

Welsh Public Sector Net Zero: Baseline and recommendations

Report to Welsh Government

April 2022



Document details	Welsh Public Sector Net Zero: Baseline and recommendations for improvements
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Executive Summary

In October 2021 the Welsh Government set out its second carbon budget, Net Zero Wales. This statutory emissions reduction plan contains 123 government policies and proposals for the next 5 years to achieve a reduction in greenhouse gas emissions across all sectors to put us on a longer-term path to net zero by 2050. It includes the ambition of achieving a collective carbon neutral public sector by 2030, in recognition of the size and reach of the public sector and the critical leadership role it has to embed net zero across all that we do. The reporting of emissions annually by public bodies in Wales is an important part of achieving that ambition, by helping to shape our actions and priorities.

In May 2021 the Welsh Government published the Welsh Public Sector Net Zero Reporting Guide, which aimed to be a universal guide as a set of instructions for use by Welsh public bodies to estimate baseline emissions. This new reporting is being done in parallel with other activities within many public sector organisations related to carbon emissions estimates and developing and implementing action plans to reduce emissions. Many organisations have already developed or are in the process of writing action plans. This report summarises current carbon emissions estimates, provides insight into the distribution of emissions across the different parts of the Welsh public sector and identifies priority sources for action. It also identifies current gaps in information where organisations have not submitted data or have not included emissions from key sectors.

The Welsh Government acknowledges that the reporting process is **a learning process** for all parties involved and that the response rate and completeness of data is bound to improve over time. In future years the peer review process will continue to be encouraged as it will provide opportunities for learning and sharing best practice in data collection and carbon accounting which should lead to improving accuracy of reporting.

It is encouraging to see such a **high level of response** and engagement with the reporting process in the first round of submissions and praise should be given to all organisations that participated. Overall coverage of reporting was good, with 80% of organisations reporting for 2020-21. However, it is important to consider that the 2020-21 year will have been impacted by the COVID-19 restrictions so is likely not representative of a 'normal' year. It is expected that organisations that have not reported will respond in the next round.

The **current estimate for total Welsh public sector** emissions based on the methodology used in this report is 3,353 kt CO₂e in 2019-20 and 3,279 kt CO₂e in 2020-21. These figures include significant uncertainty, particularly in the supply chain emissions, and also include estimates to fill gaps in the data (46% gap filled for 2019-20 and 11% in 20-21). Considering only the 38 organisations that reported a full set of data for both years (i.e. not including any gap-filling) and excluding emissions from renewables, the total emissions for these organisations, across all types, reduced overall by 5% between 2019-20 and 2020-21. There are significant gaps in employee commuting and potentially some gaps in waste, the latter particularly for Local Authorities but this may reflect the variety of methods that can be used to calculate waste related emissions. It should be noted that the data has not been thoroughly audited and whilst some significant consistency issues have been fixed there are likely to remain some errors in estimation methods that have not been fixed.

The level of public sector emissions reported in the National Atmospheric Emissions Inventory (on which the Net Zero Wales Plan is based) differs from what is reported here. This report concerns the emissions under the control (both direct and indirect) of an organisation, which may cut across different sectors of the inventory.

The **operational emissions data** shows the dominance of buildings within the footprint (56% in 2020-21, including electricity) and shows the dominance of the Local Authorities across many emission types, illustrating their key role in providing a broad range and comprehensive coverage of services in Wales. Universities and health boards are also significant in relation to electricity and fossil fuel use in buildings and to a lesser extent their transport emissions. Transport for Wales makes a large contribution to fleet fuel in 2020-21, for running rail services.

Estimates of the carbon **emissions associated with the purchase of goods and services** have been made within this reporting process using a method which uses emission factors that are based on industry sectors and organisational expenditure as a proxy for activity data. The limitations of this method are acknowledged, and its application is a screening process rather than for monitoring. Although the dataset is not yet complete, because some organisations didn't report this time, the data collected show that significant emissions are associated with 4 key areas of procurement: purchase of products (manufacturing), construction, transportation and health and social care. These are areas to be targeted for more accurate emission estimates in future years.

In the next round of reporting, the spend based emissions screening will still be requested from organisations, with the aim of compiling a more complete set to improve this prioritisation process while working in parallel to develop more accurate methods of reporting the carbon. However, based on stakeholder learning and feedback, the reporting template will be improved for the next round to also allow recording of more accurate carbon estimates where they are available related to procurement, enabling a transition towards an approach which will allow monitoring of progress. This will encourage action on supply chain carbon emissions across the Welsh Public sector, linking to existing guidance from Welsh Government (Policy note WPPN 12/21: Decarbonisation through procurement - Addressing CO₂e in supply chains¹).

The method used to estimate **land use emissions and removals** is also a screening assessment to enable prioritisation. It provides a first view of where more effort should be spent to improve the emissions estimates and consider action. This screening approach will continue to be used, with an option for more detailed estimates to be submitted by organisations that have that data. It is also recommended that a project is undertaken to analyse All Wales land use data and consider approaches to optimising land use change to maximise carbon sequestration.

Renewable electricity and heat generation reduces emissions by displacing electricity and fossil fuel sources with zero emissions. It is important to acknowledge the contribution made towards net zero, both in terms of increasing deployment of renewable technologies but also in terms of the leadership shown by the public sector, to encourage others to follow suit. Better clarity is required (through better reporting metrics) on how much electricity generation is onsite and how much is offsite

¹ <https://gov.wales/wppn-12-21-decarbonisation-through-procurement>

generation linked to the grid. This would help to identify how much of this technology investment is directly impacting on organisations carbon emissions.

The www.publicsectornetzero.org online forum provided a platform for questions and answers to be shared relating to the guidance and reporting template. This was not only to help improve the quality of data submitted this year, but to also shape improvements to the guidance and data submissions in the future. Engagement with the forum was high, leading to over 60 unique questions asked and answered. They will help to improve the ease and accuracy of future reporting. The online forum will be maintained for future rounds of reporting, providing further support to the individual organisations. Support has also been provided to organisations through a series of online workshops both before and after the reporting process to provide advice and enable discussion of challenges and improvements. These workshops were very well attended, demonstrating the public sector commitment and enthusiasm to engagement on this challenge. The approach will continue into the next reporting year to provide ongoing learning and support for public bodies.

The **variability in quality of the reporting** outputs from organisations for the initial two years demonstrates the difficulty for the public sector of consistently applying complex carbon accounting methodology. In particular, there was a large variation in how emission factors were interpreted, units used and categorisation of emissions.

Detailed recommendations have been provided related to improvements to the data collection template, improvements to the guidance report and also some clarifications and changes in the scope of emissions covered by the net zero target.

Significant progress has been achieved across the last 12 months, in terms of individual organisations developing new skills and in reporting new data as well as sharing of ideas and collectively improving the processes. The Welsh Government has responded to the learning and feedback throughout this round and committed to the improvement of the reporting process for the next round. This provides a solid foundation for the next round of reporting to bring improvements in completeness and accuracy as well as in understanding where emissions reductions are required.

The Public Sector reporting is not the same as the **Emissions Inventory** data. Rather than trying to get a completely accurate picture of the territorial emissions, Public Sector reporting is about mapping the emissions under the control (both direct and indirect) of an organisation. All scope 3 emissions are also the scope 1 or 2 emissions of another organisation but are reported to enable the public sector to map their boundaries of influence and tackle their emissions. The Inventory considers emissions at a territorial level to remove any double counting.

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1 Introduction

1.1 Net Zero Ambitions

In October 2021 the Welsh Government set out its second carbon budget, Net Zero Wales, which confirmed the ambition of achieving a collective carbon neutral public sector by 2030. In doing so, it recognised the public sector is uniquely placed to influence emissions far more widely than its own, relatively small direct emissions in areas such as transport, energy and land use. As well as tackling the issues of climate change, this approach can have a positive impact on the local economy by reducing energy costs and by creating investment opportunities for the low carbon economy.

Achieving this ambition will require, amongst other things:

- Achieving net zero carbon emissions through actions to reduce emissions and increase the removal of carbon from the atmosphere;
- Understanding the priorities, costs, stakeholders and wider impacts of actions;
- Improving understanding of opportunities to implement climate change mitigation;
- Improving understanding of the role of the public sector in influencing change in the wider society and economic system.

In May 2021 the Welsh Government published the Welsh Public Sector Net Zero Reporting Guide, which aimed to be a universal guide for use by Welsh public bodies, to estimate baseline emissions, identify priority sources and to monitor progress towards meeting the collective ambition of a net carbon neutral public sector by 2030. Alongside this guide a net zero reporting template was provided, designed to help organisations with the reporting process and to provide information in a consistent format.

This new reporting is being done in parallel with other activities within many public sector organisations related to carbon emissions estimates and developing and implementing action plans to reduce emissions. Some baseline estimates may not be entirely consistent with the Welsh Public Sector net zero reporting requirements, and aiming for consistency in future will be important to aid the monitoring process. Many organisations have already developed or are in the process of writing action plans, and these will sit alongside the public sector route map² and the whole Wales net zero plan³. The data compiled for the net zero reporting can be used within organisations and across the wider public sector to monitor progress of these plans.

1.2 Purpose of this report

This report summarises current carbon emissions estimates, provides insight into the distribution of emissions across the different parts of the Welsh public sector and identifies priority sources for action. It also identifies current gaps in information where organisations have not submitted data or have not included emissions from key sectors. In order to evaluate a first estimate of the total carbon emissions across the whole of the Welsh public sector, gaps have been filled with organisation specific estimates. But it is acknowledged that this estimate of total emissions is highly uncertain at this stage,

² <https://gov.wales/sites/default/files/publications/2021-07/a-route-map-for-decarbonisation-across-the-welsh-public-sector.pdf>

³ <https://gov.wales/sites/default/files/publications/2021-10/working-together-to-reach-net-zero-all-wales-plan.pdf>

because of modelling needed to fill these gaps and uncertainties in supply chain estimates.

A detailed commentary on issues identified in the reporting process is also provided, such as common mistakes and gaps in data. These issues have been considered when providing recommendations for improving the quality of reporting for the next round of data submissions. Specific actions are identified which involve making changes to the reporting guide and template to improve the process in future years.

Through analysis of the data received, this report also recommends some high-level next steps for reducing carbon emissions, to support individual organisations' action planning, and improvements to methods for quantifying emissions.

1.3 Context of the reporting in 2021

It is encouraging to see such a high level of response and engagement with the reporting process in the first round of submissions and praise should be given to all organisations that participated. Although organisations were advised to submit information that was as complete as possible, the Welsh Government acknowledges that the reporting process is a learning process for all parties involved and that the response rate and completeness of data is bound to improve over time. Everyone recognises that the learning from this first year of reporting is as important as the emissions data.

The 2019-20 and 2020-21 years have not been typical years across the public sector, due to the COVID-19 pandemic. The data reported here need to be considered within this context. This first emissions reporting process has also included a screening exercise, providing a starting point for prioritisation for further data collection. Useful evidence has been gathered that demonstrates a need to refine data collection methods in future reporting years, for example for the supply chain and land use sectors.

2 Emissions estimates for 2019-20 and 2020-21

This section presents summaries of the data that has been collected in the first round of reporting.

A review of data completeness is followed by an estimate of total emissions for the whole Welsh Public sector. Further details are then presented in the remainder of this chapter, showing more breakdown of the reported data: building and operational emissions, supply chain emissions, land use emissions and other data reported such as renewable energy generation.

2.1 Completeness of reporting

Table 1 below shows the numbers of organisations of each type within the Welsh public sector and how many reports were received for each year of reporting required. Overall coverage of reporting was good with 80% of organisations reporting for 2020-21. More reports were received for the 2020-21 year than 2019-20 and so these data are quoted more frequently in this summary report as they are more complete. It is important to consider that the 2020-21 year will have been impacted by the COVID-19 restrictions so is unlikely to be representative of a ‘normal’ year. This is considered later in this report.

