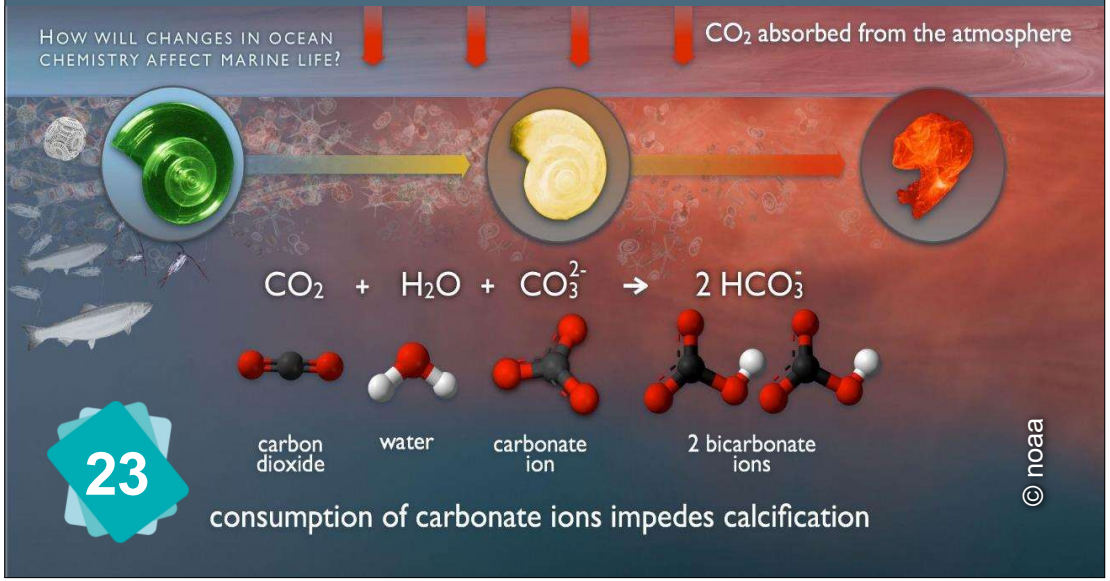
Oceans absorb 91% of the energy accumulated on Earth. The water temperature has therefore increased, especially close to the surface. Water expands as it warms.

Set 3

Calcification difficulties



23

consumption of carbonate ions impedes calcification

Terrestrial Biodiversity

25

River Flooding

26

Marine Biodiversity

27

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

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 impacts marine biodiversity.

Set 4

23

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When the pH drops, it becomes harder for limestone to form, espessially for calcareous shells.

