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August 2025

University of Manchester

Scope 3 Footprint Report

Contents

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Introduction

Project Overview

The University of Manchester (UoM) has a commitment to become zero carbon by 2038 for Scopes 1 and 2 and net zero carbon by 2050 for Scope 3.

The University commissioned Eunomia to complete the scope 3 footprint for the 2023/24 academic year. The project objectives were as follows:

- Understand what should be included within the boundary of the Scope 3 footprint;
- Collect appropriate data in an effective format and analyse available data for coverage and quality;
- Complete a carbon footprinting exercise to calculate Scope 3 2023/24 emissions in line with best practice and compare to previous years; and
- Host a cross-functional in-person workshop to present the 2023/24 footprint and discuss scope 3 reduction opportunities.

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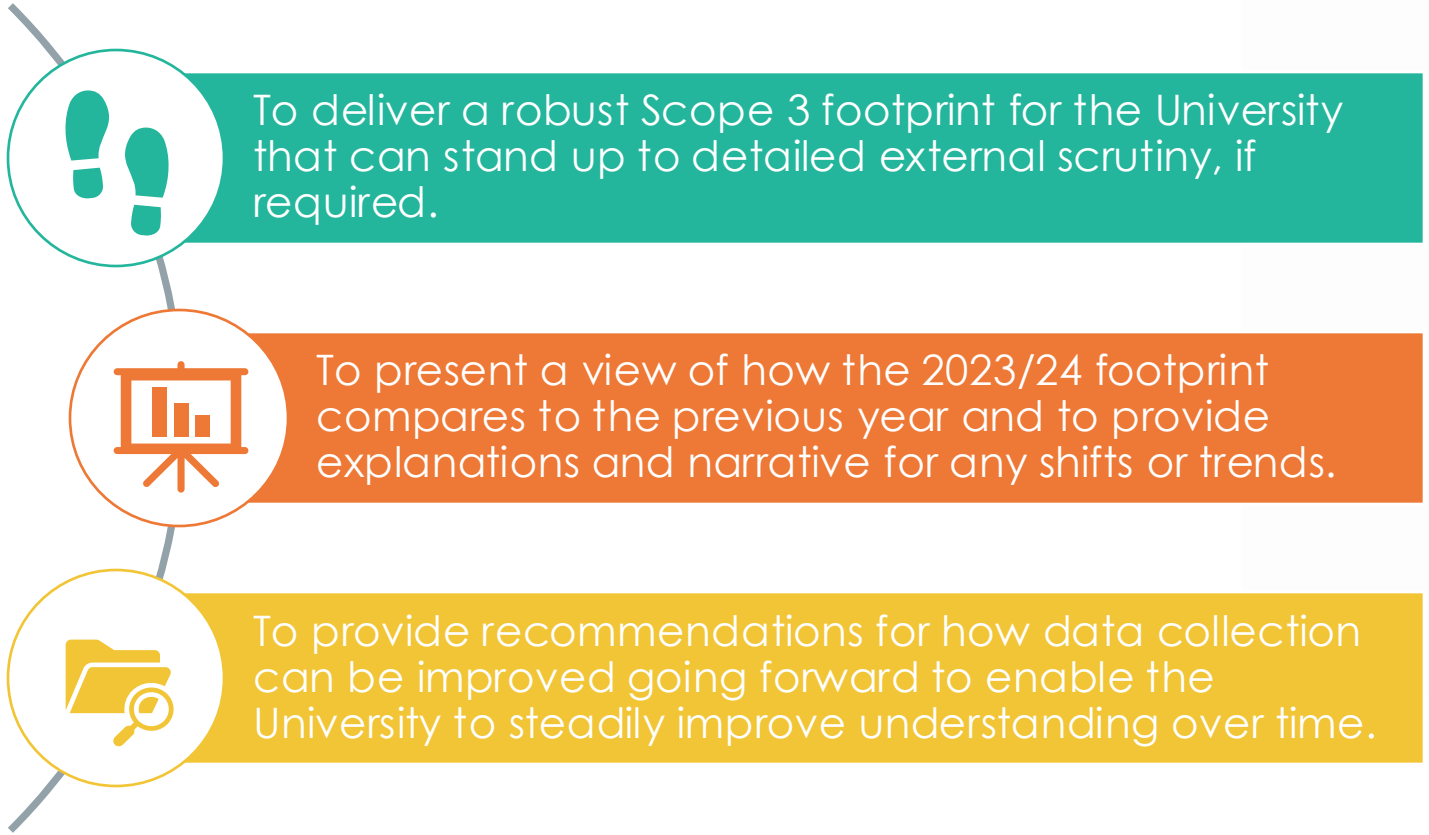
Footprint Aims

This report shows the outcome of the 2023/24 footprinting exercise. The aims of this exercise were as follows:



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Method Overview

The Greenhouse Gas Protocol

The Greenhouse Gas (GHG) Protocol provides the world's most widely used GHG accounting standards and has been used to guide the GHG boundary recommendations outlined, along with guidance from the Alliance for Sustainability Leadership in Education.[1,2] Such GHG accounting standards provide a framework for measuring and tracking the quantity of GHGs an organisation emits. This will ensure the calculated GHG footprint is robust and in line with best practice.

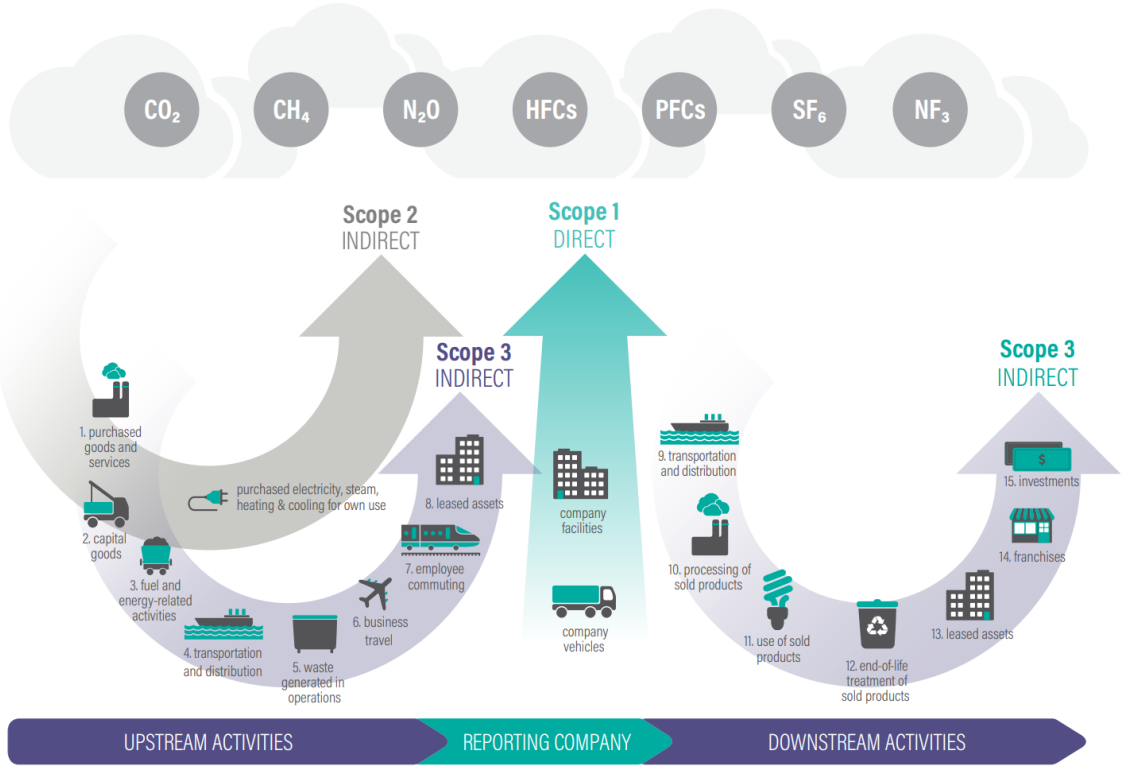
Under the GHG protocol, emissions are separated into 3 'Scopes' according to the relationship between the reporting organisation and the emitting activity:

- Scope 1 – all direct emission sources (e.g., gas and fuel usage);
- Scope 2 – indirect emissions arising from the generation of electricity (and heat and steam, although in the UK, it is almost exclusively electricity); and
- Scope 3 – all other indirect emission sources – there are 15 categories (see Figure 1).

The GHG protocol provides guidance regarding the setting of organisational and operational boundaries and the allocation of GHG sources into Scopes. However, it is not well aligned with the needs of large, complex organisations such as universities. This is common to all existing footprinting frameworks. However, with suitable amendments, it remains an appropriate and comprehensive framework for calculating the emissions of academic institutions. The 'University of Manchester Boundary Setting and Data Request v1.0' document highlights where such amendments have been applied to the University's boundary setting.

This project and all associated outputs relate to The University of Manchester's Scope 3 emissions only.

Figure 1: Diagram of the GHG Protocol scopes and categories

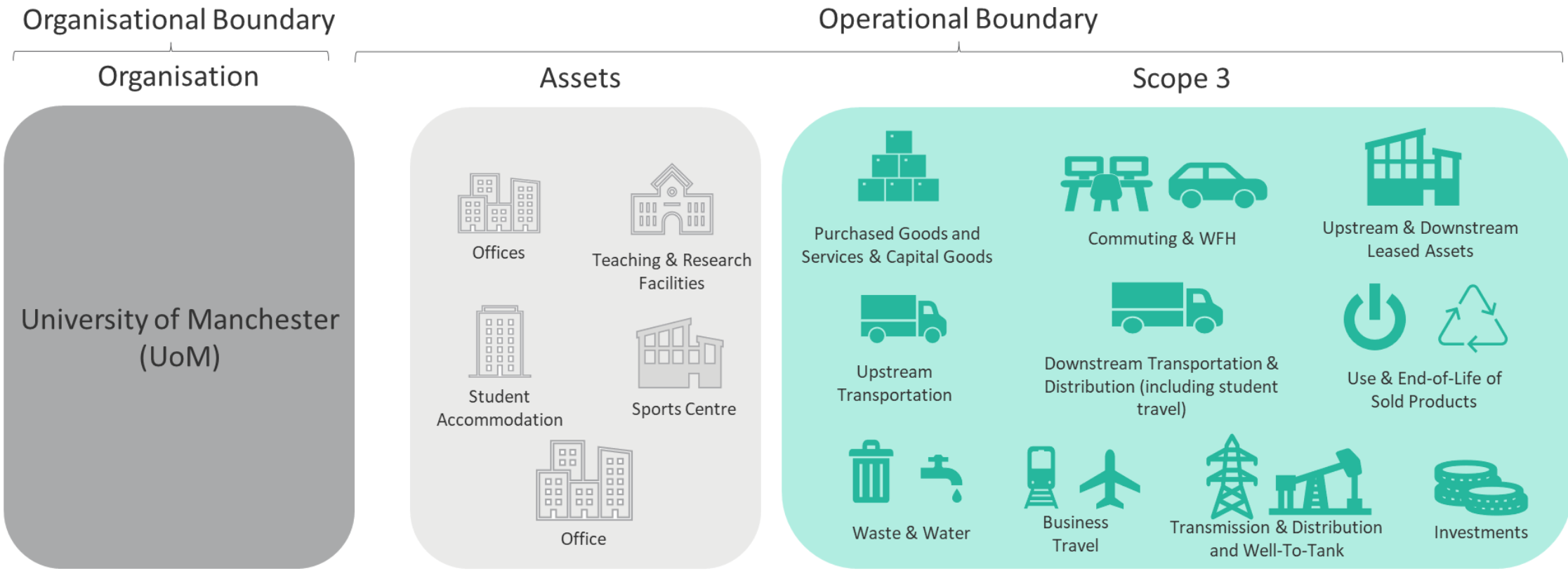


1. Greenhouse Gas Protocol (2001). Greenhouse Gas Protocol Corporate Standard. Available at: https://ghgprotocol.org/sites/default/files/standards/ghg-protocol-revised.pdf
2. The Alliance for Sustainability Leadership in Education (2022). Standardised Carbon Emissions Reporting For Further and Higher Education. Available at: https://www.eauc.org.uk/scef

Boundary Setting

The entities, assets and GHG sources included within The University of Manchester's Scope 3 footprint are outlined in Figure 2. More information on the University's Scope 3 organisational and operational boundary can be found in 'University of Manchester Boundary Setting and Data Request v1.0' document and are summarised in Appendix A.1.

