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Wales**

Advice on emissions accounting and reporting methods to inform Welsh public sector decarbonisation policy delivery

Aether, Carbon Forecast

Report No 329

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1. Crynodeb Gweithredol

1.1. Cefndir y Prosiect

Fel rhan o'u polisi datgarboneiddio, yn 2017, cyhoeddodd Llywodraeth Cymru eu huchelgais i gael sector cyhoeddus carbon niwtral yng Nghymru erbyn 2030. Mae Llywodraeth Cymru wrthi'n datblygu cynigion ar gyfer cwrmpas manwl yr uchelgais hon a'r dull o fonitro cynnydd yn ei herbyn. I gyfarwyddo'r gwaith hwn, rhoddodd Llywodraeth Cymru gyllid i CNC i geisio asesiad annibynnol yn ymwneud â dulliau posibl o gyfrifyddu allyriadau nwyon tŷ gwydr ar gyfer y sector cyhoeddus; mae'r adroddiad yma'n nodi canlyniad yr asesiad annibynnol hwn.

Mae'r prosiect yn cynnwys dwy ran:

- Rhan 1** – cynnal asesiad o natur gymaradwy gwahanol safonau mewn perthynas ag adrodd ar nwyon tŷ gwydr, o gofio bod nifer o sefydliadau eisoes yn monitro eu hallyriadau nwyon tŷ gwydr ac y gallai cyflwyno system adrodd gyffredin i bawb arwain at oblygiadau sylweddol o ran adnoddau.
- Rhan 2** – cymharu dulliau cyfrifyddu a ddefnyddir ar hyn o bryd yn y sector cyhoeddus a'r sector preifat, sy'n golygu cael arfarniad opsiynau i adolygu cryfderau a gwendidau pob dull, yn erbyn meini prawf y cytunwyd arnynt.

Bwriedir i ganlyniadau'r prosiect helpu i gyfarwyddo'r dull a roddir ar waith gan Lywodraeth Cymru i fonitro cynnydd mewn perthynas â datgarboneiddio'r sector cyhoeddus hyd at 2030 a thu hwnt.

1.2. Methodoleg

Cafodd diffiniadau gweithredol o'r hyn y mae safon a dull yn ei olygu eu datblygu er mwyn penderfynu pa gategori oedd yr un mwyaf priodol. Datblygwyd meini prawf, is-feini prawf a disgrifyddion lefel ar wahân ar gyfer pob categori a rhoddwyd y rhain mewn cronfa ddata. Dylunwyd y gronfa ddata hon i alluogi sgorio ac asesu ac fe'i cyflwynir ochr yn ochr â'r adroddiad hwn.

Tabl 1 Crynodeb o feini prawf ar gyfer safonau adrodd a dulliau adrodd

Meini prawf ar gyfer safonau adrodd	Nifer yr is-feini prawf
Beth yw hyd a lled yr allyriadau a ystyrir?	6
Beth yw'r goblygiadau o safbwynt adnoddau wrth roi'r safon ar waith?	4
A yw'r safon yn diffinio terfynau sy'n berthnasol i'r sector cyhoeddus?	3
A yw'r safon yn ysgogi ac yn gwobrwyo prynu a chynhyrchu ynni adnewyddadwy?	3
A yw'r safon yn nodi rheolau'n ymwneud ag archwilio?	3
Meini prawf ar gyfer dulliau adrodd	Nifer yr is-feini prawf
Pa mor gyflawn yw'r dull o safbwynt adrodd ar bob un o'r tri Chwmpas allyriadau?	22
A yw'r dull adrodd yn ystyried carbon sydd wedi'i ddal a'i storio?	3

A yw'r dull yn ysgogi ac yn gwobrwyo prynu neu gynhyrchu ynni adnewyddadwy?	3
A yw'r dull yn arwain at allu dangos cynnydd dros amser?	3
A yw'r dull yn arwain at allu cydgrynhoi ac adrodd ar allyriadau'r holl sefydliadau yn sector cyhoeddus Cymru?	6
A yw'r dull adrodd yn arwain at allu dod i gasgliadau pendant ynghylch cynnydd yn erbyn yr ymrwymiad i gael Sector Cyhoeddus carbon niwtral yng Nghymru erbyn 2030?	3
Beth yw'r goblygiadau o safbwynt adnoddau wrth roi'r dull ar waith?	5

Cafodd cyfanswm o 15 o safonau adrodd ac 11 o dulliau adrodd eu hadolygu a'u sgorio yn erbyn pob un o'r is-feini prawf.

Ymhellach, cafodd gwybodaeth a ddeilliodd o Arolwg Sector Cyhoeddus Gwasanaeth Ynni Llywodraeth Cymru, ei hadolygu yng nghyd-destun y prosiect hwn. Defnyddiwyd y wybodaeth hon i ddarparu rhywfaint o gyd-destun ar gyfer trafod y canlyniadau.

1.3. Crynodeb o'r canlyniadau

Ni lwyddodd unrhyw un o'r safonau adrodd a adolygwyd i gael sgôr o 100% yn erbyn yr holl feini prawf a bennwyd. Llwyddodd tair safon i sgorio 60% neu fwy, a llwyddodd grŵp arall o chwech i sgorio rhwng 30% a 50%. Gwelir bod cyfuniad o bedair safon yn darparu'r cwmpas mwyaf a'r sgôr fwyaf ar gyfer yr holl is-feini prawf. Dyma nhw:

- 1) *The Greenhouse Gas Protocol: Corporate Accounting and Reporting Standard*
- 2) *The Greenhouse Gas Protocol: Interpreting the corporate standard for U.S public sector organisations*
- 3) *British Standard Greenhouse Gases Part 1 (BS EN ISO 14064-1)*
- 4) *2006 IPCC Guidelines for National Greenhouse Gas Inventories*

Ni lwyddodd unrhyw un o'r dulliau adrodd a adolygwyd i gael sgôr o 100% yn erbyn y meini prawf a bennwyd. Llwyddodd pedwar dull i sgorio mwy na 50%; sgoriodd y gweddill rhwng 30% a 49%. Gwelir bod y pedwar dull a gafodd y sgôr uchaf hefyd yn darparu'r cwmpas gorau a'r sgôr orau ar gyfer yr holl is-feini prawf:

- 1) CDP (a elwid o'r blaen yn *Carbon Disclosure Project*)
- 2) *Public Bodies Climate Change Duties Report*, Llywodraeth yr Alban
- 3) Cyfoeth Naturiol Cymru – Carbon Bositif
- 4) *UK Water Industries Research Carbon Accounting Workbook*

Fodd bynnag, ni pherfformiodd yr un o'r dulliau'n eithriadol o dda; mae'r pedwar dull a restrir uchod yn wahanol iawn i'w gilydd, gyda chryfderau a gwendidau gwahanol yn perthyn iddynt. Er mwyn bodloni'r holl ofynion o safbwynt dull adrodd, mae'n debyg y bydd angen naill ai ddatblygu dull arbenigol neu leihau'r gofynion adrodd a bennwyd.

1.4. Casgliadau a phwyntiau trafod sy'n deillio o'r gwaith

Dengys canlyniadau arolwg llinell sylfaen y sector cyhoeddus fod y sefyllfa bresennol o adrodd ar allyriadau nwyon tŷ gwydr yn anghyson o ran dull, ac y ceir amrywioldeb

sylweddol yn y terfyn gweithredol a chyfundrefnol a'r fethodoleg adrodd. Ni fyddai'r system adrodd bresennol yn bodloni gofynion Llywodraeth Cymru i fonitro ac adrodd ar gynnydd yn erbyn eu huchelgais o gael sector cyhoeddus carbon niwtral yng Nghymru erbyn 2030.

Er bod canlyniadau'r prosiect hwn wedi dangos na fyddai unrhyw safon ar ei phen ei hun yn bodloni pob un o'r gofynion ar gyfer adrodd ar allyriadau'r sector cyhoeddus yng Nghymru, dangoswyd hefyd y byddai modd bodloni'r holl ofynion trwy gyfuno cyfres o safonau a chanllawiau'r *GHG Protocol*, ynghyd â safon y Panel Rhynglywodraethol ar y Newid yn yr Hinsawdd (IPCC) i ymdrin â charbon wedi'i ddal a'i storio a mân elfennau yng nghyswllt safonau ychwanegol. Mae'n debygol y bydd modd i'r GHG Protocol sydd ar ddod ar waredu carbon a defnydd tir ddisodli safon yr IPCC yn y grŵp hwn.

Argymhellir y dylid defnyddio'r grŵp o safonau a nodir uchod i ddatblygu arweiniad adrodd unedig ar gyfer sector cyhoeddus Cymru, gan ddefnyddio'r rhannau gorau o blith y dogfennau priodol. Dylid gwneud hyn yn hytrach na chyfeirio defnyddwyr at lu o ddogfennau, y mae rhai ohonynt yn bur dechnegol mewn manau.

Yn yr un modd, ni ddaethpwyd o hyd i un dull adrodd sy'n bodloni'r holl feini prawf a bennwyd ar gyfer dull adrodd i sector cyhoeddus Cymru; mae hyn yn rhannol oherwydd y gofynion unigryw sydd ynghlwm wrth gael dull lle y mae'n ofynnol gallu dod i gasgliadau pendant ynghylch cynnydd yn erbyn yr ymrwymiad i gael Sector Cyhoeddus carbon niwtral yng Nghymru erbyn 2030.

Yr opsiwn arfaethedig cyntaf yw diwygio dull presennol. Caiff y dulliau mwyaf tebygol ar gyfer addasu eu rhestru, ond mae'n debyg y bydd angen cyfrannu'n sylweddol at bob un o'r rhain er mwyn eu gwneud yn addas i'r diben, ac efallai y byddant yn dal i gynnwys gwendidau mewn perthynas â monitro uchelgais Cymru.

Yr ail opsiwn a archwiliwyd oedd cynllunio system newydd sbon. Mae pennu manyleb ar gyfer dull newydd y tu hwnt i gylch gwaith y prosiect hwn, ond cyflwynir nifer o wersi a ddysgwyd yn sgil yr adolygiad, ar gyfer eu hystyried. Mae'r rhain i gyd yn dangos yr angen i ystyried yn ofalus fanyleb y dull, yn cynnwys gofynion y system a'r fformat adrodd. Os penderfynir cynllunio dull newydd sbon, wedi'i deilwra, mae'r prosiect hwn wedi dangos y ceir nifer o elfennau mewn dulliau presennol sy'n gweithio'n dda, y gellir eu hymgorffori, a dylai hyn leihau'r gwaith cynllunio a gwella'r perfformiad.

Mae pump o gamau nesaf awgrymedig wedi'u cynnig:

Cam awgrymedig 1

Ceir arolwg ar-lein ar wefan *GHG Protocol* sy'n galluogi sefydliadau i helpu i ffurfio'r GHG Protocol arfaethedig ar waredu carbon a defnydd tir. Awgrymir y dylai CNC/Llywodraeth Cymru ymateb i'r arolwg hwn a gofyn am ddiweddariadau rheolaidd. Ceir cyfle yn yr arolwg i grybwyll unrhyw fethodolegau, canllawiau, setiau data neu fentrau'n ymwneud â'r pwnc, a byddai'n fuddiol tynnu sylw at y gwaith helaeth sydd wedi'i wneud yn y prosiect Carbon Bositif ar ddal a storio carbon ar ystâd CNC.

Cam awgrymedig 2

Dylai Llywodraeth Cymru adolygu rhwydweithiau presennol a ddefnyddir at ddibenion rhyngweithio gan dimau ac unigolion sy'n rheoli carbon, y daethpwyd o hyd iddynt trwy'r arolwg llinell sylfaen. Dylid gwneud hyn gyda golwg ar gyfethol rhwydweithiau o'r fath fel cyfrwng ar gyfer darparu cymorth, ond hefyd fel ffordd o ganfod aelodau ar gyfer gweithgor i helpu i ddatblygu system adrodd sector cyhoeddus Cymru.

Cam awgrymedig 3

Fel cam cyntaf wrth ddatblygu safon adrodd ar gyfer sector cyhoeddus Cymru, dylid llunio drafft cychwynnol o safon unedig trwy ddefnyddio'r rhannau perthnasol yn y gyfres o safonau presennol. Bydd hyn yn cynnig man cychwyn ar gyfer datblygu diffiniad gweithredol o niwtraled carbon.

Cam awgrymedig 4

Ar hyn o bryd, mae'r *Sustainable Scotland Network*, sy'n rheoli gwaith adrodd y sector cyhoeddus yn yr Alban ar ran Llywodraeth yr Alban, yn adolygu'r broses adrodd ac mae wedi sefydlu grŵp gweithredu Adrodd i hwyluso'r broses hon. Y broses adrodd PBCCD oedd un o'r dulliau y tynnwyd sylw ato fel opsiwn posibl y gellid ei addasu ar gyfer gofynion Cymru, ond oherwydd yr amseru efallai y byddai'n werth archwilio opsiynau ar gyfer gweithio ar y cyd. Felly, argymhellir y dylai Llywodraeth Cymru gysylltu â Llywodraeth yr Alban a'r *Sustainable Scotland Network* i drafod opsiynau.

Cam awgrymedig 5

Datblygu manyleb ddrafft (e.e. yr hyn y mae angen i'r system ei wneud) ar gyfer dull adrodd sector cyhoeddus Cymru, fel man cychwyn ar gyfer cynnal trafodaethau gyda gweinyddiaethau datganoledig eraill a chyda sefydliadau adrodd. Gall y fanyleb ddrafft hon ddefnyddio'r arfer gorau a nodir ar gyfer is-feini prawf unigol, gan osgoi'r angen felly i ail-greu system newydd sbon.

2. Executive Summary

2.1. Background to the project

As part of its decarbonisation policy, in 2017, the Welsh Government announced its ambition for a carbon neutral Welsh public sector by 2030. The Welsh Government is developing proposals for the detailed scope of this ambition and the approach to monitoring progress against it. To inform this work, Welsh Government provided NRW with funding to seek an independent assessment of potential greenhouse gas (GHG) emissions accounting approaches for the public sector; this report details the outcome of this independent assessment.

The project contains two parts:

3. **Part 1** to undertake an assessment of the comparability of different GHG reporting standards, given that many organisations are already monitoring their GHG emissions and that the introduction of a common reporting system for all could have significant resource implications.
4. **Part 2** to compare existing public and private sector accounting approaches currently in use, entailing an options appraisal reviewing the strengths and weaknesses of each approach, against an agreed set of criteria.

The results of the project are intended to help inform the approach adopted by Welsh Government to monitor public sector decarbonisation progress to 2030 and beyond.

2.2. Methodology

Working definitions of what constitutes a standard and an approach were developed in order to make decisions about which category was most appropriate. Separate sets of criteria, sub-criteria and level descriptors were developed for each category and these were entered into a database, provided alongside this report and designed to enable scoring and assessment.

Table 1 Summary of criteria for reporting standards and approaches

Criteria for reporting standards	Number of sub-criteria
What breadth of emissions are accounted for?	6
What are the resource implications of adopting the standard?	4
Does the standard define boundaries applicable to the public sector?	3
Does the standard stimulate and reward purchase and generation of renewable energy?	3
Does the standard specify rules for auditing?	3
Criteria for reporting approaches	Number of sub-criteria
How complete is the approach in terms of reporting all three emissions Scopes?	22
Does the reporting approach account for sequestered carbon?	3
Does the approach stimulate and reward purchase and generation of renewable energy?	3

Does the approach enable the ability to demonstrate progress over time?	3
Does the approach enable the ability to aggregate and report emissions for all Welsh public-sector organisations?	6
Does the reporting approach enable robust conclusions to be drawn regarding progress against the commitment to a carbon neutral Welsh Public Sector by 2030?	3
What are the resource implications of adopting the approach?	5

In total 15 reporting standards and 11 reporting approaches were reviewed and scored against each of the sub-criteria.

Information from the Welsh Government Energy Service Public Sector Survey was also reviewed in the context of this project. This information was used to provide some context to the discussion of the results.

