

Unit 3: Climate change

A future in STEM?

At Siemens we understand that it can be challenging for parents and carers to find ways of supporting the education of young people at home. We believe that all young people should be given the opportunity to explore their interests and discover their talents. This resource has been designed to support you in guiding your child through a range of STEM topics, to engage them and spark an interest in STEM subjects.

There are three of these in the set:

Medical Imaging



Showing how ideas about waves from Physics are used to produce stunning and exciting images of the inside of the human body.

Smart Cities



Exploring ways in which our cities are being redesigned to make them suitable for a low energy and sustainable future.

Climate Change



Showing how technologies are used to counter the causes of disastrous variations in conditions around the world.

Many people who work for Siemens are experts in STEM subjects.



Science



Technology



Engineering



Maths



There is a strong relationship between these subjects. Studying them enables students to follow a pathway that leads to a wide range of training and employment in STEM careers. These are often well paid, prestigious and secure.

One of the key skills for many STEM professionals is being able to draw upon a wide range of ideas. For example, large bridges are designed by civil engineers; these professionals are not scientists or mathematicians, but they use ideas and processes from those subjects and can only become qualified having studied those subjects extensively.

Young people often struggle to relate the topics they learn about in school to the real world and careers. Sometimes young people can formulate ideas in school but can't see their immediate relevance. Students in school can spend a lot of time studying maths and science. In fact, many people who go on to use those subjects don't work as mathematicians or scientists but as engineers. Engineers are problem solvers; they use ideas and skills to come up with solutions. For example:

Programmer



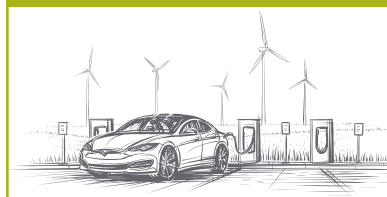
How can I use code to make a more exciting game?

Food Technologist



How can I design a cake with healthier ingredients?

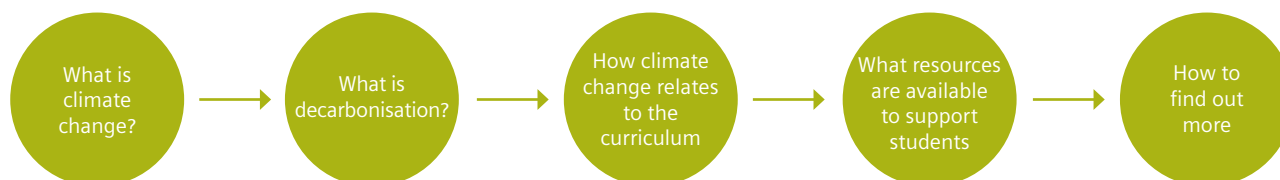
Designer



How can I design an electric car with a greater range?

Climate change

In this topic we are exploring climate change, and how it relates to the STEM curriculum and STEM careers. We'll be finding out:



Climate change refers to long-term changes in temperature and weather patterns that are occurring at a local, regional and global scale. This pattern of change is primarily driven by global warming caused by human activity, namely our dependence on fossil fuels to satiate our ever-growing demand for electricity and transport.

The challenge in combatting climate change is enormous and technical, and will require huge changes to the way that we power our world. In short, we will need to adjust how we produce energy, but also in how we use it.

An integral part of your child's understanding of climate change is that *they are not too small to make a difference*, and that their everyday actions matter with regards to the future of our planet. Whether that involves joining in with global climate change activism, changing energy use habits at home, or working towards a career with an active role in combatting climate change, your child has a part to play.

Decarbonisation

CO₂ (carbon dioxide) emissions are a huge contributing factor to global warming and climate change. These emissions are created by the chemical reaction that occurs when we burn fossil fuels. Oxygen (O₂) comes from the air, which reacts with carbon (C) released from the combustion of fossil fuels when they are burned to form CO₂. Once released, these CO₂ particles trap heat in the atmosphere, raising global temperatures. This is the Greenhouse Effect.