Figure 2: The University of Manchester's assets and premises included in its Scope 3 emissions footprint



Data Collection and Emissions Calculations

Following the boundary setting exercise, Eunomia provided the University of Manchester with a data request to guide the collection and provision of the necessary data to calculate a full carbon footprint for the year 2023/24. This covered all entities and split the request into the relevant GHG protocol emission categories, each of which contained up to three levels of data requirements: minimum, intermediate and optimal.[1]

The levels were ranked based on the accuracy of the University of Manchester's emissions data and the resulting calculations. For instance, when considering natural gas usage for heating upstream leased buildings, the greenhouse gas (GHG) emissions result from the combustion of the gas. Therefore, the ideal data required would measure this activity, specifically the amount of gas combusted during the footprint year. The intermediate requirement was the amount paid for the supply of the combusted gas, which, while requiring the assumption of a price per unit supplied, correlates directly with the amount combusted. The minimum requirement was the floor area of buildings heated by natural gas. These data, combined with secondary sources like national averages on fuel consumption for heating various types of commercial buildings, could be used to estimate the consumption.

Where there were data gaps, extrapolation was used to cover the University's full organisational boundary. For example, the calculation of the end-of-life emissions associated with the products sold at the University gift shop was based on a detailed review of the material composition of 80% of units sold. The distribution of materials and likely disposal routes for this 80% were assumed to be representative of the remaining products. Consequently, these data was extrapolated to cover all items sold by the gift shop in 2023/24.

Following this, a relevant emission factor was applied to calculate the tonnes of carbon dioxide equivalent (tCO_2e) generated from the activity. Unless otherwise stated, the emission factors used were sourced from the Department for Business, Energy & Industrial Strategy (BEIS) and the Department for Energy Security and Net Zero (DESNZ) conversion factors for 2024.[2]

The application of these emission factors, along with the methods of extrapolation and use of secondary data, is further detailed in the category-specific sections of this report. The sources for this information are listed in the Data Sources section.

1. The GHG Protocol Corporate Standard
2. Greenhouse gas reporting: conversion factors 2024

Data Quality

Data Sources

Wherever possible, activity-based primary data on the University of Manchester's activities was used to calculate Scope 3 emissions. These data are considered the highest quality as they have the most direct relationship to the emitting process and produce the most accurate footprint results.

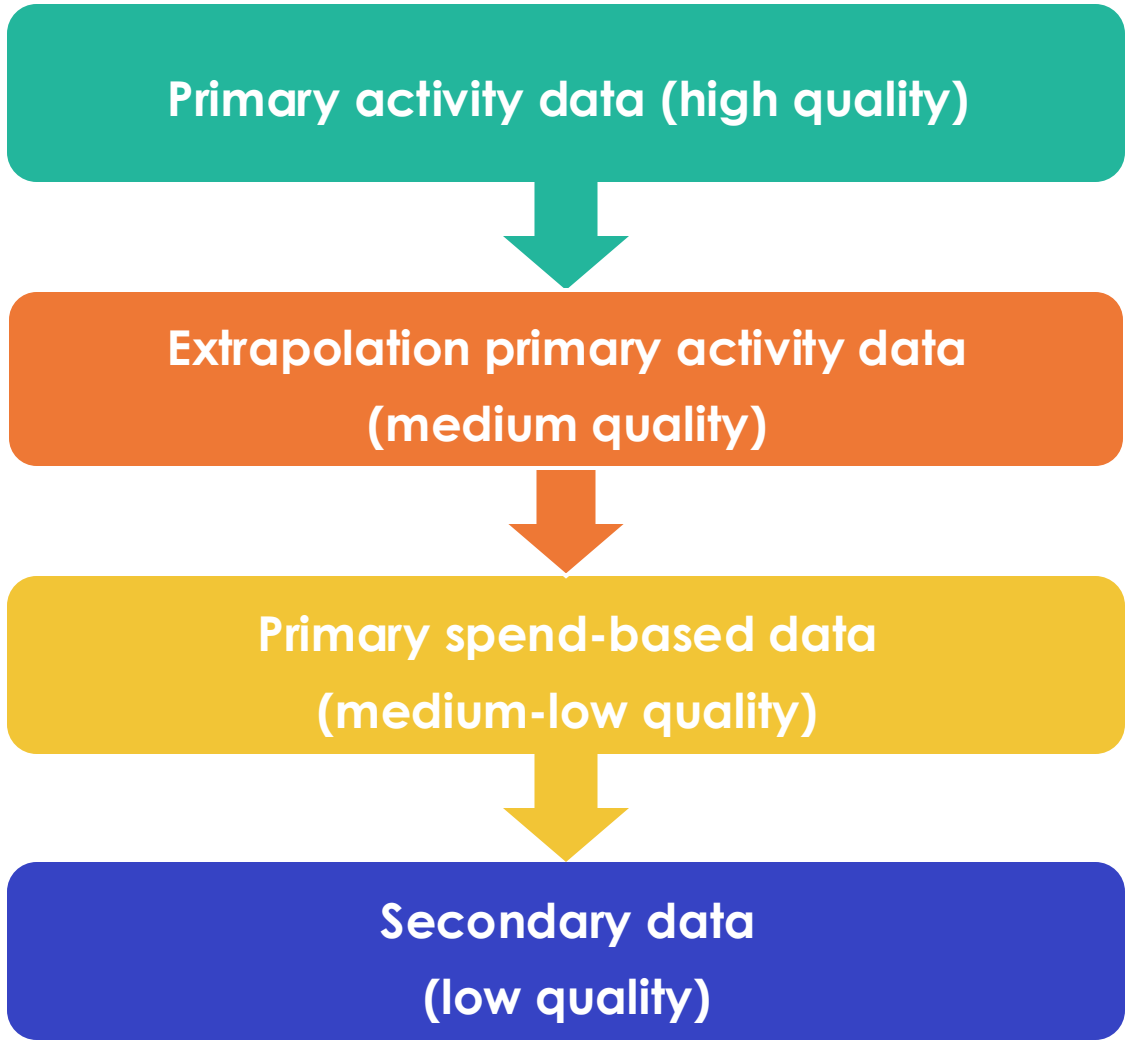
Where there were gaps in these data, extrapolation was used to ensure that as much of the results were based on the University of Manchester's specific data as possible. These data were of medium quality.

Where no primary activity-based data was available, spend-based data was used to estimate emissions. Data on the amount spent by the University of Manchester on goods or services was multiplied by conversion factors. These conversion factors reflect the industry average emission intensity per pound sterling. While this method uses spend data specific to the University of Manchester, it also relies on industry average emission intensities which do not reflect the specific good or service procured. Due to this, this type of data was considered medium-low quality.

Where none of the above were possible, secondary data was used to estimate the emissions attributable to the University of Manchester. UK average energy intensities of different commercial building types is one example of a secondary data set used. Although secondary data is used only when the source is reputable and the methodology is robust, this data is still considered low quality. This is because these data do not accurately reflect the actual emission-causing activities of the University of Manchester and offers limited scope for tracking progress.

Following each category's results, the relevant data improvement recommendations are given. A summary of key recommendations is given in slides 57-62.

Figure 3: Data hierarchy



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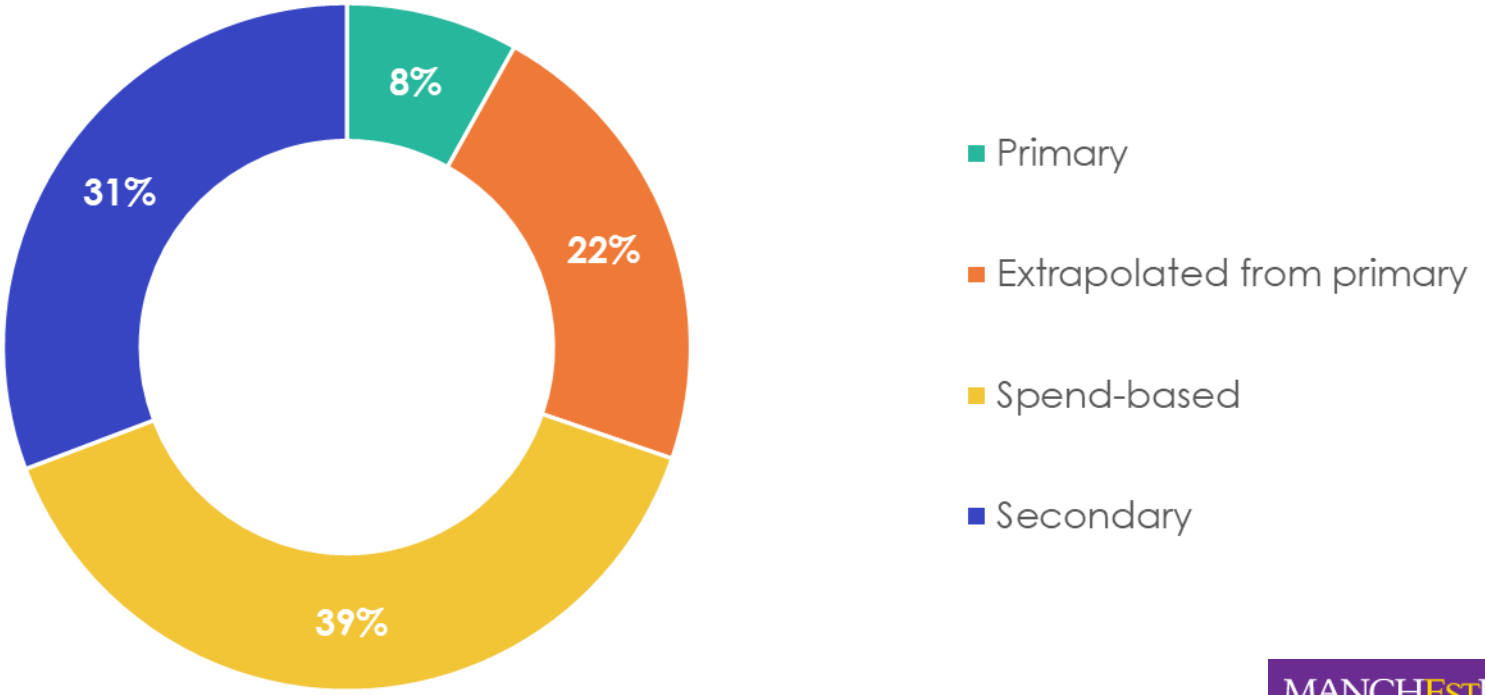
Data Sources

Following the calculation of the footprint according to these principles, the greatest data source category was 'spend-based', which covered almost 40% of all emissions while 'primary' was less than 10%. The main contributing factor to these results is the PGS, data, which, while containing some primary data, such as data for the food and drink supplied by Klimato, required spend-based data to quantify the majority of the category's emissions.

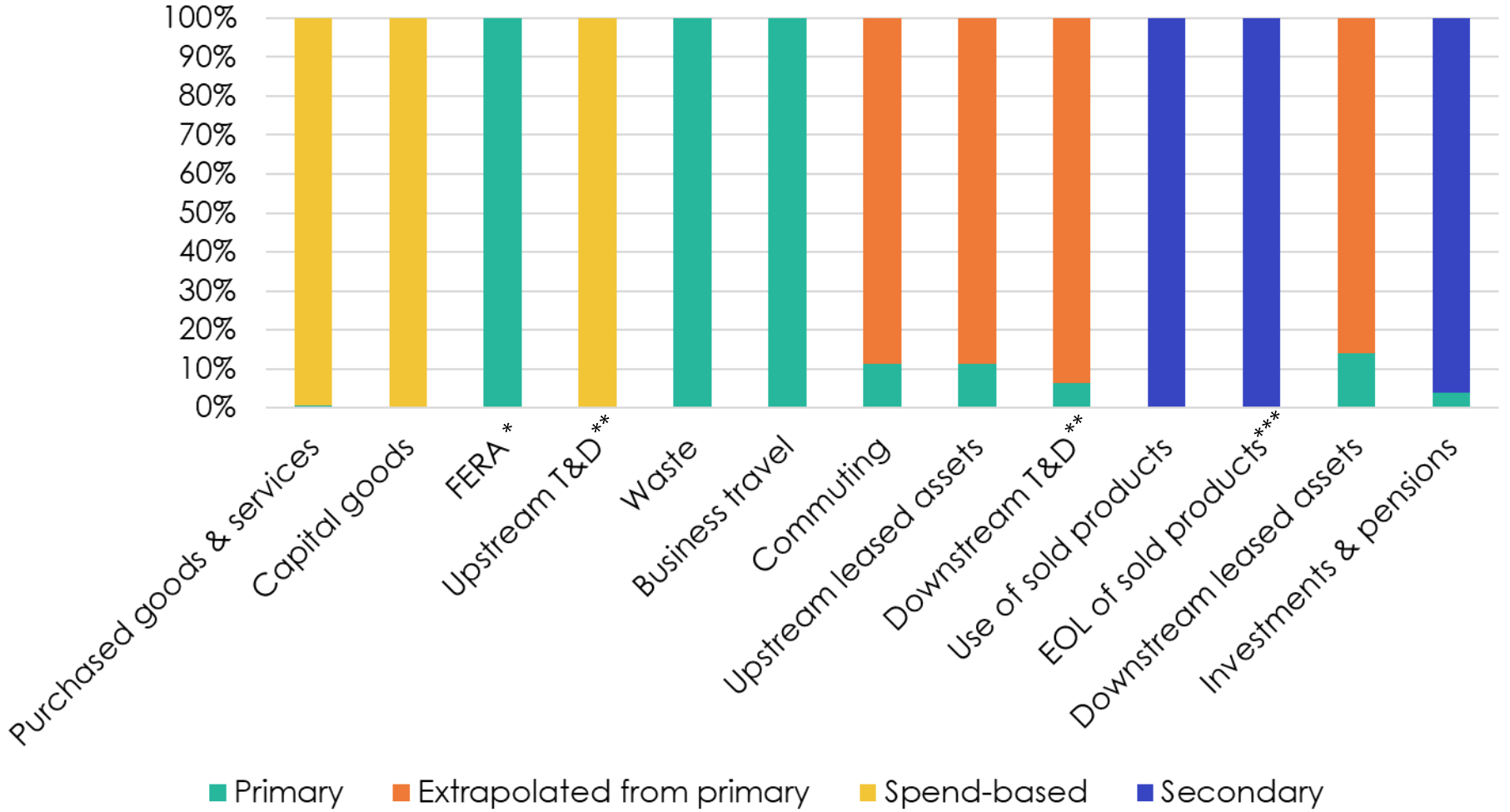
This distribution is shown in total in figure 4 below and by emission category on the following slide.

