



Credit: Roxanne Desgagnés

Subject links:

Geography, Science, Maths,
Citizenship

Ages 7–9

Curriculum links:

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

Ocean Literacy Principles:

3. The ocean is a major influence on weather and climate
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 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), and thermometers

Climate, the sea and me

Sustainability Goals:



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.

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: What is climate change?

To explore climate change in more detail watch the [Climate change \(according to a kid\) video](#), pausing at 1 minute 30 seconds. After watching, ask students what is causing climate change. Students should discuss in pairs before combining thoughts as a class, and creating a brainstorm on your whiteboard. Rewatch the section from 0:24–1:12 to check their learning and to add any ideas not previously mentioned to 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 are included in the rising sea level [experiment instructions](#).

Step 3

Activities (continued)

Activity 3: 20 minutes – Warming ocean

Conduct a simple experiment to understand how the greenhouse effect is warming the ocean. For this activity you will need two clear jars with lids, plastic wrapping, (preferably reused, like 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 students to respond to each statement with a thumbs up (positive for the ocean) or thumbs down (negative 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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via Unsplash



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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?

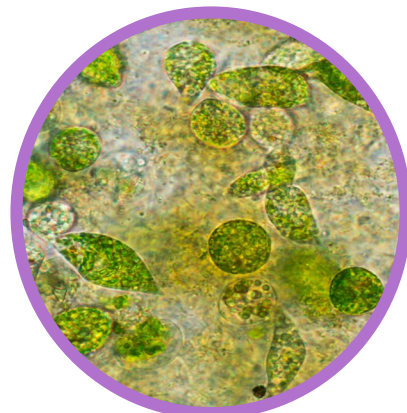
Habitats in the UK like seagrass beds and salt marshes, as well as mangrove forests in tropical waters, are brilliant at absorbing carbon dioxide from the atmosphere through photosynthesis. These habitats take up and store more carbon per metre than forests on land.

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.

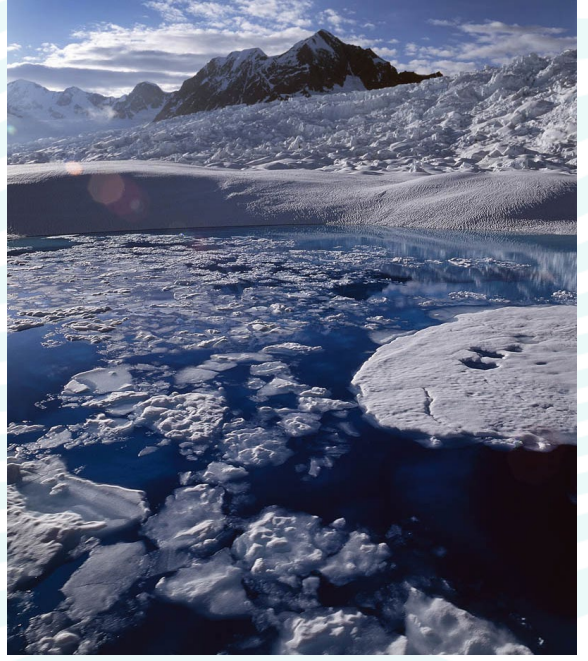


Image credits: NASA Goddard Space Flight Center, Allan Hopkins, Edwin.II

Rising sea level experiment

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

Ice melting on land

1. Place rocks or your object in the bowl and fill the bottom of the bowl with water. The rock will represent the 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. Students should measure the difference in sea level rise
5. Relate this experiment to real-life situations – you could use news websites to search for relevant stories

Sea ice melting

1. Repeat the same steps as above, but instead of putting the ice cubes on rocks, place them directly in the water
2. Measure the water once you've placed the ice cubes in the water and again after they've melted
3. Relate this experiment to sea ice melting. Explain how this doesn't contribute to climate change, but that it can still harm wildlife as 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

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

Curriculum links

England

Science

Working scientifically – Years 3 & 4

- Asking relevant questions and using different types of scientific enquiries to answer them
- Setting up simple practical enquiries, comparative and fair tests
- Making systematic and careful observations and, where appropriate, taking accurate measurements using standard units, using a range of equipment, including thermometers and data loggers
- Gathering, recording, classifying and presenting data in a variety of ways to help in answering questions
- Recording findings using simple scientific language, drawings, labelled diagrams, keys, bar charts, and tables
- Reporting on findings from enquiries, including oral and written explanations, displays or presentations of results and conclusions
- Using results to draw simple conclusions, make predictions for new values, suggest improvements and raise further questions
- Identifying differences, similarities or changes related to simple scientific ideas and processes
- Using straightforward scientific evidence to answer questions or to support their findings.

