



OUR FROZEN WORLDS

Our life on earth depends on the coldest places on our planet – the icy worlds of the Arctic and Antarctica.

The Arctic region is the northernmost region of the planet, consisting of the Arctic Ocean and parts of Russia, Greenland, Canada, USA, Norway, Iceland, Sweden and Finland that lie above the 'Arctic Circle'. This is an imaginary line around the top of the globe. About 4 Million people live in the Arctic region, and the Arctic sea ice supports a wide range of animal species from microscopic algae to the world's largest land carnivore, the polar bear.

At the other end of the earth, **the Antarctic** is the world's highest, driest, windiest and coldest continent. It is bigger than Europe and is so dry that it's actually classed as a desert. The freezing Southern Ocean surrounding Antarctica is teeming with life. The waters are full of nutrients which feed plankton at the bottom of the food chain. This is a vital source of food for krill, tiny shrimp-like creatures which are then eaten by seals, penguins, seabirds and whales.

WHY DOES ICE MATTER?

The ice provides a platform on which much life in the polar regions depends. Polar bears need the sea ice to hunt for seals. If the ice connected to land forms later and melts earlier in the year, the bears have less time to hunt and it becomes harder for females to build up the fat stores that they need to nurse their cubs. Walrus can't climb out of the sea onto thin ice, and caribou risk falling

through it as they cross between islands or headlands. In the Antarctic, krill need sea ice under which to feed and nurture their young. Penguins, which eat krill and small fish are a vital source of food for predators such as leopard seals and killer whales.

Gentoo penguins in Antarctica live mainly on crustaceans, such as krill. Krill depend on the shelter and algae food source provided by sea ice to survive their first year of life.





Almost all humpback whales in the Southern Hemisphere come to the Antarctic to feed on krill. Since the ban on commercial whaling, their numbers have recovered dramatically, but their food supply is now under threat.

Every one of us needs the ice in these frozen worlds. That's because it reflects the rays of the sun back into space and this keeps our planet cool. The polar regions act as a giant air conditioner, helping to protect us from the effects of climate change.

SO, WHAT'S THE PROBLEM?

Globally, sea ice is diminishing faster than ever before. Some regions are losing sea ice faster than others, with terrible consequences for wildlife in those areas. We are burning fossil fuels such as coal, oil, and natural gas which releases carbon dioxide into the earth's atmosphere. This causes global warming and melting ice. At a local level cars that use petrol or diesel add to the problem, while also making the air we breathe dirty so that more people get asthma as a child, and people die earlier because of problems caused by air pollution.

Melting ice causes lots of problems that affect everyone on the planet – not just the animals who need the ice to hunt, breed and sleep. Loss of ice from the poles is causing weather systems to change because the Arctic and parts of Antarctica are warming faster than the rest of our planet. We are already seeing more droughts and flooding around the world. Also, when ice melts it will cause sea levels to rise so that millions of people and lots of wildlife could see their homes disappear below the waves.

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WHAT CAN WE DO?

The future of our planet is in our hands. We have the technology to use energy that comes from clean and renewable sources such as wind and solar power. If we stop burning fossil fuels it's better for our planet and better for us too. Using renewable energy is cheap, and it means we can breathe clean air which keeps us all healthier. Electric cars can reduce the use of petrol, which means cleaner air for us all to breathe. If the electricity is coming from clean renewable sources then the planet is benefiting too!