Figure 4: Emissions by data source



Data Sources

Figure 5: Emissions by data source and category



* FERA = Fuel- and energy-related activities. These are not included in Scope 1 or Scope 2
** T&D = Transportation and distribution
*** EOL = End-of-life

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Results Overview

Scope 3 GHG emissions footprint summary

Eunomia has worked with the University of Manchester to calculate its Scope 3 emissions for August 2023 – July 2024.

These emissions were found to total **617,090 tCO_2e** and are outlined in Table 1.

Table 1: Scope 3 Emission Summary

Category	Description	tCO_2e	%
1	Purchased goods & services (PG&S)	**192,794**	**31%**
2	Capital goods	**29,174**	**5%**
3	Fuel- and energy- related activities (FERA)	**13,251**	**2%**
4	Upstream transport and distribution (UT&D)	**227**	**0.04%**
5	Waste generated during operations	**163**	**0.03%**
6	Business travel	**14,531**	**2%**
7	Employee commuting	**7,181**	**1%**
8	Upstream leased assets	**9,463**	**2%**
9	Downstream transport & distribution (DT&D)	**105,636**	**17%**
11	Use of sold products	**10**	**0.002%**
12	End of Life (EoL) of sold products	**4**	**0.001%**
13	Downstream leased assets	**10,730**	**2%**
15	Investments	**233,927**	**38%**
Total		**617,090**	

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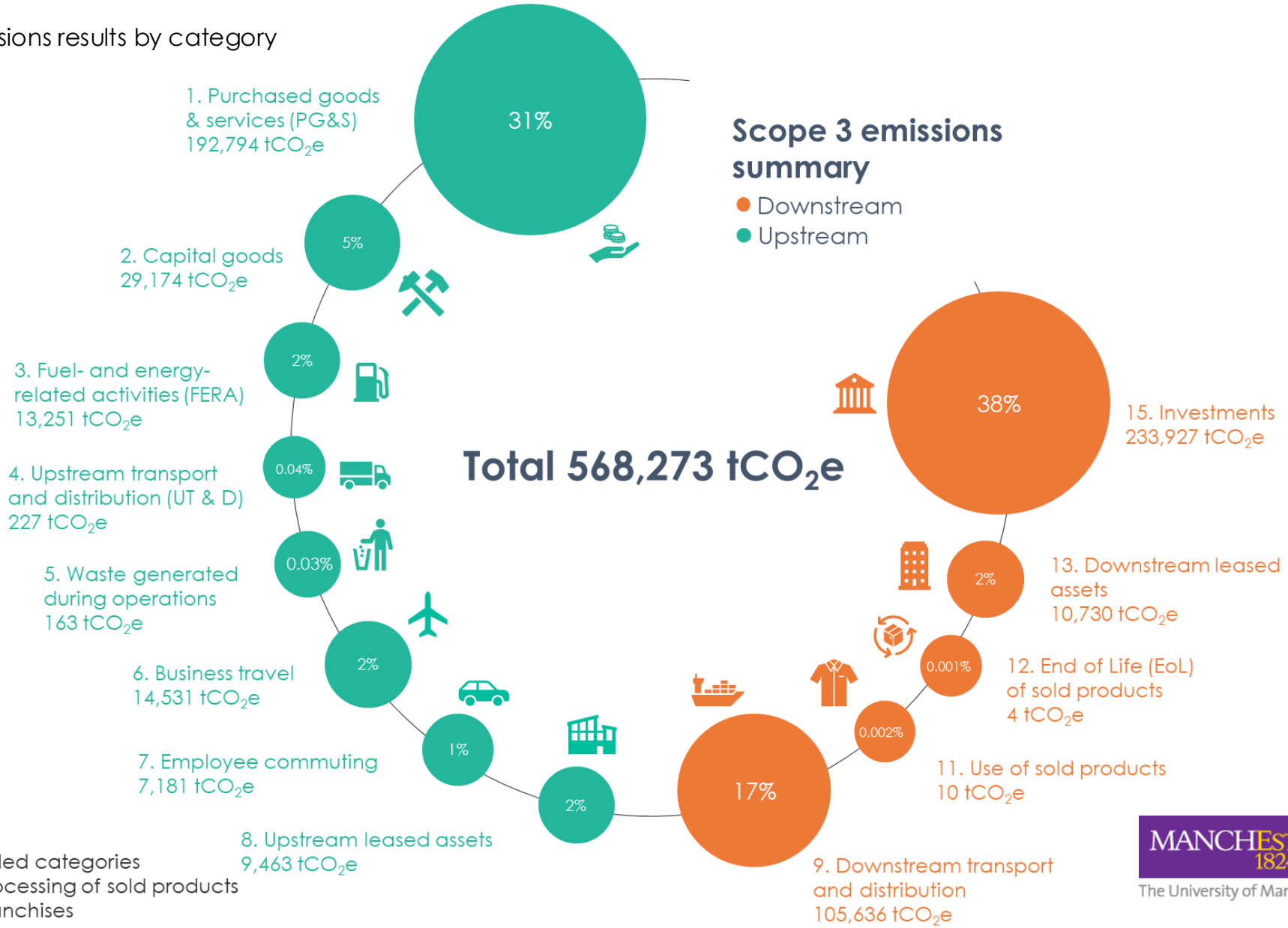
Scope 3 GHG emissions footprint summary 2023/2024

Figure 6: Emissions results by category



Excluded categories
10. Processing of sold products
14. Franchises

Scope 3 GHG emissions footprint summary

Table 2 shows the breakdown of the results along with the changes since the baseline, 2018/19, and the previous year, 2022/23. It should be noted here that the scope of the footprint has been increased in line with carbon accounting best practice. Table 3 presents a breakdown of the footprint with the newly included emission sources excluded.

With the newly included emission sources, the overall emissions value has increased compared to both the baseline and the previous year, with the baseline value being exceeded by 58%. There are some large increases in emissions for individual categories too, including a nearly 3-fold increase for upstream leased assets.

Areas of significant progress are:

- Waste, the university produces less than a quarter of the waste it did in 2018/19;
- Upstream transportation and distribution, the University spends 35% less of shipping and freight services than it did in 2018/19; and
- Capital goods, the university spent less than one-tenth the amount on capital goods in 2023/24 as it did in the baseline, mainly facilitated by the lack of construction projects.

Table 2: Scope 3 Emissions Tracking

Category	Description	2018/19	2022/23	2023/24	Change since 2018/19	Change since 2022/23
1	Purchased goods & services (PG&S)	171,213	203,036	192,794	13%	-5%
2	Capital goods	40,654	13,634	29,174	-28%	114%
3	Fuel- and energy- related activities (FERA)	10,215	11,588	13,251	30%	14%
4	Upstream transport and distribution (UT&D)	652	698	227	-65%	-68%
5	Waste generated during operations	831	227	163	-80%	-28%
6	Business travel	19,042	12,945	14,531	-24%	12%
7	Employee commuting	3,639	8,880	7,181	97%	-19%
8	Upstream leased assets	4,160	2,452	9,463	127%	286%
9	Downstream transport & distribution (DT&D)	97,461	169,722	105,636	8%	-38%
11	Use of sold products	-	-	10	-	-
12	End of Life (EoL) of sold products	6	2	4	-40%	108%
14	Downstream leased assets	1,163	2,588	10,730	823%	315%
15	Investments	41,247	33,371	233,927	467%	601%
	Total	**390,283**	**459,142**	**617,090**	**58%**	**34%**

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Scope 3 GHG emissions baseline like-for-like comparison

In the like-for-like comparison shown in Table 3, we see a 1% decrease in overall emissions compared to the previous year.

However, when the like-for-like emissions are compared to the baseline year, an increase of 16% is seen. This is largely driven by an increase in emissions from purchased goods and services, which should be an area of focus for the University if their climate goals are to be achieved.

The emission sources that were calculated for the first time in this iteration of the footprint but excluded from this like-for-like analysis are:

- Energy use in 19 upstream leased assets (6,925 tCO_2e)
- Student placement travel (6,769 tCO_2e)
- Use of sold products (10 tCO_2e)
- Energy use in 23 downstream leased assets (5,555 tCO_2e)
- Emissions associated with the Greater Manchester Pension Fund and Universities Superannuation Scheme (16,200 tCO_2e and 130,000 tCO_2e, respectively).

Table 3: Scope 3 Emissions Like-For-Like Tracking

Category	Description	2018/19	2022/23	2023/24	Change since 2018/19	Change since 2022/23
1	Purchased goods & services (PG&S)	171,213	203,036	192,794	13%	-5%
2	Capital goods	40,654	13,634	29,174	-28%	114%
3	Fuel- and energy- related activities (FERA)	10,215	11,588	13,251	30%	14%
4	Upstream transport and distribution (UT&D)	652	698	227	-65%	-68%
5	Waste generated during operations	831	227	163	-80%	-28%
6	Business travel	19,042	12,945	14,531	-24%	12%
7	Employee commuting	3,639	8,880	7,181	97%	-19%
8	Upstream leased assets	4,160	2,452	2,538	-39%	4%
9	Downstream transport & distribution (DT&D)	97,461	169,722	101,851	5%	-40%
11	Use of sold products	-	-	-	-	-
12	End of Life (EoL) of sold products	6	2	4	-40%	108%
14	Downstream leased assets	1,163	2,588	5,175	345%	100%
15	Investments	41,247	33,371	87,727	113%	163%
Total		**390,283**	**459,142**	**454,616**	**16%**	**-1%**

* More information on this increase is provided on slide 26.

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Scope 3 GHG emissions footprint – methodology changes

As mentioned in the previous slide, the scope of included emissions was increased for this iteration of the footprint in order to better align with the guidance of the GHG protocol and the carbon accounting practices of other universities. The changes are summarised below.

Table 4: Methodology changes summary

Category	Description	Changes
8	Upstream leased assets	Buildings without data are no longer excluded from the footprint. The associated emissions are now estimated using energy intensity averages. This resulted in 19 additional assets being included, bringing the total to 31. Note, some buildings are subdivided into multiple assets (e.g. Bright Building Suite 2 and Suite 3 are separate assets). This increased the emissions of the category more than a factor of three.
9	Downstream transport & distribution (DT&D)	The initial outbound and final inbound journeys of students' placements were additionally included in this footprint. This resulted in the total distance travelled by students that was relevant to the University's footprint increasing by 4% and the associated emissions to increase by 7%.
11	Use of sold products	This was a newly included category, which accounts for the indirect energy use that occurs when sold clothing is laundered. The emissions of this category is relatively small, totalling less than 1% of all emissions.
14	Downstream leased assets	Buildings without data are no longer excluded from the footprint. The associated emissions are now estimated using energy intensity averages. This resulted in 36 additional assets being included, bringing the total to 57. Note, some buildings are subdivided into multiple assets. This caused the accounted for downstream leased asset emissions to double.
15	Investments	The emissions associated with the Greater Manchester Pension Fund and Universities Superannuation Scheme have also been included for the first time this year. The resulting emissions of the category were more than five times greater than if the additional funds had not been included.
As a result of the increased scope, the total emissions are 36% greater than they otherwise would have been.		

