



SSC DIVE IN! CLIMATE CHANGE



WHAT IT MEANS FOR US & OUR SEAS





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WELCOME!

Hello, and welcome to “SSC Dive In!” - packs of resources providing marine learning directly into family homes and classrooms.

This pack’s theme: **Climate Change**

Climate Change, a change to Earth’s global climate patterns, is something being discussed everywhere at the moment—in our schools, businesses, governments and homes.

But why? What is it? How is it impacting our seas? What is being done about it?

Find answers to these and other big questions inside.

Inside this pack:

- **Fact File: Climate Change**
- **Discover: COP27**
- **Experiment: Ice Investigation**
- **Experiment: Ocean Acidification—video**
- **Activity: Carbon Footprint**
- **How to: Help Our Planet**
- **Activity: Pledge to the Planet**
- **Look: Logo Hunt**
- **Glossary: Science words**

We’d love to hear from you. If you’ve enjoyed reading our pack, or been inspired to have a go at any of the activities, let us know. Please send any comments or pictures you are happy for us to share and have permission for to marineengagement@seabird.org.

Enjoy using our packs and want to see more? The Scottish Seabird Centre is an environmental conservation charity and every penny we raise helps us deliver our projects and resources such as these Dive In packs. If you enjoy using our resources and would like to support our work, please consider making a donation through our [JustGiving page](#). Thank you.

More resources available on our [website](#).

We hope you enjoy diving in to the pack.

Scottish Seabird Centre Learning Team



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FACT FILE

CLIMATE CHANGE

WHAT IS CLIMATE CHANGE?

A change in the global climate patterns.

Climate change is measured by studying changes in weather patterns (temperature, rainfall and storms) over long periods of time, across the world. Land and sea temperatures have been rising since the late 1800s. Warming has already reached a 1.1°C increase since pre-industrial times and continues to rise.

Though that doesn't sound like a lot, it's enough to have a big impact on life on Earth.



WHAT CAUSES CLIMATE CHANGE?



One of the main drivers for climate change is the burning of **fossil fuels** (coal, gas and oil) to create the energy we need to power industry, our homes and workplaces. We also use these fossil fuels for travel in our cars, on buses, trains and planes.

When we burn fossil fuels it releases **carbon dioxide (CO₂)**. CO₂ is a **greenhouse gas** which means it gets trapped in the earth's atmosphere and acts like a blanket, trapping warm air that normally escapes away from the earth's surface.

WHAT DOES CLIMATE CHANGE MEAN FOR THE PLANET?

Rising temperatures have a number of consequences for our planet, including:

- Hotter, drier climate leads to more wildfires in the hottest parts of the world.
- More moisture **evaporating** from our oceans, increasing rainfall and leading to more frequent and damaging storms.
- Melting ice-sheets and glaciers in the polar areas.
- Species moving into areas they haven't been seen before, forcing other species out of their homes, disrupting **food chains** and resulting in **biodiversity** loss.





FACT FILE

CLIMATE CHANGE

WHAT ABOUT OUR SEAS?

As well as warming seas, climate change is causing other changes to the marine environment:

OUR SEAS ARE GETTING MORE ACIDIC



At least one quarter of the CO₂ that is released from burning fossil fuels dissolves into the sea. This changes the seas chemistry making it more acidic. This change is measured on the **pH scale** and, since the industrial revolution, it has **dropped from 8.2 to 8.1**. Like changes in the temperature of our seas, this increase may seem like a small change, but it has a big impact. For example, it can weaken the skeletons of corals, crabs and other species with a shell. See page 9 to find out more and conduct your own experiment.

OUR SEAS ARE LOSING OXYGEN

Like us, the creatures living in the sea need **oxygen (O₂)** to survive. O₂ is created at the surface of the sea through **photosynthesis** by tiny plants called **phytoplankton**. This O₂ reaches lower parts of the ocean through the mixing and movement of water. As the seas warm there's less mixing so less O₂ makes its way down to the bottom of the ocean. This process is known as **deoxygenation** and may make the sea uninhabitable for many creatures.



