

Promoting engineering and technology careers through environmental sustainability

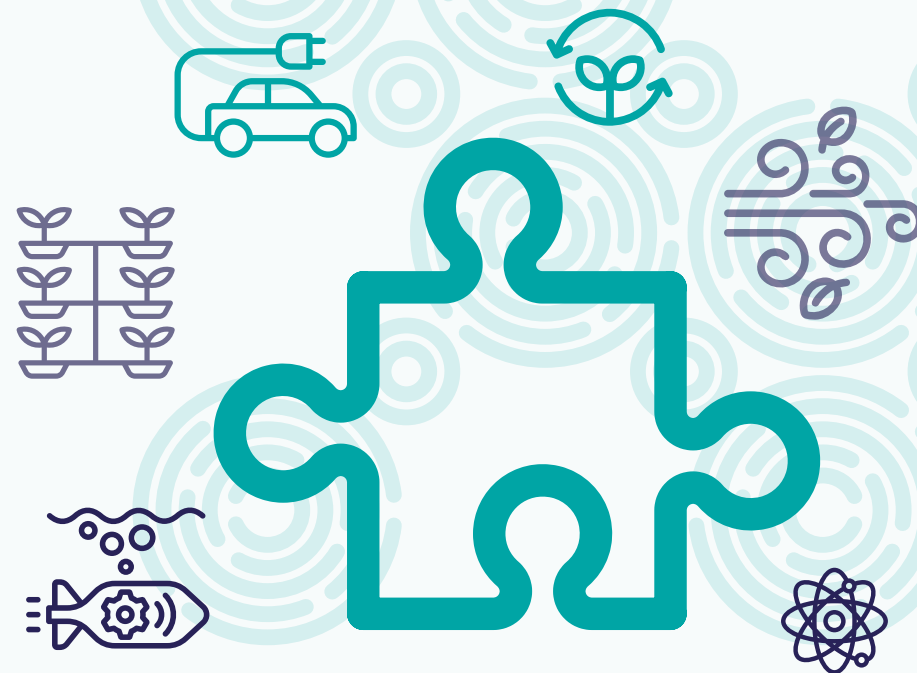
A guide for content developers

The demand for engineering skills is growing rapidly across all industries, especially as we work towards a net zero future. It's estimated that up to 725,000 new jobs will be needed by 2030 to support this transition.¹

However, we know that employers in the engineering and technology sector are already reporting skills shortages and recruitment difficulties. Additionally, there is underrepresentation of certain groups in the workforce, particularly women. The challenge that the engineering and technology sector faces is to recruit more people, and crucially, increase diversity in the sector. One solution is to encourage and support more young people to consider a career in engineering and technology. However, interest in science has declined, and only 16% of girls think engineering is suitable for them.²

We know that young people show a strong interest in environmental matters, especially climate change. Girls demonstrate greater interest in the environment than boys³, and this interest remains high throughout secondary school. This presents an exciting opportunity to channel girls' enthusiasm towards a future in engineering and tech. Engineers, technicians, and technologists play an important role in creating solutions to environmental problems.

Inspiring young people with green careers also supports the DfE's Sustainability and Climate Change strategy (2022), emphasising action in climate education and green skills and careers.



This guide explores how engagement activities can use environmental issues to inspire and motivate young people into engineering and tech career pathways when designing and delivering careers education activities and experiences. Learn more about how to showcase green careers, and the opportunities available in the engineering and tech sector.



EngineeringUK
INSPIRING FUTURES TOGETHER

¹ A Net Zero workforce (Climate Change Committee, May 2023)

² Science Education Tracker 2023 (Verian, The Royal Society, EngineeringUK, April 2024 – Fig 12.4)

³ Science Education Tracker 2023 (Verian, The Royal Society, EngineeringUK, April 2024 – Fig. 13.1)

Promoting engineering and technology careers through environmental sustainability

1

Link to curriculum



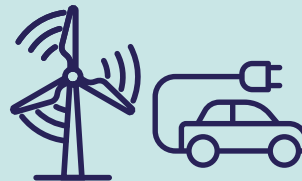
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Identify environmental problem(s)



3

Identify engineering solutions (plus behaviour change)



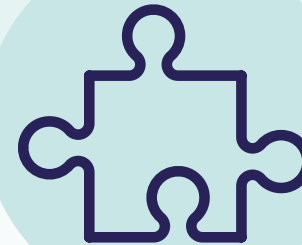
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Highlight engineering careers



5

Skills for the future



Our model outlines the 5-point approach we recommend to promote engineering and technology careers through an environmental sustainability lens

Link to the curriculum

When designing content, linking environmental sustainability to the school curriculum allows teachers to include it in their school day. It also makes the issues relevant and understandable for young people.

