



OCTOBER 2021

Primary School
Climate Change Conference

Science Session
Teacher Notes

SAW Climate Change Conference

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Science Session - ~Intro 15 mins & activities ~ 1 hour 45 mins

Materials: Print out Greenhouse Gas role play cards (pages 3-5) and food/crop cards (pages 12-13), ~10 x see-through tubs (take away boxes work well!), water, plasticine, pebbles or stones, marker pens, ice cubes. There are pictures on pages 2, 9, 10 and 14 to copy and paste to show on the whiteboard too.



Introduction – *Play Lizzie Daly's welcome video* ~9 minutes

We hope the class enjoyed Lizzie's video and are feeling inspired to learn more about our amazing planet!

The final slide on the video is shown below and offers an opportunity to recap on some of the words Lizzie used in case the class are unfamiliar with any of them ~5 minutes. This could provide a good starting point for collecting a vocabulary list that can be added to during the day. Many of the points made here will be further explained and investigated through the day so the class will have a better understanding of them later.

NORWICH SCIENCE FESTIVAL @ School

Key Points!

- COP26 stands for **C**onference **O**f the **P**arties and this year is the 26th meeting = COP26! In Scotland in November, COP26 brings together almost all countries on Earth to discuss climate change.
- Climate change is caused by Greenhouse Gases in the atmosphere, made worse by things like deforestation.
- Climate change is warming our oceans, causing severe storms and increased flooding. This destroys habitats, reduces resources like food and creates conflict for land.
- Can we do anything about it? YES!! We all need to act together!

The following science session is divided into 3 sections;

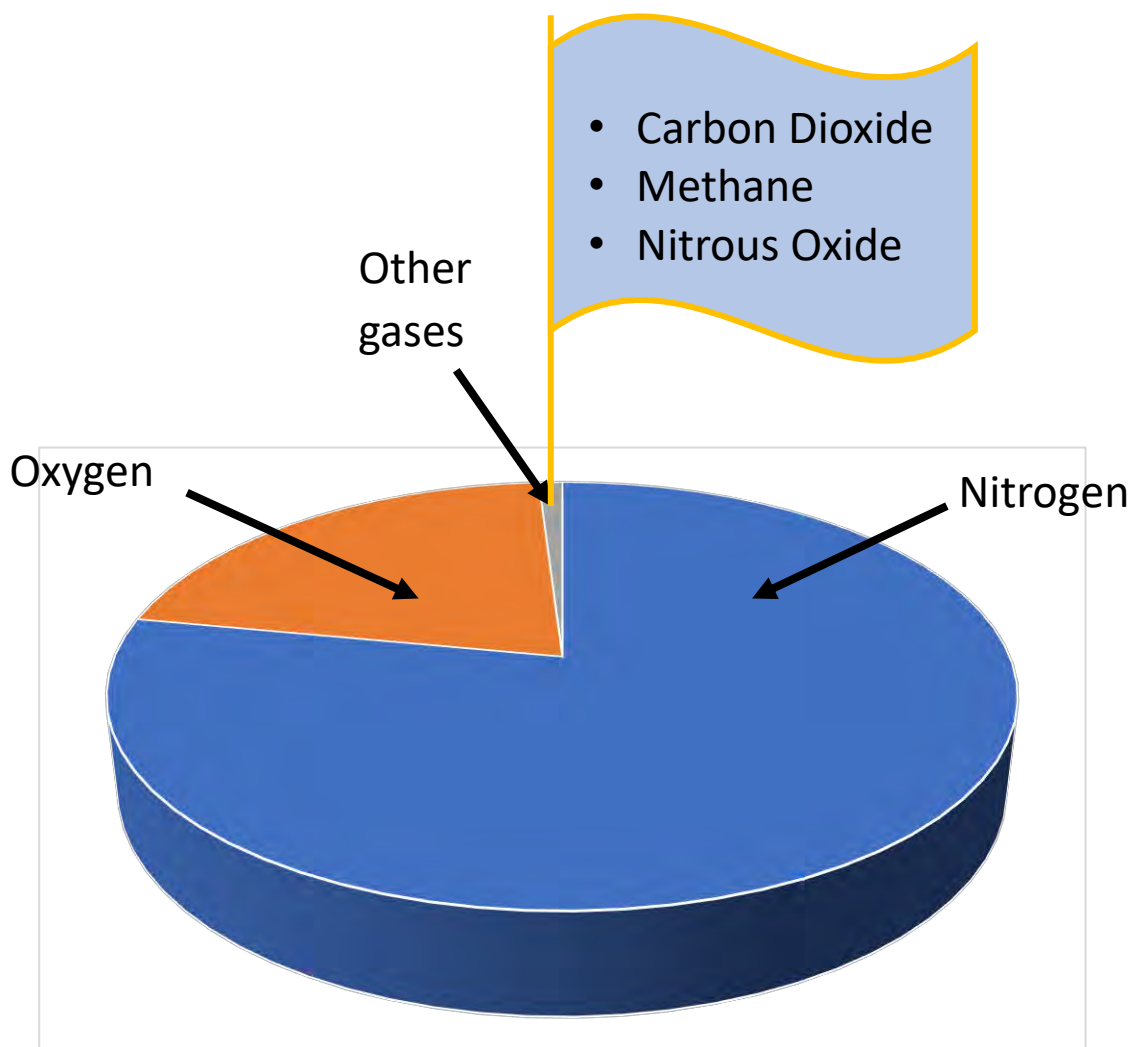
- 1, Greenhouse Gases (~30 mins)
- 2, Extreme Weather (~25 mins)
- 3, Food production and soils (~50 mins)

