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# Climate, the sea and me

## Sustainability Goals:



## Subject links:

Geography, Science, Maths, Citizenship

## Curriculum links:

Weather, Climate, Human impact, Materials & properties, Investigation, Measurement, Topical issues

Ages 7–9

## Ocean Literacy Principles:

3. The ocean is a major influence on weather and climate.
4. 6. The ocean and humans are inextricably interconnected

## Learning Objectives:

- To understand the difference between climate and weather
- To begin to understand what climate change is and how it is caused
- To conduct an experiment to learn about the effects of sea level rise
- To make observations about change of temperature associated with greenhouse effect
- To explore how we can all help to reduce climate change

## Resources provided:

- [Climate change fact file](#)
- [Climate explained - video](#)
- [Climate change \(according to a kid\) – video](#)
- [Rising sea level images](#)
- [Rising sea level experiment instructions](#)
- [Climate change scenario statements](#)

## Extra resources required:

Activity 2 – Clear bowl, ice, rocks, erasable felt tip pen

Activity 3 – Clear jars with lids, plastic wrapping (reuse), thermometers

## Step 1

### Background

Climate change is the long-term global shift in the planet's average temperatures and weather patterns. Human activities are adding greenhouse gases into the atmosphere accelerating the rate of change. Climate change is causing both atmospheric and sea temperatures to rise. Our ocean and its ecosystems are suffering from rising sea levels, ocean acidification, changes in ocean currents and increased extreme weather events. Globally, we all need to reduce carbon emissions from activities both on land and at sea to reduce the rate of climate change.

More info in the [fact file](#).

## Step 2

### Set the scene

#### 10 minutes – What is the climate?

[Watch this BBC video](#) which explains the difference between weather, climate and climate change to introduce the topic. After the video ask the questions; What is the weather like today? What is the climate like in the UK? What is climate change? Ask pairs to discuss each question before reviewing answers as a class. Explain that today you are going to investigate how climate change is affecting the ocean.

## Step 3

### Activities

#### Activity 1 – 20 minutes – What is climate change?

To explore climate change in more detail [watch this video](#), pausing at 1 minute 30 seconds. After watching ask the question. What is causing climate change? Students should discuss in pairs before combining thoughts as a class, to create a brainstorm on your whiteboard. Rewatch the section from 0.24 – 1.12 to check learning, and to add any ideas not previously mentioned onto your whiteboard.

Now ask the question. How is climate change affecting the planet? Again, students should have a paired discussion, followed by class discussion before rewatching the section of the video 1.12 – 1.30.

#### Activity 2 – 30 minutes – Rising sea levels

Show the [Rising sea level images](#) and ask students if they know what the images are showing. Conduct a simple experiment, as a class, or in small groups, to show students how ice melting on land is leading to sea level rise. All details included in the [Rising sea level experiment instructions](#).

#### Activity 3 – 20 minutes – Warming ocean

Conduct a simple experiment to understand how the greenhouse effect is warming the ocean. For this you will need clear jars with lids for example Kilner jars, plastic wrapping, (preferably reused, for example, from food wrapping or packing) and thermometers. Place cold water in both jars and take the temperature. Wrap one jar in clear plastic wrapping to represent the greenhouse gas blanket around the earth. Place both jars under direct sunlight or a bright lamp and leave for a few hours. Return to record the temperature of both jars. Observe how the temperature is different in both jars and relate this learning to the greenhouse gas effect.

#### Activity 4 – 5 minutes – How does my life connect to life in the ocean?

Read out the statements on the [Climate change scenario worksheet](#). For each statement, ask children to consider how this action could affect the ocean and whether the statement is a good or bad thing for the ocean. Ask children to respond to each statement with a thumbs up (positive for the ocean) or thumbs down (bad for the ocean). Use each statement as a way of linking our lives to climate change and to the ocean.

## Step 4

### Extend

#### **1 hour - Protecting the ocean through education**

Students should work together in small groups to create a short presentation about what climate change is and how the ocean is affected. Encourage students to think creatively about how they can engage their audience with the subject. Students could perform their presentation at a school assembly to inspire other students. Presentations could even be filmed and shared on your school's website to help educate and inspire others.