OUR SEABIRDS ARE IN TROUBLE



Climate change is also impacting some of Scotland's most iconic seabirds. As the water warms, colder-water species such as sandeels are moving northwards and deeper, in search of cooler water. Many seabirds therefore have to travel further to find their prey food and can't provide enough to feed their chicks. Harsher (colder and wetter) conditions can also affect seabirds ability to breed and makes it harder for young birds to successfully **fledge**.

Many of our seabirds are in serious decline and according to the International Union of Nature Conservation (IUCN) species such the popular puffin are globally at risk of **extinction**.



FACT FILE

CLIMATE CHANGE

IS ANYTHING BEING DONE ABOUT IT?

Thanks to years of research by scientists, we understand the extent of the problem and how to prevent it getting worse.

We know greenhouse gases are causing climate change so reducing the amount of carbon dioxide being released into the atmosphere is one of the best ways of stopping it.

Different activities release, or emit, more carbon dioxide than others—they have different **carbon footprints**. By avoiding activities with the biggest carbon footprints, using more **sustainable** products and **renewable** sources of electricity, we can reduce carbon emissions.

This has already started happening around the world and, even better, many countries are now aiming to achieve **net zero climate emissions**. This is when human activities no longer cause an increase in the amount of carbon dioxide in the atmosphere.

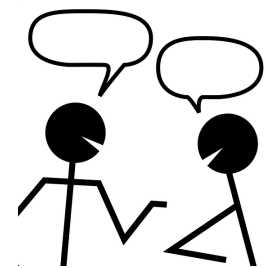
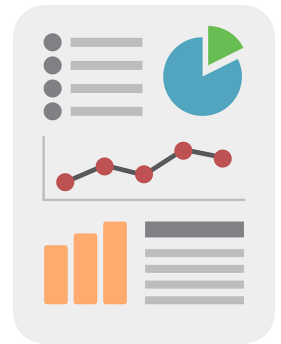
People around the world are taking part in protests for change and the world's leaders are meeting regularly to discuss how to make these necessary changes happen.

CAN I DO ANYTHING TO REDUCE THE EFFECTS OF CLIMATE CHANGE?

Absolutely, we can all change our actions and look at reducing our own carbon footprints. See page 11 for some ideas for changes you can make yourself.

Speaking up is also key. Get your friends, family, school and local politicians doing their bit by:

- Looking at ways of making buildings more energy efficient (which also reduces costs) and choose renewable energy sources to heat them.
- Supporting and getting involved in projects which are planting more trees, in the right places, to lock up carbon.
- Supporting projects which are looking to **restore** habitats in our marine environment that lock up carbon (blue carbon).
- Ensuring peat-free compost is bought for gardens.
- Writing to your local member of parliament to let them know you support green policies and want change to happen.
- Supporting environmental charities - donate, volunteer, or help spread the word!

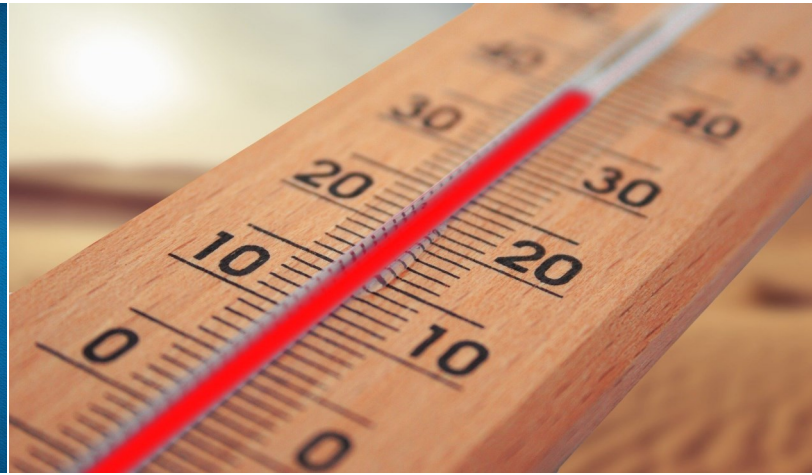


DISCOVER

WHAT IS COP?



COP is a conference about climate change which usually takes place once a year, with a different country acting as host each time. In 2021, the UK hosted the 26th conference—COP 26. In 2022, the subsequent conference, COP 27, will be held in Egypt. When dealing with a huge issue like climate change, people from all over the world need to work together.