Section 1 – Greenhouse Gases

Activity 1 – Greenhouse Gases Role Play ~20 minutes

This activity gets the class to act out 3 different scenarios to help them understand the role of greenhouse gases and why our planet is getting warmer.

Begin by asking the class if they know what air is made of? Write up on the whiteboard any suggestions. You are aiming to arrive at Nitrogen, oxygen and **some other gases**. Tell them it's roughly **78% Nitrogen & 21% Oxygen** and then a bunch of other gases including carbon dioxide, methane and nitrous oxide. You can copy and paste the pie chart below onto a slide for the whiteboard if you like.



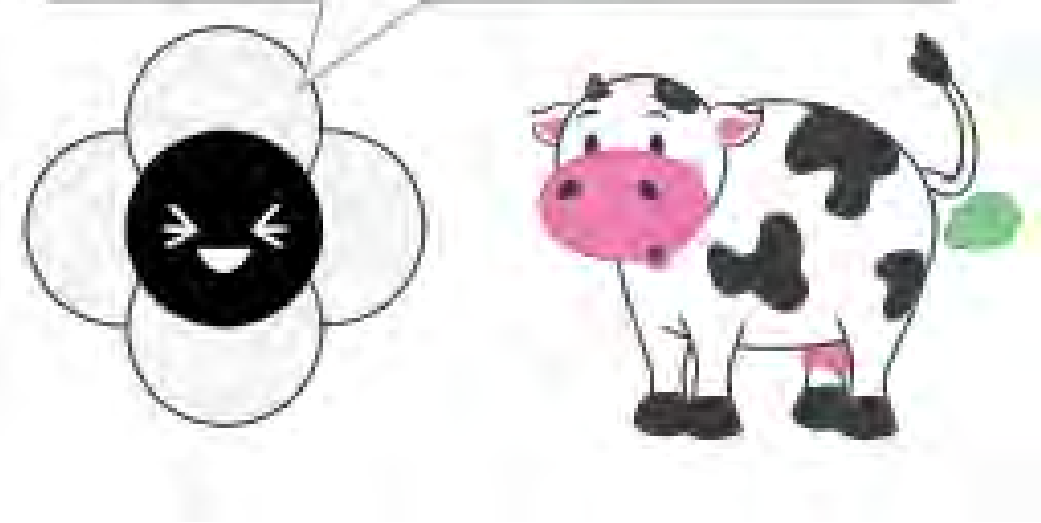
Next ask them if they can see the gases? Tell them that although they can't see them, they can feel the effect of them being there. Obviously by breathing, but in other ways too. Then ask them if they have heard of greenhouse gases and if they are good or bad. Collect their thoughts and then move on to the first role play scenario.

