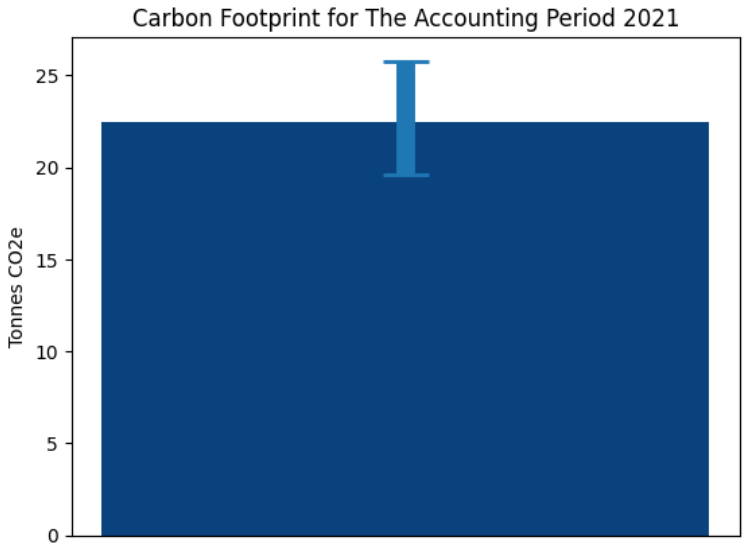
Advanced Infrastructure Carbon Footprint Calculation 2021/2022

6 C Free

Breakdown of Carbon Footprint

Activity	*Unit*	*TCO2e*
Scope 1 - Direct Emissions	**Total**	**0.0**
Scope 2 - Emissions from Electricity Purchased	**Total**	**0.0**
Scope 3 - Indirect Emissions	**Total**	**22.58**
Employee Commuting		0.08
Travel		2.94
Digital		0.93
Equipment		1.45
Expenses		12.55
Work from Home		4.63
Total	**Tonnes**	**22.58**



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Introduction

The first step in developing an organisation's carbon management strategy involves calculating the Greenhouse Gas emissions (GHGs) over a given period. Once this has been undertaken, a reduction strategy can be set out for the future. This report is the first step in that journey and demonstrates the workings for Advanced Infrastructure's carbon footprint calculation.

Advanced Infrastructure produce data-driven software to aid their clients transition to low carbon power solutions. They were founded in 2020, growing as a company working for clients ranging from private companies to local authorities and building partnerships with respected universities across the UK.

The Reporting Period in question is 1/5/21 to 30/4/22. This will be used to both highlight the current environmental state of the business as well as comparatively inform the future success of any new sustainability practices.

Organisational Boundaries

When calculating and organisation's carbon footprint, it is important to set out boundaries to what degree the emissions will be calculated. Those are defined herein. For this base year and initial calculation, Advanced Infrastructure will be calculating 100% of scope1, 100% scope 2, scope 3 emissions outlined in this document.

C Free has completed a carbon footprint calculation of Advanced Infrastructure's business. It should be noted that this is not an entire Lifecycle Assessment of emissions.

Scope 1

Over the reporting period, Advanced Infrastructure has produced no scope 1 emissions as no fuel was combusted on premises or in vehicles belonging to the company, and no fugitive emissions or processing emissions were released.

Scope 2

Scope 2 represents indirect emissions caused by the purchase of energy. Typically, this is in the form of electricity purchased from the grid, but it also includes purchased heat, steam, or cooling.

Over the reporting period, none of the above emissions sources were relevant to the business operations of Advanced Infrastructure. They are a completely remote company and therefore have no premises on which to consume energy. Having said this, they will have scope 3 emissions resulting from their working from home practices which will be detailed in the scope 3 section.

Scope 3

Scope 3 includes all indirect emission sources not included in scope1 and scope 2. They occur as a result of the activity of the company, but not from sources owned or controlled by the company (World Resources Institute, 2013). Examples include the production of raw materials the company is reliant on, the transportation of materials, or the use of services such as online meeting platforms etc.