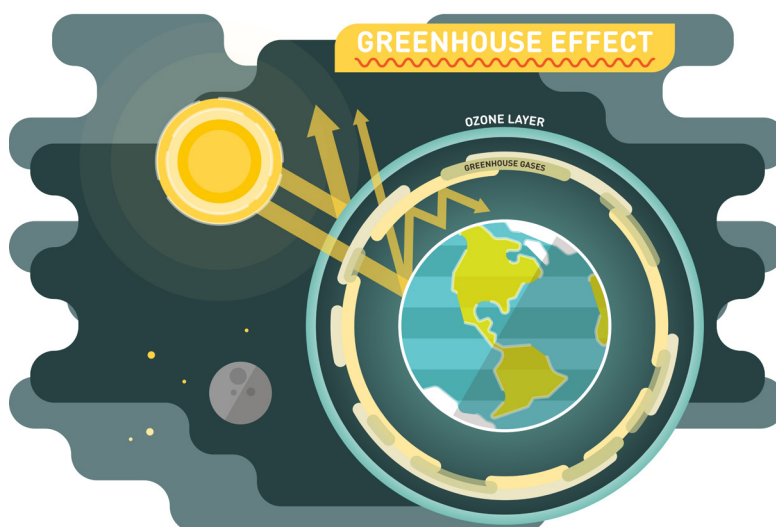


Figure 1 Greenhouse gases such as CO₂ trap heat in Earth's atmosphere, preventing it from escaping back into space.

Decarbonisation is the process of reducing our reliance on this particular reaction in energy production and finding other, non-fossil fuel, sources of energy to create electricity. This involves turning to green and renewable energy sources in the long-term and finding more efficient ways to use current resources in the meantime, including how we store electricity.

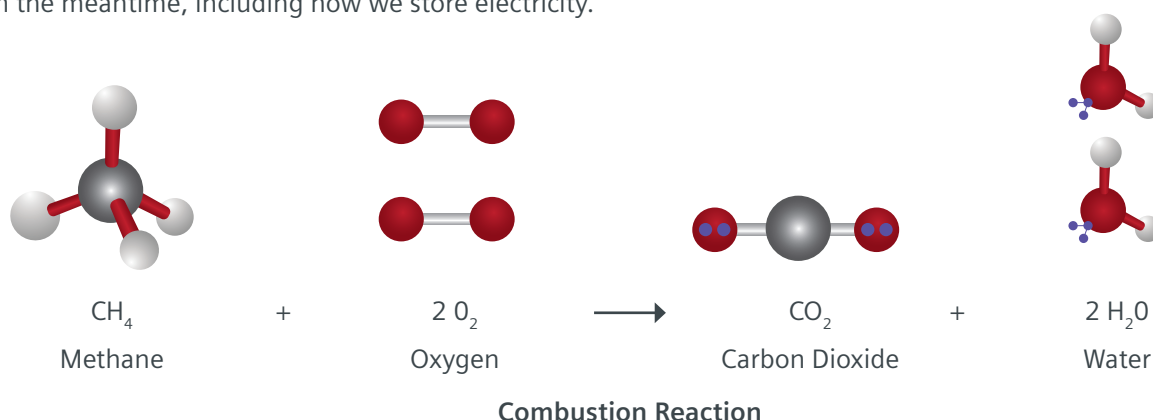


Figure 2 Diagram showing the combustion of methane, a fossil fuel.

Decarbonisation is currently underway across our infrastructural systems, including the energy, transport, medical and manufacturing systems. This process involves switching to localised renewable sources of energy, and the introduction of smart technologies all help to reduce and optimise our energy use. The design, installation and maintenance of these systems is a huge undertaking, and your child will enter a jobs market very much defined by our response to climate change. This means that there will be huge opportunities for your child to make a direct impact on our climate response through a STEM career. Many of our learning resources aim to highlight these career paths in science and engineering.