An international agreement to tackle climate change, known as the **Paris Agreement**, was agreed by leaders back in 2015 when 195 countries attended COP21 in Paris. The Paris agreement says nations must:

- Reduce the amount of harmful greenhouse gasses produced and increase renewable types of energy like wind, solar and wave power
- Keep global temperature increase "well below" 2C (3.6F) and to try to limit it to 1.5C
- Review progress made on the agreement every five years
- Spend \$100 billion dollars a year in climate finance to help poorer countries by 2020, with a commitment to further finance in the future.

These key points will be discussed at COP27, where there will be a keen focus on implementation, adaptation, finance and biodiversity (linking to COP 15 in December, the 15th Conference of the Parties to the United Nations Convention on Biological Diversity).

QUICK FACTS

- COP stands for **Conference of Parties**
- The 2022 conference will be the **27th meeting** about climate change
- To be held in Egypt **6-18 November 2022**





EXPERIMENT

ICE INVESTIGATION



QUESTION: HOW DO DIFFERENT TYPES OF MELTING ICE AFFECT SEA LEVEL?

You might have heard that climate change is melting the polar ice caps and that this can contribute to sea level rise. However, does it make a difference whether that melting ice is on land or in the sea?

In the Arctic Ocean (at the north pole) ice floats on the surface of the water. In Antarctica (at the south pole) the ice is mainly in the form of an ice sheet on top of land. This experiment models both scenarios.

TEST

Test to see which type of ice contributes more to sea level rise – **land ice** (as found in Antarctica) or **sea ice** (as found in the Arctic).



WHAT DO I NEED?

2 identical clear plastic containers

Two shallow tins of food

Tray of ice cubes

Cold water

Measuring Tape or Ruler

Paper and pencil

1



Place one tin into each of the plastic containers.
If you don't have tins you could make an 'island' from clay, play dough or pebbles instead.

2



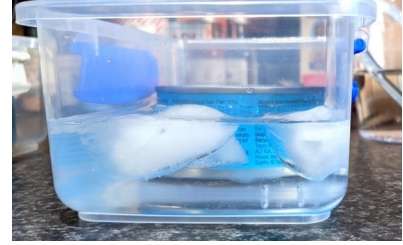
In one of the containers, place a few ice cubes on top of the tin (this represents **land ice**).

3



In the other container, place the **same** number of ice cubes on the bottom of the container, next to the tin. This represents **sea ice**.

4



Pour cold water into the **sea ice** container until the ice floats. Be sure no ice is resting on the bottom of the container and that the water isn't higher than the tin (land level).

5



Without disturbing the ice cubes, pour water into the **land ice** container until the water level is about equal to the water level in the sea ice container.

6



Using the ruler, measure the water level (in millimetres) in each container and record the data on your data sheet or piece of paper.

7

Sea Ice	Land Ice
31mm	31mm
31mm	36mm

Once all the ice cubes have melted, measure the water level in each container again with a ruler and record it on the data sheet. Has either water level changed?

8



Think about what your observations mean for melting ice around the planet and how it affects sea level.

ANSWER: LAND ICE AFFECTS SEA LEVEL MORE THAN SEA ICE



You may have noticed that the water level in the **land ice** model has risen whilst the **sea ice** model has not. This means that the melting of Antarctic ice would have a much more dramatic effect on sea levels around the globe than Arctic ice.



EXPERIMENT

OCEAN ACIDIFICATION

Ocean acidification causes problems for any organism with a shell, exoskeleton (a skeleton around the outside of its body) or a body made-up of **calcium carbonate**.

Click on the photo below to view a video explaining this process and an experiment you can do at home involving vinegar and sea shells.