The vast majority of Advanced Infrastructure's emissions come from Scope 3. Although it is not required, in cases where most emissions come from scope 3, it is highly recommended to include such emissions in the calculation.

Some of the data needed for the calculation of scope 3 emissions was unreliable or unobtainable. In cases where the data was unreliable, why it was used and what was done to ensure accuracy has been made clear in the methodology. In cases where the data was unobtainable, suitable proxies were used.

As stated in the GHG protocol, it is important to focus on the scope 3 areas that are expected to have the most significant GHGs, have the best opportunity to reduce those emissions, and are most relevant to Advanced Infrastructure's business goals.

For these reasons, the following areas were analysed:

- Employee Commuting
- Travel
- Digital
- Equipment
- Expenses
- Work from Home

In some cases, some emissions sources fall out of the scope of this document. This can be due to unreliable information, inadequate information, lack of research pertaining to the source in question, or a lack of relevance/ significance to the reporting company's value chain.

For Advanced Infrastructure the following areas were not relevant:

- Pensions and Investments
- Franchises
- Upstream Transportation and Distribution
- Waste Generated in Operations
- Upstream Leased Assets
- Downstream Leased Assets
- Downstream Transportation and Distribution
- End of Life Treatment of Sold Products

Employee Commuting

When an individual would not usually travel if they were not working for a company, it is reasonable to put responsibility of the emissions produced from that travel on the company. Employee commuting is therefore scope 3 emissions that should be included in the calculations of a company's carbon footprint.

Methodology

Using the survey sent to the Advanced Infrastructure employees, the bulk of the information required to make an estimation of employee commuting was available. The questionnaire included information about the location of their homes and offices, the days worked per month, methods of transport used, and the frequency with which these methods were used.

Therefore, the emissions were estimated by finding the distance travelled, multiplying the total commuting distance by the relevant conversion factor for a given mode of transport, and then weight this by the frequency multiplier supplied (Government, 2021) and the number of days worked per month. This information was used to calculate the total emissions due to commuting.

Formula

> ***2 x km travelled x kgCO2e/km per method = kgCO2e***

Result

Employee Commuting:

0.08 Tonnes CO2e

Travel

In order to interact with clients and effectively satisfy their requirements, travel to and from client offices is necessary. However, this travel comes at an environmental cost.

As with the previous section, COVID-19 restrictions played a large role in curtailing the business travel emissions of Advanced Infrastructure. Again, movement restrictions and stay at home orders prevented usual activity.

Methodology

Advanced Infrastructure provided the data related to their travel. Information about departure, destination, mode of transport was collated and used to calculate the emissions related to this activity.

Where specific location information was unavailable approximate values for average taxi, bus or train journeys were used from the governments Department of Transport reports.

Formula

> ***km x kgCO2e/km = kgCO2e***

Result

Plane:
2.93 Tonnes CO2e
Train:
0.01 Tonnes CO2e

Digital

Although invisible to the user, online services are facilitated by data centres and server banks which consume significant amounts of energy. Naturally, this energy comes at some environmental cost. Therefore, these online services are critical to consider when establishing environmental impact; particularly for modern businesses who rely so heavily on this online infrastructure.

Methodology

Where data is provided, we use a variety of data points, including Gb of data transferred, number of emails sent, number of instant messages, Gb stored, etc, and correlate these with the electricity consumption required for these activities.

AWS and Google Cloud provided carbon reporting so the primary data from these suppliers was used.