2.3. Summary of results

None of the reporting standards reviewed achieved a 100% score against the whole criteria set. There were three standards that scored 60% or over and a further group of six that scored between 30% and 50%. A combination of four standards were shown to provide maximum coverage and scoring for all the sub-criteria. These were:

- 5) The Greenhouse Gas Protocol: Corporate Accounting and Reporting Standard
- 6) The Greenhouse Gas Protocol: Interpreting the corporate standard for U.S public sector organisations
- 7) British Standard Greenhouse Gases Part 1 (BS EN ISO 14064-1)
- 8) 2006 IPCC Guidelines for National Greenhouse Gas Inventories

None of the reporting approaches reviewed achieved a 100% score against the criteria set. There were four approaches that scored over 50%; the rest scored between 30% and 49%. The four top scoring approaches also provided the best coverage and scoring for all the sub-criteria:

- 5) CDP (formerly the Carbon Disclosure Project)
- 6) The Scottish Government Public Bodies Climate Change Duties Report
- 7) Natural Resources Wales - Carbon Positive
- 8) UK Water Industries Research Carbon Accounting Workbook

However, there were no standout performers across the approaches; the four approaches listed above are all very distinct, with different areas of strengths and weaknesses. Meeting all the requirements for a reporting approach is likely to require either the development of a specialised approach or a reduction in the reporting requirements set.

2.4. Conclusions and discussion points arising from the work

The results from the public sector baseline survey show that the current situation of reporting GHG emissions is inconsistent in terms of approach, including significant variability in the operational and organisational boundary and reporting methodology. The current system of reporting emissions would not meet the requirements of the

Welsh Government to monitor and report progress against their ambition of having a carbon neutral Welsh public sector by 2030.

The results from this project have demonstrated that while there is no single reporting standard that would meet all of the Welsh public sector emissions reporting requirements, by combining the suite of GHG Protocol standards and guidance, along with the IPCC standard to cover sequestered carbon and minor elements of additional standards, all of the requirements can be met. It is probable that the forthcoming GHG Protocol on carbon removals and land use will be able to displace the IPCC standard in this group.

It is recommended that the group of standards mentioned above are used to develop a unified Welsh public sector reporting guide, taking the best parts from the appropriate documents. This is as opposed to simply referring users to a large number of documents, some of which are quite technical in places.

Similarly, no single reporting approach that meets all the criteria set for a Welsh public sector reporting approach was found; this is partly due to the unique set of requirements of an approach which requires robust conclusions to be drawn regarding progress against the commitment to a carbon neutral Welsh Public Sector by 2030.

The first proposed option is to amend an existing approach. The most likely approaches for adapting are listed but all of these are likely to require significant input to make them fit for purpose and might still contain existing identified shortcomings with respect to monitoring the Welsh ambition.

The second option explored was to design a system from scratch. The specification of a new approach is outside the remit of this project but a number of lessons learnt from the review are presented for consideration. These all point to the need to carefully consider the specification of the approach, including the system requirements and the reporting format. If a decision is taken to design a tailored approach from scratch, this project has demonstrated that there a number of elements in existing approaches that work well and can be incorporated, which should reduce design effort and improve performance.

Five suggested next steps have been proposed:

Suggested action 1

There is an online survey on the GHG Protocol website which allows organisations to help shape the proposed GHG protocol on carbon removals and land use. It is suggested that NRW/the Welsh Government respond to this survey and request periodic updates. There is the opportunity within the survey to mention any methodologies, guidance, datasets or initiatives related to the topic and it would be useful to highlight the extensive work done in the Carbon Positive project on sequestration in the NRW estate.

Suggested action 2

The Welsh Government should review existing networks through which carbon management teams and individuals, identified through the baseline survey, interact. This should be with a view to co-opting such networks as vehicle for providing support but also as a means to identify participants for a working group to help develop a Welsh public sector reporting system.

Suggested action 3

As a first step in developing a Welsh public sector reporting standard, an initial draft of a unified standard should be assembled from the relevant sections in the suite of existing standards. This will provide a starting point for developing a working definition of carbon neutrality.

Suggested action 4

The Sustainable Scotland Network which manages public sector reporting in Scotland on behalf of the Scottish Government is currently in the process of reviewing the reporting process and has set up a Reporting action group to facilitate this process. The PBCCD reporting process was one of the approaches that was highlighted as being a potential option for adapting to the Welsh requirements but due to the timing, it could be worth exploring the options for joint working. Therefore, it recommended that the Welsh Government contact the Scottish Government and Sustainable Scotland Network to discuss options.

Suggested action 5

Develop a draft specification (e.g. what does the system need to do) for a Welsh Public Sector reporting approach as a starting point for discussions with other devolved administrations and with reporting organisations. This draft specification can draw on the identified best practice for individual sub-criteria, therefore avoiding the requirement to reinvent a system completely from scratch.

3. Glossary

Table 2 Glossary of terms

Term	Definition
Accuracy	The degree to which the result of a measurement, calculation, or specification conforms to the correct value or a standard.
Baseline scenario	A baseline is the reference scenario from which the impact of an emissions reduction programme or project can be measured.
Carbon dioxide equivalent (CO ₂ e)	Carbon dioxide equivalent is a measure used to compare the emissions from various greenhouse gases based upon their global warming potential. For example, the global warming potential for methane over 100 years is 21. Therefore 1 tonne of methane released is equivalent to 25 tonnes of CO ₂ (measured on a 100 year time horizon). Therefore CO ₂ e works as a single 'currency' for greenhouse gases.
Carbon emissions	Used as a shorthand to refer to greenhouse gas emissions that are included in the Kyoto Treaty. Carbon dioxide is the most common greenhouse gas and other gases can be measured in relation to it (see CO ₂ e)
Carbon neutral	Carbon neutrality, or having a net zero carbon footprint, refers to achieving net zero carbon dioxide emissions by balancing carbon emissions with carbon removal (often through carbon offsetting) or eliminating carbon emissions altogether.
Carbon reduction	An activity that reduces carbon emissions compared to a baseline scenario.
Climate change	The large-scale, long-term shift in the planet's weather patterns or average temperatures.
Conversion factor	A numerical ratio to express a measurement from one unit to another unit e.g. miles to kilometres but also sometimes used instead of emission factor
Decarbonisation	Reducing the carbon intensity of energy sources, transport or goods and services. It is often used in the context of electricity generated (reducing emissions per kWh) by increasing efficiency of supply and modal generation switching to renewables and low carbon sources.
Emission factor	The average emission rate of a given greenhouse gas for a given source, relative to units of activity.
Global warming	Refers to the recent and ongoing rise in global average temperature near Earth's surface. It is caused mostly by increasing concentrations of greenhouse gases in the atmosphere. Global warming is causing climate patterns to change. However, global warming itself represents only one aspect of climate change.
Greenhouse Gas (GHG)	A gas in our atmosphere that absorbs and emits radiation within the thermal infrared range. There are naturally occurring greenhouse gases in our atmosphere which maintain surface temperatures in a range conducive to life. However, since the industrial revolution, anthropogenic sources of GHGs have increased hugely, leading to 40% increase in atmospheric

Term	Definition
	concentration of carbon dioxide. This is causing increases in surface temperatures and the main cause of global warming and a large contributory factor in climate change. There are seven GHGs covered by the Kyoto Treaty but the main ones are carbon dioxide (CO ₂), methane (CH ₄) and nitrous oxide (N ₂ O) and action needs to be taken to reduce emissions of these
Operational boundary	The operational boundary describes the emission sources that are included in a carbon footprint. These are divided into three Scopes; direct Scope 1 emissions, indirect energy Scope 2 emissions and other indirect Scope 3 emissions.
Organisational boundary	The organisational boundary describes the operations and facilities that are included in a carbon footprint of an organisation.
Removals	CO ₂ removals refer to a set of techniques that aim to remove CO ₂ directly from the atmosphere by either increasing natural sinks for carbon or using chemical engineering to remove the CO ₂ , with the intent of reducing the atmospheric CO ₂ concentration.
Scope	Scopes are ways of describing different categories of emission sources and are used as a way of providing transparency in emissions accounting, making it clear the type of emission source that is included and the level of control of the reporting organisation over the source. Three levels of Scope have been defined and used on a global basis.
Scope 1	Direct GHG emissions occur from sources owned or controlled by the body concerned, such as emissions from combustion in owned or controlled boilers, furnaces, vehicles, etc.
Scope 2	Energy indirect GHG emissions from the generation of purchased electricity or heat and steam. Scope 2 emissions physically occur at the facility where electricity is generated but are reported by the organisation that uses the energy.
Scope 3	Other indirect GHG emissions that occur as a consequence of the activities of the body concerned, but occur from sources not owned or controlled by that body. Some examples of scope 3 activities are extraction and production of purchased materials; transportation of purchased fuels; and use of sold products and services.
Sequestration	A natural or artificial process by which carbon dioxide is removed from the atmosphere and held in solid or liquid form. The uptake of atmospheric carbon by plants and the growth of wood or increase of peat volume are examples of biological sequestration. Also see removals.

4. Introduction

As part of its decarbonisation policy, in 2017, the Welsh Government announced its ambition for a carbon neutral Welsh public sector by 2030 (Welsh Government, 2017). The Welsh Government is developing proposals for the detailed scope of this ambition and the approach to monitoring progress against it. To inform this work, Welsh Government provided NRW with funding to seek an independent assessment of potential greenhouse gas (GHG) emissions accounting approaches for the public sector; this report details the outcome of this independent assessment.

The project contains two parts:

1. **Part 1** to undertake an assessment of the comparability of different GHG reporting standards, given that many organisations are already monitoring their GHG emissions and that the introduction of a common reporting system for all could have significant resource implications.
2. **Part 2** to compare existing public and private sector accounting approaches currently in use, entailing an options appraisal reviewing the strengths and weaknesses of each approach, against an agreed set of criteria.

The results of the project will help inform the approach adopted by Welsh Government to monitor public sector decarbonisation progress to 2030 and beyond. As with all projects looking at GHG accounting approaches and trying to understand and clarify the complexities in terms of public sector reporting, it is important to remember two important principles:

- 1) Reporting is a means to an end, not an end itself, and the purpose of GHG accounting is to manage and reduce emissions. Therefore, it is important that all aspects of a reporting approach are demonstrably functional in the aim of reducing emissions and mitigating climate change; and
- 2) Reporting activity should not get in the way of identifying and implementing carbon reduction projects but it should support prioritisation of the projects with the best return in terms of emissions reduction, financial savings or new revenue streams and contribution towards Wales' well-being goals.

4.1. Aims and objectives

- Develop a working definition to differentiate between reporting standards and reporting approaches
- Draw up a list of reporting standards and approaches to be reviewed, including, but not limited to, those listed in the project brief;
- Develop criteria and a methodology for reviewing existing reporting standards and approaches;
- Produce a report detailing the results of the review, including:
 - a description of the review approach taken, criteria for comparison and rationale for criteria selection for Parts 1 and 2
 - any caveats to the approach and wider considerations
 - results of the comparisons for Parts 1 and 2
 - an at a glance summary of the results, and
 - conclusions.

4.2. Outline of this report

Section 5 discusses the policy context and background to the project.

Section 6 describes the methodology used to define the criteria, develop sub-criteria and a scoring system and contains a complete list of all the reporting standards and approaches that were reviewed.

Section 7 contains the results of the review, in terms of overall percentage score, percentage scores achieved for each criteria; and details of the scores assigned to each sub-criteria, where required for clarity.

Section 8 discusses the results from Section 7 in the context of the Welsh Government's requirements and outlines some strategies to achieve those requirements.

Section 9 summarises the conclusions arising from the review.

Section 10 provides references for all of the Standards and Approaches reviewed as part of this study.

5. Background to the project

5.1. Welsh climate change policy context

The Environment (Wales) Act 2016 and the Well-being of Future Generations (Wales) Act 2015 together provide the legislative structure to enable sustainable development in Wales by requiring the sustainable management of natural resources and providing a framework for improving the social, economic, environmental and cultural wellbeing of Wales.

The Environment (Wales) Act 2016 sets out the targets and approach to reduce GHG emissions in Wales. The Act has set a target of reducing net emissions by 80%, compared to the baseline by 2050. In December 2018 the National Assembly for Wales agreed to secondary legislation¹ which sets the framework for how emissions are accounted for in Wales. These regulations were informed by advice received from statutory advisors, the UK Committee on Climate Change (UKCCC), with detailed analysis and advice provided on suggested levels. The Regulations set interim targets for 2020, 2030 and 2040, and the first two 5-yearly carbon budgets to create a trajectory towards the 2050 target, as shown in Table 3.

Table 3 Interim targets and carbon budgets for Wales

Interim emission reduction targets	% reduction (based on 1990 baseline)	Budget period	Carbon budgets
2020	27%	2016 - 2020	Emissions limited to average of 23% below 1990 levels
2030	45%	2021 - 2025	Emissions limited to an average of 33% below 1990 levels
		2026 - 2030	Not yet set
2040	67%	2031 - 2035	
		2036 - 2040	

Although the public sector only accounts directly for a small amount of Wales' emissions, it is uniquely placed to influence emissions far more widely in areas such as transport, energy and land use. The influence of public bodies is recognised by the Well-being of Future Generations Act, which requires these bodies to think more about the long-term, work better with people and communities and each other, look to prevent problems and take a more joined-up approach. Climate change action is included in two of the goals, as shown in Table 4.

¹ [The Carbon Accounting \(Wales\) Regulations 2018](#); [The Climate Change \(Carbon Budgets\) \(Wales\) Regulations 2018](#); [The Climate Change \(Interim Emissions Targets\) \(Wales\) Regulations 2018](#); [The Climate Change \(International Aviation and International Shipping\) \(Wales\) Regulations 2018](#); and [The Climate Change \(Net Welsh Emissions Account Credit Limit\) \(Wales\) Regulations 2018](#)

Table 4 Well-being of future generations' goals

Goal	Description of the goal
A prosperous Wales	An innovative, productive and low carbon society which recognises the limits of the global environment and therefore uses resources efficiently and proportionately (including acting on climate change) ; and which develops a skilled and well-educated population in an economy which generates wealth and provides employment opportunities, allowing people to take advantage of the wealth generated through securing decent work.
A resilient Wales	A nation which maintains and enhances a biodiverse natural environment with healthy functioning ecosystems that support social, economic and ecological resilience and the capacity to adapt to change (for example climate change) .

In a plenary session of the Welsh Government in June 2017², a debate on public sector decarbonisation agreed the following points, as part of an overall motion

To propose that the National Assembly for Wales:

- 1. Notes the Welsh Government's leadership in implementing actions to decarbonise the Welsh public sector, in line with its statutory commitments within the Environment (Wales) Act 2016.*
- 2. Supports the Welsh Government's aim of accelerating decarbonisation in the public sector to provide further stimulus to the low carbon economy.*
- 3. Supports the Welsh Government ambition that Wales' public sector is carbon neutral by 2030.*
- 4. Notes the forthcoming call for evidence which will seek views on the approach to be taken to decarbonise the Public Sector.*

The ambition for the Welsh public sector to be carbon neutral by 2030 was then announced in July 2017, by the cabinet secretary for Environment and Rural Affairs, Lesley Griffiths (Welsh Government, 2017).

In December 2017 a Call for Evidence (Welsh Government, 2017) explored the most effective mechanisms for achieving the ambition and the appropriate strategic actions required, recognising that progressing the right actions has the ability to reduce carbon, increase public sector efficiency and influence emission reductions in other sectors of the economy and society.

A number of questions directly related to this work were explored through the call for evidence:

Scope of Emissions - All responses supported including Scope 1 and 2 emissions. There was widespread support for including Scope 3 emissions, but this was widely noted as being difficult to define, control, manage and ultimately achieve savings within.

A number of responses called for some support to standardise the definition of Scope 3 to aid organisations to achieve reductions here. There were a number of further

² <http://senedd.assembly.wales/ielssueDetails.aspx?Ild=19314&Opt=3>

suggestions that Scope 3 should either be outside of the target, should be introduced incrementally or should be included following further study of how the target would be defined, controlled and monitored.

Approaches to monitor progress – There were a variety of responses to this question, however all indicated a need to utilise existing activities and methods where possible, to reduce complexity and overhead costs, Responses recommended any solution should work alongside the Carbon Reduction Commitment (CRC) and European Union Emission Trading Scheme (EU ETS) arrangements that some organisations are subject to already.

Whilst there was recognition that these reporting arrangements were not applicable to all organisations likely to be included in the ambition, it was felt there was sufficient knowledge across Wales to be able to increase capability of others easily.

There was an alternative view that there was a good fit with the statutory duties of the Public Service Boards, whose arrangements include reporting on well-being objectives, statements and plans. Another view expressed was the need to ensure consistency with any future carbon budgeting arrangements, with clear, common and consistent data services required.

In terms of methods, it was noted the Greenhouse Gas protocol (WRI/WBCSD, 2004), the standard ISO 14001:2015 Environmental management systems (BSI, 2015) (for Scope 1 & 2) and ISO 14064 – Greenhouse Gases Part 1 organisations (BSI, 2012) for Scope 3) already provide some standardisation.