All Local Authorities, National Park Authorities, Fire and Rescue Authorities and the Welsh Government provided reports for both years. Coverage for the health boards was better for 2020-21 than for 2019-20, because there was a decision taken to focus on the later year given previous work on carbon baselines. However, three health boards did not provide any reports. Reporting was voluntary for the universities and colleges; 5 universities and 1 college reported for 2019-20. There were a small number of organisations that made a nil return because they were not able to complete the work in time. It is expected that organisations that have not reported will respond in the next round. In particular, Universities should be encouraged to report as data are already collected for the HESA report so should be readily available.

Table 1 Numbers of reports received by organisation type

Organisation type	Number of organisations	Number of reports for 2019-20	Number of reports for 2020-21
Health Boards and Trusts	14	4	9
Local Authorities	22	22	22
National Park Authority (NPW)	3	3	3
Other Welsh Public bodies	14	7	11
Universities/Colleges	9	6*	5
Welsh Fire and Rescue Authorities	3	3	3
Welsh Government	1	1	1
Total	66	46	54

Notes: One University/college reported for 2018-19 which has been assumed to be equivalent to 2019-20. In total 57 organisations reported for at least one year.

Within the reports received there was some variability of completeness and clarity of emissions boundaries chosen by the organisations. Some analysis of completeness is provided in the following sections. However, this has a wide confidence margin because

it is not possible to determine all variations in completeness, such as outsourced services, and because of a lack of information about organisation boundaries.

As part of the data compilation and aggregation process, various checks and corrections have been undertaken. The data processing is described in **Annex 1**. It should be noted that the data has not been thoroughly audited and whilst some significant consistency issues have been fixed there are likely to remain some errors in estimation methods that have not been fixed. In future years the peer review process should lead to improving accuracy of reporting and good opportunities for learning between organisations.

2.2 Total emissions estimates for 2019-20 and 2020-21

A net total emission has been estimated for the whole of the public sector in Wales based on the reported data plus some gap filling where reports were not received or were not complete. 14 organisations reported data for one year only. The total emission estimate is therefore an uncertain value. The whole public sector total emission estimate will be improved year on year as the completeness and accuracy of organisations' reporting improves. With a net zero target, this improvement over time does not create problems for comparability because it is a forward-looking emissions reduction target towards a discrete amount (net zero). There is no need to compare backwards as would be the case if the target was for a percentage reduction.

In order to calculate the combined total emission from the Welsh public sector in each year, various approaches were used to replace gaps in the data with emissions estimates. Firstly, where organisations have only reported data for one year, emissions have been duplicated for the second year.

Secondly, the NHS Wales Carbon Footprint 2018/19 report⁴ provides a combined emissions total for buildings (including water and waste), transport and supply chain. For these emission categories, the report also provides a percentage share of the emissions for each individual health board or trust. This data was used to calculate emissions for 2018-19 from buildings, transport and supply chain for the three Health Boards and Trusts that had not submitted any data. Patient and visitor travel emissions were removed from the total transport emissions for each organisation as it is not in the scope of this emissions report. These 2018-19 data were used as gap filling estimates for both 2019-20 and 2020-21.

Thirdly, HESA⁵ data for the reporting year 2019/20 was used to fill gaps in data for the 3 universities. For each university, the total scope 1 and 2 emissions reported to HESA were added to scope 3 emissions reported for waste, water supply and wastewater treatment. This is equivalent to the building emissions category that should have been reported (with the addition of waste). Transport and supply chain data collected from universities that did submit reports was used alongside student numbers (obtained from HESA) to calculate average emissions per student for these two categories. These average values were then used alongside student numbers to estimate 2019-2020 emissions for transport and supply chain for those universities that did not provide reports. The 2019- 2020 estimates were also used to fill gaps in the 2020-2021 data.

⁴ <https://gov.wales/nhs-wales-carbon-footprint-2018-2019>

⁵ <https://www.hesa.ac.uk/>

Lastly, supply chain data was not reported for one Fire service, one National Park and two Local Authorities. Estimates have been made to fill these gaps based on the ratios of operation to supply chain emissions for the other organisations in these groups.

It was not possible to estimate emissions for Social Care Wales as not enough information is available to find a suitable proxy for this organisation. Gap filling has also not been done for sub-sectors such as commuting.

The net operational emissions plus land use emissions/removals were estimated to be 543 kt CO₂e in 2019-20 and 440 kt CO₂e in 2020-21. Supply chain emissions were estimated at 2,810 kt CO₂e in 2019-20 and 2,839 kt CO₂e in 2020-21. Supply chain emissions are very uncertain, as they are based on a screening assessment method. The supply chain currently represents a very significant contribution to the overall total, and this estimate needs to be improved over time through the development of more accurate methods. **The current estimate for total Welsh public sector emissions is 3,353 kt CO₂e in 2019-20 and 3,279 kt CO₂e in 2020-21.** These figures include estimates to fill gaps in the data (46% gap filled for 2019-20 and 11% in 2020-21). Whilst there are data presented for 2 consecutive years it is important to note that they are not fully comparable in terms of a timeseries for various reasons such as due to difference in the completeness of reporting and COVID-19 impacts. Considering only the 38 organisations that reported emissions in all key emission types for both years (i.e. not including any gap-filling) and excluding emissions from renewables, the total emissions for these organisations, across all types, reduced overall by 5% between 2019-20 and 2020-21.

The breakdown of these emission totals between different types of organisations is shown in **Figure 1**, with the data split by emission source and reported and gap filled data to show where gap filling was necessary. It does not include 'out of scopes' emissions or emissions classified as renewable energy. These types of emissions are discussed in **Annex 3**.

A further split of this the total emissions for 2020-21 is shown in **Figure 2** for the operational and land use emissions (buildings, transport, waste, land use) and **Figure 3** for supply chain related emissions. **Table 2** shows the emission summary data for each year by organisation type. A full list of the organisations included in these groups is provided in **Annex 2**.

Figure 1 Total Welsh Public Sector emissions by organisation type, showing gap-filling

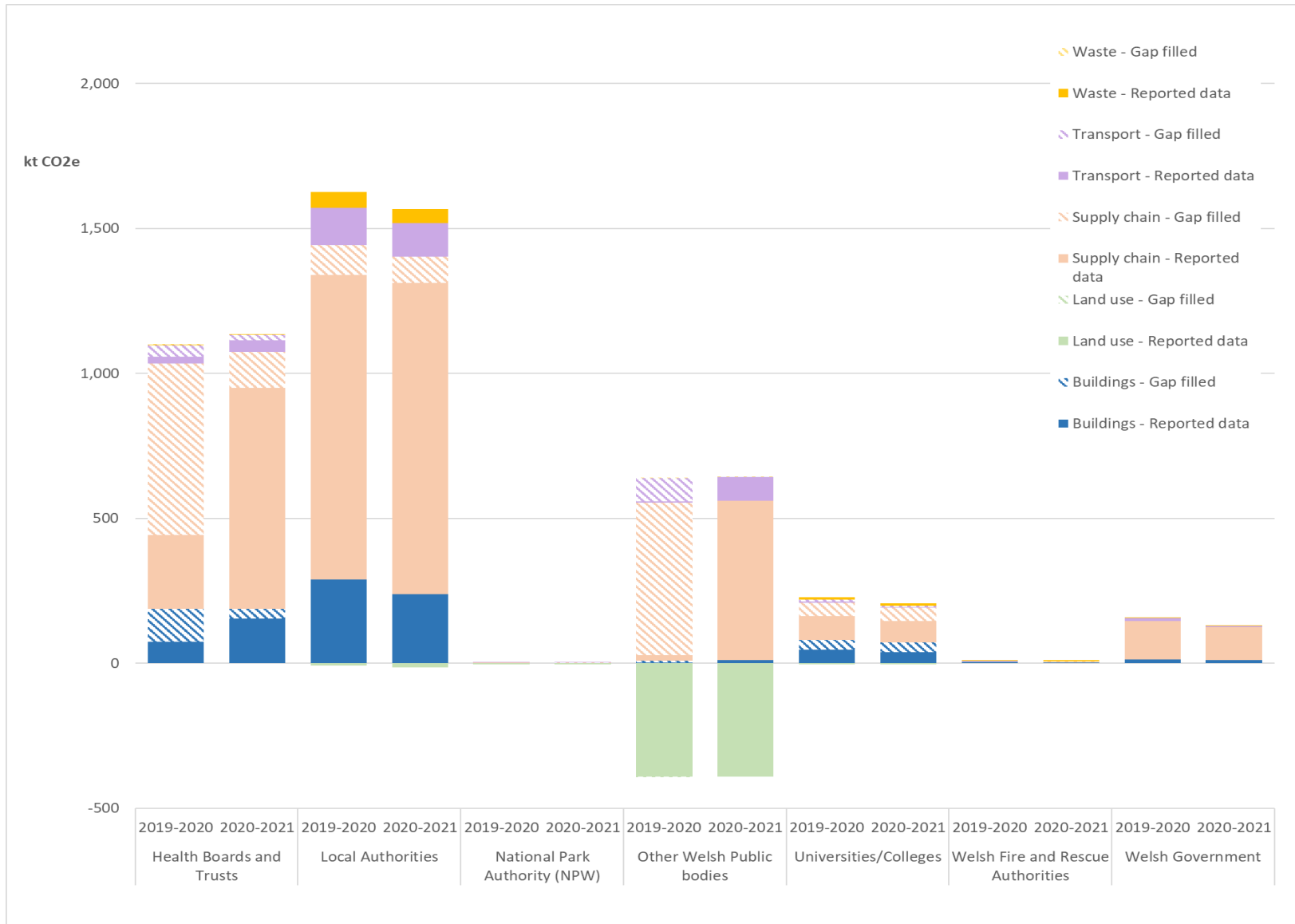
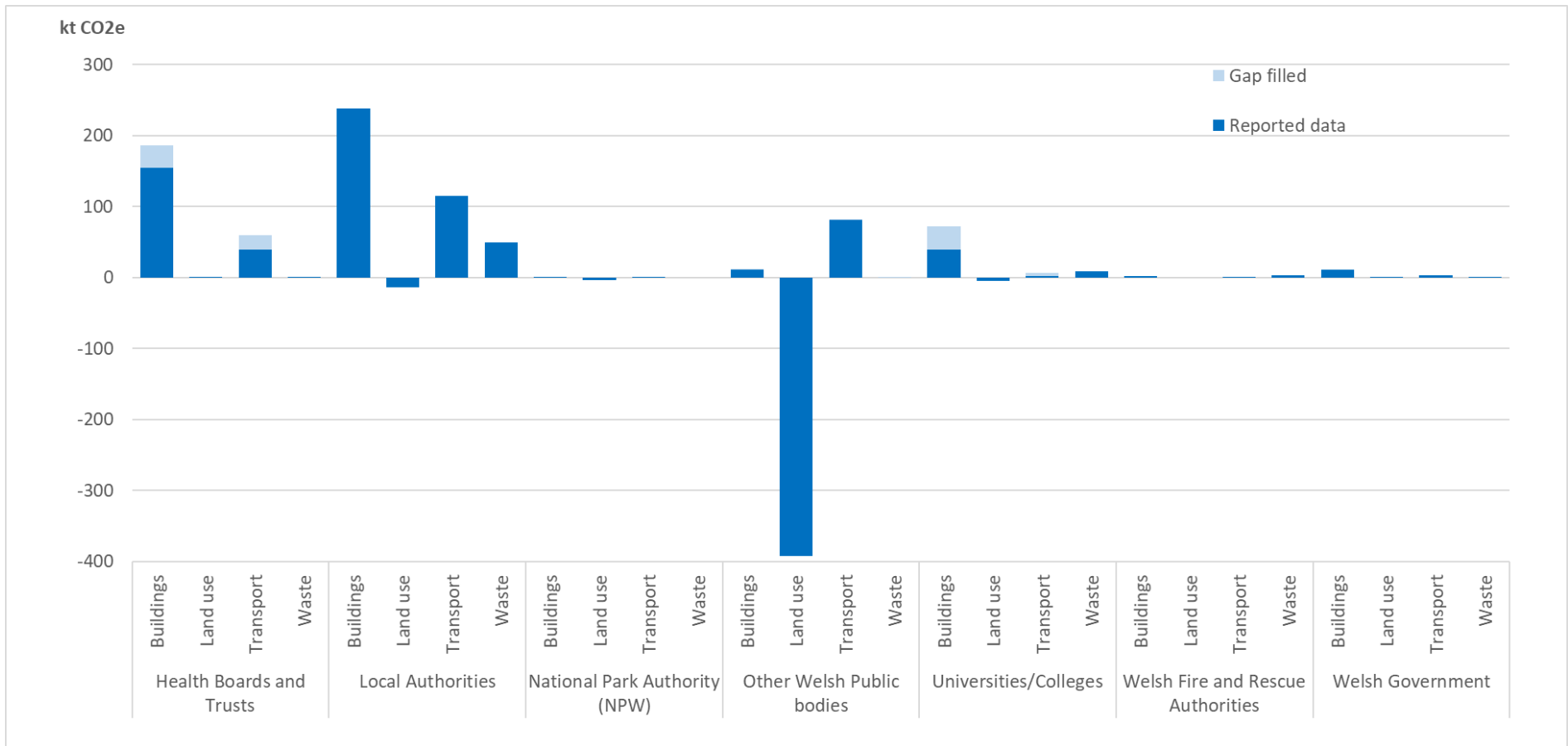


Figure 2 Welsh Public Sector emissions by organisation type, 2020-21 Operational emissions (buildings, transport, waste) and Land use emissions, showing gap-filling



N.B Agriculture emission are excluded in this figure because that sector is only applicable to one organisation (see table below). The large negative emissions are dominated by Natural Resources Wales (NRW).