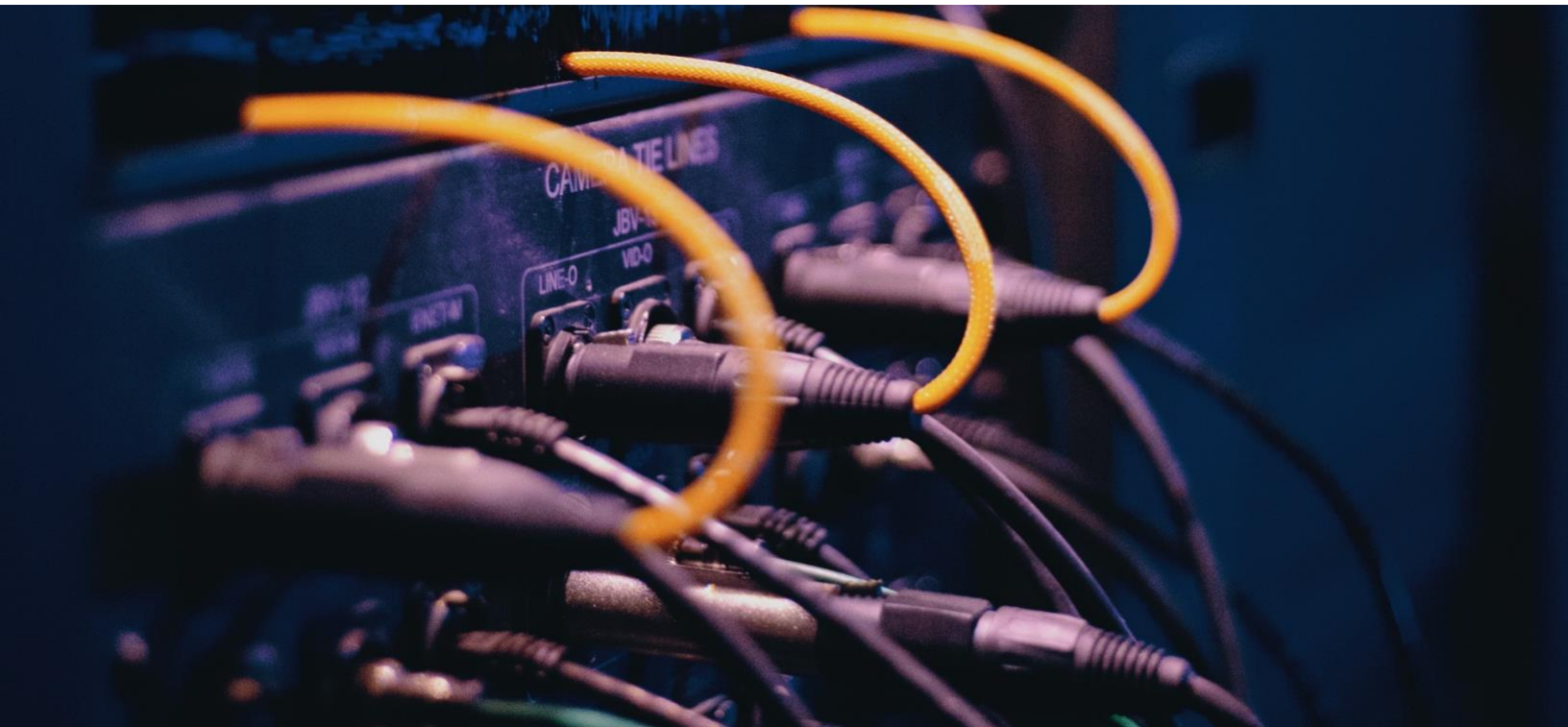
However, in some cases this data is unavailable. Therefore, we would apply the spend-based method.

Formula

Gb x kgCO2e/Gb = kgCO2e

Result

Video Calling:
0.79 Tonnes CO2e
Cloud Storage:
0.03 Tonnes CO2e
Video Streaming:
0.01 Tonnes CO2e
AWS:
0.10 Tonnes CO2e
Google Cloud:
0.003 Tonnes CO2e



Equipment

Specific pieces of equipment can have significant carbon impacts. In particular, equipment such as computers that are dependent on precious metals (which are mined in a carbon intensive way) or that require significant energy to produce can have a significant impact on a company's carbon footprint.

