dxw carbon emissions calculation 2022-2023

Introduction

This report presents the carbon emission calculations for The Dextrous Web Limited (dxw) for the reporting period 01/09/2022 - 31/08/2023. These calculations have informed the carbon reduction plan and the establishment of targets to offset the identified emissions.

dxw is a leading digital agency specialising in the design, development, and management of digital public services. We hold our values high, with a strong commitment to the public good guiding every aspect of our work. As a technology-intensive company, this commitment makes it essential for us to actively monitor and reduce our carbon footprint. In line with our social value statement, we are dedicated to achieving net-zero emissions, working closely with sustainable and ethical suppliers, and ensuring that our efforts contribute positively to the wider community.

Carbon emissions were measured using the Greenhouse Gas Protocol (GHG), a globally recognised framework that provides standards, guidance, and tools for managing greenhouse gas emissions. GHG emissions will be reported in carbon dioxide equivalent (CO_2e), a standard unit that compares the impact of different greenhouse gases on global warming. By using CO_2e, the emissions from all GHGs are accounted for and reported in tonnes of CO_2e.
To quantify the GHG emissions for each activity, carbon emission factors from the GOV.UK website were used. For activities that could not be explicitly categorised, estimates were generated using information from manufacturer websites and reliable studies.

At dxw, our vision is to improve lives while minimising our impact on the planet. By calculating our carbon emissions, we have not only offset them but also identified key areas where we can make meaningful reductions. As we move forward, we will uphold our commitment to reduce our environmental impact while maintaining our focus on delivering exceptional services and creating lasting value for the communities we serve.

Overview

Scope 1

Direct emissions

Scope 1 emissions are those that arise from sources owned or controlled by the company, such as their own fuel combustion and fugitive emissions.

Carbon emissions total (tonnes CO_2e):
2.831

Scope 2

Indirect emissions

Scope 2 refers to the indirect greenhouse gas emissions associated with the consumption of purchased electricity, heat, or steam by an organisation.

Carbon emissions total (tonnes CO_2e):
1.188

Scope 3

All indirect emissions not included in scope 1 and scope 2, which resulted from the activity of the company but not from sources owned or controlled by the company.

Carbon emissions total (tonnes CO_2e):
256.981

Total carbon emissions (tonnes CO_2e):
261.00

2021-2022
(tonnes CO2e)

Scope 1: 1.88
Scope 2: 10.36
Scope 3: 248.42

Total: 260.66

2020-2021
(tonnes CO2e)

Scope 1: 1.59
Scope 2: 3.69
Scope 3: 173.24

Total: 178.53

Summary

dxw made significant strides in reducing emissions in key areas for 2022-2023. Notably, Web Hosting emissions fell to near zero thanks to AWS's transition to green energy. While there was a modest overall increase in carbon emissions the emissions per employee fell. These improvements underscore dxw's continued dedication to lowering its environmental footprint, and our drive towards Net Zero.

direct emissions

Scope 1

Scope 1 emissions are those that arise from sources owned or controlled by the company, such as their own fuel combustion and fugitive emissions.

What's in Scope 1 for dxw?

Gas used in the Leeds office at 36-38 Calls landing

Method

The amount of gas used was supplied by dxw in kWh from their energy bills. This number, multiplied by the UK Government conversion factor for natural gas (Government, 2021) gives the emissions.

Data source

A gas bill was provided by the Finance team at dxw.
The greenhouse gas conversion factors were sourced from GOV.UK.

Formula

> **kWh consumption * emission factor**

Calculation and result

Emission factor = 0.20226
kWh gas consumption = 2.831

Scope 1 carbon emissions (tonnes CO_2e):

2.831

indirect emissions

Scope 2

Scope 2 in carbon accounting refers to the indirect greenhouse gas emissions associated with the consumption of purchased electricity, heat, or steam by an organisation.

What's in Scope 2 for dxw?

Electricity used in the Leeds office at 36-38 Calls landing.

Method

Where possible dxw supplied the kWh used over the reporting period at their offices from their energy bills. If unavailable an average based on the occupancy of the location was used. This can be used in conjunction with the Government conversion factors (Government, 2021) to give the carbon footprint associated with electricity purchased.