Interim Targets - There was widespread support for interim targets in the responses received, arguing they would help to ensure progress is achieved towards the overall goal, and help to measure progress along the way. A number of responses suggested interim targets could be applied to Scope 1 and 2 emissions, but be voluntary or introduced incrementally for Scope 3.

Many responses called for interim targets to be set on a multi-year basis, with recommendations of both 3 yearly and 5 yearly commonly made and a strong preference to dovetail with existing reporting arrangements. The views were expressed due to a recognition of the multi-year nature of the projects needed to reduce emissions, the need to avoid year on year gaming of statistics and the need to avoid overly burdensome reporting. Responses did note interim targets alone would be insufficient, without appropriate governance, finance and framework to deliver the projects needed to meet them.

Areas for action - A wide range of potential areas of early action were highlighted:

- Support around transport fleet decarbonisation
- Better quality training and commissioning of new building capital projects to ensure the energy efficiency performance designed was achieved in real-life conditions
- Action to reduce emissions of purchased utilities
- Potential for heat networks within the public estate
- Public sector wide benchmarking and reduction reporting method
- Support to develop more delivery models for renewable energy projects
- Policy support for grid scale low carbon energy
- Land based carbon sinks
- Lower carbon design of new and retrofit buildings

- Electric vehicle charging infrastructure, storage and on site use integrated with renewable energy projects
- Widespread work with suppliers to reduce Scope 3 emissions in procurement

Carbon offsets or trading - Responses around carbon trading were varied, with some support. Some responses felt carbon trading of some form, either within the public sector or beyond as an offsetting measure would be essential to meet the headline carbon neutrality target. Widespread caution was offered about the need for trading schemes to be implemented carefully to ensure they do not become perceived as a tax, or fail to drive decarbonisation behaviours.

A number of responses highlighted that the potential to offset or trade carbon emissions risks not creating the overall level of carbon reduction needed to avoid the worst impacts of climate change, and risks inequity in the treatment of emissions where trading can be afforded. Used well, it was felt that creating opportunities for carbon sequestration in Wales could lead to additionality in creating forestry, with the potential to improve biodiversity.

This report represents one of three pieces of evidence funded by the Welsh Government building on the Call for Evidence which will inform the approach to take; the other two projects are:

1. The Carbon Positive project; and
2. Carbon Neutral Public Sector by 2030: Baseline Survey.

5.2. The Carbon Positive project

The Carbon Positive project was funded by the Welsh Government to demonstrate how an organisation can evaluate and improve its net carbon status (NRW, 2018). The aim of the Carbon Positive Project was to calculate the GHG emissions and carbon sequestration baseline of Natural Resources Wales (NRW), enabling identification of strategic priorities for mitigation action, supporting the evaluation of the most cost and carbon effective mitigation options and to provide a useful resource and reference for other public sector organisations managing their carbon impact.

The project looked at both emissions from NRW estate and activities, and land-based sequestration from owned and managed land to work out as the balance between the quantity of GHG emitted by the organisation's operations and the net quantity of carbon sequestered in habitats on the NRW estate.

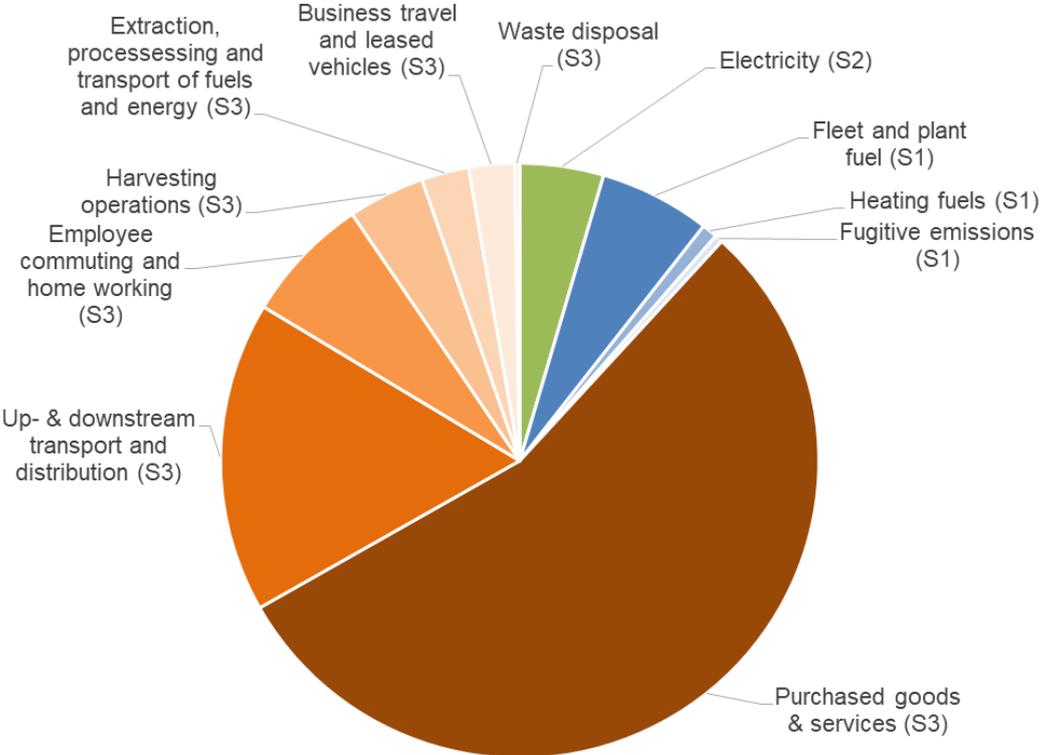
The organisational and operational boundary of NRW's operations was drawn deliberately to include as many emission sources as possible. All 3 emissions categories, known as Scopes, were included:

- **Scope 1** - direct GHG emissions to the atmosphere from sources owned or controlled by NRW e.g. fuel combustion in owned boilers and vehicles;
- **Scope 2** - indirect emissions to the atmosphere from the generation of electricity purchased by NRW for use in assets and buildings under operational control;
- **Scope 3** - other indirect emissions that arise from sources outside of NRW's operational control but are a consequence of activities e.g. purchased materials, contractor services, employee commute.

One of the notable results of the Carbon Positive inventory was the huge contribution of Scope 3 emissions to the overall footprint (shown in various shades of orange in

Figure 1); accounting for 88% of the overall emissions. The largest category within this Scope was purchased goods and services.

Figure 1 GHG Inventory for NRW, by category and Scope (data source: Carbon Positive Project Summary Report, January 2018 – some categories have been collated to aid presentation)



Scope 3 is the most diverse Scope category and contains not only traditional Scope 3 emissions such as waste disposal and business travel, but also purchased goods and services, extraction, processing and transport of fuel and energy (also referred to as Well to Tank emissions (WTT)) and employee commuting and homeworking. However, the reporting of Scope 3 emissions is voluntary under the majority of reporting standards and therefore these emissions are often under-reported.

5.3. Welsh Government Energy Service Public Baseline Sector Survey

The Welsh Government, through its Welsh Government Energy Service, and in conjunction with NRW, has developed and delivered a survey of public sector organisations in Wales. The purpose of the survey was to:

- determine the degree of strategic leadership around climate action, capacity and capability to deliver actions on climate change within Welsh public bodies,
- the level of activity in terms of GHG accounting and reporting, the planning and delivery of climate mitigation measures, and
- whether GHG impacts feature within procurement decisions.

As part of this survey, organisations were asked to detail what environmental and GHG reporting standards and guidelines are being utilised at present.

The survey was completed in January 2019 and initial results from the survey have been used to inform the range of standards and approaches to be covered by this project, as well as providing supporting evidence for the discussion of the results.

5.4. An estimate of the scale and range of public sector emissions in Wales

The latest data (2016) available on Welsh national GHG emissions shows that the public sector was responsible for just 0.71% of the total Welsh emissions³ (Welsh Government, 2017); however, this data only attributes emissions from public sector combustion (i.e. Scope 1 emissions only). In reality the emissions that the public sector is responsible for, and the influence that the public sector has, are likely to both be much greater. To demonstrate the need for comprehensive and aggregate emissions reporting for the public sector, Table 5 shows the results from four different estimates, based on different methodologies, of the annual GHG emissions of the Welsh Public Sector and demonstrates the huge range in the estimated emissions – these estimates are based on four very different methodologies and data sources and are provided to indicate the potential range of emissions, depending on the scope of emission sources that are included.

Table 5 Range of estimated emissions from Welsh Public Sector

Method 1	Method 2	Method 3	Method 4
0.36 Mt CO ₂ e	0.76 Mt CO ₂ e	1.48 Mt CO ₂	13.2 Mt CO ₂ e
Emissions from National Inventory allocated to the Welsh public sector (BEIS, 2018).	Results from the Welsh Government Energy Service Public Sector Survey Question 30 ⁴ .	Estimated from Public Bodies Climate Change Duties data from Scotland (SSN, 2019), pro-rated for population size of Wales (ONS, 2018).	Intensity measure of emissions/FTE from full organisational boundary for NRW (2015/16), scaled up to number of FTE working in the Welsh Public Sector in 2017 (Stat Wales, 2018).
Only includes Scope 1 direct emissions from energy.	Variable boundary for reporting; likely to include a reasonable proportion of Scope 1 and Scope 2 emission but be low on Scope 3 emissions.	Emissions from Transport Partnerships and Scottish Water removed from total as these are not included in the Welsh public sector organisations. Variable boundary for reporting as per Method 2.	The methodology uses an extrapolation from only one data point and therefore could be a large over, or under estimate. Estimate includes a very comprehensive set of Scope 1, 2 and 3 emissions.

³ The report can be downloaded from http://naei.beis.gov.uk/reports/reports?section_id=4

⁴ Factor of one thousand corrections were applied to two very large figures, as it is probable that these are incorrect units of kg rather than tonnes. See page 30 of this report for wording of Question 30.

5.5. What organisations are included?

The final list of public bodies to be covered by the commitment will be established alongside other issues of Scope. However, current thinking is emissions reporting requirements will be placed on the public bodies identified in the Well-Being of Future Generations (Wales) Act 2015. Section 6 of the Act contains a list of public bodies, including the Welsh Ministers, the local authorities, the local Health Boards, National Park authorities and fire and rescue authorities, amongst others. The eight Welsh universities were also added to the list, as it is proposed that they will be asked to participate in the commitment and report their emissions alongside those listed in the Act on a voluntary basis. Figure 2 shows the categories of public bodies and number of organisations per category. The total number of bodies on the list is 53.

Figure 2 Categories of public bodies in Wales covered by the reporting requirements



5.6. Public sector reporting in other parts of the UK

There are two other public sector reporting obligations currently in place in the UK. Both of these have been covered as reporting approaches in this review but it is worth providing a brief description of what these approaches involve and how they have been implemented.

5.6.1. Sustainability Reporting for the Greening Government Commitments

The Greening Government Commitment (Department for Environment and Rural Affairs, 2018) set out the actions that UK government departments and their agencies are required to take to reduce their impacts on the environment. Within the commitments, there are two emissions targets for 2020:

1. Reduce GHG emissions by at least 43% from a 2009 to 2010 baseline
2. Reduce the number of domestic business flights by at least 30% from the 2009 to 2010 baseline

The bodies included in the commitment are required to report on an annual basis using the Sustainability Reporting guidance (HM Treasury, 2019). The scope of the key outcomes for 2016 to 2020 includes office and non-office estate and other

operational activities in UK government departments, their Executive Agencies, executive Non-Departmental Public Bodies (NDPBs) and Non-Ministerial Departments (NMDs). They do not apply to the estates and operations of the Devolved Administrations, their Executive Agencies and related bodies.

In the Clean Growth Strategy (BEIS, 2018) the UK government also introduced a voluntary target for the wider public and higher education sectors in England. This target would aim to reduce GHG emissions across these sectors by 30% by 2020/21, compared to a 2009/10 baseline. Annual reporting for the wider public and higher education sectors in England is also on a voluntary basis.

5.6.2. Scotland's Public Bodies Climate Change Duties

In 2009, the Scottish Parliament passed the Climate Change (Scotland) Act. Part 4 of the Act states that a “*public body must, in exercising its functions, act: in the way best calculated to contribute to the delivery of (Scotland's climate change) targets; in the way best calculated to help deliver any (Scottish adaptation programme); and in a way that it considers most sustainable*”.

The Climate Change (Duties of Public Bodies: Reporting Requirements) (Scotland) Order 2015 came into force in November 2015 as secondary legislation made under the Climate Change (Scotland) Act 2009. The Order sets out reporting requirements, lists those public bodies required to report every year (major players) and details the standard climate change reporting template. There are six required sections of the Public Bodies Climate Change Duties Report, covering governance, emissions, targets and projects, adaptation and procurement, as well as a recommended reporting section on public bodies' wider influence. Organisations are required to report by the end of November for the previous year (which can be financial, calendar or academic), using online validation software called ProcXed. The software was originally designed to collect and validate local authority education data but was adapted in-house by the Scottish Government for the PBCCD reporting.

5.7. A new set of requirements

This project has identified that the requirements that result from the Welsh Government ambition of a carbon neutral public sector by 2030 contains three conditions that are unique in public and private sector carbon reporting in the UK:

- In order to demonstrate carbon neutrality, the sector needs to assess annual carbon sequestration from land use;
- The Carbon Positive project for NRW measured a very complete and comprehensive boundary and demonstrated the importance of Scope 3 emissions in the public sector, in particular the large contribution of emissions from purchased goods and services; and
- The ambition is set for the whole Welsh Public Sector, not for individual organisations, therefore to measure progress, results reported by different organisations need to be consistent between organisations as well as consistent between reporting periods.

Therefore, this project provides an independent assessment of potential GHG emissions accounting standards and approaches in relation to these requirements. The next section of the report details the methodology developed for this review of reporting standards and approaches, including the development of criteria, sub-criteria and a scoring system, and a complete list of all the reporting standards and approaches that were reviewed.

6. Methodology

6.1. Introduction

To facilitate national baselining and reporting of progress towards the ambition of a carbon neutral public sector in 2030, the Welsh Government is developing a GHG emissions accounting and reporting approach for public bodies. There are a range of environmental and GHG reporting guidelines and standards available, some of which are already in use by Welsh public sector bodies. Many bodies already report organisational energy use or emissions as part of voluntary or regulated schemes.

Therefore, the scope of this project was divided into two parts:

- **Part 1:** An assessment of the comparability of different GHG reporting standards given that many organisations are already monitoring their GHG emissions and that introduction of a common reporting system for all would have implications for the public bodies, for instance in terms of capacity and capability.
- **Part 2:** An options appraisal reviewing the strengths and weaknesses of the approaches for use as the basis for an organisational GHG reporting system for Welsh public bodies, to assist in showing organisational progress towards decarbonisation and collective progress towards the 2030 carbon neutrality commitment.

This section of the report explains the approach taken to allocating documents to part 1 or part 2 of the project, how standards and approaches were defined, how the criteria for assessment and appraisal were developed, the development of a database to record and calculate all scores and the full list of standards and approaches that were reviewed.

6.2. Categorising standards and approaches

The project steering group agreed to divide documents into GHG reporting standards and GHG reporting approaches. For the majority of documents it was relatively easy to see which category they fell into but some were not easily categorised. In order to clarify the categorisation, working definitions were developed to provide a functional way of deciding whether something should be reviewed as a GHG reporting standard, or a reporting approach. Table 6 shows the definitions that were used.

Table 6 Functional definitions of reporting standards and approaches

Reporting standards	Reporting approaches
Standards are designed to provide a common global language so that carbon accounts are understandable and comparable across international boundaries	Approaches are the way that an authority for a group of organisations has interpreted the standards to develop a common method for reporting emissions or achieving other types of goals
Standards are irreducible; they do not require reference to other standards	Approaches use standards as a reference and as a basis of their methodology
Standards are likely to require independent audit	Approaches might require independent audit

6.3. Development of review criteria

6.3.1. Initial development

A list of characteristics for assessing the standards and approaches was agreed by the project team at the project initiation meeting. The initial list of characteristics for assessing the comparability of standards were:

- The breadth of emissions accounted for; and
- The resource implications of adopting the standard.