Methodology

Significant equipment purchases were listed in an activity data spreadsheet. The emissions factors associated with these were found and combined to calculate the carbon footprint.

Formula

> ***n_items x kgCO2e/item = kgCO2e***

Result

Office Chair:
0.01 Tonnes CO2e
Table:
0.01 Tonnes CO2e
Headphones:
0.01 Tonnes CO2e
Sofa:
0.18 Tonnes CO2e
Flat screen:
1.24 Tonnes CO2e

Expenses

A company has a responsibility for the emissions produced by the production and distribution of the goods that are purchased in order to provide goods and services. Often this can be calculated by the amount spent in different areas using the spend-based method.

Methodology

In order to calculate the carbon footprint of items purchased by Advanced Infrastructure, we used a combination of research done by Anne Owen at the University of Leeds and government conversion factors (Government, 2021). This research is available through the UK Government and is verified by WWF who used it for their calculations.

Owen has assigned kgCO2e per pound spent on various consumer goods. Advanced Infrastructure were able to share accounting information about the amount spent on such goods and services. These were categorised and multiplied by the relevant factor to give the total carbon footprint by using the spend-based method.

It can be argued that the carbon footprint associated with the production of various commodities should be spread across their lifetime. However, for the purpose of this calculation, we treat them as a point source at the time of purchase as, in practice, the lifetime of such goods is highly variable.

Furthermore, consumption is typically quite regular (on an annual basis) and therefore, treating emissions as a point source will not skew the resultant footprint.

Formula

> ***kg x kgCO2e/kg = kgCO2e***

Result

IT Subscriptions:
0.16 Tonnes CO2e
Consulting:
12.02 Tonnes CO2e
Financial:
0.02 Tonnes CO2e
Advertising:
0.13 Tonnes CO2e
Food and Drink:
0.14 Tonnes CO2e
Restaurant:
0.08 Tonnes CO2e

Work From Home

Advanced Infrastructure is a remote first company. Therefore, much of the emissions associated with office life, (electricity consumption, heating, etc.) are transferred to the respective homes of employees. It is important to include these resultant extra home emissions in the overall calculation of Advanced Infrastructure's footprint.

Methodology

The Employees of Advanced Infrastructure provided the days worked at home and their average monthly energy bills, this information and factors gathered from a paper regarding working from homes effect on utility usage (ecoact, 2020) was used to calculate the added gas and electricity used. Then with conversion factors kWh per pound spent on utilities and kWh emissions factors from (Government, 2021) we calculated the carbon footprint.

Some employees of Advanced Infrastructure are not situated in the UK but in Greece and India. This represents a conundrum as working from home emissions profiles have not been established for these countries. In lieu of better research C Free applied the same emissions factors as for UK working from home as (a) this should be an overestimate as is mandated by the GHG protocol and (b) the requirement for energy intensive air conditioning in these regions should increase the naïve assumption that no heating is required. However, for appliances that run on electricity, we converted the emissions factor into the grid factor for the respective countries as these are well established.

Formula

> ***kWh x kgCO2e/kWh = kgCO2e***

Result

Heating/cooling:
3.77 Tonnes CO2e
Appliances:
0.86 Tonnes CO2e

Conclusion

In conclusion, we find that Advanced Infrastructure have emitted 22.58 Tonnes of CO2e over the accounting period Advanced Infrastructure. This is approximately 1.5 Tonnes CO2e per full time equivalent employee. With all uncertainty considered the upper limit is 25.89 Tonnes CO2e.