Figure 3 Welsh Public Sector emissions by organisation type, 2020-21 Supply chain emissions, showing gap-filling

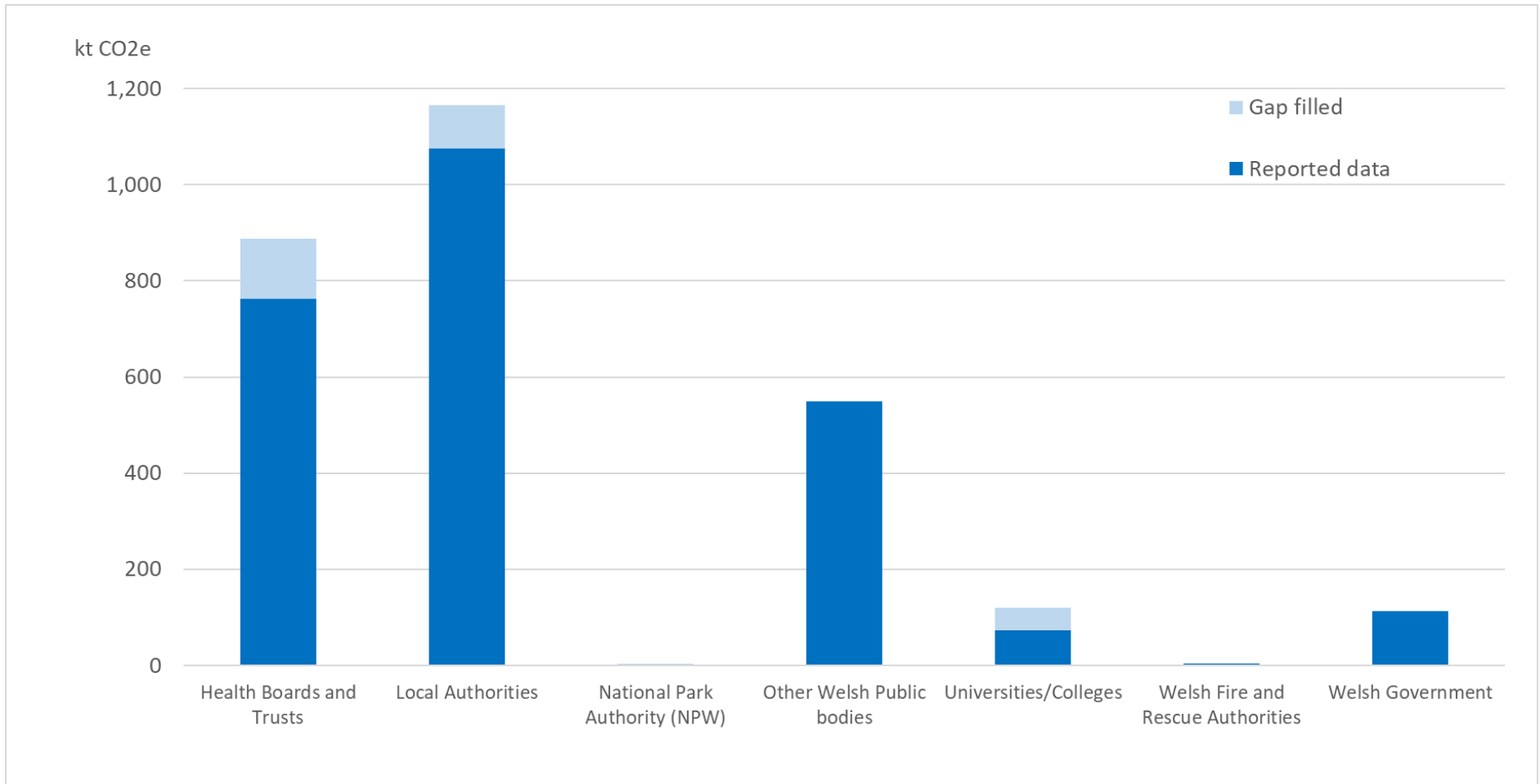


Table 2 Estimated total Welsh Public Sector Emissions 2019-2020 and 2020-21, including gap filling (kt CO₂e)

	Agriculture	Buildings	Transport	Waste	Supply chain	Land use	Total
Health Boards and Trusts							
2019-2020		187.0	64.1	1.2	846.6	0.1	1,099
2020-2021		186.7	59.6	1.0	887.0	0.1	1,134
Local Authorities							
2019-2020		288.7	127.6	55.6	1,154.1	-8.7	1,617
2020-2021		238.0	115.5	49.5	1,164.5	-13.7	1,554
National Park Authority (NPW)							
2019-2020		0.53	0.27	0.00	1.25	-3.61	-1.56
2020-2021		0.34	0.22	0.00	1.00	-3.61	-2.06
Other Welsh Public bodies							
2019-2020		8.3	84.8	0.1	544.8	-391.6	246.4
2020-2021		10.9	81.4	0.2	550.0	-391.9	250.5
Universities/Colleges							
2019-2020	2.1	79.9	10.5	7.8	128.8	-4.6	224.4
2020-2021	2.1	71.8	6.9	8.6	119.8	-4.2	204.9
Welsh Fire and Rescue Authorities							
2019-2020		4.3	1.9	2.2	2.6	0.0	11.0
2020-2021		2.1	1.4	2.7	4.1	0.0	10.2
Welsh Government							
2019-2020		12.6	11.9	0.007	131.9	0.13	156.6
2020-2021		11.2	3.1	0.002	113.2	0.13	127.7
Total							
2019-2020	2.1	581.4	301.1	66.8	2,809.7	-408.4	3,353
2020-2021	2.1	520.9	268.1	61.9	2,839.3	-413.2	3,279

2.3 Buildings and other operational emissions

This section presents data reported for the following main categories:

- building energy use
- water use
- waste
- fleet fuel use
- business travel
- commuting

The data presented in this section does not include the estimates made for gap filling, as presented in the previous section. This is because the gap filling was done at a more aggregated level than the data presented below. Therefore, the emission totals are not consistent with those presented in **section 2.2**.

Table 3 presents data on the number of emission types that were reported on by organisation type, to identify where there are gaps in reporting at this level of disaggregation. The 2020-21 year has been chosen for this summary because it is more complete.

For some emission types it is expected that only a few organisations will be reporting: heat & steam is an uncommon form of energy and other electricity is generally related to street lighting. Some organisations also have no fleet. However, all the other types we expect full or almost full coverage. There are significant gaps in employee commuting and potentially some gaps in waste, the latter particularly for Local Authorities but this may reflect the variety of methods that can be used to calculate waste related emissions. A couple of very small other public sector organisations did not report emissions related to building energy.

Table 3 Number of organisations reporting each emission type, by organisation type (2020-21)

Type of emission reported	Health Boards and Trusts	Local Authorities	National Park Authority	Other Welsh Public bodies	Universities/Colleges	Fire and Rescue Authorities	Welsh Government	All
Building energy	9	22	3	9	5	3	1	52
Heat and steam	1	1					1	3
Other electricity	1	22		1			1	25
Business travel	6	22	2	8	4	1	1	44
Fleet fuel	8	22	2	4	4	3	1	44
Employee commuting	2	7		3	2		1	15
Water	8	21	3	8	5	3	1	49
Waste	8	16		7	5	3	1	40
Total number of this organisation reported in 2020-21	9	22	3	11	5	3	1	54

Figure 4 and **Figure 5** show the emissions totals by emission type, split into organisation types. This graph shows the dominance of buildings within the footprint (56% in 2020-21, including electricity) and shows the dominance of the Local Authorities across many emission types, illustrating their key role in providing a broad range and comprehensive coverage of services in Wales. Universities and health boards are also significant in relation to electricity and fossil fuel use in buildings and to a lesser extent their transport emissions. The large contribution to fleet fuel in 2020-21 for the other Welsh public Bodies is dominated by Transport for Wales which did not report for 2019-20.

Figure 4 Operational Emissions 2019-20

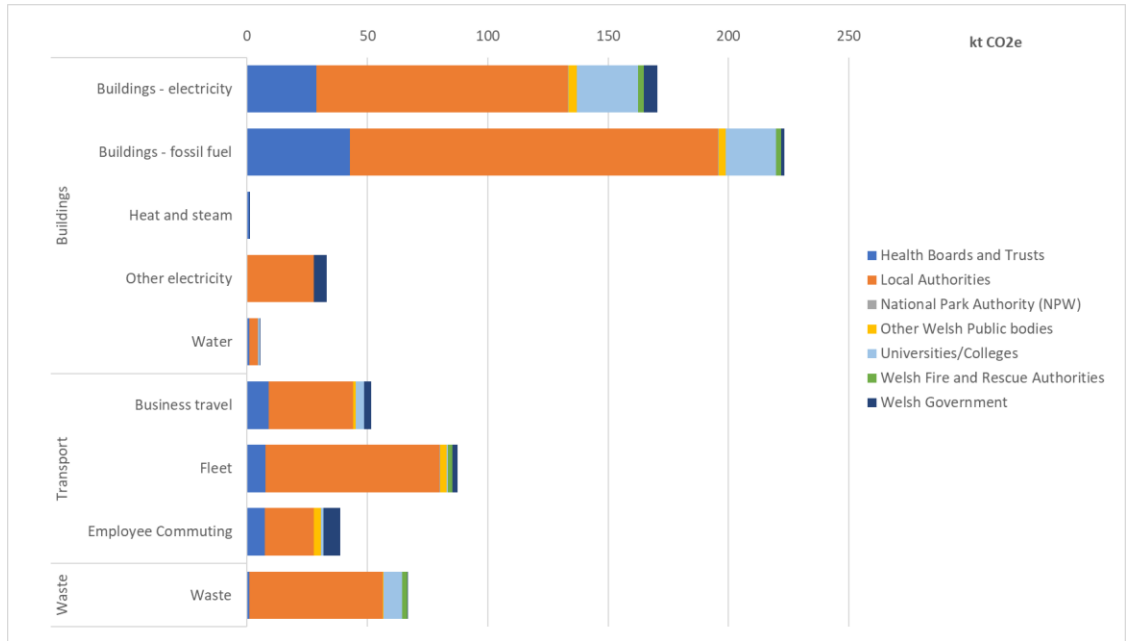
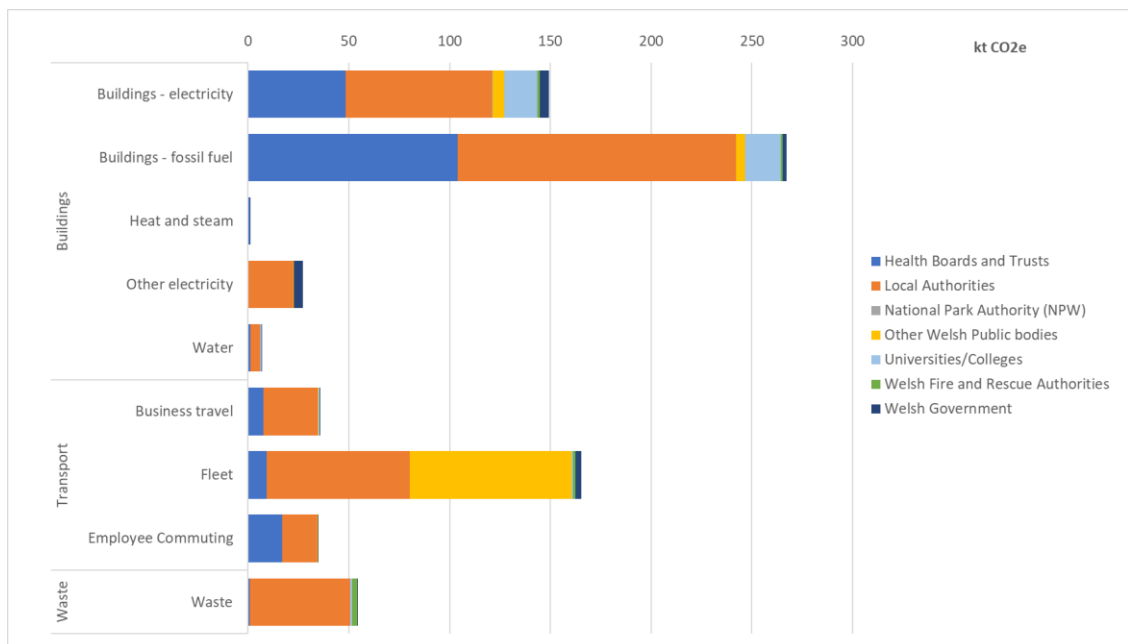


