University of Southampton Greenhouse Gas Emissions Report: 2020-2021

Technical Report

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Abstract

This report summarises trends in the University's Scope 1, 2 and 3 emissions up to and including academic year 2020-21. It also includes estimates of other emissions that the University chooses to report but which are not formally included in the Scope 1, 2 and 3 emissions as defined by the Greenhouse Gas Protocol.

The University's Scope 1, 2 and 3 emissions were estimated to be 115.4 kT CO2e in 2020-21 with an additional 'induced' 12.7 kT CO2e emissions under additional reporting. Total emissions under Scope 1-3 reduced by 8% from 2018-19 to 2020-21 largely due to reductions in emissions from Scope 2 Purchased Electricity and COVID-19 affected Scope 3 Business Travel.

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- V1.1 – 16/2/2023: updated following identification of error in overseas and home student relocation emissions estimates
- V1.0 – 20/12/2022; for publication

Executive Summary

This report summarises trends in the University's Scope 1, 2 and 3 emissions up to and including academic year 2020-21. It also includes estimates of other emissions that the University chooses to report but which are not formally included in the Scope 1, 2 and 3 emissions as defined by the Greenhouse Gas Protocol.

The University's Scope 1, 2 and 3 emissions were estimated to be 115.4 kT CO_2e in 2020-21 with an additional 'induced' 12.7 kT CO_2e emissions under additional reporting. Total emissions under Scope 1-3 reduced by 8% from 2018-19 to 2020-21 largely due to reductions in emissions from Scope 2 Purchased Electricity and COVID-19 affected Scope 3 Business Travel.

Scope 1 emissions (17.8 kT CO_2e) comprised 15% of total Scope 1, 2 and 3 emissions in 2020-21. These emissions are dominated by emissions from burning gas in the University's gas-fueled combined heat and power plant (CHP) and other boilers. As a result, Scope 1 emissions have remained roughly constant (2% increase) since 2015-16 with major fluctuation depending on the operational status of the CHP. Addressing these emissions whilst the University grows is a key challenge for the Strategic Plan – Sustainability's Goal 1.

Scope 2 emissions (4.8 kT CO_2e) comprised 4% of total Scope 1, 2 and 3 emissions in 2020-21 having declined by 66% since 2015-16 with some fluctuation in response to the operational status of the CHP which generates a significant proportion of the electricity we use. These emissions are dominated by purchase of electricity from the grid (67% emissions reduction since 2015-16) and the overall reduction is due to our energy efficiency projects as well as the rapid decarbonisation of the UK electricity grid. From 2021-22 these emissions will fall to zero due to our switch to a renewable energy tariff in June 2021.

Scope 3 emissions (92.8 kT CO_2e) comprised 80% of total Scope 1, 2 and 3 emissions in 2020-21. These were dominated by ~80 kT CO_2e of supply chain emissions from Purchased Goods and Services which showed a slight (1%) reduction from 2018-19. Emissions from Staff Commuting in 2020-21 (3.2 kT CO_2e) were estimated to have fallen substantially due to COVID while Business Travel emissions fell 99% to 0.05 kT CO_2e from pre-COVID levels of ~ 8.3 kT CO_2e in 2018-19. Neither of these reductions are likely to be wholly sustained even if 'new normal' operations establish, especially given the strategic focus on growth.

Additional 'induced' emissions (12.7 kT CO_2e) are dominated by overseas student relocation but this was considerably lower in 2020-21 due to COVID-19. Note that both student commuting and relocation emissions are likely to increase as the number of students registered at the University grows in line with our ambitions

Overall, the University will therefore need to carefully consider how the growth objectives outlined in the Strategic Plans can be delivered whilst at the same time *reducing emissions from these activities*. **The difficulty of decoupling emissions from growth should not be underestimated**.

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1 About this report

1.1 Circulation

This report is intended for full publication.

1.2 Copyright

1.3 Attribution

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[1] *https://creativecommons.org/licenses/by-nc/4.0/*

2 Introduction

The University of Southampton's Strategic Plan - Sustainability[2] sets out six goals. These are:

1. **Goal 1: Reduce Scope 1 & 2 to net-zero by 2030**
2. **Goal 2: Measure our total emissions footprint and set targets for Scope 3 emissions reductions**
3. **Goal 3: Set a business travel emissions reduction target and implement through an appropriate action plan.**
4. **Goal 4: Ensure that sustainability is a part of every University education programme by 2025**
5. **Goal 5: Make sustainability a cornerstone of UoS' research and societal impact**
6. **Goal 6: Implement a sustainable and ethical investment policy**

The report provides a breakdown of Scope 1, 2 and 3 emissions as currently known or estimated. This includes analysis of trends where longer-term data is available. Where emissions are not known or uncertain, this is noted in the relevant sections.

This report therefore directly contributes to Goal 2 by updating the University of Southampton's GHG Protocol[3] (WRI/WBCSD 2015b) emissions estimates for Scopes 1, 2 and 3 up to and including the Academic Year 2020-21. This detailed technical report builds on our 2021 report (Anderson 2021)[4] which updated the initial Strategic Plan - Sustainability 2018-19 estimates using the same methodology. It provides the background to the shorter summary report which will be published at the same time.

This report does not repeat the full detail of the GHG Protocol methodology unless it is relevant to explaining the way in which emissions were calculated or estimated. Readers should refer to our earlier 2018-19 data update report (Anderson 2021) for full details of the method.

3 Emissions reporting

Goals 1-3 focus on emissions under the Greenhouse Gas (GHG) Reporting Protocol Scopes 1-3 as well as any reporting of other emissions that are not specified within the GHG Scope 1-3 standard (WRI/WBCSD 2015b) but which the University chooses to report. This includes 'induced' emissions from student relocation to come to Southampton and their commuting to campus. In future it could also include carbon sequestration due to the University estate's land-use.

GHG Protocol Scopes were discussed in some detail in the 2021 report (Anderson 2021) but in summary:

- **Scope 1** emissions are those produced by fuel combustion on site such as gas boilers, fleet vehicles; by physical or chemical processes and from fugitive emissions such as air-conditioning, refrigeration or pipework leaks.
- **Scope 2** emissions are those that are due to purchased or acquired electricity, steam, heat and cooling.
- **Scope 3** emissions are indirect emissions that derive from activities of the organisation from sources that they do not own or control. These are usually the greatest share of the carbon footprint, covering emissions associated with business travel, employee commuting, procurement (i.e. supply chain), leased assets, waste and water.

[2] *https://www.southampton.ac.uk/susdev/our-approach/sustainability-strategy.page*

[3] *https://ghgprotocol.org/*

[4] *https://eprints.soton.ac.uk/457440/*

- **Other reporting**: emissions (or sequestration) that the University may choose to report, such as student commuting or 'induced' travel due to annual student relocation.

Emissions are reported as CO2e – carbon dioxide equivalent units. This enables the reporting of emissions from non-CO2 sources which have different warming potentials than CO2. This is highly relevant to sectors which produce GHG emissions other than CO2 such as agriculture (e.g. methane - CH4) and industry but is generally of less relevance to non-specialist higher education institutions. In the University's case this enables us to include fugitive emissions due to refrigerant leaks (F-gases) and also to methane and other Greenhouse Gas (GHG) emissions in upstream energy production and waste treatment services.

In general, the major components of the University's Scope 1 and 2 emissions have been reported annually to the Higher Education Statistics Agency (HESA) since 2004-5. Published versions of these submissions are available from HESA from 2015/16 onwards[5] and we have therefore re-used the HESA submissions to give a 2015/16 baseline and recent trends for Scope 1 and 2 emissions. Where applicable we provide two emissions reduction calculations for Scope 1 and 2 – one based on change since 2015/16 and one based on change since the initial University's Strategic Plan – Sustainability estimates for 2018/19.

Unfortunately, Scope 3 emissions saw little attention prior to 2018-19 when the University's Strategic Plan - Sustainability was developed. Our updated emissions for 2018-19 (Anderson 2021) provided additional detail on Scope 3 emissions and this has now been further extended as documented in this report. Where applicable we therefore provide one emissions reduction calculation for Scope 3 based on change since 2018/19.

Overall, we now have relatively complete emissions estimates for the major Scope 1, Scope 2 and applicable Scope 3 categories. Table 1 summarises GHG emissions by Scope (excluding 'Other reporting') for all years. Note that change since 2015-16 has not been estimated for Scope 3 as emissions under this category were not adequately reported prior to 2018-19.

Table 1: University of Southampton Annual totals - GHG Protocol Scopes (to nearest 100 T CO_2e)

	T CO_2e (nearest 100)				**% of Total**		
Year	*Scope 1*	*Scope 2*	*Scope 3+*	*Total*	*Scope 1*	*Scope 2*	*Scope 3*
2015-16	17,400	14,300	500	32,200			
2016-17	17,900	11,500	500	29,900			
2017-18	17,300	9,600	500	27,400			
2018-19	13,400	10,600	101,600	125,600	11%	8%	81%
2019-20	16,000	7,600	94,300	117,900	14%	6%	80%
2020-21	17,800	4,800	92,800	115,400	15%	4%	80%
% change 2015-16 to 2020-21	2%	-66%	N/A*	N/A			
% change 2018-19 to 2020-21	33%	-55%	-9%	-8%			

Scope 3+ - *not adequately estimated before 2018-19*

N/A Not calculated due to missing or non-comparable data*

In summary:

Scope 1 emissions (17.8 kT CO_2e) comprised 15% of total Scope 1, 2 and 3 emissions in 2020-21. They have remained roughly constant (2% increase) since 2015-16 with some fluctuation depending on the operational status of the CHP. Addressing these emissions whilst the University grows is a key challenge for the Strategic Plan – Sustainability's Goal 1.

Scope 2 emissions (4.8 kT CO_2e) comprised 4% of total Scope 1, 2 and 3 emissions in 2020-21. They have declined by 66% since 2015-16 with some fluctuation in response to the operational status of the CHP which generates a significant proportion of the electricity we use. From 2021-22 these emissions will fall substantially due to our switch to a renewable energy tariff.

Scope 3 emissions (92.8 kT CO_2e) comprised 80% of total Scope 1, 2 and 3 emissions in 2020-21.

[5] https://www.hesa.ac.uk/data-and-analysis/estates

The remainder of the report provides further detail on each of these scopes as well as 'Other reporting'. Categories that are considered inapplicable to the University's operations are noted, with reasons, below

3.1 Scope 1

Scope 1 emissions comprise:

- **Stationary combustion**: combustion of fuels in stationary equipment such as boilers, furnaces, burners, turbines, heaters, incinerators, engines, flares, etc.
- **Mobile combustion**: combustion of fuels in transportation devices such as automobiles, trucks, buses, trains, airplanes, boats, ships, barges, vessels, etc.
- **Fugitive emissions**: intentional and unintentional releases such as equipment leaks from joints, seals, packing, gaskets, as well as fugitive emissions from coal piles, wastewater treatment, pits, cooling towers, gas processing facilities, etc.
- **Process emissions**: emissions from physical or chemical processes such as CO2 from the calcination step in cement manufacturing, CO2 from catalytic cracking in petrochemical processing, PFC emissions from aluminium smelting, etc.

In the case of the University this covers:

- Combustion of natural gas for heat and hot water, and for the on-site generation of electricity via the University's combined heat and power (CHP) plant
- Fleet vehicle fuel (including research vehicles and vessels)
- Fugitive emissions such as equipment leaks, HFC release and gas network leaks
- Physical or chemical processing (e.g in laboratories)

Figure 1 shows Scope 1 emissions over time while Table 2 reports the latest estimates and indicators of change where applicable.

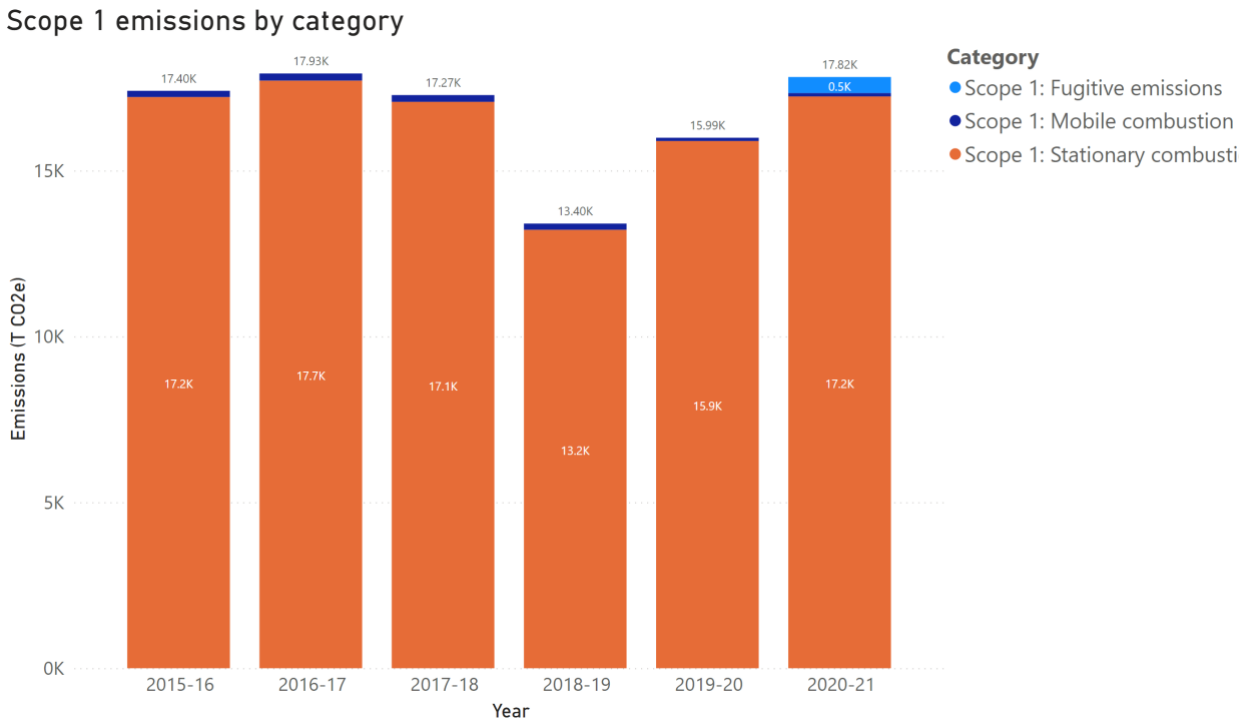

Figure 1: University of Southampton Scope 1 emissions

Table 2: University of Southampton Scope 1 emissions

Indicator	Stationary Combustion	Mobile combustion	Fugitive emissions
Latest total (T CO_2e, 2020-21)	17,233	104	482
Change since 2015-16 (% difference)	0.1	-44.4	N/A
Change since 2018-19 baseline (% difference)	30.4	-44.1	N/A

Overall, Scope 1 emissions have remained roughly constant over time (2% increase since 2015-16, see Table 1) even though overall estate size has increased. This is due to energy efficiency projects, higher efficiency new-builds and a small reduction in the emissions factor of natural gas. Mobile combustion due to fleet vehicles and estimated fugitive emissions, first estimated in 2020-21, comprise a very small fraction of our emissions.