Print out the pictures below to assign different roles to different children as you run through the 3 scenarios. You can print multiple arrows and greenhouse gases to suit the size of your class and use to fit to the storyline of the scenario being played out. Just make sure **there's one sun and** at least one child is playing the part of life on Earth!





I'm methane! I'm released when animals like cows and sheep fart, burp and poo. I'm also released by rotting plants.



I'm nitrous oxide, I'm released from soils when farmers add chemical fertilizer to crops.

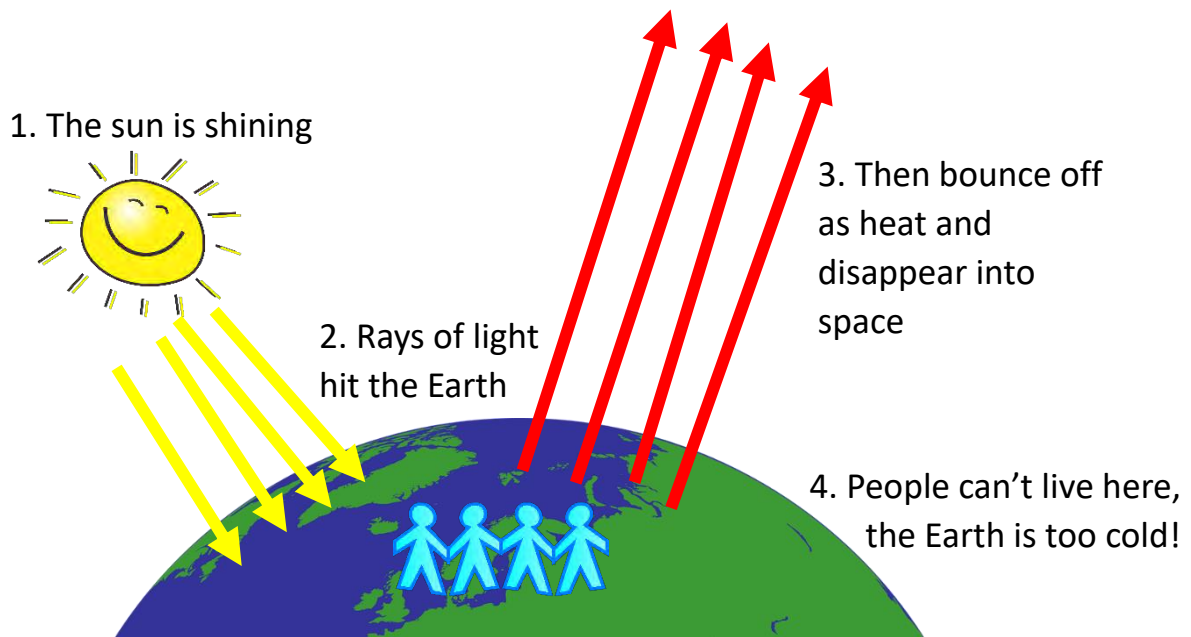


I'm carbon dioxide or CO₂ for short! I get released when humans burn wood, coal, gas and oil to power things. I'm also released by volcanoes.



Scenario 1 – The Earth without greenhouse gases

Roles for children - 1 x sun, 4 x light rays, 4 x heat rays, the rest of the class to be people on Earth:



First, the sun is shining brightly, and its rays of light are hitting the Earth (suggest light rays move in straight lines from the sun, down to the floor).