Data source

Electric usage was provided by the Finance team at dxw for sites where the data was available.
The greenhouse gas conversion factors were sourced from GOV.UK.

Formula

> **kWh consumption * emission factor**

Calculation and result

Emission factor = 0.20707

kWh gas consumption = 5739.273

Scope 2 carbon emissions (tonnes CO_2e):

1.188

indirect emissions

Scope 3

Scope 3 includes indirect emissions not included in scope 1 and scope 2, which resulted from the activity of the company but not from sources owned or controlled by the company.

What's in scope 3 for dxw?

Scope 3 includes multiple emission types which are summarised and linked to below.

1. **Employee Commuting**
   Total emissions (tonnes CO_2e) = 4.970

2. **Purchased Items**
   Total emissions (tonnes CO_2e) = 14.244

3. **Waste**
   Total emissions (tonnes CO_2e) = 3.997

4. **Water**
   Total emissions (tonnes CO_2e) = 0.0997

5. **Work from home**
   Total emissions (tonnes CO_2e) = 51.04

6. **Well-to-tank**
   Total emissions (tonnes CO_2e) = 2.269

7. **Web hosting**
   Total emissions (tonnes CO_2e) = 4.454

8. **Transmission and distribution**
   Total emissions (tonnes CO_2e) = 0.843

9. **Expenses**
   Total emissions (tonnes CO_2e) = 161.82

10. **Mileage**
    Total emissions (tonnes CO_2e) = 0.423

11. **Travel**
    Total emissions (tonnes CO_2e) = 12.811

Scope 3 carbon emissions (tonnes CO_2e):

256.981

1. Employee Commuting

This includes commuting via National Rail, bus, underground, motorcycle and car

Method

We surveyed staff about their commuting habits this year, excluding transport already covered in this report. We then use this to make the 'Average Employee' and multiplied this usage by our staff numbers of the period (134) to get total distances traveled.

Data source

Staff survey.
Emission factors from GOV.UK.

Formula

> **Sum (distances traveled per time interval (km)*emission factor * frequency of journey)**

Calculation and result

	National rail	Bus	Underground	Motorcycle	Car
Emission factor ($kgCO_2e/km$)	0.035463	0.078323	0.027802	0.10108	0.17246
Quantity	81388	6997	33574	796	3030
Carbon emissions total (tonnes CO_2e)	2.886	0.548	0.933	0.080	0.523

Employee commuting (tonnes CO_2e) = 4.970

2. Purchased Items

Macbook Air, Macbook Pro, Monitors

Method

Where the data was clear enough, activity data was extracted from dxw's expenses using AI such that the number of a given type of item purchased could be used with the best available conversion factor for said item to calculate the emissions rather than using the spend-based method. This method has a lower uncertainty.

Data source

dxw finance department.
Data for the Macbook Pro and Macbook Air came from Apple
Data for the monitor came from an Oxford University study

Formula

> **Sum (quantity of product * emission factor)**

Calculation and result

	Macbook Air	Macbook Pro	Monitor
Emission factor (tonnes CO_2e per item)	0.147	0.167	0.282
Quantity	27	21	24
Carbon emissions total (tonnes CO_2e)	3.969	3.507	6.768

Purchased items (tonnes CO_2e) = 14.244

3. Waste

Method

The amount of waste was unavailable. The nature of the business means there was no additional operational waste to consider. The average amount of waste per employee per day (The World Bank, 2022) along with the number of days worked was used in conjunction with the government conversion factors used to calculate a figure for $kgCO_2e$ (Government, 2021).

Data source

The People team at dxw.
The World Bank shows a UK mean 1.33 kg of solid waste per person per day.
We have assumed 1/4 of a persons daily waste has been generated during working day.

Formula

> **number of person work days /**
> **X(1/Xth of a days refuse generated while at work) * 1.33*10-3 * emission factor**
>
> **we have used X=4**

Calculation and result

Emission factor = 497 kg CO_2e per tonne
number of person work days = 24186

Waste (tonnes CO_2e) = 3.997

4. Water

Method

The energy required to pump, treat and distribute water to homes and businesses can generate significant GHG emissions, which should be accounted for in a company's overall carbon footprint. Incorporating water usage in sustainability reporting and carbon management planning is crucial for companies committed to reducing their overall environmental impact.