Stationary emissions in the 2018-19 baseline year were notably lower than trend as the Highfield campus gas-powered combined heat and power plant (CHP) was only partially operational. This means that we are likely to see a percentage increase from the baseline year until gas use starts to fall substantially as Goal 1 progresses.

The CHP returned to normal use in 2019-20 and gas use started to return to 'normal' levels in the context of the COVID-19 pandemic which required many of the university staff and students to work from home and buildings to close.

2020-21 saw a return to near 'normal' operations and results in the anomalous 30% increase in the 'change since 2018-19' indicator for stationary combustion. This is also the first year that we have been able to include an estimate of fugitive emissions due to F-gas leakage.

The following sections discuss each of the Scope 1 categories in more detail.

3.1.1 Scope 1: Stationary combustion

Stationary combustion principally comprises gas burnt in the University's Combined Heat and Power plant and in individual gas boilers on campus and in halls of residence. These emissions are calculated by the Estates Energy team as part of the HESA submission process using activity data (kWh purchased) and the appropriate UK GHG conversion factors (See Table 20)[6].

[6] *https://www.gov.uk/government/collections/government-conversion-factors-for-company-reporting*

Emissions from gas (and gas oil) providing heat and hot water to the University's Science Park (USSP Ltd) is also reported under this category where data are available. These have been calculated in the same way.

Figure 2 shows Scope 1: Stationary combustion emissions over time while Table 3 reports the latest estimate and indicators of change where applicable.

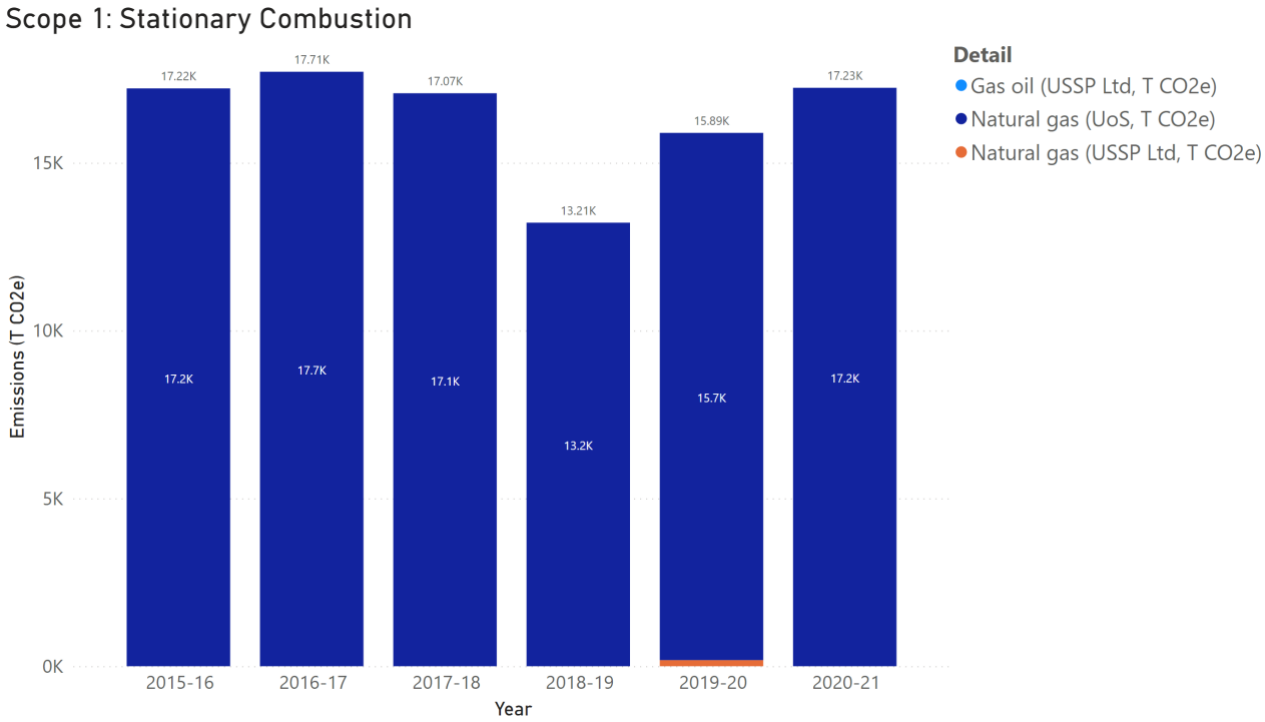

Figure 2: University of Southampton Scope 1: stationary combustion emissions

Table 3: University of Southampton Scope 1: stationary combustion emissions

Statistic	Value
Latest total (T CO_2e, 2020-21)	17,233
Change since 2015-16 (% difference)	0.1
Change since 2018-19 baseline (% difference)	30.4

Explanatory notes:

- Overall trends:
  - Stationary combustion emissions have decreased slightly over time even though overall estates size has increased. This is due to energy efficiency projects, higher efficiency new-builds and a small reduction in the emissions factor of natural gas.
- 2018-19:
  - Stationary emissions in the 2018-19 baseline year were notably lower than trend as the Highfield campus gas-powered combined heat and power plant was only partially operational (see Figure 18 and Figure 19). This means that we are likely to see a percentage increase from the baseline year until gas use starts to fall quite substantially as Goal 1 progresses.
- 2019-20:
  - The CHP returned to normal use in 2019-20 and so gas use started to return to 'normal' levels but in the context of the covid-19 pandemic which required many of the university staff and students to work from home and buildings to close.
  - USSP Ltd (University of Southampton Science Park Ltd) emissions are currently only available for 2019-20 but include stationary emissions from both USSP Ltd and its tenants. Tenant emissions are therefore **not** reported under *Scope 3: Upstream leased assets*.

- 2020-21:
    - This year saw a return to near 'normal' operations and, as noted above, results in the somewhat anomalous percentage change since 2018-19 indicator.

3.1.2 Scope 1: Mobile combustion

Mobile combustion comprises combustion of fuels in transportation devices such as cars, trucks, buses, trains, airplanes, boats, ships, barges, vessels, etc. Currently fuel for research vehicles & vessels is reported under *Scope 3: Purchased Goods & Services*.

These emissions are calculated by the Estates Energy team as part of the HESA submission process using activity data (kWh purchased) and the appropriate UK GHG conversion factors.

Figure 3 shows Scope 1: Mobile combustion emissions over time while Table 4 reports the latest estimate and indicators of change where applicable.

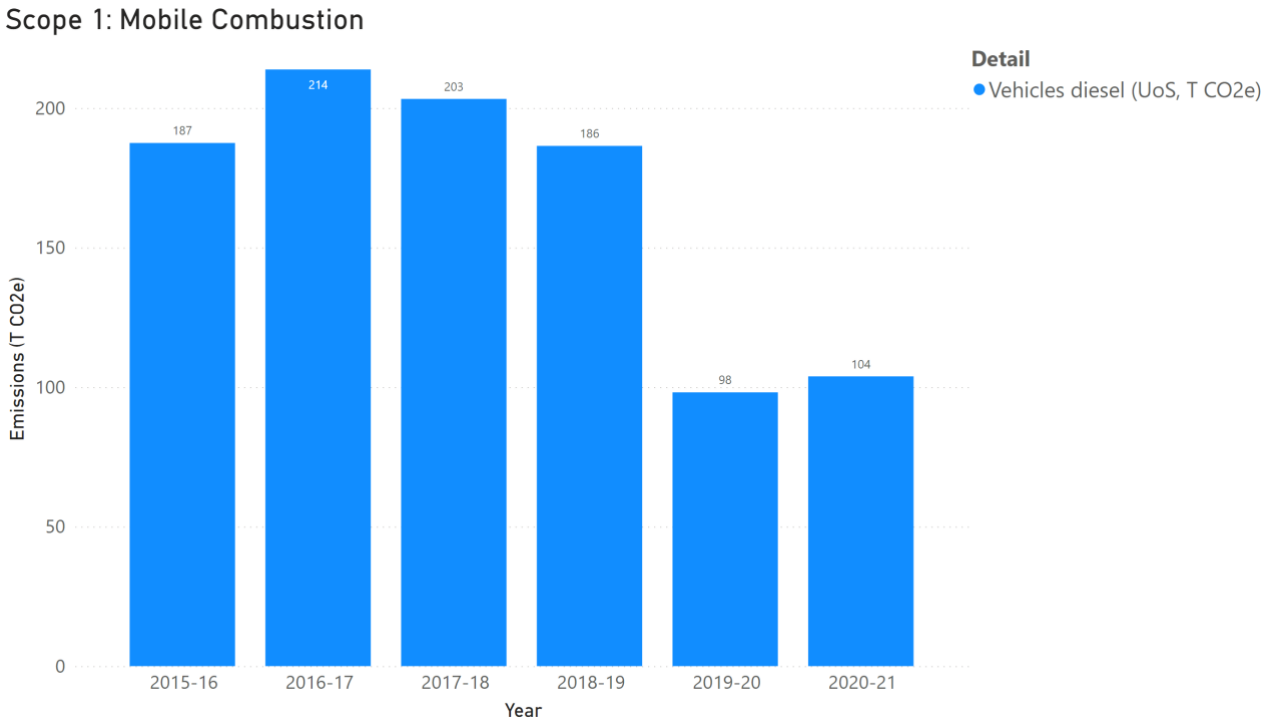

Figure 3: University of Southampton Scope 1: mobile combustion emissions

Table 4: University of Southampton Scope 1: mobile combustion emissions

Statistic	Value
Latest total (T CO_2e, 2020-21)	104
Change since 2015-16 (% difference)	-44.4
Change since 2018-19 baseline (% difference)	-44.1

Explanatory notes:

- pre 2018-19:
    - Mobile combustion emissions have been reducing since 2016-17.
- 2019-20 and 2020-21:
    - The COVID effect on University operations is clear with a slight rebound in 2020-21

3.1.3 Scope 1: Fugitive emissions

Fugitive emissions cover intentional and unintentional releases such as equipment leaks from joints, seals, packing, gaskets, as well as fugitive emissions from coal piles, waste-water treatment, pits, cooling towers and gas processing facilities.

In the case of the University this is likely to be mainly refrigerant leaks and leaks from gas supply infrastructure.

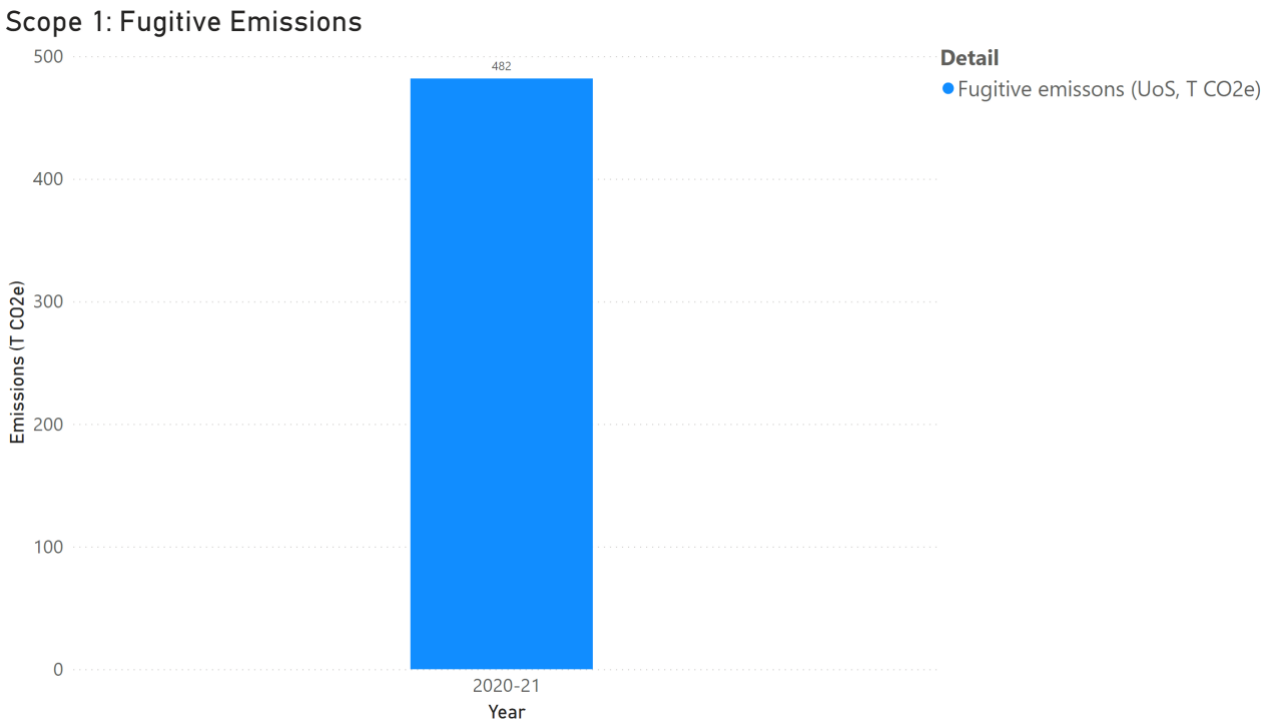

Figure 4: University of Southampton Scope 1: fugitive emissions estimates

Table 5: University of Southampton Scope 1: fugitive emissions estimates

Statistic	Value
Latest total (T CO_2e, 2020-21)	482
Change since 2015-16 (% difference)	Not applicable
Change since 2018-19 baseline (% difference)	Not applicable

Explanatory notes:

- 2020-21:
    - Following a literature review of the likely scale of the various fugitive emissions components (Trewick & Anderson, 2022), fugitive emissions for refrigerants (only) were estimated using a record of centrally managed cooling systems and average leakage rates from the literature (see Figure 4 and Table 5). The estimates are known to be incomplete as they do not cover cooling systems that are locally managed within Departments or Laboratories.