And for comparing the strengths and weaknesses of approaches were:

- The completeness of the approach in terms of reporting all three emissions Scopes e.g. are the Scope 3 requirements adequate where they are focussed on a subset of priority emissions sources;
- The ability to demonstrate progress over time, either as quantified emissions reductions or qualitative assessment where this is the only option e.g. for emissions sources calculated using secondary activity data or non-specific emissions factors;
- The ease by which results can be aggregated and reported for the entire Welsh public-sector;
- The robustness of any conclusions drawn regarding progress against the commitment to a carbon neutral Welsh public sector by 2030;
- Accounting for sequestration so that in combination with the GHG emissions approach it is possible to assess carbon neutrality. This should include considering if the Carbon Positive Project approach to carbon sequestration and net carbon status provides an appropriate methodology; and
- Whether the accounting approach for the purchase of electricity on a renewable tariff and renewable energy generation stimulates and 'rewards' purchase and generation of renewable energy or whether it reduces the incentive for energy efficiency.

Agreeing these characteristics was the first step towards the development of criteria to assess the standards and approaches. Effective criteria are one of the most fundamental elements of making a high quality decision. They help avoid the tendency to latch onto a favourite standard or approach and, in so doing, lose sight of its weaknesses while also overlooking other, more creative or effective alternatives. Well-written criteria provide balance to the assessment and can be used to evaluate different options when combined to a measuring/scoring scale.

The characteristics set out above were further developed into broad criteria which could be fitted into an assessment framework. These were then further subdivided into sub-criteria, in order to tease out the detail and differences in the accounting requirements of the various standards and approaches.

Each standard and approach was scored against the relevant criteria and sub-criteria using a four point scale (0-3). Three or four score descriptors were used, depending on the sub-criteria in question, as shown in Table 7.

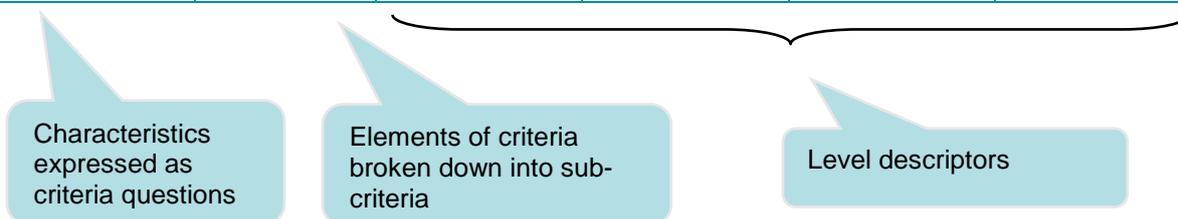
Table 7 Scoring systems used for criteria

	Level 3	Level 2	Level 1	Level 0
Mandatory–voluntary scale		Mandatory inclusion	Voluntary inclusion	Not included
Strong–weak scale	Strong coverage	Reasonable coverage	Weak coverage	Not mentioned
Minimal–high scale	Low resource requirements	Medium resource requirements	High resource requirements	Cannot be assessed

Using these descriptors, the direction of preference is the same for each of the three descriptor sets, i.e. a higher number (2 or 3) is always the “best” score. For example, the highest score could be awarded for *mandatory inclusion* of emission sources (2), *strong coverage* of important characteristics (3) and *low resourcing requirements* (3). This is not to say that all these are necessarily achievable in the same standard or approach. An annotated example of a criteria and how it is scored is shown in Table 8.

Table 8 Example of criteria, sub-criteria and strong-weak scale scoring

Criteria	Sub-criteria	Strong (3)	Reasonable (2)	Weak (1)	Non-existent (0)
Does the standard define boundaries applicable to the public sector?	Does the standard provide rules to deal with shared services/ estate?	The standard provides clear rules and guidance about how to deal with shared estate and services	The standard provides rules and guidance about how to deal with shared estate but provides limited guidance on services	The standard provides minimal guidance about either shared estate or shared services	The standard does not mention shared services or estate



6.4. Review of criteria and sub-criteria

The suggested list of criteria, sub-criteria and scoring level descriptors were reviewed by the project team and then discussed in detail in a meeting with the Welsh Government and Natural Resources Wales. Following this review, a number of amendments were made, principally amended wording and adding additional criteria or replicating criteria from standards to approaches, or vice-versa. The final versions of the criteria and sub-criteria for reporting standards are shown in Table 9 and for approaches, in

Table 10. Full tables of criteria, sub-criteria, codes (see section 6.4.1), and scoring level descriptors are shown in Appendix 1.

Table 9 Criteria and sub-criteria for standards

Criteria	Sub-criteria	Rationale for inclusion
What breadth of emissions are accounted for?	Does the standard provide specifications for accounting of organisational Scope 1 direct emissions?	The purpose of these sub-criteria is to check that the standard covers the key categories of emissions from an organisational perspective. It is expected that most standards will cover this, although the full set of Scope 3 might not be explicitly covered.
	Does the standard provide specifications for accounting of organisational Scope 2 indirect emissions?	
	Does the standard provide specifications for accounting of organisational Scope 3 indirect emissions?	
	Does the standard provide specifications for accounting of organisational out of Scope emissions?	The purpose of these sub-criteria is to check if the more unusual categories of organisational emissions are included within the standard. It is expected that these will be rarer elements within standards.
	Does the standard provide specifications for accounting of carbon sequestration on the organisational estate?	
	Does the standard provide specifications for accounting of organisational carbon stocks?	
What are the resource implications of adopting the standard?	What level of GHG accounting expertise is required to use the standard?	The purpose of these sub-criteria is to get a sense of how ready the standard is for use in the public sector and how much resource, both in terms of time, knowledge and money would be required to implement it successfully.
	Is the standard ready to use in a public sector setting, with appropriate tools and guidance?	
	How many resources would be required on a periodic basis to implement the requirements of the standard?	
	What financial commitment would be required to implement the requirements of the standard?	
Does the standard define boundaries applicable to the public sector?	Does the standard explicitly mention public sector organisations?	Many GHG accounting standards originated to provide guidance to the private sector and therefore the purpose of this criteria was to test how applicable the standard would be for specific public sector issues.
	Does the standard provide rules to deal with shared services/estate?	
	Does the standard provide rules about how to deal with shared responsibility e.g. council housing, municipal waste?	
Does the standard stimulate and reward purchase and generation of renewable energy?	Does the standard reward the generation, use and export of renewable energy?	Decarbonisation of energy supply is likely to be a key element of achieving the ambition of a carbon neutral public sector and therefore clear
	Does the standard enable a market-based approach for accounting for purchased 'green' energy?	

Criteria	Sub-criteria	Rationale for inclusion
	Does the standard enable accounting of private-wire arrangements?	rules that stimulate purchase and generation of renewables are a requirement.
Criteria	Sub-criteria	
Does the standard specify rules for auditing and for defining whether carbon neutrality is met?	Does the standard require verification?	Required to understand the auditing requirements for achievement of standards.
	Does the standard provide guidance about how the verification should be achieved?	
	Does the standard provide guidance about what constitutes carbon neutrality?	Question specific to the ambition of the Welsh Government.

Table 10 Criteria and sub-criteria for approaches

Criteria	Sub-criteria	
How complete is the approach in terms of reporting all three emissions Scopes? ⁵	Major fuels	More specific criteria to determine the coverage of the approach with respect Scope 1 direct emissions.
	Minor fuels	
	Biomass	
	Fleet fuels	
	Refrigerants	
	Process emissions	
	Fugitive emissions	More specific criteria to determine the coverage of the approach with respect Scope 2 indirect energy emissions.
	Grid electricity – generation	
	Steam and heat - generation	More specific criteria to determine the coverage of the approach with respect Scope 3 indirect emissions.
	Grid electricity – T&D losses	
	Organisational waste disposal	
	Municipal waste disposal	
	Water supply and treatment	
	Business travel	
	Commuting	
	Homeworking	
Procurement of goods		
Procurement of services		

⁵ The purpose of this criterion is not to assess against an exhaustive list of all possible emission sources but those which are important sources of emissions from across the public sector.

Criteria	Sub-criteria	
	Upstream WTT emissions	
How complete is the approach in terms of reporting all three emissions Scopes?	Does the approach enable reporting of activity data	These sub-criteria also relate to the ability to draw reliable conclusions from reported data.
	Does the approach enable a range of units for activity data	
	Does the approach enable use of all UK Government reporting factors or a limited set	
Does the reporting approach account for sequestered carbon?	Is there a defined boundary for sequestered carbon from terrestrial sources	The reporting of sequestered carbon may be a key element of the carbon neutral ambition of the Welsh Government.
	Is there a defined methodology for calculating sequestration rates	
	Are there appropriate emission factors and conversion factors	
Does the approach stimulate and reward purchase and generation of renewable energy?	Does the approach reward the generation, use and export of renewable energy?	As with the same criteria for standards: decarbonisation of energy supply is likely to be a key element of achieving the ambition of a carbon neutral public sector and therefore clear rules that stimulate generation and, potentially, purchase of renewables are highly desirable.
	Does the approach enable a market-based approach for accounting for purchased 'green' energy	
	Does the approach enable accounting of private-wire arrangements	
Does the approach enable the ability to demonstrate progress over time?	Does the reporting approach require regular reporting against a consistent boundary, methodology and emission factors?	A key element of GHG reporting is for organisations and sectors to demonstrate progress over time, against targets or against ambitions. In order to do this, the same thing needs to be measured at both time points and organisations need to understand what has caused the change.
	Does the reporting approach require organisations to quantify project reductions?	
	Does the reporting approach require organisations to quantify external/other factors leading to emissions increases/reductions?	
Does the approach enable the ability to aggregate and report emissions for all Welsh public-sector organisations?	Does the reporting approach provide rules for boundary setting that would produce a comparable boundary for all organisations?	This criteria looks at whether the approach is likely to enable aggregation of emissions from a variety of different sectors to draw conclusions about the whole public sector.
	Does the reporting approach detail appropriate emission factors for reporting?	
	Does the reporting approach provide a mechanism for consistently categorising emission sources into Scopes and end-uses?	

Criteria	Sub-criteria	
	Does the approach have an electronic tool to aid reporting?	
	Does the approach have the facility to report metrics such as floor area, FTE etc?	
	Does the approach have the facility to report progress against targets?	
Does the reporting approach enable robust conclusions to be drawn regarding progress against the commitment to a carbon neutral Welsh Public Sector by 2030?	Does the reporting approach provide guidance about what constitutes carbon neutrality?	This criteria looks at elements of reporting that lead to robust conclusions about aggregated data and carbon neutrality is defined effectively.
	Does the reporting approach provide guidance for organisations to deal with uncertainty?	
	Does the reporting approach provide guidance for organisations to deal with variation?	
What are the resource implications of adopting the approach?	What level of GHG accounting expertise is required to use the approach?	As with the same criteria for standards: the purpose of these sub-criteria is to get a sense of how ready the standard is for use in the public sector and how much resource, both in terms of time, knowledge and money would be required to implement it successfully. An additional sub-criteria looks at whether the approach adds to reporting or supports existing requirements.
	Is the approach ready to use in a public sector setting, with appropriate tools and guidance?	
	How much resource would be required on a periodic basis to implement the approach?	
	What financial commitment would be required to implement the requirements of the approach?	
	Is there duplication of other reporting obligations?	

6.4.1. Development of review database

In order to facilitate scoring and enable the potential for adding further documents for review in the future, a review database was developed using Microsoft Excel. Key elements of this database included:

1. All the criteria and sub-criteria were coded and entered in a single tab called criteria.
 - a. Criteria for reporting standards were coded with S, followed by a sequence number (1 to 5) and a sub-criteria letter (a to e)
 - b. Criteria for reporting approaches were coded with A, followed by a sequence number (1 to 7) and a sub-criteria letter (a to e). The list of emission sources were further coded (i to xii).
2. The review data for standards and approaches were kept on separate colour coded tabs

3. A number of fields relating to each standard and approach were added:
 - a. Name
 - b. Abbreviation
 - c. Category
 - d. Produced by
 - e. Version/date
 - f. Link
 - g. Documents reviewed
 - h. Brief description
 - i. Summary of findings
4. Each criteria and sub-criteria was listed, with a drop-down box for the appropriate score, value, level description (definition) and notes (see Figure 3, below)
5. The scores for each sub-criteria were summed to provide a total score per criteria for each reporting standard or approach
6. These criteria scores were converted to percentage scores for each criteria, by dividing the score achieved for the criteria by the maximum score possible for that criteria.
7. An overall score was calculated for each standard or approach, based on the average of the percentage criteria scores. This method avoided accidentally weighting criteria that had more sub-criteria.
8. The results were collated and displayed in the results and graphs tabs.

The full list of criteria, sub-criteria, codes and scoring system is shown in Appendix 1, Table 22 for standards and Table 23 for approaches.

Figure 3 Scoring columns in review database for standards and approaches

Ref.	Criteria	Sub-criteria	Score	Value	Definition	Notes
S1a	What breadth of emissions are accounted for?	Does the standard provide specifications for accounting of organisational Scope 1 direct emissions?	Strong	3	<i>The standard provides clear specification for accounting of all organisational scope 1 emissions</i>	Section 4 on GHG inventory design and development contains specification for organisational and operational boundaries and how to quantify GHG emissions, including direct GHG emissions.

Ref.	Criteria	Sub-criteria	Score	Value	Definition	Notes
A1a-i	How complete is the approach in terms of reporting all three emissions scopes?	Major fuels	M	2	<i>Reporting emissions from major fuels, such as natural gas and heating oils, is mandatory</i>	In Section 7: SECR reporting requirements for large unquoted companies and large limited liability partnerships it states that these organisations are required to report activities for which you are responsible involving the combustion of gas. It defines "gas", except in the definition of "offshore activity", as any combustible substance which is gaseous at a temperature of 15 degrees Celsius and a pressure of 101.325 kPa (1013.25 mb) and which consists wholly or mainly of methane, ethane, propane, butane, hydrogen or carbon monoxide, or a combination of those, or a combustible mixture of those and air. The Example corporate SECR report for unquoted large companies and large LLPs contains an entry for emissions from activities for which the company own or control including combustion of fuel & operation of facilities.

The completed database spreadsheet of all evaluation, scores and results entitled "Database of GHG reporting standards and formats v2.4.xls" was provided to NRW alongside this report.

The project team recognises that the determination of scores for some of the criteria is, to a certain extent, subjective, despite being based on definitions agreed prior to scoring. It should be noted that the purpose of the exercise was not to arrive at a categorical score for each standard or approach, but rather to identify those with the greatest potential for use by the Welsh public sector for the specific purpose of reporting against the carbon neutral public sector commitment.

6.5. Reporting standards and approaches covered

The full lists of reporting standards and approaches reviewed in this project are shown in Figure 4 and Figure 5, split by category. This was developed from the initial list of documents to be covered, standards for Part 1 and approaches for Part 2 provided in the tender documentation, with further suggestions made by the project team. Some adjustment to these lists was made following research by the project team and discussion with NRW. These changes are shown in Appendix 2, Table 24. Full references for all of the standards and approaches reviewed are provided in Section 10.