## Step 5

### Reflect

#### **5 minutes**

What is climate? What is climate change? How is climate change affecting the ocean? What can we do to help reduce climate change?

## Step 6

### Follow up

To learn more about threats to the ocean and how as individuals, and as a school, we can help to protect it, complete our [Protect the ocean lesson](#).

# Climate Change Fact File

Climate change is the long-term global shift in the planet's average temperatures and weather patterns



## How is climate change caused?

Human activities are adding greenhouse gases like carbon dioxide, methane and nitrous oxide into the atmosphere. These gases form a kind of bubble over the earth. This atmospheric bubble traps the sun's rays and heats up the planet. Activities that increase greenhouse gases include:

- The burning of **fossil fuels** (coal, gas, and oil) for electricity, heat and transport releases large amounts of carbon dioxide into the atmosphere
- The meat industry, through the production of **methane** by livestock
- The destruction of carbon-storing **habitats** like forests and seagrass beds



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# Climate Change Fact File

Climate change is causing a rise in both atmospheric and sea temperatures, causing many negative effects to our planet.



## How does climate change affect the land?

- Increased frequency and intensity of **storms** are having devastating effects on whole communities, livelihoods, agriculture and industries across the globe
- **Wildfires** are destroying large areas of forests, killing animals and wiping out people's homes
- Increased **drought** affects many people through lack of water and severe hunger
- The change to seasonal weather systems is having negative impacts throughout the **natural world**, with plants and animals struggling to find food and reproduce.



Porthcawl, UK  
© Marcus Woodbridge  
via Unsplash



Wildfire devastation  
© Egor Vikhrev via Unsplash



Drought conditions  
© Markus Spiske via Unsplash

# Climate Change Fact File



## How does climate change affect the ocean?



Ice melting on land in our polar regions is causing **sea levels to rise**. It is estimated that by 2050 sea levels will rise globally by one metre. Flooding caused by sea level rise will affect many coastal communities and habitats, with some low-lying islands in countries like the Maldives becoming submerged. Sea level rise also leads to increased coastal erosion, threatening UK towns like Happisburgh which is losing 2 metres of land per year



Increasing concentrations of carbon dioxide are causing a decrease in ocean pH, known as **ocean acidification**. This causes problems for animals that grow a calcium carbonate shell, like corals. Coral reefs create vitally important habitats for many other animals. Shellfish and some plankton species, which are important food sources, also have calcium carbonate shells and will be affected by ocean acidification



The ocean plays a huge role in regulating our climate and our water cycle. But rising temperatures are impacting **ocean currents** and the circulation of water around our planet, which in turn is having an impact on our climate



Climate change is causing an increase in the frequency and size of storms and **extreme weather events**. These events have devastating effects on fragile marine coastal environments, like coral reefs and seagrass beds



Plant and animal species are **travelling further north**, and to greater depths, to search for cooler waters. These new areas may not provide animals with the food they need or effective reproduction sites. New species moving to an area could also have a negative impact on native plants and animals through competition for resources and space



# Climate Change Fact File

**Blue Carbon** refers to carbon that is removed from the atmosphere by ocean plants and is then stored in ocean habitats and sediments.



How does the ocean help to reduce climate change?

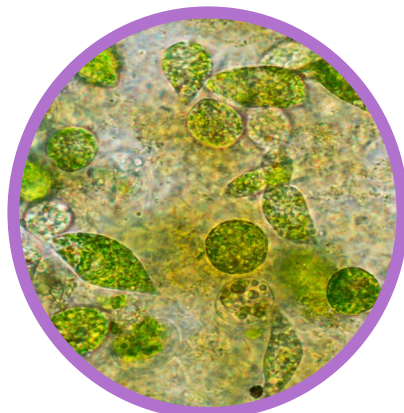
**Habitats** in the UK like seagrass beds and salt marshes, as well as mangrove forests in tropical waters, are brilliant at absorbing carbon dioxide from the atmosphere through photosynthesis. These habitats take up and store more carbon per metre than forests on land.