3.1.4 Scope 1: Process emissions

We currently do not have estimates for process emissions. A literature review of Fugitive and Process emissions has recommended further work to establish the potential scale of the University's Process emissions (Trewick & Anderson, 2022).

3.1.5 Future work

Future reporting will ensure that:

- Stationary combustion emissions for USSP Ltd are updated
- Fugitive emissions estimates are updated and expanded
- Process emissions are understood

3.2 Scope 2

Under the GHG Protocol Scope 2 guidance (WRI/WBCSD 2015a) Scope 2 emissions are:

- **Purchased electricity** - emissions from purchased or acquired electricity
- **Steam, heat and cooling** - emissions from purchased heat, hot water, steam or cooling

In the case of the University this covers:

- Purchase of electricity from the grid
- Purchase of heat from the City of Southampton's heat network at some sites

Scope 2 emissions (4.8 kT CO_2e) comprised 4% of total Scope 1, 2 and 3 emissions in 2020-21 having reduced by 66% since 2015-16 (Table 21) with some fluctuation in response to the operational status of the CHP which generates a significant proportion of the electricity we use.

Figure 5 shows Scope 2 emissions over time while Table 6 reports the latest estimates and an indicator of change since the 2018-19 baseline where applicable. They show that Scope 2 emissions reductions were almost entirely driven by reductions in emissions from purchased electricity. Emissions from this source have fallen substantially due to both the ongoing decarbonisation of the grid and to reductions in electricity use through energy efficiency projects[7].

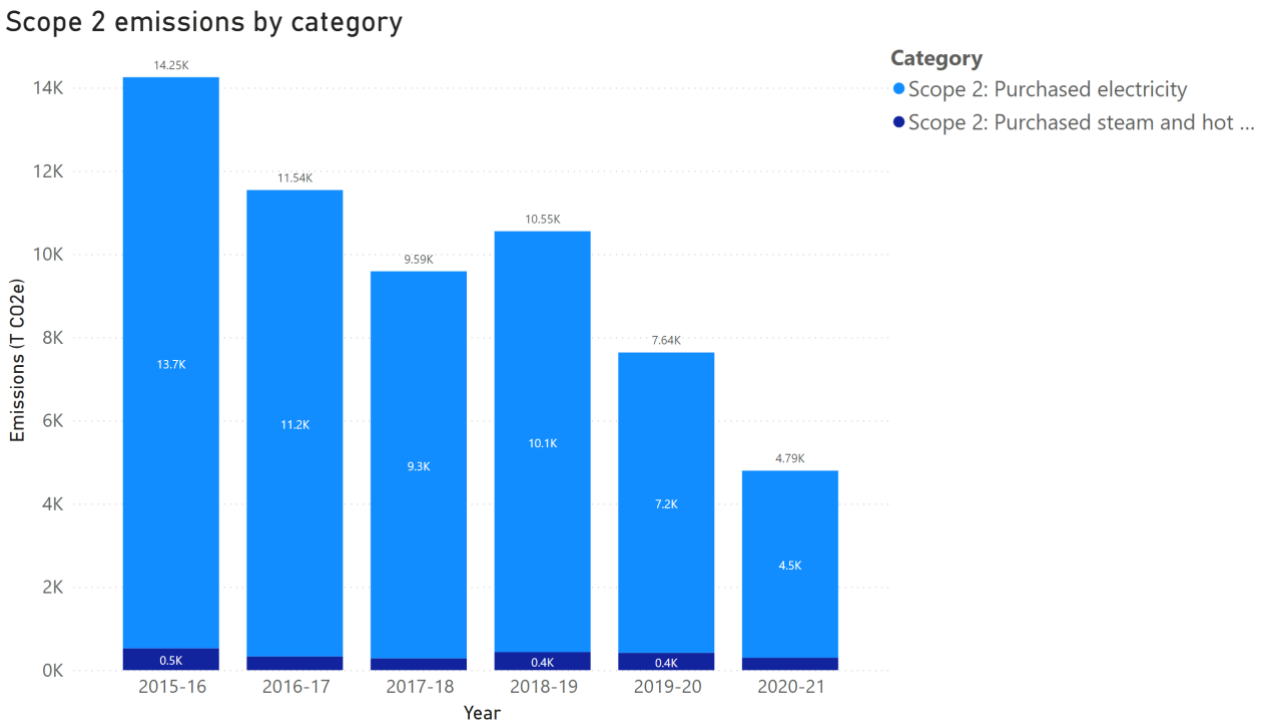

Figure 5: University of Southampton Scope 2 emissions

Table 6: University of Southampton Scope 2 emissions

Indicator	Purchased electricity	Purchased steam and hot water
Latest total (T CO_2e, 2020-21)	4,495	300
Change since 2015-16 (% difference)	-67.3	-43
Change since 2018-19 baseline (% difference)	**-55.6**	**-30.9**

- Emissions in the 2018-19 baseline year were slightly higher than trend as the Highfield CHP, which generates a significant proportion of the electricity used by the University, was only partially operational. The University therefore had to buy more electricity from the grid and as a result subsequent years will show a higher-than-expected percentage reduction from this 'high usage' baseline year.
- In 2019-20 the CHP returned to normal use resulting in a decline in purchased electricity compounded by the COVID-19 pandemic which required many university staff and students to work from home and buildings to close.

[7] See Figure 19: University of Southampton electricity use over time (Source: HESA *https://www.hesa.ac.uk/data-and-analysis/estates*).

- 2020-21 saw a return to near 'normal' operations and this combined with the higher than trend 2018-19 baseline, produces the 55% reduction value. Note that our switch to a renewable electricity tariff did not take effect until June 2021[8] and so will be accounted in the 2021-22 emissions reporting.

The following sections discuss each of the Scope 2 categories in more detail.

3.2.1 Scope 2: Purchased electricity

These emissions can be calculated using one of two methods:

- **market-based** - the specific emissions factors reported by the contracted supplier
- **location-based** - the average grid carbon intensity for the region in which the University is located

In the following we use the **location-based** approach. These emissions are calculated by the Estates Energy team as part of the HESA submission process using activity data (kWh purchased) and the appropriate UK GHG conversion factors (see Table 20).

From 2021-22 onwards the majority of these emissions can be set to zero to reflect our switch to a REGO-backed renewable tariff in June 2021. Note that this will not affect our *Scope 3: Upstream fuel and energy* emissions.

Figure 6 shows Scope 2: Purchased electricity emissions over time while Table 7 reports the latest estimate and indicators of change where applicable.

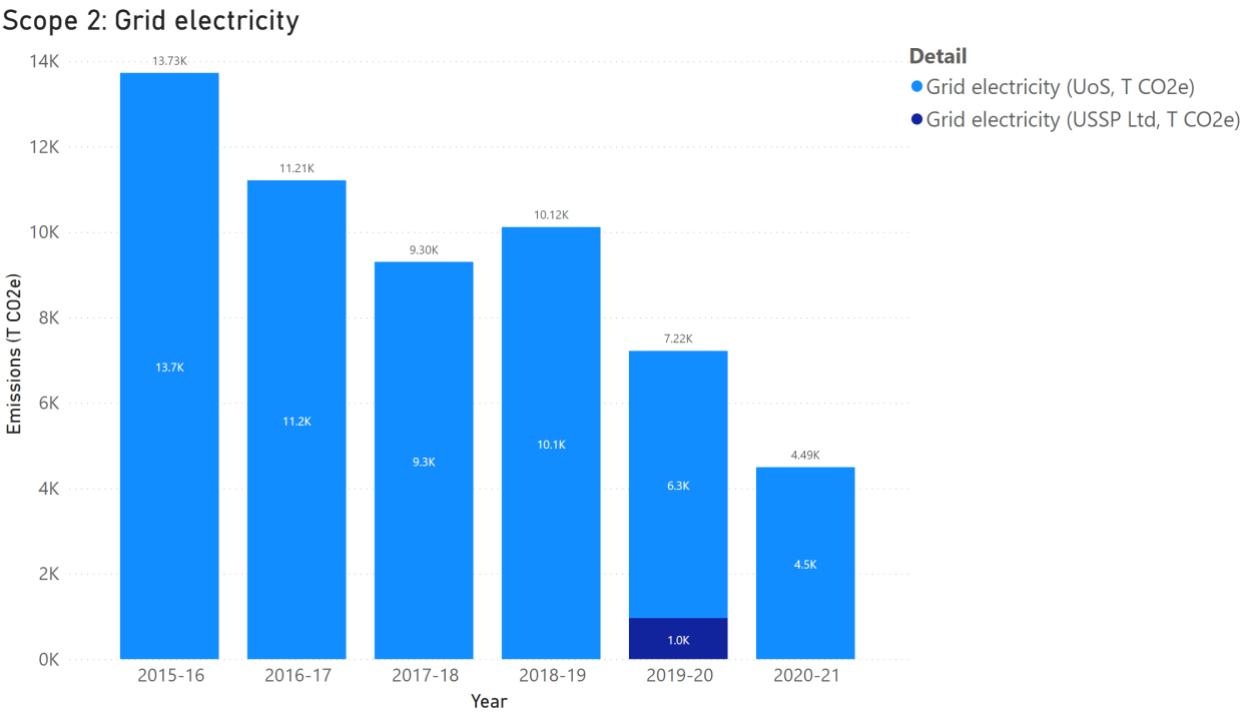

Figure 6: University of Southampton Scope 2: purchased electricity emissions

Table 7: University of Southampton Scope 2: purchased electricity emissions

Statistic	Value
Latest total (T CO_2e, 2020-21)	4,495
Change since 2015-16 (% difference)	-67.3
Change since 2018-19 baseline (% difference)	-55.6

Explanatory notes:

[8] See *https://www.southampton.ac.uk/blog/sussed-news/2021/10/20/university-switches-to-renewable-energy-electricity-contract/*

- Overall trends:
  - Figure 6 shows that purchased electricity emissions have fallen over time due to *both* the substantial and ongoing decarbonisation of the grid *and also* to reductions in electricity use through energy efficiency projects (see Figure 19 in the Annex).
- 2018-19:
  - Emissions in the 2018-19 baseline year were slightly higher than trend as the Highfield campus gas-powered combined heat and power plant was only partially operational so the University had to buy more electricity from the grid (see Figure 18 and Figure 19 in the Annex). This means that subsequent years will show a higher than expected percentage reduction from this 'high usage' baseline year.
- 2019-20:
  - The CHP returned to normal use resulting in a decline in purchased electricity but the substantial reduction from 2018-19 to 2019-20 is largely due to the covid-19 pandemic requiring many of the university staff and students to work from home and buildings to close.
  - USSP Ltd (University of Southampton Science Park Ltd) emissions are currently only available for 2019-20 but include emissions from both USSP Ltd and its tenants. Tenant emissions are therefore not reported under Scope 3: Downstream Leased Assets to avoid double-counting.
- 2020-21:
  - This year saw a return to near 'normal' operations as shown by Figure 19 in the Annex and, combined with the higher than trend 2018-19 baseline produces the higher than expected percentage reduction figure as anticipated.

3.2.2 Scope 2: Purchased steam and hot water

These emissions are calculated by the Estates Energy team as part of the HESA submission process using activity data (kWh purchased) and the appropriate UK GHG conversion factors (see Table 20). Figure 7 shows Scope 2: Purchased steam and hot water emissions over time while Table 8 reports the latest estimate and indicators of change where applicable.

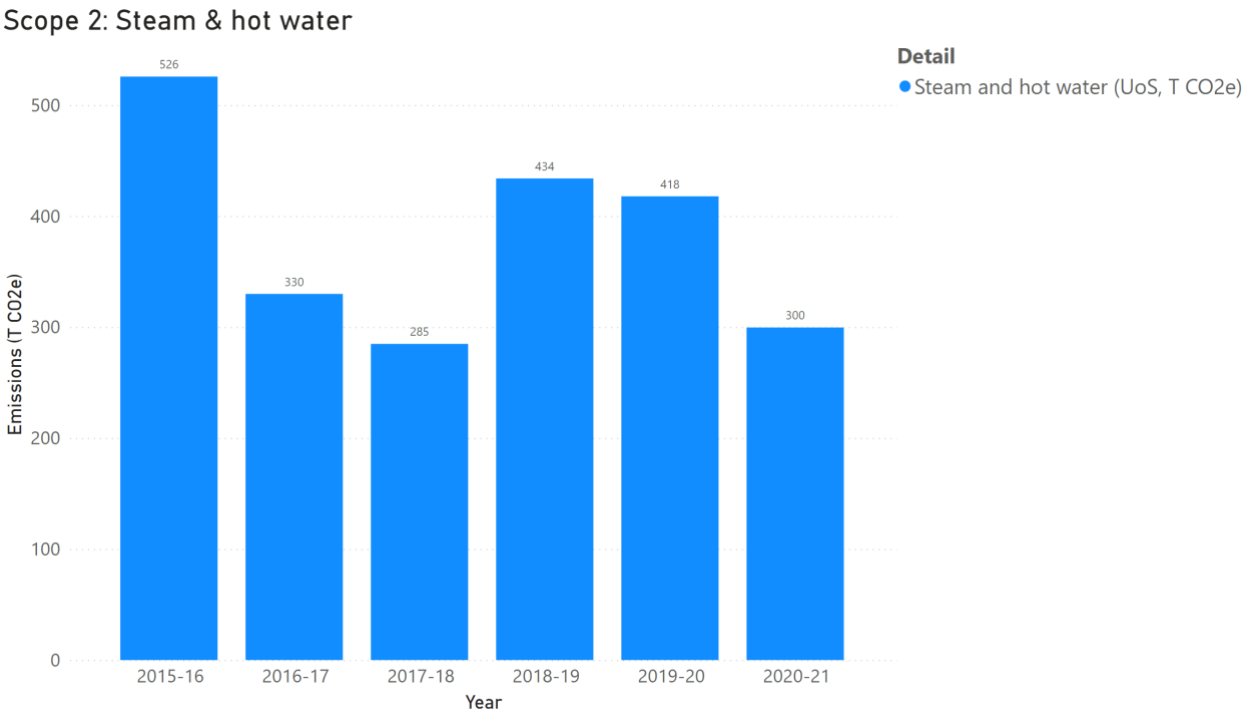

Figure 7: University of Southampton Scope 2: purchased steam and hot water emissions

Table 8: University of Southampton Scope 2: purchased steam and hot water emissions

Statistic	Value
Latest total (T CO_2e, 2020-21)	300
Change since 2015-16 (% difference)	-43
Change since 2018-19 baseline (% difference)	-30.9

Explanatory notes:

- The steam and hot water figures relate to the Southampton city district heating for Mayflower (heat and hot water) and City Gateway (hot water) halls. The system was operating sub-optimally in 2016-17 and suffered a major split in the pipework during 2017-18 which resulted in loss of heat and the use of a back-up boiler.