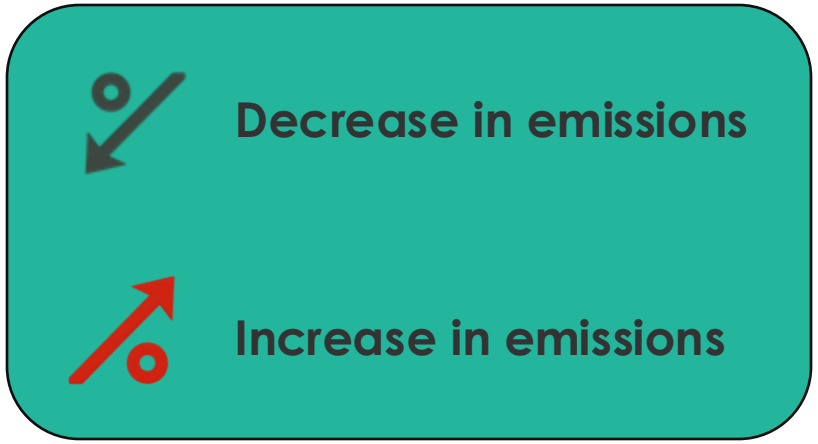
Category-Specific Method and Results

Results:
Upstream Categories

Icons Key

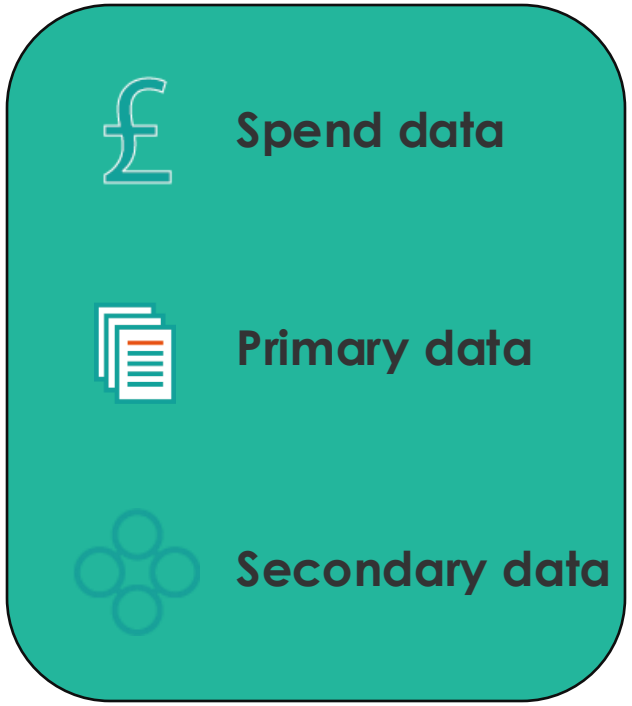
Throughout the results slides, you will notice some icons below the title for each new category. These describe whether the emissions have increased or decreased since the **baseline year** and the data type analysed for that category.

See below an explanation for each emissions change icon:



Where additional emission sources have been included in a category for this iteration of the footprint, the change in emission icon refers to the like-for-like comparison.

See below an explanation for each data type icon:



Icons Key

Following each results slide, or set of results slides, there are data improvement recommendation slides to help guide future iterations of the footprint.

The priority of each the improvements are illustrated by its colour :

- Higher priority
- Medium priority
- Lower priority

The timescale for the improvement is indicated by the following symbols:

Annually

5-yearly

Only when there is a significant change

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Purchased Goods & Services Category 1

Category 1, Purchased Goods & Services (PG&S), refers to emissions associated with goods and services. This includes emissions from material extraction, processing, manufacturing and transport.

Most category 1 emissions were calculated using data aligned with the Higher Education Supply Chain Emissions Tool (HESCET).[1] These data were then cleansed in accordance with the GHG Protocol, removing spend categories that would fall within other emission categories or were covered by other data sources. To quantify the environmental impact of the procurement, spend-based emission factors—specifically conversion factors by Standard Industrial Classification (SIC) code—were adjusted for inflation to 2024 and applied to the data.[2]

The emissions associated with the HESCET aligned data totalled **191,913 tCO_2e** from a relevant spend of £365,455,417. The total value of the data provided was £532,771,055 with £167,315,638 excluded due to the associated emissions being calculated elsewhere, or the spend not being relevant to a GHG footprint.

In addition to this, primary emissions data for the food and drink supplied by Klimato was provided, equating to **781 tCO_2e**.

This category also includes the emissions associated with the supply of 652,906 m^3 of water, which totalled **100 tCO_2e.** The treatment of wastewater is covered in category 5 as waste generated in operations.

The total emissions for this category are **192,794 tCO_2e**, the largest source of emissions and 34% of the total. With the current data being over 99% spend-based by resulting emissions, the only way the University could reduce their footprint in this category is to spend less, with more sustainable purchases not being reflected in the results. Therefore, the University should seek to collect primary emissions data where it is possible, and mass/quantity data where it is not.

Table 5: Procurement emissions by spend category, excluding water and Klimato emissions

Proc-HE2 category	Spend (£m)	Emissions (tCO_2e)	Cumulative share of emissions
Other Professional & Bought-in Services	78.3	29,604	15%
Software-as-a-service including Hosting	18.7	28,018	30%
IT Software including Bespoke Licences Maintenance	17.5	26,263	44%
Laboratory Consumables and Sundries	12.7	15,514	52%
Laboratory Chemicals	9.7	11,919	58%
Accountancy Services e.g. Audit Consultancy	22.4	8,467	62%
Laboratory Equipment Maintenance and Repair	6.8	8,281	66%
Temporary & Recruitment Employment Agencies	12.6	4,755	69%
Laboratory Gases and Refrigerants	1.1	4,587	71%
Building Related Professional Services	8.6	3,253	73%
Laboratory Small Apparatus and Equipment	2.3	2,836	74%
Other and General Laboratory	2.2	2,723	76%
Fees, Lecturing, Examining, Moderating	12.8	2,300	77%
Remaining 242 categories	162.8	43,621	100%
Total	**368.5**	**191,913**	

1. Higher Education Supply Chain Emissions Tool (HESCET)
2. Conversion factors KgCO2 per £ spent, by SIC code 2021

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Data Improvement Recommendations
Purchased Goods & Services Category 1

Emissions Source	Current Data	Intermediate Recommendation	Timescale	Optimal Recommendation	Timescale
Purchased goods and services excluding water and Klimato	Minimum	• Obtain the physical quantity of each purchased good or service in number of units, e.g., kg or other relevant units.		• Obtain supplier-specific cradle-to-gate emissions data for the procured goods and services. • Obtain gigabytes of data stored via a third party.	 
Food and drink supplied by Klimato	Optimal	• N/A	• N/A	• N/A	• N/A
Water supply	Optimal	• N/A	• N/A	• Obtain volume consumed during operations in m^3 or litres <u>at a building level.</u>	

For purchased goods and services, although minimum data requirements were provided, data was clearly categorised to facilitate separation of spend into relevant scope 3 categories. This is effective in future-proofing the carbon accounting within scope 3 for when higher quality data becomes available. Sometimes, all spend data must be categorised under Category 1 due to low oversight over what the spend represents. When better quality data becomes available, emissions are effectively 'recategorised' into the relevant scope 3 category, which gives limited visibility of change in emissions through time. The University's clear labelling of spend data means that emissions can be appropriately categorised at this stage, enabling comparability when better quality data becomes available, and emissions are recalculated.

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Capital Goods Category 2

Category 2, Capital Goods, refers to emissions from the production of final products that have an extended life, often termed 'fixed assets' in financial accounting. These fixed assets include items such as buildings, equipment, machinery, buildings and vehicles.

These emissions were calculated using spend data aligned with the HESCET tool.[1] After re-categorising the data to comply with GHG Protocol emission categories, HESCET-aligned emission factors—specifically conversion factors by SIC code—were applied to this spend data. This resulted in a GHG emissions footprint of **29,174 tCO_2e** from £25,654,209 of procurement, 5% of the overall footprint.[2] A summary of this footprint is provided in Table 6.

As with the previous category, the dependency on spend-based data means more sustainable procurement is not reflected in the results and only spending less can lower the calculated emissions.

In the previous year, the majority of spend was associated with Capital Projects, for which the emission intensity was calculated by EcoAct. This calculated emission intensity was relatively low, giving rise to fewer emissions per £. For the latest year, more than 75% of the spend was on laboratory capital equipment, for which the emission intensity is much higher. The emissions from this sub-category alone are more than those calculated in total for the previous year. This is not unsurprising when a spend based approach is used. Specific Capital Goods are mostly not purchased annually but rather bought as needed and not replaced for many years due to their long use phases. This can lead to inconsistent emission values for the category as the types of goods purchased can vary significantly from year to year.

The average emission intensity of Capital Goods bought in the previous year was 0.24 kg CO_2e while for the current year it was 1.14 kg CO_2e, with the intensity for laboratory capital equipment being 1.22 kg CO_2e.

1. Higher Education Supply Chain Emissions Tool (HESCET)
2. Conversion factors KgCO2 per £ spent, by SIC code 2021

Table 6: Capital Goods emissions

Proc-HE 2 category	tCO_2e
Laboratory Capital Equipment	24,130
Medical Capital Equipment	3,926
Plant Purchase, Hire & Maintenance	912
Telephony Capital Purchase	130
Temporary & Mobile Buildings, Hire & Purchase	59
Agricultural, Fisheries, Forestry, Oceanographic Capital Equipment	16
Total	**29,174**

Data Improvement Recommendations
Capital Goods Category 2

Emissions Source	Current Data	Intermediate Recommendation	Timescale	Optimal Recommendation	Timescale
Capital Goods	Minimum	• Obtain the physical quantity of each purchased capital good in number of units, e.g., kg or other relevant units.		• Obtain supplier-specific cradle-to-gate emissions data for the procured goods and services.	

Fuel- and Energy-related Activities not included in Scope 1 or Scope 2 (FERA) Category 3

Category 3, Fuel- and Energy-related Activities (FERA), refers to emissions from the extraction, production and transportation of fuels and energy used by the University of Manchester. It does not include emissions from direct fuel or electricity consumption, as these activities fall within Scope 1 and 2 under the GHG Protocol.

For fuel, such as natural gas used to heat buildings and fuel used in fleet vehicles, this includes Well-to-Tank (WTT) activities from the production, processing, and delivery of the fuel. For electricity, WTT emissions are included along with those associated with energy loss through transmission and distribution (T&D) before it is used by the University.

The University of Manchester provided fuel and energy consumption data for their buildings and vehicles. Eunomia then applied the relevant FERA emission factors for Well-to-Tank (WTT) activities and transmission and distribution (T&D) losses.[1] A summary of these results are presented in Table 7, indicating a total of **13,251 tCO_2e**, 2% of the overall footprint.

Table 7: FERA emissions

Activity	Consumption	Unit	Emission Factor ($kgCO_2e$ per unit)	tCO_2e
Natural Gas - WTT	211,608,403	kWh (Gross CV)	0.0302	6,393
Electricity - WTT	100,238,684	kWh	0.0459	4,601
Electricity - T&D	100,238,684	kWh	0.0183	1,834
Electricity - WTT (T&D)	100,238,684	kWh	0.0040	398
Diesel - WTT	30,561	litres	0.6110	19
Petrol - WTT	11,500	litres	0.5809	7
Total				**13,251**

1. Greenhouse gas reporting: conversion factors 2024

Data Improvement Recommendations

Fuel- and Energy-related Activities not included in Scope 1 or Scope 2 (FERA) Category 3

Emissions Source	Current Data	Intermediate Recommendation	Optimal Recommendation	Timescale
Fuel consumption in University-owned vehicles	Optimal	• N/A	• Obtain fuel consumption in m^3 or litres in owned vehicles for each type of fuel used at a vehicle level.	
Electricity consumption in University-owned vehicles	Below minimum	• N/A – the University owns some electric vehicles but does not have data about electricity consumption. However, if charged onsite, this electricity consumption is already accounted for by the University.		• N/A
Fuel consumption in operational buildings	Optimal	• N/A	• N/A	• N/A
Electricity consumption in operational buildings	Optimal	• N/A	• N/A	• N/A

For fuel and electricity consumption in operational buildings, we received data at a building level with unique building codes to map between fuels and electricity. This should be commended as it maximises data transparency and minimises potential errors.

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Upstream Transportation & Distribution Category 4

Category 4, upstream transportation and distribution, refers to emissions from the transportation of goods from suppliers to the University of Manchester's premises in vehicles not owned by the University.