6.6. Additional information sources

In addition to the reporting standards and approaches shown in Figure 4 and Figure 5, information from the Welsh Government Energy Service Public Sector Survey was reviewed in the context of this project. At this stage the detailed responses are not publically available and therefore the detailed responses to the specific questions on GHG accounting were supplied on a confidential basis:

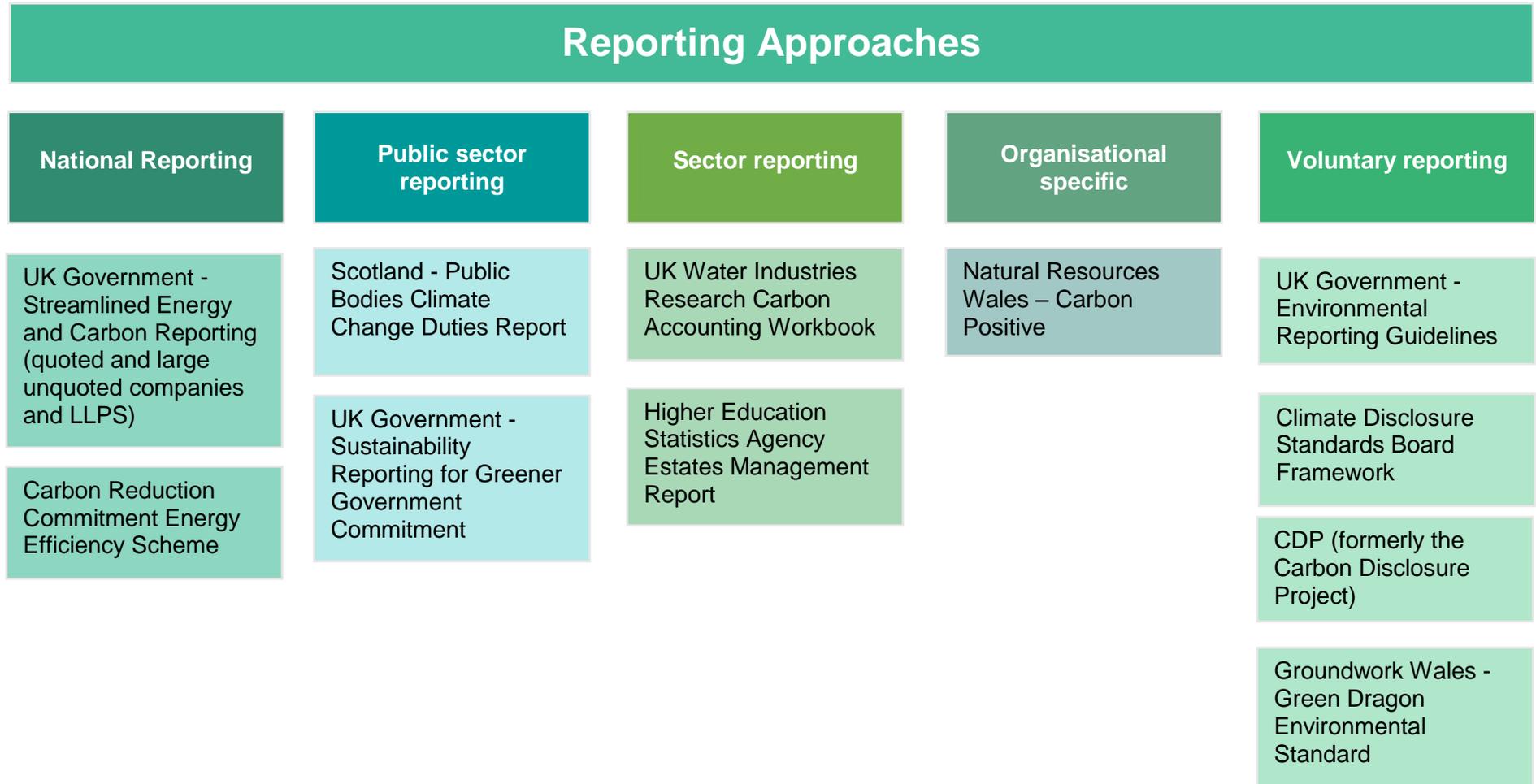
1. **Question 9:** Does your organisation have a dedicated budget for meeting energy/carbon reduction targets?
2. **Question 10:** Does your organisation have a team or individual that is responsible for carbon management?
3. **Question 24:** Do you report organisational greenhouse gas emissions as part of any voluntary or regulated schemes?(Please tick all that apply)
4. **Question 25:** Has your organisation used the following guidelines/ sources of information to inform your emissions accounting methods or reporting?
5. **Question 26:** What is the boundary of your emissions reporting?
6. **Question 27:** Do you use the Greenhouse Gas Protocol Convention for reporting Scopes of emissions (i.e. Scope 1, 2, 3?)
7. **Question 28:** If yes, which Scopes of emissions do you record?
8. **Question 29:** How has the quality of your organisation's greenhouse gas data been audited or assessed?(Please tick all that apply)
9. **Question 30:** If known, what is your organisation's greenhouse gas footprint (tCO₂ emissions/year) and when was this last calculated? Please state whether the figure given is absolute or normalised. If normalised please state the unit (i.e. tCO₂/person, tCO₂/m²)

The responses to Question 25 confirmed that the full range of standards and approaches currently in use in the Welsh public sector has been captured by this study. Question 30 was used to generate one of the estimates of Welsh public sector emissions (see Table 5) and the other questions were used to provide some context to the discussion of the results of this review of reporting standards and approaches.

Figure 4 Reporting standards included in the review

Reporting Standards					
National Inventory	Organisation	Project/product	Energy management	Disclosure & Reporting	Environmental Management System
2006 IPCC Guidelines for National Greenhouse Gas Inventories	ISO 14064 – Greenhouse Gases Part 1 organisations	ISO 14064 – Greenhouse Gases Part 2 projects	ISO 15001:2018 Energy management systems	Carbon Trust Standard	ISO 14001:2015 Environmental management systems
	The Greenhouse Gas Protocol: Corporate Accounting and Reporting Standard	The Greenhouse Gas Protocol – project accounting		PAS 2070:2013 Specification for the assessment of greenhouse gas emissions of a city	ISO 8555:2016 Environmental management systems - phased implementation guide
	The Greenhouse Gas Protocol: public sector organisations	PAS 2050:2011 Specification for the assessment of the life cycle greenhouse gas emissions of goods and services			Eco-Management and Audit Scheme
	The Greenhouse Gas Protocol: Corporate Value Chain (Scope 3) Accounting and Reporting	ISO 14040:2006 Environmental management — Life cycle assessment			

Figure 5 Reporting approaches included in the review



7. Results

7.1. Introduction

This section shows the results of the review, in terms of:

- overall percentage score for each standard and approach;
- percentage scores achieved for each criteria; and
- detail of the scores assigned to each sub-criteria, where required for clarity.

The results have been split into two parts: reporting standards and reporting approaches. Discussion of the scores, and the implications for the development of a Welsh public sector reporting approach, are covered in Section 8.

7.2. Results from the review of standards

In total 15 standards were reviewed; these are shown in Table 11, in order of overall score (see section 6.4.1 for an explanation of how the score was calculated). It should be noted that the score reflects the assessed suitability of the standard in developing a public sector GHG reporting system for Wales and is not a general critique of the standard.

Table 11 Overall results for reporting standards

Standard	Abbreviation	Category	% score
The Greenhouse Gas Protocol: Corporate Accounting and Reporting Standard	GHG protocol - corporate	Organisation	71%
The Greenhouse Gas Protocol: Interpreting the corporate standard for U.S public sector organisations	GHG protocol - public sector	Organisation	61%
Specification for the assessment of the life cycle greenhouse gas emissions of goods and services	PAS 2050:2011	Project/ product	60%
Carbon Trust Standard	CT Standard	Disclosure and reporting	47%
British Standard Greenhouse Gases Part 1	BS EN ISO 14064-1	Organisation	47%
The Greenhouse Gas Protocol: Corporate Value Chain (Scope 3) Accounting and Reporting ⁶	GHG protocol - value chain	Organisation	45%
Eco-Management and Audit Scheme	EMAS	Environmental Management System	41%
Specification for the assessment of greenhouse gas emissions of a city	PAS 2070:2013	Disclosure and reporting	35%

⁶ The GHG Protocol Corporate Value Chain (Scope 3) is listed as a separate standard on the GHG Protocol website and therefore has been assessed separately. In contrast, the GHG Protocol Scope 2 Guidance is listed under guidance and is an amendment to the GHG Protocol Corporate Standard and has therefore been assessed as part of this standard.

Standard	Abbreviation	Category	% score
2006 IPCC Guidelines for National Greenhouse Gas Inventories	IPCC	National Inventory	33%
The Greenhouse Gas Protocol: the GHG Protocol for Project Accounting	GHG protocol - project	Project/ product	27%
British Standard Environmental management systems	BS EN ISO 14001:2015	Environmental Management System	21%
Environmental management — Life cycle assessment — Principles and framework	BS EN ISO 14040:2006	Project/ product	21%
British Standard Environmental management systems - phased implementation guide	BS EN ISO 8555:2016	Environmental Management System	19%
British Standard Greenhouse Gases Part 2	BS EN ISO 14064-2	Project/ product	17%
British Standard Energy management systems	BS EN ISO 15001:2018	Energy management	12%

The results in Table 11 show that no single standard reviewed achieves a 100% score against the criteria set. There are three standards that score 60% and over and a further group of six scoring between 30% and 50%. The remaining six standards which scored below 30% have not been taken further in the analysis; this reflects the fact that they focus on EMS, energy or projects/products and therefore they are not designed for the purpose of informing an organisation-based public sector GHG reporting system.

7.3. Results from review of standards by criteria

Table 12 shows the breakdown of the top nine standards by percentage scores per criteria. This demonstrates that there was significant variation across the criteria for all of the standards reviewed and that no single standard contains all the requirements set out by NRW and the Welsh Government. Overall, the two GHG Protocol standards emerge as the strongest basis for a prospective Welsh public sector standard, with weaknesses in one being balanced by the other. In terms of the breadth of emissions covered, BS EN ISO 14064-1 performed better, although not by much. Crucially, the GHG Protocol standards performed best when assessed on the resource implications of implementing them.

This is reflected in Table 13, which summarises the best performing standard per criteria. Where two standards have scored the same amount, the highest overall scoring standard has been selected; this helps reduce the overall number of standards referred to.

Table 12 Highest scoring standards against individual criteria

Criteria	The Greenhouse Gas Protocol: Corporate Accounting and Reporting	The greenhouse gas protocol: Interpreting the corporate standard for U.S	Specification for the assessment of the life cycle greenhouse gas emissions Carbon Trust Standard	British Standard Greenhouse Gases Part 1	The greenhouse gas protocol: Corporate Value Chain (Scope 3) Accounting	Eco-Management and Audit Scheme	Specification for the assessment of greenhouse gas emissions of a city	Intergovernmental Panel on Climate Change	
What breadth of emissions are accounted for?	61%	61%	78%	33%	83%	39%	22%	50%	50%
What are the resource implications of adopting the standard?	92%	75%	67%	58%	50%	75%	50%	58%	58%
Does the standard define boundaries applicable to the public sector?	56%	78%	22%	56%	33%	44%	22%	22%	11%
Does the standard stimulate and reward purchase and generation of renewable energy?	100%	33%	89%	44%	11%	22%	44%	0%	0%
Does the standard specify rules for auditing and for defining whether carbon neutrality is met?	44%	56%	44%	44%	56%	44%	67%	44%	44%
Overall score	71%	61%	60%	47%	47%	45%	41%	35%	33%

Table 13 Best reporting standard per criteria

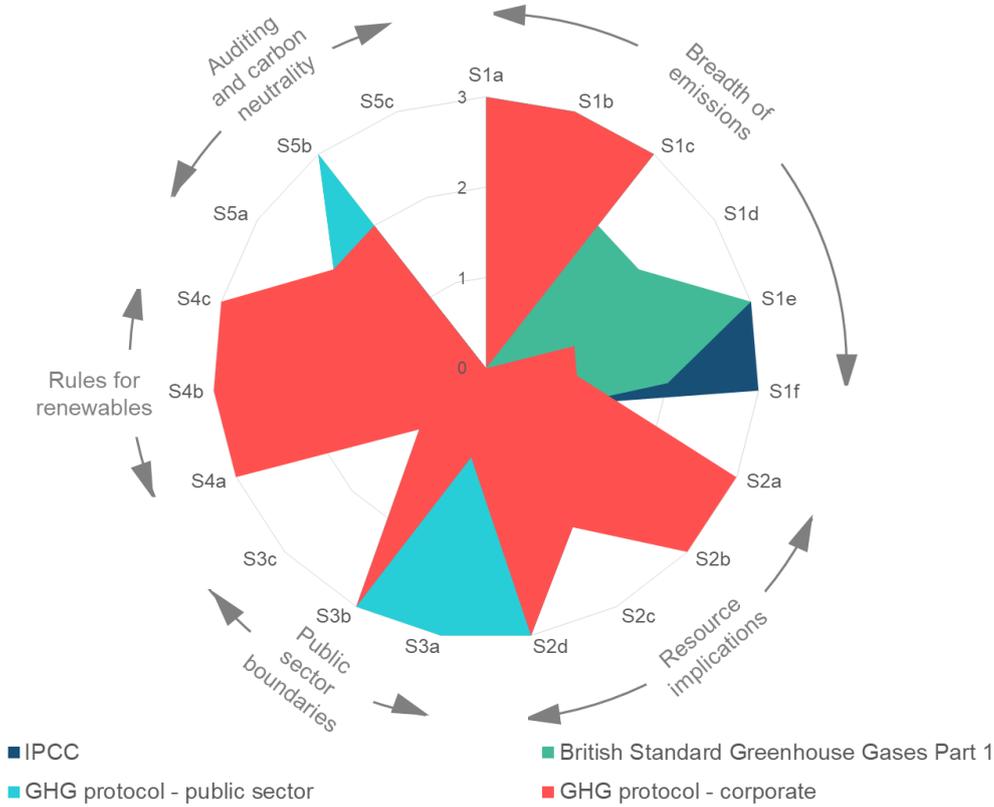
Criteria	Code	Overall winner	Score	Comments
What breadth of emissions are accounted for?	S1	British Standard Greenhouse Gases Part 1	83%	The BS ISO 14064 scores the highest in this category and is consistent across all sub-criteria, in particular providing a framework for sequestration and carbon stocks. However, it should be noted that a new Greenhouse Gas Protocol guidance to help organisations account for greenhouse gas emissions and carbon removals from land use is under development.
What are the resource implications of adopting the standard?	S2	GHG protocol - corporate	92%	It was noted that the GHG Protocol – corporate was the most accessible of the standards, providing clear guidance and reporting tools on the website.
Does the standard define boundaries applicable to the public sector?	S3	GHG protocol - public sector	78%	The GHG protocol – public sector contains the best guidance on public sector boundaries but it should be noted that there is still limited advice on shared services and estate.
Does the standard stimulate and reward purchase and generation of renewable energy?	S4	GHG protocol - corporate	100%	The GHG Protocol Scope 2 Guidance which is an amendment to the GHG protocol Corporate Standard provides comprehensive and clear advice on accounting for renewables
Does the standard specify rules for auditing and for defining whether carbon neutrality is met?	S5	GHG protocol - public sector	56%	The GHG protocol – public sector offers clear guidance on verification, although it offers flexibility about how this achieved. None of the standards provided guidance on what constitutes carbon neutrality.

7.4. Detail of scores for sub-criteria

The percentage scores per criteria do not show the gaps in the requirements. A radar plot of all the sub-criteria scores was used to show the gaps in the requirements,

broken down by sub-criteria and to demonstrate the shortest list of standards that would achieve the highest overall score and fewest gaps. Figure 6 shows the most economical grouping of standards in order to maximise the scores across the sub-criteria. In order to achieve this, only four standards are required, adding additional standards does not achieve better coverage.

Figure 6 Radar plot of sub-criteria scores



Note: the codes referred to in Figure 6 can be found in Appendix 1.

Figure 6 shows that there was one sub-criteria for which no standard scored anything (S5c: *Does the standard provide guidance about what constitutes carbon neutrality?*) and another where there is no standard above weak (S3c: *Does the standard provide rules about how to deal with shared responsibility e.g. council housing, municipal waste*). All the other sub criteria score reasonable or above. In total, there are four standards that appear on the plot:

1. GHG protocol – corporate
2. GHG protocol – public sector
3. BS EN ISO 14064-1
4. IPCC

This means that the list of standards in Table 13 could also be augmented by the IPCC for accounting for organisational carbon stocks and sequestration.

7.5. Comparison with results from the Baseline Survey

It is interesting to look at whether there is any relationship between the standards reviewed as appropriate for the public sector and the ones identified in the survey as being used by the public bodies to inform their emissions accounting methods or reporting. Table 14 shows that only 5 organisations were using the GHG corporate protocol as their main/only source and just a few were making some use of any of the other three standards.

Table 14 Results from Question 25 of the public sector bodies baseline survey

Reporting standard	Main/only source	Some use	Not at all	Plan to use in near future
GHG protocol – public sector	Standard not in survey			
GHG protocol – corporate	17%	17%	63%	3%
BS EN ISO 14064-1	0%	0%	92%	0%
IPCC	0%	12%	80%	0%

It is unsurprising that the GHG protocol – public sector standard is not used by the public sector. This is primarily a US standard which is designed to interpret the GHG Corporate Standard for the US public sector organisations. Therefore it has useful information about drawing public sector boundaries but from an emissions accounting perspective it is not very different to the much more widely used corporate GHG protocol.

7.6. Results from the review of reporting approaches

In total 11 approaches were reviewed; these are shown in Table 15, in order of overall average percentage score (see section 6.4.1 for an explanation of how the score was calculated).

Table 15 Overall results for reporting approaches

Approach	Abbreviation	Category	% score
CDP (formerly the Carbon Disclosure Project)	CDP	Voluntary reporting	63%
Public Bodies Climate Change Duties Report	PBCCD Report	National reporting	56%
Carbon Positive	CP	Organisational specific	55%
Carbon Accounting Workbook	CAW	Sector reporting	54%
Sustainability Reporting	SR	Sector reporting	42%
Environmental Reporting Guidelines	ERG	Voluntary reporting	39%

Approach	Abbreviation	Category	% score
Climate Disclosure Standards Board Framework	CDSB Framework	Voluntary reporting	38%
Streamlined Energy and Carbon Reporting	SECR	National reporting	37%
Estates Management Report	EMR	Sector reporting	35%
CRC Energy Efficiency Scheme	CRC EES	Sector reporting	34%
Green Dragon Environmental Standard	Green Dragon	Voluntary reporting	31%

The results in Table 15 show that as with the standards, no approach reviewed achieves a 100% score against the criteria set. There are four approaches that score over 50% overall – the CDP, the Public Bodies Climate Change Duties Report, Carbon Positive and the Carbon Accounting Workbook. The remainder score between 30% and 50%.

