Introduction

Siemens and The Wildlife Trusts are working together to ensure we have a healthy natural environment to pass on to the next generation. To help achieve this Siemens provides 600 employee volunteering days a year, across the UK, to help The Wildlife Trusts manage their nature reserves and also delivers a range of business skills support, and expert advice to support them. In partnership together, Siemens and The Wildlife Trusts wish to go further, supporting the habitats and green spaces that are so vital for our biodiversity, wellbeing and prosperity.

Resources required

- GHG scrip (attached) ◯
- Carbon worksheet (attached) ◯
- Coats ◯
- Pen ◯

About this Resource

The majority of the world's population live in an ever more urbanised world, increasingly disconnected from nature.

The affects of human actions can have both long and short-term consequences on the natural world, impacting various complex and interdependent natural systems.

By sharing the knowledge and expertise of our partner charity, The Wildlife Trusts, and using Siemens' technological know-how on topics such as carbon reduction and sustainable cities we aim to help students to understand that these topics do not sit in isolation from each other and demonstrate how solutions that benefit both humanity and nature are possible.

Overall learning objectives and outcomes

- To understand the interrelationship of the systems and cycles in the natural world
- To understand the consequences of human development on different aspects of life in the UK
- To understand how STEM subjects can be utilised to reduce or eradicate these impacts
- To understand how you can make a personal contribution to these issues.

Curriculum Learning Objectives

Students should be able to:

Geography	Biology	Technology
Understand key features of and apply concepts from: global warming, the water cycle and severe weather	Understand key features of and apply concepts from: Habitats and Corridors	Understand how technology has an impact on the natural world Explore how the design of projects, buildings and objects considers a variety of factors and constraints

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Participation in these sessions will also enable students to earn a Siemens Digital Badge.

Digital Badges enable young people to showcase their achievements and gain evidence-based endorsement for their STEM skills.

By earning a badge, young people are able to show what they have learnt, evidence the activities they have undertaken and who has issued the badge. They can be collected and shared across the web forming a rich picture of individual's achievements. They are used by thousands of organisations across the world. Find out more at http://www.siemens.co.uk/education/en/digitalbadges.htm

Lesson 1: Carbon

Introduction:

The purpose of this session is to learn more about global warming, how it happens and what it does. For students to consider their carbon footprint and consider solutions to the issue.

Resources required

- Coats ◯
- Greenhouse Gas (GHG) script ◯
- Carbon worksheet ◯

Learning Objectives

To understand:

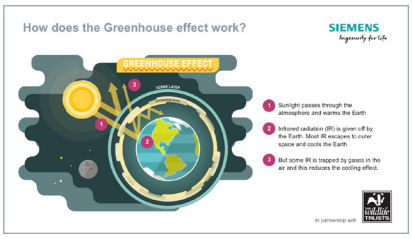
- what greenhouse gases are, what they do, and how they affect the natural world
- the atmospheric cycle and how this affects global warming
- the impacts of climate change
- how we can reduce our carbon footprint in everyday life

Starter

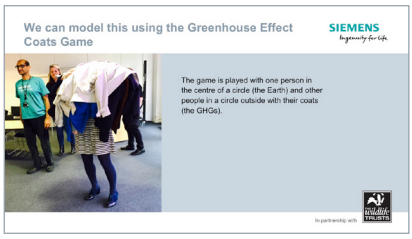
Start off by asking students if they:

- Have heard about global warming
- Know what it is and how it's caused
- Know some of the effects it has

Use the graphic on **Slide 5** to explain ideas behind the proces. Then play the Coats Game on **Slide 6**.



Slide 5



Slide 6

Coats game

- The game is played with one person in the centre of a circle (the Earth) and other people in a circle outside with their coats (the GHGs).
- The teacher uses a script to talk about the effect of GHGs on the earth while the people outside the circle pile their coats on the 'earth'... who gets very hot.
- You can use the following GHG script:

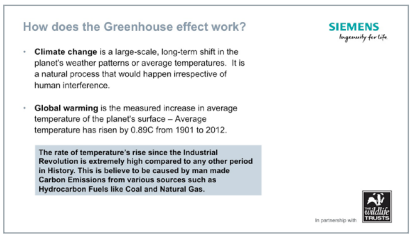
GHG Script

"Some gases in the Earth's atmosphere stop heat radiating into space from the Earth. They include methane, water vapour and carbon dioxide. This is called the greenhouse effect and the gases involved are called greenhouse gases. An increased greenhouse effect can lead to global warming and climate change. Electromagnetic radiation at most wavelengths from the Sun passes through the Earth's atmosphere. The Earth absorbs electromagnetic radiation with short wavelengths and so warms up. Heat is radiated from the Earth as longer wavelength infrared radiation. Some of this infrared radiation is absorbed by greenhouse gases in the atmosphere, warming up the atmosphere."