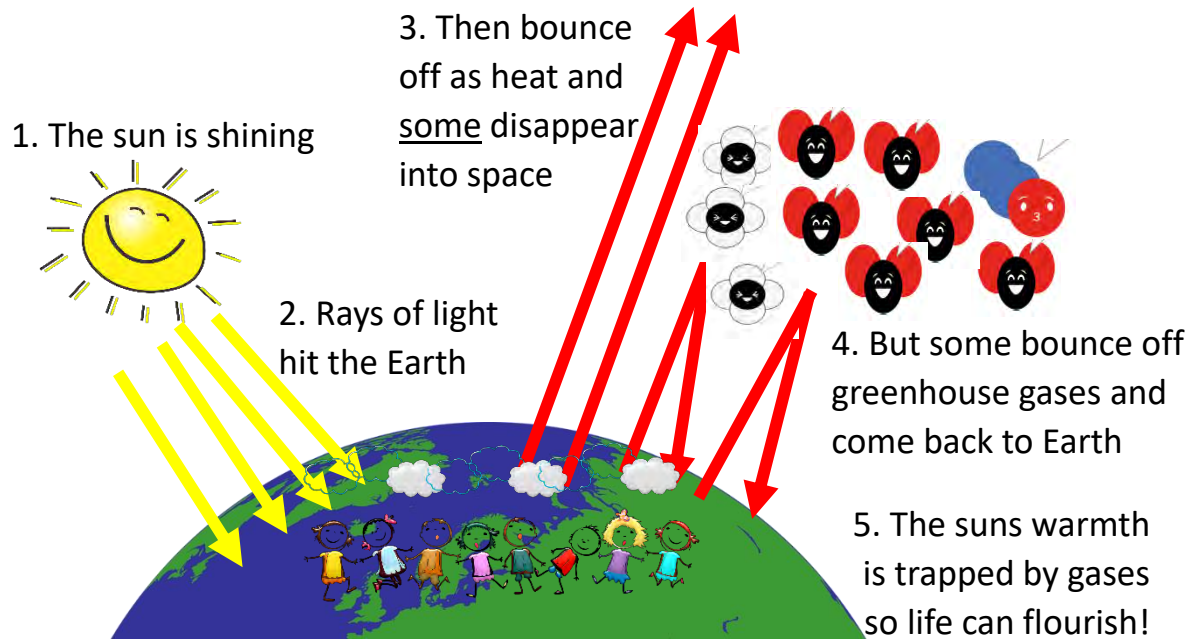
The light bounces off the Earth and travels as heat up into space (suggest the light rays stay on the floor while the heat rays get up off the floor and travel to the outer edges of the room).

The children on Earth are very very cold, so cold in fact that they can't survive!

Tell the class that in this scenario the temperature is about -20° , too cold for life.

Move on to scenario 2 – The Earth with greenhouse gases

Roles - 1 x sun, 4 x light rays, 4 x heat rays, 6 x Carbon Dioxide, 3 x methane, 1 x Nitrous Oxide and the rest of the class are people on Earth



Again, begin with the sun shining brightly, its rays of light are hitting the Earth (suggest light rays move in straight lines from the sun, down to the floor)

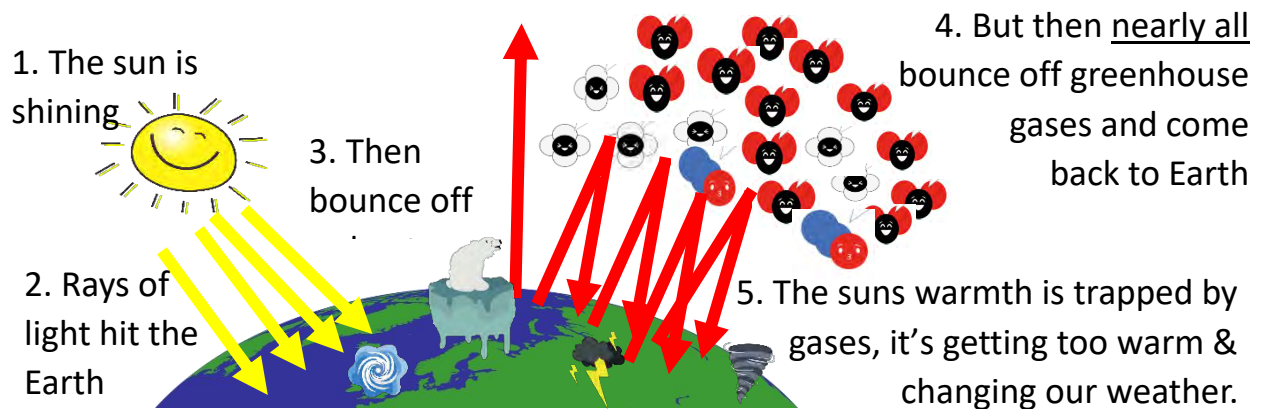
The light bounces off the Earth and travels as heat up into space (the light rays stay on the floor while half of the heat rays travel to the outer edges of the room).

