UKCEH at the Edinburgh Climate Festival 14th Aug 2021 Leith Links, Edinburgh

UK-SCAPE
UK Status, Change and Projections of the Environment

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August 2021

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Summary

In total over 200 people engaged with the UKCEH Team between noon and 6 pm on the 14th Aug 2021 at the Edinburgh Climate Festival.

The stand fulfilled its aim to raise awareness of publicly funded research conducted at UKCEH Edinburgh, including the national capability project UK-SCAPE, as evidenced by the number of people attracted into the stand, the remarks made in conversations with the team members and written in the answers to the poster quiz.

Three activities were offered to target different age groups:

- Carbon Game – target children- duration typically 2-4 min, estimated 100 children and adults participated
- Intergenerational trend in CO_2 concentration – target all age ranges – duration typically 1 to 5 min, estimated 80 children and adults participated
- Poster quiz – target adults - duration typically 5-20 min, 42 primarily adults participated.

A wide range of conversations were noted by the UKCEH team members primarily focused

- on the role of carbon in the environment and link to climate change,
- the steep rise in CO_2 concentration in the lifetime of the people present
- the range of science conducted at a local institution
- the variety of options that people could make to their life choices that could improve the environment
- routes for a career in STEM subjects

1 Introduction

The Edinburgh Climate Festival is a free, family-friendly event aimed at inspiring and celebrating climate action and sustainability through community involvement.

In 2019, UKCEH contributed to the Edinburgh Climate Festival at the Meadows, Edinburgh, which attracted in the region of 6000 visitors *(more see info http://www.elrec.org.uk/wp-content/uploads/2020/06/ECF-2019-Report.pdf).* It was decided to join again in 2021. The event was held on Leith Links, near Leith Community Croft, 4 Links Garden on Saturday 14 August 2021 12:00-19:00.

The event plan written prior to attendance followed the NERC Impact Development framework which focuses on five aspects i.e. why, who, how, with what impact, with what evidence. The answers to these questions are detailed below.

1.1 Why engage

What difference are we trying to make? *Raise awareness of publicly funded research conducted at UKCEH, Edinburgh including the National Capability project UK-SCAPE.*

1.2 Who are we targeting?

Who are we trying to engage with UKCEH and UK-SCAPE research? *A wide range of 'publics' who attend The Edinburgh Climate Festival.*

1.3 How to engage

What methods will we use to engage people with UK-SCAPE research and when?

We are targeting attendees at The Edinburgh Climate Festival, 14 August 2021, Leith Links, Edinburgh, UK, because they reresent a relatively diverse audience attending a local event relevant to UKCEH science. In 2019 the UKCEH tent attracted families, students and ecologically engaged citizens.

Means of interacting

Three activities planned

- *Carbon Game (Appendix 1)*
- *Intergenerational trend in CO_2 concentration (Appendix 2)*
- *Poster quiz (appendix 3)*

How will we maximise involvement with the event?

- *Tweet about the forthcoming event (UKCEH Comms team tweeted twice before the event, on the day of the event, and again on the following Monday*
- *Write a blog post after the event for UKCEH and UK-SCAPE web site (see here)*
- *By taking a stand UKCEH and UK-SCAPE will have a physical presence and appear in the delegate information pack*
- *Attract visitors by having clear signage and a visually appealing exhibit.*
- *People engaging in longer 'significant' exchanges, e.g. complete the poster quiz, will be offered a 'free gift', which will be branded and thus offer further 'advertising'.*

1.4 With what impact

What do we hope will change as a result?

Increased number of people aware of UKCEH and UK-SCAPE science

1.5 With what evidence

How can I evidence that change?

5.1 Number of people entering stand/booth (count button badges)

5.2 Number of people who start the quiz (given pencil) and those who complete (number of submitted quiz papers)

5.3 Number of people who take part in the carbon game

5.4 Number of people who add dot on the 'What was the CO_2 concentration of the Earth when you were born?' poster

5.4 Number of people who have significant engagement counted as those receiving 'branded gift' e.g. CEH pencil

5.5 We will keep a UKCEH/ UK-SCAPE notebook and encourage all UKCEH team members to write down interesting or funny comments or interactions in the project notebook as a means of capturing feedback.

5.6 A subset of 'visits' will be timed to gauge the duration of interactions (quiz, intergenerational CO2 trend and carbon game).