Figure 5 Operational Emissions 2020-21



Notes: agriculture emissions are not shown on these graphs because they are only relevant to one organisation. Out of scopes emissions are also excluded.

As has already been noted above, it was not part of the remit of the current work to audit the data beyond high level checks and corrections. There are likely some errors and potential double counts within the individual organisations reports, and also some double counting across the sector as a whole. For example, there will be some double counting of emissions between the rail fleet and business and employee travel by rail.

2.4 Supply chain related emissions

Estimations of the carbon emissions associated with the purchase of goods and services have been made within this reporting process using a method which uses emission factors that are based on industry sectors and organisational expenditure as a proxy for activity data. The emission factors are not based on the cradle to gate carbon footprint of individual product or service purchased but instead are averages based on the estimated carbon emissions and economic value of a particular sector.

This is a common method used to identify the parts of the supply chain that are more carbon intensive than others – essentially as a screening exercise enabling more detailed analysis to be prioritised. It is acknowledged that there have been issues raised regarding the use of this methodology, and these are considered in **section 4.2** later in this report, together with suggestions for improving the approach.

Within the recent reporting, three main methods have been used by the organisations:

- Procurement spend breakdown by **SIC codes** (the applying the 2011 factors which are based on 156 categories of spend) - as outlined in the reporting guide and template.
- **Atamis** Carbon Emissions Data, which uses 2009 SIC codes (based on 75 categories), because this data was already available to some organisations
- Higher Education Supply Chain Emissions tool (**HESCET**), which uses a slightly different set of factors based on Classification of Individual Consumption According to Purpose (COICOP), an international classification of household expenditure. These factors have more categories (311) and have been updated more recently but are household rather than organisational based spend.

Figure 6 shows a summary of the emissions estimated for the supply chain for all organisations that reported for 2020-21. The emissions by SIC code have been aggregated to SIC groups (labelled with letters, which are explained in the table below the chart). However, some reporting could not be allocated to these groups, so is shown as Atamis, HESCET and Total in the chart, and a small amount of “unknown” which relates to expenditure that couldn’t be attributed to SIC codes.

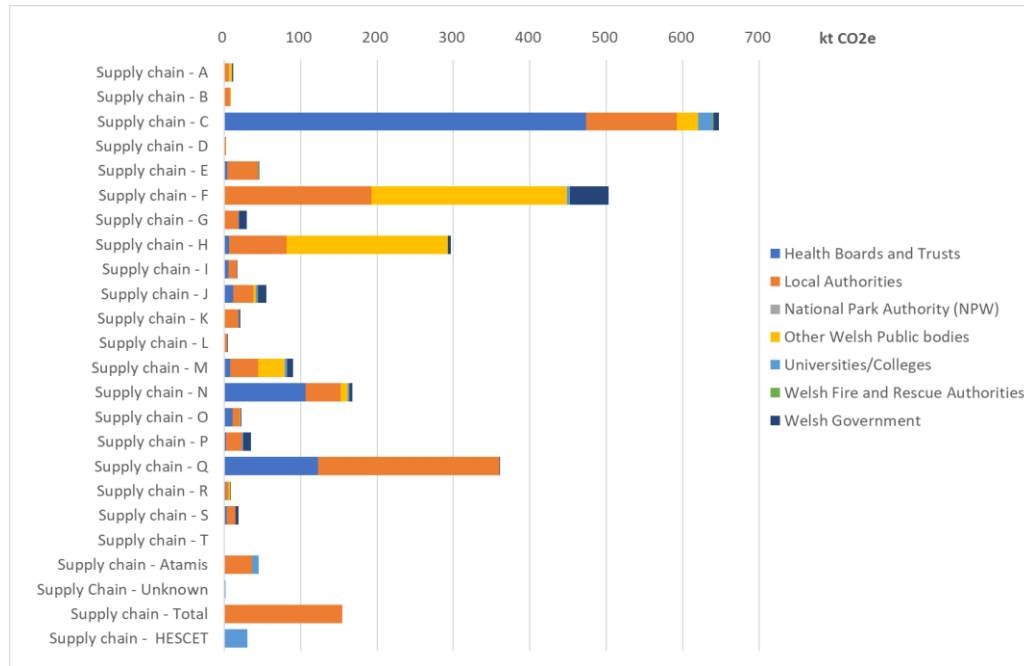
Data are only presented for one year, and 2020-21 was more complete. Because of the nature of the ‘top down’ estimates for this type of activity it does not enable enough accuracy for monitoring change in carbon emissions. The spend based estimates provide a screening assessment. However, it will still be requested from organisations in the next round of reporting, with the **aim of compiling a more complete set**. Five organisations that provided reports have not yet reported their supply chain emission estimates. A complete set will provide a good starting point for prioritising more accurate emissions estimates and joined-up action on supply chain carbon emissions across the Welsh Public sector.

Some modifications have been made to the data submitted, where it was assumed that **double counting** of carbon had occurred. Therefore spend on electricity, gas, water and

waste management was removed where these emissions had been reported within the operational emissions reporting (except in cases where notes had been made to say that double counting had already been removed).

Figure 6 shows the sectors that are the likely largest sources of emissions resulting from the purchase of goods and services across the public sector.

Figure 6 Supply chain related emissions 2020-21



- | | |
|---|--|
| <p>A: Agriculture, forestry and fishing</p> <p>B: Mining and quarrying</p> <p>C: Manufacturing</p> <p>D: Electricity, gas, steam and air conditioning supply</p> <p>E: Water supply; sewerage, waste management and remediation activities</p> <p>F: Construction</p> <p>G: Wholesale and retail trade; repair of motor vehicles and motorcycles</p> <p>H: Transportation and storage</p> <p>I: Accommodation and food service activities</p> <p>J: Information and communication</p> | <p>K: Financial and insurance activities</p> <p>L: Real estate activities</p> <p>M: Professional, scientific and technical activities</p> <p>N: Administrative and support service activities</p> <p>O: Public administration and defence; compulsory social security</p> <p>P: Education</p> <p>Q: Human health and social work activities</p> <p>R: Arts, entertainment and recreation</p> <p>S: Other service activities</p> <p>T: Activities of households as employers; undifferentiated goods- and services-producing activities of households for own use</p> |
|---|--|

This data can be used to identify and prioritise action to reduce supply chain emissions. The key sectors with the largest estimated emissions are as follows.

- **C Manufacturing** relates to purchase of manufactured products and is dominated by purchases by the health boards and Local Authorities. This covers a very large range of different product types, but particularly high values are shown in the data for pharmaceuticals and pharmaceutical preparations, computer, electronic and optical products, Other manufactured goods and particularly in 2020-21 for wearing apparel (which must relate to the PPE purchases related to COVID-19 because the values shown for this type of spend are much lower in the 2019-20 reporting)
- **Sector F Construction** is significant for Local Authorities and also for other public bodies, particularly Transport for Wales in 2020-21.

- **Sector H Transportation** is dominated by railway transport (Transport for Wales) and significant for Local Authorities (road transport) but this is potentially a source of some double counting.
- **Sector Q Human health and social work activities** are significant for both health boards and Local Authorities

These sectors are considered in more detail in **section 4.2**.

2.5 Land use emissions and removals

The method used to estimate land use emissions and removals is also a screening assessment to enable prioritisation. It provides a first view of where more effort should be spent to improve the emissions estimates and consider action. 45 organisations reported data on land areas, 38 of them had land areas greater than 10 hectares. A breakdown of the land types reported is presented in **Table 4**. Land areas are dominated by NRW and Local Authorities.

NRW is a very large public landowner and has already undertaken a more detailed study of emissions and removals which provides better quality data than the screening assessment. NRW reported land use emissions using a different, more detailed set of land use types. These have been approximately assigned to the simpler land use types for the purposes of summarising in **Table 4** below.

Table 4 Total land sizes (hectares) by organisation type for 2020-2021

	Cropland	Forest land	Grassland	Other land	Settlements	Wetlands	Total
Health Boards and trusts		28	66		208		302
Local Authorities	1,733	4,901	19,915	5,827	10,910	2,302	45,587
National Park Authority		371	268	52	29	17	737
Other Welsh Public bodies (inc NRW)	15	108,294	9,592	13,303	161	12,519	143,885
Universities / Colleges	19	211	2,041	169	40	236	2,717
Welsh Government			134		153		287
Total	1,766	113,805	32,016	19,352	11,502	15,074	193,515

As a result of different methods being used across the organisations that reported, it was not possible to present the full detail of emissions and removals by land use type. Therefore the data have been summarised, in **Table 5**, as either emissions or removals.

Figure 7 Land use Emissions 2020-21

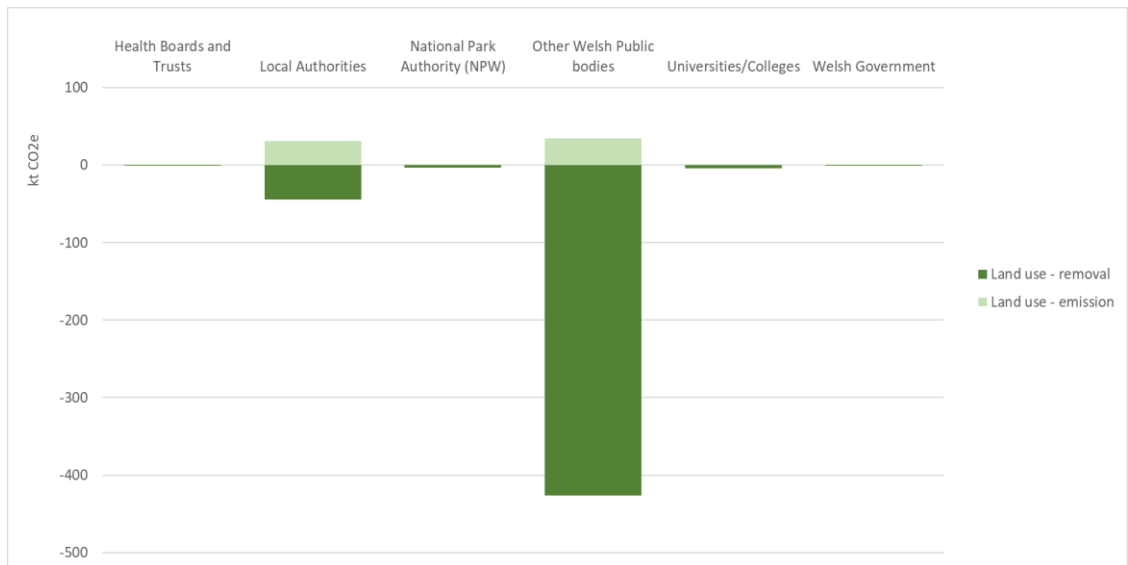


Table 5 Total land emissions by organisation type 2020-21 kt CO₂e

	Land use - emission	Land use - removal	Net emission
Health Boards and Trusts	0.27	-0.21	0.07
Local Authorities	31	-45	-14
National Park Authority (NPW)	0.00	-3.62	-3.61
Other Welsh Public bodies	34	-426	-392
Universities/Colleges	0.11	-4.34	-4.24
Welsh Government	0.32	-0.19	0.13
Total	66	-479	-413

It is clear that local authority owned land, as well as university and national park owned land, may have some potential for improvements for carbon storage in addition to NRW land. However, calculating and monitoring carbon emissions and removals from land is scientifically complex and is not appropriate to expect all organisations to undertake this individually.

