The Climate Web

an introduction to climate science

Aim: for participants to have a basic understanding of the causes and consequences of climate change and how these are inter-connected.

Preparation & Resources: cut up one set of cards for each group of 6-8 participants. Have pens and bluetac available.

Introduction: what do participants know already about the causes and consequences of climate change? (5 mins)

Activity:

- Can they order the green and grey cards to explain the causes and consequences of climate change? The green cards are headings and may be set out as below. The grey cards can be organised under these headings. Alternatively, participants can choose their own way of ordering the cards. (15 mins)

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Activity cont:

- Can they draw arrows to show the inter-connections between the grey cards? (10 mins)
- Look at the pink FACT cards – which ones shock / surprise them most? Can they add the FACT cards next to the relevant cards of the web? Do they know any other facts about climate change? (10 mins)
- How are schools connected to the causes and consequences of climate change? Can they identify these by placing the school icons on the relevant cards.
- There is no definitive answer to the activity – but hopefully participants will recognise how the causes and consequences of climate changes are intricately linked in a complex web.

Discussion: what can we do as individuals, school staff and schools to address some of the issues raised?

NB: The 'Carbon Sinks' card is a bit of an anomaly, being the only card that has a positive impact on GHG storage.

Human Activities

Scientists across the world agree that human activities are the main cause of climate change. The Anthropocene is the geological era where human activity is having a substantial impact on our planet.

Greenhouse Gases (GHGs)

GHGs are gases in the atmosphere that trap heat. They occur naturally but human behaviour is increasing their concentration in the atmosphere.

Impact on the Climate

How does global warming impact our climate?

Impact on the Planet

How does climate change impact the planet?

Impact on People

How does climate change impact people around the globe?

Impact on Biodiversity

How does climate change impact biodiversity?

Burning Fossil Fuels

Fossil fuels, coal, gas and oil have been created over thousands of years from dead plant and animal materials. When we burn fossil fuels, CO2 is released into the atmosphere

Meat production

Cows release a lot of methane when they burp and wind. Producing all types of meat produces GHGs but beef has by far the greatest impact (6x more than chicken).

Agriculture

Around 25% of global GHG emissions come from agriculture – through deforestation, methane from cattle and nitrous oxide from fertilizers.

Production of goods

Everything we buy comes from the industry which creates a lot of C02 emissions. A lot of what we buy is barely used. Manufacturing accounts for about 12% of global emissions.

Disposal of goods

Most goods that we buy are sent to landfill, burnt or recycled. Burning waste is our most polluting form of energy production. Recycling also uses a lot of energy in the process.

Energy use

Energy use in buildings for heating, cooling etc, accounts for 20% of GHG emissions.

Building & Construction

Chemical reactions involved in the production of cement create C02. 7% of all GHG emissions come from the building industry.

Transport

Transportation typically relies on oil to move. Burning oil releases C02. Transportation accounts for approximately 15% of all GHG emissions.

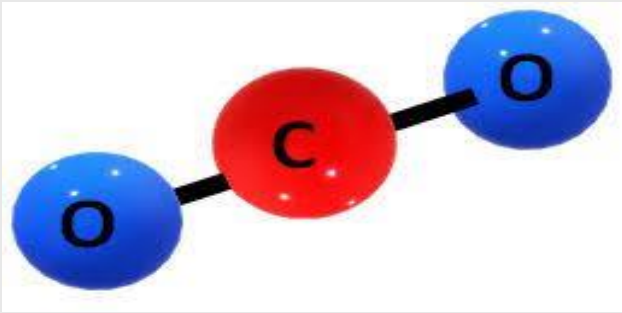
Cooling

F-gases are GHGs used in fridges, air conditioning and aerosols.

Deforestation

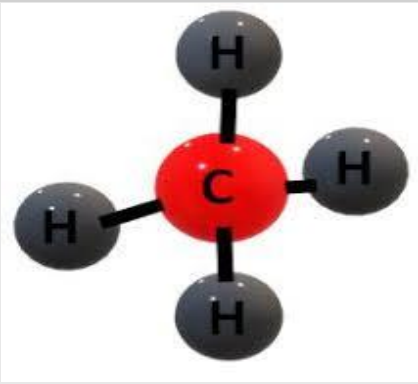
80% of deforestation is for agriculture and food production. This destroys habitats, impacts species and stops C02 being absorbed by forested land.