Category 4 emissions were calculated from the spend data, which was provided by HESCET Proc-HE 2 category and also used for category 1 and 2. The emissions here are those associated with the Proc-HE 2 categories for courier and shipment services. This was then multiplied by the relevant emission factor to indicate an emission footprint of **227 tCO_2e**, 0.04% of the overall footprint, as summarised in Table 8.[1]

Table 8: Upstream transportation and distribution emissions

Activity	tCO_2e
Freight, Carriage & Haulage Services	119
Courier Services	105
Mail Services	3
Total	**227**

1. Greenhouse gas reporting: conversion factors 2024

Data Improvement Recommendations
Upstream Transportation & Distribution Category 4

Emissions Source	Current Data	Intermediate Recommendation	Timescale	Optimal Recommendation	Timescale
Fuel consumption in non-operational vehicles	Minimum	• Obtain mileage, vehicle type and fuel type associated with third-party journeys.		• Obtain supplier-specific emissions data for transportation and distribution services.	

Waste Generated in Operations Category 5

Category 5 refers to emissions from the disposal and treatment of waste generated in operations, for example, the emissions from decomposing waste in landfills or the emissions from the operations of material recycling facilities. This category includes the emissions related to the treatment of wastewater.

The University of Manchester provided data on the mass of waste by material and disposal/treatment pathway generated during construction works, as well as in the student residences and campus (non-residential). For wastewater treatment emissions, the University provided the volume of water used at their premises. An emission factor relevant to the material and disposal pathway was then applied to these data.[1] A summary of these emissions for each disposal/treatment pathway are presented in Tables 9 to 11.

The University's emissions from waste were calculated to be **163 tCO_2e,** of which **121 tCO_2e** was from wastewater**.** This category makes up 0.03% of the overall footprint.

Table 9: Campus waste emissions summary

Disposal/treatment pathway	Mass of waste (tonnes)	Effective emission factor ($kgCO_2e$/tonne)*	Emissions (tCO_2e)
Landfill	36	520.3	18.719
Combustion	1,159	6.4	7.427
Recycling	570	6.4	3.640
Composting	138	8.9	1.230
Anaerobic digestion	39	8.9	0.342
Total	**1,942**		**31.358**

*Actual emission factors used were specific to each material/disposal type combination. The effective emission factor values presented here are therefore the average of all factors used.

1. Greenhouse gas reporting: conversion factors 2024

Waste Generated in Operations Category 5

Table 10: Residences waste emissions summary

Disposal/treatment pathway	Mass of waste (tonnes)	Effective emission factor ($kgCO_2e$/tonne)*	Emissions (tCO_2e)
Combustion	637	6.4	4.083
Landfill	2	520.3	0.972
Composting	65	8.9	0.577
Recycling	85	6.4	0.544
Anaerobic digestion	38	8.9	0.341
Total	**827**		**6.517**

Table 11: Construction waste emissions summary

Disposal/treatment pathway	Mass of waste (tonnes)	Effective emission factor ($kgCO_2e$/tonne)*	Emissions (tCO_2e)
Landfill	61	41.0	2.511
Recycling	877	1.3	1.120
Combustion	72	6.4	0.459
Reuse	15	0.0	0
Total	**1,025**		**4.090**

*Actual emission factors used were specific to each material/disposal type combination. The effective emission factor values presented here are therefore the average of all factors used.

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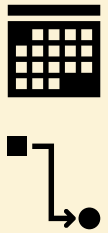
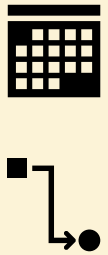
Data Improvement Recommendations
Waste Generated in Operations Category 5

Emissions Source	Current Data	Intermediate Recommendation	Optimal Recommendation	Timescale
Waste generated in operations	Optimal	• N/A	• Obtain mass and end-of-life treatment of waste by material type at a construction project level. • Align naming conventions of buildings across waste data and energy consumption data.	
Wastewater generated in operations	Optimal	• N/A	• Obtain volume of water consumed during operations at a building level. • Consider adjusting volume of water consumed down slightly to correct for water which is consumed but not wasted onsite.	

For waste generated in operations, we received mass, material and treatment type of both operational and construction waste. Construction waste data was provided broken down to construction company level. We received waste data at a building level, however different naming conventions mean that we cannot easily compare waste data to energy consumption data on a per-building basis.

For wastewater, the current approach taken is to assume that water purchased is equal to water wasted. This is the recommendation made by UoM's water supplier and is industry standard. However, a slight correction of wastewater compared to purchased water would account for anticipated differences between the true values e.g. due to water being consumed and moved out of the University (95% would be a typical adjustment).

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Business Travel Category 6

Category 6, Business Travel, includes emissions from employee travel for business-related activities in vehicles not owned or operated by the University of Manchester, such as air, rail, ferry, bus and taxi travel. Category 6 also includes emissions from hotel stays.

For staff travel, which included air, bus, car, taxi, rail and ferry journeys, the University of Manchester provided the total annual distance and class, where relevant, to which a distance-based emission factor was applied.[1] For hotel stays, the expense data was provided, which provided the location and, in most cases, the check in/out dates. Where the latter was not provided, extrapolation was used from similar trips to estimate the number of nights stayed. A country-specific emission factor for hotel stays was then applied to these data from the BEIS Conversion Factor collection.[1] If a country was not listed in these factors, another was used as a proxy, with the selection made considering climate and national grid inputs.

Data for student field trip travel was provided in various formats, tailored to specific schools or trips. From each data source, the locations, number of students and modes of travel were provided, and approximate distances travelled were provided in most cases. The total combined distance travelled by all students per mode was calculated for each trip, to which the relevant BEIS conversion factors were applied to calculate the associated emissions.[1] Where the distances were not provided per mode, they were estimated using various online resources.[2,3,4]

The University's emissions from Business Travel were calculated to be **14,531 tCO_2e**, 3% of the overall footprint. Tables 12 to 13 provide a breakdown of emissions by transport mode for staff business travel and student field trips respectively.

1. Greenhouse gas reporting: conversion factors 2024
2. Flight distances taken from https://www.airmilescalculator.com/
3. Rail distances from https://brouter.damsy.net/latest/#map=13/55.9329/-3.1979/standard&profile=rail
4. Driving distances https://www.google.co.uk/maps

Business Travel Category 6

Table 12: Staff business travel emissions

Type and Class	Consumption	Unit	Emission Factor ($kgCO_2e$ per unit)	Emissions (tCO_2e)
Long-haul - economy class	20,429,129	passenger.km	0.200	4,088
International - economy class	22,743,635	passenger.km	0.135	3,062
Long-haul - business class	2,772,174	passenger.km	0.580	1,609
International - business class	2,721,493	passenger.km	0.390	1,063
Short-haul - economy class	5,521,883	passenger.km	0.183	1,010
Hotel*	41,212	Nights	17.264	711
Long-haul - premium economy class	1,533,187	passenger.km	0.320	491
National rail	6,107,472	passenger.km	0.035	217
International - premium economy class	935,277	passenger.km	0.215	201
Average car - fuel unknown	759,949	km	0.167	127
Short-haul - business class	352,395	passenger.km	0.274	97
Long-haul - first class	47,193	passenger.km	0.800	38
International - first class	29,986	passenger.km	0.539	16
Regular taxi	70,941	passenger.km	0.149	11
Local bus	42,670	passenger.km	0.130	6
Ferry average	2,936	passenger.km	0.113	0.3
International rail	72,321	passenger.km	0.004	0.3
Average motorbike	279	km	0.114	0.03
			Total	**12,746**

*For hotels, the emission factor varies by country. The value presented here is therefore the average factor across all hotel stays.

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Business Travel Category 6

Table 123: Student field trip travel emissions

Type and Class	Consumption	Unit	Emission Factor ($kgCO_2e$ per unit)	Emissions (tCO_2e)
Long-haul - Average passenger	4,258,897	passenger.km	0.261	1,113
Long-haul - Economy class	1,243,114	passenger.km	0.200	249
Short-haul - Average passenger	1,187,423	passenger.km	0.186	221
Short-haul - Economy class	912,479	passenger.km	0.183	167
Coach	766,401	passenger.km	0.027	21
National rail	409,180	passenger.km	0.035	15
Regular taxi	1,622	passenger.km	0.149	0.24
Ferry average	913	passenger.km	0.113	0.10
Average car - fuel unknown	62	km	0.167	0.01
			Total	**1,785**

Data Improvement Recommendations
Business Travel Category 6

Emissions Source	Current Data	Intermediate Recommendation	Optimal Recommendation	Timescale
Business travel including field trips	Optimal	• N/A	• Add characteristics to staff business travel data to support prioritisation of action e.g. purpose of trip, department.	
Hotel stays – staff and students	Optimal	• N/A	• Split total number of hotel nights and locations between staff and students.	

Employee Commuting Category 7

Category 7, Employee Commuting includes emissions from staff travel between their residences and their primary place of work. It also includes the emissions generated by staff energy consumption while working from home (WfH).

The University of Manchester provided survey data on the number of journeys made per year, the distance of these journeys, the primary mode of transport and the number of days per week of WfH. From these data, the total distance travelled per mode and the number of days the survey sample worked from home in the footprint year were calculated. The survey data covered 8.5% of the University staff and so these results were scaled up to account for the full workforce, with the assumption that the distribution of commuter types in the survey was representative of all staff.

A minority of respondents indicated that they regularly commuted as a car passenger. It was assumed that these journeys were carried out in vehicles driven by colleagues who were already doing the same journey, resulting in no additional emissions.

An emission factor relevant to the mode of transport, or a specific WfH emission factor, was then applied to these data.[1] The total emissions from this category were **7,181 tCO_2e**, 1% of the overall footprint. These results are presented in Table 14.

Table 14: Employee Commuting Emission Summary

Transport mode (UK)	Consumption	Unit	Emission Factor ($kgCO_2e$ per unit)	Emissions (tCO_2e)
Homeworking	1,159,340	Days	2.670	3,096
Average car - fuel unknown	15,732,727	km	0.167	2,626
National rail	21,514,230	passenger.km	0.035	763
Local bus	4,478,952	passenger.km	0.130	582
Light rail and tram	2,076,583	passenger.km	0.029	59
Average motorbike	469,173	km	0.114	53
Regular taxi	5,042	km	0.208	1
Non-emitting travel	5,484,743	km	0.000	0
		Total		**7,181**

1. Government conversion factors for company reporting of greenhouse gas emissions (BEIS)
2. Usual method of travel to work by region of workplace, TSGB0109 (DEFRA), 2019
3. Average number of trips and distance travelled by purpose and main mode: England, 2002 onwards, NTS0409 (DEFRA), 2024

Data Improvement Recommendations
Employee Commuting Category 7

Emissions Source	Current Data	Intermediate Recommendation	Optimal Recommendation	Timescale
Employee commuting	Optimal	• N/A	• Aim to improve response rate to the travel survey to increase accuracy when extrapolating. • Obtain distance travelled by mode of transport and vehicle type (e.g. petrol, diesel, electric).	
Remote working/ working from home	Optimal	• N/A	• Aim to improve response rate to the travel survey to increase accuracy when extrapolating.	

Upstream Leased Assets Category 8

Category 8, Upstream Leased Assets, includes emissions from assets leased by the University of Manchester, not already included in Scopes 1 and 2. This is primarily emissions from the consumption of energy and fuels for heating.

The University of Manchester provided fuel and energy consumption data for five of their leased sites to which the relevant emission factors were applied.[1] For any sites that did not have consumption data available, the energy and fuel consumption was approximated using the floor area provided by the University of Manchester and Chartered Institution of Building Services Engineers typical performance energy benchmarks for each building type.[2] Exceptions for this was made for the data centre site, for which desk-based research was carried out to estimate typical energy-use intensities, and car parks, for which a Better Building Partnership published value was used.[3]

The total emissions from this category were **9,463 tCO_2e**, 2% of the overall footprint. These results are presented in Table 15 and the energy intensity assumptions are shown in Table 16. Table 17 provides a breakdown per asset with primary data.