The screening approach will continue to be used, with an option for more detailed estimates to be submitted by organisations that have that data. It is also recommended that a project is established to analyse land use data and consider approaches to optimising land use change to maximise carbon sequestration.

2.6 Renewable generation and use of biofuels

Renewable energy production was reported by 32 organisations. Organisations reported generating renewable energy through solar photovoltaics, hydroelectric power ground source heat pumps and combined heat and power systems.

Renewable generation reduces emissions by displacing electricity and fossil fuel sources with zero emissions, and it is important to monitor the growth in these activities. The renewable generation data are not directly used within the carbon emissions calculations. Onsite generation directly reduces emissions because of a reduced

requirement for grid electricity, but cannot be counted as a negative credit and so cannot net-off carbon emissions created elsewhere.

Accounting for renewables within the public sector has always been a contentious topic and the increasing range of options for generation and ownership structures is adding to the complexity. It is important to acknowledge the contribution made towards net zero, both in terms of increasing deployment of renewable technologies but also in terms of the leadership shown by the public sector, to encourage others to follow suit.

Better clarity is required (through better reporting metrics) on how much electricity generation is onsite and how much is offsite generation linked to the grid. This would help to identify how much of this technology investment is directly impacting on organisations carbon emissions. Further explanation of the various types of generation and accounting for them is provided in **Annex 3**.

A total of 46,467 MWh of renewable energy was reported across the Welsh public sector, with the split of heat and electricity shown in **Table 6**.

Some renewable energy reporting included CHP installations. It is not currently known if the CHP is powered by biofuels or gas. Only biofuel energy generation can be considered renewable in the context because, whilst gas-fired CHP should be a more efficient way to general electricity on site, it is not classified as renewable energy. Further clarification is required for technology / fuel type where CHP is reported.

Table 6 Total renewable energy reported (MWh) by organisation type

Organisation type	Renewable electricity (MWh)	Renewable heat (MWh)	Total of renewable energy generated
Health Boards and Trusts	370	8,962	9,332
Local Authorities	32,728	299	33,026
National Park Authorities	165		165
Other Welsh Public Bodies	624	1,352	1,976
Universities / Colleges	1,896		1,896
Welsh Fire and Rescue Authorities	72		72
Total	35,855	10,613	46,467

Use of biofuels was reported by 19 organisations. This does not include the biofuel portion of petrol and diesel. All biofuels that were reported are wood based (chips, pellets or logs). A breakdown of biofuel emissions by organisation type is presented in **Table 7**.

Direct CO₂ emissions from biofuels are considered ‘outside of scopes’ because the emissions are balanced by short-cycle carbon uptake by plants. However, there are a small proportion of direct non-CO₂ emissions to account for which are seen as additional during combustion.

Table 7 Total emissions from biofuels by organisation type

Organisation type	Total biofuel emissions (ktCO2e)
Health Boards and Trusts	5.94
Local Authorities	7.0
National Park Authorities	0.17
Other Welsh Public Bodies	0.36
Universities/Colleges	0.06
Welsh Fire and Rescue Authorities	0
Total	13.5

2.7 Analysis of variations in emissions intensity

For some organisations it is possible to calculate emissions per full time employee (FTE), per capita based on population served (LAs, health boards) and by number of students enrolled (for higher education).

The most easily available data is for Local Authorities, so this is presented below, showing variations in emissions intensity by different metrics for the Local Authorities but without identifying each. Two Local Authorities did not report supply chain emissions and therefore their emission totals with supply chain are not included in **Figure 8** or **Figure 9**. The total emissions do not include land use emission estimates because these are very uncertain.

However, the data are not yet completely comparable between Local Authorities because of the **different levels of completeness of the data from each authority**. Therefore, it may be unfairly identifying higher emissions intensity for some authorities which in fact is because they have provided more complete data.

Figure 8 and **Figure 9** show there are significant differences in reported emissions intensities between Local Authorities even when number of full-time employees are considered or population. This may indicate inconsistencies in reporting as well as actual variations in emissions intensity.

The pattern shown in the graphs is very similar between per FTE and per capita, due to the close correlation between FTE and population in the Local Authorities. The significant impact of supply chain emissions on total emissions is made clear. Supply chain emissions make up the majority of total emissions for most Local Authorities but the contribution of supply chain emissions to the total does vary significantly.

One Local Authority has significantly higher emissions intensity in their operational emissions, related to commercial waste sent to landfill. The other Local Authorities have fairly similar emissions intensities when supply chain emissions are not included.

Figure 8 Per FTE Local Authority emissions – with and without supply chain, 2020/21

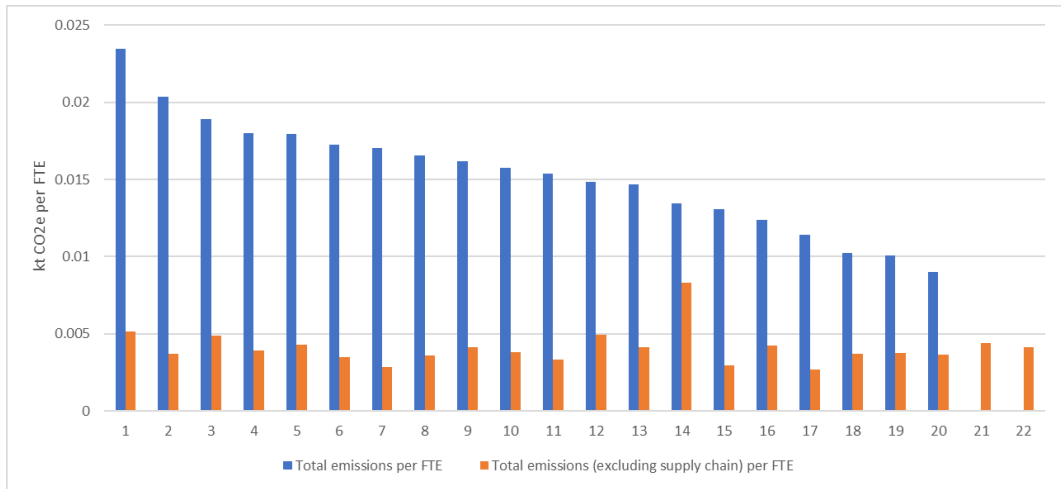
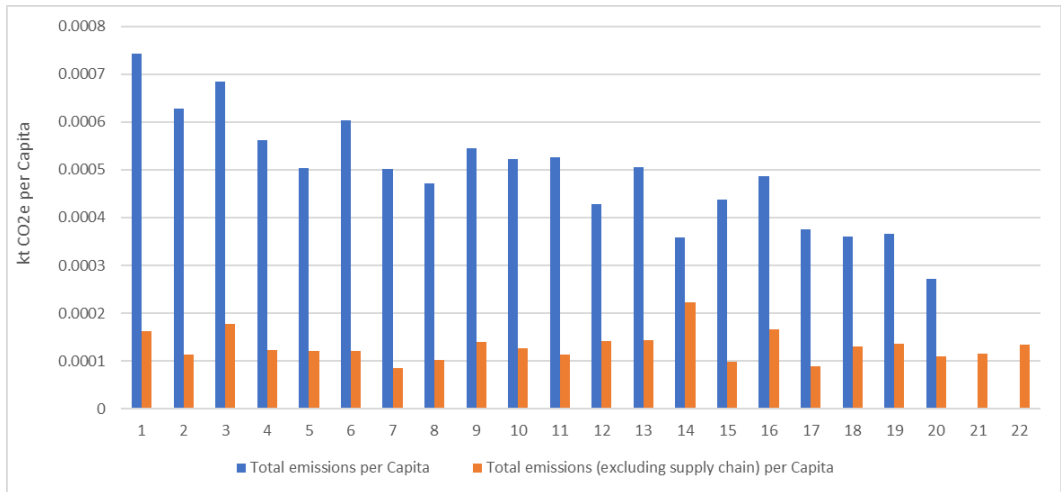


Figure 9 Per Capita Local Authority emissions – with and without supply chain, 2020/21



3 Lessons learnt related to emissions reporting

Support has been provided to organisations through an online Q&A forum and through a series of online workshops both before and after the reporting process to provide advice and enable discussion of challenges and improvements. Output from the workshops has been used to inform improvements to the reporting template and guidance. The workshops were very well attended, with over 120 people in each of the latest events, and will be continued into the next reporting year.

3.1 Summary of the queries raised through the Q&A Forum

The www.publicsectornetzero.org online forum provided a platform for questions and answers to be shared relating to the guidance and reporting template. This was not only to help improve the quality of data submitted this year, but to also shape improvements to the guidance and emission submissions in the future.

Engagement with the forum was high, leading to over 60 unique questions asked and answered. They will help to improve the ease and accuracy of future reporting. The most common queries are summarised here.

The greatest proportion of questions related to identifying **emissions boundaries**. This was particularly relevant to the emissions of leased assets. An example of such a question is about a Leisure Trust that delivers leisure and cultural services using leased council buildings - should it be included within their reporting boundary? In this example the emissions are to be counted as the Leisure Trust is providing a core service. Similar issues arose for others surrounding the definition of a 'core service'.

More specific boundary issues were also raised including the emissions of overseas assets and those related to the commuting of supply teachers and relief staff. Delineating between in boundary and out of boundary was found to be difficult in some cases. This is an area for improvement in future additions of the guidance.

Issues also arose when an organisation was not able to collate the detailed activity data for higher-tier (more accurate) methods. For example, an organisation did not have data detailing each vehicle type used for employee commutes. This impacted their ability to accurately calculate travel emissions. In this case and others like it, an estimation is required. By the number of questions relating to this, it is clear that **some did not have the confidence to estimate emissions where data was lacking**. It is important the guidance is clear about the situations where it is appropriate to use lower tier methods.

The forum allowed for the discussion of any gaps in information that were not fully covered in the guidance. This included many examples including how **private wires transferring renewable energy between organisational bodies** should be handled and how to report **surplus renewable energy** that was used to charge electric vehicles instead of being exported to the national grid. Cases such as these can be added to the guidance to provide more clarity.

However, it is important that an overload of information does not occur, leading to the core information becoming more difficult to find. This has potentially already happened, as **many questions that were asked in the forum were about information already available in the guidance**.

Some questions identified **additional emissions sources**, that while out of scope for this edition of reporting, could be included in future inventories to improve accuracy. A Fire Service asked about recording the emission impact of fires for example; and this is out of scope for this reporting. Furthermore, an organisation explained that it owned research and commercial farms and wished to report their emissions. Due to a lack of easily available published emissions factors for livestock they were advised they could exclude them for this year, but an area for future improvement was identified. The willingness shown here to report extra emissions data is a good demonstration of the high-level of engagement seen in this process.