Our bill is unmetered so we looked up how much revenue our water company collected from their end of year shareholders accounts. From their website we looked at their total carbon emission figure, and thus were able to calculate our share.

Data source

Water suppliers / Finance team at dxw

Formula

> **CO_2e per £ x water bill**

Calculation and result

CO_2e per £ = 0.000147

bill (£) = 680

Water (tonnes CO_2e) = 0.0997

5. Work from home

This included emissions from heating and appliances whilst working from home.

Method

The Employees of dxw provided the days worked at home. 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.

From our survey, we knew the average work from home days per employee was 158.5925, and our total number of employees which is 134.

Data source

Staff survey, Government emission factors.

Formula

$E\_appliance\ [kgCO_2e] = h\_FTE\ [hour] \times e\_appliance\ [kgCO_2e/hour]$

$E\_heating\ [kgCO_2e] = h\_FTE\ [hour] \times e\_heating\ [kgCO_2e/hour]$

Where h_FTE is the total number of full-time equivalent hours worked at home.

Calculation and result

Heating

Emission factor = 0.30234
hours worked = 158960

For heating we knew that 6.5% of the energy consumed is green so we adjusted the total number of work from home days to =158.5925*134*0.935 = 19870 days. At 8 hours per day, that gave us 158960 hours worked.

Appliances

Emission factor = 0.03144
hours worked = 102006

For heating we knew that 39.5% of the energy consumed is green, therefore using the same method above we calculated 102006 hours worked.

Heating (tonnes CO_2e) = 48.06

Appliances (tonnes CO_2e) = 2.98

Total Work from home (tonnes CO_2e) = 51.04

6. Well-to-tank

The carbon footprint associated with energy use extends beyond the combustion of fossil fuels to generate electricity or heat. The extraction, transportation and production of materials required to generate energy contribute to the overall carbon footprint. It is essential to consider the well-to-tank (WTT) emissions factors associated with the various energy generation facilities used in electricity grid mix. Additionally, in the case of gas, the carbon footprint must include the emissions during mining, transportation and production.

Well- to-tank emissions were therefore calculated for Calls Landing electricity and gas, and AWS.

Method

Data for fuel-based activities was collected for scope 1 and 2 calculations. The emissions factors associated with these were found and combined to calculate the carbon footprint.

AWS provide a scope 1 and 2 carbon emission report. They also report savings in CO_2e over a 'traditional' server setup. If we sum these two we can reverse the scope 2 calculation for UK electricity to gain an estimate of kWh used. This will be used for scope 3 calculations.

Data source

Electricity suppliers

Formula

> electricity/gas consumed * emission factor

Calculation and result

	Gas	Electric	AWS
Emission factor ($kgCO_2e/km$)	0.046	0.034	0.0465
energy (kwh)	5739.27	13996	32848.2
Carbon emissions total (tonnes CO_2e)	0.267	0.476	1.527

Well-to-tank (tonnes CO_2e) = 2.269

7. Web Hosting

Bytemark and AWS

Method

dxw provided the CPU hours used per month, with this we used a conversion factor for CPU hours to kWh found using different CPU manufacturers data: Intel's mainstream Core processors have a Thermal Design Power (TDP) around 65W as do some of AMD's Ryzen CPUs. Higher-performance CPUs or those designed for gaming or professional workstations often have higher TDPs, sometimes exceeding 100W. Using the resultant electricity usage and the conversion factor for electricity we calculated the total emissions. dxw supplied the data for their AWS usage in kWh per type for their CPU, database and frontend usage. This information and the emissions factor for electricity per kWh was used to calculate the emissions due to AWS web hosting (Government, 2022).

As AWS has a carbon calculation page we used the estimated AWS emission figure. The AWS figure includes only scope 1 and 2 carbon.

For Bytemark we had 16 servers running at an assumed use of 1000kw per year each. In this case this is 115W per hour which is likely to be an overestimation. The emission factor + well to tank + distribution was 0.272.

Data source

IT department

Formula

1. estimate electricity used
2. use the method in scope 2 to estimate CO_2e for that power.
3. use the transmisson and distribution method for that power.
    a. bonus points for including well to tank rates.
4. total
5. consider the data moved, and if this is significant.