The greenhouse gases are hanging around in the Earth's atmosphere and as the other half of the heat rays are travelling out to space, they bounce off the gases back down to Earth, warming the planet.

The children on Earth are nice and warm, life can flourish!

Move on to scenario 3 – The Earth with more greenhouse gases

Roles - 1 x sun, 4 x light rays, 4 x heat rays, 12 x Carbon Dioxide, 6 x methane, 2 x Nitrous Oxide and the rest of the class are people on Earth



*If you have a small class size then you could reduce the number of some of these roles to make sure there is at least one person left on Earth!

In the final scenario the sun is shining brightly, its rays of light are hitting the Earth (suggest light rays move in straight lines from the sun, down to the floor).

The light bounces off the Earth and travels as heat up into space (the light rays stay on the floor while the heat rays begin to travel to the outer edges of the room).

There are more greenhouse gases hanging around **in the Earth's atmosphere** now and so all but one of the heat rays bounce off the gases back down to Earth, warming the planet even more.

Living things on Earth are experiencing the impacts!

You can tell the children to act out certain negative effects of our warming climate **that they might remember from Lizzie's video**, such as flooding, extreme storms, drought, habitat loss, food shortages, or you can ask them to suggest possible things.

You can repeat the role play so children get a chance to play a variety of roles and you can also get them to look at the things that are releasing greenhouse gases into the atmosphere (written on the cards above) and ask them how they could stop more being released. This will be picked up on a bit later so it's good to get them thinking!

Finish the activity with a recap on the main points that some greenhouse gases are natural and needed in the atmosphere to make it warm enough for life. We have focussed on 3 natural gases, one of which is CO₂.

Looking more at Carbon (~10 minutes)

The two pictures below can be shown on the whiteboard to explain more about carbon and fossil fuels to help join the dots between greenhouse gases, fossil fuels and carbon.

The first picture could be used to calculate the amount of carbon in a class member if they know their weight or are willing to be weighed!

Carbon is in Carbon Dioxide



Carbon is in all living things – including you!

If you weigh 6 stone, then around 1 stone of you is carbon!