How you can help to fight climate change

Fighting climate change relies on everybody helping, not just professionals. You can contribute by how you approach energy use within your family and by teaching your child how to save electricity and reduce waste as part of their long-term life skills. This will help your child to move beyond the science and to connect their learning to everyday life. Showing your child how to creatively repurpose packaging or grow houseplants from waste fruit and vegetable seeds will help them to appreciate the potential in sustainable living. It will also help to change their perception that living sustainably is about living with less, and that in fact there is abundance to be found whilst still saving energy.

Real life demonstrations of living sustainably also reinforces the idea that societal change begins at home. This will complement any wider participation in direct action, from school climate strikes to demonstrations, as it is important for young people to understand that to fight climate change it will take more than just changing the legal frameworks in which we live. It also requires changes to how we approach our daily lives. Demonstrating to young people ways to make these changes helps to reinforce their own personal input in the face of what can seem like an impossibly large global problem.

Climate change and society

Sustainability is not just about environmental solutions; the innovations currently being produced by Siemens will have a lasting impact beyond climate change. Decarbonisation solutions such as renewable energy and electric vehicles will also clean up our air, reducing deaths and lung damage caused by pollution, and the development of Smart Infrastructure will aid global development, bringing energy and economic growth to areas where this is currently impossible.

Your child will be part of this green revolution, and will be working as part of a green economy.

Climate change and the curriculum

Climate change is included across the KS3 and KS4 STEM curricula, in Science, Design & Technology and Engineering, whilst Maths provides the key skills that underpin science theory, design and engineering practice.

To help draw these curriculum strands together in a real-world, industry-led context, Siemens Education have produced a series of KS3 and KS4 digital education resources. The aim of these resources is to help students to expand and relate their curricular learning to real-life applications and challenges to inspire them to become the green leaders of the future.

Energy provision

For young people interested in how energy is produced, Siemens Education have created Energy Island and Energy Farm, two interactive games where they must create cost effective green energy solutions that model the real-life problem of energy provision. Students must balance costs with the required energy consumption and geography, giving them a taste of real-life energy solution engineering.

Complementing these games are the *Here Comes the Sun* resource pack, a primer on renewable energy. Here young people can explore the mathematics behind solar power and the societal impacts of renewable energy supplies in a developing country.

Energy Island can be accessed here: <http://siemens.zincmediadev.com/energy/island/index.html>

Here Comes the Sun can be accessed here:

<https://assets.new.siemens.com/siemens/assets/api/uuid:45bd7963b0d0bb53e04f7b631084754a63826504/version:1533119580/ks4-energy-badges-here-comes-the-sun-sow.pdf>

Energy Farm can be accessed here: <http://siemens.zincmediadev.com/energy/farm/index.html>



Figure 3 In 2018, Isabella Island in the Galapagos became a real life 'Energy Island' using a renewable energy system designed by Siemens.

Transport

Siemens has recently unveiled Electric Avenue, the UK's first residential street fully equipped with electric car chargers, and Siemens Education are encouraging students to explore low and zero-carbon transport solutions with the *Greenpower Challenge* and the *Inspired Bus Company* resource pack. The Greenpower Challenge sets students the challenge of joining the electric car revolution by designing an electric racing car, whilst *The Inspired Bus Company* is an introduction to hybrid power, an important stepping stone to decarbonisation.

Greenpower Challenge can be accessed here:

<https://new.siemens.com/uk/en/company/education/teachers/key-stage-3.html#GreenpowerChallenge>

The Inspired Bus Company can be accessed here:

<https://new.siemens.com/uk/en/company/education/teachers/key-stage-3.html#Moreactivities>