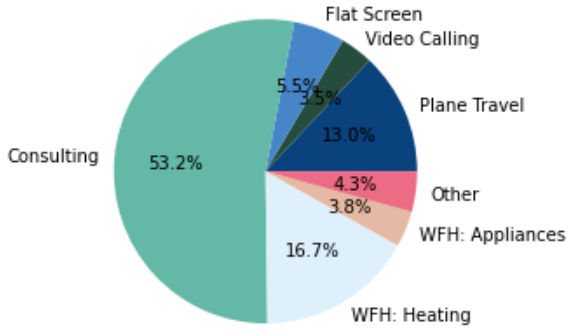


Figure 1: All emissions over 2% of the total

Figure 1 shows all the emitters that comprised of 2% and over of the total footprint, with all else grouped under the label 'Other'. Here we see consultancy expenses was the largest emitter. This is likely due to the fact that Advanced Infrastructure outsourced a large part of their build work to external organisations.

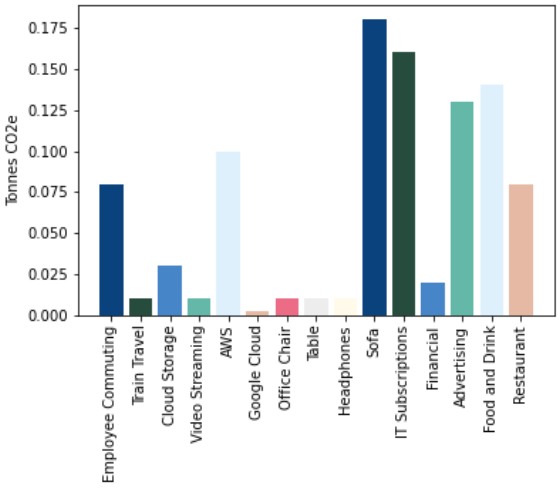


Figure 2: All emissions less than 2% of the total

Figure 2 shows the emitters that are labelled 'Other' in Fig. 1.

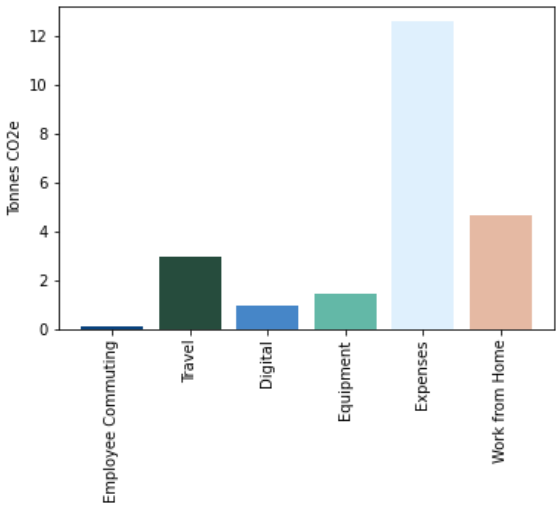


Figure 3: All emissions grouped by category

Figure 3 shows the emissions labelled by general category; most emissions are from expenses.

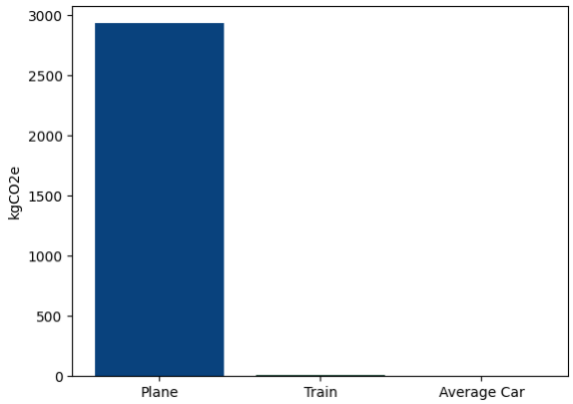


Figure 4: Travel emissions by method of travel

Figure 4 shows that plane travel made up almost all of Advanced Infrastructures travel emissions. Plane travel has a very high emissions factor.