You get carbon from the food you eat

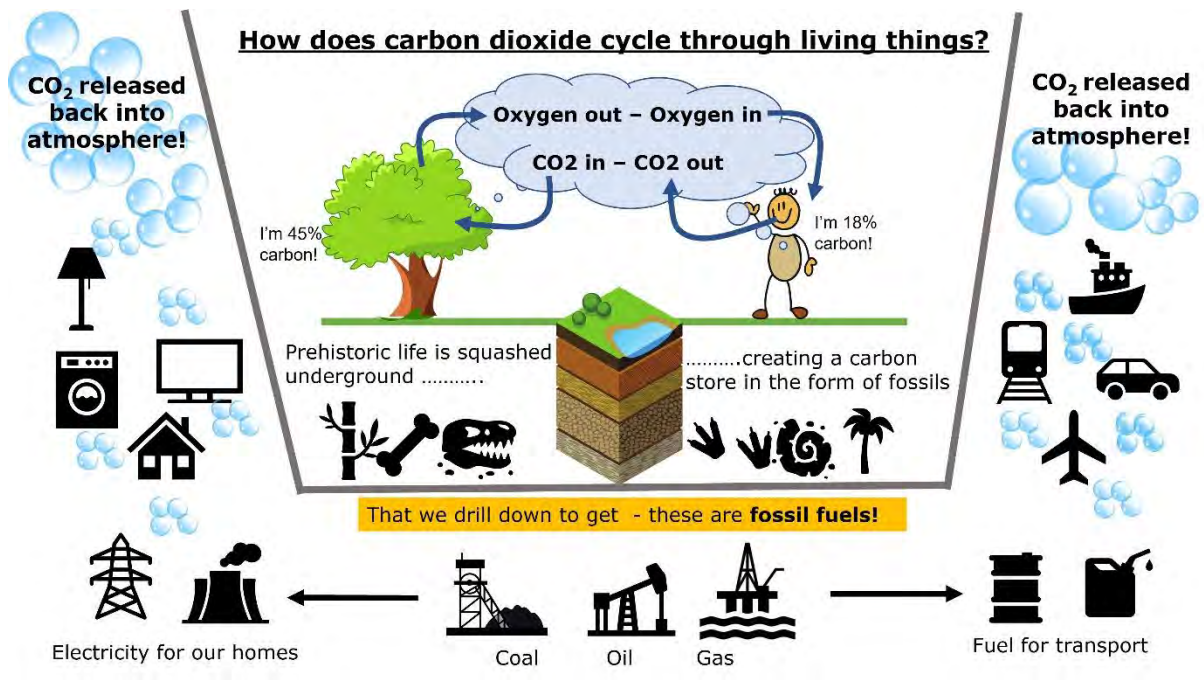


You are 18% carbon



Plants are 45% carbon, that's nearly half!

Fossil Fuels are the carbon-rich remains of prehistoric plants and animals, squashed in layers deep underground.



Be sure to mention the industrial revolution here as they will hear about it in the next video!

Section 2 - Extreme Weather



Play the video by Natasha Senior that looks at rising temperatures and extreme weather ~5 minutes.

Activity 2: Rising Sea Levels ~15 minutes & 5 minutes to look at results

This activity will help the children explore the difference between the effects of melting icebergs and the melting of glaciers on land to explore the relative effects on sea level rise. You will set this up and then move on to the next science activity while you wait for the ice to melt – you can come back to check the results later.

You will need the following per group:

- Two tubs (take away boxes work well!)
- Water
- Plasticine, pebbles or stones
- Marker pen
- Ice cubes

Begin by asking the children: Where do you find ice on Earth? What happens when the ice on Earth melts? Do they think climate change and sea level are linked? Is there a difference between icebergs melting and ice caps melting?

First, have them put the stones/pebbles/plasticine in their tubs to make the land, and fill both tubs halfway up with water (this is the sea!).

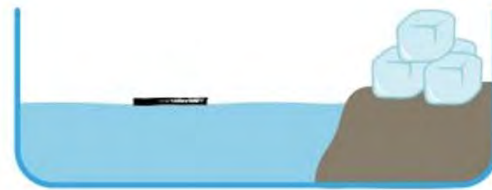
Now, in one tub, have them place ice cubes in the water (these represent icebergs) and in the other tub, place ice cubes on the land (these represent glaciers). Make sure they place the same amount of ice cubes in each tub to keep the investigation fair.

Have them mark the water level on the outside of the tubs using a pen and then wait for the ice to melt.

Once all the ice has melted, they can see if the water level has changed.



a, Sea Ice



b Land Ice

While you wait for the ice to melt, recap on Natasha's video about extreme weather and the plant Natasha showed. This represented drought conditions. Ask the class if they think drought might be important for food production and then move onto section 3 – you can come back and check the results of the ice melt at the end.

Results of ice-melt experiment

Ask them if the water level has changed in either of the tubs (or both)? How has it changed? Is there a difference between the two tubs?

Discuss the findings as a class. You should find that the tub with the ice cubes that were placed on the land saw the greatest sea level rise while the other did not rise. This is because glacier ice, like that at the South pole, is mostly sitting on land, so when it melts it runs into the sea, causing the sea level to rise.

Whereas icebergs, like that of the ice at the North pole, are already in the water so take up the same volume as water as they do when they are ice, which means when they melt, **they don't cause sea levels to rise.**

If you don't have enough tubs to give 2 per group, you can conduct the sea ice experiment first and then conduct the land ice experiment in the same tub.

Section 3 – Food Production and Soils

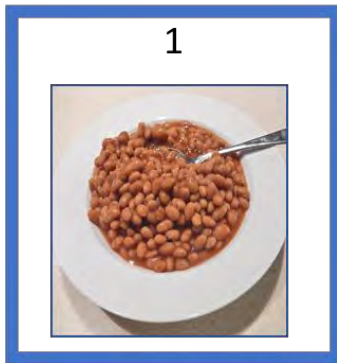
In the final part of the science session we are going to look more closely at plants, soil and food production.

