Integrating climate change into the curriculum:

How can individuals help tackle climate change?

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Intended learning outcomes

By the end of this session you will be able to:

- develop activities that engage your students in investigating and communicating local climate issues and solutions
- develop your teaching practice and use of climate change as a context for curriculum learning

Outline for the session

- Context and introduction
- Developing engaging activities
- Linking skills and application into lessons
- Critique pre-made lessons
- Develop your own activity
- Additional resources

Starter

Order the CO_2 savings from largest to smallest.

Challenge - How much of a reduction of CO_2 (tonnes per year) would each of these activities achieve if renewables were used?

1. heating in homes
2. low carbon electricity for houses
3. transportation
4. using smart lighting systems/appliances
5. proper waste management

These savings can reduce CO_2 emissions anywhere between 0.25-2.0 tonnes per year

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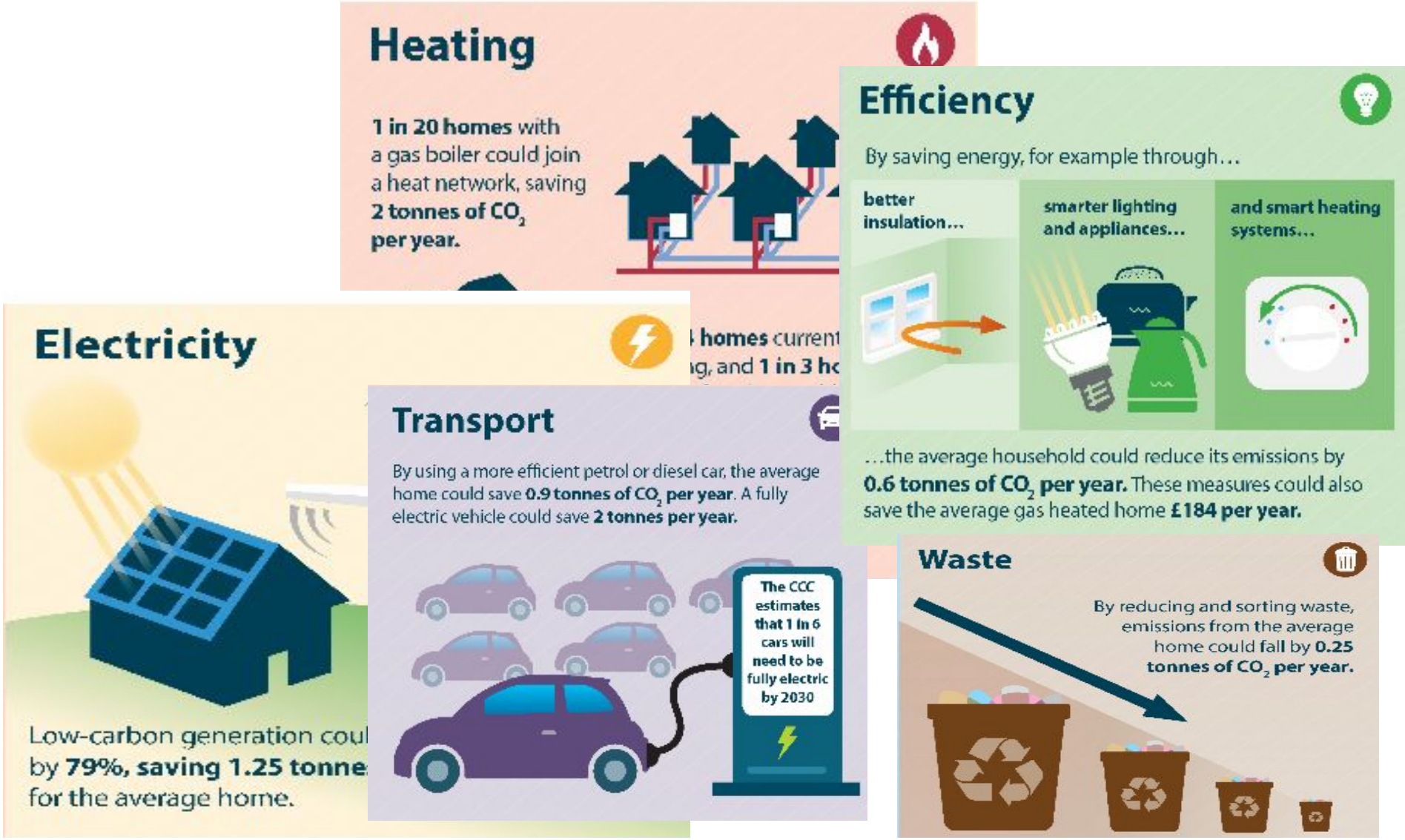
Fifth Carbon Budget - Infographic - Climate Change Committee (theccc.org.uk)