Some organisations asked whether their data could be supplied in the template in an altered format to increase the ease with which it was submitted. For example, universities operating on a **different financial year** compared to the rest of the public sector could report against their financial year instead. Allowing for this option in the template will make reporting easier and more consistent for universities. Similarly, some organisations use **HESCET and Atamis to estimate supply-chain emissions** as alternatives to SIC codes. They queried whether data could be reported in this form instead.

The forum also helped to identify small **formatting issues with the submission template** that should be fixed for the next edition. This included formatting that led a user to incorrectly believe they should input ‘well to tank’ emissions for water.

The online forum will be maintained for future rounds of reporting, providing further support to the individual organisations.

3.2 Errors and inconsistent reporting – suggested improvements for the reporting template for future years

The variability in quality of the reporting outputs from organisations for the initial two years demonstrates the **difficulty for the public sector of consistently applying complex carbon accounting methodology**. In particular, there was a large variation in how emission factors were interpreted, units used and categorisation of emissions. However, this is not a criticism of the many staff who have been tasked with this job, as they are not experts in this field and therefore need continued support and would benefit from a more robust reporting and calculation tool to reduce the chance of errors.

The majority of the reports received were provided in the correct report format. Many organisations had provided some notes about their methods, and some had made additions to the reporting spreadsheet to show the emission factors used in the calculations. However, **10 organisations modified the templates** to some degree or **chose to provide data in an alternative format**. In future years it is important to require that all reports are in the correct formats. This will ensure consistency for the efficient aggregation of data and reduce the chance of errors in reformatting the data provided.

Table 8 lists the main issues found related to inconsistencies or potential errors in the data reported, together with suggestions for improvements to the reporting template.

Table 8 Issues identified with reporting and emission calculations, and recommended improvements

Issue area	Identified issue	Suggested improvement
Organisation information	<p>Some organisations used non-standard naming convention for the organisation name e.g. initials or full name.</p>	<p>Incorporate a list of standardised organisation names to select instead of free entry, to ensure year to year consistency.</p>
	<p>In order to be able to analyse emissions intensity of different organisations, various metrics had to be identified and the data sourced. Some data are not available for all organisations.</p>	<p>Some metrics are fairly standard e.g. FTE. Some metrics are organisational category specific e.g. population served (local authority and health boards), number of students (universities). Where there are obvious useful metrics, the fields for these should be required data in future years.</p>
Emission source classification	<p>It is not always possible to identify which ‘scope’ emissions fall into. There are some emission sources that can be direct and indirect within a single organisation e.g. natural gas can be purchased directly for owned/controlled assets or indirectly through leased assets.</p>	<p>Rather than asking organisations to define scopes, there can be a drop-down option enabling them to respond to the relationship that they have with the asset and energy (using defined categories such as owned/leased/outsourced activity etc). This can then be used in the analysis to separate out emissions into scopes without the organisations needing to understand these complexities of carbon accounting.</p>
	<p>There was a large variation in categorisation of emission sources and this required lookups to be created from the input data, rather than just summarising the existing data. This variation was inevitable when a range of organisations are separately completing a spreadsheet. For example, waste descriptions were very varied, and also business travel had many different categories that were easily confused and often overlapping with employee commuting.</p>	<p>The categories of emission sources need to be much more tightly prescribed within the reporting template, so that it is much more consistent and obvious what activity the data refers to.</p>

Issue area	Identified issue	Suggested improvement
	Some emission types were missing from the template, such as separate categories for types of Employee Commuting, which meant that it was sometimes difficult to distinguish from business travel.	As above, more complete and prescribed emission categories to be hard-coded into the template.
Activity data	The units used for activity data were generally reasonably consistent but, for example, some organisations chose to use litres over kWh and therefore may have found it more difficult to find the correct emission factors in some cases, particularly for fuels such as diesel and biomass.	Limited choices of units for reporting will simplify the template and allow for automated calculations.
	Some organisations did not supply all the activity data requested, e.g. some supply chain data was not captured for those who use Atamis, because only aggregated emissions data were available from that source.	More complete data returns will be encouraged for the next round of reporting, and the ability to define if activities are not relevant, to aid completeness assessments.
Emission factors	Interpretation of which emission factor to use was inconsistent. This is not the fault of individual organisations but due to the complexity and range of options in the UK Government Conversion Factors file. An example is the choice of gross rather than net emission factors.	The emission factors, including appropriate parts (direct/indirect/WTT/outside of scopes etc.) should be incorporated into the excel template and locked down. This will need to be done in a way that makes it easier for users e.g. with dependent drop down lists, leading to only appropriate combinations. The reporting template will need to be updated every year with the relevant factors for that year.
	Consumption data units need to align with the emission factor used. There was some evidence to show that some incorrect emission factors had been applied, through back-calculation of emission factors and comparison with the units specified for the activity data.	The addition of drop-down lists for units can be combined with automatically applied emission factors based on the user choice of units entered. This will reduce errors.

Issue area	Identified issue	Suggested improvement
<p>Tiers / methods</p>	<p>The land use estimation method is very simplified and not applicable to organisations that have already undertaken more detailed work (e.g. NRW)</p>	<p>As occurred in some cases this year, organisations that have better methods for assessing land use emissions should report their data together with information supporting their assessments.</p>
	<p>There was a significant amount of debate about the validity of the supply chain spend based estimates including concerns that the emission factors are old and therefore emissions are likely to be estimated too high, and also that the method doesn't allow for any monitoring of the impacts of changes in decisions related to carbon because it is only based on spend.</p>	<p>It has been explained that the supply chain estimates provide a screening tool for prioritising action to reduce carbon in the supply chain, and that a full set of screening data enables a more complete process for this. The next round of reporting will allow for additional more accurate data on supply chain emissions to be reported in addition to the SIC code spend based approach, as a transition towards more comprehensive and accurate reporting.</p>
<p>Completeness of reporting</p>	<p>Municipal waste is an emission source that is only really relevant to Local Authorities but there were clear variations on how this had been interpreted</p>	<p>The guidance needs to provide more clarity on how Waste Data Flow returns from Local Authorities should be used to complete this element of reporting. Additional clarity is required on how to manage the potential overlap between direct fuel emissions from waste collection vehicles, waste tonnage emission factors and procurement of waste disposal services.</p>
	<p>It was not always clear whether activity data was missing, not relevant to the organisation or was captured under supply chain categories.</p>	<p>Provide a new element of the reporting template which enables organisations to specify if a type of emission/activity is relevant in their organisation or not. If they are not able to estimate emissions, they can state that it is not yet estimated.</p>

4 Recommendations related to emission reduction

4.1 Broad recommendations for action planning

There are multiple sources of guidance available for public sector climate change action planning covering a wide variety of emission sources. This section does not attempt to replicate this detailed guidance and instead outlines some basic principles to guide or evaluate action plans.

- Emission sources can be considered in two dimensions; size and control. When prioritising action planning, an organisation should focus first on those emission **sources that are both large in size and that it has the most control over**.
- To maximise benefit from the action plan, consideration of the impact on wider **sustainability goals, climate change adaptation and economic gain for Wales** should be integrated into actions.
- Learning from other organisations across the UK to **share best practice** will bring significant efficiencies.
- Make the most of **local partnerships** such as benefiting from innovation led by the Universities.
- Managing scope 3 emissions often requires **co-ordination and communication** with other organisations; a good starting point is communicating the overall objectives and requirements clearly. Analyse in more detail the most carbon intensive parts of the supply chain (see below).
- Focus on enabling the **decarbonisation of heat and transport**. Electricity use is not currently such a key issue because the emission per unit of electricity will decrease with time as the grid decarbonises. Some of the actions that organisations take now will be future net zero ready e.g. heat pumps, heat networks but might take a few years to really show the benefits in their footprint
- **Recycle and reuse, avoiding landfilling** waste.

4.2 Monitoring and managing the impacts of procurement of goods and services

The Welsh public sector agreed to report the emissions that arise from the supply chain of goods and services because it is acknowledged that influencing the supply chain is a critical element of decarbonisation. Some organisations have already started to do this through discussions about carbon with their suppliers. However, many organisations have also highlighted the difficulties and concerns with using a spend-based approach to estimating these emissions, and for future monitoring. This section investigates some of the concerns and suggests a pathway for evolving this methodology.

The first thing to note is that corporate GHG accounting is not the same as producing an inventory; rather than trying to get a completely accurate picture of the territorial emissions resulting from a sector, it is about mapping the emissions under the control (both direct and indirect) of an organisation. While scope 1 and scope 2 are mandatory to report, under the GHG protocol, scope 3 is an optional reporting category. All scope 3 emissions are also the scope 1 or 2 emissions of another organisation. For example, business travel by bus is scope 3 to the passenger using the service but scope 1 to the bus service operator. The category of scope 3 emissions exists to enable organisations to

map their boundaries of influence and it is acknowledged that this would result in double-counting if applied to the overall carbon reporting system.

Scope 3 contains 15 different categories of emissions which occur indirectly in the organisation's value chain; categories 1 and 2 are purchased goods and services and capital goods. For the purposes of Welsh public sector reporting these have been combined, as public sector organisations do not usually make this distinction between different types of spend. The methodologies used to estimate emissions were outlined in **section 2.4**. The three methods used (SIC codes, Atamis and HESCET) essentially use the same underlying methodology of allocating spend to different codes and estimating carbon emission based on that spend.

There are advantages to this methodology:

- It is accessible and requires relatively minimal data processing;
- It provides an estimate of sectors that are likely to be responsible for significant emissions either as a function of high spend or high carbon intensity, or a combination of the two.

However, there are also disadvantages:

- Relationships between spend and carbon emissions are complex. For materials and simple products, the relationships are likely to be reasonably accurate because energy and transport make up a larger proportion of the product cost. However, for complex products and services, it is likely that each category represents a much larger range of actual emissions.
- For the largest categories used by the public sector, a spend-based method is unlikely to be an accurate assessment of carbon emissions. This is especially true for service categories such as social care and education because there are multiple different service models and activities that are grouped together.
- Different supply chain carbon factor sets use different boundaries for the supply chain and different cost basis, for example some are basic price, not including retail mark up, taxes and duties whereas others are full consumer price. These differences mean it is not possible to pick and choose factors from different sets to create a more complete picture.
- The supply chain carbon factors are designed to estimate the upstream scope 3 emissions of goods and services but some purchasing decisions will also have potential impacts on the scope 1 and 2 emissions of the organisation e.g. energy use by IT equipment or significant downstream scope 3 emissions e.g. non-reusable products going to landfill. These carbon per unit of spend factors do not enable easy understanding of these additional emissions.
- A spend-based methodology where emission factors are not updated annually or refined over time, makes it hard for organisations to monitor the benefits of carbon reduction actions and demonstrate that the carbon footprint of the supply chain is being decarbonised, especially those in the public sector who have limited flexibility on delivery of services.

Therefore, to support ongoing development of more accurate supply chain carbon footprints and better decision-making, a more dynamic approach is required, enabling organisations to identify probable hotspots of carbon emissions within their supply chain (which might be related to the spend, or high carbon categories, or volume of materials) and then using a **more collaborative approach with suppliers** to identify both key sources of emissions within the specific product or service, and opportunities for

reducing these and reporting savings. The aim would be to achieve carbon reductions in the supply chain but also give a clear signal to the market to drive suppliers to reduce emissions and report them, as a key driver of increased revenue. This approach is consistent with the recently published Welsh Procurement Policy Note WPPN 12/21: Decarbonisation through procurement - Addressing CO2e in supply chains⁶.

There are **three key hotspots** that have been identified from the annual reporting for the whole Welsh public sector. These are:

- Construction
- Manufacturing (including basic pharmaceutical products and pharmaceutical preparations, PPE and computer, electronic and optical products)
- Social care services

Construction and **manufacturing** are industry sectors which already have an understanding of their carbon footprint and environmental impact, although there is variation depending on the size of the company. For these sectors it is recommended that more detailed guidance is produced to help organisations make low/lower carbon choices by default. For manufactured products this should include consideration of ecolabelling and/or the carbon footprint of individual products, including their delivery routes, as well as energy use after purchase and environmental implications for disposal. A policy shift away from simply most economic choice will be needed, to weigh up the value of lower carbon goods.