Set 4

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

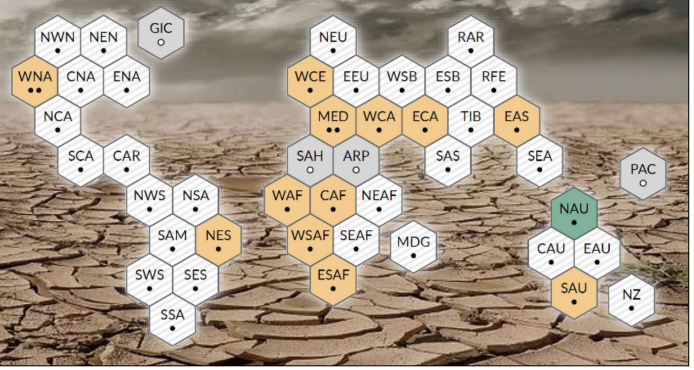
Cyclones

34

Pteropods and Coccolithophores

29

Droughts



30

Marine Submersion

33

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

33

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

Set 4

34

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

Set 4

29

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

Set 4

Vectors of Disease
28

Freshwater Resources
31

Decline in Agricultural Yields
32

Wild Fires
35

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

35

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

Set 5

28

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

Set 5

31

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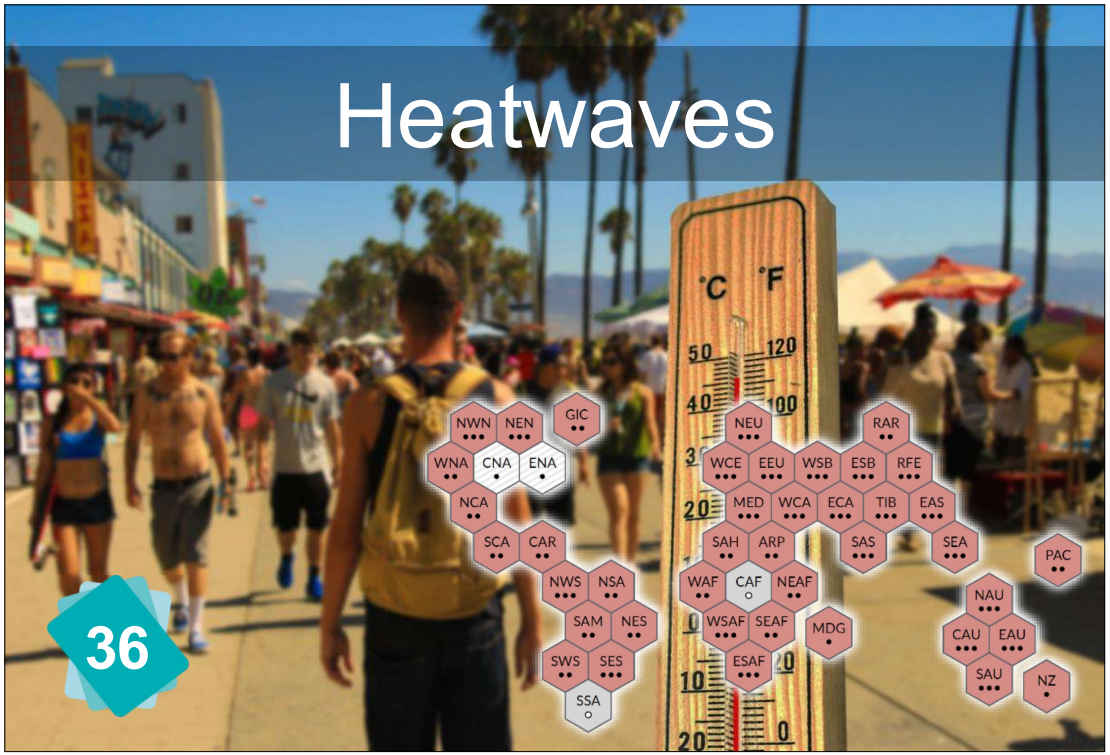
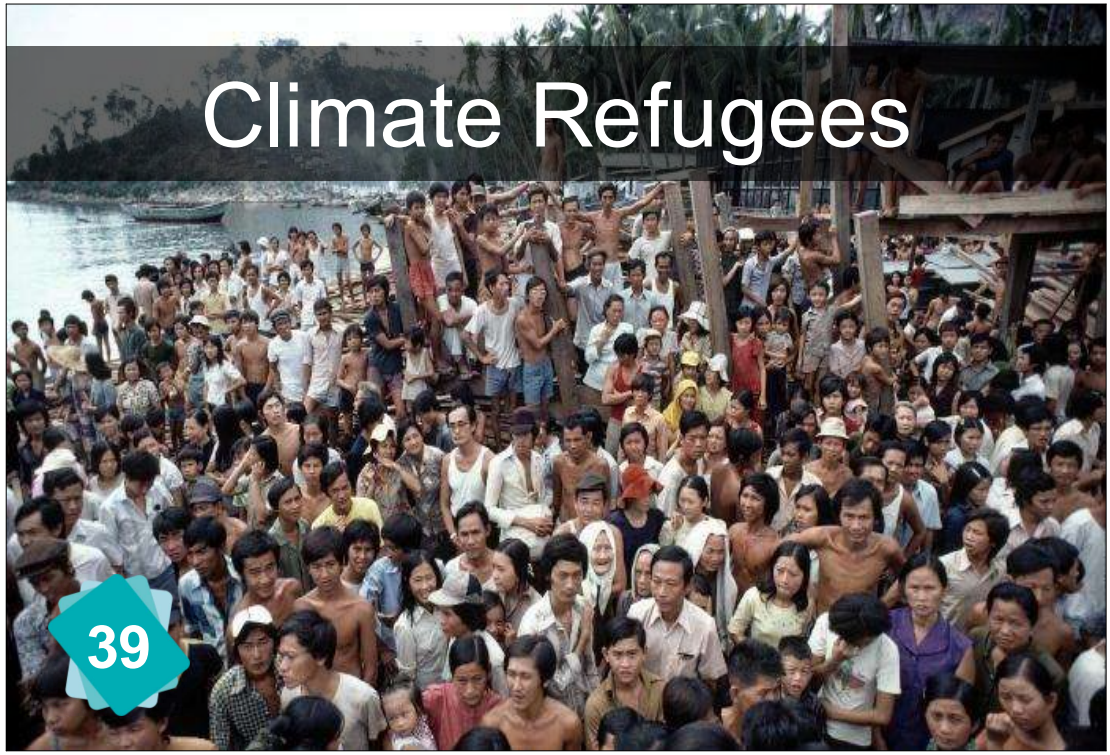
Freshwater resources are affected by changes in rainfall and by the melting of glaciers that regulate the flow of rivers.