**Plankton** is the term for tiny algae (phytoplankton) and animals (zooplankton). Phytoplankton produce huge amounts of oxygen and absorb huge amounts of carbon dioxide through photosynthesis. Carbon is transferred up the food chain from small plankton species to larger fish species. When plankton that isn't eaten dies, their bodies sink down to the seafloor (known as marine snow), and carbon in the plankton is buried and stored in the seabed.

As **fish** move from deep waters to shallow waters to feed, they bring nutrient-rich waters from below. These nutrients enhance the production of plankton, and therefore enhance the uptake of carbon dioxide. Carbon also builds up through the food chain and is stored in the bodies of marine species. When they die, their bodies can sink to the seafloor and some of this carbon is eventually stored and buried in deep ocean sediments.



Seagrass habitat © Benjamin Jones via Unsplash



Phytoplankton © Rattiya Thongdumhyu



Horse mackerel © Peter Bardsley

# Climate Change Fact File

**Globally, we all need to reduce carbon emissions from activities both on land and at sea.**



**What needs to change to reduce the effects of climate change on the ocean?**



We need to increase the amount of **renewable energy** sources such as wind, wave and tidal, and decrease the extraction of fossil fuels

Marine industries like shipping, ferries and fishing need to improve their **environmental efficiency** to reduce carbon emissions



Damaging activities like dredging, coastal development or destructive fishing methods, can release carbon from sediments and destroy important blue carbon habitats. These activities need to be **managed in a climate-smart way**.



For most people, the majority of the protein in our diet comes from meat grown on land, which produces huge amounts of carbon emissions.

**Sustainable fishing** practices produce much less carbon, and a shift towards a sustainable fish diet could offer positive solutions to providing protein with less carbon emissions. Protein doesn't just come from fish, but other seafood species like mussels, crabs and even seaweed, which have especially low carbon emissions



**Marine protected areas** are like nature reserves in the ocean, providing a great way to help protect and recover blue carbon habitats

**Outreach and education** helps to raise awareness amongst schools, universities, the public and businesses, and guide them on how to take action for the climate



**Everybody can help** to reduce the effects of climate change on the ocean. Shifting diets to eat more sustainable protein, buying second hand clothing, buying less and fixing things when they're broken, switching energy suppliers to support green energy, and decreasing electricity, heating and transport use all help reduce your own carbon emissions

**We can all make positive changes to our lives to help protect the ocean and reduce climate change.**





# Rising sea level

**Equipment:** Large clear bowl, water, some rocks or a object to place in the bowl large enough to sit above the water line, ice cubes, erasable felt tip pen.

## Ice melting on land experiment:

1. Place rocks or object in the clear bowl and fill the bottom of the bowl with water. The rock will symbolise land and the water the ocean.
2. Draw a line on the bowl with a wipeable pen to mark the water level.
3. Place ice cubes on the rocks.
4. Allow ice cubes to melt and then draw another line of where the water level is now.
5. Students could measure the difference in sea level rise.
6. Relate this experiment to what is happening in real life.

## Sea ice melting:

1. Repeat the same steps as in the above experiment but instead of putting the ice cubes on rocks place them directly into the water.
2. Measure the water once you have placed ice cubes in and then again after they have melted.
3. Relate this experiment to sea ice melting. Explain how this doesn't contribute to climate change, but that it is still bad because animals like polar bears depend on sea ice as a platform to hunt from.
4. For older groups discuss why the results were different, relating this to volume.

A visual example of this experiment can be found [here](#) between 0.36 – 2.35.

# Climate change scenarios

1

I do not re-use or recycle, I throw everything away

2

The computer is left on all the time

3

I walk, cycle or catch the bus to school

4

I always turn the tap off when I'm brushing my teeth

5

I go on aeroplanes on my holidays all the time

6

I have energy saving light bulbs in my house

7

My house is always hot, I wear a t-shirt at home in the winter

8

All the lights in the house are switched on all day

9

I buy food that is grown in my local area

10

I share my magazines and books with my friends when I have finished with them