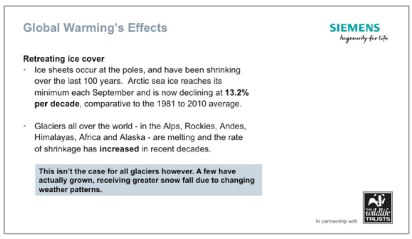
Teachers notes Scheme of Work - **Going wild** 04

Development

Use **Slide 7** to explain more about how global warming works. Then explore some of the effects of this, including: melting ice caps (**Slides 8 & 9**), rising sea levels (**Slide 10**), the effects on wildlife (**Slides 11 & 12**) and the implications for the UK on the following slides.

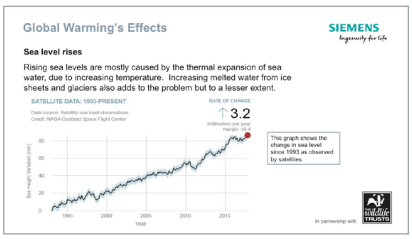


Slide 7

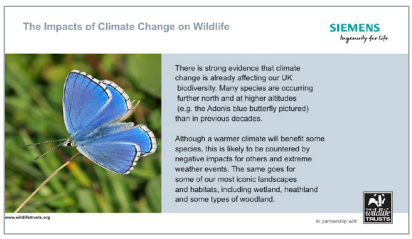


Slide 8

Slide 9

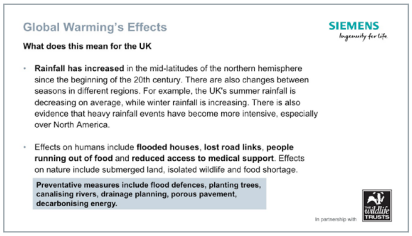


Slide 10

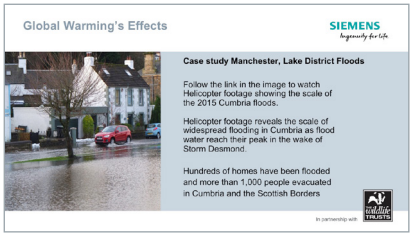


Slide 11

Slide 12



Slide 13



Slide 14

Ask students to indicate if any of this isn't clear or if they have any other questions.

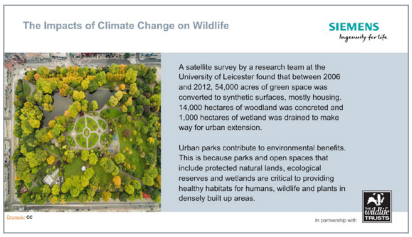
Carbon footprint activity

- Ask the students to calculate their carbon dioxide usage using the worksheet provided.
- Answer the questions below, then fill in the corresponding values on the far right. Tally the values to find your carbon footprint. Only fill in one value for each question, unless otherwise stated.
- Compare worksheets and find out which student has the lowest emissions in the class.
- Discuss other ways in which the students could reduce carbon dioxide at school and at home and how you could implement these.

In partnership with

Exploring solutions

Explain that one of the solutions for urban environments is the development of parks and other green spaces (**Slides 16 & 17**). Share these ideas and ask students for their reactions.



Slide 16

Slide 17

Overall Learning Outcomes:

- Understand how greenhouse gases work
- Understand the effects global warming will have
- Understand how we can reduce our carbon footprint

Now share what you have learned and earn a Siemens Digital Badge

Lesson 2: Water

Introduction

This session encourages students to use their knowledge of the water cycle to explore the advantages and disadvantages of using water to generate and decarbonise our energy.