Table 16 shows the breakdown of the 11 approaches by individual percentage scores per criteria. This shows that, even more than the standards (see Table 12), there are areas of very high scores, and conversely, very low scores for different criteria. No single approach contains all the potential requirements for a future Welsh public sector reporting approach. Some criteria – notably those on accounting for sequestered carbon, and the purchase and generation of renewable energy – give relatively low scores for most of the approaches, with a few approaches scoring well. None of the approaches scores over 45% with respect to enabling robust conclusions to be drawn regarding progress against the commitment to a carbon neutral Welsh Public Sector by 2030. This indicates a mismatch between the requirements of the Welsh Government and the coverage in existing approaches. If these issues are to be addressed within the prospective Welsh public sector approach, they will require additional work. Only two of the standards scored over 70% for resource implications and these performed poorly against some of the other criteria which suggests that some level of resource burden for the final system may be difficult to avoid.

The list of the best reporting approaches per criteria is shown in Table 17. Where two approaches have scored the same amount, the highest overall scoring standard has been selected, apart from criteria A6, where there were 5 approaches scoring the same; four have been selected for their different solutions. This indicates that, if a combined approach were to be developed, this could be done using a minimum of 3 or 4 approaches. Nevertheless, as Figure 8 shows, there would still be significant weaknesses which would need to be addressed if all criteria are to be met.

Table 16 Scores of all 11 approaches against individual criteria

Criteria	CDP	PBCCD Report	CP	CAW	SR	ERG	CDSB Framework	SECR	EMR	CRC EES	Green Dragon
How complete is the approach in terms of reporting all three emissions Scopes, in terms of sources?	58%	61%	84%	66%	45%	61%	66%	47%	50%	16%	61%
How complete is the approach in terms of reporting all three emissions Scopes, in terms of data?	56%	78%	89%	78%	67%	67%	22%	67%	56%	56%	22%
Does the reporting approach account for sequestered carbon?	33%	0%	89%	56%	0%	0%	0%	0%	0%	0%	22%
Does the approach stimulate and reward purchase and generation of renewable energy?	100%	56%	33%	67%	33%	56%	0%	56%	44%	67%	0%
Does the approach enable the ability to demonstrate progress over time?	89%	89%	33%	33%	44%	44%	78%	33%	33%	33%	56%
Does the approach enable the ability to aggregate and report emissions for all Welsh public-sector organisations?	72%	78%	50%	67%	50%	50%	50%	44%	67%	44%	44%
Does the reporting approach enable robust conclusions to be drawn regarding progress against the commitment to a carbon neutral Welsh Public Sector by 2030?	44%	33%	44%	44%	44%	11%	44%	11%	0%	22%	0%
What are the resource implications of adopting the approach?	47%	73%	53%	40%	73%	53%	33%	67%	47%	47%	40%
Overall Score	63%	56%	55%	54%	42%	39%	38%	37%	35%	34%	31%

Table 17 Best combined approach

Criteria	Code	Approach	Score	Comment
How complete is the approach in terms of reporting all three emissions Scopes (sources)?	A1a	Carbon Positive	84%	Carbon Positive scored the highest for the individual emissions source inclusion and therefore completeness.
How complete is the approach in terms of reporting all three emissions Scopes (data)?	A1b	Carbon Positive	89%	Carbon Positive also scored the highest for aspects of reporting data.
Does the reporting approach account for sequestered carbon?	A2	Carbon Positive	89%	The Carbon Positive approach was designed to account for sequestered carbon and specific methodology and emission factors developed for the project.
Does the approach stimulate and reward purchase and generation of renewable energy?	A3	CDP (formerly the Carbon Disclosure Project)	100%	The CDP questionnaire had the best approach for accounting for renewable generation and purchase.
Does the approach enable the ability to demonstrate progress over time?	A4	Public Bodies Climate Change Duties Report	89%	There were two approaches that scored highly here but the PBCCD report was chosen because it is public sector specific.
Does the approach enable the ability to aggregate and report emissions for all Welsh public-sector organisations?	A5	Public Bodies Climate Change Duties Report	78%	The PBCCD report with its consistent online reporting platform offers the best solution for aggregating and reporting emissions but still contains a number of key flaws.
Does the reporting approach enable robust conclusions to be drawn regarding progress against the commitment to a carbon neutral Welsh Public Sector by 2030?	A6	CDP (formerly the Carbon Disclosure Project)	44%	The approach by the CDP is to ask challenging questions about both inclusions and emissions, governance and progress towards targets.
		Carbon Positive	44%	The Carbon Positive offers a very complete reporting approach but users could struggle with complexity.
		Climate Disclosure Standards Board Framework	44%	The CDSB Framework offers useful guidance about supporting evidence around data reporting,

Criteria	Code	Approach	Score	Comment
				enabling more robust conclusions.
		Carbon Accounting Workbook	44%	The CAW offers the best approach to dealing with uncertainty.
What are the resource implications of adopting the approach?	A7	Public Bodies Climate Change Duties Report	73%	Two approaches scored the same but the PBCCD report has been selected because of the range of tools and guidance available, specifically designed for the public sector.

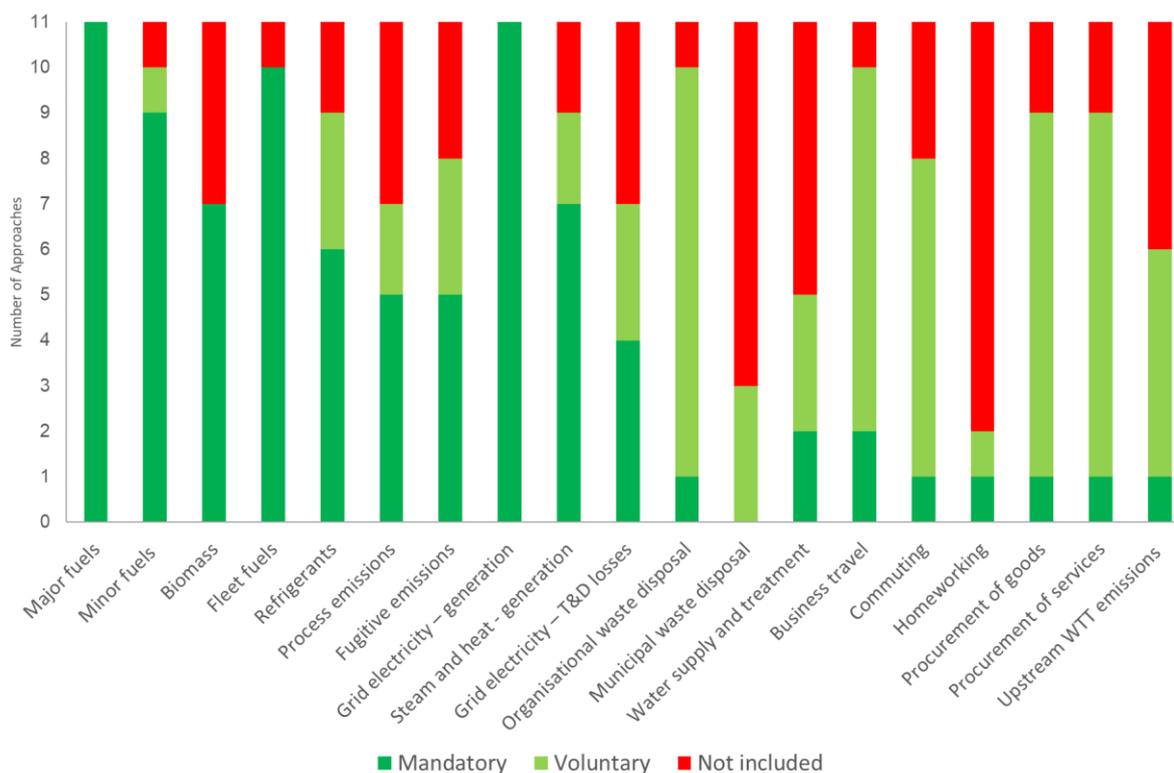
7.7. Detail of scores for sub-criteria

The percentage scores per criteria do not show the gaps in the requirements, therefore all the sub-criteria scores have been plotted on two graphs – a stacked bar chart for sub-criteria A1a and a radar plot all the remaining sub-criteria.

7.7.1. Sub-criteria A1a

Sub-criteria A1a lists key emission source categories; reporting approaches are scored 2 for mandatory inclusions, 1 for voluntary and 0 for not included. Figure 7 shows that two categories of emissions are mandatory for all approaches; major fuels and grid electricity; representing direct energy and some indirect energy emissions. However, all the other categories vary between approaches with a combination of mandatory, voluntary and not included.

Figure 7 List of emission categories

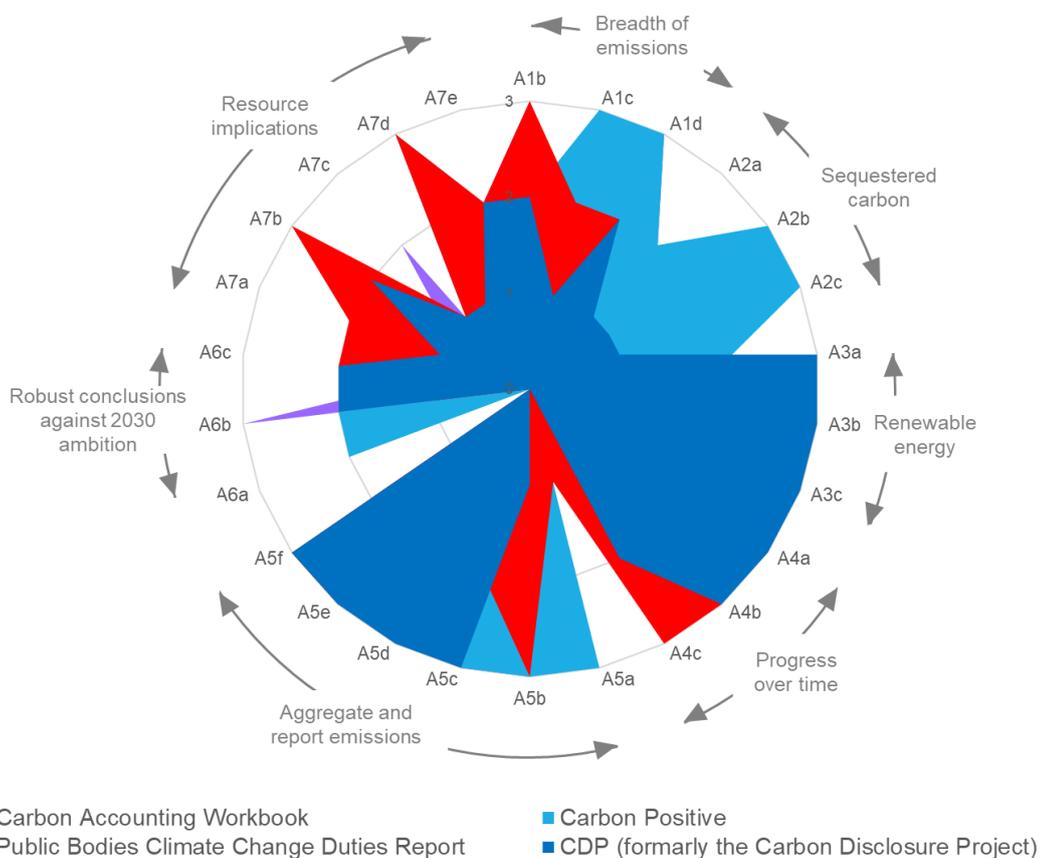


7.7.2. Other sub-criteria for reporting approaches

A radar plot has been used to show both the gaps in the requirements, broken down by the remaining sub-criteria and also to demonstrate the shortest list of approaches that would achieve the highest overall score and fewest gaps. Figure 8 shows the most economical set of approaches that achieve the highest score across all of the remaining sub-criteria. Four of the eleven approaches are required to achieve this and these are the top scoring approaches. The three most prominent are again: CDP, PBCCD and Carbon Positive, which between them achieve either a 2 or 3 for most of the sub-criteria. The CAW only scores higher in sub-criteria A6b which asks *Does the reporting approach provide guidance for organisations to deal with uncertainty* and sub-criteria A7c which asks *How much resource would be required on a periodic basis to implement the approach?* The approach of the CAW to measuring and estimating uncertainty was the best reviewed but the amount of resource required is a subjective assessment and is likely to vary from organisation to organisation.

There are no sub-criteria with a score less than reasonable across the four approaches; however, there is also not one single standout approach. Whereas for the standards, the suite of GHG Protocol resources together could cover the majority of the criteria, the four reporting approaches here are all very different; with different areas of strengths and weaknesses. This makes it much harder to identify and recommend one of the approaches as they currently exist.

Figure 8 Radar plot of sub-criteria scores for approaches



Note: the codes referred to in Figure 8 can be found in Appendix 1, Table 23

Section 8 provides a discussion of the results from this review in the context of the aims and objectives of this project.

8. Discussion of review outcomes

8.1. Introduction

The aim of this section is to discuss the results from Section 7 in the context of the Welsh Governments requirements and provide some alternatives to achieve those requirements.

8.2. Welsh Government requirements

As noted in Section 5.7, the ambition for the Welsh public sector of achieving carbon neutral status by 2030 produces a set of unique requirements for the reporting system. The steps required to meet these requirements are set out in Table 18. It should be noted that while step 1 is outside the scope of this project, recommendations for steps 2 and 3 will be heavily dependent on it. Therefore, it is not possible at this time to provide unequivocal recommendations on the reporting system to be developed.

Table 18 Steps for meeting the Welsh Government requirement

Steps	What needs to be in place for this to happen?
Step 1	<p>A clear and unambiguous definition of carbon neutrality needs to be set, including:</p> <ul style="list-style-type: none"> • What boundary organisations should report against • What emission sources are included in the inventory • What types of carbon sequestration are included • Whether this can include purchased offsets (domestic and/or international) or emissions trading among public bodies • How purchased and generated renewable electricity should be treated • What constitutes an acceptable level of assurance • What is an appropriate frequency of reporting • What happens if and when the target is achieved
Step 2	Public sector bodies need to collect activity data, calculate, verify and report <i>emissions</i> in a standard format on a periodic basis
Step 3	Public sector bodies need to collect activity data, calculate, verify and report <i>sequestration</i> on their estate in a standard format on a periodic basis
Step 4	The Welsh Government needs to aggregate the data and publish the position of the public sector with respect to the ambition

8.3. Why standardise public sector GHG reporting?

Collecting and reporting good quality data is not a zero cost activity and therefore there must be a convincing reason why the data are required and evidence that the benefits of the dataset outweigh the collection and reporting costs. The first question

is therefore whether there is sufficient data being collected currently to achieve Step 2. There is evidence to answer this question from the public sector baseline survey. Question 28 asked *which Scopes of emissions do you report?* A summary of the responses is shown in Table 19.

17% of respondents stated that Scopes were not used to report emissions and a further 17% did not report emissions. This shows that the current reporting of emissions is not consistent in terms of boundary, sources and reporting methodology. Therefore the current system would not meet step 2 of the requirements. There are no questions within this survey that directly address reporting of sequestration on estate but it is likely that very few organisations report this, and therefore step 3 is also unlikely to be met through current reporting arrangements.

Table 19 Results from Question 28

	All of Scope	Some of Scope
Scope 1	45%	21%
Scope 2	48%	17%
Scope 3	2.4%	36%

8.4. What are the benefits to a standard GHG reporting format?

There are a number of identified benefits to GHG reporting, which include:

- Supporting organisations to focus reduction efforts where emissions reductions are most effective and have the greatest wider benefits
- Seeing data that is often held in different parts of the organisation as part of a bigger picture; for example energy and business travel data are often not held or analysed by the same team – connecting them through their carbon units enables organisations to think about more holistic costs and benefits of decisions
- Increasingly the reporting of GHG emission data is a part of demonstrating credibility to third party organisations. It also demonstrates the commitment of the Welsh public sector to tackling the causes of climate change, to its staff, service users, suppliers and wider society.