Table 15: Upstream leased assets emissions summary

Activity	Consumption	Unit	Emission Factor ($kgCO_2e$ per unit)	tCO_2e
Natural Gas	29,537,626	kWh (Gross CV)	0.183	5,402
Electricity	19,611,715	kWh	0.207	4,0601
			Total	**9,463**

1. Government conversion factors for company reporting of greenhouse gas emissions (BEIS)
2. Chartered Institution of Building Services Engineers energy benchmarks
3. Better Building Partnership benchmarks

Table 16: Energy Consumption Intensity Data

Building Type	Electricity Consumption Intensity (kWh/m^2)	Gas Consumption Intensity (kWh/m^2)
Car park	103	-
Data centre	2,452	25
Education (further and higher) Science laboratory	175	132
Education (Higher) Administration	85	108
Education (Higher) Library or learning centre	103	112
Education (Higher) Residential	64	199
Entertainment theatre	86	137
Office - Air conditioned, standard	226	178
Sports and recreation combined centre	152	598
Stores/ warehouses (unoccupied)	3	54

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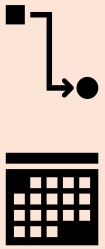
Upstream Leased Assets
Category 8

Table 17: Upstream leased assets – primary data provided.

Asset	Building Type	Activity	Consumption	Unit	Emissions (tCO_2e)
Darnhall Telescope	Telescope	Electricity	99,390	kWh	20.58
Defford Telescope	Telescope	Electricity	78,753	kWh	16.31
Knockin Telescope and Transceiver	Telescope	Electricity	126,329	kWh	26.16
Lords Bridge Telescope	Telescope	Electricity	113,640	kWh	23.53
Unit 5 Guinness Road Trading Estate	Storage	Electricity	10,549	kWh	2.18
	Storage	Natural gas	125,105	kWh (Gross CV)	22.88

Data Improvement Recommendations
Upstream Leased Assets Category 8

Emissions Source	Current Data	Intermediate Recommendation	Timescale	Optimal Recommendation	Timescale
Upstream leased assets	Mixed*	• Aim to obtain data for all assets leased to the University. • As a minimum, obtain floor space in m^2 and building type (residential or non-residential, with the latter split by sub-type) for all assets leased to the University. • Preferably, obtain total spend on heating and electricity *or* EPC ratings for all assets leased to the University.		• Obtain fuel consumption in tonnes, litres or m^3 and electricity consumption in kWh for all assets leased to the University.	

Emissions calculated and estimated using minimum and optimal data are extrapolated to assets for which no data is provided. This introduces uncertainty into UoM's emissions from this category, partly because the data available for most of the assets only meets minimum requirements and is based on national averages. Furthermore, the types of assets for which optimal data requirements were provided are not comparable to the types of assets for which no data are provided (e.g. data was provided for telescopes but not for student residential sites). Improving data availability across all assets leased to the University and aiming to maximise the number of assets for which optimal data requirements are available, would considerably improve accuracy of calculating emissions from this category and better enable prioritisation for decarbonisation action.

* ***Minimum*** *requirements were received for nearly half the assets leased to the University (15/31).*
Optimal *requirements were received for a small number of assets leased to the University (5/31).*
No data *was received for a third of assets leased to the University (11/31).*

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Results:
Downstream Categories

Downstream Transportation & Distribution Category 9

Under the GHG Protocol, category 9, Downstream Transportation & Distribution (DT&D), includes emissions from the transportation and distribution of sold products in vehicles and facilities not owned or controlled by the reporting organisation, as well as, optionally, those from customers traveling to and from retail stores. However, the GHG Protocol is a general set of requirements and often lacks the specificity required for more complex organisations such as universities.

To bring consistency and confidence to higher education institutions wishing to report their emissions, the Alliance for Sustainability Leadership in Education developed the Standardised Carbon Emissions Framework for Further and Higher Education (SCEF).[1] This framework is an extension to the GHG protocol that defines best practice for carbon accounting by universities.

The framework places student travel to/from the University within category 9, like how customer travel is accounted for in retail organisations. This includes the journeys students make to attend university, encompassing regular commutes to campus and trips between term-time and non-term time addresses, such as traveling from their hometown to Manchester at the beginning and end of term. To increase the completeness of the University's footprinting, the initial outbound and final inbound journeys of students traveling to placements have also been included here for the first time. Any additional journeys during placements beyond these are considered outside the University's operational boundary, however.

Although the categorisation of these emissions may seem arbitrary, their inclusion is crucial and has significant impacts. Although Universities may have limited control over these emissions, they still occur as a result of University operations and should be accounted for, similar to the impacts of their investments and suppliers.

Furthermore, while defensible arguments exist for the inclusion of these emissions in category 6, 7 and 9, consistency across organisations is important to facilitate comparability and transparency. It is therefore recommended that all further and higher education organisations follow the guidance of SCEF and quantify their impacts within category 9.

The calculation of the emissions associated with student commuting used the same data source as employee commuting, the 2024 Carbon Commuter Survey. This estimated the annual distance travelled per mode of transport by all 43,326 students from 500 completed surveys. This report also provided data on the annual distances travelled per mode for students travelling between their term-time and non-term-time address for both domestic and international students.

For international students, the survey returned an overwhelming preference for air travel, with 95% of international students reporting this as their mode of travel. As air travel journeys will be far longer than those done via other modes, the proportion of miles travelled by non-air modes were assumed to be negligible. For example, the second most prevalent mode of travel for international students was ferry travel, which accounted for 4% of journeys. Eunomia analysis of such journeys found that the average ferry journey to the UK was 141 km, while the average short-haul flight was 10 times longer at 1,432 km. The equivalent long-haul flights were found to be 4,381 km, or 31 times longer, on average.[3,4] With the conservative assumption that all flights are short-haul, this still puts the miles travelled by air at 99% of all international student journey miles. Consequently, the distances travelled to Manchester by international students were calculated using data on their home address provided during enrolment for each student individually and all journeys were assumed to be via air travel, which matches the method used in previous iterations.

1. Standardised Carbon Emissions Framework
2. Modal comparisons (TSGB01)
3. Average ferry distances calculated using data from https://www.gov.uk/government/statistical-data-sets/sea-passenger-statistics-spas
4. Average flight distances calculated using data from https://assets.publishing.service.gov.uk/media/66a9fe4ca3c2a28abb50da4a/2024-greenhouse-gas-conversion-factors-methodology.pdf

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Downstream Transportation & Distribution Category 9

To capture the travel of students on placements, data was provided on students' home and placement location. For placements where all travel was within the UK, the latitude and longitude of the origin and the placement city were used to estimate the straight-line travel distances. This was then corrected to estimate actual road distances with the modes of travel taken from the Office for National Statistics data on the average distribution of vehicle mode usage in the UK.[2] Where placements were international, the air travel distance between Manchester Airport and the main airport of the capital city of the destination country was used.[1] All international placement travel was assumed to be carried out via flight.

Once the distances were calculated for each mode and purpose, BEIS GHG conversion factors were applied to calculate the associated emissions.[2] The total emissions for this category are **105,636 tCO_2e**, 17% of overall emissions. This is the third largest source of emissions, for which the current data provision requires a lot of extrapolation. To increase confidence in the results, and to allow better tracking of progress, it is recommended that the University collect a large sample of student travel data, as well as more specific travel mode information.

Table 18: Student commuting emissions

Mode of travel	Consumption	Unit	Emission Factor ($kgCO_2e$ per unit)	tCO_2e
Local bus	7,564,642	passenger.km	0.1300	983
Average car - fuel unknown	2,131,609	km	0.1669	356
National rail	5,527,968	passenger.km	0.0355	196
Light rail and tram	500,964	passenger.km	0.0286	14
Non-emitting travel	8,289,984	km	0.000	0
			Total	**1,549**

Table 19: Domestic student travel to/from home emissions

Mode of travel	Consumption	Unit	Emission Factor ($kgCO_2e$ per unit)	tCO_2e
Average car - fuel unknown	24,742,728	km	0.1669	4,130
Domestic - average passenger	8,400,311	passenger.km	0.2726	2,290
National rail	22,667,157	passenger.km	0.0355	804
Light rail and tram	1,986,963	passenger.km	0.0286	57
Coach	1,146,907	passenger.km	0.0272	31
			Total	**7,311**

Table 20: International student travel to/from home emissions

Mode of travel	Consumption	Unit	Emission Factor ($kgCO_2e$ per unit)	tCO_2e
Short-haul - economy class	508,166,208	passenger.km	0.1829	92,928
Long-haul - average passenger	238,075	passenger.km	0.2613	62
			Total	**92,991**

1. Flight distances taken from https://www.airmilescalculator.com/
2. Greenhouse gas reporting: conversion factors 2024

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Downstream Transportation & Distribution Category 9

Table 21: Student travel for placements

Mode of travel	Consumption	Unit	Emission Factor ($kgCO_2e$ per unit)	tCO_2e
Long-haul - average passenger	13,610,572	passenger.km	0.2613	3,556
Short-haul - average passenger	1,033,144	passenger.km	0.1859	192
Average car - Petrol	114,205	km	0.1645	19
Average car - Hybrid	14,457	km	0.1261	12
Average car - Diesel	65,952	km	0.1698	11
Local bus	18,860	passenger.km	0.130	2
National rail	15,029	passenger.km	0.0355	0.5
Regular Taxi	2,063	km	0.2081	0.4
Average car - battery Electric	6,068	km	0.0475	0.3
Average motorbike	2,358	km	0.1137	0.3
Light rail and tram	12,082	passenger.km	0.0286	0.3
Ferry average	346	passenger.km	0.1127	0.04
Non-emitting travel	43,614	km	0	0
			Total	**3,784**

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Data Improvement Recommendations
Downstream Transportation & Distribution Category 9 (2/2)

Emissions Source	Current Data	Intermediate Recommendation	Optimal Recommendation	Timescale
Travel from student residency to University facilities during termtime	Intermediate	• N/A	• Aim to improve response rate to the travel survey to increase accuracy when extrapolating. • Obtain distance travelled by mode of transport and vehicle type (e.g. petrol, diesel, electric).	
Student travel to and from their permanent address to the University or their student residency at the start and end of term	Intermediate	• N/A	• Aim to improve response rate to the travel survey to increase accuracy when extrapolating. • Obtain distance travelled by mode of transport and vehicle type (e.g. petrol, diesel, electric). • Collect more detailed data on the modes used by international students to travel to Manchester.	

Data Improvement Recommendations
Downstream Transportation & Distribution Category 9 (1/2)

Emissions Source	Current Data	Intermediate Recommendation	Timescale	Optimal Recommendation	Timescale
Transportation and distribution of products sold by the University, not paid for by the University	Below minimum	• As a minimum, obtain or estimate average mass of products sold by the University and the distance the product is transported. • Preferably, obtain the amount spent on transportation services by third-party distributors or by consumers.		• Obtain mass of each product sold by the University, distance the product is transported and mode of transport for each journey.	
Retail and storage facilities not owned, operated or paid for by the University	No data	• If retail and storage facilities become relevant to the University in the future, aim to collect fuel and electricity consumption data for all facilities if possible, or spend on fuel and electricity consumption, or as a minimum aim to obtain floor space in m^2 of all facilities.			

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Use of Sold Products

Category 11

Category 11, Use of Sold Products, refers to emissions from the use of products sold by the University of Manchester, which includes the direct energy consumption by electrical products and (optionally under the GHG Protocol) indirect energy usage associated with other sold products. As no products are sold by the University which directly consume energy these emissions are exclusively from the indirect energy usage from washing, drying and ironing sold clothing.

Data was provided on the type and number of products sold. The indirect energy consumption data associated with sold clothing was estimated using secondary data from industry reports.[1,2,3] Emission factors were then applied to this calculated energy consumption.[4]

The total emissions from this category were **10 tCO_2e**, 0.002% of the emissions total. These results are presented in Table 22.

Table 22: Use of sold products

Activity	Consumption	Unit	Emission Factor ($kgCO_2e$ per unit)	$kgCO_2e$
Use of sold clothing	47,135	kWh	0.2071	9,759

1. Clothing Longevity And Circular Business Models Receptivity In The UK
2. A New Textiles Economy: Redesigning Fashion's Future
3. Fiber Uptake Calculation Guide
4. Greenhouse gas reporting: conversion factors 2024

Data Improvement Recommendations
Use of Sold Products Category 11

Emissions Source	Current Data	Intermediate Recommendation	Timescale	Optimal Recommendation	Timescale
Use of sold products	Minimum	• In addition to type and quantity of products sold, record the weight of clothing where possible.		• In addition to recording item weight, consider obtaining usage and longevity data from suppliers, or by surveying customers.	

We received numbers of items sold by the University and have applied assumptions for the mass, longevity and usage of the clothing sold. This introduces uncertainty into calculations, although it should be noted that primary data is hard to collect for this category.

End-of-life of Sold Products Category 12

Category 12, End-of-life of Sold Products, refers to emissions from the treatment of the products sold by the University of Manchester once they reach the end of their life.

The emissions in this category used the same product data used to calculate category 11 emissions, that is, the number and type of products sold by the University of Manchester. For category 12, an assumed disposal/treatment pathway was assigned to each product based on its material composition and UK government data.[1,2] From this, the emission factor relevant to that pathway was applied.[3]

The total emissions from this category were **4 tCO_2e**, 0.001% of the overall footprint. These results are presented in Table 23.