Solutions to environmental issues, such as climate change and biodiversity loss, don't feature explicitly in the current curriculum. However, there are still opportunities to make connections. In England, links can be made in KS3 and KS4 geography, science and D&T. The Scottish curriculum offers links in sciences, social studies and technologies at 2nd, 3rd and 4th Level. Wales and Northern Ireland's curricula also offer opportunities to make relevant links. [See Appendix 1 for more detailed information for your region.](#)

Environmental themes can also be used across other subjects, such as English (e.g. debates on use of climate-related language), history (e.g. of energy use), economics (e.g. carbon pricing) and computer science (e.g. tracking of biodiversity).

Additionally, all environmental issues align with the United Nations Sustainable Development Goals (UN SDGs), which some schools may already be incorporating into their curriculum.

Extra-curricular activities outside the classroom (e.g. an after-school activity) can be more flexible, and do not need to be linked to the curriculum.

Schools are likely to take an increasing interest in environmental sustainability topics. The DfE's Sustainability and Climate Change strategy⁴ requires all educational settings in England to have a Climate Action Plan by 2025. These plans will need to address climate education, as well as connections to green skills and future careers.



Identify the environmental problem(s) to be addressed

When planning engagement activities, it's important to showcase environmental issues that resonate with young people. Research suggests that girls and boys can engage with environmental issues differently. Girls tend to show more interest and are more consistent in their engagement with climate change topics throughout school.

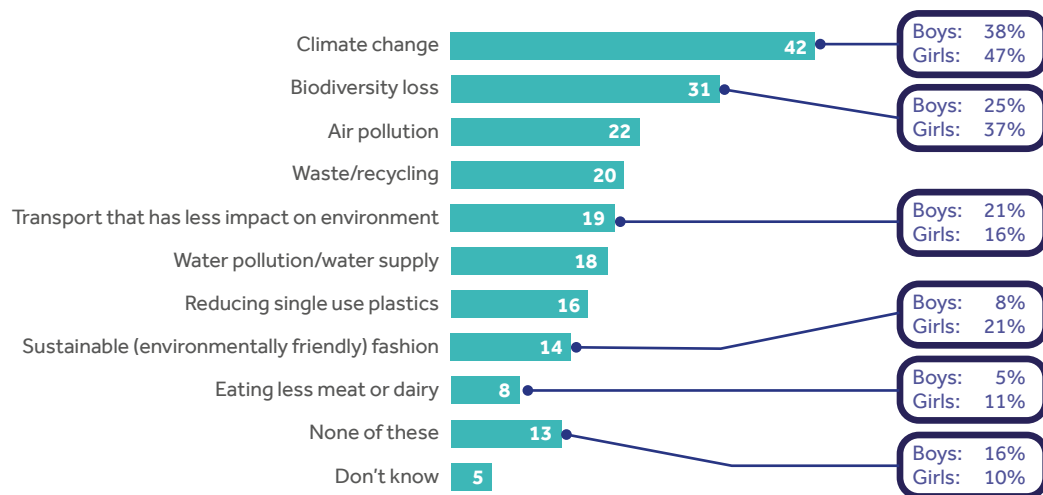
When it comes to choosing a career in tackling climate change, there appears to be no difference between the interest of boys and girls (35% of students). You can also consider topics that align with young people's experiences and local contexts. For instance, research indicates that students in rural areas of England are particularly interested in biodiversity, while those in London show above-average interest in air pollution.