2 At the event

The event planner was mostly followed. However, it was not possible to calculate the total number of people taking part in each of the three activities as it was decided on the day to place only one Button sticker (Fig 1.) on a participant if they interacted with any of the activities rather than use three Button stickers if they took part in all three activities. Many groups took part in more than one activity. However, as the UKCEH team members were primarily in charge of one of the activities the total number of badged distributed by each team member was used to estimate the number of people engaged in each activity. Also, the number of people starting the Poster quiz compared with those completing was not noted because pencils were also given to children of adults who completed the quiz.

Figure 1. Button stickers (UK-SCAPE logo) given to anyone engaging in one the activities or a conversation with UKCEH Team members.

UKCEH team members took a strip of 10 button badges and recorded each strip of ten they took in the 'Team notebook'.

UKCEH team members gave approx. 200 Button badges at the event

Surprisingly adults liked them just as much as the children did.

2.1 Carbon Game

As in previous events, the carbon game was well received especially by children who enjoyed the activity of rolling the dice and moving around the game (Fig 2). The full instructions to the game are provided in Appendix 1. A surprising number of adults also played the game. The length of time people played the game depended on a range of factors but in general young children played for 2-4 min., while adults played for 2-6 min. Several teachers were very interested in the game as a class activity and studied the game for longer taking pictures of the various cards.

There was no attempt to evaluate the uptake of the science involved in the game although comments by participants indicated that learning was taking place. For example, an elderly lady commented *I did not know that plants also give out CO_2 in the night like us;* while a parent of a small child commented *so, the same carbon molecule can move around into and out of plants and animals for a long time*.

One person noted, *I keep going back around in a cycle between the atmosphere and the ocean,* showing they had understood the cyclical nature of carbon movement.

A few participants asked if the various pathways were realistic which enabled UKCEH team members to explain in more detail the science conducted by UKCEH staff and their contribution to the understanding of the carbon cycle and its influence on the climate.

Figure 2. Children and adults playing the carbon game, at the Edinburgh Climate Festival, Leith Links, 14th Aug 2021

2.2 Intergenerational trend in CO_2 concentration

This game proved very useful to engage passing public as it was possible to show them the activity on an A4 sheet and then invite them into the tent (see Appendix 2 for details of the activity). The sticky dots were too small to write the concentration of CO_2 so it is recommended that larger ‘dots’ are used in future (Fig 3) or potentially more useful a ‘log book’ of answers. Writing the concentration in a log book would reinforce the learning points of this activity.

It was not possible to determine the exact number of people playing the game as sometimes a family would each place a sticker on the graph to represent their birth year but then were also invited by the UKCEH team member to add a grandparent who was not present. Placing a dot on the grandparents' birth year and reading off the graph provided two useful learning points:

(i) to emphasise the slow increase between for example a grandmother and mother and the steeper increase between the mother and child present and (ii) provide another opportunity for a child to improve their graph reading skills (it was invariably the child to wanted to add additional sticky dots – they often did so for the parent year of birth).

In order to empathise the present day concentration, the UKCEH team member sometimes asked participants to place a dot on the birth year of a family pet (usually less than 5 years old).

In total 98 dots were placed on the graph and it is estimated that around 80 individual people took part in this activity (some childless adults placed a dot for the birth year of their pet). The duration of the interaction with the UKCEH team member varied between 1 and 5 min, although subsequent conversation could last a further 5-10 min.

Few participants were interested in the main sources of the greenhouse gasses (poster placed above the activity graph). Although one child of approx. 10 years of age noted that, the numbers did not equal 100% enabling the UKCEH Team member to discuss the emissions due to the F-gases.