3.2.3 Future work

Future reporting will ensure that:

- Purchased electricity emissions for USSP Ltd are updated
- University purchased electricity emissions are set to zero as appropriate to reflect the switch to a renewable electricity tariff

3.3 Scope 3

Under the GHG Protocol Scope 3 guidance (WRI/WBCSD 2013) reporting Scope 3 emissions involves the identification of other indirect emissions from the University's upstream and downstream activities as well as emissions associated with outsourced/contract manufacturing, leases, or franchises not included in Scope 1 or Scope 2. The inclusion of Scope 3 emissions allows the University to expand its inventory boundary up and down the value chain to identify all relevant GHG emissions. This provides a broad overview of the University's business linkages and possible opportunities for significant GHG emission reductions that may exist upstream (or downstream) of our immediate operations.

Scope 3 emissions categories:

- Upstream
    - 3.1: **Purchased goods and services**
    - 3.2: **Capital goods** - we include these in purchased goods and service reporting
    - 3.3: **Upstream fuel & energy** (non Scope 1 & 2)
    - 3.4: **Upstream transportation and distribution**
    - 3.5: **Waste generated in operations**
    - 3.6: **Business travel**
    - 3.7: **Employee commuting**
    - 3.8: **Upstream leased assets**
- Downstream
    - 3.9: **Downstream transportation and distribution** - considered not applicable and not included in this report
    - 3.10: **Processing of sold products** - considered not applicable and not included in this report
    - 3.11: **Use of sold products** - considered not applicable and not included in this report
    - 3.12: **End-of-life treatment of sold products** - considered not applicable and not included in this report
    - 3.13: **Downstream leased assets (operation)** - the University's Science Park is our only downstream leased asset and emissions are reported under Scope 1 and 2 above.
    - 3.14: **Franchises** (operation) - considered not applicable and not included in this report

- 3.15: **Investments** (operation) - applicable but we do not yet have estimates that can be reported

Scope 3 emissions are therefore indirect emissions that derive from activities that the University does not own or control. These emissions are usually the greatest share of the emissions footprint, covering emissions associated with business travel, employee commuting, procurement (i.e. supply chain), leased assets, waste and water.

Most of the currently known values for Scope 3 emissions categories are estimates and so, where relevant, we report them rounded to the nearest 100 Tonnes CO_2e to avoid assumptions of over-precision.

Figure 8 shows Scope 3 emissions over time (where estimated) while Table 9 reports the latest estimates and an indicator of change since the 2018-19 baseline where applicable.

Note that Upstream transport & distribution are excluded from Table 9 as estimates are only available for 2017 and assumed to be constant (see Scope 3: Upstream transportation and distribution below). Employee commuting is based on estimates from the pre-COVID Travel Survey with suitable COVID-year adjustments[9]. Upstream leased assets are only included from 2020-21 and estimates of emissions from Investments are excluded as we do not yet have this data.

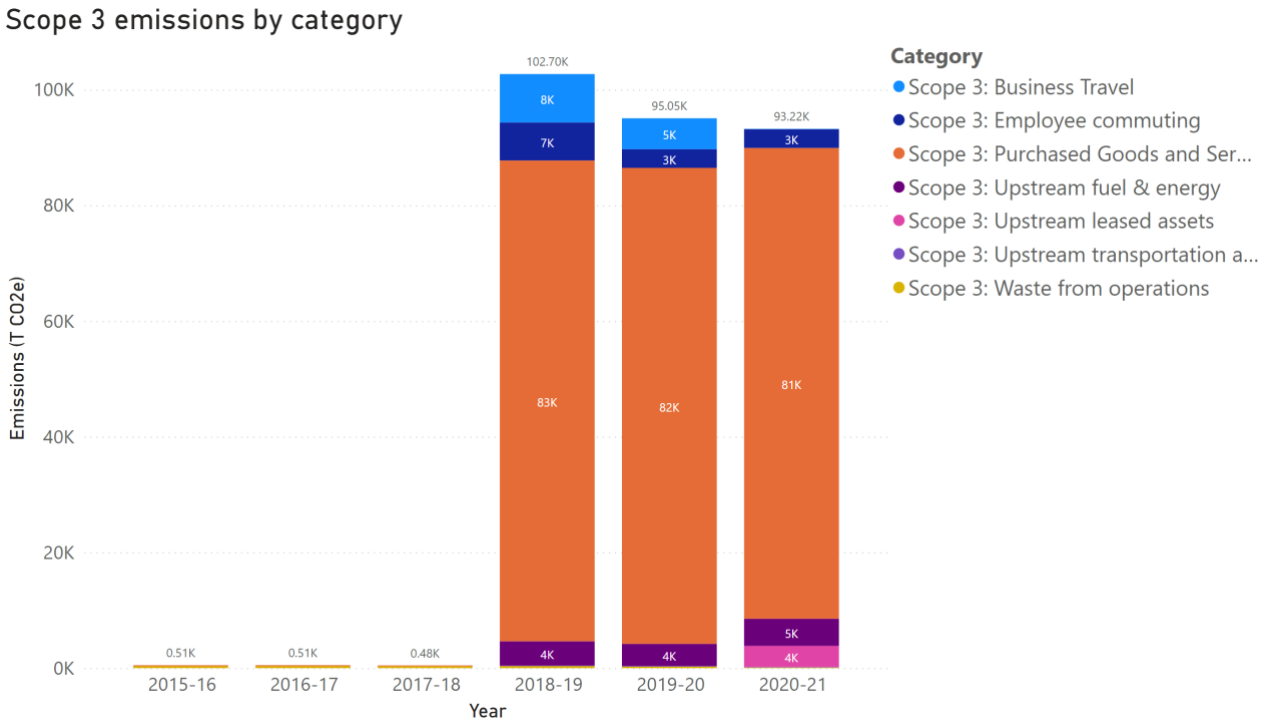

Figure 8: University of Southampton Scope 3 emissions

Table 9: Selected University of Southampton Scope 3 emissions categories

Indicator	Purchased goods and services (nearest 100 T)	Upstream fuel & energy	Waste from operations (nearest 100 T)	Business travel	Employee commuting (nearest 100 T)	Upstream leased assets (nearest 100 T)
Latest total (T CO_2e, 2020-21)	81,000	4,698	100	58	3,200	3,700
Change since 2015-16 (% difference)	Not applicable	Not applicable	Not applicable	Not applicable	Not applicable	Not applicable

[9] See the technical report for further detail.

Change since 2018-19 baseline (% difference)	-1.2	11.8	-75	-99.3	-51.5	Not applicable

Prior to 2018-19 Scope 3 emissions were only estimated for water treatment and waste-water services. These are now subsumed into *Purchased Goods & Services* and *Waste from operations* respectively.

Overall, Scope 3 emissions have fallen by 9% since 2018-19 with a notable ongoing decrease in emissions due to waste. The increase in upstream fuel and energy emissions was due to the increased use of gas.

However, the majority of the 9% decrease was due to the effects of COVID-19 on measured Business Travel and estimated Employee Commuting. Neither of these are likely to be wholly sustained reductions even if 'new normal' operations establish, especially given the strategic focus on growth.

The following sections discuss each of the Scope 3 categories in more detail.

3.3.1 Scope 3: Purchased Goods & Services (and Capital goods)

These emissions include all upstream (i.e., cradle-to-gate) emissions from the production of products purchased or acquired by the reporting company in the reporting year. Products include both goods (tangible products) and services (intangible products) but does **not** include services reported in other categories such as Business Travel and Waste from Operations. The minimum boundary is:

- All upstream (cradle-to-gate) emissions of purchased goods and services

These emissions may be estimated in four ways:

- **Supplier-specific method** – collects product-level cradle-to-gate GHG inventory data from goods or services suppliers.
- **Hybrid method** – uses a combination of supplier-specific activity data (where available) and secondary data to fill in the gaps.
- **Average-data method** – estimates emissions for goods and services by collecting data on the mass (e.g., kilograms), or other relevant units of goods or services purchased and multiplying by the relevant secondary emission factors (e.g., average emissions per unit of good or service).
- **Spend-based method** – estimates emissions for goods and services by collecting data on the economic value of goods and services purchased and multiplying it by relevant secondary (e.g., industry average) emission factors (e.g., average emissions per monetary value of goods.

In this section we use:

- the **spend-based method** via the Higher Education Supply Chain Emissions tool (HESCET)[10] which uses University-supplied expenditure data mapped to BEIS/DEFRA emissions factors. The HESCET tool outputs (emissions) data is provided by the University's Procurement team.
- the **average-data method** for emissions from treatment of our supplied water using our metered water use and appropriate UK GHG conversion factors. This data forms part of our annual HESA return.

Note that emissions due to waste and waste-water services are included in *Scope 3: Waste from operations* below.

Figure 9 shows Scope 3: Purchased Goods and Services emissions over time while Table 10 reports the latest estimate and an indicator of change since the 2018-19 baseline. Note that this table excludes all other Scope 3 categories, including purchased business travel which are accounted separately (see above).

[10] *https://www.sustainabilityexchange.ac.uk/hescet_tool*

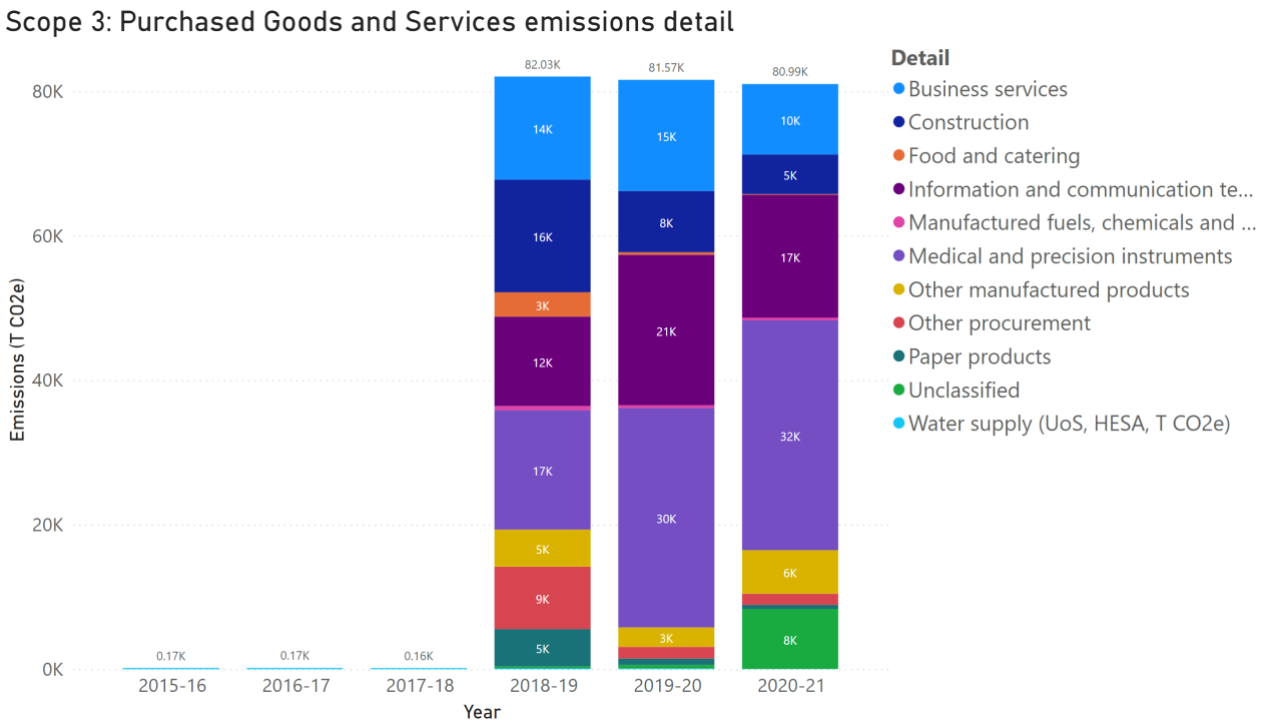

Figure 9: University of Southampton Scope 3: purchased goods & services emissions

Table 10: University of Southampton Scope 3: purchased goods & services emissions

Statistic	**Value**
Latest total (to nearest 100 T CO_2e, 2020-21)	81,000
Change since 2015-16 (% difference)	Not applicable
Change since 2018-19 baseline (% difference)	-1.2

Explanatory notes:

- The relationship between expenditures, emissions factors and actual upstream emissions is not necessarily that robust. These emissions estimates should therefore be viewed with caution and significant changes should be analysed in detail to ensure they are not artefacts of the estimation method.
- As these emissions are estimated using an expenditure-based approach and the underlying emissions factors for each good or service do not change annually, the emissions reported will fluctuate as expenditure on different goods and services fluctuates.

With these caveats in mind, it is nevertheless clear that expenditures classified as *Business services*, *Construction*, *ICT*, and *Medical and precision instruments* comprise the major components of these emissions. *Food and catering* and *Paper products*, which comprised 3 and 5 kT CO_2e respectively in 2018-19, were essentially absent in 2019-20 and 2020-21 largely due to COVID restrictions.