Interestingly, boys are more likely than girls to be motivated by pay, while girls are more likely to be incentivised by a desire to help people or society.⁵

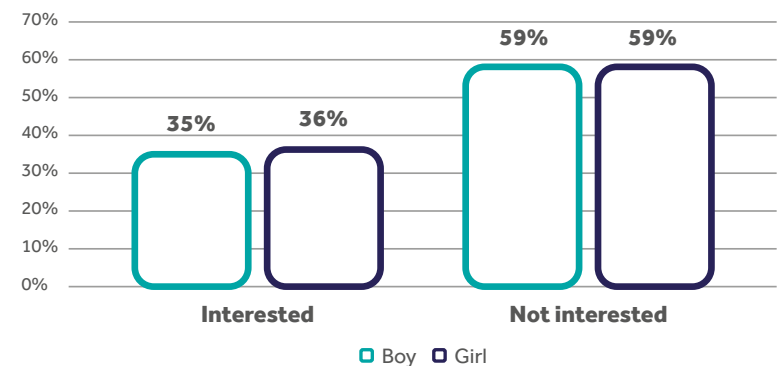


Figure 13:1 Level of interest in topics related to the environment among year 7 to 13 students by gender (2023)

% of all year 7 to 13s interested in topics related to the environment



How interested are you in a future career that will help to reduce the impact of climate change?



Identify the engineering and technology solutions

In the content, it's important to explain what engineers and technicians do, as many students may not know.

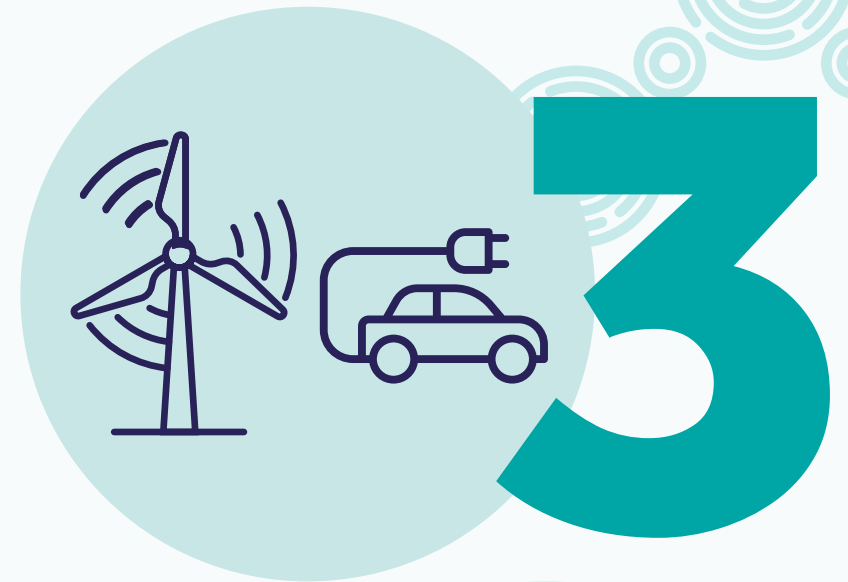
To explain, you can showcase the real-life impact that engineering and technology careers will have in addressing sustainability challenges. Reaching net zero by 2050 means that lots of sectors need to innovate and change. This transition relies on both expanding existing engineering solutions and introducing new technologies. For example, wind power will need to become more efficient, and we may adopt new innovations such as sustainable aviation fuel and direct air capture of carbon dioxide.

There's lots of options you could showcase – we recommend focusing on a familiar topic (e.g. wind farms or electric vehicles) alongside a less common but exciting subject (e.g. vertical farming). Inspiring examples of solutions can be motivating for students to find out more about engineering and technology, as well as helping address eco anxiety. **See Appendix 2 for more examples of engineering and technology solutions to sustainability problems.**

Behavioural changes, such as reducing meat and dairy consumption, will also play an important part in reducing our impact. These behavioural aspects deserve emphasis alongside technological innovations.

▶ **Engaging classroom resources can support your outreach. Our team has developed exciting and inspiring posters and postcards centered around environmental themes, spanning topics from food to transportation. The resources are linked to many of the UN Sustainable Development Goals and are excellent conversation starters for classroom discussions.**

**You can download or order them free of charge on Neon:
www.neonfutures.org.uk/resources**



Highlight careers linked to engineering and technology solutions

From the ages of 11 to 14, young people will start to consider their skills and interests, and their future career paths.