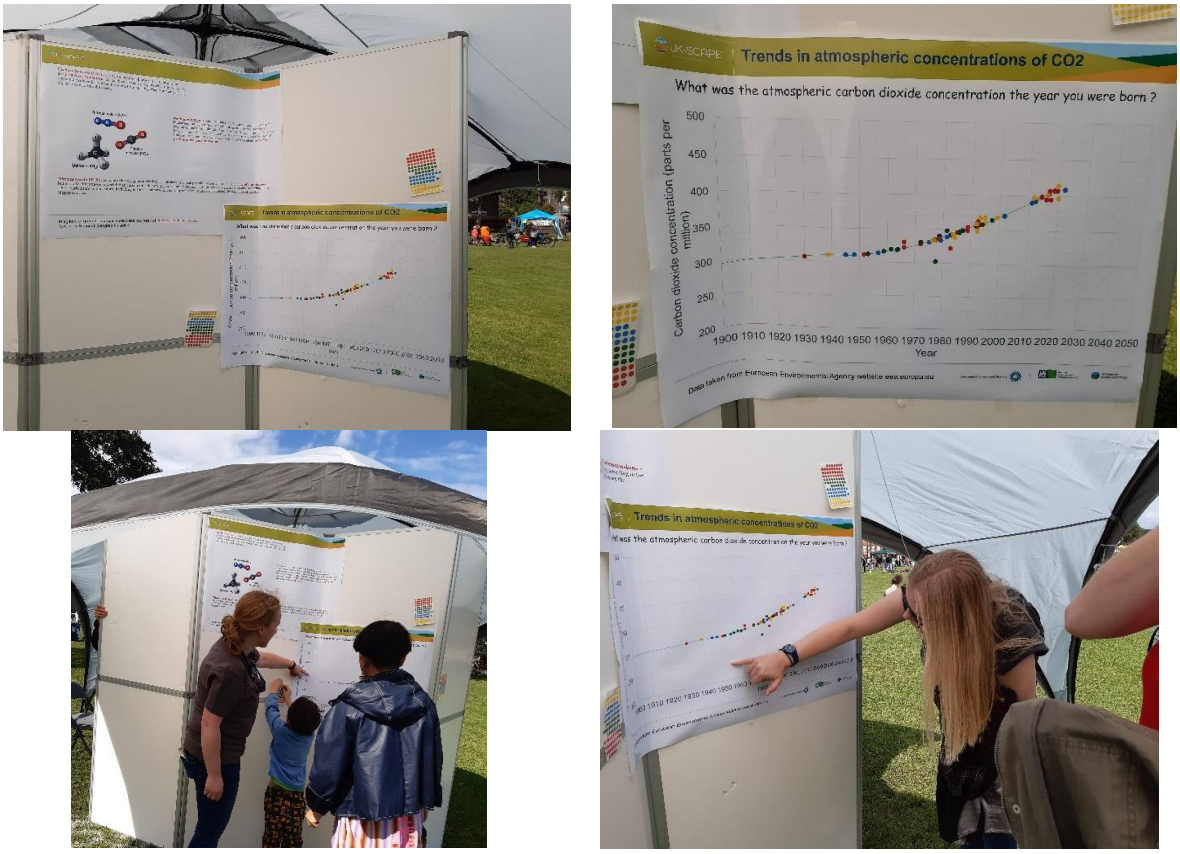


Figure 3. Adults and children playing the Intergenerational trend in CO2 concentration activity at the Edinburgh Climate Festival, Leith Links, 14th Aug 2021

2.3 Poster quiz

Six posters (Fig 4) were displayed in the tent covering a range of UKCEH science conducted in the Edinburgh station. The poster titles were:

- UK Environmental Change Network
- Bloomin' Algae and the changing climate
- COVID-19 Large reduction in central London CO_2 emissions
- Marked difference among sympatrically-breeding species in winter mixing
- Auchencorth Moss atmospheric monitoring site
- Whim Bog Long-term experimental site. Nitrogen effects on ecosystems

These posters were aimed at adults and a quiz (Appendix 3) was designed to encourage people to read the posters (one question per poster). The final two questions (Q7 & Q8) were posed to learn the participants' thoughts relating to what they learnt during their visit and what actions they may take in the future (Table 1).

Figure 4 Adults reading the posters and completing the Poster quiz at the Edinburgh Climate Festival, Leith Links, 14th Aug 2021

In total 42 people submitted quiz papers. As the afternoon advanced, UKCEH team members invited people to only complete questions 7 and 8 as a means of engaging in conversation.

This was a successful strategy and several of the people thus engaged read some of the posters and answered some of the questions. There was no obvious pattern in people preferentially reading specific posters or answering questions. 58% of the 24 papers correctly answered all 6 questions related to the posters while 17% answered 3 questions and remaining 6 responses answered 1,2 4 or 5 questions. Eighteen people answered only Q7 or Q8.

Table 1 Number of quiz papers returned answering either some or all the questions related to the posters (Q1-6) the participants learning points from the day (Q7) or future actions they would take to help safeguard the planet (Q8). See Appendix 3 for full questions and answers.