Calculation and result

AWS (tonnes CO_2e) = 0.109	Bytemark (tonnes CO_2e) = 4.345

Total web hosting (tonnes CO_2e) = 4.454

8. Transmission and Distribution

Calls Landing and AWS

Method

Multiplying the consumption of electricity consumed with the emissions factor for transmission and distribution gives the emissions associated with Transmission and Distribution.

For AWS we use the same method of estimating equivalent kWh of electricity used as per 'Well-to-Tank' calculations.

Formula

> **Sum(electricity consumed x emission factor)**

Data source

Finance department

Calculation and result

Calls Landing

Emission factor = 0.018
energy (kwh) = 13996

AWS

Emission factor = 0.018
energy (kwh) = 32848

Calls Landing (tonnes CO_2e) = 0.252

AWS (tonnes CO_2e) = 0.591

Total transmission and distribution (tonnes CO_2e) = 0.843

9. Expenses

Advertising, Apparel & Clothing, Charity Donation, Cleaning Janitorial Services, Consulting Advisory Services, Drink, Financial services products, Food, Furniture & Decor, Gift Unknown, Health & Wellness products, Hotel, Ink, IT Accessories, IT equipment, Legal Product & Services, Monitor, Office supplies & equipment, Photography Services, Printing Services, Restaurant, Software & Digital products, Sponsorship, Staff training, Stationary, Telephone, Travel

Method

We used the numbers in the Government spreadsheet for the UK carbon footprint to allow us to make carbon estimates based on expenses.

Formula

Sum (distances traveled per time interval (km)*emission factor * frequency of journey)

Data source

Finance department, Government spreadsheet

Expense	Tonnes CO_2e
Advertising	0.875
Apparel and clothing	1.208
Charity donation	0.167
Cleaning janitorial services	0.254
Consulting advisory services	19.043
Drink	1.284
Financial services products	3.551
Food	3.259
Furniture & decor	1.908
Gift unknown	0.655
Health and wellness products	2.156
Hotel	5.256
Ink	0.116

Expense	Tonnes CO_2e
IT accessories	0.548
IT equipment	1.562
Legal product and services	1.923
Office supplies and equipment	0.502
Photography services	0.341
Printing services	0.473
Restaurant	6.584
Software and digital products	71.954
Sponsorship	5.186
Staff training	32.351
Stationary	0.099
Telephone	0.572

Calculation and result

Expenses (tonnes CO_2e) = 161.82

10. Mileage

fossil fuel vehicles and electric vehicles

Method

This is work travel for which a mileage rate has been claimed

Data source

Finance department (expenses for mileage)

Formula

Sum (all journeys, km) * emissions factor

Calculation and result

Fossil fuel

Emission factor = 0.226

all journeys (km) = 1722.64

Electric vehicle

Emission factor = 0.058

all journeys (km) = 592.24

Fossil fuel (tonnes CO_2e) = 0.389

Electric vehicle (tonnes CO_2e) = 0.034

Total mileage (tonnes CO_2e) = 0.423

11. Travel

Flights and train travel

Method

This is all work travel that is not commuting nor mileage. Plane, train (activity and spend based), bus, cab, underground, car (all likely to have been covered in mileage above)

We used revenue per franchised passenger km to turn money into km estimate, and used this with the e factor for train travel.

For flights we used the short haul economy factor

Data source

Finance department (expenses for travel) (km)

Formula

Sum (all journeys, km) * emissions factor

Calculation and result

flights (tonnes CO_2e) = 4.089

train travel (tonnes CO_2e) = 8.722

Total travel (tonnes CO_2e) = 12.811

Conclusion

At dxw, we are deeply committed to refining our approach to sustainability, ensuring that our actions reflect our dedication to the environment and our clients. This year's total emissions were 261 tonnes CO2e, an expected increase from last year given the increased workforce. Despite this, we've achieved significant accomplishments, including a 100% reduction in web hosting emissions and a notable decrease in travel emissions, both in line with our carbon reduction plan from the previous year. By developing robust in-house methodologies, we have enhanced our ability to analyse emissions with greater precision, allowing us to focus our reduction efforts where they matter most.