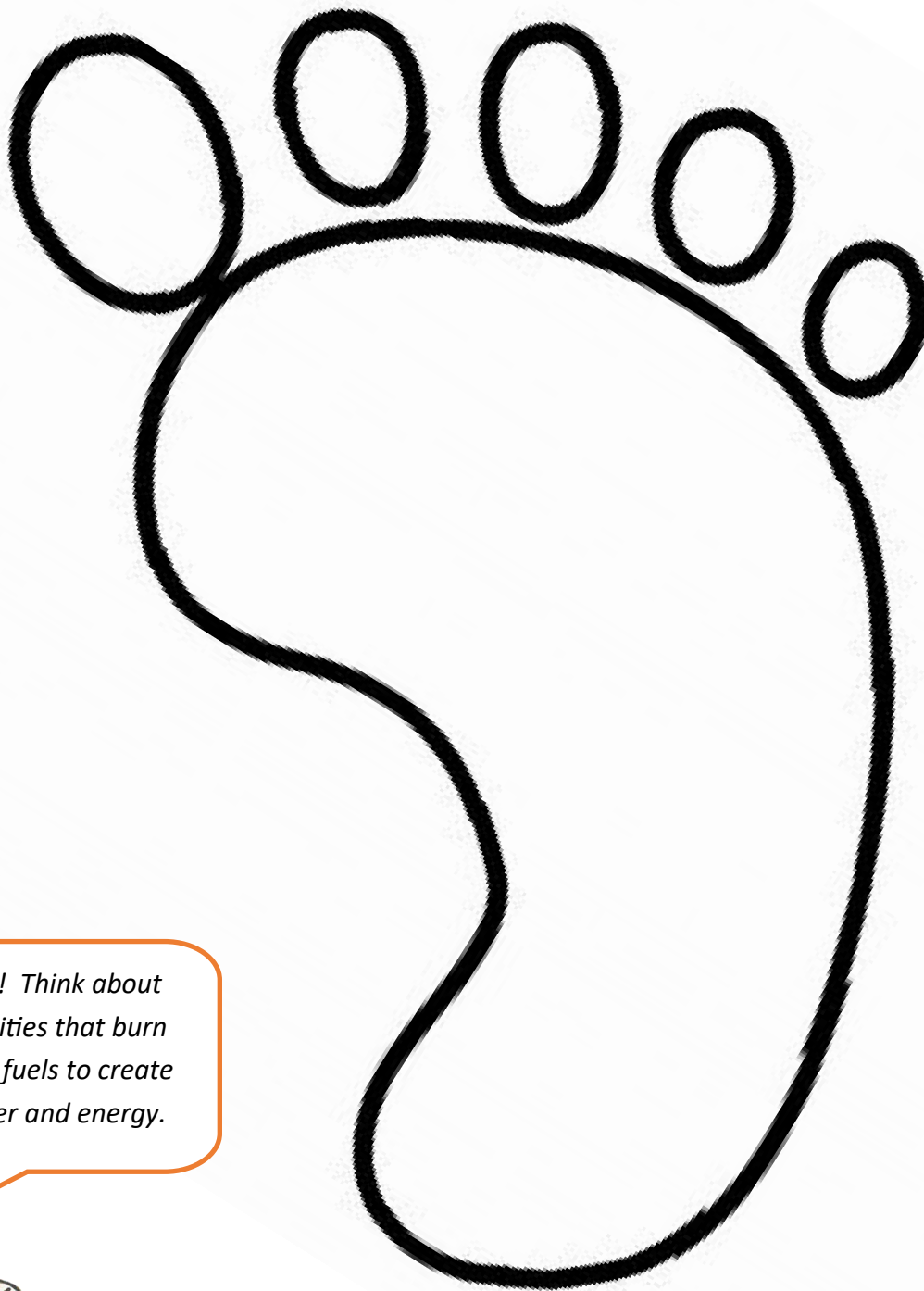




ACTIVITY

CARBON FOOTPRINT

Write a list or draw pictures of activities inside the footprint of things that contribute to your carbon footprint. Once you've made a list, why not have a think of ways to reduce them? See page 11 for some ideas.



Hint! Think about activities that burn fossil fuels to create power and energy.



HOW TO..

HELP OUR PLANET



Buy local. Where possible, buy food grown and products made in your country or as near to home as possible. This helps reduce how far your produce travels and reduces their carbon footprint. This also supports local businesses.



Check for logos. Check food labels for special accreditations— small logos, such as the [MSC's blue fish](#), showing the food has been caught, reared or grown sustainably. Other good logos to look out for are [Social Association](#) and [Forest Stewardship Council](#).



Less leftovers. Try using up any leftovers as any food that is thrown away breaks down and releases greenhouse gases into the atmosphere, contributing to climate change.