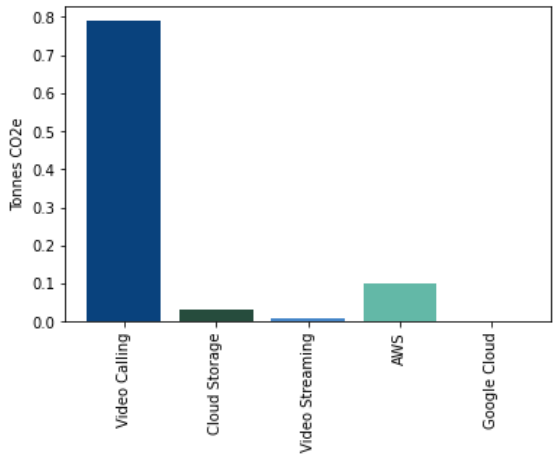


Figure 5: Digital emissions by source

Figure 5 shows Video Calling makes up most of the digital emissions. 5000 hours was spent video calling.

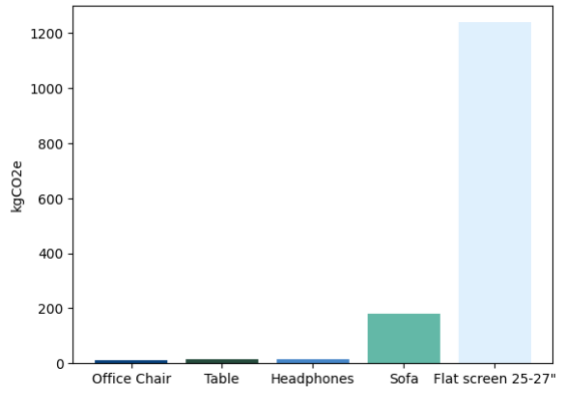


Figure 6: Purchased equipment emissions

Figure 6 shows that the purchased flat screens were the largest emitter in purchased equipment. Electronic equipment general has a significant carbon footprint.

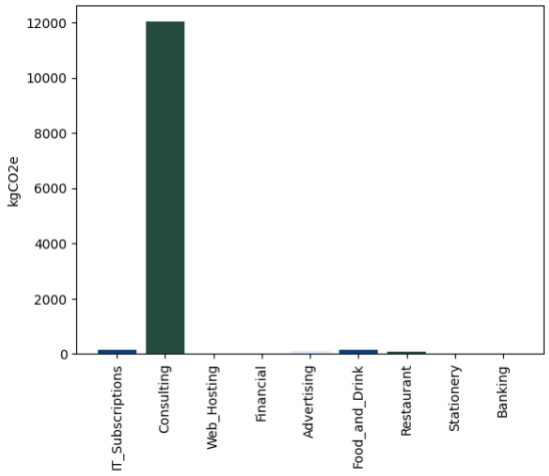


Figure 7: Expenses emissions by area

Figure 7 shows the expenses emissions, Consultancy fees made up the largest contributor. A significant amount was spent on consultancy fees.

Recommendations

We, as a society will only make progress towards net zero if everyone gets involved. Ask your suppliers how they are reducing their emissions. This could lead them to take action and may give you new ideas. Try having a conversation about reducing environmental impact with each of your supplies at least once in the next three months.

Cut out plane travel or at least introduce a train first policy where if a train is possible it should be taken over plane.

When an organisation already has done a great deal to keep their carbon footprint low, it can be difficult to think of further reduction strategies. Try to think about your GHG emissions during every decision made. A good way to go about this is thinking; a) do we need to do/ buy this, b) are we going to use this to its full potential, c) are there any better low carbon alternatives.

Recommendations from the team:

"EVs for all!"

"shutdown unused ec2 instances"

"Use low carbon cloud computing"

"I think we are doing our best to keep the carbon emissions minimum, anyways Ill have a look at the infrastructure and try to find if there is any scope to reduce further. :)"

"Pushing to use servers in lower emission regions"

"Conduct meetings online where possible to reduce unnecessary travel"