There are lots of different pathways into engineering and technology careers, e.g. T Levels, apprenticeships, degree apprenticeships and university degrees. It's important to showcase the diversity of routes in your activity, which will support Gatsby Benchmark 7, 'Addressing the needs of each pupil'.

By linking environmental solutions to the curriculum and future careers, you will also support schools to meet Gatsby Benchmark 4 'Linking curriculum learning to careers'.

There's a role in engineering for everyone – don't forget to include information about growth industries, salaries, what engineers do, current workforce diversity and ethics.

- **Around 20% of all UK jobs are in engineering**
- **Engineering and technology jobs are predicted to grow in all UK regions between now and 2030 – faster than other occupations**
- **For specialist roles and experienced Chartered Engineers, salaries can exceed £80,000⁶**
- **Advertised salaries in engineering (£38,600) are almost 30% higher than the national average of all occupations (£30,000)⁷**

⁶ www.checkasalary.co.uk

⁷ Engineering skills needs – now and into the future (EngineeringUK, Lightcast, p.28)



Outreach activities should include diverse examples of role models: real, relatable young people in green engineering and technology from both academic and technical pathways. Short videos (under 90 seconds long) keep students engaged and excited.

A diverse range of young, real engineers can be found on:

- ▶ www.eukeducation.org.uk/resources/real-jobs
- ▶ www.thisisengineering.org.uk



Share Neon resources with teachers to help make the link to engineering careers. Get information on future skills needs, different routes into engineering and more. The resources are perfect to share with parents/carers at options evenings, careers events and with students considering their future careers.

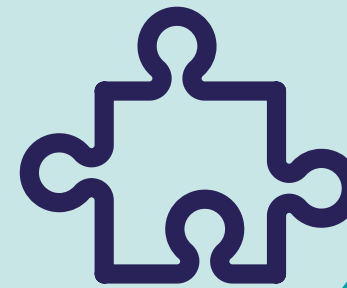
- ▶ www.neonfutures.org.uk/future-skills

Skills for the future

Engineers and technicians use their skills to improve the design and performance of everything we use today – and to develop the products and technologies of the future. Future engineers will need to be able to handle complex information, embrace change and be inclusive and ethical.

Engineering skills are highly transferable and will always be in demand. Created from research led by the Royal Academy of Engineering⁸, we showcase 8 skills on Neon careers resources to help young people understand sought after skills in engineering and technology. Outreach content should be designed to ensure young people develop these skills, whilst celebrating the skills that they already have.

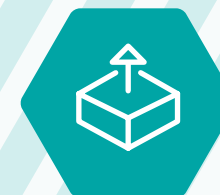
Outreach activities could encourage students to identify the skills needed for specific green careers and reflect on when they have used these skills in the past. Research shows that enjoying practical work was the top reason for feeling encouraged to learn science, so offering hands-on experiences will also help engagement.⁹



Creativity



Teamwork



Open mindedness



Social conscience



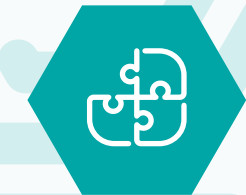
Communication



Determination



Innovation



Problem finding and solving

⁸ Thinking like an engineer: Implications for the education system (RAEng May 2014)

⁹ Science Education Tracker 2023 (Verian, The Royal Society, EngineeringUK, April 2024)

Helpful tips

When designing careers education activities and experiences, there are a few things to think about. Read our checklist to support you further, and consider the following suggestions when discussing green engineering and technology careers with students:

- **Make it fun:** research found that students recognise the value of learning about climate change and sustainability, but they don't necessarily enjoy it
- **Diverse careers:** many sectors in the UK need to improve to help meet net zero (e.g. agriculture, housing, aviation, waste and recycling), so there are plenty of sectors to work in
- **Engineering is international:** lots of countries face similar environmental issues to the UK. Careers in engineering and technology can be international, and people with these skills and experience will be in demand
- **Language:** take care with your words. Choose commonly understood terms – flying instead of aviation, and farming instead of agriculture
- **Relevance:** include examples that resonate with the experiences of young people. Account for a variety of interests, life experiences and local geographies, whilst using inclusive messaging
- **Shared responsibility:** avoid suggesting or implying that the world's environmental problems are down to the students' generation to solve