Set 5


Heatwaves
°C °F
50 120
40 100
30
20
10 0
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 SAS SEA
WAF CAF NEAF
WSAF SEAF MDG
ESAF
RAR
PAC
NAU
CAU EAU
SAU NZ
36

Famines
37

Human Health
38


Climate Refugees
39

38

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

Set 5

39

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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.

Set 5

36

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One consequence of higher temperatures is more frequent heatwaves.

Set 5

37

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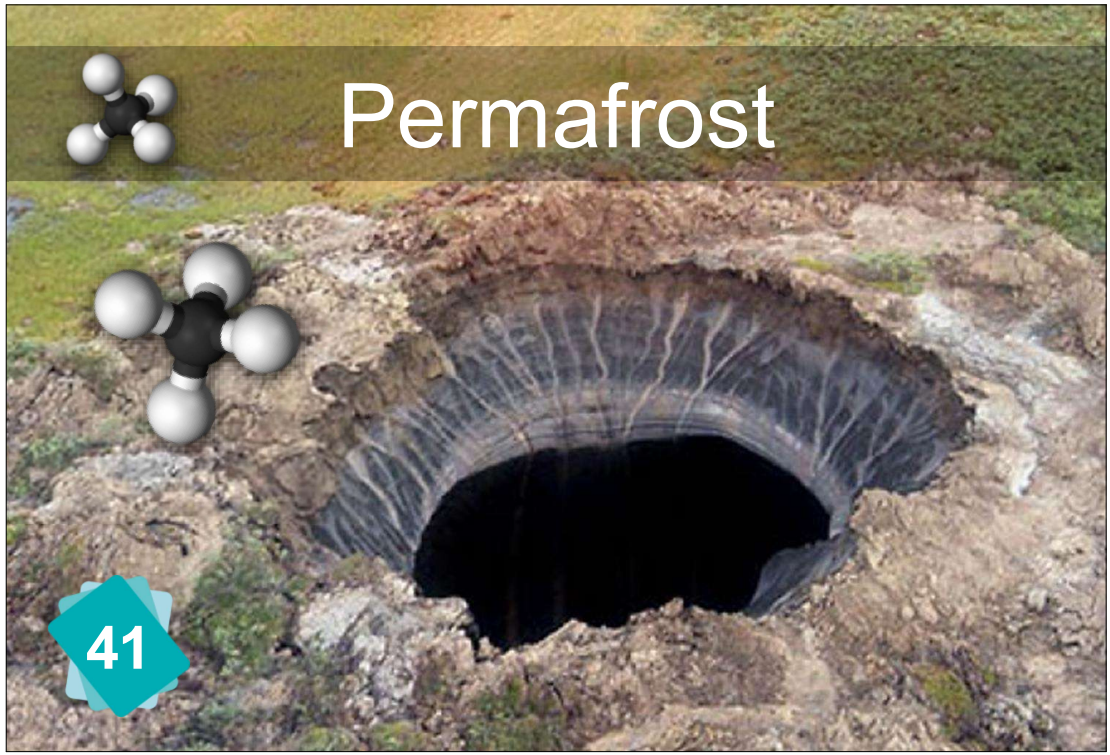
Famines can be caused by lower agricultural yields and by the loss of marine biodiversity.