Resources required

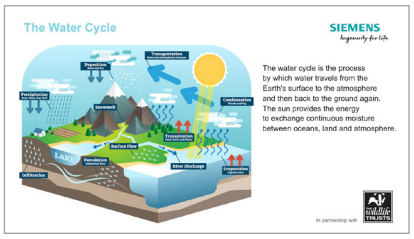
- Water is Life worksheets
- Paper

Learning Objectives

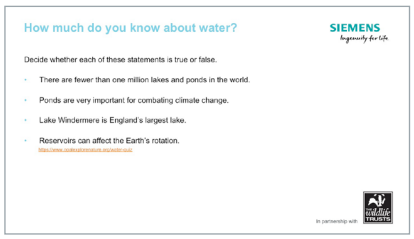
- To understand the importance of natural environments and organisations being responsible and collaborating to achieve long term sustainability.
- To identify how we use water personally vs how we use water as a resource.
- To gain an understanding of the water cycle and how it impacts specific habitats.
- To explore the impacts that water turbines have on animals and the surrounding environment.

Starter

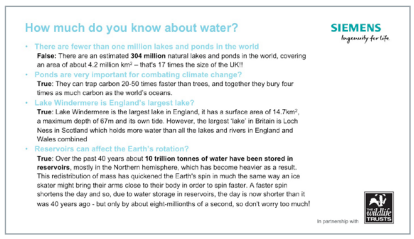
Ask students what they recall about the water cycle, what it is and how it works. Use the graphic on **Slide 5** to recap key points. Follow up by requesting students play a true/false game; sharing the statements on **slide 6**, allowing for 2 minutes discussion time, and then show the responses on **slide 7**.



Slide 5

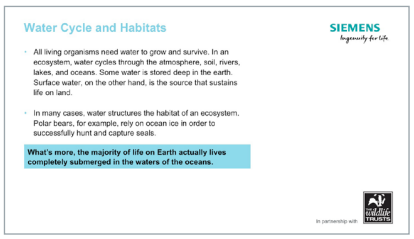


Slide 6



Slide 7

Use **slides 8** and **9** to look at the water cycle in depth. Draw out from **Slide 8** points about the water cycle affecting habitats. Then ask students to suggest whether, and how, climate change will affect the water cycle. Take feedback, show **slide 9** and explain.



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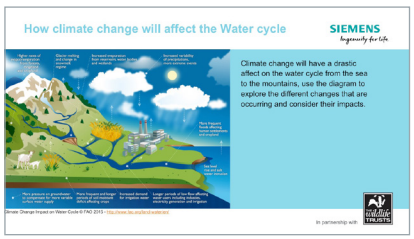


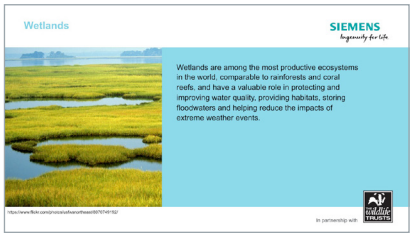
Slide 9

In partnership with THE wildlife TRUSTS

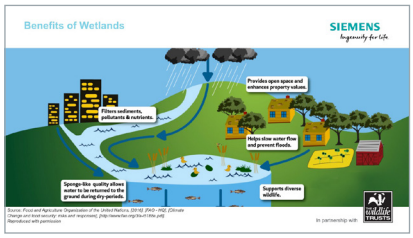
Teachers notes Scheme of Work - **Going wild** 07

Development of ideas

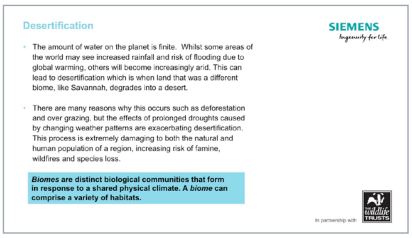
Use **Slides 10, 11 & 12** to explain the effects of excess and minimal water.