Carbon Dioxide C02



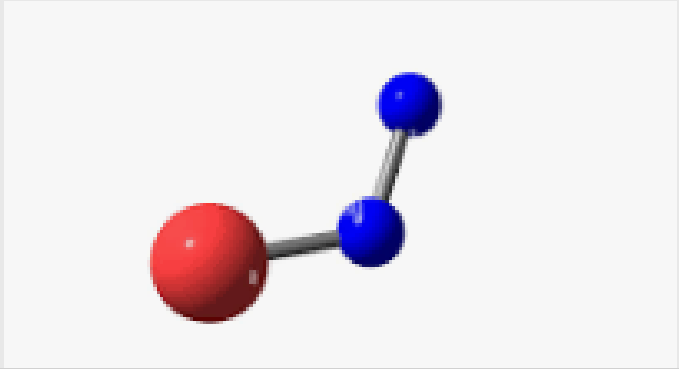
Carbon dioxide is the main greenhouse gas caused by human activities. Most C02 emissions are from burning fossil fuels or deforestation, where carbon stored in trees is released back into the atmosphere.

Methane CH4



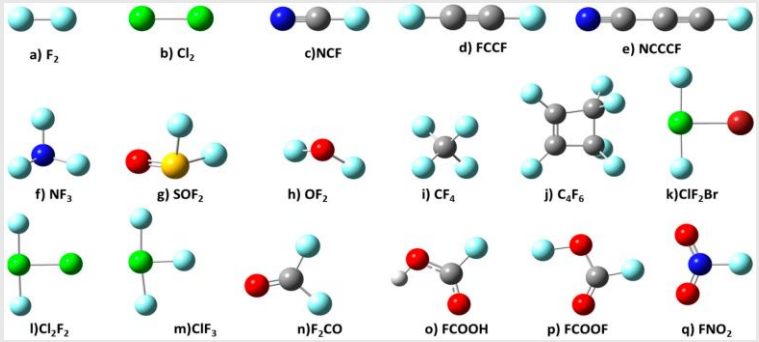
Methane is the second most powerful GHG. It is produced from agriculture (especially cows) and the decomposition of waste in landfill.

Nitrous Oxide N20



N20 is 300 times more potent than C02 and damages the ozone layer. Nearly all N20 comes from agriculture and fertilizers. It is responsible for around 6% of GHGs.

F-Gases



Fluorinated gases eg are less common than C02 but have over 3000 times more warming potential.

Greenhouse Effect

When GHGs enter the atmosphere, they act as a blanket insulating the Earth, absorbing energy and slowing the rate heat leaves the planet.

Carbon Sinks

About half our C02 emissions are captured by natural carbon sinks eg plants through photosynthesis and the ocean. The rest of our emissions stay in the atmosphere.

Melting Sea Ice

When sea ice melts, there is less 'white' to reflect light. The darker ocean absorbs more heat – a positive feedback loop called the Albido Effect

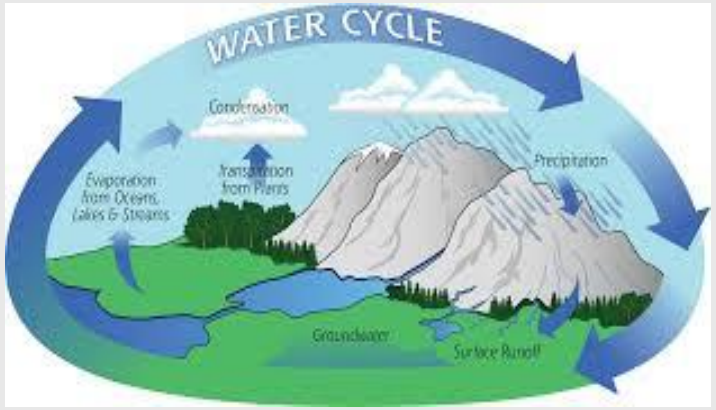
Melting Glaciers and Ice Sheets

Glaciers in Greenland and Antarctica are melting fast. If they melted completely, sea levels would rise by 7- 54m. Inland glaciers are also melting, affecting our water supply.

Warming Oceans

Water absorbs our rising temperatures. When water heats up, it expands, causing sea level rises.

Disruption to Water Cycle



Warmer water and air causes more of the oceans' surface to evaporate leading to more rainfall and drier soil.

Cyclones & Storms

Storms and cyclones are intensified, getting more energy from warmer ocean water.

Ocean Acidification

When C02 is absorbed by the ocean, it causes ocean acidification. This affects which marine life can live in the sea.

Flooding

Flooding caused by rain is often worse in urban area where the rain cannot be absorbed by hard surfaces

Droughts

Disruption of the water cycle can lead to too little rain, causing droughts. This impacts food security, people's livelihood and increased risk of disease and fuels migration.