Under the HESCET tool categorisation method:

- *Information and Communication Technologies* includes both the purchase of software (and ongoing bespoke licences) as well as cloud services and computer/AV/telecommunications hardware purchasing and maintenance;
- *Medical and precision instruments* includes nearly all laboratory materials purchasing as well as specialist research or medical equipment such as Laboratory Capital Equipment, Laboratory Support Equipment, Medical Patient Diagnostic Services and equipment for clinical trials;
- *Business services* includes all forms of purchased consultancy or fee-based services such as ICT consultancy, data information services, Building Related Professional Services, Temporary & Recruitment Employment Agencies, Building Repairs & Maintenance services and Security services.

In future work we intend to develop supplier-specific emissions reporting but anticipate that it will be some years before all suppliers are able to provide this data. In the meantime, we will continue with the approach described above.

3.3.2 Scope 3: Upstream fuel and energy

This category is intended to capture our share of upstream (well-to-tank[11]) emissions related to the energy use reported under Scope 1 and 2. This covers:

- Upstream emissions of purchased fuels (in our case gas and diesel)
- Upstream emissions of purchased electricity
- Transmission and distribution (T&D) losses (in our case for electricity and steam)
- Generation of purchased electricity that is sold to end users (not applicable to the University)

Emissions are calculated using the kWh energy/steam or litre fuel use values provided by the Energy team for *Scope 1* and *Scope 2* reporting and the relevant UK Government published conversion factors (see Table 20). These emissions could be calculated prior to 2018-19 but this has not (yet) been done.

These emissions will fluctuate as energy use fluctuates and the electricity use component will not be affected by the switch to a renewable electricity tariff.

Figure 10 shows Scope 3: Upstream fuel and energy emissions over time while Table 11 reports the latest estimate and indicators of change where applicable.

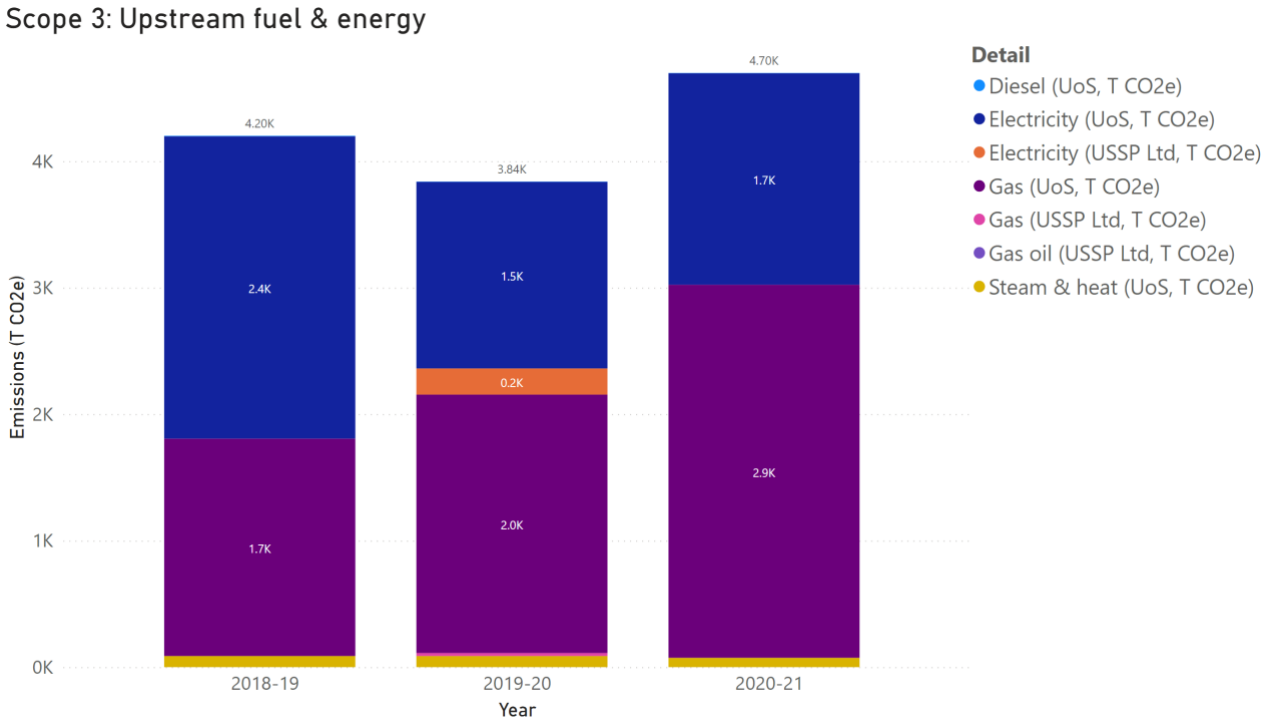

Figure 10: University of Southampton Scope 3: upstream fuel and energy emissions

Table 11: University of Southampton Scope 3: upstream fuel and energy emissions

Statistic	Value
Latest total (T CO_2e, 2020-21)	4,698
Change since 2015-16 (% difference)	Not applicable
Change since 2018-19 baseline (% difference)	11.8

Explanatory notes:

- 2018-19
  - Estimated from energy use data supplied by the Estates Energy Team

[11] https://ghgprotocol.org/sites/default/files/standards_supporting/Chapter3.pdf

- 2019-20
    - As above but with the addition of USSP Ltd energy use data
- 2020-21
    - As above but USSP Ltd data not yet available. The increase in 2020-21 reflects the increased use of gas as reported in *Scope 1: Stationary combustion*.

3.3.3 Scope 3: Upstream transportation and distribution

Emissions under this category cover:

- transportation and distribution of products purchased in the reporting year, between our suppliers and our own operations in vehicles not owned or operated by the University
- Third-party transportation and distribution services purchased by the University, including inbound logistics, outbound logistics, and third-party transportation and distribution between a company's own facilities.

The minimum boundaries are:

- The scope 1 and scope 2 emissions of transportation and distribution providers that occur during use of vehicles and facilities (e.g., from energy use)
- Optional: The life cycle emissions associated with manufacturing vehicles, facilities, or infrastructure

These can be calculated via:

- **Site-specific** method, which involves site-specific fuel, electricity, and fugitive emissions data and applying the appropriate emission factors
- **Average-data** method, which involves estimating emissions for each distribution activity, based on average data (such as average emissions per pallet or cubic meter stored per day). Estimating upstream transportation and distribution emissions is extremely difficult.

Explanatory notes:

- 2018-19
    - In the absence of other data we use an estimate for goods inwards deliveries for Highfield Campus for 2015-16 produced as part of a recent University PhD thesis (Robinson 2017)[12]. This used the average data method.
- 2019-20
    - In the absence of other data we have re-used the 2018-19 data without adjustment
- 2020-21
    - In the absence of other data we have re-used the 2018-19 data without adjustment

Table 12: University of Southampton Scope 3: upstream transportation emissions

Statistic	Value
Latest total (nearest 100 T CO_2e, 2020-21)	100
Change since 2015-16 (% difference)	Not applicable
Change since 2018-19 baseline (% difference)	0

[12] https://eprints.soton.ac.uk/438634/

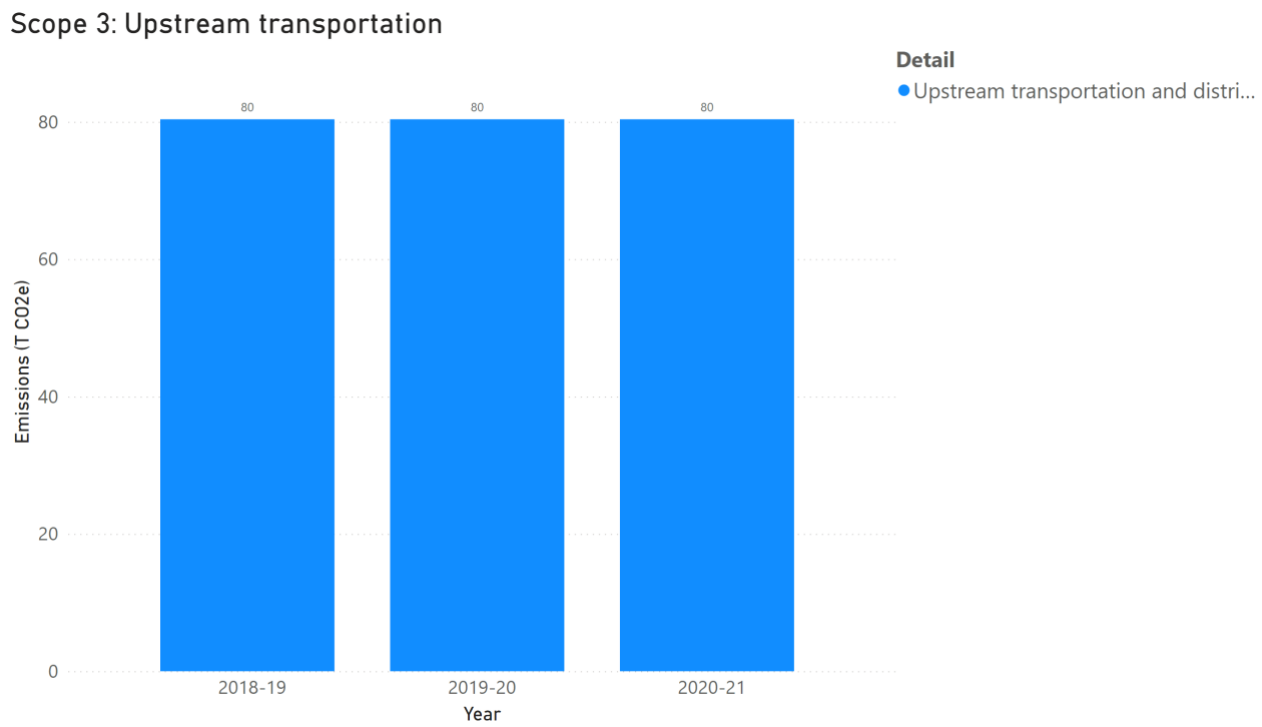

Figure 11: University of Southampton Scope 3: upstream transportation emissions

Future work will seek to provide more robust estimates of this emissions category.

3.3.4 Scope 3: Waste from operations

These emissions cover those from third-party disposal and treatment of waste generated in the University's owned or controlled operations. This category includes emissions from disposal of both solid waste and waste-water.

Only waste treatment in facilities owned or operated by third parties is included in Scope 3. Waste treatment at facilities owned or controlled by the University would be accounted for in Scope 1 and Scope 2. Treatment of waste generated in operations is categorized as an upstream Scope 3 category because waste management services are purchased by the University.

Minimum boundaries:

- The scope 1 and scope 2 emissions of waste management suppliers that occur during disposal or treatment
- *Optional*: Emissions from transportation of waste (waste transfers)

Reports may use any one of the following methods to calculate emissions from waste generated in their operations, but managed by third parties:

- **Supplier-specific** method, which involves collecting waste-specific scope 1 and scope 2 emissions data directly from waste treatment companies (e.g., for incineration, recovery for recycling)
- **Waste-type-specific** method, which involves using emission factors for specific waste types and waste treatment methods
- **Average-data** method, which involves estimating emissions based on total waste going to each disposal method (e.g., landfill) and average emission factors for each disposal method.
- To optionally report emissions from the transportation of waste, refer to category 4 (Upstream transportation and distribution) for calculation methodologies.

Figure 12 shows Scope 3: Waste from operations emissions over time while Table 13 reports the latest estimate and indicators of change where applicable.

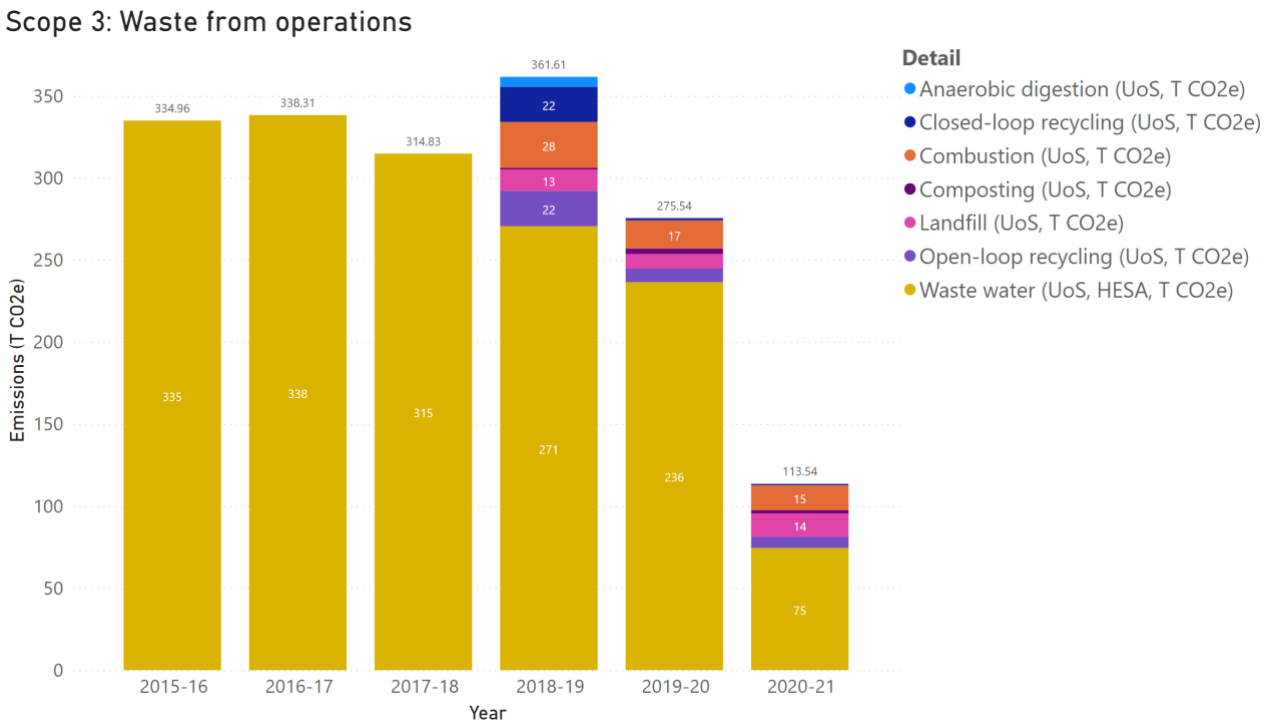

Figure 12: University of Southampton Scope 3: waste from operations emissions

Table 13: University of Southampton Scope 3: waste from operations emissions

Statistic	Value
Latest total (to nearest 100 T CO_2e, 2020-21)	100
Change since 2015-16 (% difference)	-66.7
Change since 2018-19 baseline (% difference)	-75

Explanatory notes:

- 2015-16 to 2017-18
  - These estimates include only emissions due to waste-water services as reported via HESA.
- 2018-19
  - These estimates use our HESA reported emissions due waste-water and our HESA reported waste mass and appropriate UK GHG conversion factors (**waste-type-specific** method). Due to a lack of detailed data, recycling has been equally split into open and closed-loop recycling. These estimates *do not* include waste transfers. Emissions from waste transfers were previously estimated to be ~ 2,770 T CO2e in 2015-16 by a University PhD project (Robinson 2017). This is an order of magnitude larger than emissions solely from waste.
- 2019-20
  - These estimates use our HESA reported emissions due to waste-water together with a new *Waste Emissions Calculator tool* developed in 2022 by a student project. This uses actual waste volume/tonnage returns from our contractors and converts them to emissions using appropriate UK GHG conversion factors (**waste-type-specific** method). These estimates *do not* include waste transfers. The relatively low values for 2019-20 compared to 2020-21 reflect the impact of COVID.
- 2020-21
  - These estimates use the same method as 2019-20 and, as before *do not* include waste transfers. The values for 2020-21 are unusually low due to substantial reductions in

the use of water (and thus the production of waste-water) during the COVID-19 pandemic. Nevertheless, an ongoing decreasing trend in waste emissions in general is also evident.