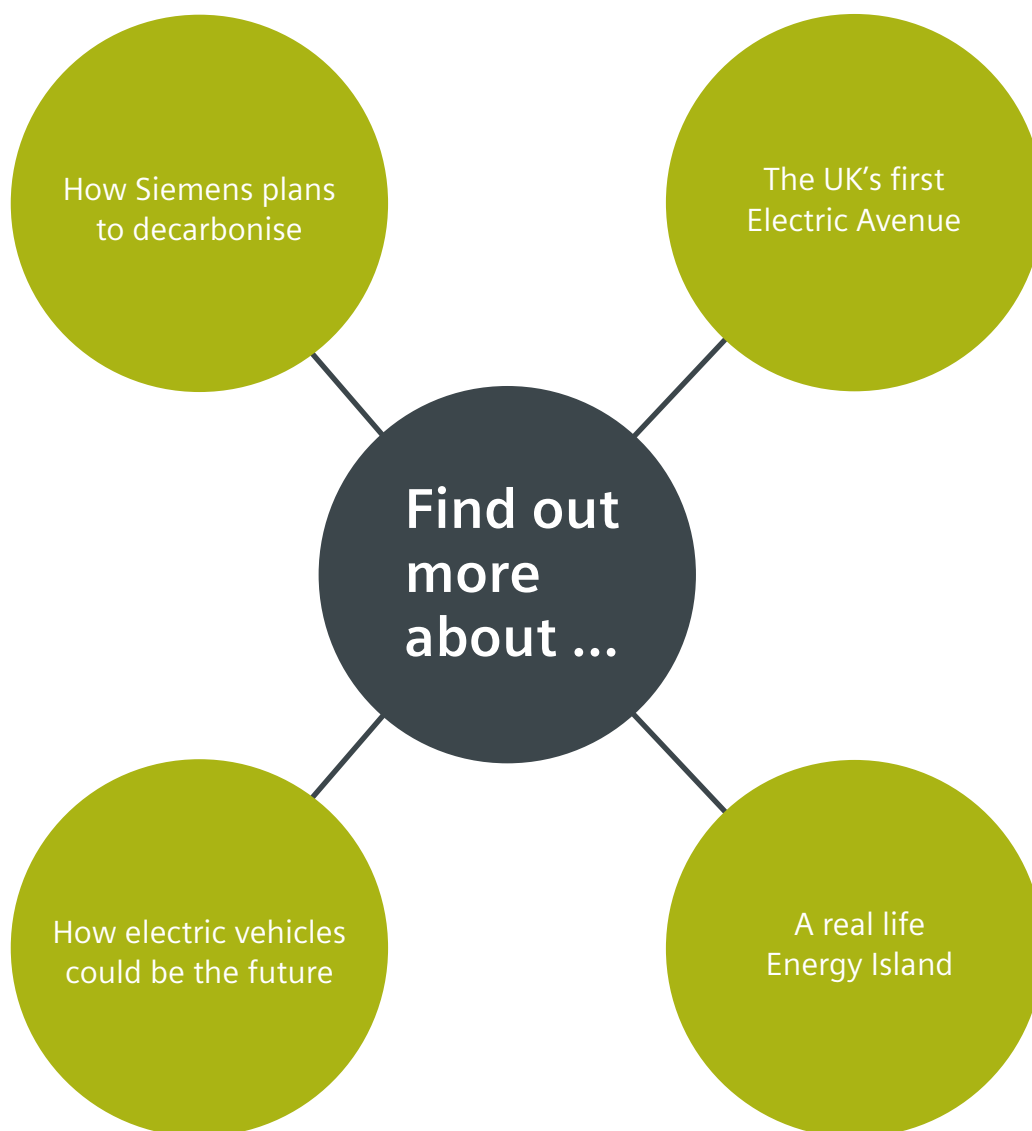
Figure 4 A newly installed electric car charger on Sutherland Avenue, a street in London dubbed 'Electric Avenue'.

Climate change and wildlife

Finally, for young people interested in how wildlife is being affected by climate change, Siemens has co-created *Siemens and The Wildlife Trusts*. This resource pack explores the connection between changes to the UK's ecosystems related to carbon dioxide, water usage and urbanisation.

Siemens & the Wildlife Trusts can be accessed here:

<https://new.siemens.com/uk/en/company/education/teachers/key-stage-3.html#TheWildlifeTrustsLessonPlans>



Apprenticeships

STEM careers can be approached at a range of different levels. Siemens offer a range of high-quality apprenticeships; these can be a great way into a rewarding career. They have an established apprenticeship scheme helping to support the industry of tomorrow. Find out more about the opportunities available at: <https://new.siemens.com/uk/en/company/jobs/search-careers/apprenticeships.html>