However, these are all benefits that would be accrued through a non-standardised reporting system and therefore it is important to consider what are the specific benefits to standardisation, as there should be no additional requirements without a reasonable degree of confidence that they will secure additional benefits.

The benefits of standardisation are:

1. It provides the only way aggregate data across a system, unless significant and often unsuccessful efforts are made post-aggregation. The public sector should not be seen as organisations in competition with each other but as a web of interacting and supporting services. This is reflected in the ambition for a carbon neutral public sector as a whole. The opportunities and costs of reduction are likely to be unevenly distributed and therefore, while all public bodies have a role in taking action, it makes sense to maximise efficiency across the whole system, not on a purely per-organisation basis.

2. Without standardisation, it is possible for organisations to minimise effort and focus on the easily captured data and the simplest reduction projects, but these might not be the most significant data or the most effective reduction projects. Until organisations are convinced of the management benefits of further information, sometimes the impetus to collect, analyse and report needs to come from an external stimulus.
3. Building and nurturing knowledge and capacity are an important part of the public sector. Unless organisations are challenged to extend their reporting outside their comfort zone, opportunities to improve organisational capacity around climate change will not emerge. Standardisation offers a way to push organisations to achieve better outcomes.
4. In the same vein, standardisation makes it easier for different organisations across the public sector in Wales to cooperate, both in terms of sharing skills and experience and in “neutralising” carbon emissions across organisations. Reporting collectively may also highlight opportunities for collaboration across organisations, for instance in tackling emissions from particular activities or geographical locations.

Therefore there is a case for both GHG reporting and for a standardised format. However, care needs to be taken to develop a reporting system that retains these benefits as far as possible, while minimising the burden of collecting and reporting data. Alongside reporting requirements, there should be support for organisations and individuals to build capacity, develop skills and actively benefit from the reporting process. This might come from peer to peer learning and through collaboration and sharing of resources. As a first step, the Welsh Government should review existing networks used by carbon management teams and individuals identified through the baseline survey. This should be with a view to co-opting these as a means for providing such support but also as a vehicle for identifying participants for a working group to help develop a Welsh public sector reporting system.

Ultimately reporting also has to be built on a fundamental rule; it must support effective climate change mitigation action. To that end, the system should not be built just to evidence targets or government ambitions but to provide at least some of the management information needed to support effective decision making. Even so, without consistent and verifiable data collection and reporting, including on the organisation boundaries and emission sources, confidence in the final assessment of carbon neutrality will be severely undermined.

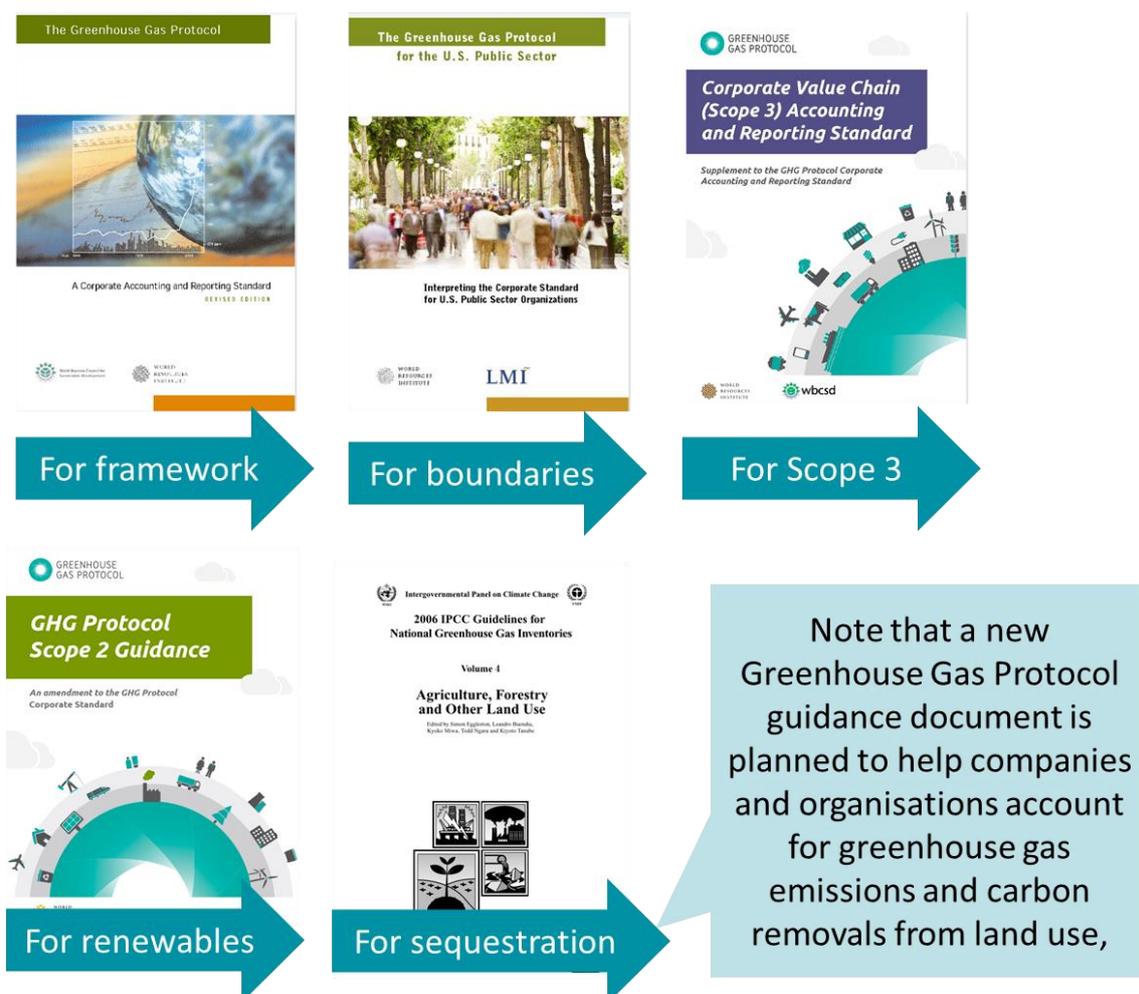
Having discussed the requirements of the system and laid out the arguments for a standardised reporting system, the next two sections look at the results from this project to identify the options for reporting standards and approaches.

8.5. Best available standard

While there was not one key reporting standard that met all the WG criteria, the results made it clear that the GHG Protocol suite of standards provided the most accessible and complete framework for reporting, as well as being freely available and widely recognised as best practice. The British Standard Greenhouse Gases Part 1 provided useful additional guidance on accounting for out of scope emissions but this is a very minor part of emissions accounting. The only area where additional external guidance is required is for carbon sequestration; while both the IPCC and PAS 2050 provide coverage of this topic, it should also be noted that a new

Greenhouse Gas Protocol guidance document on sequestration is being planned, which will further strengthen this suite.

Figure 9 Recommended suite of standards



However, this project also showed these standards are generally used as the building blocks to design sector approaches. Therefore users should do not need to refer to the source documents if the guidance and reporting platform are well-designed. The output of this project could be used to develop a Welsh public sector reporting guide, taking the best parts from a sub-set of the most appropriate available standards documents to produce a comprehensive guide based on best practice principles. This will need to be reviewed over time to check whether the source documents upon which the 'Welsh public sector standard' is based have been amended and updated and thus whether the Welsh standard needs to be updated likewise (this is not necessarily always the case). However, it should be noted that the GHG protocol suite of standards is a mature system and therefore major revisions to principles are unlikely to occur.

The public sector bodies baseline survey did not identify the GHG protocol as being a key resource currently used by organisations to inform emissions accounting methods and therefore recommending this set of resources could be seen as increasing the burden of reporting. However, in the response to this question, there were no standout common resources, with organisations using a wide variety of standards and resources for some or all of their information. The other key point is that the GHG protocol is considered as the basis of many of the approaches and standards that are mentioned. For example, out of the top four approaches, two are explicitly based on the GHG protocol (Carbon Positive and the Public Bodies Climate

Change Duties report), and the majority of large companies reporting through the Carbon Disclosure Project used GHG Protocol either directly or indirectly through a program based on the protocol (WRI/WBCSD, 2016).

8.6. Potential reporting approaches

As with the standards, there was not one reviewed approach that met all the WG criteria, as shown in Figure 8. This showed a combination of four of the approaches assessed – the CDP, the Public Bodies Climate Change Duties Report, Carbon Positive and the Carbon Accounting Workbook – offered the best coverage of the criteria, but there was no one clear leader. Instead, each of these approaches is quite different and separate, and each had significant areas of strength, but also of weakness. Therefore, two potential options have been identified.

8.6.1. Option 1: Adapt an existing approach

There are a number of existing approaches which could potentially be adapted to meet the requirements of the Welsh Government; these are detailed in Table 20. The benefits of adapting an existing approach include:

- A potential reduction in time and effort to build a system from scratch
- Using aspects of a framework that have been tested in the real world.

However, there are also potential costs of using an existing approach, including the fact that as well as inheriting its advantages, the flaws are also included. It was also noted in section 7.6 that none of the existing approaches fulfilled all of the criteria against which they were assessed. Bolting on requirements which do meet the key criteria for the system (yet to be decided) may take more effort and ultimately create a less efficient system than starting from scratch.

Table 20 Potential approaches that could be adapted

Approach	Strengths	Weaknesses	Why it could work	What adaptations would be required
CDP Questionnaire	<p>The CDP understands emissions data and units. It has been well tested in the field.</p> <p>The question set is challenging and requires organisations to report not only activity data but also governance and motivation. It is good at asking for explanations about why organisations are not doing things.</p>	<p>The CDP requires organisations to set up and manage a separate system to calculate some of their emissions e.g. scope 3 and sequestered carbon.</p> <p>The CDP is not necessarily designed for the public sector and getting an appropriate question set might be tricky.</p>	<p>The CDP is a global disclosure system with the most comprehensive collection of self-reported environmental data in the world and therefore has an effective platform, well designed questions and international credibility.</p> <p>Key lessons to be learnt from this approach include the approach taken to units and how to ask awkward questions.</p>	<p>There is a cost to organisations for reporting, it needs to be done on an annual basis and there is no current category of reporting entity that is representative of the public sector, therefore the most appropriate set of questions would need to be identified. It would still require guidance to set consistent boundaries.</p>
Scottish Public Bodies Climate Change Duties Report	<p>It is the only generic public sector approach e.g. it covers a wide range of public sector bodies, not just a single one or a single sector.</p> <p>It has an existing reporting platform with a set of tested questions.</p> <p>An attempt has been made to standardise the approach to emissions, projects and target reporting.</p>	<p>It does not cover sequestered carbon or the full range of scope 3.</p> <p>The online reporting platform does not preclude organisations making mistakes offline.</p> <p>The approach does not require or mandate a standardised boundary.</p> <p>The platform is not very user-friendly and the data is not very accessible.</p>	<p>Designed specifically for the public sector in Scotland, this approach has guidance and an online platform available.</p> <p>The Scottish Government and Sustainable Scotland Network are planning amendments to the reporting format over the next couple of years.</p>	<p>The approach does not provide emission factors for a full range of Scope 3 emission sources and there is no facility currently for entering sequestered carbon or carbon stocks. The reporting platform is recognised to be clunky and downloading and aggregating data is not straightforward. Clear rules for setting and</p>

Approach	Strengths	Weaknesses	Why it could work	What adaptations would be required
Carbon Positive	<p>The Carbon Positive project was an incredibly thorough and deep dive into the carbon footprint of NRW for the FY 2015/16. It covered all the areas that would be required for assessing the progress of the Welsh Public Sector against the 2030 ambition.</p>	<p>The Carbon Positive is really still at the stage of a single project and has not been developed into an approach that could be rolled out across other organisations.</p> <p>The thoroughness of the approach in terms of determining the boundary and collecting the data would make it hard for other organisations to replicate, both in terms of resourcing and expertise.</p>	<p>The aim of the Carbon Positive project was to calculate the GHG emissions and carbon sequestration baseline of Natural Resources Wales (NRW), enabling identification of strategic priorities for mitigation action, supporting the evaluation of the most cost and carbon effective mitigation options and to provide a useful resource and reference for other public sector organisations managing their carbon impact.</p> <p>Therefore, the approach covers all the emission sources and sequestration that is required to evidence the ambition of a carbon neutral Welsh public sector.</p>	<p>maintain boundaries would also be required.</p> <p>The thoroughness of the approach in terms of defining the boundary and the inclusion of emission sources means it would require a high level of resource and carbon accounting expertise to replicate this approach across the wider public sector and there is no reporting platform or guidance documents available to collect data and interpret the approach for other organisations.</p>

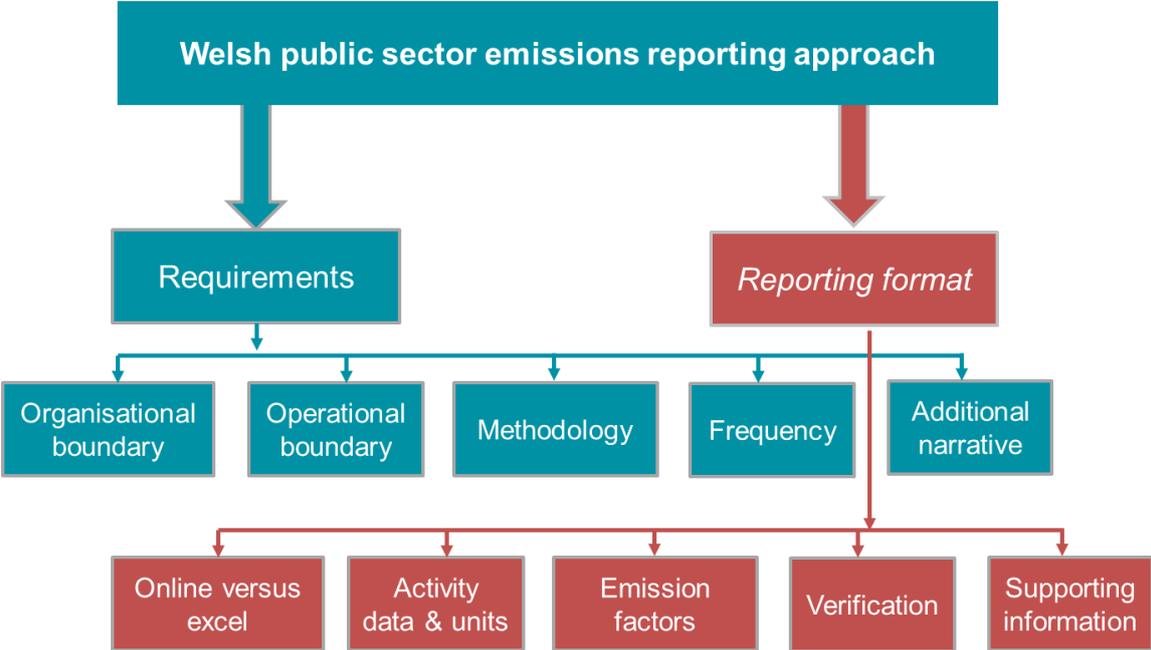
Approach	Strengths	Weaknesses	Why it could work	What adaptations would be required
Carbon Accounting Workbook (UK Water Industry Research)	<p>The approach has been tested by a number of water companies every year for the past 10+ years.</p> <p>The workbook is well established and works pretty reliably.</p> <p>Results across companies are fairly comparable.</p> <p>The approach to uncertainty is very well thought out.</p>	<p>It is designed specifically for the water industry; there is some cross over with the public sector but it would require re-organisation of the structure of the workbook (which is very hard to do).</p>	<p>The workbook is well established, contains relevant emission factors and is the only approach to deal effectively with uncertainty.</p>	<p>The workbook is in MS Excel which requires annual maintenance and it is owned by UKWIR who might not be prepared to release it for adapting for a different use.</p> <p>It is structured for the Water Industry, not the public sector; the workbook would have to be restructured and this is likely to be difficult because it is complex.</p> <p>The sequestered carbon is limited to woodland.</p>
Estates Management Report (Higher Education Statistics Agency)	<p>The EMR has a data portal which has been designed for large amounts of quantitative data. Therefore there are effective validation tools and proper coding to enable downloading of data into different formats.</p>	<p>It is designed specifically for the Higher Education sector and therefore does not cover some of the activities of the wider public sector.</p> <p>It does not cover sequestered carbon.</p> <p>As with the CDP, there still needs to be some calculation off-line of wider Scope 3 emissions,</p>	<p>The Estates Management Report has one of the most advanced data reporting portals, especially in terms of data validation tools.</p>	<p>Scope 3 emissions still have to be largely calculated offline and there is no facility for entering data on sequestered carbon.</p>

Approach	Strengths	Weaknesses	Why it could work	What adaptations would be required
		such as purchased goods and services.		