Table 23: End-of-life of sold products emissions

Product & Treatment	Consumption	Unit	Emission Factor ($kgCO_2e$ per unit)	$kgCO_2e$
Landfill	4.0	tonnes	863.176	3,474
Recycling	11.5	tonnes	6.411	74
Combustion	3.3	tonnes	6.411	21
			Total	**3,569**

1. Local authority collected waste management - annual results 2022/23
2. UK statistics on waste
3. Greenhouse gas reporting: conversion factors 2024

Data Improvement Recommendations
End-of-life of Sold Products Category 12

Emissions Source	Current Data	Intermediate Recommendation	Timescale	Optimal Recommendation	Timescale
End-of-life treatment of sold products	Minimum	• In addition to type and quantity of products sold, obtain expected end-of-life disposal route of sold products.		• In addition to type, quantity and end-of-life disposal route of sold products, obtain the material composition of sold products and the specific make and model where relevant.	

We received numbers of items sold by the University and have applied assumptions in order to convert these numbers into mass. This introduces significant uncertainty into calculations and at a minimum the University should aim to obtain data on the mass of items sold. This can be done for a sample of products in the first instance, from which the full data is extrapolated.

Downstream Leased Assets Category 13

Category 13, Downstream Leased Assets, refers to emissions from assets owned by the University of Manchester and leased to other organisations. This includes emissions associated with fuel and energy consumption during the operation of the asset.

The University of Manchester provided fuel and energy consumption data for six of their leased sites (Table 25) to which the relevant emission factors were applied.[1] For any sites that did not have consumption data available, estimations were made as described on slide 40 for upstream leased assets.

The total emissions from this category were **10,730 tCO_2e**, 2% of total emissions. These results are presented in Table 24 and the energy intensity assumptions are shown in Table 16 (slide 41). Table 25 provides a breakdown per asset with primary data.

Table 24: Downstream leased assets emissions

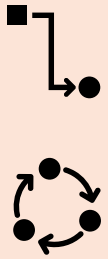
Activity	Consumption	Unit	Emission Factor ($kgCO_2e$ per unit)	tCO_2e
Electricity	25,915,312	kWh	0.207	5,366
Natural Gas	29,328,054	kWh (Gross CV)	0.183	5,364
			Total	**10,730**

Table 25: Downstream leased assets – primary data provided

Asset	Building Type	Activity	Consumption	Unit	tCO_2e
Academy Building	Mixed	Electricity	134,425	kWh	28
		Natural gas	202,513	kWh (Gross CV)	37
Core Technology Facility	Offices	Electricity	2,573,689	kWh	533
		Natural gas	2,557,600	kWh (Gross CV	468
Jodrell SKA Building (Observatory Site)	Offices	Electricity	680,352	kWh	141
		Natural gas	N/a	kWh (Gross CV)	N/a
Manchester Biotech Incubator Building (ground floor offices 1, 2, 17 & 18)	Offices	Electricity	2,055,162	kWh	426
		Natural gas	7,018,183	kWh (Gross CV)	1,284
Sackville Street Building	Mixed	Electricity	0	kWh	0
		Natural gas	0	kWh (Gross CV)	0
Students Union - Steve Biko Building	Mixed	Electricity	600,608	kWh	124
		Natural gas	135,570	kWh (Gross CV)	25

1. Greenhouse gas reporting: conversion factors 2024

Data Improvement Recommendations
Downstream Leased Assets Category 13

Emissions Source	Current Data	Intermediate Recommendation	Timescale	Optimal Recommendation	Timescale
Downstream leased assets	Mixed*	• Aim to obtain data for all assets leased to a third party. • As a minimum, obtain floor space in m^2 and building type (residential or non-residential, with the latter split by sub-type) for all assets leased to a third party. • Preferably, obtain total spend on heating and electricity *or* EPC ratings for all assets leased to a third party.		• Obtain fuel consumption in tonnes, litres or m^3 and electricity consumption in kWh for all assets leased to a third party.	

Emissions calculated and estimated using minimum and optimal data are extrapolated to assets for which no data is provided. This introduces uncertainty into UoM's emissions from this category, partly because the data available for most of the assets meets minimum requirements and is based on national averages. *Furthermore, the types of assets for which optimal data requirements were provided are not comparable to the types of assets for which no data are provided (e.g. data was provided for telescopes but not for student residential sites).* Improving data availability across all assets leased to a third party, and aiming to maximise the number of assets for which optimal data requirements are available, would considerably improve accuracy of calculating emissions from this category and better enable prioritisation for decarbonisation action.

* ***Minimum*** *requirements were received for the majority of assets leased to the University (48/57).*
Optimal *requirements were received for a small number of assets leased to the University (8/57).*
No data *was received for a single assets leased to the University (1/57).*

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Investments Category 15

Category 15, Investments, refers to emissions associated with the investments of the University of Manchester that are not captured in the University's Scope 1 and 2 emissions. In line with the GHG Protocol, organisations reporting this category are required to include emissions from equity investments, debt investments with known use of proceeds and project finance. The protocol also recommends the inclusion of pensions, although notes that this is optional.

Relevant investments included £167,775,809 in equities and fixed-income assets, as well as pensions held in the Greater Manchester Pension Fund (GMPF), the University of Manchester Superannuation Scheme (UMSS), and the Universities Superannuation Scheme (USS).

To calculate emissions from investments, the amount invested in each recipient organisation was provided, along with the weighted average carbon intensity (WACI) and the absolute emissions attributable to the University from these investments

For emissions associated with GMPF, the total value of the assets held by the University of Manchester (~£150 million) was provided. This was then multiplied by the emissions intensity figure (108 tCO_2e/£m invested) published in the fund's annual report.[1]

For the UMSS, data on the amount invested by the fund per asset manager and asset class, totalling £561 million, was provided. These investments were then mapped to a traded fund, and the emissions intensity, measured in tCO_2e per million pounds invested, was used to estimate the emissions of these investments.

For the USS, only the approximate proportion of scheme assets held by the University was available. Using the scheme's 2024 Task Force on Climate-Related Financial Disclosures (TCFD) report, the total value of assets under management and the emissions intensity for the defined-benefit component of the scheme were identified. These figures were then used to estimate the emissions attributable to the University.[2]

The methodology used for this category followed the accounting and reporting standard for financed emissions set out by the Partnership for Carbon Accounting Financials.[3]

The total emissions from this category were **233,927 tCO_2e**. This was the second largest source of emissions, contributing 38% of the total. These results are presented in Table 26. It should be noted that almost all the emissions here were calculated from secondary data, it is recommended that the University engage with pension fund managers to acquire primary emissions data where possible.

Table 26: Investments emissions

Investment	tCO_2e
Universities Superannuation Scheme	130,000
University of Manchester Superannuation Scheme	80,779
Greater Manchester Pension Fund	16,200
Investments	6,948
Total	**233,927**

1. Pg. 112, GMPF Annual Report 2024
2. Pg. 27, USS TCFD Report 2024
3. The Global GHG Accounting and Reporting Standard for the Financial Industry

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Data Improvement Recommendations
Investments Category 15

Emissions Source	Current Data	Intermediate Recommendation	Timescale	Optimal Recommendation	Timescale
Equity, debt and project finance investments held by the University	Optimal	• N/A	• N/A	• Clarify whether the data provided by Mercer represents estimates or calculated emissions. • Establish whether the data provided by Mercer includes scope 3 emissions as well as scopes 1 and 2 (best practice is to include scopes 1, 2 and 3).	
Pension investments	Minimum	• Obtain the proportional share of the investment in the investee, to more accurately attribute.		• Obtain total scope 1, 2 and 3 emissions associated with pension investments for the reporting year.	

Data were provided by the University's fund manager, Mercer. It is commendable that the University has emissions data for this category – this is not typical when undertaking these types of Scope 3 assessments and represents a significant stride forward and opportunity to take informed action in decarbonising the University's investments.

For pensions, we note that some pension funds were excluded from the data provided as the University deemed these immaterial, irrelevant, or there were no data available. For transparency, we recommend that the University disclose these exclusions in any external reporting and make a clear note of these exclusions internally for auditing purposes.

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Key takeaways for reaching net zero

Student travel data is extrapolated form just 1% of students

The largest source of emissions, pensions & investments, relies on secondary data

85% of emissions (categories 1, 9 & 15) require extensive external stakeholder action for decarbonisation

Spend-based data is the basis of 39% of emissions

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Data Improvement Recommendations

Method: Data Improvement Recommendations

This section outlines how UoM can improve the data it holds and collects, in order to calculate a more accurate and reliable scope 3 emissions estimate.

Each category of emissions was quantitively scored against the following equally-weighted criteria:

- **Size of emissions** – more significant contributors to the University's Scope 3 footprint are prioritised;
- **University priority** – sources of emissions that are not a current or previous focus on University efforts to improve data availability are prioritised (sources of emissions which require improvement but are already a priority of the University are deprioritised);
- **Level of influence** – sources of emissions over which the University has greatest ability to enact change are prioritised; and
- **Extent of improvement required** – where the University provided minimum data requirements, or held no data, the category is prioritised.

This provides a quantitative score for each category of emissions, which is ranked and demarcated into high, medium, and low priority for improvement. This method was pre-determined alongside members of the UoM team and applied consistently across each emissions Source. Following the presentation of results for each emissions Source, a description of current data quality, further data collection and how this could be used in calculations to improve accuracy and reliability of the emissions estimate is provided. This will provide the platform to plan for decarbonisation.

Recommendations are also made for how frequently to collect the recommended data. This is based on how complex the data are to collect as well as the impact on calculated emissions, balancing the resource burden for the University with the accuracy of the Scope 3 footprint. This is presented in the Appendix. The timescales are:

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Results: Data Improvement Recommendations

Higher	• Upstream leased assets • Downstream leased assets • Downstream transportation and distribution • Investments
Medium	• Waste • Purchased Goods and Services • Capital Goods • Upstream transportation and distribution • Use and end-of-life treatment of sold products
Lower	• Business travel • Employee commuting • Fuel- and energy-related activities

Summary: High Priority Data Improvement Recommendations

Upstream leased assets	• Aim to obtain data for all assets leased to the University. • As a minimum, obtain floor space in m^2 and building type (residential or non-residential, with the latter split by sub-type) for all assets leased to the University.
Downstream leased assets	• Aim to obtain data for all assets leased to a third party. • As a minimum, obtain floor space in m^2 and building type (residential or non-residential, with the latter split by sub-type) for all assets leased to a third party.
Downstream transportation and distribution	• Increase the response rate of the travel survey by students to improve accuracy when extrapolating. • Obtain distance travelled by mode of transport and vehicle type (e.g. petrol, diesel, electric). • Collect more detailed data on the modes used by international students to travel to Manchester.
Investments	• For pensions, obtain the proportional share of the investment in the investee, to more accurately attribute.

As well as these specific recommendations, we would recommend that the University aims to maximise transparency in data processing in future years. This means where data summaries are produced, a clear and auditable trail of processing steps is logged. This means that the footprint and data inputs are comparable year-on-year, and any changes to methodology can be transparently documented in line with best practice.

Summary: Medium Priority Data Improvement Recommendations

Waste	• Obtain mass and end-of-life treatment of waste by material type at a construction project level. • Align naming conventions of buildings across waste data and energy consumption data. • Obtain volume of water consumed during operations at a building level.
Purchased Goods and Services and Capital Goods	• Obtain the physical quantity of each purchased good, service, or capital good in number of units, kg, or other relevant units.
Upstream transportation and distribution	• Obtain mileage, vehicle type, and fuel type associated with third-party journeys.
Use and end-of-life treatment of sold products	• In addition to type and quantity of products sold, obtain approximate energy consumption during use or energy efficiency rating, and expected end-of-life disposal route of sold products.

Summary: Low Priority Data Improvement Recommendations

Business travel	• Add characteristics to business travel data to support prioritisation of action e.g. purpose of trip, department. • Split total number of hotel nights and locations between staff and students.
Employee commuting	• Aim to improve response rate to the travel survey to increase accuracy when extrapolating. • Obtain distance travelled by mode of transport and fuel type (e.g. petrol, diesel, electric).
Fuel- and energy-related activities	• Obtain fuel consumption in m^3 or litres in owned vehicles for each type of fuel used at a vehicle level.

Secondary Data & Emission Factor Sources

Emission Factors

Tables 29 and 30 summarise the emission factors, and their sources, used in calculating the University of Manchester's Scope 3 emissions footprint.