Questions	Number of papers submitted
Q1-Q6 related specifically to the six posters displayed	24
Q7. Tell us one thing you have learnt today at the Edinburgh Climate Festival.	23
Q8. Name one thing you are going to do to reduce your impact on the climate over the next year?	41
Total papers submitted	42

In total 23 responses were submitted for Q7: “Tell us one thing you have learnt today at the Edinburgh Climate Festival” (Table 2).

Just over half of the 23 responses highlighted learning from the posters or conversations with UKCEH members of staff and a further three specifically commented on learning about the institution of UKCEH (65% of all answers). The answers revealed learning points taken from all three activities (Table 2). A third commented that they had learnt about the diversity of groups and shared community goals present at the event.

Table 2 Number of responses per themes and example text of responses to Q7. Tell us one thing you have learnt today at the Edinburgh Climate Festival.

Theme	Example text on theme	Number & % of responses
Knowledge gained from the posters or activities or conversations with staff	• *The impact of carbon / algal bloom;* • *How people measure the atmosphere;* • *CO_2 emission reduced in London by 60% over lockdown;* • *reduced activity in 2020 had negligible impact on atmospheric level of CO_2;* • *I didn't know anything about ECN, so it is good to learn about things they do* • *Peat bogs are fascinating!*	12 (52%)

	• *Fossil fuels - carbon dioxide takes thousands of years to break down, methane 12* • *carbon cycles*	
General feeling of community and shared goals related to combating climate emergency	• *Edinburgh is a good example for most countries;* • *faith in community restored;* • *so many groups working for change;* • *The diversity and creativity of the people and organisations engaged in the good fight*	5 (30%)
Recognition of UKCEH	• *I didn't know the Centre for Ecology and Hydrology was based near Edinburgh;* • *contact for UKCEH;* • *The UK Centre for Ecology and Hydrology and its role*	3 (13%)
Unsure	• *Just started will be able to say when I have gone around*	1 (5%)

In total 41 people completed question 8 providing a total of 66 suggested actions they would do or continue doing to reduce their impact on the climate over the next year.

Nine major themes were identified (Table 3). The most often mentioned actions were related to plastic and recycling activities. People reported they would either reduce plastic use directly, e.g., replacing with paper, or use products that did not require plastic e.g., shampoo bars, or reduce their plastic use by reuse the plastic container e.g., refilling liquid soap. The theme of recycling plastic was also coded as recycling and in addition, the recycling of cloths and household items was frequently mentioned. Seven mentions of support for activist groups were noted. Several of the groups mentioned also had stands at the event and this may have influenced the respondents indicating learning from these stands. However, when UKCEH team members toured the other stands, they realised that some of the people who completed the quiz where part of the team staffing other tents which may also have influenced the number of times activist groups were mentioned.

Cycling or walk more and using the car or aeroplane less were also common actions participants claimed they would do in the coming year to reduce their impact on the climate. These two themes were often combined for example one responder wrote *get rid of my car and share or cycle.* Similarly, energy and water efficiency were linked themes e.g., *less water in the kettle*. Several commented that they would reduce dairy and meat in their diet or *continue to eat plant based diet.* These latter suggestions led to interesting conversations about the true cost of some plant-based foodstuffs (e.g. rice that is not grown in UK).

One individual was so inspired by the work of the UKCEH they commented in response to Q8 *I am going to research peat bogs and their positive benefits to carbon capture*.

Table 3 Number of responses per themes and example text of responses to Q8. Name one thing you are going to do to reduce your impact on the climate over the next year.

Theme	Example text on theme	Number of mentions
Use of plastic	• *Less single use plastic;* • *use paper not plastic;* • *always carry a cloth shopping bag;* • *shampoo bars*	10
Recycle	• *Continue to only reuse, refill and upcycle + recycle my clothes + most household items;* • *no new;* • *I use refills for detergent, soap. Shampoo and conditioners;* • *reusing plastic;* • *buy second hand clothes and other stuff*	9
Activist	• *continue to support Sea Shepherd, inspire + network with others on climate collapse issues + accessible sustainable ways to live;* • *fill in #stopcambo petitions + get more involved in their actions;* • *Continue to work for Earth and Common and champion # Restorative climate Justice and #Urban crofts;* • *mobilise for COP26*	7
Cycle/ walking	• *Cycle to work;* • *cycle to school;* • *Walk more* • *Hoping to get an electric bike;* • *get my bike out of the garage;* • *walk/cycle more*	8
Use cars and aeroplanes less	• *drive less;* • *less flights;* • *take bus for go to work;* • *Use an electric car to get around;* • *I got rid of my car last week*	7
plant based diet /less meat	• *continue to eat plant based diet;* • *reduce meat and dairy consumption;* • *eat vegetarian;* • *use plant based products that have a low mileage ground to fork;* • *eat less meat*	5
Energy efficacy	• *switch off the light when I'm not in that room;*	5