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[Fifth Carbon Budget - Infographic - Climate Change Committee (theccc.org.uk)]

Why is Climate Change so relevant?

If only 16% of students in high and middle income countries were to receive climate change education, we could see nearly a 19 gigaton reduction of CO_2 by 2050

Just 4% of students feel they know a lot about climate change, and 57% of students want to learn more.

54% of students surveyed saw climate breakdown as the 2nd biggest threat to the UK (after the quality of the NHS)

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Source: Centre for Universal Education, 2021

Why is Climate Change so relevant?

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Developing engaging activities

Benefits of ‘engaging activities’

- good behaviour
- emotional engagement
- cognitive engagement

Edutopia, Nicolas Pino-James, 2015

What are the main factors to consider in designing activities to help increase student engagement behaviourally, emotionally and cognitively?

Developing engaging activities

- make it meaningful
  - connect with students' previous knowledge, highlight the value of the activity
- foster a sense of competence
  - accessible to all, include feedback to help students make progress
- develop a sense of ownership
  - value students' opinions
- embrace collaborative learning
- establish positive teacher-student relationships
- promote mastery orientations

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Edutopia, Nicolas Pino-James, 2015.
https://www.edutopia.org/blog/golden-rules-for-engaging-students-nicolas-pino-james

What do we want students to take away?

Significant ideas

- there is a range of different energy sources available to societies that vary in their sustainability, availability, cost and socio-political implications

- the choice of energy source is controversial and complex. Energy security is an important factor in making energy choices

What do we want students to take away?

Applications and skills

- **Evaluate** different CO_2 saving choices (Maths & IT skills)
- **Discuss** the factors that affect the choice of CO_2 savings to different societies (valuing diversity & difference, communication and interpersonal skills)
- **Develop** solutions (problem solving skills, negotiation skills)

Teaching ideas - student investigations

The following slides have a series of ideas on how you can incorporate student investigations into lessons.

They are designed to give students the opportunity to evaluate evidence, develop research skills and increase curiosity.

Can you suggest any other activities?

Exemplar activities

These links are examples of activities to be used with secondary age pupils. When looking at them, consider;

Are they engaging, do they challenge students perceptions? How can they be improved or tweaked?

https://www.wwf.org.uk/get-involved/schools/school-campaigns/shaping-our-future

https://www.rgs.org/schools/teaching-resources/climate-4-classrooms/

https://www.solarforschools.co.uk/

https://er.jsc.nasa.gov/seh/160491main_SESETeachersGuide_dc4[1].pdf

https://education.theiet.org/secondary/teaching-resources/saving-the-planet-one-journey-at-a-time/