Slide 10

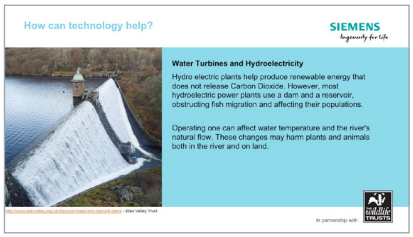


Slide 11

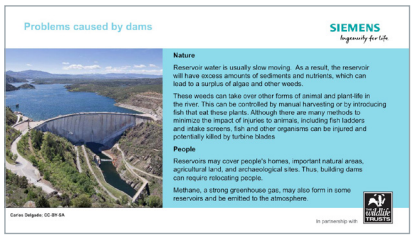


Slide 12

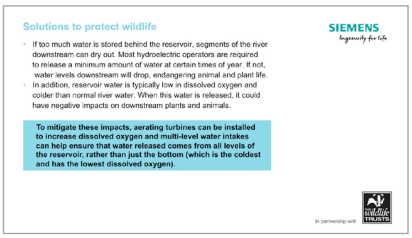
Then introduce material on *hydroelectric* power by asking students if they know what it is. Following this ask for ideas and explain how the construction of such a project changes the environment. Point out the advantages and disadvantages, and ask for responses: **Slides 13-16**.



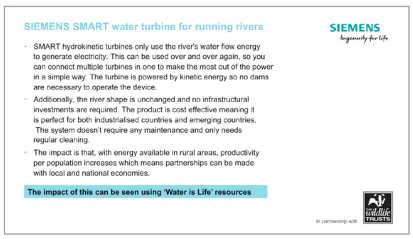
Slide 13



Slide 14



Slide 15



Slide 16

Water is Life activity

- Print the Siemens Crystal education resources (Water is Life).
- Use this with students to get them to explore ideas about water usage.
- Consider how and why this could be reduced.
- Fill in the sheets and provide some extra paper for planning of activities.

Overall Learning Outcomes:

- Understand the stages of the water cycle
- Understand how the water cycle is affected by climate change
- Gain an understanding of how reliant ecosystems are on water
- Explore the advantages and disadvantages of using water to generate and decarbonise our energy.

Now share what you have learned and earn a Siemens Digital Badge

Explorer Energy SIEMENS

In partnership with THE wildlife TRUSTS

Lesson 3: Urban

Introduction

This activity encourages students to consider the impact cities and urbanisation can have on wildlife and the measures that can be undertaken to reduce negative effects.

Resources required

- Access to satellite images or mapping of local area ◯
- Paper ◯

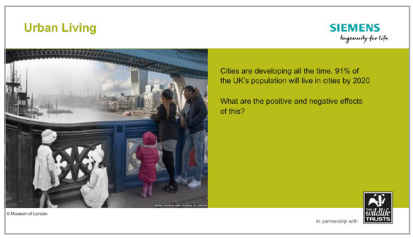
Learning Objectives

- Gain an understanding of how cities and towns affect our environment
- Identify different types of habitats and the importance of wildlife corridors.
- Explore how cities affect wildlife and what can be done to protect ecosystems

Introduction

Show the image of London on **Slide 5** and ask students to suggest where you could find wildlife in an area like this. Then ask whether it is possible for a city to support wildlife, before moving to **Slide 6** and asking for ideas about how the city has changed over the last 400 years.

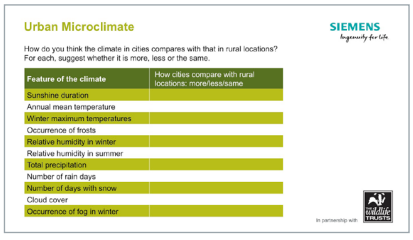
Slide 5



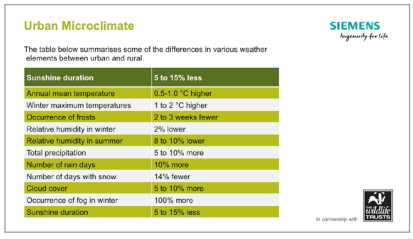
Slide 6

Development

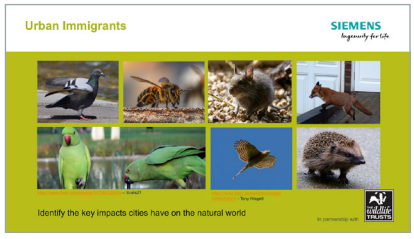
Use the following slides to further explore the urban environment. Challenge students, using **Slides 7 & 8**, to suggest how features of a city's micro-climate compares with that of rural areas. Then ask students to identify the animals featured on **Slide 9** and to find the ways life in cities can be advantageous or challenging for these and other creatures.



