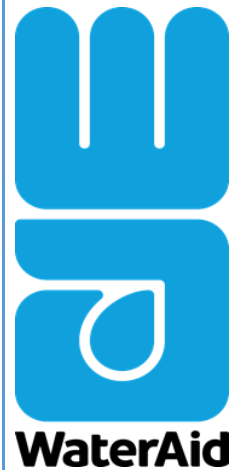


Secondary School Lesson Plan — Key Stage 4 — (14-16 Years)

Lesson 1: Natural causes of climate change

Background:

WaterAid is an international not-for-profit organisation, determined to make clean water, decent toilets and good hygiene normal for everyone, everywhere within a generation. As our climate changes we feel the effects more and more through extreme weather, rising temperatures and ice melting leading to issues around too much or too little water. This makes the climate crisis a water crisis, as hundreds of millions of people across the world struggle to get clean water, pushing them further into disease and poverty.



Context:

This is the first lesson in a series of six that explain the causes, impacts and ways of managing climate change. This lesson introduces the natural causes of climate change and the greenhouse effect.

Notes for teachers / educators

The activity timings should act as a guide only. Teachers should adjust timings and adapt activities according to the lesson time available and the ability of the learners.

Learning Question:

- What is climate change?

Learning Objectives:

- I can explain the greenhouse effect.
- I can judge the evidence of natural climate change.

Key words:

- Climate change
- Greenhouse effect
- Milankovitch cycles
- Axial precession
- Eccentricity
- Obliquity

Curriculum link: The curriculum links are not exhaustive but offer a guide

- **Science:** Earth and atmospheric science; Energy
- **Geography:** Physical geography: processes and change; People and environment: processes and interactions.

Resources:

- YouTube Video: What is climate change? – <https://youtu.be/y66KFJtmUuk>
- Resource 1 – Lesson Slides
- Resource 2 - Natural causes worksheet

Key Question	Activity	Resource	Timing
What is climate change?	<ul style="list-style-type: none"> • Display slide 1 and explain to the students that you are beginning a series of lessons on climate change. These lessons will help them understand what climate change is, what is causing it, what it means for our world and how we might be able to fix it. • Ask students to put up their hand if they have heard of climate change. Ask if anyone can explain what is meant by climate change, what is causing it and what it means for the future of our planet. Gather some responses to gauge prior understanding. • Display slide 2 — Ask students to write down any questions they have about climate change on a piece of paper and then pass them to the front. Read through a few of the questions and tell the class that you will revisit the questions once all the lessons have been completed to see if they can be answered. 	Resource 1 - Lesson Slides	5 mins
What are the causes of climate change?	<ul style="list-style-type: none"> • Display slide 3 - Introduce the “What is climate change?” film embedded on slide 3 (or follow the link in the notes section). This film outlines the differences between climate and weather, explains the greenhouse effect and the causes of climate change. Encourage students to watch and listen for the difference between weather and climate and the natural causes of climate change. • You may prefer to stagger the film to ensure that the students understand each section and have time to make any notes or ask for clarification. You can stop the video after the natural causes have been explained (3:12) and continue the video at (3:33) for the greenhouse effect. 	Film - https://youtu.be/y66KFJtmUuk	10 mins
What is the greenhouse effect and how does it affect climate?	<ul style="list-style-type: none"> • After watching the film, ask students to give you a definition of weather and climate. • Display slide 4 - Using slide 4, check the answers that were given to see if they match with the student’s definitions. Reiterate the differences between weather (short term) and climate (long term). Emphasise that weather is short term (day/week), and climate is long term (average, yearly, monthly). • Refer back to the film and ask students what the greenhouse effect is? Following a few responses ask why the greenhouse effect is problematic. 		10 mins

Key Question	Activity	Resource	Timing
<p>What is the greenhouse effect and how does it affect climate? - continued</p>	<ul style="list-style-type: none"> • Display Slide 5 - Read or ask one of the students to read out the slide. This slide explains that climate change is a natural process but that recent changes, created by humans are causing concerning changes to our planet. • Display slide 6 - Read through the slide which explains that the greenhouse effect is necessary to keep us warm and safe from space. • Display slide 7 - This is a clickable step by step animation that explains the greenhouse effect. Go through each stage of the greenhouse effect displayed and follow the arrows to show the journey of "heat" from the sun. • Once the animation has been explained, reiterate that this is a natural process needed for us to stay safe. • Ask students what they think might happen if we made the "blanket" of the atmosphere thicker with greenhouse gases (e.g. world will get warmer, hotter weather, less ice) 		
<p>What are the natural causes of climate change?</p>	<ul style="list-style-type: none"> • Display slide 8 - Give each student a copy of the worksheet (lower ability and higher ability options available). • Explain to students that you will be explaining various natural causes of climate change and they will be recording these on their sheets. They should write what the natural cause is, its frequency and impact. They should also include a diagram. You will be explaining nine natural causes using the slides. • Throughout the explanations allow time for discussion and questions from students as the graphs and other images may provoke ideas and thoughts. • Display slide 9 - Read through the slide to explain that the way that the earth orbits the sun impacts our climate. The earth's orbit changes over time in cycles. • Display slide 10 - Explain that eccentricity, the shape of the earth's orbit around the sun, changes. Click play on the animation from NASA and then read from the slide to provide students with the information they need to fill in their sheet. • Display slide 11 - Ask students to look at the graph and point out the glacial and interglacial periods earth has had over the last 450,000 years. Note that the time between glacial periods is approximately 100,000 years. 	<p>Resource 2 - Causes worksheets (higher and lower ability)</p>	<p>25 mins</p>

Key Question	Activity	Resource	Timing
<p>What are the natural causes of climate change? - continued</p>	<ul style="list-style-type: none"> • Display slide 12 – Explain that changes in obliquity (the tilt of the earth) impacts on the climate. Click play on the NASA animation and then read from the slide to provide students with the information they need to fill in their sheet • Display slide 13 - Explain that changes in axial precession (wobble of the earth) impacts on the climate. Click play on the NASA animation and then read from the slide to provide students with the information needed to fill in their sheet. • Display slide 14 – Explain that the amount of energy the sun emits or “solar output” impacts our climate. Read through the slide to explain the information. Then display slide 15 to show the cycle of the sun. Draw attention to the images brighter sunspots, which make earth warmer. • Display slide 16 – Explain that the graph shows solar output compared with temperature. Explain that at the beginning of the graph the output measurements and temperature follow a similar pattern. However, the pattern since the 1960’s has changed, implying that humans are making climate change worse. • Display slide 17 – Explain that volcanoes also impact the climate with the gases they emit. Read from the slide to provide students with the information needed to fill in their sheet. Emphasise that volcanoes release aerosol particles that cool earth and greenhouse gases that warm earth. • Display slide 18 — Explain to students that people and animals impact the climate. Read from the slide to provide students with the information needed to fill in their sheet. 		
<p>Plenary</p>	<ul style="list-style-type: none"> • Display slide 19 – Give students a few moments to recap to themselves the information on their sheets and then put these out of sight. They should then attempt to answer the questions on slide 19 through a class discussion. Refer back to their questions at the start of the lesson. Are they now able to answer them? Read out a few of the questions and ask for answers. End the lesson by asking which natural causes of climate change were most surprising and why. 		<p>5 mins</p>