Future work will seek to provide robust estimates of waste transfers to include in the reporting for this emissions category.

3.3.5 Scope 3: Business Travel

Emissions from transportation in vehicles owned or controlled by the University are accounted for in either scope 1 (for fuel use), or in the case of electric vehicles, scope 2 (for electricity use). Emissions from leased vehicles operated by the University not included in scope 1 or scope 2 are accounted for in Scope 3: Upstream leased assets. Emissions from transportation of employees to and from work are accounted for in *Scope 3: Employee commuting*. All other business travel emissions are reported in this category.

Emissions from business travel may arise from:

- Air travel
- Rail travel
- Bus travel
- Car travel (e.g., business travel in rental cars or employee-owned vehicles other than employee commuting to and from work)
- Other modes of travel (taxi etc)

Minimum boundaries for these emissions are:

- The scope 1 and scope 2 emissions of transportation carriers that occur during use of vehicles (e.g., from energy use)

Optional:

- The life cycle emissions associated with manufacturing vehicles or infrastructure;
- Emissions from business travellers staying in hotels.

Allowable calculation methods:

- **Fuel-based** method, which involves determining the amount of fuel consumed during business travel (i.e., scope 1 and scope 2 emissions of transport providers) and applying the appropriate emission factor for that fuel
- **Distance-based** method, which involves determining the distance and mode of business trips, then applying the appropriate emission factor for the mode used
- **Spend-based** method, which involves determining the amount of money spent on each mode of business travel transport and applying secondary (EEIO) emission factors.

The data used here are extracted from the University's travel management system (go2book, supplied by Clarity). They include emissions from flights, hotels and rail travel booked via Clarity. The emissions are calculated (by Clarity) using the **distance-based** method and the factors used apply radiative forcing factors, type and class of flight but do not yet account for full well-to-tank emissions.

The data *excludes* any travel not booked via Clarity which may include light rail, bus or taxi transport paid for on the day and reclaimed via expenses. It also excludes any travel funded by external sources or paid for from personal sources. The values reported are therefore likely to be under-estimates of total business travel emissions (Ellie Harrison 2020).

Figure 13 shows Scope 3: Business Travel emissions over time while Table 14 reports the latest estimate and indicators of change where applicable.

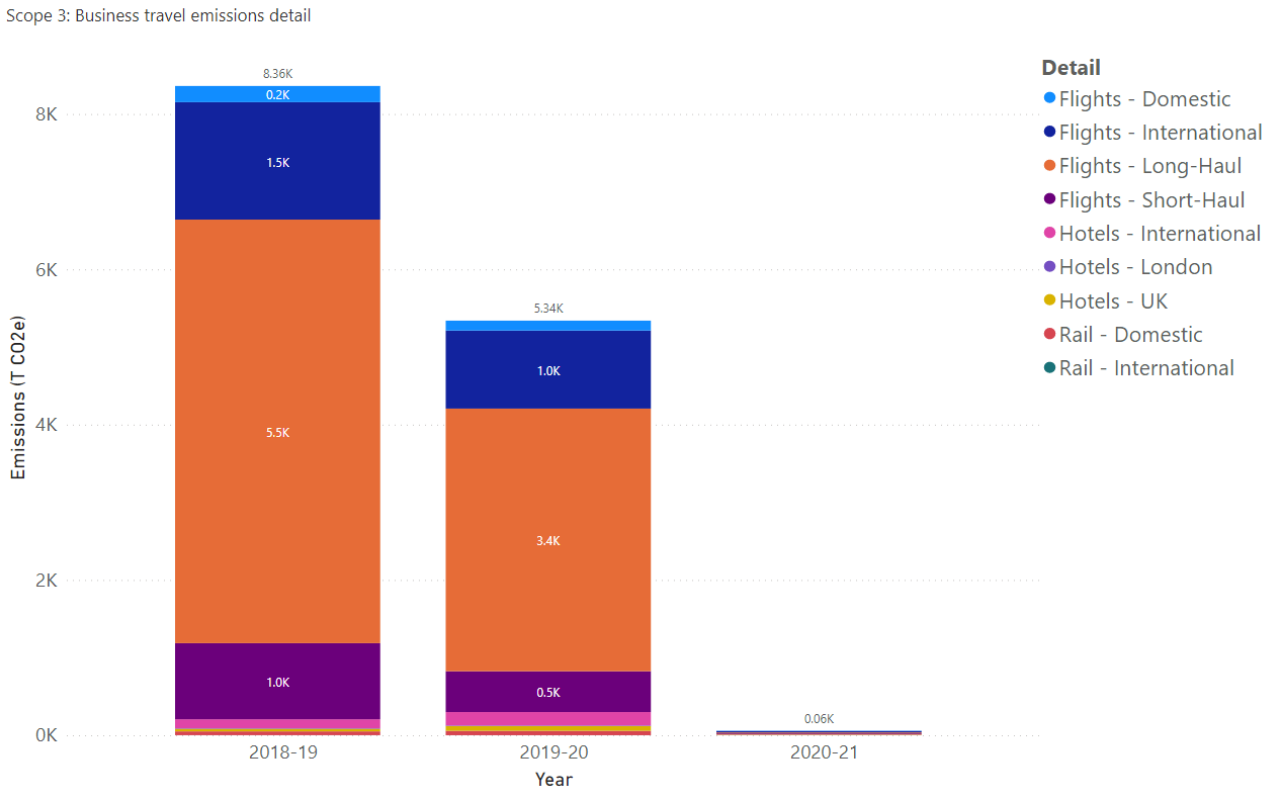

Figure 13: University of Southampton Scope 3: Business Travel emissions

Table 14: University of Southampton Scope 3: Business Travel emissions

Statistic	Value
Latest total (T CO_2e, 2020-21)	58
Change since 2015-16 (% difference)	Not applicable
Change since 2018-19 baseline (% difference)	-99.3

Explanatory notes:

- 2018-19
  - This was the last pre-COVID year of 'normal' travel
- 2019-20
  - This year was the first to be impacted by COVID travel restrictions from March 2020
- 2020-21
  - This data is not an error. Business travel emissions fell by over 99% from 2018-19 to 2020-21. However, we should expect emissions to rebound in 2021/22 as business travel restarts.

Future work will explore the feasibility of extracting non-Clarity business travel emissions data from business expenses data.

3.3.6 Scope 3: Employee Commuting

This category includes emissions from the transportation of employees between their homes and their worksites. Emissions from employee commuting may arise from:

- Car travel
- Bus travel
- Rail travel
- Air travel

Other modes of transportation (e.g., subway, bicycling, walking).

Minimum boundaries (WRI/WBCSD, 2013) Table 1:

- The scope 1 and scope 2 emissions of employees and transportation providers that occur during use of vehicles (e.g., from energy use)
- *Optional*: Emissions from employee teleworking

Companies may use one of the following methods:

- **Fuel-based** method, which involves determining the amount of fuel consumed during commuting and applying the appropriate emission factor for that fuel
- **Distance-based** method, which involves collecting data from employees on commuting patterns (e.g., distance travelled and mode used for commuting) and applying appropriate emission factors for the modes used
- **Average-data** method, which involves estimating emissions from employee commuting based on average (e.g., national) data on commuting patterns.

For compliance with the GHG Protocol we include only estimates of emissions due to employee commuting. Emissions due to student commuting is estimated under *Other reporting* below.

Figure 14 shows Scope 3: Employee commuting emissions over time while Table 15 reports the latest estimate and indicators of change where applicable.

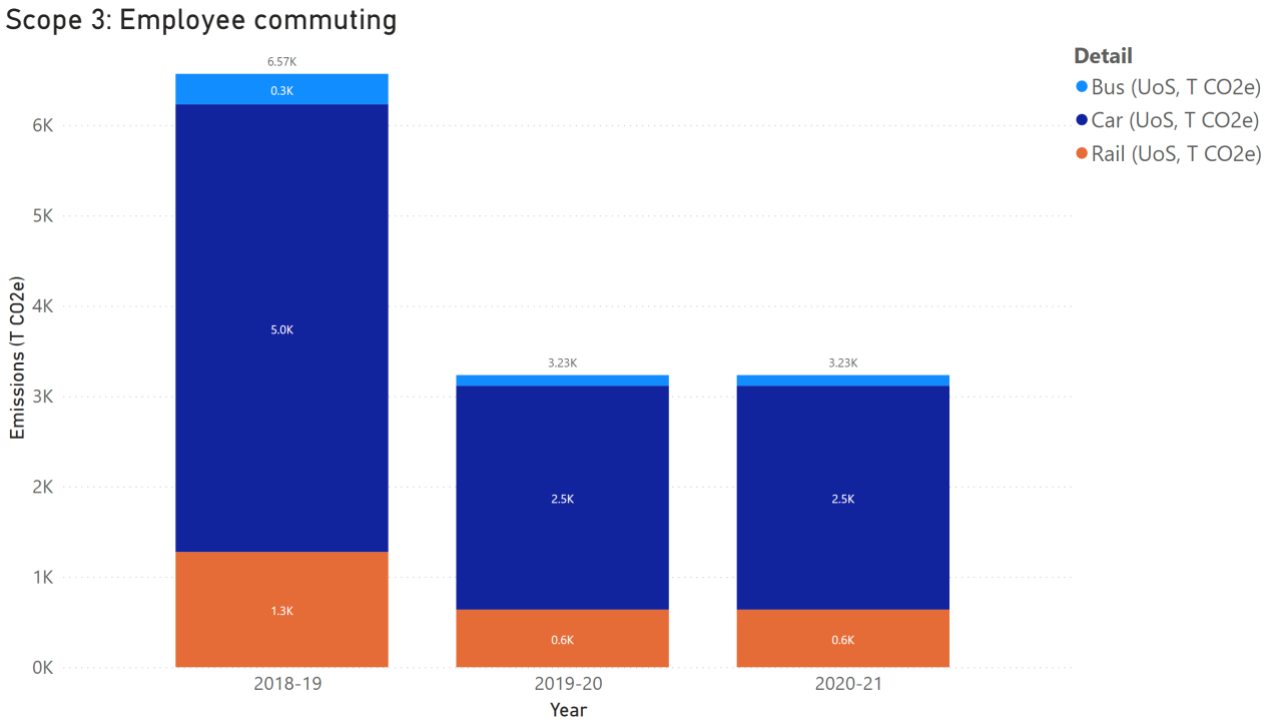

Figure 14: University of Southampton Scope 3: Employee Commuting emissions

Table 15: University of Southampton Scope 3: Employee Commuting emissions

Statistic	Value
Latest total (to nearest 100 T CO_2e, 2020-21)	3,200
Change since 2015-16 (% difference)	Not applicable
Change since 2018-19 baseline (% difference)	-51.5

Explanatory notes:

- 2018-19
  - These estimates are based on the results of a 2017 PhD study (Robinson 2017) which used the 2015 University Travel Survey. These use the distance-based method and estimates of teleworking emissions are not included.
- 2019-20
  - These estimates use the same data but assumes a 65% reduction in bus travel and a 50% reduction in car and rail commuting took place in 2019-20 based on feedback

from Estates & Facilities. This does not account for COVID-19 specific travel habits such as a move away from public transport, towards active travel and single-car occupancy.

- 2020-21
    - These estimates use the same data and make the same adjustments for 2020-21 again based on feedback from Estates. We would expect the % change since 2018-19 baseline figure to show a smaller change in future years as 'new normal' commuting patterns emerge.

Future work will produce estimates based on the latest (2022) and future University Travel Surveys.

3.3.7 Scope 3: Upstream leased assets

This category includes emissions from the operation of assets that are leased in the reporting year and not already included in the scope 1 or scope 2 inventories.

Minimum boundaries:

- The scope 1 and scope 2 emissions of lessors that occur during the operation of leased assets (e.g., from energy use)
- *Optional*: The life cycle emissions associated with manufacturing or constructing leased assets

Figure 15 shows Scope 3: Upstream leased assets emissions over time while Table 16 reports the latest estimate.