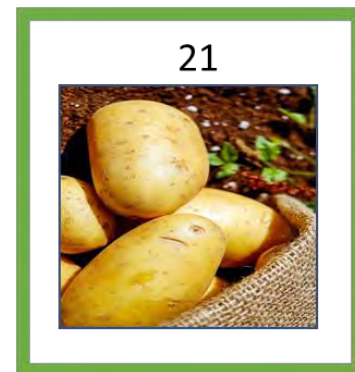
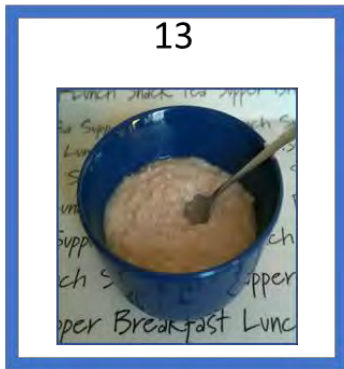


[Play the video by Sam Warner](#) that looks at climate change and crops.

~3 minutes

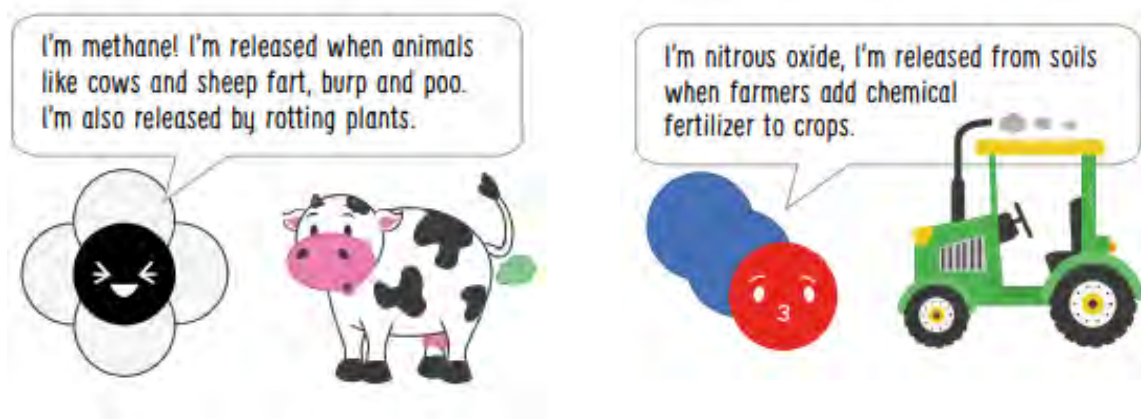
Activity 3: Food and Crops Matching Game. To help the class appreciate how many foods come from plants, print out the following pictures and cut up into cards. Do a set for each table and then get the children to work in groups to match the plant (green border cards) to the food (blue border cards). ~10 minutes





Food Product	Crop
1. Baked Beans	9. Haricot beans
2. Bread	18. Wheat
3. Chocolate	12. Cacao bean
5. Coffee	11. Coffee cherry (beans are inside!)
8. Crisps	21. Potato
10. Maple syrup	6. Maple Tree
13. Porridge	4. Oat
15. Sugar	19. Sugar beet
16. Spaghetti	18. Wheat
17. Taco crisps	7. Sweetcorn
20. Tofu	14. Soybeans

Bring back the following pictures from the greenhouse gases role play game to lead the following discussion ~10 minutes:



Use these to raise the issue that although its important for scientists, like Sam, to create better crops for a warming climate, we also need to look at the way we produce our food as this is a big contributor to greenhouse gas emissions.

Show the slide below to say that we can change not just the crops, but also the way we grow them (vertical farming), we can get our dietary needs from more different sources like insects, algae and lab-grown meat. But we can also farm in better ways. This will be the focus of the final section...

NORWICH SCIENCE FESTIVAL @ School **Greener food production – we have options!**



Gene editing – this is the kind of thing scientists like Sam are working on to make crops resilient to drought & resistant to pests and diseases so we don't need to spray chemicals



Vertical farming – no soil, less water and can bring food production into urban areas, reducing food miles