Fix the problem. If possible, mend things that break or turn them into something else. For example, sew-up any holes in clothing or turn it into a bag!



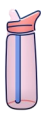
Ease-up on engines. Things with engines produce greenhouse gases, so either travelling under your own steam, such as walking and cycling, or using public transport and car sharing reduces the number of engines on the roads. Flying less also helps.



Second-hand is a helping hand. Buying or inheriting second hand clothes and items is a great way of reducing the amount we throw away and ending up in landfill.



Pause on plastic. When buying a plastic item, consider if there is an alternative material you can buy instead—for example, bamboo toothbrushes, or buying items that are in cans or glass instead of plastic.



Reusing rocks. Single-use plastics, such as drink bottles, make up the majority of litter and are an unsustainable use of plastic. Using reusable items such as re-usable water bottles, mugs and bags, is a great way of reducing the amount of plastic you use.



Recycle regularly. If an item can't be reused, check if it can be recycled and put in the correct recycling bins wherever possible.



Plant power. Feeding the world uses a lot of energy and releases a huge amount of greenhouse gases, especially during the production of meat and dairy products. Growing your own vegetables and reducing the amount of meat and dairy in your diet helps reduce the impact.



Save energy. Turning off lights and electronic devices when you're not using them helps reduce the amount of electricity being produced and the greenhouse gases released in the process.



Watch your water use. There's only so much fresh water available on the planet so save as much as you can, for example by taking shorter showers or turning off the tap whilst you brush your teeth.





ACTIVITY

PLEDGE TO THE PLANET

A pledge is a promise you make to do, or not do, something.

Everyone has a part to play in saving the planet and an easy way to get started is to pledge to make one or a few changes to your lifestyle.

You can start with something that isn't too hard to change and then add more pledges or make them harder as you go. Pledges will be different for different people but some examples include:

"I pledge to ride my bike to school once a week" or "I pledge to not eat meat twice a week".



MY PLEDGE TO THE PLANET

Name:

.....

My Pledge:

.....

.....

.....

.....

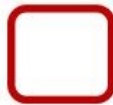
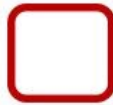
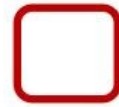


LOOK

SPOT THE LOGO



Next time you are out shopping, see how many of the logos below you can spot on items for sale. Tick off the ones that you spot and use the links below to find out more about the standards that products need to meet in order to use these special **accreditations**.



FIND OUT MORE.....

Fairtrade: <https://www.fairtrade.org.uk/>

Marine Stewardship Council: <https://www.msc.org/uk>

RSPCA Assured: <https://www.rspcaassured.org.uk/>

Forest Stewardship Council: <https://fsc.org/en>

Soil Association: <https://www.soilassociation.org/our-work-in-scotland/organic/>

Aquaculture Stewardship Council <https://www.asc-aqua.org/>



DISCOVER

GLOSSARY

ACCREDITATION	The process of being officially recognised of meeting a specified standard or particular status.
BIODIVERSITY	The variety of species or habitats on the planet. The more variety, the
CARBON FOOTPRINT	A carbon footprint is the total amount of greenhouse gases (including carbon dioxide and methane) that are generated by our actions.
EVAPORATE	Evaporation describes the process of a liquid becoming a gas due to being heated.
EXTINCTION	When a species, or type, of animal or plant dies out completely.
FLEDGE	To fledge is the stage in a young bird's life when the feathers and wing muscles become developed enough for flight.
FOOD CHAIN	The order in which living things, depend on each other for food.
FOSSIL FUELS	Fuels made from animals or plants that died millions of years ago e.g. coal.
GREENHOUSE GASES	Greenhouse gases are gases in the Earth's atmosphere that trap heat. They let sunlight pass through the atmosphere, but they prevent the heat that the sunlight brings from leaving the atmosphere.
PH SCALE	pH (potential of hydrogen) is a scale of acidity from 0 to 14. It tells how
PHOTOSYNTHESIS	The process by which green plants and some other organisms use sunlight to make nutrients from carbon dioxide and water.
RENEWABLE	Resources that are always available and will not run out e.g. wind.
RESTORE	To bring something back to its former condition.
SUSTAINABLE	Use of resources in such a way that they will not run out or become too scarce.