- **Precision:** replace vague terms like “more sustainable” (often used when “less damaging to the environment” would be more accurate) with specific descriptions. Remember that sustainability is binary – either a process is sustainable, or it isn't
- **Independent verification:** if you can, get independent validation for engagement materials, for example by the Royal Meteorological Society



▶ Get further support with resources available on EngineeringUK:

- Discover the **Environmental Sustainability: Classroom Content Maturity Checklist**
- Read the **Getting the Message Across** guide to get more general support when you're developing or delivering engineering outreach activities



Appendix 1: Link to the curriculum

England

	Key Stage 3 (Age 11 to 14, year 7, 8, 9)	Key Stage 4/GCSE (Age 14 to 16, year 10, 11)
Biology	<ul style="list-style-type: none"> • Changes in the environment, adaptation and extinction • Importance of maintaining biodiversity 	<ul style="list-style-type: none"> • Importance of biodiversity, positive and negative human interactions with ecosystems
Chemistry	<ul style="list-style-type: none"> • Earth as a source of limited resources and the efficacy of recycling • Production of carbon dioxide by human activity and the impact on climate 	<ul style="list-style-type: none"> • Evidence for additional anthropogenic causes of climate change • Potential effects of, and mitigation of, increased levels of carbon dioxide and methane on the Earth's atmosphere • Common atmospheric pollutants: sulphur dioxide, nitrogen oxides, particulates • Water resources, obtaining potable water
Physics	<ul style="list-style-type: none"> • Fuels and energy resources 	<ul style="list-style-type: none"> • Renewable and non-renewable energy sources, and changes in how these are used
Geography	<ul style="list-style-type: none"> • Weather and climate, change in climate from the Ice Age • The use of natural resources • How humans change the climate 	<ul style="list-style-type: none"> • Causes, consequences of, and responses to, extreme weather conditions • Characteristics of climatic change, evidence for different causes • Global ecosystems, biodiversity and sustainable use and management
Design & Technology	<ul style="list-style-type: none"> • Investigate new and emerging technologies • Understand developments in D&T, its impact on individuals, society and the environment... 	<ul style="list-style-type: none"> • Be aware of... environmental and economic factors • The impact of new and emerging technologies on... sustainability... and the environment • Selection of materials influenced by factors such as environmental

Source: National curriculum in England, DfE

Appendix 1:

Link to the curriculum

Wales

	Progression step 2	Progression step 3	Progression step 4
Science & Technology	<ul style="list-style-type: none"> Identify things in the environment which may be harmful Investigate different forms of energy 	<ul style="list-style-type: none"> Consider how my design proposals will solve problems and how this may affect the environment Take into account the impact my making may have on the environment 	<ul style="list-style-type: none"> Adopt an iterative process to improve my design proposals, while minimising their negative impact on the environment and society Evaluate and apply responsible habits of working which consider environmental and societal impacts
Humanities	<ul style="list-style-type: none"> Describe how people and the natural world may impact on each other Appreciate and care for living things and my own environment Take care of resources and not waste them, and I am conscious of the importance of creating a sustainable future 	<ul style="list-style-type: none"> Describe and give simple explanations about the impact of human actions on the natural world in the past and present Understand the consequences of my actions and the actions of others, and how these affect local, national and global issues 	<ul style="list-style-type: none"> Explain the connections between past, present and anticipated challenges and opportunities faced by people in my locality and in Wales, as well as in the wider world Understanding of my own and others' environmental, economic and social responsibilities in creating a sustainable future

Source: Curriculum for Wales Curriculum – Hwb (gov.wales) (accessed 2024)

