

# Clinical Trial Staff Business Travel: an evaluation of pre-COVID carbon emissions from travel and projected impact of sustainability policies

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## Introduction

Carbon dioxide (CO<sub>2</sub>) and other greenhouse gases are the primary drivers of global climate change. Average annual greenhouse gas emissions between 2010-2019 were at the highest levels in human history.<sup>1</sup> According to the UN's Intergovernmental Panel on Climate Change (IPCC) it is 'now or never' if we want to limit global warming to 1.5°C but immediate and deep emission reductions are needed across all sectors.<sup>1</sup>

The UKCRC-registered Edinburgh Clinical Trials Unit (ECTU) has a Clinical Trials Strategy that prioritises the design of clinical trials that are efficient, and economically, environmentally, and socially sustainable. We started a benchmarking exercise in 2022 to identify sources of carbon emissions across ECTU operations in line with the NIHR Carbon Reduction Guidelines.<sup>2</sup>

Because staff business travel is a significant driver of emissions, Edinburgh University's Sustainable Travel Policy was published in 2021 and advocates Climate Conscious Travel.<sup>3</sup>

## We aimed to:

- Quantify carbon emissions generated by staff business travel in the 2 years preceding the first UK COVID-19 lockdown in March 2020
- Calculate impact of the Sustainable Travel Policy restricting domestic UK flights

## Methods

We extracted all business travel data generated by ECTU staff and affiliates for any purpose from a travel booking system operated by Key Travel and an internal electronic expenses system for the period January 2018-March 2020.

We calculated both direct and well-to-tank (WTT) carbon emissions as carbon dioxide equivalent in kg (kg CO<sub>2</sub>e), using UK Defra emission factors with radiative forcing (RF) values for air travel and 'unknown' fuel types for all overland travel.<sup>4</sup>

Figure 1. kg CO<sub>2</sub>e Explainer

## Carbon dioxide equivalents (CO<sub>2</sub>e) explained

CO<sub>2</sub>e stands for carbon dioxide equivalents and it is used as a measure of global warming.

CO<sub>2</sub>e is the standard for measuring carbon footprint. It is defined as the amount of CO<sub>2</sub> (or its equivalent for other greenhouse gases as shown below) released into the atmosphere as a result of an organisation's activities.

The three main greenhouse gases are:

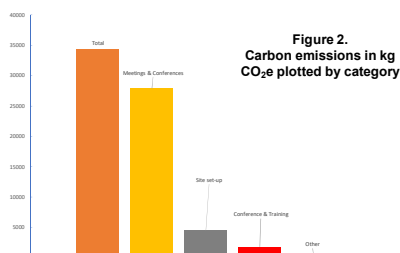
Carbon dioxide CO<sub>2</sub> = 1kg CO<sub>2</sub>  
Methane CH<sub>4</sub> 1kg CH<sub>4</sub> = 84kg CO<sub>2</sub>  
Nitrous oxide N<sub>2</sub>O 1kg N<sub>2</sub>O = 298kg CO<sub>2</sub>



## Results

### Carbon emissions by travel type

During 27 months staff business travel charged to ECTU generated 34,346.44 kg CO<sub>2</sub>e in the following categories: meetings and consultancy (27,875.10 kg CO<sub>2</sub>e [81%]), site set-up (4,499.35 kg CO<sub>2</sub>e [13%]), conferences and training (1,769.68 kg CO<sub>2</sub>e [5%]) and other (202.29 kg CO<sub>2</sub>e [1%]).



### Carbon emissions by staff member

Emissions were generated by 33 staff members (out of a staff body of 65) and 15 affiliates. Affiliate travel, particularly by Chief Investigators, is often charged elsewhere so this is very likely an underestimate.

### Impact of the 2021 sustainability policy restricting the use of domestic flights

If ECTU staff had followed the University's Sustainable Travel Policy, replacing domestic air travel with travel by train, it would have reduced emissions to 18,289.28 kg CO<sub>2</sub>e (53% of actual total). If meetings and site set-up visits had been conducted remotely overall emissions would have been reduced further to 1,595.14 kg CO<sub>2</sub>e (5% of actual total).

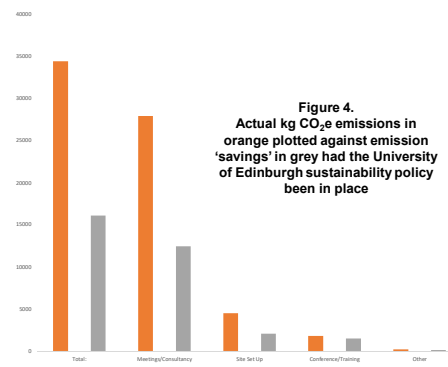


Figure 3. kg CO<sub>2</sub>e emission equivalencies<sup>5</sup>

100 kg CO <sub>2</sub> e = 248 miles		= 1.7 trees for 10 years	
1,000 kg CO <sub>2</sub> e = 2,482 miles		= 16.5 trees for 10 years	
10,000 kg CO <sub>2</sub> e = 24,822 miles		= 165 trees for 10 years	
100,000 kg CO <sub>2</sub> e = 248,221 miles		= 1,654 trees for 10 years	

## Key Findings

- Avoiding domestic air travel would have more than halved ECTU's carbon emissions due to staff business travel if it had been followed before the COVID-19 pandemic.
- Further reductions could be made from sources that we did not quantify, such as staff commuting, trial participant travel and the transportation of trial supplies.
- The COVID-19 pandemic prevented almost all staff business travel, when activities successfully pivoted to a virtual format. We will monitor the extent to which staff business travel returns to pre-pandemic levels, and use these data to encourage behaviour change.
- Further work is needed to quantify carbon emissions from all aspects of clinical trials and develop interventions to reduce them.



1. IPCC Sixth Report <https://www.ipcc.ch/report/sixth-assessment-report-working-group-3>

2. NIHR Carbon Reduction Guidelines <https://www.nihr.ac.uk/documents/the-nihr-carbon-reduction-guidelines/21685>

3. University of Edinburgh Sustainability Policy : [www.ed.ac.uk](http://www.ed.ac.uk)

4. DEFRA GHG Emission Factors 2021: [www.gov.uk](http://www.gov.uk)

5. EPA GHG Equivalencies: <https://www.epa.gov/energy/greenhouse-gas-equivalencies-calculator>