Increased Rainfall

Warmer air holds more water than cool air so rainfall increases leading to more and heavier rainfall.

Rising Sea Levels

Sea levels are rising as the water heats up and expands. It's also affected by melting sea ice and glaciers.

Reduced Crop Yields

Crops are affected by changes in temperature, rainfall, floods, droughts and extreme weather events

Starvation

Famines occur when crop failure and insufficient fish in the oceans means there is insufficient food for a population.

Loss of homes

Extreme weather events eg flooding, wildfires, hurricanes as well as coastal erosion and sea level rise cause many homes to be destroyed

Climate Migration

Extreme weather will make some areas difficult or impossible to survive in. War over resources may be more likely. People will be forced to move to more hospitable areas.

Species Loss - terrestrial

The climate crisis is also a biodiversity crisis. Species are affected by loss of habitats, changing temperature, water availability, pollution and human activity.

Habitat Loss

Human activity and climate change is causing habitats to shrink, flood, burn, melt, shift or disappear completely.

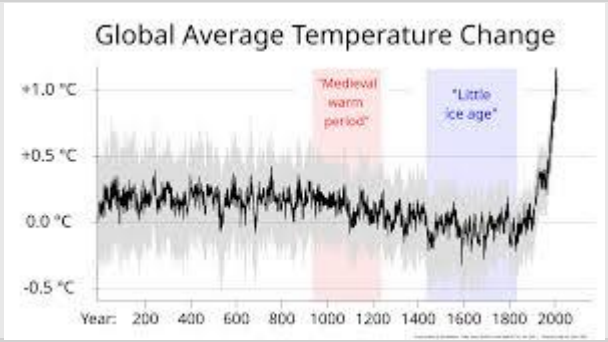
Heatwaves

Heatwaves are becoming more common and more intense, impacting human health and plant and animal species.

Melting Permafrost

Warming temperatures melt permanently frozen ground. As it thaws, the frozen ground decomposes, releasing C02 and CH4.

Rising Temperatures



Average global temperatures are now 1.5 oC above pre-industrial levels. This is the level scientists have agreed we need to keep below. Temperatures are predicted to rise between 2 and 5oC by 2100.

Industry

Industry uses a lot of fossil fuels and accounts for 40% of GHG emissions.

Particulates

Airborne particulates are caused from the incomplete burning of fossil fuels and have a negative effect on air quality and human health.

Species loss - marine

Warming oceans, ocean acidification and over-fishing affect the abundance of marine species that live in our seas.

Disease

Warming temperatures cause animals to migrate, carrying disease to new areas.

Wildfires

Wildfires are more likely when places experience hotter, drier weather and droughts. As wildfire burn, they emit large quantities of C02 – a positive feedback loop.

Access to Freshwater

Our water supply is affected by droughts, changes in rainfall and melting glaciers (that store water) and pollution.

Human Health

Human health is affected by extreme weather, disease carried by animals, pollution and also conflict as a result of the climate crisis.

FACT

2024 was the hottest year on record and the first year to exceed 1.5ºC above pre-industrial levels for the whole year.

EU Copernicus Climate Service, 2024

FACT

Average rainfall in the UK is 7% higher than 2 years ago

Met Office, 2024

FACT

Under current policies, global temperature averages are predicted to rise by 3.2 degrees by 2100

Intergovernmental Panel on Climate Change, 2023

FACT

Since 1900, sea levels have risen by 20cm

NASA, September 2024

FACT

Average global ocean surface temperatures records have been broken everyday since May 2023

EU Copernicus Climate Service, 2024

FACT

Between 2030 – 2050 climate change is expected to cause approximately 250 000 additional deaths per year

World Health Organisation, 2023

FACT

CO_2 levels in our atmosphere have risen from 280 parts per million (ppm) - 45Oppm in the last 150 years.

NASA (2024)

FACT

In 2021, 89 million people were displaced from their homes due to extreme weather events. Climate migration is predicted to rise to 1.2 billion by 2050 and 3 billion by 2100.

Institute for Economics and Peace (2020)

FACT

Antarctica is losing ice mass (melting) at an average rate of about 150 billion tons per year

NASA (2024)

FACT

Global wildlife populations have shrunk by 73% in the last 50 years

Living Planet Report, 2024

FACT

If we continue to see climate related extreme-weather events increase at the same rate, the world faces losing nearly 167 million homes by 2040

Northumbria University, 2021

FACT

Between 2030 – 2050 climate change is expected to cause approximately 250 000 additional deaths per year

World Health Organisation, 2023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