Appendix 1: Link to the curriculum

Scotland

	2nd Level	3rd Level	4th Level
Sciences	<ul style="list-style-type: none"> • Identify energy source, how it is transferred and ways of reducing wasted energy • Exploring non-renewable energy sources • How lifestyles can impact on the environment and Earth's resources 	<ul style="list-style-type: none"> • Renewable energy sources • Processes which contribute to climate change 	<ul style="list-style-type: none"> • Risks and benefits of different energy sources • Use of fossil fuels; responsible use and conservation of finite resources • Exploring the carbon cycle
Social Studies		<ul style="list-style-type: none"> • Identify the possible consequences of an environmental issue and make informed suggestions about ways to manage the impact 	<ul style="list-style-type: none"> • Discuss the sustainability of key natural resources and analyse the possible implications for human activity • The role of agriculture in the production of food and raw material, draw reasoned conclusions about the environmental impacts and sustainability • Assess impact of transport infrastructure in a selected area and contribute to a discussion on development of sustainable systems
Technologies	<ul style="list-style-type: none"> • Analyse how lifestyles can impact on the environment and Earth's resources, suggest how to live in a more sustainable way • How individuals and organisations may use technologies to support sustainability and reduce the impact on our environment 		<ul style="list-style-type: none"> • Analyse products taking into consideration sustainability • Consider the material performance as well as sustainability of materials

Source: Curriculum for Excellence, Education Scotland (accessed 2024)

Appendix 1:

Link to the curriculum

Northern Ireland

	Knowledge, Understanding & Skills	Objective 1	Objective 2	Objective 3
Environment & Society	<ul style="list-style-type: none"> The need for social, economic and environmental change to be sustainable 	<ul style="list-style-type: none"> Investigate factors that impact on personal health locally, e.g. pollution 	<ul style="list-style-type: none"> Research and debate ethical issues in geography, e.g. nuclear power, use of non-renewable resources 	<ul style="list-style-type: none"> Evaluate the environmental impact of... the industrial revolution Investigate the conflict between social, economic and environmental needs, e.g. climate change
Science & Technology	<ul style="list-style-type: none"> The environment and human influences 			<ul style="list-style-type: none"> Identify how skills... will be useful to a wide range of careers Investigate the effects of pollution Explore the importance of biodiversity Pursue design solutions using environmentally friendly materials and energy sources

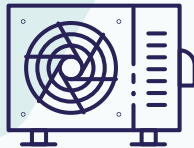
Source: The Statutory Curriculum at Key Stage 3 (CCEA 2007)

Appendix 2: Engineering and technology solutions



Built environment

- Retrofit
- Timber design
- Climate adaptation



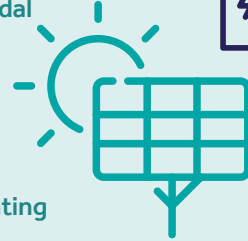
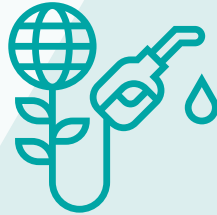
Agriculture

- Farming, incl. vertical
- Methane reduction
- Meat alternatives
- Reduced food waste



Energy and power

- Wind power
- Solar
- Wave and tidal
- Hydro
- Nuclear
- Biofuels
- Hydrogen
- District heating
- Energy storage
- Grid infrastructure
- Carbon capture and storage

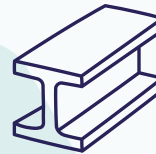


Transportation

- Electric vehicles, charging networks
- Rail electrification
- Electric planes, sustainable aviation fuel
- Electric shipping and ports, alternative fuels
- Increased cycling and walking (town planning)



Climate change



Industry

- Low-carbon steel
- Low-carbon concrete
- Energy efficient products
- Circular economy

CO2 removal and modelling

- Bioenergy with CCS
- Direct Air Capture
- Climate change modelling



Appendix 2: Engineering and technology solutions



Biodiversity loss

- Satellite monitoring
- Autonomous underwater vehicles
- Camera traps
- Drone tracking
- Green walls and roofs



Air quality

- Electric vehicles, incl. charging networks
- Rail electrification
- Fossil-free aircraft
- Active travel



Waste management

- Plastic alternatives
- Recycling
- Design for repair
- Food waste reduction and processing
- Energy from waste