Set 5

Armed Conflicts

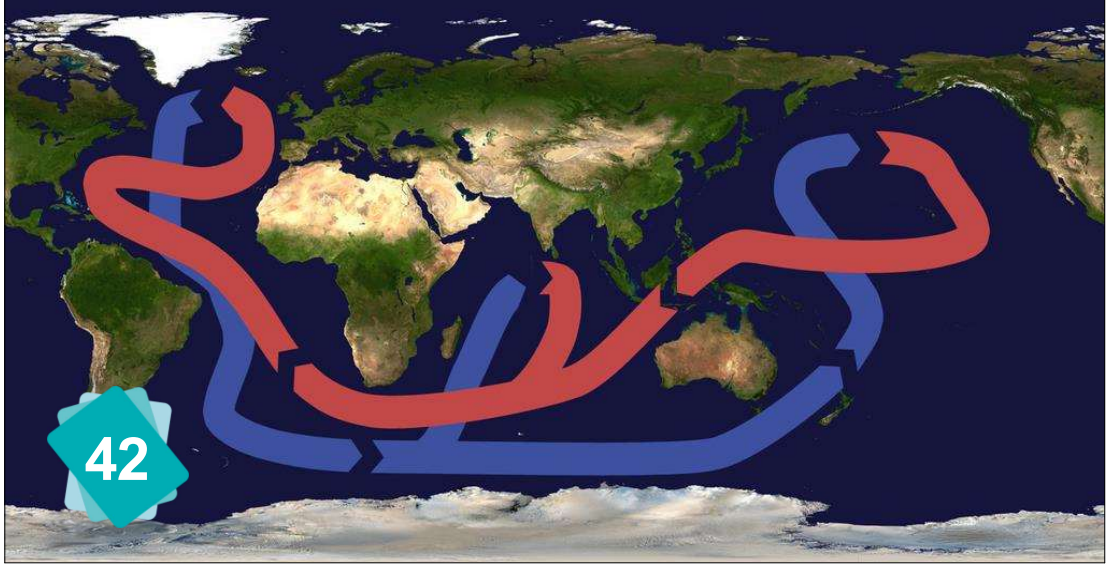
40

Permafrost



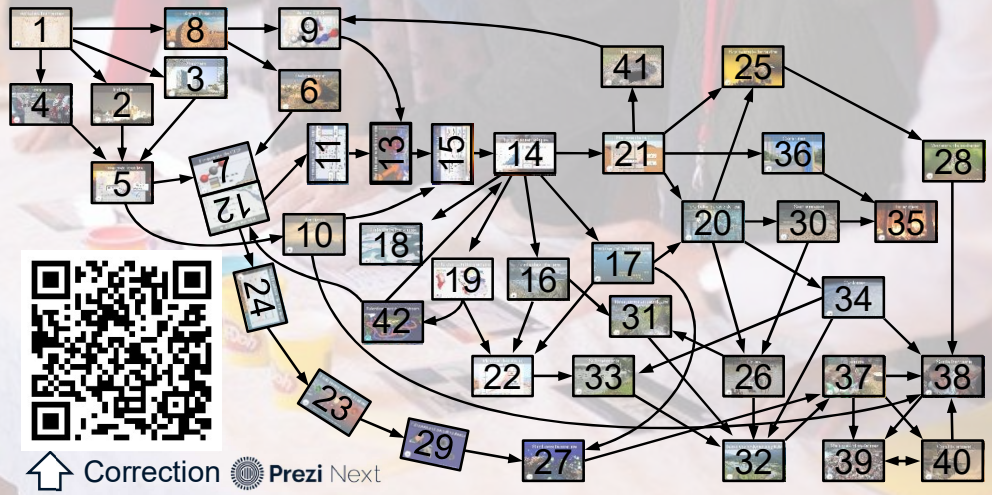
41

Thermohaline Circulation



42

Key



42

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Thermohaline Circulation 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 carbon and heat.

Set 5

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Its distribution is managed by the non-profit association "La Fresque du Climat".

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EN-GB

English

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All the cards are in your hands!

Scan to join us!

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40

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We shouldn’t let it come to this…

Set 5

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