Table 29: Emission factor sources

Category		Description	Source
1	PG&S	Spend-based emission factors aligned with the HESCET tool categories	HEPA : Higher Education Procurement Association Conversion factors KgCO2 per £ spent, by SIC code 2021
2	Capital goods	Spend-based emission factors aligned with the HESCET tool categories	HEPA : Higher Education Procurement Association Conversion factors KgCO2 per £ spent, by SIC code 2021
3	FERA	Fuel and energy WTT and T&D losses	Greenhouse gas reporting: conversion factors 2024
4	UT&D	Spend-based emission factors for courier and postal services	Conversion factors KgCO2 per £ spent, by SIC code 2021
5	Waste from operations	Disposal & treatment for waste generated during operations	Greenhouse gas reporting: conversion factors 2024
6	Business travel	Transport and hotel stays for business trips	Greenhouse gas reporting: conversion factors 2024
7	Employee commuting	Employee commuting & Work from home (WfH)	Greenhouse gas reporting: conversion factors 2024
8	Upstream leased assets	Energy consumption of assets leased to the University of Manchester	Greenhouse gas reporting: conversion factors 2024
9	DT&D	Student transport emissions	Greenhouse gas reporting: conversion factors 2024

Emission factors

Table 30: Emission factor sources (cont.)

Category		Description	Source
11	Use of sold products	Energy consumption of sold products	Greenhouse gas reporting: conversion factors 2024
12	EoL of sold products	Disposal & treatment of sold products at the end of their life	Greenhouse gas reporting: conversion factors 2024
13	Downstream leased assets	Fuel and Energy consumption of assets leased by University of Manchester	Greenhouse gas reporting: conversion factors 2024

Secondary data

Tables 31 to 33 summarise the secondary data, and their sources, used in calculating the University of Manchester's Scope 3 emissions footprint

Table 31: Secondary data sources

Category		Description	Source
6	Business travel	Flight distances Rail distances Driving distances	Air Miles Calculator BRouter Routing Engine Google Maps
8	Upstream leased assets	Building energy use intensity from: Data centres Car parks Other leased assets	Public Data on Data Centre Energy Use Better Building Partnership benchmarks CIBSE Energy Benchmarks

Secondary data

Table 32: Secondary data sources (cont.)

Category		Description	Source
11	Use of sold products	Clothing item characteristic and associated indirect energy use	Average clothing item lifespan (year) • Citizen Insights - Clothing Longevity and CBM Receptivity in the UK.pdf (wrap.ngo) Washing – Energy use per load • How Much Electricity Does a Washing Machine Use? (inthewash.co.uk) Washing – Average mass per load • Washing machine capacity guide | Currys Tumble Drying – Energy use per load • How Much Does It Cost to Run a Tumble Dryer in the UK? (2024) (inthewash.co.uk) Tumble Drying – Average mass per load • Standard assumption Tumble Drying – Proportion of loads that are tumble dried • Standard assumption Ironing – Energy use per load • Standard assumption Ironing – Proportion of loads that are ironed • Standard assumption
12	Use of sold products	Clothing item characteristic and associated indirect energy use (cont.)	Average number of uses before disposal • A New Textiles Economy: Redesigning fashion_s future.pdf (thirdlight.com) Number of wears between washes • Citizen Insights - Clothing Longevity and CBM Receptivity in the UK.pdf (wrap.ngo) Product lifespan per clothing item type • Citizen Insights - Clothing Longevity and CBM Receptivity in the UK.pdf (wrap.ngo) Approximate mass per clothing item • Fiber-Uptake-Calculations-CFMB.pdf (textileexchange.org)

Secondary data

Table 33: Secondary data sources (cont.)

Category		Description	Source
12	EoL of sold products	Typical EoL disposal and treatment pathways	Local authority collected waste management - annual results 2022/23 UK statistics on waste
13	Downstream leased assets	Building energy use intensity from: Car parks Other leased assets	 Better Building Partnership benchmarks CIBSE Energy Benchmarks
15	Investments	GMPF UMSS USS	GMPF Annual Report 2024 Y Charts, AXA USS TCFD Report 2024

Appendix: Boundary Setting

A.1

University of Manchester's Scope 3 Boundary Setting

Tables 34 to 38 summarise the boundary setting for each relevant Scope 3 category used in calculating the University of Manchester's Scope 3 emissions footprint.

Table 34: Scope 3 emission categories included in the University of Manchester's Scope 3 reporting

Name	No.	Description
Purchased goods & services	1	Emissions from the production of both tangible products (goods) and intangible products (services) purchased/acquired by the University in the reporting year, not already included in categories 2 through to 8 (below). It includes all upstream cradle-to-gate emissions such as those from material extraction, processing, manufacturing and transport.
Capital goods	2	This category includes all upstream (i.e., cradle-to-gate) emissions from the production of capital goods purchased/acquired by the University in the reporting year. Capital goods are final products that have an extended life. In financial accounting, capital goods are often treated as fixed assets or as plant, property and equipment (PP&E). Total emissions of purchased capital goods should be accounted for in the year of acquisition (regardless of whether the production of the capital good spans multiple reporting years).
Fuel- and energy-related activities	3	Emissions from the extraction, production and transportation of fuels and energy used, not already accounted for in Scope 1 or 2. These are the emissions associated with getting the energy from its extraction or production to point-of-use (including transmission losses, such as leakage in gas pipes). This category includes emissions associated with the fuel consumed by the University (e.g., by University-operated vehicles) and electricity consumed by the University (e.g., by University buildings and electric vehicles).
Upstream transportation and distribution	4	This category involves both: 1. Emissions from the transportation of products purchased from tier 1 suppliers (by the University) to University premises (i.e., transportation between tier 1 suppliers and the University); and 2. Emissions resulting from the transportation services (of goods, by e.g., freighters, couriers) that the University purchases. This is technically considered 'upstream' by the GHG Protocol because the University is engaging another supplier to perform a service.

University of Manchester's Scope 3 Boundary Setting

Table 35: Scope 3 emission categories included in the University of Manchester's Scope 3 reporting (cont.)

Name	No.	Description
Waste generated in operations	5	The emissions from waste disposal and treatment of all waste generated in operations, including waste treatment to landfill, incineration, composting and recycling. This category also includes the treatment of wastewater.
Business travel	6	Emissions resulting from employee transportation for business activities in third-party vehicles, including air, rail, ferry, bus, and taxi travel. This category also encompasses mileage from employee-owned vehicles used for business travel and optionally includes emissions from hotel stays. We recommend this category also accounts for emissions from student travel the University pays for, for example student travel to field trips and conferences. We also recommend the University considers including student travel associated with recreational travel (e.g., to sports clubs) if the University pays for this transportation to take place.
Employee commuting	7	Employee commuting encompasses all transportation of staff between their residences and University premises (in vehicles not owned or operated by the University). It also optionally includes the emissions (arising from energy use) generated by staff remote working/working from home (WfH).
Upstream leased assets	8	Under the operational control approach, any Scope 1 and 2 emissions resulting from assets leased to the University (e.g., rented offices) are included in the University's Scope 1 and 2 unless the University can demonstrate that it does not have operational control over a leased asset. If this is the case, this category includes the Scope 1 and 2 emissions from these assets that occur during the University's operational control. Based on this definition, the following buildings are understood to be relevant to category 8: Aquatics / Booth St East Car Pk B [levels 4-7]; Denmark Road Halls of Residence [part]; Brook Hall (formerly Liberty Park); Weston Hall; Salford Innovation Forum Room 110 & 111; Guinness Road Trading Estate, Unit 5; Bathurst Street 7-11; Parkway Gate; Rusholme Place; IQ Daisy Bank; IQ Student Quarter Salford; and Rutherford Appleton Laboratory Lab02 building R70.

University of Manchester's Scope 3 Boundary Setting

Table 36: Scope 3 emission categories included in the University of Manchester's Scope 3 reporting (cont.)

Name	No.	Description
Downstream transportation and distribution	9	Emissions from the transportation and distribution of products and merchandise sold by the University, covering the journey from the University's operations to the end-consumer, provided these costs are not borne by the University and do not involve University-owned or operated vehicles/facilities. This category also includes emissions from retail and storage activities. This category also optionally includes emissions from 'customers' travelling to and from retail premises. In the context of a higher education institution, the following instances of student travel can be considered relevant to this category: • travel from student residency (i.e. student accommodation) to University facilities during term-time (e.g., for lectures); and • travel to and from their permanent address to either the University or their student residency, at the start and end of each term. This also includes both national and international student travel. Eunomia recommends that the University includes this travel within their calculations, with the option to report it separately to its full footprint (as an optional disclosure). The GHG Protocol is designed primarily for corporations and has been adapted in this project to meet the needs of the University. Whilst the allocation of emissions from student travel may sometimes be included in category 7 – employee commuting, Eunomia is recommending it for inclusion in category 9 to align with the University's previous allocation of this GHG source and the approach taken by other universities. This also aligns with guidance provided by the Alliance for Sustainability Leadership in Education. Following discussions with the University, Eunomia also recommends that the initial outbound and final inbound journeys of students travelling for placements be included in this category. The emissions from these journeys are incurred as a direct result of the Universities operation and their inclusion gives a complete understanding of student travel behaviours and positions the University as a leader within their sector by taking on increased accountability.
Processing of sold products	10	Excluded as the University does not sell intermediate products.

University of Manchester's Scope 3 Boundary Setting

Table 37: Scope 3 emission categories included in the University of Manchester's Scope 3 reporting (cont.)

Name	No.	Description
Use of sold products	11	Emissions from the end use of the products sold by the University. This includes direct-use phase emissions over the product's expected lifetime (i.e., the Scope 1 and 2 emissions of the end-users). Optionally, this category also includes indirect use-phase emissions. Indirect emissions may refer to such activities as maintenance, for example, washing and drying for clothing and kitchen equipment, or refrigeration for perishable goods. It is understood that the University does not sell products that directly consume energy so direct use-phase emissions are not relevant. Other sold products include pens, paper, paint, fabric, wearing apparel (e.g., branded sportswear) and other merchandise-related products. These can be considered for indirect use-phase emissions as an optional reporting disclosure.
End-of-life treatment of sold products	12	Expected end-of-life emissions from the waste disposal and treatment of products sold by the University in the reporting year. This is applicable to any products the University sells, such as art suppliers, wearing apparel and merchandise-related products.
Downstream leased assets	13	Emissions from the operation of assets owned by the University (acting as a lessor) leased to other entities, which are not already included in the University's Scope 1 and 2 reporting. The following are understood to be relevant to category 13: Jodrell Bank Farms; Stopford Building; Ellen Wilkinson Building; Simon Building; Mansfield Cooper Building; Aquatics / Booth Street East [Car Park B]; Dryden Street Nursery; Horniman House; Contact Theatre; Sugden Sports Centre; Alliance Manchester Business School; MSS Building; Charles St (Car Park A); Masdar Feeders; Wolfson Molecular Imaging Centre; Whitworth Park - Thorncliffe Units & Community Hub; Crawford House; George Begg Building; Thorncliffe House; and Crawford House. This includes the Scope 1 and 2 emissions from the lessee during the operation of the leased asset.
Franchises	14	Excluded as the University does not have any franchises.

University of Manchester's Scope 3 Boundary Setting

Table 38: Scope 3 emission categories included in the University of Manchester's Scope 3 reporting (cont.)

Name	No.	Description
Investments	15	Emissions associated with the University's investments (including equity investments, debt investments and project finance) which are not already included in the University's scope 1 or 2. This category optionally includes emissions from the following pension schemes: Universities Superannuation Scheme; Pension Saver; NHS Scheme; Greater Manchester Pension Fund; and Nest Pensions. Emissions from investments are allocated to the University based on the University's proportional share of investment in the investee. For example, if the University owns a 2% share in the investee it accounts for 2% of the emissions associated with that investment in category 15.

About Eunomia

Eunomia is an independent sustainability consultancy driven by a genuine passion to make a positive change to the clients we work with and the communities they operate in. Founded in 2001, we have been pioneers in the sector - early advocates for helping NGOs as well as leading public and private sector organisations in the UK and overseas to adapt their approach and adopt more sustainable processes.

Our consultants are experts in the field, deeply immersed in the subject with the technical knowledge and skill to offer clients innovative, clear and practical recommendations. We are committed to finding solutions to better protect the planet, while supporting the wider aims and needs of our clients.

Each client is treated as an individual, with consultants taking the time to understand their objectives and how best we can support them. This personal service ensures a strong relationship is forged, based on honest and regular communication. It also ensures if these objectives change, there is the flexibility to adapt.

As an established leading independent consultancy, clients can have complete confidence that consultants will offer evidence-led solutions based on robust, impartial thinking that offer both pragmatic and positive outcomes.