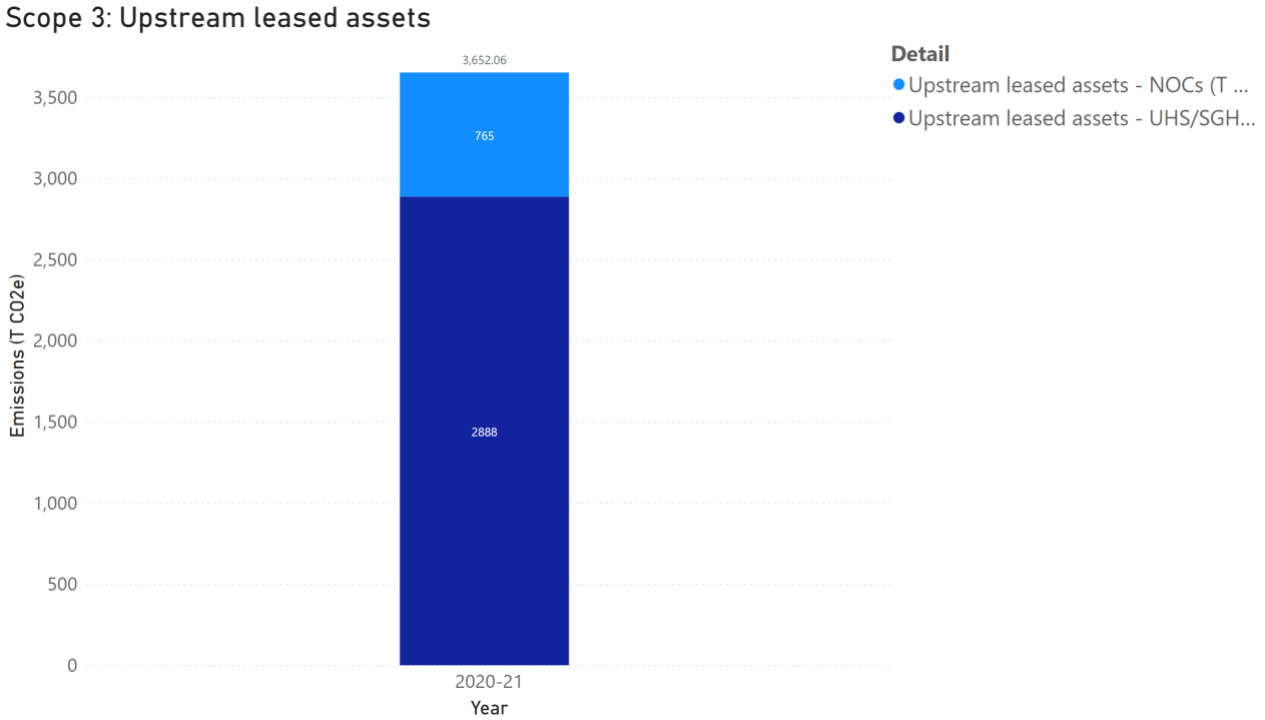

Figure 15: University of Southampton Scope 3: upstream leased assets emissions

Table 16: University of Southampton Scope 3: upstream leased assets emissions

Statistic	Value
Latest total (to nearest 100 T CO_2e, 2020-21)	3,700
Change since 2015-16 (% difference)	Not applicable
Change since 2018-19 baseline (% difference)	Not applicable

Explanatory notes:

- 2018-19
    - Emissions not estimates

- 2019-20
  - Emissions not estimated
- 2020-21
  - The emissions from our leased space at the National Oceanography Centre (NOCs) and University Hospital Southampton (UHS/SGH) have been estimated for 2020-21 using the gross internal floor area of the lease and the mean Scope 1 and 2 emissions per m2 for the Highfield Campus. They do not, therefore, take account of any Scope 1 or 2 emissions sources that are specific to the leased assets.

Future work will refine these estimates and include further estimates for our activities in Malaysia which moved into a self-contained leased building in 2021-22.

3.3.8 Scope 3: Investments (operation)

These emissions are proportional Scope 1 and Scope 2 emissions from our equity investments.

We do not currently have an estimate of proportional Scope 1 and 2 emissions from our equity investments. However, in implementing the updated Ethical Investment Policy, the University has recently appointed new portfolio fund managers who will be providing these estimates in future years for reporting both here and also in the 2022/23 financial statements.

3.4 Other reporting

This section reports on emissions that are beyond the specific GHG Protocol categories but which the University has opted to report. Estimates for these other sources are available from 2018-19 onwards only.

As *Figure 12* shows, emissions in these categories are dominated by the contribution of overseas student relocation.

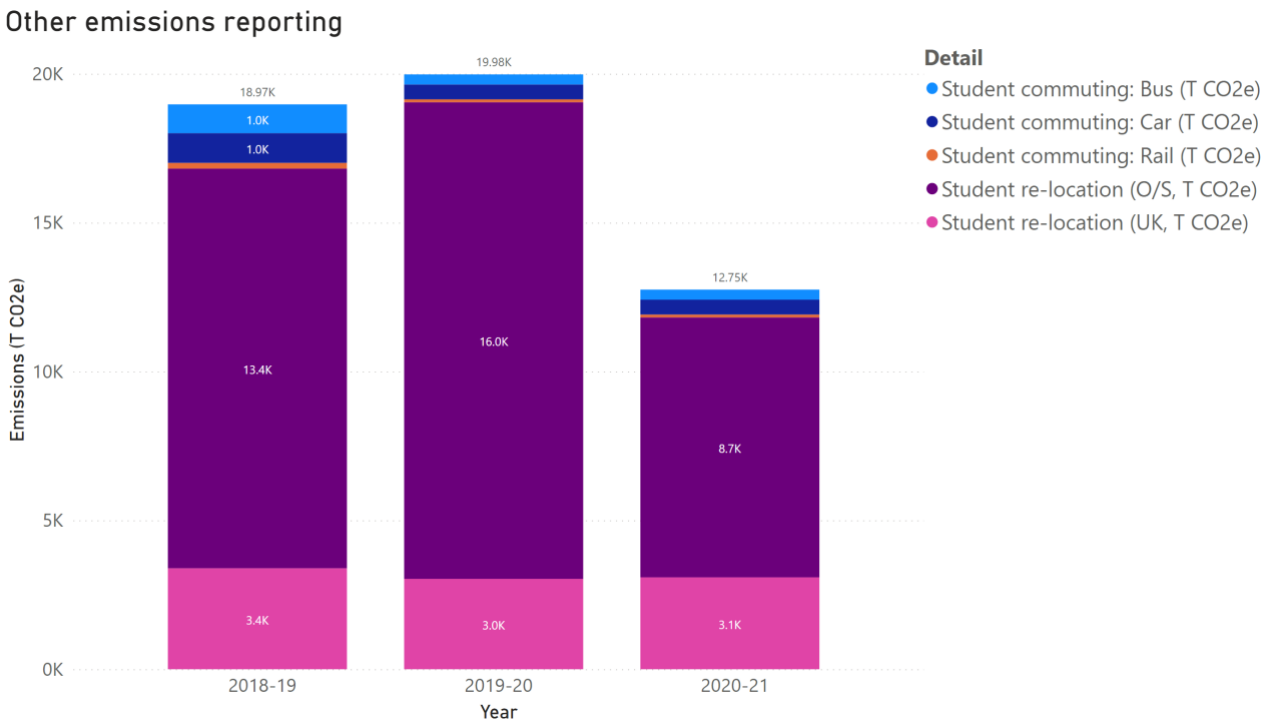

Figure 16: University of Southampton other emissions reporting over time

Table 17: University of Southampton other emissions reporting

Statistic	Student commuting	O/S student relocation	UK student relocation
Latest total (to nearest 100 T CO_2e, 2020-21)	900	8,700	3100
Change since 2015-16 (% difference)	Not applicable	Not applicable	Not applicable
Change since 2018-19 baseline (% difference)	-59%	-44%	-18%

Notes

- Emissions/removals (sequestration) due to the University estate's land-use have not yet been estimated.
- 2018-19
    - Student commuting emissions are derived from the same source as the Scope 3: Employee Commuting estimates.
    - Student relocation emissions are estimated using registered student numbers by domicile supplied by the University's Data Analytics and Insight team. O/S students are assumed to fly from their capital city, UK students are assumed to travel by car unless they are from Northern Ireland in which case they are assumed to fly from Belfast. The emissions are estimated based on one round trip per year.
- 2019-20
    - Student commuting emissions as for 2018-19 but adjusted for COVID using the same percentage by mode reductions as used above for staff commuting.
    - Student relocation emissions are estimated using student numbers by domicile as above.
- 2020-21
    - Student commuting emissions as for 2018-19 but adjusted as above.
    - Student relocation emissions are estimated using student numbers by domicile as above. Note that international student registrations were considerably lower due to COVID-19 but we do not know how many registered students did not travel to Southampton at all during 2020-21.

Note that both student commuting and relocation emissions are likely to increase as the number of students registered at the University grows in line with our growth ambitions.

4 All scope summary

Combining the data reported in each of the previous sections, Figure 17 shows overall emission by Scope, excluding other reporting.

Total emissions under Scope 1-3 reduced by 9% from 2018-19 to 2020-21 due largely to reductions in *Scope 2 Purchased electricity* and *Scope 3 Business travel emissions*. This has been partly offset by the inclusion of upstream leased assets.

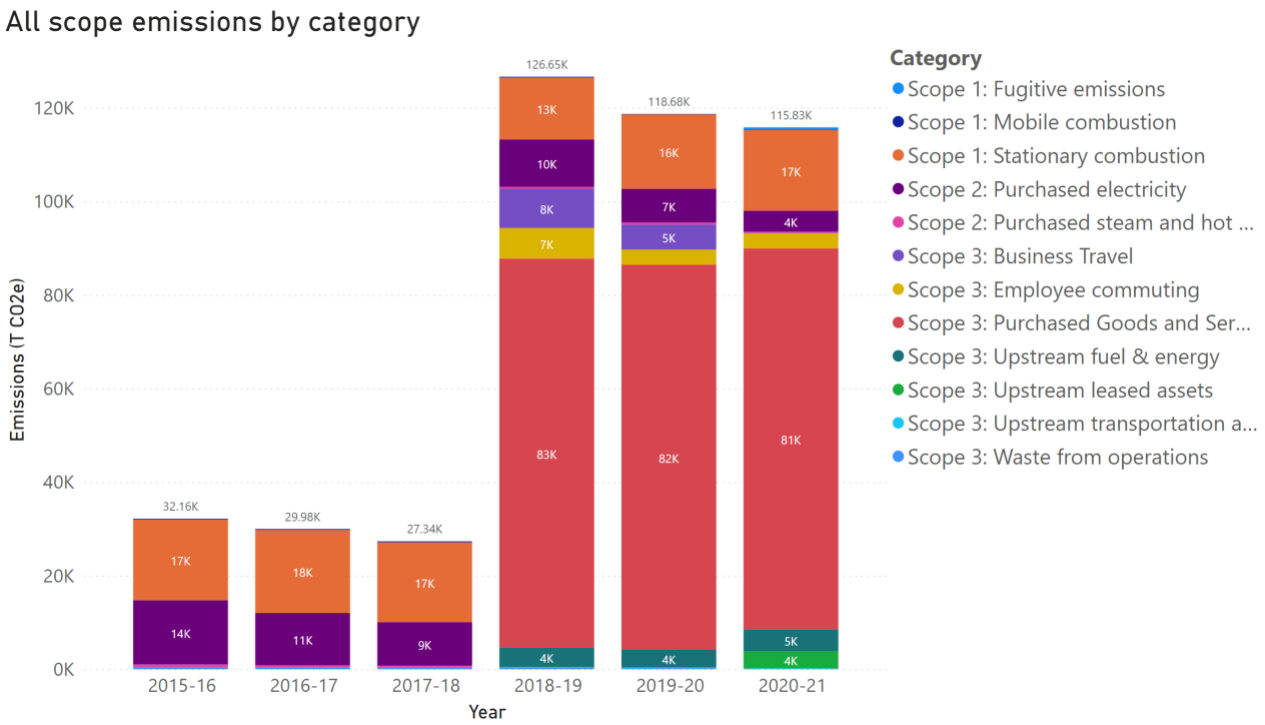

Figure 17: University of Southampton Scope 1-3 emissions by sub-category

Table 18 summarises Scope 1 to 3 over time showing that Scope 3 generally contributes ~80% of total GHG Protocol emissions. Scope 1 and 2 comprise ~ 20% of emissions. As noted above the 33% rise in Scope 1 emissions since 2018-19 is driven by the return to full use of the gas CHP while the 55% reduction in Scope 2 emissions is driven by grid decarbonisation as well as reductions in energy use.

Table 18: University of Southampton Scope 1-3 emissions totals

	To nearest 100 T CO_2e				**% of total**		
	Scope 1	*Scope 2*	*Scope 3+*	*Total*	*Scope 1*	*Scope 2*	*Scope 3*
2015-16	17,400	14,300	500	32,200			
2016-17	17,900	11,500	500	29,900			
2017-18	17,300	9,600	500	27,400			
2018-19	13,400	10,600	101,600	125,600	11	8	81
2019-20	16,000	7,600	94,300	117,900	14	6	80
2020-21	17,800	4,800	92,800	115,400	15	4	80
% change 2015-16 to 2020-21	2%	-66%	N/A*	N/A			
% change 2018-19 to 2020-21	33%	-55%	-9%	-8%			

Scope 3+ - *not adequately estimated before 2018-19*
N/A Not calculated due to missing or non-comparable data*

Overall:

Scope 1 emissions (17.8 kT CO_2e) comprised 15% of total Scope 1, 2 and 3 emissions in 2020-21. They have remained roughly constant (2% increase) since 2015-16 with some fluctuation depending on the operational status of the CHP. Addressing these emissions whilst the University grows is a key challenge for the Strategic Plan – Sustainability's Goal 1.

Scope 2 emissions (4.8 kT CO_2e) comprised 4% of total Scope 1, 2 and 3 emissions in 2020-21. They have declined by 66% since 2015-16 with some fluctuation in response to the operational status of the CHP which generates a significant proportion of the electricity we use. From 2021-22 these emissions will fall substantially due to our switch to a renewable energy tariff.

Scope 3 emissions (92.8 kT CO_2e) comprised 80% of total Scope 1, 2 and 3 emissions in 2020-21.

Table 19 repeats Table 18 but includes 'Other reporting' which accounted for around 10% of total emissions in 2020-21 if this wider definition is used.