	• *Aim to get house better insulated - find funding;* • *LED lights;* • *use heating less;* • *turning off the oven early to use residual heat to finish cooking food*	
Water efficacy	• *less water in the kettle;* • *use less water while washing dishes*	4

3 Suggested improvements for future events

Although the three activities were clearly branded as UKCEH and sometimes UK-SCAPE from a distance, the tent was not obviously a research centre. Future events should consider clearer branding.

When touring the other stands it was obvious that many were in fact taking the opportunity to sell membership and merchandise to the public e.g. RSPB, Woodland Trust, and Greenpeace. The fact that the UKCEH stand was not may have attracted more people.

The wind was a significant issue on the day. Poster boards which were more stable or a tent large enough to house both poster boards would have been useful.

A detailed rota sheet for each activity was not decided beforehand and consequently most of the team members were on the stand all day. A schedule of break times before the event would have been beneficial to ensure everyone had a suitable rest period; some felt it was difficult to take ad-hoc breaks during the event when the stall was busy.

Some team members considered career recognition for attendance at such events important. When producing media posts after events it is recommended to include a note of UKCEH staff and students who attended and helped with the event. Similarly, all engagement events should be reported as other UKCEH funded activities and staff involved should be co-authors.

4 Learning points gained by the UKCEH team and interesting interactions

4.1 UKCEH Staff

In total six staff members were involved in the event on the day and pre-post activities (Fig 5).


Figure 5 UKCEH team at the event (Stella White had to self-isolate on the day because of COVID restrictions).

4.2 UKCEH staff learning points

The team learnt a great deal by interacting with the public including:

- The existence of compostable rubbish bags (Bowercollective.com)
- The existence of a bicycle transport service in Edinburgh (Farr Out Deliveries)
- The many activities groups related to climate change in Edinburgh
- The role of children in the climate debate (some afraid for children, some consider bring children into the world ‘criminal’).

Touring the other stands also provided thought for future events.

- A wishing tree (Fig 6) to encourage contributions from the public
- A game that is revealed as the player answers questions – estimated time 20 min. The concept was considered useful but when it was announced that the ‘game’ would take 20 min this was considered by team members as too long! However, the concept that could be adapted for many of the process/ model/ food web diagrams used by UKCEH staff was considered noteworthy (Fig 6)

Figure 6 Other potentially useful public engagement ideas a) a wishing tree where participants wrote what they hoped would happen in the future (similar to our question 8 in the quiz) and a game that was played by answering questions and then revealing pictures with the correct answer. This was designed to raise awareness of the interconnected issues of climate change through workshops that the charity run.

4.3 Interesting comments

A few interesting sayings were noted by the team including: *I don't want to be a fossil fuel!* And: *Don't be a fossil fool!*

When a team member comment *Imagine you are a carbon molecule* the response was *No need to imagine it! We are all made of carbon.*

One visitor referenced Star Trek where humans are described as a carbon-based lifeform in an episode and could relate more to the carbon game due to this connection.

Paul Gill visited the tent and was critical, as Dr Catt ex-Banchory CEH station had undercut him when bidding for survey work with what was then called the Scottish Natural History. He calmed down in conversation and commented that he now worked mostly in contracts related to renewable wind energy projects. The conversation turned to the IMLOT group work on wind energy, and he commented that he knew Francis Daunt and said *Francis is still just shy of genius but may reach it by the time he dies.*

One couple with a young baby asked whether it was too late to stop global warming and wondered what world their child would grow up in. This sentiment was echoed in several conversations on the day by parents and grandparents. However, childless people questioned the desire of adults to bring another human being into the world both from the perspective of the child and others on the planet.

Another memorable question related to pollution swapping with respect to the introduction of electric vehicles: would potential land and aquatic pollution arising from the disposal of spent car batteries outweigh the benefits of powering the vehicles using renewable energy sources? The complexity of the climate emergency was the subject of many conversations during the day.