Working scientifically – Years 5 & 6

- Planning different types of scientific enquiries to answer questions, including recognising and controlling variables where necessary
- Taking measurements, using a range of scientific equipment, with increasing accuracy and precision, taking repeat readings when appropriate
- Recording data and results of increasing complexity using scientific diagrams and labels, classification keys, tables, scatter graphs, bar and line graphs
- Using test results to make predictions to set up further comparative and fair tests
- Reporting and presenting findings from enquiries, including conclusions, causal relationships and explanations of and degree of trust in results, in oral and written forms such as displays and other presentations

Plants – Year 3

- Identify and describe the functions of different parts of flowering plants: roots, stem/trunk, leaves and flowers
- Explore the requirements of plants for life and growth (air, light, water, nutrients from soil, and room to grow) and how they vary from plant to plant

Living things and their habitats – Year 4

- Recognise that environments can change and that this can sometimes pose dangers to living things.

Properties and changes of materials – Year 5

- Know that some materials will dissolve in liquid to form a solution, and describe how to recover a substance from a solution
- Give reasons, based on evidence from comparative and fair tests, for the particular uses of everyday materials, including metals, wood and plastic
- Explain that some changes result in the formation of new materials, and that this kind of change is not usually reversible, including changes associated with burning and the action of acid on bicarbonate of soda.

Geography

- Name and locate geographical regions of the UK and their identifying human and physical characteristics, key topographical features (including hills, mountains, coasts and rivers) and land-use patterns; and understand how some of these aspects have changed over time.
- Human and physical geography
- Describe and understand key aspects of physical geography including climate zones, biomes and water cycle

Wales

Science and technology

Being curious and searching for answers is essential to understanding and predicting phenomena.

- I can ask questions and use my experience to suggest simple methods of inquiry.
- I can recognise patterns from my observations and investigations and can communicate my findings.
- I can use my knowledge and understanding to predict effects as part of my scientific exploration.
- I can observe and describe ways in which materials change when they are mixed together.
- I can identify things in the environment which may be harmful and can act to reduce the risks to myself and others.

The world around us is full of living things which depend on each other for survival.

- I can recognise that what I do, and the things I use, can have an impact on my environment and on living things.
- I can explore relationships between living things, their habitats and their life cycles.

Matter and the way it behaves defines our universe and shapes our lives.

- I can explore and describe the properties of materials and justify their uses.
- I can observe and describe ways in which materials change when they are mixed together.

Humanities

Enquiry, exploration and investigation inspire curiosity about the world, its past, present and future.

- I have experienced a range of stimuli, and had opportunities to participate in enquiries, both collaboratively and with growing independence.
- I can collect and record information and data from given sources. I can then sort and group my findings using different criteria.
- I can present what I have discovered in a variety of ways and draw simple conclusions

Our natural world is diverse and dynamic, influenced by processes and human actions.

- I can describe how people and the natural world may impact on each other.
- I can recognise the distinctive features of places, environments and landforms, and how these may change.

Curriculum links

Scotland (First level)

Science

Inquiry and investigative skills

- Plans and designs scientific investigations and enquiries
- Carries out practical activities in a variety of learning environments
- Analyses, interprets and evaluates scientific findings
- Presents scientific findings

Biodiversity and interdependence

- I have observed living things in the environment over time and am becoming aware of how they depend on each other.

Properties and uses of substances

- Through creative play, I explore different materials and can share my reasoning for selecting materials for different purposes.

Topical Science

- I can talk about science stories to develop my understanding of science and the world around me
- I have contributed to discussions of current scientific news items to help develop my awareness of science.

Social sciences

People, place and environment

- I can consider ways of looking after my school or community and can encourage others to care for their environment.
- By exploring climate zones around the world, I can compare and describe how climate affects living things.
- By exploring a natural environment different from my own, I can discover how the physical features influence the variety of living things.

Curriculum links

Scotland (Second level)

Science

Inquiry and investigative skills

- Plans and designs scientific investigations and enquiries
- Carries out practical activities in a variety of learning environments
- Analyses, interprets and evaluates scientific findings
- Presents scientific findings

Biodiversity and interdependence

- I can identify and classify examples of living things, past and present, to help me appreciate their diversity. I can relate physical and behavioural characteristics to their survival or extinction.
- I can use my knowledge of the interactions and energy flow between plants and animals in ecosystems, food chains and webs. I have contributed to the design or conservation of a wildlife area.

Materials – Properties and uses of substances

- By contributing to investigations into familiar changes in substances to produce other substances, I can describe how their characteristics have changed.
- By investigating common conditions that increase the amount of substance that will dissolve or the speed of dissolving, I can relate my findings to the world around me.

Chemical changes

- I have collaborated in activities which safely demonstrate simple chemical reactions using everyday chemicals. I can show an appreciation of a chemical reaction as being a change in which different materials are made.

Topical science

- I can report and comment on current scientific news items to develop my knowledge and understanding of topical science.

Social sciences

People, place and environment

- I can describe the physical processes of a natural disaster and discuss its impact on people and the landscape
- I can discuss the environmental impact of human activity and suggest ways in which we can live in a more environmentally-responsible way.