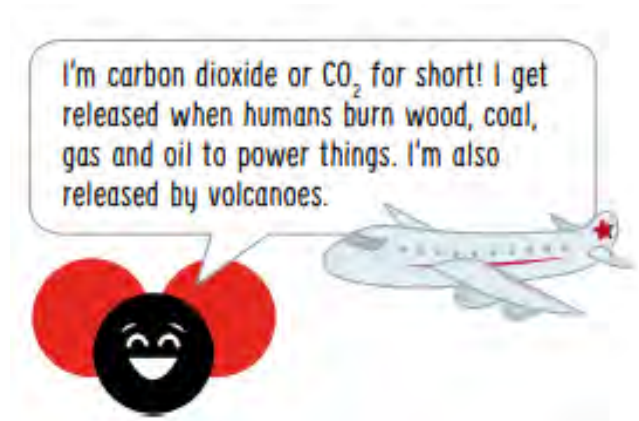


Alternative protein – insects are nutritious but equally algae and even lab-grown meat offer new dietary sources



Precision farming – technology can be used to run farms more efficiently and use resources more effectively.

Bring back this final image from the greenhouse gas game to put with the other two:



Methane and Nitrous Oxide are released by farming practices, but carbon dioxide is also released by not only burning fossil fuels for farm machinery and industrial processes to make fertilisers etc but also by mixing up the soil when ploughing and cultivating as carbon stored in the soil comes to the surface and mixes with oxygen, forming CO₂.

Growing plants is an excellent way to store carbon (remember they are made of nearly half carbon!), **whether it's** in gardens, rainforests or on farm fields, we just need to work out a better way to do it to make use of the powerful creatures under the ground!

Load up the BBC video 'Secrets of Soil by Henry Driver' that brings to life the community in the soil that can help us beat climate change. The whole video is 23 minutes so we recommend only watching certain sections of the video in stages (see below) and then breaking out to have a quick chat with the class (however, if time allows, and the children are interested then feel free to watch the whole thing!).

Just for fun!

You can build up to the video by telling the class that they are going to go on an underground safari! To do this they need to shrink themselves down to the size of a full-stop!



Play section 1 – From the start up to 4 mins 40 secs, there is a natural pause there. ~ 5minutes

Breakout chat – Ask the class if they new there was so much going on underground? Were they surprised to learn that there are a billion bacteria in one teaspoon of soil? Did they think such tiny lifeforms could help stop climate change? ~5 minutes

The next section introduces the problems with modern farming so the class can understand why the soil isn't performing as a carbon sink in the way that it could do.



Play section 2 – From 13 mins 13 secs to 16 mins 9 secs. ~3 minutes

Breakout chat – Ask the class if they were surprised to hear that healthy soil can store up to 3 x more carbon than all the plants and trees on Earth? Tell them that the next video will look at how we can fix the soil to make it hold carbon for us. ~2 minutes



Play the video by farmer, Adam Driver to show an example of a farmer who is changing the way he farms to improve the health of the soil.

~4 minutes

Breakout chat – Recap **on the points in Adam’s video**: the soil is no longer churned up by machinery, it always has something growing on it (cover crops) **so that the soil doesn’t erode away and there is a constant source of energy** captured from the sun by plants to take food into the soil for microbes. The soil can hold more water in times of drought and drain better in times of floods and **above ground, more wildlife can thrive, so they don’t need to control pests with chemicals** as there are predators about to eat them.

Ask the class what they think about this type of farming? Did they think it could help fight climate change? ~5 minutes



Now return to the BBC video on the secrets of soil

Play section 3 – from 16 minutes 9 secs to 17 minutes 11 secs ~1 minute

Finally – check the results from the ice-melting experiment from earlier. This should show the class that when land ice, such as glaciers melt, this causes the sea levels to rise, but melting sea ice does not. This rise is a problem for low-lying coastal land but also presents a real threat in terms of habitats for certain species and water supply for communities who rely on glacial ice for drinking water and irrigation.

This concludes the science session. We hope the class have a good overview of the impacts of greenhouse gases, where they come from and some of the practical ways we can try and stop the climate warming any further, particularly by looking after the soil.

If you wanted to try out some climate-busting longer activities at school then you could set up a compost project or **try a ‘no-dig’ garden approach** to grow some food!

<https://www.wildlifetrusts.org/actions/how-compost-your-waste>

<https://www.gardenorganic.org.uk/no-dig-method>

You can now move on to the writing session where the class can learn about activism and come up with more ideas for helping the climate and use the concepts, vocabulary, and knowledge from the science session to write their own poems and pledges.