5 Acknowledgements

The authors are grateful to all the people who took the time to visit the stand and take part in the activities and shared their knowledge with the team. We are also indebted to all the adults, parents and children who allowed their photographs to be taken and gave permission for them to be included in this public report. Every photograph was shown to the individuals and many remarked that they were happy for their faces to be shown.

Appendix 1 – Carbon Game

The game simulates being a carbon atom flowing through the carbon cycle by rolling dice and moving between different carbon states. The states included: atmosphere, ocean, rock, vegetation, sea plants, sea shells, animals and fossil fuels. Each state has text explaining the process of how carbon arrived there and what it could potentially move on to become. The participant rolls the dice to determine which next state they will move to.

The aim of the game is to avoid being a carbon dioxide molecule in the atmosphere, so participants want to avoid the atmosphere state. At this event there was no end point of the game: rather participants continued to move between the different states of carbon rolling the dice until they decided to stop. The game can also be played using score cards; players get a point for every turn in which they do not enter the atmosphere, once they enter the atmosphere 3 times the game is over. Highest score wins! The duration of the game can be very variable depending on what the player rolls, some players may re-enter the atmosphere on consecutive turns and finish very quickly, while others may be similarly ‘stuck’ between other compartments. Though frustrating for the player, this can be quite useful in demonstrating the nature of the carbon cycle.

Appendix 2 – Intergenerational trend in CO2 Concentration

Game created to engage all ages and sexes at the Edinburgh Climate Festival, 14th Aug 2021.

Aim

- engage visitors in participatory game and subsequent conversation about the science conducted at UKCEH and within the UK-SCAPE program
- highlight the rise in atmospheric CO_2 in the time frame relevant to their family
- educate them on the sources of the main greenhouse gases
- Additional educational aspects - Learn how to read a graph

Rules of the game

Approach visitors and ask them to take a small sticker and write the concentration of CO_2 in the atmosphere the year they were born. Only help if they do not know how to read a graph.

If appropriate, ask also to estimate from the graph the year their mother or grandmother or father or grandfather was born.

If a sticker is already on the 'spot' on the graph they want to use line up above on the correct year but wrong concentration (concentration is already written on the sticky dot).

In order to comply with social distancing rules - have an A4 copy of the poster to hand so it is possible to explain at a distance from the poster the rules of the game. Participants can calculate the CO_2 concentration they need to write on the sticky dot and where on the poster they should put it when it is safe to approach the poster.

Have one colour if the person present and another if they are adding someone who is not present.

Note the x-axis of poster taken to 2050 on purpose. No predictions have been added to enable conversation – i.e. participants think the concentration might be in 2050 and what would be the consequences and what would have to be done to change the 'direction' of the line.

Evaluation

Photograph final poster and count the dots of those present to calculate the total number of participants taking part.

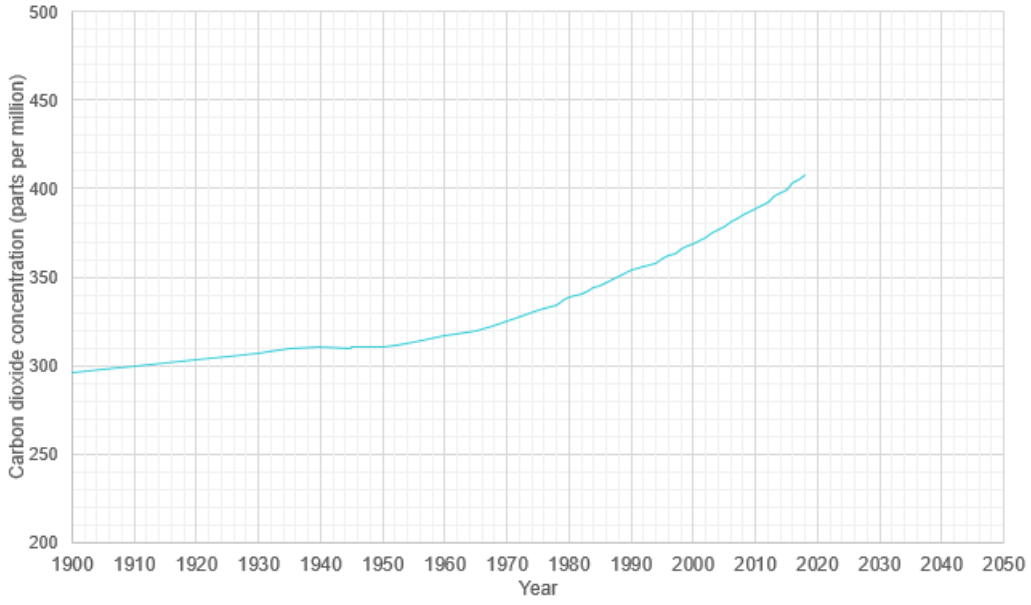
Split total attending into appropriate age groups based on the number of dots in year groups.