Table 19: University of Southampton Scope 1-3 emissions totals (including other reporting)

	To nearest 100 T CO_2e					% of total			
	Scope 1	*Scope 2*	*Scope 3*	*Other*	Total	*Scope 1*	*Scope 2*	*Scope 3*	*Other*
2015-16	17,400	14,300	500		32,200				
2016-17	17,900	11,500	500		29,900				
2017-18	17,300	9,600	500		27,400				
2018-19	13,400	10,600	101,600	21,600	147,200	9	7	69	15
2019-20	16,000	7,600	94,300	17,700	135,600	12	6	70	13
2020-21	17,800	4,800	92,800	12,700	128,100	14	4	72	10
% change 2015-16 to 2020-21	2%	-66%	N/A*	N/A	N/A				
% change 2018-19 to 2020-21	33%	-55%	-9%	-8%	-13%				

Scope 3+ - *not adequately estimated before 2018-19*
N/A Not calculated due to missing or non-comparable data*

Overall, the University will need to carefully consider how the growth objectives outlined in the various Strategic Plans can be delivered whilst at the same time *reducing emissions from the activities that generate these emissions*. The difficulty of decoupling emissions from growth should not be underestimated.

5 Future reporting plans

We intend to update our emissions reporting in May 2023 to add estimates of emissions for the academic year 2021-22. We will also provide a goal-by-goal progress report during the scheduled Strategic Plan update in May. This cycle of reporting will then be repeated on an annual basis.

In addition, we are developing an emissions reporting dashboard which will be updated annually in line with this reporting cycle.

6 Feedback

If you have any comments or feedback on this report, please contact us:

- in confidence via *sustainability@soton.ac.uk*
- or if you are a member of our staff and student community you are welcome to start a discussion via our *yammer group*[13]

7 Code

This report was created using quarto and R in RStudio and the code used to produce it is available for inspection by registered users at *https://git.soton.ac.uk/sig/goal_2/emissionsReporting/*.

Packages used:

- quarto (Allaire 2022)
- data.table (Dowle et al. 2015)
- flextable (Gohel and Skintzos 2022)
- ggplot2 (Wickham 2009)
- here (Müller 2017)
- lubridate (Grolemund and Wickham 2011)

[13] *https://web.yammer.com/main/groups/eyJfdHlwZSI6Ikdyb3VwIiwiaWQiOiI2ODMxNzI5ODY4OCJ9/all*

8 References

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9 Annex

9.1 Emissions factors (2020/21)

Table 20 reports the main emissions factors used in the calculation of the 2020/21 emissions. These were sourced from the UK Government factors for 2021[14].

Table 20: 2021 Emissions factors as used in calculations

Scope	Item	Kg CO_2e per unit	Unit
1: Stationary combustion	Natural gas	0.203	kWh
1: Mobile combustion	Diesel	2.512	litre
2: Purchase of electricity	Grid electricity	0.212	kWh
2: Steam & hot water	Steam & Hot water	0.171	kWh
3: Staff/student commuting	Bus (local)	0.118	Km
3: Staff/student commuting	Car (medium petrol)	0.188	Km
3: Staff/student commuting	Train (national)	0.035	Km
3: Upstream energy	WTT – natural gas	0.035	kWh
3: Upstream energy	WTT – electricity (generation)	0.055	kWh
3: Upstream energy	T&D losses - electricity	0.019	kWh
3: Upstream energy	WTT – electricity (T&D losses)	0.005	kWh
3: Upstream energy	WTT – steam (generation)	0.032	kWh
3: Upstream energy	T&D losses - steam	0.009	kWh
3: Upstream energy	WTT – steam (T&D losses)	0.002	kWh

Notes:

- The emissions factors used to estimate Scope 1: Fugitive emissions are described in Trewick & Anderson (2022).
- The calculation of emissions from Scope 3: Purchased Goods and Services was carried out by and is embedded within the HESCET tool. These provide emissions per unit for an extremely large number of different goods and services reflecting the heterogeneity of the supply chain.
- The calculation of emissions for Scope 3: Business Travel is embedded within the Clarity system and is provided pre-calculated to the University. Clarity use the same UK Government source for UK emissions factors but do not yet include all upstream fuel (WTT) emissions.
- In the case of Scope 3: Staff/student commuting a medium sized petrol car emission factor is used as the data is insufficiently detailed to use more specific size/fuel emissions factors.

9.2 Detailed emissions reporting

In the following tables NA represents missing (not calculated) or not applicable data.

9.2.1 All scopes

Table 21 summarises GHG emissions by Scope (excluding 'Other reporting') for all years.

Table 21: University of Southampton Annual totals - GHG Protocol Scopes (to nearest 100 T CO_2e)

Year	Scope 1	Scope 2	Scope 3	Total

[14] https://www.gov.uk/government/collections/government-conversion-factors-for-company-reporting

2015-16	17400	14300	500	32200
2016-17	17900	11500	500	29900
2017-18	17300	9600	500	27400
2018-19	13400	10600	101600	125600
2019-20	16000	7600	94300	117900
2020-21	17800	4800	92800	115400
% change 2015-16 to 2020-21	2%	-66%	N/A	N/A

Table 22 shows Scope 1, 2 and 3 emissions as a percentage of all Scope 1, 2, 3 emissions since the baseline year of 2018-19 when more complete estimates of Scope 3 emissions were available.

Table 22: University of Southampton Scope 1,2 and 3 (% of total)

Year	Scope 1	Scope 2	Scope 3
2018-19	10.7	8.4	80.9
2019-20	13.6	6.4	80.0
2020-21	15.4	4.2	80.4

Table 23 updates Table 21 to include other reporting.

Table 23: University of Southampton Annual totals - GHG Protocol Scopes (to nearest 100 T CO_2e)

Year	Scope 1	Scope 2	Scope 3	Other reporting	Total
2015-16	17400	14300	500	NA	32200
2016-17	17900	11500	500	NA	29900
2017-18	17300	9600	500	NA	27400
2018-19	13400	10600	101600	21500	147100
2019-20	16000	7600	94300	17700	135600
2020-21	17800	4800	92800	20000	135400

Table 24 updates Table 22 to include 'Other Reporting'.

Table 24: University of Southampton Scope 1, 2, 3 and other reporting (% of total)

Year	Scope 1	Scope 2	Scope 3	Other reporting
2018-19	9.1	7.2	69.1	14.6
2019-20	11.8	5.6	69.5	13.1
2020-21	13.1	3.5	68.5	14.8

9.2.2 Scope 1 and 2 detail

Table 25 shows Scope 1 and 2 emissions only by category for all years.

Table 25: University of Southampton Scope 1 & 2 over time (to nearest 100 T CO_2e)

Year	Scope 1: Fugitive emissions	Scope 1: Mobile combustion	Scope 1: Process emissions	Scope 1: Stationary combustion	Scope 2: Purchased electricity	Scope 2: Purchased steam and hot water	Total
2015-16	NA	200	NA	17200	13700	500	31600
2016-17	NA	200	NA	17700	11200	300	29400
2017-18	NA	200	NA	17100	9300	300	26900
2018-19	NA	200	NA	13200	10100	400	23900
2019-20	NA	100	NA	15900	7300	400	23700
2020-21	500	100	NA	17200	4500	300	22600

9.2.3 Scope 3 detail

Table 26 shows Scope 3 emissions by category for all years where available.

Table 26: University of Southampton Scope 3 emissions over time (to nearest 100 T CO_2e)

Year	Scope 3: Business Travel	Scope 3: Employee commuting	Scope 3: Purchased Goods and Services	Scope 3: Upstream fuel & energy	Scope 3: Upstream leased assets	Scope 3: Upstream transportation and distribution	Scope 3: Waste from operations
2015-16	NA	NA	200	NA	NA	NA	300
2016-17	NA	NA	200	NA	NA	NA	300
2017-18	NA	NA	200	NA	NA	NA	300
2018-19	8300	6600	83200	4200	NA	100	300
2019-20	5400	3200	82300	3800	NA	100	200
2020-21	0	3200	81400	4700	3700	100	100

9.2.4 Other reporting detail

Table 27 shows 'Other reporting' emissions by category for all years where available.

Table 27: University of Southampton Other reporting emissions overt time (to nearest 100 T CO_2e)

Year	Other reporting: Student commuting	Other reporting: Student relocation (O/S)	Other reporting: Student relocation (UK)
2018-19	2200	15600	3800
2019-20	900	13400	3400
2020-21	900	16000	3000

9.3 Energy use over time

This section reports activity (energy use) data to provide context for the Scope 1 and Scope 2 emissions reporting sections in the main body of the report.

Figure 18 shows the University's use of gas since 2015/16 for all estate excluding the Science Park (USSP Ltd). The plot reflects the discussion of reductions in *Scope 1: Stationary combustion* emissions in 2018/19 due to maintenance and their subsequent suppression by COVID lockdowns in 2019/20.

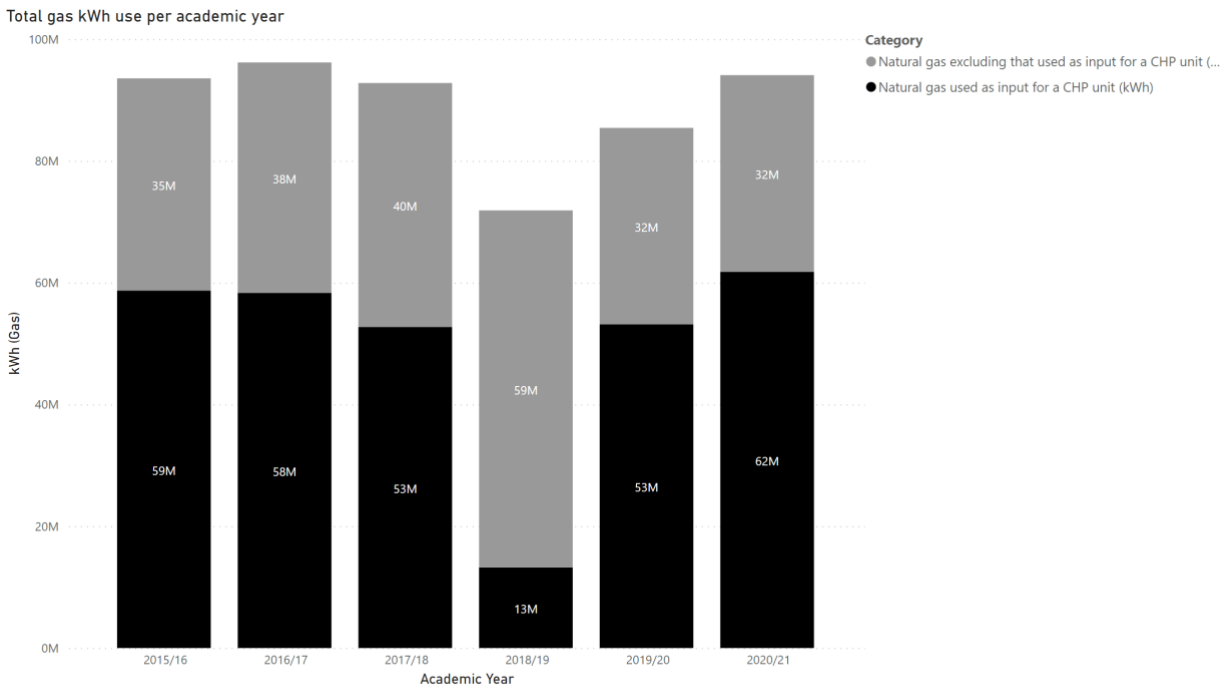

Figure 18: University of Southampton natural gas use over time (Source: HESA - https://www.hesa.ac.uk/data-and-analysis/estates)

Figure 19 shows the University's use of electricity over time for all estate since 2015/16 excluding the Science Park (USSP Ltd). The plot reflects the discussion of trends in *Scope 2: Purchased electricity*

emissions with respect to overall energy use reduction trends both before and also as a result of COVID. The exception was 2018/19 when the CHP was unable to provide as much onsite electricity generation due to maintenance.

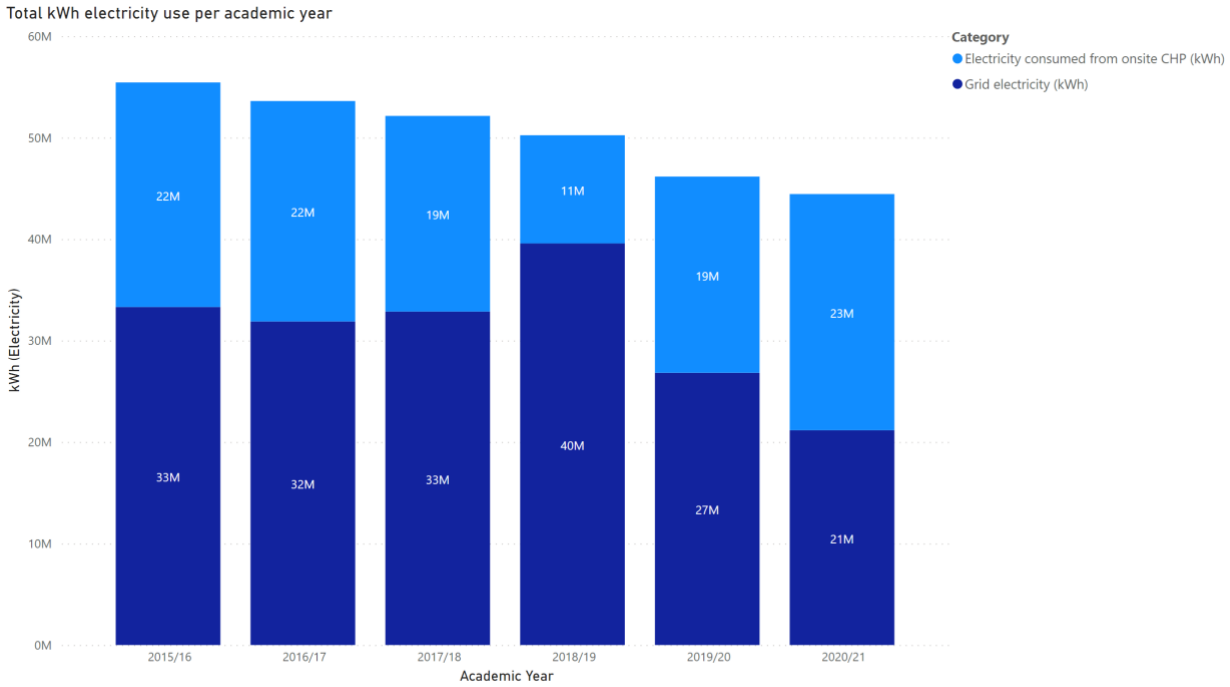

Figure 19: University of Southampton electricity use over time (Source: HESA https://www.hesa.ac.uk/data-and-analysis/estates*)*