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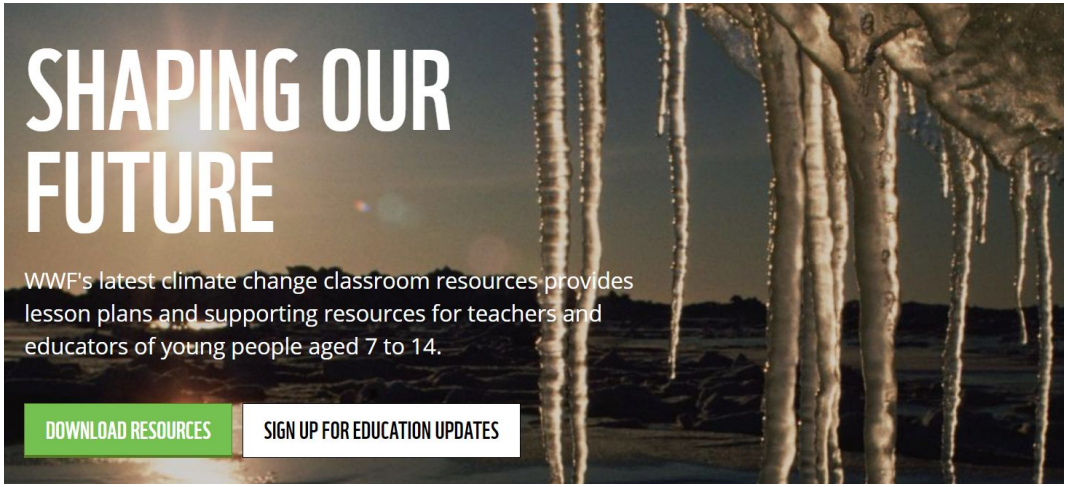
Shaping our Future: The Climate Challenge (WWF)

3 lessons (stand alone or in a series)

PDF presentation, group activities, worksheets & handouts



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https://www.wwf.org.uk/get-involved/schools/school-campaigns/shaping-our-future (WWF)

Royal Geographical Society: Climate4Classrooms

12 modules with teacher notes & student activities (PDF and editable .doc)

Resources include:

- data sets showing the latest global and national climate predictions
- climate science brought to life by the experts
- case studies investigating global, national and local impacts and solutions
- guidance for teachers on using the resources

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https://www.rgs.org/schools/teaching-resources/climate-4-classrooms/ (Royal Geographical Society)

Investigating solar panels

Investigate the impact of installing solar panels at school. Could lead to a real impact (with permission!) - www.solarforschools.co.uk

Series of lessons on solar panels

https://er.jsc.nasa.gov/seh/160491main_SESETeachersGuide_dc4[1].pdf

Solar cells investigation

https://www.tes.com/teaching-resource/solar-cells-investigation-6315993

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Teaching ideas - saving the planet one journey at a time

The IET have developed a maths-based challenge to calculate journey times and carbon footprint of different methods of travel.

This could also be used as a one-off main lesson activity to use maths skills in context, or as part of a scheme of work on sustainability, to build knowledge and understanding of climate change and ways of reducing it.

Exemplar - Plastic fantastic?

Paper or Plastic: Which Is Really The Best For The Environment?

Introduction - https://www.cheaperwaste.co.uk/blog/paper-or-plastic-which-is-really-the-best-for-the-environment/

Resources -

https://www.wired.com/2016/06/banning-plastic-bags-great-world-right-not-fast/

https://www.ecopackagingsolutions.co.uk/post/are-paper-bags-better-than-plastic-bags

https://www.onegreenplanet.org/animalsandnature/whats-so-bad-about-plastic-bags/

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Simple practical ideas

- Broken thermometers (ones that read too high or low).
- Put the broken ones into tubes labelled CO_2 (if too high) or air (if too low) and regular ones vice versa.
- This lets students take a reading and compare CO_2 with air.
- Can also be done properly by sealing CO_2 in tubes and leaving overnight on a windowsill if time allows.