Resume Slide Show

UK-SCAPE

Trends in atmospheric concentrations of CO2

What was the atmospheric carbon dioxide concentration the year you were born ?



Data taken from European Environmental Agency website eea.europa.eu

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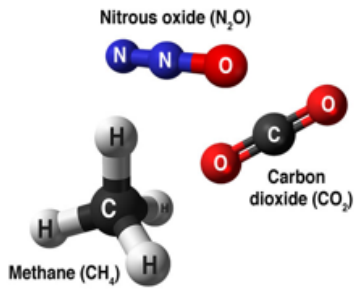
Carbon dioxide (CO_2): is the primary greenhouse gas, responsible for about **75% of emissions**. It can linger in the atmosphere for 1000s of years. Carbon dioxide emissions mainly come from burning organic materials: coal, oil, gas, wood, and solid waste.



Methane (CH_4): is released from landfills, natural gas and petroleum industries, and agriculture (especially from the digestive systems of grazing animals). A molecule of methane doesn't stay in the atmosphere as long as a molecule of carbon dioxide—about 12 years—but it is at least 84 times more potent over two decades. It accounts for about **16% of all greenhouse gas emissions**.

Nitrous Oxide (N_2O): Nitrous oxide occupies a relatively small share of global greenhouse gas emissions—about **6% of emmissions** —but it is 264 times more powerful than carbon dioxide over 20 years, and its lifetime in the atmosphere exceeds a century, according to the IPCC. Agriculture and livestock, including fertilizer, manure, and burning of agricultural residues, along with burning fuel, are the biggest sources.

Imagines of greenhouse gas molecules courtesy of https://climate.nasa.gov/
Text from National Geographic article

Appendix 3 – Poster Quiz

UKCEH Poster Quiz

Take a look at our poster display! See if you can use the posters to answer the questions below…

1. When was Auchencorth Moss field site established as an experimental site, originally to measure sulphur dioxide (SO_2), ammonia (NH_3) and ozone (O_3)?

Year

2. Studies at Whim Bog found that which three pollutants had negative impacts on biodiversity, at levels found here in the UK?

(i)..... (ii) ..... (iii) .....

3. True or false: Road traffic is the only cause of carbon dioxide (CO_2) emissions in London.

True False

UK Centre for Ecology & Hydrology

4. How many terrestrial Environmental Change Network (ECN) sites are active in the UK?

1.....5.....8.....11.....15.....19.....22

5. Who can you contact if you suspect a harmful algal bloom?

?

6. How many seabird colonies were studied to help determine the non-breeding season distributions of guillemots and razorbills?

? guillemots and ?? razorbills from ?? seabird colonies

7. Tell us one thing you have learnt today at the Edinburgh Climate Festival.

8. Name one thing you are going to do to reduce your impact on the climate over the next year?

UKCEH Poster Quiz Answers

… Did you get them right?

1. **Auchencorth Moss was established in 1995** as a site to measure sulphur dioxide (SO_2), ammonia (NH_3) and ozone (O_3) fluxes. It now measures much more!

2. Research undertaken at Whim Bog helped to show that, at levels found in the UK, **ammonia (NH_3), ammonium (NH_4) and nitrate (NO_3)** pollution has a negative impact on biodiversity.

3. **False**: there are many other sources of carbon dioxide (CO_2) such as heating, cooking, and even human and plant/soil respiration (breathing). Plants also **remove** CO_2 from the atmosphere during the daytime through photosynthesis.

4. There are **11 active terrestrial sites** in the UK:
    - Cairngorms & Glensaugh in Scotland
    - Sourhope, MoorHouse, Wytham, Rothamsted, Alice Holt, Porton Down & North Wyke in England
    - Snowdon in Wales
    - Hillsborough in Northern Island

5. If you suspect a harmful algal bloom you can **report it** using the app or report directly to your local authority environmental health department or SEPA.