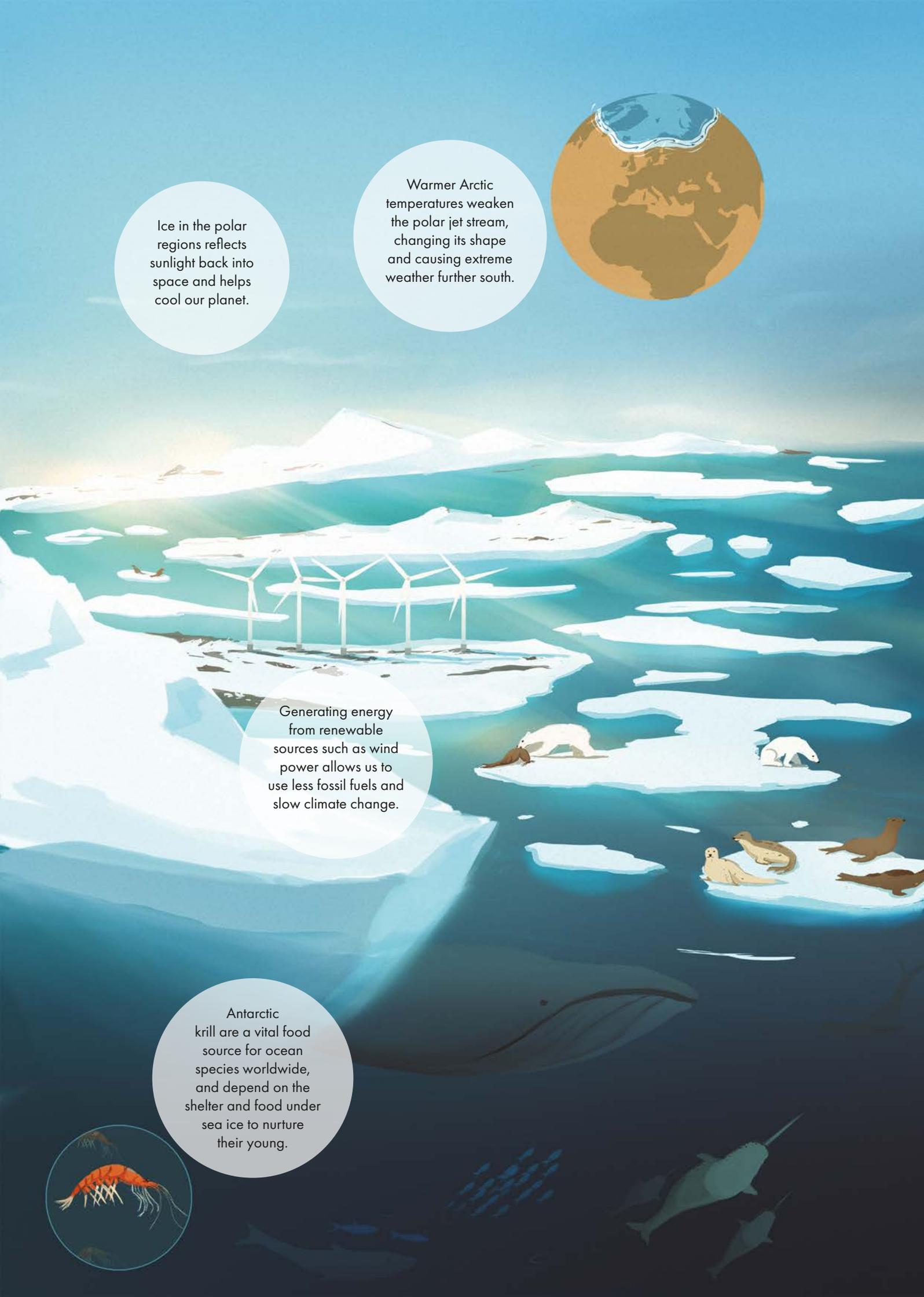
Ice in the polar regions reflects sunlight back into space and helps cool our planet.

Warmer Arctic temperatures weaken the polar jet stream, changing its shape and causing extreme weather further south.



Generating energy from renewable sources such as wind power allows us to use less fossil fuels and slow climate change.

Antarctic krill are a vital food source for ocean species worldwide, and depend on the shelter and food under sea ice to nurture their young.





The polar jet stream is a circle of fast-moving air currents created by the temperature difference between the cold Arctic and warmer areas further south.



Burning fossil fuels releases carbon into the atmosphere, causing global warming that leads to loss of sea ice.



As sea ice disappears predators such as walrus and polar bears have to swim long distances from land to find food.





MEET THE LOCALS: WALRUSES

Found in the freezing waters of the Arctic, walrus are huge mammals that grow to between 2.2 and 3.6 metres in length and weigh between 400 and 1,800 kg – about the same as a family car. Their main diet is clams, though they can feed on many other marine animals, including sea cucumbers, coral, shrimp, crabs, seals, sea birds and even whales. To find clams, walrus dive to shallow sea floors and search with their sensitive vibrissae (whiskers). They can dive to depths of over 90 metres, and stay underwater for more than 30 minutes at a time.

Both male and female walrus have large tusks, used for cutting through ice and getting out of the water, as well as defence. Tusks can be as long as 3 feet (0.9 m) for males! Walrus can withstand freezing temperatures as low as -35°C (-31°F) thanks to thick layers of blubber (fat) beneath their skin that help insulate them from the cold. They are also capable of slowing their heartbeat to endure the temperature, allowing them to live comfortably in the Arctic.