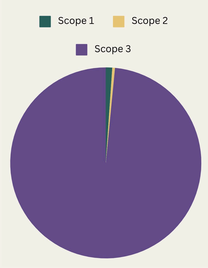

Fig1. All carbon emissions by scope.

Fig 1 demonstrates the carbon emission per scope, with Scope 3 significantly contributing to the total emissions. As noted in previous reports, targeting these indirect emissions is a good initiative for reducing carbon emissions, through collaborating with suppliers and implementing greener practises.

One of our key achievements has been the significant reduction in emissions from Web Hosting. Historically one of our largest carbon contributors, this area has seen a dramatic decrease thanks to AWS's transition to greener energy. This shift not only benefits dxw but also helps our clients lower their own environmental footprints. Additionally, our focus on reducing travel-related emissions has been successful, with an overall 20% decrease and a significant reduction in emissions from flights.
We have also observed an increase in emissions related to Employee Commuting, Expenses and Work from Home, which is reflective of our growing team. However, we are actively encouraging the use of green energy among our staff, and with the ongoing efforts of our dxw Earth group, we expect to see positive changes in these areas in the near future.

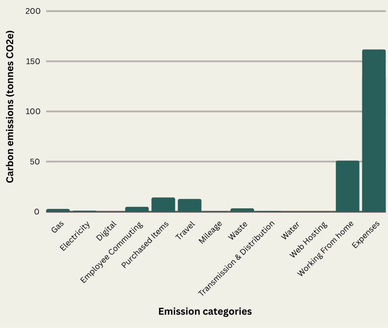

Figure 2. Breakdown of individual emission categories

Figure 2 displays the emissions breakdown by category, with expenses being the most significant contributor, followed by working from home and purchased items. These provide dxw insights into which emissions significantly contribute to carbon emissions and consequently which ones we can target in our carbon reduction strategy.

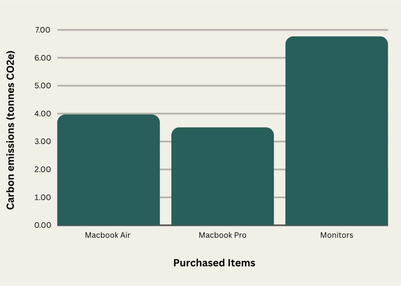

Figure 3. Breakdown of emissions from Purchased Items.

Figure 3 displays the carbon emissions from purchased items: Macbook Air, Macbook Pro and monitors. Monitors contributed the most to carbon emissions under this category. dxw may consider purchasing fewer monitors in exchange for more energy efficient products, to reduce emissions in this category.

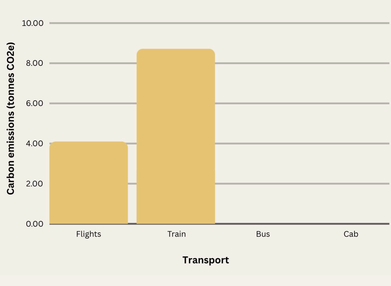

Figure 4. Breakdown of carbon emissions from Transportation.

Figure 4 demonstrates the emissions from different modes of transport used by dxw, which includes flights and trains. The most significant contributor to carbon emissions was trains, which differs from the previous year where flights generated the most emissions. It was concluded carbon emissions for buses and cabs did not have a significant contribution to carbon emissions, largely due to their infrequent usage.

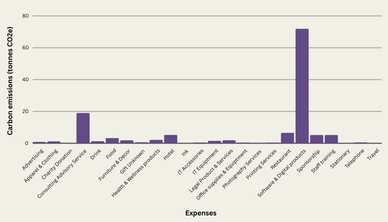

Figure 5. Breakdown of carbon emissions from Expenses

Software and digital products significantly contributed to the emissions in the expenses category. Staff training and consulting advisory services also had relatively high contributions. Note that emissions from travel were accounted for in a separate category. This plot offers insights into the key areas where dxw can focus their efforts to reduce emissions.

This report demonstrates our commitment to a sustainable future. By continuing to refine our analysis and reduction strategies, we're not just reducing our own carbon footprint but also helping our clients do the same. As we move forward, our focus remains on spending our carbon budget wisely, ensuring that every step we take contributes towards our journey to Net Zero.