Sources

Factor	Unit	Source	Date	Comment
Average water used	Litre	Energy Saving Trust- at home with water	2013	Average amount of water used per person in the UK
Average waste produced	kg	CUNDALL info paper 6	2013	Average amount of waste produces in an office per person in the UK
Energy of an office	kWh	UK Green Building Council	2017	The average energy consumption of a non-residential building in Europe
Employee density of an office	m2	Health and Safety Executive UK Government	2013	The minimum allowed space per employee for an office in the UK
Average distance travelled	miles	Department for Transport UK Government	2018	The average distance travelled by various modes of transport in the UK
Fuel	£	University of Leeds comsumption of emissions	2018	The emissions of fuel per pound spent
Train	km	UK Government Conversion factors	2021	The emissions of a train per km per person
Bus	km	UK Government Conversion factors	2021	The emissions of a bus per km per person
Car	km	UK Government Conversion factors	2021	The emissions of an average car per km
Water	Litre	UK Government Conversion factors	2021	Water purchased and treated
Gas	kWh	UK Government Conversion factors	2021	Natural gas supplied through a utility company
Electricity	kWh	UK Government Conversion factors	2021	National grid electricity supplied and associated transmission and distribution
Landfill	kg	UK Government Conversion factors	2021	Average emissions of household waste (as no specialised commercial waste) x 5 for 5kg binbag
Recycling	kg	UK Government Conversion factors	2021	Average emissions of recyclable waste x 5 for 5kg binbag
Expenses - Various	£	University of Leeds consumption emissions	2018	Average emissions due to pounds spent on various items

Glossary of Terms

Accessories	For the purposes of report 'Accessories' refers to purchasing of office equipment excluding otherwise stated like computers, furniture, etc.
Base year	A year of accounting GHG emissions against which of organisation emissions can be tracked.
Carbon sequestration	The uptake of Carbon Dioxide. In context, the removal of greenhouse gases from the atmosphere.
CO2e	Carbon Dioxide and Equivalent Greenhouse gases.
Conversion factor	A factor also known as an emissions factors which allows GHG emissions to be estimated from a unit of available activity data (e.g. tonnes of fuel consumed, tonnes of product produced) and GHG emissions.
Direct GHG emissions	Emissions that are from sources controlled or owned by the organisation.
Double counting	Accounting for emissions or reductions more than once. This can be done either through two separate reporting companies accounting for the same emissions/reductions, or one company including emissions/reductions related to one activity more than once.
Emission factor	A factor allowing GHG emissions to be estimated from a unit of available activity data (e.g. tonnes of fuel consumed, tonnes of product produced) and GHG emissions.
Emissions	The release of Greenhouse Gases into the atmosphere.
GHG protocol	The Greenhouse Gas protocol is a comprehensive, global, standardized framework for measuring and managing GHGs from private and public sector operations, value chains, products, cities, and policies.
Greenhouse gasses (GHGs)	GHGs are the sic gases listed in the Kyoto Protocol: carbon dioxide (CO2); methane (CH4); nitrous oxide (N20); hydrofluorocarbons (HFCs); perfluorocarbons (PFCs); and sulphur hexafluoride (SF6).

Indirect GHG emissions	Emissions that are a consequence of the operations of an organisation but occur at sources owned or controlled by another organisation.
IT Equipment	Throughout this report IT equipment refers to computers.
Kyoto protocol	A protocol to the United Nations Framework Convention on Climate Change (UNFCCC). It requires countries listed to meet reduction targets of GHG emissions relative to their 1990 levels during the period of 2008-12.
PAS:2060	PAS:2060 is an internationally renowned standard detailing how to demonstrate carbon neutrality produced and published by the British Standards Institution.
Renewable energy	Energy taken from sources that are not limited, e.g. wind, water, solar, geothermal energy, and biofuels.
Scope 1	All direct GHG emissions under an organisation control.
Scope 2	An organisation's emissions associated with the generation of electricity, heating/cooling, or steam purchasing for own consumption.
Scope 3	All organisation's indirect GHG emissions not covered in Scope 2.
Spend-based method	This is a way of estimating emissions for goods and services by collecting data on the value of goods and services purchased and multiplying it by relevant emission factors.

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