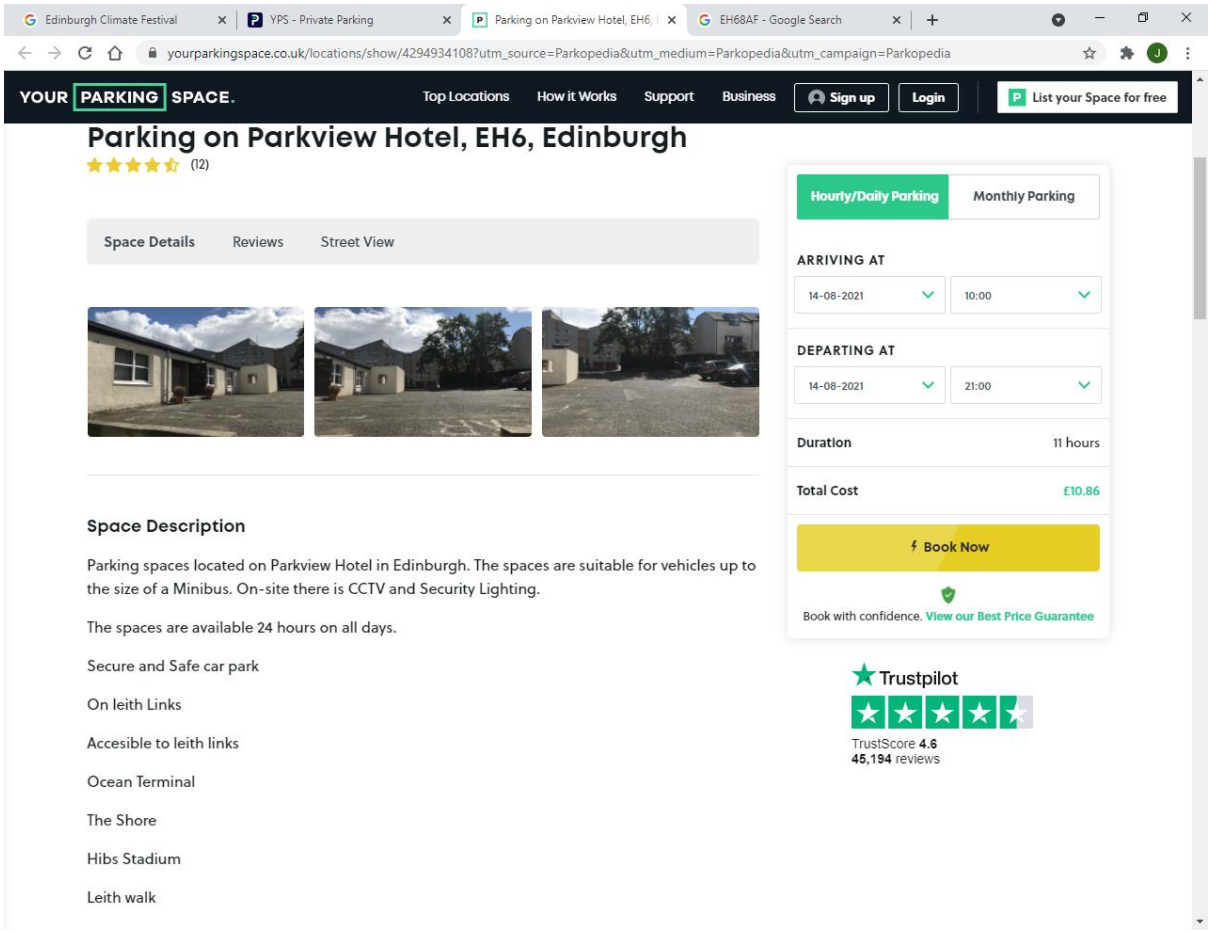
6. 118 guillemots and 47 razorbills from **7 seabird colonies** in Scotland were tracked over winter to help determine their non-breeding season distributions.

Appendix 4 – Logistics for the event

Car parking

Free street parking is possible but paid secure parking was available form

www.yourparkingspace.co.uk at Parkview Hotel, Edinburgh, EH68AF. The car park is behind the hotel – 6 Burns Street. At a cost of less than £12 for the day this was very cost effective.



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