Slide 7



Slide 8



Slide 9

Describing and evaluating solutions

Now explore some solutions that have been developed. Use the resources and explain how these work:

Slide 10 - Wildlife Corridors

Slide 11 - Field Margins

Slide 12 - Green Bridges

Slide 13 - Green Spaces

Ask students to indicate if any of this isn't clear or if they have any other questions.

Green Spaces activity

Use these activities to support students in developing responses to the challenges you have explored with them.

Explain that when considering the impact of a project, they would need to consider:

- What green spaces currently exist in their area.
- Are there any simple ways to improve the habitat benefit of those green spaces e.g. adding pond, increasing number of flowering, number of native species, strata?
- How to best manage these green spaces for nature e.g. grass mowing regimes.
- How different types of plants and wildlife can move between these areas. Are there any barriers?
- How it might be possible to connect greenspaces in their area.

Students could then write a report summarising the plan. In it they should:

- Consider the impact wildlife corridors could have in their area.
- Suggest how this would be beneficial for the community and wildlife.
- Explain how this could be achieved, indicating how this could help with biodiversity and the conservation of animals.

Extension Activity

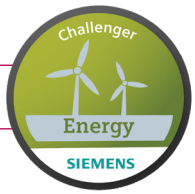
Ask students to imagine they have been contracted by pupils in the science club at the local primary school. They are exploring ways in which their habitat could be improved for animals. They have some questions they would like you to answer.

1. Is it a good idea to leave out food to attract wildlife? If so, what sort and what might it attract?
2. They are considering planting trees and plants to provide nectar and other nutrients for animals, as well as shelter. What sort would be good and why?
3. Would it be a good idea to put a bird feeder up at school?
4. What about a bird bath?
5. Would it work for pupils to make shelters out of old plant pots? One pupil has suggested carving a hole out of the bottom, hide it in soil near bushes and seeing which animals use this shelter. Do you think this would work and what might they see there?

Overall Learning Outcomes:

- Identify the key impacts cities have on the natural world
- Understand how habitat corridors can connect different sections of wildlife
- Understand what you can do to support nature and wildlife where you live.
- Apply these concepts to where you live

Now share what you have learned and earn a Siemens Digital Badge



If you have enjoyed using these resources, further schemes of work to support STEM education covering themes aligned to these topics are also available:

From Siemens Education

www.siemens.co.uk/education

Blowing in the Wind
KS3/S1&2 – science, technology and maths

Gather and use data to support conclusions relating to energy efficiency and arguments about noise pollution; use ideas to inform discussions about overall power supply systems and judge impact of design on environment and communities.

eZero Island
KS3/S1&2 – science and technology

Investigate how maths can support the modelling of a multi-faceted system using data and logic; apply ideas about energy transfer and sustainability to a novel context to produce a practical overall system.

Siemens Island

In this game your aim is to get the balance right between cost, pollution and efficiency to keep Energy Island from grinding to a halt!

You will be asked to purchase and place energy production facilities on the Island to bring power to the opulation. Once you've made your selections run a 24 hour simulation to see whether enough power has been provided to keep the population happy and the costs and pollution level to a minimum.

From The Wildlife Trusts

Build a nestbox:
7474fab53f1b6ee92458-8f3ac932bad207a00c83e77eaee8d15c.r12.cf1.rackcdn.com/NEST-BOX.jpg

Make an insect hotel:
7474fab53f1b6ee92458-8f3ac932bad207a00c83e77eaee8d15c.r12.cf1.rackcdn.com/INSECT-HOTEL.jpg

Make a bird feeder:
7474fab53f1b6ee92458-8f3ac932bad207a00c83e77eaee8d15c.r12.cf1.rackcdn.com/BIRD-FEEDER.jpg

Make seed bombs:
7474fab53f1b6ee92458-8f3ac932bad207a00c83e77eaee8d15c.r12.cf1.rackcdn.com/SEED-BOMBS.jpg

Build a batbox:
7474fab53f1b6ee92458-8f3ac932bad207a00c83e77eaee8d15c.r12.cf1.rackcdn.com/BAT%20BOX-WAG-2016.jpg