Other greenhouse gases

Properties of Carbon Dioxide

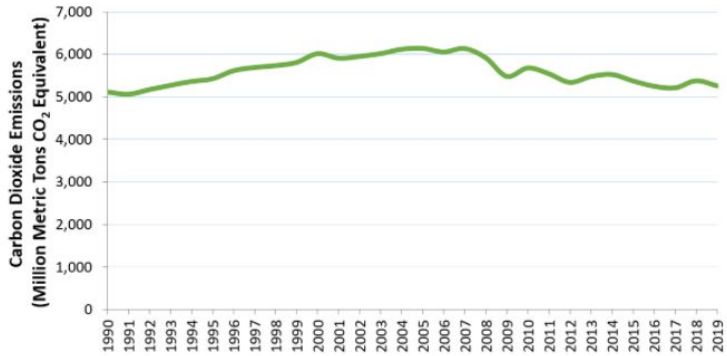
Chemical Formula: CO_2
Lifetime in Atmosphere:
See below[1]
Global Warming Potential (100-year): 1

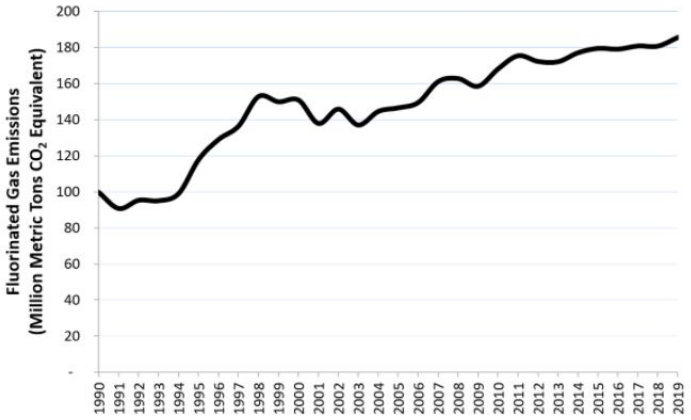
https://www.epa.gov/ghgemissions/overview-greenhouse-gases#CO2-references

Using the data supplied, which greenhouse gas has the greater impact?

A good activity for older groups and can link in a lot of maths.

Link to carbon cycle, can be removed by numerous processes, some quick (oceans), some take thousands of years (rock cycle)





Properties of F-gases

Chemical Formulas:
HFCs, PFCs, NF_3, SF_6
Lifetime in Atmosphere:
HFCs: up to 270 years
PFCs: 2,600–50,000 years
NF_3: 740 years
SF_6: 3,200 years
Global Warming Potential (100-year):[1]
HFCs: up to 14,800
PFCs: up to 12,200
NF_3: 17,200
SF_6: 22,800

Methane

Related to the previous slide, a potent Greenhouse gas.

Produced from landfill so can be tied into the importance of recycling where possible to reduce landfill size.

Also produced during agriculture, rice farming and cattle farming produce the most, can be linked to changing food habits. It's not just the carbon footprint of our diet we should consider.

Developing an activity

Using the key points from today, consider an activity that you might develop

What CO_2 saving intervention was most interesting? *Do you want to develop your activity around this?*

Ensure you consider the six factors for engaging activities

Can you build in any links to STEM careers?

Curriculum Intent

Climate change is part of student's community awareness on the national and international level.

It should be identified as an area where your subject is raising community awareness/participation in your curriculum plans

Local links

- https://portofblyth.co.uk/ UK's biggest offshore renewable hub. We base some resources around this to give a local hook

- Formica – Local manufacturer, likely was involved in the manufacture of your lab benches. Again we try to link CO_2 emissions in manufacture and distribution to this local example.

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Upcoming event

North Tyneside Learning Trust is excited to be launching our climate programme, focusing on educating young people about the importance of caring for our planet, and the wealth of career opportunities available in this growing sector.

The first phase of this climate programme will run from spring term 2022 until the end of the autumn term 2022. At the heart of this phase, are two principles:

- To provide opportunities for young people to develop their voice about important issues and to educate others.
- To connect young people with the range of North East companies working in this sector as well as raising the aspirations of young people.

We would like to invite you to the launch of the NTLT Climate Strategy on the 14th February, 4pm-5pm. This online session will give you an opportunity to hear in greater detail about the opportunities available to your school and to understand how you can become involved.

You can register for this session here

https://ntlearningtrust.us4.list-manage.com/track/click?u=3cf190efa09a952e07a731d40&id=17f9e53dbc&e=272b13d769

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