A standard set of climate change impact questions should be developed for procurement of contracts, ranging from the relatively simple about evidence of carbon reduction targets for the organisation to the more complex carbon footprint of whole projects. This would be directly applicable to **construction projects**, which should also consider targets for carbon efficiency of the construction and in-use phase of buildings and other infrastructure

Social care is quite a different sector; the sector is relatively low carbon intensity (but accounts for a large amount of spend), does not have a well developed understanding of climate change impact and runs on very small margins. Asking the wrong questions at procurement stage could have serious implications for organisations being able to respond which could have a negative impact on care outcomes. Therefore, for this sector a different approach is proposed, in order to test some of the assumptions behind the very broad spend factor. It is suggested that this research should be carried out at a national level to inform development of local procurement models that support the social care sector over time to decarbonise. This method would:

- Define the variety of social care service models that are typical of this spend category across the public sector in Wales (with geographical and adult/child service distribution)
- Develop a carbon model for these services using benchmark building and travel data to test the accuracy of the spend-based emission factor and understand more about the distribution of emissions across different service models.
- Identify hotspots of carbon emissions within these models and consider ways that the services could be decarbonised

⁶ <https://gov.wales/wppn-12-21-decarbonisation-through-procurement>

- Work with willing partners in the sector to collect real data to test the models and understand the support needs to enable the sector to decarbonise.

It is recommended that the current spend based reporting will continue to be requested, and that **all organisations report in the same format based on SIC codes** for consistency. This will provide a complete dataset from which to drill down to consider hot spots in more detail, but will not be used to monitor change in future years.

The reporting template should be modified to enable organisations to also enter more accurate emissions data for specific spend categories, if they have it available. For example, an organisation might have spent £1m on computing equipment and as part of the procurement process, could ask suppliers to provide evidence of the product carbon footprints of different options for different use phases (production, use, disposal). The information provided by the supplier awarded the contract can be entered as total emissions for this expenditure. Over time, more expenditure will move to supplier specific factors.

4.3 Impacts of COVID-19: issues for reporting boundaries

From the end of March 2020, due to COVID-19 lockdowns and other restrictions, the profile of emissions from the public sector is expected to have changed, with many services moving online, staff working from home and non-essential services being cancelled. The main **effects of COVID-19 restrictions** on public sector emissions are expected be:

- A large reduction in electricity use in buildings as many IT, lighting and other power use is reduced through lower occupancy
- A lesser reduction in fossil fuel use in buildings as minimum temperatures required to maintain buildings (seasonal impact)
- A large reduction in business travel and employee commuting for most organisations
- A reduction in water use
- A small reduction in fleet fuel

In order to consider the impacts, a selected sample of 13 organisations that reported all categories of emissions for both reporting years was selected and the percentage change in emissions between reporting years compared across the following categories (see **Table 9**). Electricity emissions were corrected for the reduction in emission factor between years to compare actual reduction in use. This analysis is different from the year on year comparison for 38 organisations considered in section 2.2.

Table 9 shows an average reduction of 29% in electricity use in buildings, but only a 7% reduction in fossil fuels. Water use followed the occupancy reduction pattern with a reduction of 32%. Business travel and employee commuting showed a 74% and 50% reduction respectively, while fleet only reduced by an average of 10% and supply chain emissions by just 4% (the pattern of spend is likely to have changed but this has not been analysed in depth). Interestingly, other electricity, which is mainly used for streetlighting also decreased significantly in 2020/21 compared to the previous year.

Table 9 Changes in emissions (%) between 2019-20 and 2020-21 for a sample of organisations which reported emissions in all categories

Organisation	Buildings - electricity	Buildings - fossil fuels	Other - electricity	Water	Business travel	Employee commuting	Fleet	Supply chain
Local Authority 1	-28	-11	-42	-22	-59	-33	-2	-1
Local Authority 2	-29	-18	0	-93	-62	-1	-11	0
Local Authority 3	-37	-6	-15	-75	-77	-7	-4	-2
Local Authority 4	-30	-11	-33	-1	-64	-36	-7	-6
Local Authority 5	-14	-19	-13	-26	-57	-14	-7	-22
Local Authority 6	-34	-12	-38	-26	-81	-95	-10	-47
Other public body 1	-19	-7		-7	-82	0	-44	27
Other public body 2	-74	-18		-7	-99	-98		-56
Other public body 3	-58	-19		-60	-70	-95	-29	8
Other public body 4	-14	46	-6	-65	-91	-97	29	-14
University 1	-23	-6		48	-71	-70	-23	5
University 2	-13	-7		-71	-100	-100		53
Health Board 1	-2	1		-10	-50	1	0	0
Average of all organisations	-29	-7	-24	-3	-74	-50	-10	-4

What this analysis does not show is the **potential increase in emissions due to increased occupancy and energy use in the home** because home-working emissions were not included in the boundary. It is likely that Covid-19 will have medium to longer-term impacts on working location for some staff at least some of the time.

The emissions resulting from public sector workers delivering services from their own homes instead of offices and other public estate locations occur due to increases in domestic heating and electricity use for lighting and computing equipment. Homeworking is included as an optional category within the Scope 3 guidance⁷.

Category	Category description	Minimum boundary
7. Employee commuting	Transportation of employees between their homes and their worksites during the reporting year (in vehicles not owned or operated by the reporting company)	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

⁷ Corporate value chain (Scope 3) accounting and reporting standard. GHG protocol, World Resources Institute and WBCSD, <https://ghgprotocol.org/standards/scope-3-standard>

There is an interrelationship between:

- Organisational scope 1 & 2 emissions from heating, equipment and lighting use on site
- Scope 3 commuting emissions from private and public transport
- Scope 3 homeworking emissions from employee domestic locations

An increased proportion of staff working from home results in an increase in scope 3 domestic energy use but a decrease in both commuting energy use and office/estate energy use (as long as lower occupancy leads to lower energy use).

Pre-covid, the proportion of homeworking by employees for most public sector organisations was sufficiently low to be able to reasonably exclude this as an emission source. In the original boundary for the Welsh public sector, commuting by staff was included in the footprint boundary (although commuting by service users such as students was excluded) but homeworking was excluded due to the complexity of data collection compared to the size of and lack of influence over the emissions. However, with the large shift to homeworking, it is a logical to also map emission increases as well as the decreases. It should be noted that the issues in terms of collecting accurate data and influencing net zero transition for both commuting and homeworking remain.

The balance in changes in home working emissions and commuting emissions will be very variable between different locations because of the nature of commuting journeys (urban/rural etc), and also very variable for individual employees within the same organisation depending on the home working situation. To assess impacts of potential reductions in organisations office space, organisations will need to consider the overall picture and not simply the reduction in their own buildings related emissions.

In terms of methodologies for assessing home working emissions, the Scottish Public Bodies Climate Change report has included a method for estimating homeworking emissions within the reporting template. The data entry required is the percentage of Full Time Equivalent (FTE) workers who work from home. The emissions factor of 0.3 tCO₂e/FTE/year is based on a Carbon Trust report for the Vodafone Institute on homeworking (June, 2021). There is also a more detailed data collection and methodology proposed by the Homeworking emissions whitepaper produced by Ecoact, in partnership with Lloyds and Natwest Group, which is likely too data intensive for most organisations at this stage.

It is recommended that a simple approach to estimating homeworking emissions is included within scope for the next reporting year. This will require a change to the organisational boundary and the guidance and reporting template updated with an appropriate methodology.

5 Conclusions and Next Steps

5.1 Improvements in process and governance

A good level of reporting has been achieved which provides an excellent starting point for prioritising action for carbon reduction. There are some data gaps and these should be filled in the next round of reporting to enable a more accurate complete estimate of emissions across the public sector.

The initial reporting round has resulted in organisations building up experience and capability. This will be a continual learning process, which will result in better reporting in future years.

It is important to embed this data collection and review into the annual cycle of business data reporting. This can be aided by ownership of the process by a key senior manager and clear delegation of specific actions to individuals across the various relevant activities within an organisation.

It is also important that the accumulated learning is retained within organisations, and this is often best done through good documentation of data collection and calculation processes, to enable handover as staff inevitably change. The process of peer review also helps to establish this transparency, because a good level of documentation needs to be in place to make this data checking and review possible. A peer review process should also lead to improving accuracy of reporting and good opportunities for learning between organisations.

5.2 Summary of recommended changes for the reporting template

The following list suggests the changes that need to be made to the reporting template for more robust, accurate and consistent reporting in the next round:

- Scope of emissions to be defined through pick lists of options identifying relationships between assets and the organisation
- Enable organisations to specify if a type of emission/activity is relevant to their organisation or not.
- Categories of emission sources to be more tightly prescribed to ensure consistency and comparability
- Provide more structured data entry including drop-down lists for activity types and activity data units. Limited choices of units for reporting will simplify the template and allow for automated calculations.
- Emission factors to be provided for the relevant year, and to be included automatically in calculations
- Additional columns to be automatically completed where possible e.g. RSD in most cases
- Organisations that have better methods for assessing land use emissions and supply chain emissions can report their own data in more detail
- New requests for organisation metrics such as turnover, FTEs, locations etc for benchmarking as well as standardised set of organisation names.
- Separation of reporting of renewable energy generation (electricity and possibly heat from GSHP/ASHP) into a different table
- Further clarification is required for technology / fuel type where CHP is entered.

- Request information about peer review processes that have been completed
- Provide a new carbon emissions summary that organisations can use for communicating their carbon emissions.

These improvements in the reporting template should make it easier for organisations to complete the reporting, and prevent other templates being used. Alternative formats should not be accepted in future years.

5.3 Improvements in emissions estimation methods

Higher tier methods should be used as far as possible, especially for emissions sources that represent a significant proportion of an organisations' emissions. This may require new data collection effort for some organisations. Organisations should be encouraged to develop data improvement plans, preferably through collaboration with other similar organisations to share learning.

Addressing carbon emissions and removals from land is complex and is not a task easily undertaken. It is recommended that a co-ordinated whole Welsh public sector approach should be taken to planning land use change to maximise carbon sequestration. This will be the most effective way to identify and modify the land that can be most effectively improved.

For the supply chain, the screening estimate will still be requested from organisations in the next round of reporting, with the aim of compiling a more complete set. It is recommended that the estimates are all made using the prescribed method in the template (SIC code) rather than alternatives (Atamis and HESCET) because it has been shown to be possible by the majority of organisations and consistency will be helpful for prioritising. Additional reporting will be included for more detailed estimates to be added where this is available. To support emissions reductions, more detailed guidance is required to help organisations make low/lower carbon choices by default within the key sectors that are most important within the public sector: purchase of manufactured products, construction, and health and social care.

Better clarity is required (through better reporting metrics) on how much electricity generation is onsite and how much is offsite generation linked to the grid. This will help to identify how much of this technology investment is directly impacting on organisations carbon emissions.

A simple approach to estimating homeworking emissions should be included within scope for the next reporting year. This will require a change to the organisational boundary and the guidance and reporting template updated with an appropriate methodology.

5.4 Summary of recommended improvements to the guidance document

Changes in methods and reporting processes need to be reflected in an updated guidance document, including:

- Some simplification of the template (multiple parts of EFs) will allow simplification of the guidance.
- The purpose of the data collection on the supply chain will be better explained (screening exercise) and data requirements made clear for alternative options for reporting equivalent data (requiring aggregation to particular sector categories).

- Make reference to the Welsh Gov public procurement policy documents – to show the context of the screening exercise and next steps for considering carbon reduction in more detail.
- Clarifications on the many options for estimating emissions from waste - landfill, fleet emissions, tonnage EFs procurement double count and so on.
- Encourage basic assessments for employee commuting where data are lacking, which should improve completeness of this emission type.
- Clarification of reporting of renewable electricity and heat.