Walrus herd together on ice floes in herds of several hundred, but in mating season there can be thousands in one massive herd. The sea ice is vital to walrus because it provides a platform from which they can dive into the sea



to search for clams and mussels on the ocean bed, and a place to rest between dives without having to go far from the food source. The ice also allows life to thrive in the ocean because it supports the growth of algae which provides food for other wildlife and therefore food for walrus.

As the Arctic warms, ice is disappearing and walrus in the far north are having to herd together on coastlines further south than their usual hunting grounds. Huge numbers of walrus depend on limited land and resources, causing stressful conditions that many walrus do not survive.

FACILITATOR INSTRUCTIONS

KEY MESSAGES

PROBLEMS FACING OUR FROZEN WORLDS

- Global warming caused by fossil fuels
- Loss of sea ice reducing space for species to hunt, sleep and breed
- Loss of sea ice reduces krill populations, meaning less food for many other species

SOLUTIONS

- Replacing fossil fuels with renewable energy to slow global warming

SDGs LINKS

Goal 7: Ensure access to affordable, reliable, sustainable and modern energy

<https://www.un.org/sustainabledevelopment/energy/>

Goal 13: Take urgent action to combat climate change and its impacts

<https://www.un.org/sustainabledevelopment/climate-change-2/>

Goal 14: Conserve and sustainably use the oceans, seas and marine resources

<https://www.un.org/sustainabledevelopment/oceans/>

Ensuring the future of our frozen worlds also contributes to other SDG goals, including the following:

GOAL 2: Zero Hunger

GOAL 12: Responsible Consumption and Production

GOAL 15: Life on Land



GUIDED DISCUSSION PROMPTS

Use these prompts to generate a class or small group discussion based on the Our Oceans briefing, or videos on ourplanet.com.

Can you describe the frozen worlds of the polar regions? What do the polar regions look like? What do they feel like?

Allow children to convey their sense of wonder at these places that they will never have seen.

What animals can you think of that live in these frozen landscapes? Which are the biggest animals? And which are the smallest?

The polar bear is the world's largest carnivorous land animal. Bowhead whales in the Arctic can grow to 18m in length while the Blue whale, which spends the warmer months in the Antarctic, can grow to over 33m in length. The smallest animals are microscopic plankton and krill, which are tiny, shrimp-like, animals.

Why are the smallest animals important? What would happen if these tiny creatures disappeared?

Through the food chains, the largest animals, depend on the smallest for their survival. The Bowhead whale needs to eat about 100 tonnes of tiny zooplankton every year.

Can you think of one important change that is taking place to these ice worlds?

Global warming means that the earth's climate is changing and the ice in the frozen worlds is melting.

Why does this change matter?

Melting ice means that the future of animals and people living in the polar regions is under threat. As a result of the ice melting global warming is accelerating. This means that there are more extreme weather events, more species are threatened, and sea levels are rising.

Some species rely on the ice – eg walrus and polar bears who hunt from sea ice.

What can we do about it?

Using less energy. Using renewable power such as hydro-electric, wind or solar instead of fossil fuels (locally through solar panels etc, and for power stations).

Imagine it is 2030 (12 years time). What would you like the world to be like? What is different at the poles, and what is a city of the future like? How are they connected?

ACTIVITIES

ACTIVITY IDEA	SUGGESTED AGE	SUBJECTS
<p>Separate into groups, each focused on a different animal that lives in the Arctic or Antarctic (seal, polar bear, walrus, penguin, krill, narwhal, arctic tern etc). Think about what the creature looks like and discuss/research how it has evolved to survive in the frozen world. Consider how it will be affected if temperatures rise and ice melts.</p>	7 – 14	Geography Science
<p>Ask the young people to write a story in the first person from the perspective of a polar animal, experiencing the effects of climate change. What challenges do they face? How does it make them feel?</p>	6 – 11	Literacy Geography
<p>Working in small groups, ask the young people to map out a typical day (as a diary or as a picture storyboard). They should highlight every time an activity uses energy or contributes to global warming, and consider what they, their parents or their school could do differently to reduce impact. Groups report back and compile a list of all the things that could be changed for the better on the board. Discuss if any of these could actually be achieved, and who would have to make those changes. Write letters or design posters to try and persuade the people who need to do things differently to act.</p>	7 – 14	Geography Citizenship Art & Design
<p>Ask the young people to work in small groups to plan a polar expedition. What would they need to take? How would they get there? What dangers would they face and how would they deal with them?</p>	7 – 14	Geography Literacy
<p>Show the image of the polar bears and penguins on the sea ice (below). Animals can't speak, but ask the young people to imagine that these animals could send a message to all of us? What would that message would be?</p>	6 – 11	Literacy