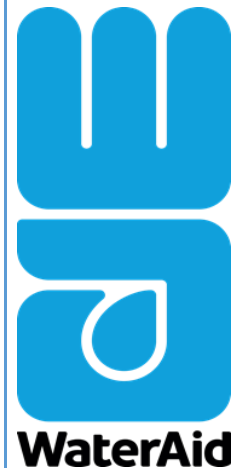


Secondary School Lesson Plan — Key Stage 4 — (14-16 Years)

Lesson 3: Evidence 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 third lesson in a series of six that explain the causes, impacts and ways of managing climate change. This lesson introduces the evidence 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 evidence is there that climate change is happening?

Learning Objectives:

- I can compare the different scientific methods of measuring climate change.
- I can judge the evidence of human made climate change.

Key words:

- Climate change
- Quaternary period
- Surface temperature
- Ice core

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 - Poster copying task (print on A3)
- Resource 3 - Graph analysis handout

Key Question	Activity	Resource	Timing
Recap	<ul style="list-style-type: none"> • Display slide 1 - Explain to students that this lesson will help them understand how we know that drastic and unnatural climate change is happening. • Ask students to recap the natural and human causes of climate change from the previous lesson. • Display slide 2 - Ask students to use their own knowledge and any knowledge they have gathered from the last two lessons to name five ways scientists measure the climate (e.g. thermometers, weather stations, satellites, average weather patterns) and to think of five ways scientists might measure climate changes over time (e.g. CO₂ levels, changes to weather patterns or ice coverage). 		5 mins
What evidence do we use to show climate change?	<ul style="list-style-type: none"> • Display slide 3 - This video is a repeat of the video from previous lessons. If you have been watching the video in stages, then begin the video at the evidence of climate change sections (4:40). • Play the video for students and ask them to listen out for the ways in which we gather evidence of climate change. • Once the video has finished ask the students to name the ways in which climate change can be measured. 	Film - https://youtu.be/y66KFJtmUuk	10 mins
How do we know climate change is real?	<ul style="list-style-type: none"> • Display slide 4 - Ask the students how we are able to know what the climate was like thousands of years ago, considering the thermometer was only invented 400 years ago. They should read the information displayed on the slide and discuss this in pairs and feedback their ideas to the rest of the class. Answers could be recorded and referred to later in the lesson. • Display slide 5 - Divide the class into small groups. Give each group a piece of A3 paper. Explain to the students that in their groups they will be creating a poster that explains how we can work out what the climate was like before weather equipment. • Display the A3 copying task poster in a location that can be easily accessed by the students but hidden from the whole class. Depending on the classroom this could be on a wall outside the class. 	Resource 2 - Poster copying task (A3)	20 mins

Key Question	Activity	Resource	Timing
<p>How do we know climate change is real? - continued</p>	<ul style="list-style-type: none"> • Each member of the group will take turns to look at some information which is outside the classroom / set location. They have just one minute to memorise and analyse the information. Once the minute is up, they will return to their group and write / draw what they have learnt on their sheet of paper. The next group member can then go and look at the information and the process is repeated until all group members have had a turn or a set time limit is up. • When each student returns to draw and write what they have learnt, they should relay this to their group to ensure that there is no repetition. • Students are not to take paper with them to copy what they have seen and stress that the text is more important than the images. • Once their time is up, each group should explain one section of their poster to the rest of the class. Groups can add to their posters any information that they had missed. Ensure that each section of the poster has been covered by all the groups. • With the information they now have, the students should answer the question that was posed at the start of the lesson – how do we know what the climate was like before thermometers were invented? You could compare their answers to their initial thoughts on the question. • Photocopy their posters and give each member of each group a copy for reference. 	<p>Resource 2 - Poster copying task (A3)</p>	
<p>What does the evidence show us?</p>	<ul style="list-style-type: none"> • Display slide 7 – Explain to the students that some people do not believe that climate change is real. On the slide are a few common arguments raised against climate change. Ask students to read through the slide and ask if any agree of them agree with, or have heard others use, these statements. Ask some students if they have any opinions about these statements. • Display slide 8 – Explain to students they will now be analysing the evidence of climate change and answering questions to see if they can find proof of climate change and prove or disprove the statements on the previous slide. Give students a set of the graph analysis handouts. These will be used so they can study the graphs more easily and to see more detail than on the screen. 	<p>Resource 3 - Graph analysis handout</p>	<p>15 mins</p>

Key Question	Activity	Resource	Timing
<p>What does the evidence show us? - continued</p>	<ul style="list-style-type: none"> • Display slide 9 – Tell the students that this graph shows measurements of the surface temperature of earth since 1880. They can view the graph both on the handouts and on this slide. Ask students to answer the three questions on the slide using the graphs evidence and facts to support their answers. Explain that despite the fluctuations in temperature since 1880, the graph highlights how the mean dramatically since 1880 from -0.1°C to 0.95°C. Whilst this might look like a small amount, this level of rise is already enough to have melted glaciers, raised sea levels and change climates. If the pattern continues the impacts would be devastating. • Display slide 10 – Tell the students that this graph shows the levels of glacial ice loss since 1970 as measured from glacier monitoring stations. They can view the graph both on the handouts and on this slide. Ask students to answer the three questions on the slide using the graphs evidence and facts to support their answers. Explain that since 1970 the metres of ice lost have been steadily increasing. Ask students if they can explain to you why this might be an issue (e.g. less meltwater as a water supply in downstream areas, increase in sea level, increased flooding). • Display slide 11 – Tell students that this graph shows the levels of global sea level rise since 1995 as measured from satellite data. They can view the graph both on the handouts and on this slide. Ask students to answer the three questions on the slide using evidence and facts from the graphs to support their answers. Explain that since 1995 sea levels have been steadily rising. • Display slide 12 – Tell the students that this graph showing the CO_2 levels over the past 800,000 years ago since 1995 as measured from ice core data. They can view the graph both on the handouts and on this slide. Ask students to answer the three questions on the slide using evidence and facts from the graphs to support their answers. Explain that since 1950 there has been a dramatic increase in CO_2 levels. • If students struggle aid them by analysing the graphs and questions as a class. 	<p>Resource 3 - Graph analysis handout</p>	

Key Question	Activity	Resource	Timing
Is climate change real?	<ul style="list-style-type: none">• Display slide 13 — In pairs students should write a response to the statements given on the slide. Encourage students to use facts from the graphs to help support their responses.• Once students have had a chance to develop a response begin a debate. You, or another student, should roleplay belief in the statements on the slide. Have students debate with you to try to convince you that the statements are untrue.		10 mins