Annex 1 Data review and data processing steps

An R programming script was used to process all reports received in the net zero reporting template format. This script combined all the data, outputting a single excel file containing sectoral emissions for all organisations for both 2019 - 2020 and 2020-2021. Checks were made to calculate emission factors that were used for key sources such as electricity and natural gas.

The following fixes were made to the data:

- Any data received that was not in the correct template format was restructured so that it was consistent with the net zero reporting spreadsheet template provided.
- Where consumption data were provided but emissions were not calculated, the correct emission factor was applied to calculate emissions.
- Emission factors applied to electricity and natural gas consumption data were found to be inconsistent. All natural gas and electricity emissions were recalculated to ensure the correct the emission factor was used.
- In some cases, double counting occurred between operational and supply chain emissions. Where this was obvious (e.g. water, gas, electricity) double counting was removed.
- The information tab was filled in for any organisations that had left this blank or had used a different version of their organisation name

Some improvements to the data collection process could be implemented in the future. These include requiring that all data is reported on time and in the same format in order to improve the efficiency of the data compilation process. Correct emission factors will be provided in the template to prevent inconsistency in emission calculations between organisations. Standardised organisation names could be incorporated into the template to ensure year to year consistency.

Annex 2 List of organisations and types

Type of Organisation	Organisation Name	
Health Boards and Trusts	Aneurin Bevan University Health Board	
	Betsi Cadwaladr University Health Board	
	Cardiff and Vale University Health Board	
	Cwm Taf Morgannwg University Health Board	
	HEIW	
	Hywel Dda University Health Board	
	NWSSP-SES shared services	
	Powys Teaching Health Board	
	Public Health Wales NHS Trust	
	Velindre University NHS Trust	
	Welsh Ambulance Services NHS Trust	
	Swansea Bay University Health Board	
	Digital Health and Care Wales	
	Local Authorities	Blaenau Gwent Council
		Bridgend County Borough Council
Caerphilly CBC		
Cardiff Council		
Carmarthenshire County Council		
Ceredigion CC		
Swansea Council		
Conwy County Borough Council		
Denbighshire County Council		
Flintshire County Council		
Cyngor Gwynedd		
Isle of Anglesey County Council		
Merthyr Tydfil County Borough Council		
Monmouthshire County Council		
Neath Port Talbot Council		
Newport City Council		
Pembrokeshire County Council		
Powys County Council		
Rhondda Cynon Taf CBC		
Torfaen County Borough Council		
Vale of Glamorgan Council		
Wrexham County Borough Council		
National Park Authority	Brecon Beacons National Park Authority	
	Pembrokeshire Coast National Park Authority	
	Snowdonia National Park Authority	

Other Welsh Public bodies	Arts Centre Wales
	Career Choices Dewis Gyrfa
	Centre for Digital Public Services
	Estyn
	The Higher Education Funding Council for Wales
	Life Sciences Hub Wales
	National Library Wales
	Amgueddfa Cymru - National Museum Wales
	Natural Resources Wales
	Qualifications Wales
	Social care Wales
	Sport Wales
	Transport for Wales
	Welsh Revenue Authority
Universities/Colleges	Aberystwyth University
	Bangor University
	Cardiff Metropolitan University
	Cardiff University
	Glybdwr Wrexham University
	Pembrokeshire College
	Swansea University
	University of Wales Trinity Saint David
	University of South Wales
Welsh Fire and Rescue Authorities	Mid & West Wales Fire & Rescue
	North Wales Fire & Rescue
	South Wales Fire & Rescue
Welsh Government	Welsh Government

Annex 3 Further Information on Renewables

Accounting for renewables within the public sector has always been a contentious topic and the increasing range of options for generation and ownership structures is adding to the complexity.

Collecting data about renewable generation and consumption enables organisations to report effort that has been made to decarbonise their electricity and heat supply at source. It also enables an estimate of overall carbon savings to the public sector from this investment and also enables tracking of trends and projects.

Renewable Energy Types

The data are complex because renewables energy types can be categorised in different ways, which are described here and summarised in **Figure 10**.

1. **Zero input (harvesting natural flows)**. Some renewable energy is harvested from natural energy flows (hydro, wind and solar) and therefore, the units generated do not have any input fuel to be reported. When an organisation uses the energy they have generated, the benefit is the avoided use or displacement of grid average electricity. If instead the electricity is exported to the grid (usually for a financial payment), the benefit is transferred from the organisation to the electricity grid and helps to reduce the overall average grid emission factor for electricity. For solar thermal, which generates heat rather than electricity, the benefit to the organisation is the displacement of heat that would have been generated using fossil fuels.
2. Fuel input to get renewable output. These come in two main varieties (with a hybrid option)
 - a) **Low carbon fuels**. Some renewable energy is generated from fuel sources which are considered low carbon.
 - i. Where the fuel source is biogenic (e.g. biomass, biomethane) or has a biogenic component (e.g. residual waste, average biofuel blend diesel), it is considered low carbon because the CO₂ emitted during combustion is matched by the CO₂ that was removed during the growing phase making this short-cycle carbon. However, there are still some direct non-CO₂ (CH₄ and N₂O) to be accounted for, as well as the Well To Tank (WTT) required to process and transport the fuel. The CO₂ from combustion should be calculated but reported separately from the main GHG account as Outside of Scopes. The organisation benefits from the displacement of whatever fossil fuel was being used for heat or transport.
 - ii. Where the fuel source is an energy carrier (blue hydrogen) that has been produced from natural gas with Carbon Capture and Storage (CCS), the CO₂ that is released as a by-product of the conversion process is captured and stored underground. The organisation needs to account for any WTT and fugitive emissions resulting from the fuel production chain. Where the energy carrier (green hydrogen) has been produced from hydrolysis of water using zero input renewable electricity, the organisation still has to account for the WTT emissions resulting from the compression, storage and transport of the hydrogen but these should be lower than for blue hydrogen.

- b) **More efficient processes.** Some renewable energy can be harvested from natural energy flows but require an energy input. For example, air source heat pumps require electricity as input, but they can extract more units of heat from the air than the input units of electricity. If the electricity used is renewably generated by the organisation, then the benefit to the organisation is the displacement of energy that would have been generated using fossil fuels. If the electricity used comes from the grid, the organisation gets the benefit of the energy that would have been generated using fossil fuels but has a small increase in electricity consumption to be accounted for (as the grid decarbonises, this ‘carbon cost of harvesting’ gets lower).
- c) There is a special case of **Biofuel Combined Heat and Power (CHP)**, where a low carbon fuel is used in a more efficient process that produces both electricity and heat. The biogenic fuel input should be accounted for as in ai) above. The organisation benefits from the displacement of both grid average electricity and fossil fuel used for heating. If the organisation sells the heat to another organisation, a proportion of the emissions can be allocated to the other end user.

CHP which runs on natural gas does not count as a renewable energy technology because it does not involve capture of carbon at source or removal of short-cycle carbon from the atmosphere. Although it is likely to be more efficient than generating electricity without heat recovery and use, it should be accounted for in terms of the natural gas used as an input and the electricity and heat should not be reported as renewable generation. If the heat is sold to another organisation, a proportion of the emissions can be allocated to the other end user.

Renewable energy ownership structures

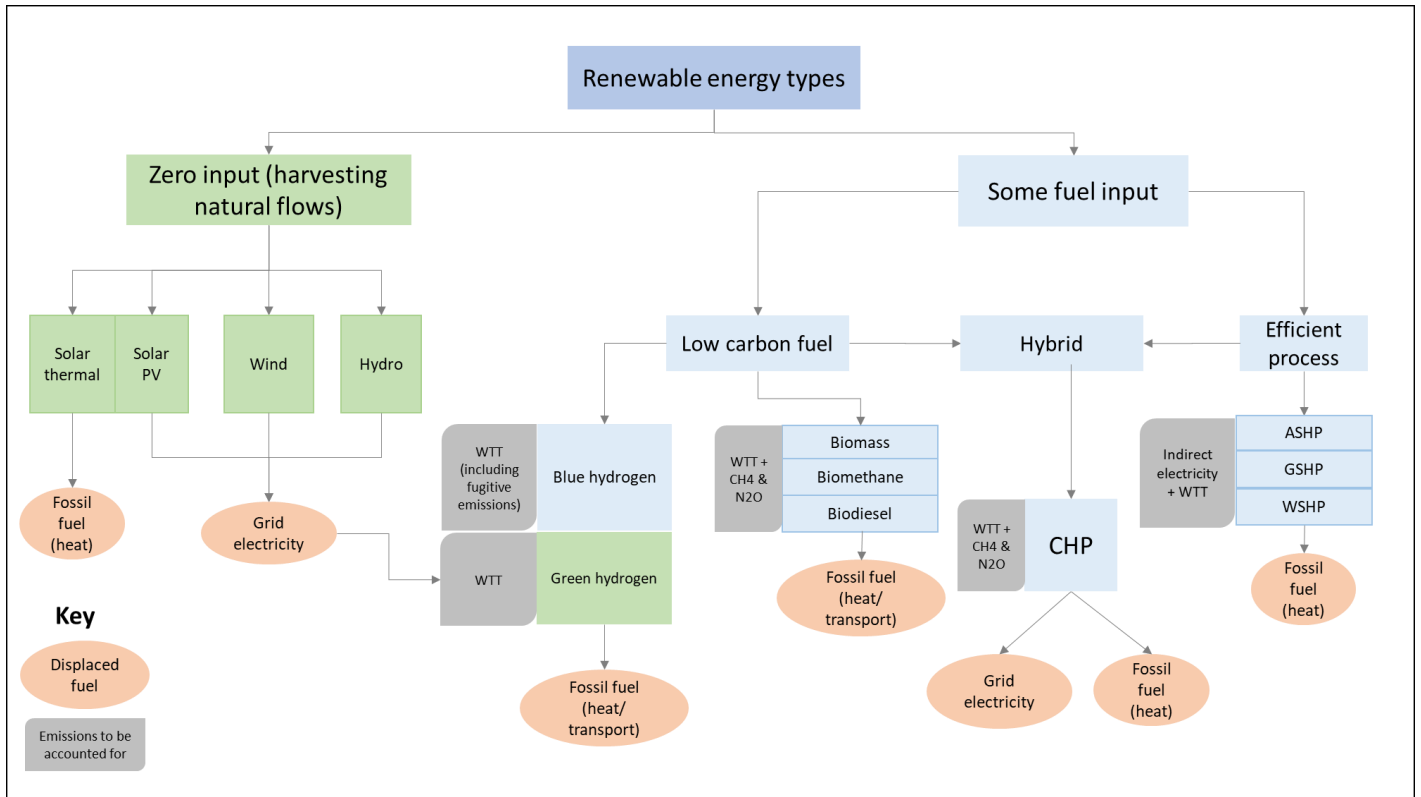
The second issue for generation of renewable is around **ownership structure** and what happens when the electricity and/or heat generated is not consumed by the reporting organisation. This is where it gets more complicated because when renewable electricity is exported to the grid, the credit for it being renewable is generally absorbed into the electricity grid – producing and exporting renewable electricity to the grid is beneficial because it reduces the overall average grid factor, but this benefit cannot then also be claimed as a ‘carbon credit’ by the generating organisation.

It is possible for organisations to enter into agreements with suppliers that appear to avoid this double-counting issue by using a variety of Power Purchase Agreements, private wire arrangement or sleeving agreements. In order for an organisation to claim this as renewable electricity with a zero emission factor, they need to demonstrate that the ‘renewableness’ is not being claimed anywhere else within the system by another organisation or by the national grid. Purchasing green tariff electricity from the grid clearly does not meet this requirement because the same renewable electricity is being counted towards the overall grid emission factor and therefore the credit would be double counted.

In reality, from a net zero strategy perspective, it is important that organisations reduce their energy demand through efficiency and conservation, maximise opportunities to generate and use renewable energy on a small scale (e.g. solar PV and solar thermal) where it is cost effective and consider carefully the implications of installing renewables that rely on an energy input of low carbon fuels. Finding different ways to capture the

carbon credit of renewable generation to reduce their own footprint comes at a cost and is unlikely to produce an overall net benefit in their area.

Figure 10 Classification of renewable energy types





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