8.6.2. Option 2 Design a specialised system from scratch

The results of Section 7.6 shows that there is no straightforward option of an approach that scores highly against all, or even most of, the criteria. The alternative to adapting an existing approach is to build a new approach specifically for the purposes of Welsh public sector reporting. This does not preclude using elements of existing approaches and reporting systems that are successful but does mean that the new approach can be designed and built to a specification that meets the WG and organisational requirements. Figure 10 shows elements of the requirements and reporting format that should be considered in the development of Welsh public sector reporting approach.

Figure 10 Elements of reporting approach requirements and format specification



The following sections of this discussion section look at certain elements of that specification, providing suggestions for consideration.

8.7. Elements of reporting approaches – considerations for specification

8.7.1. The cost, content, usability conflict

There are essential conflicts in the design of any system, which are especially true of those with an IT component. One of the classic conflicts is between cost, content and usability. Increasing the usability will increase the cost. Increasing the content will probably negative impact on the usability. In other words, if a system needs to be both usable and complete, it will not be cheap; if the system needs to be cheap, it can't be both usable and complete. Therefore, at some point, trade-offs are likely to be made; either in term of the range and complexity of the dataset or in terms of the user-friendliness of the system.

8.7.2. Defining a public sector boundary that works for all organisations

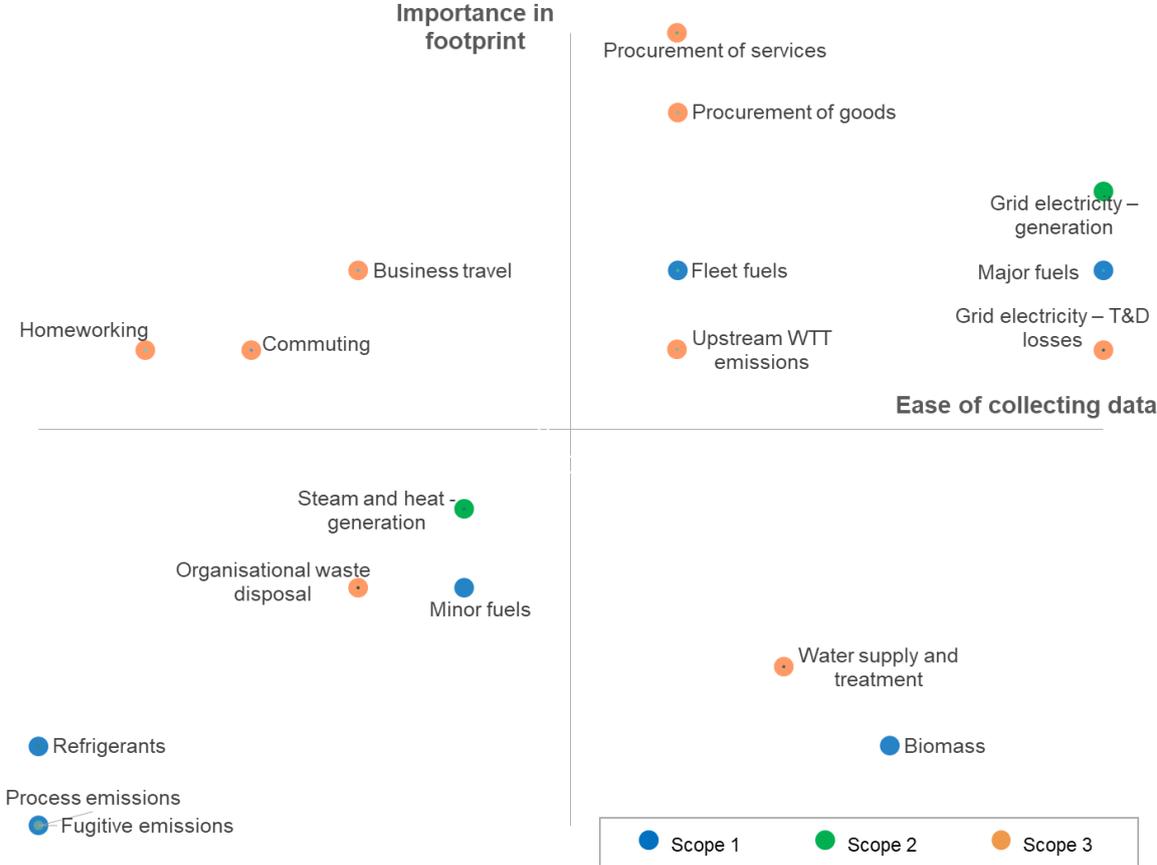
Agreeing and implementing a consistent public sector boundary is a key part of being able to aggregate and report emissions for all Welsh public-sector organisations, and enable robust conclusions to be drawn regarding progress against the commitment to a carbon neutral Welsh Public Sector by 2030.

The exact contents of this boundary are likely to require discussions between the Welsh Government and Welsh public bodies, in order to implement a consistent reporting framework. However, the following should be considered:

1. Just because it’s there doesn’t mean it has to be included

Figure 11 shows an assessment of the emission categories reviewed in Criteria A1a in terms of how easy it is to collect the data versus the probable importance in the footprint. These are based on the knowledge and experience of the project team but are subjective and therefore intended only as an illustration; it is expected that these will vary between sectors and organisations. Figure 11 shows that when emission sources fall in the lower left-hand quadrant of the graph, it is worth considering whether they merit inclusion, as the cost of collecting the data is likely to exceed the benefits of including it the footprint.

Figure 11 Ease of collection versus importance in footprint



A good example is refrigerants. The effort to accurately extract and maintain a record of emissions from air-conditioning and refrigeration units, that in the case of NRW, equated to <1% of total emissions, is likely to be disproportionate to the benefit of collecting the data. This is not to say that refrigerant leaks should be ignored, but that there is likely to be a more productive way to manage this environmental impact.

It should be noted that the evidence from the Carbon Positive project demonstrated that some of the less commonly reported emission sources, such as procurement of goods and services and well to tank emissions are actually very significant and/or easy to collect. Therefore, it is important that an assessment of which emission sources to include looks at evidence of these two factors, rather than going on the basis of what is typically reported. Reducing the range of emission sources is unlikely

to change the leader board of approaches because the ones that are more likely to be eliminated are not necessarily unusual to be collected.

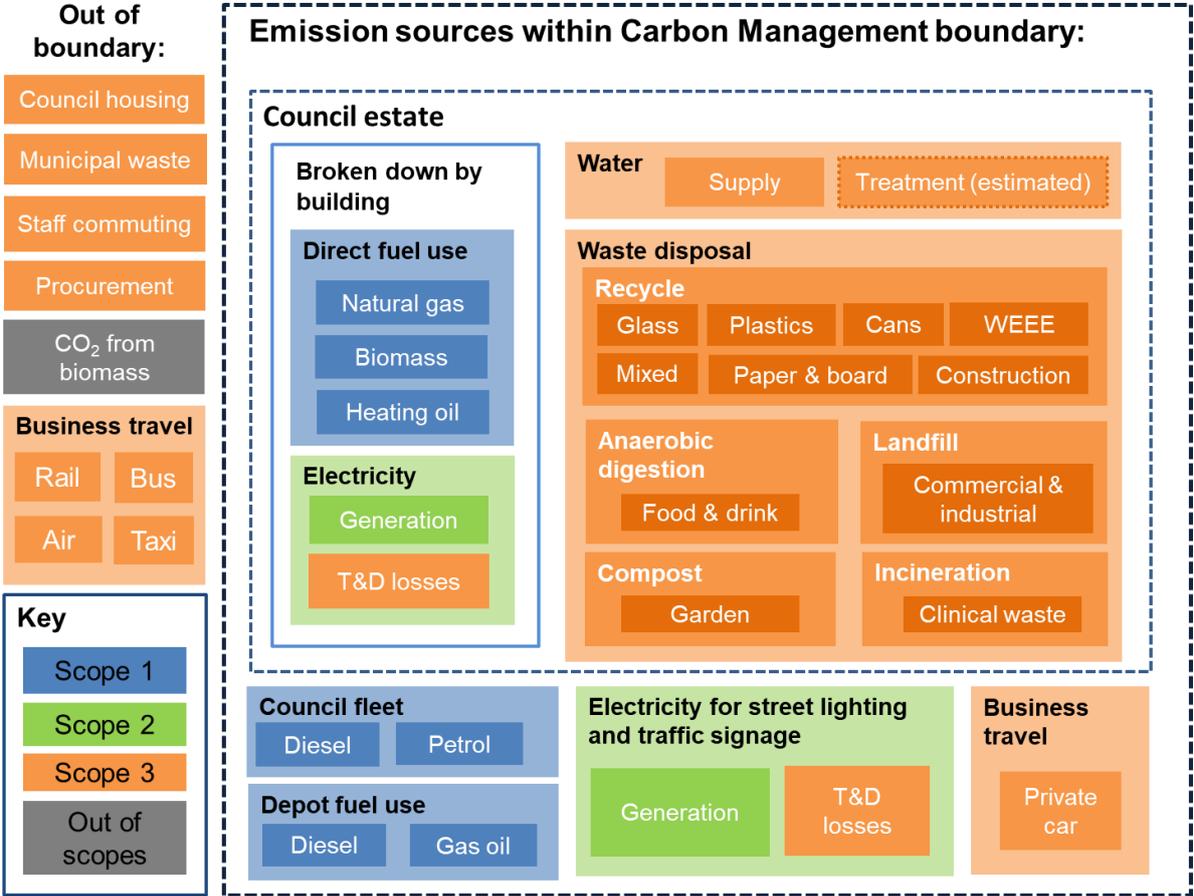
2. For agreed emission sources, there should be no gaps

The converse of this is that where an emission source is included and is universal, there should not be gaps representing a lack of data. For example, all organisations produce waste and use water; if there is no actual activity data available for any particular organisation, methodologies to establish benchmarks and other estimating methodologies should be used to fill the gaps, either at an organisational level or at the whole public sector level. The approach taken by the CRC EES is to uplift consumption when using estimates (usually by 10%). The benefit of this approach is that it provides an incentive for improving data quality, and by starting with a complete footprint, even when parts are estimated, make it much easier to maintain a consistent boundary.

3. Good quality diagrams and documentation

A common format of boundary diagram is very useful for organisations to understand and communicate their boundary but this should not be at the expense of good quality documentation and asset databases. With public sector boundaries, the devil is often in the detail and this needs to be carefully documented, along with rules for dealing with changes. Figure 12 shows an example of a boundary diagram from a Local Authority in Scotland. There are further good examples in the Carbon Positive technical report (see Figure 1, page 19).

Figure 12 Example of an operational boundary diagram



8.7.3. To Scope or not to Scope

Reporting emissions by Scope is a virtually worldwide system and scopes are useful as a basic way of understanding which emissions fall under the direct remit of an organisation or are indirectly controlled. All of the top four approaches use Scopes as the main, or only, category of emissions. However, very precise and inflexible application of Scope categories can lead to some non-intuitive outcomes and thus to confusion. For example, if electricity is used by an external organisation but reported within the public sector operational boundary (i.e. outsourced servers), it is classified as Scope 3, although this can cause confusion to users. If very accurate reporting of Scopes causes users to become confused, they are no longer helpful and therefore there should be some discretion about the application of these. Useful guidance is available from the UKWIR carbon accounting workbook on how to deal effectively with Scope allocation.

In many cases, more useful than Scopes are categories and sub-categories of emissions which indicate the sources and/or activities associated with the emissions categories. The GHG Protocol Scope 3 guidance provides 15 categories of Scope 3 emissions (covering both upstream and downstream emissions). Appropriate sub-categories can be set for these.

It should be noted that effective use of categories depends on the data resolution of individual organisations and upfront effort to develop an effective set of categories and nested sub-categories is essential to produce a workable system.

8.7.4. Where should emission factors live?

There are two main options for the presentation of emission factors for reporting;

1. Refer organisations to use a standard set of factors, usually in the case of reporting in the UK, this would be the UK Government GHG Conversion Factors for Company Reporting, for the relevant year. If sequestered carbon is included in reporting, this is likely to require recourse to an additional set of factors. Examples of approaches that use this option are the Streamlined Energy and Carbon Reporting and the Sustainability Reporting.
2. Alternatively, the approach can provide an appropriate sub-set of factors within a reporting tool or format. Examples of approaches that use this option are the UKWIR Carbon Accounting Workbook and the Scottish Public Bodies Climate Change Duties report.

It is recommended that the second option is used as it provides a better level of control over the emission factors and enables the reporting system to steer users to the appropriate factor. However, it should be noted that this does require regular maintenance of the system to ensure emission factors are appropriate and up to date. Moreover, it is standard practice in international emissions reporting to allow 'country specific' emissions factors where they better represent local circumstances. In a public sector reporting system, this might manifest as using product specific embodied carbon factors provided by suppliers. This would allow for innovation which may change the emission factor (rather than the activity data) but caution and proper auditing need to be applied to ensure that like for like comparisons between different bodies remain valid.

8.7.5. Periodicity of reporting

With the reporting approaches reviewed, all except the Carbon Positive approach required submission of an annual report and the GHG Protocol defines the corporate inventory programme as ‘a program to produce annual corporate inventories that are in keeping with the principles, standards, and guidance of the GHG Protocol Corporate Standard’. However, the Welsh Government could decide on a different reporting frequency, or to report at different intervals for different emissions sources. There are both benefits and disadvantages to opting for reporting on a more infrequent basis than annual and these are summarised in Table 21.

Table 21 Benefits and disadvantages of non-annual reporting

Benefits	Disadvantages
Non-annual reporting might help reduce the reporting burden by using a 2, 3 or 5 year reporting schedule, rather than annual.	Non-annual reporting requires organisations to periodically request resources for this activity, rather than having a standing budget item. In the experience of the project team, this can make it more challenging to get resources
Non-annual reporting gives more time to analyse the data in a meaningful way and provide feedback to the public sector (although the data becomes more susceptible to outliers, e.g. especially cold winters)	There is a greater risk of losing capacity, knowledge, required skills and stakeholder engagement between reporting periods, which reduces the ability to produce reports based on a consistent boundary and methodology.
In the case of some emission sources, significant change is unlikely to happen on an annual basis (e.g. sequestered carbon) and therefore, for some emission sources non-annual reporting helps organisations not get side-tracked by annual fluctuations.	Other reporting obligations often require annual reporting and therefore a non-annual approach might not be the most compatible method.

8.7.6. More than just numbers

Most of the reporting approaches reviewed contained the requirement to provide a degree of narrative to the data or to provide supporting qualitative information about governance, procurement and emissions reduction activity. In the view of the project team, this surrounding narrative is an important part of active reporting, as well designed questions make organisations be reflective about their practice. Some of the best examples of supporting information can be found in the CDP Questionnaires and also in the Carbon Disclosure Standards Board Guidance and these resources should be considered in the design of any approach.

8.7.7. Resourcing

From the WGES initial survey output, in response to question 10; *Does your organisation have a team or individual that is responsible for carbon management?* 32 out of 38 organisations responded ‘yes’. A review of the additional comments showed that there was a wide spread of different job titles involved, including energy managers/officers, sustainability officers, carbon project manager, environmental

champion, technical manager and head of estates. However, it is likely that the responsibility for collecting data, reporting and implementing reduction activity is largely focused in energy and estates teams or the remit of a specific sustainability officer. If Welsh public bodies will be reporting on a wider boundary of emissions and removals in the future, organisations would ideally develop teams that cut across different departments. Consideration could also be given to sharing resources between public bodies to deliver effective and efficient data collection. For example, Scotland has the Sustainable Scotland Network which is a national network for public sector sustainability and climate change professionals. SSN is funded through a Scottish Government contract that provides for a secretariat and an associated work programme (currently a partnership between the Edinburgh Centre for Carbon Innovation and the charity Sniffer). Individual membership is open to all public sector professionals with a focus on delivering positive action on climate change and sustainability. The network offers a programme of support, capacity building, communications and events focused on key themes and offering peer-to-peer support and wider networking opportunities.

It has long been acknowledged in Scotland that there is a need for professional development in the area of carbon management that goes beyond energy management and this is also likely to be the case in Wales. Investment by the public sector in courses and qualifications for their staff to increase skills, knowledge would also be consistent with the well-being of future generations' goal of *developing a skilled and well-educated population in an economy which generates wealth and provides employment opportunities*.

9. Conclusions

The results from the public sector baseline survey show that the current situation of reporting GHG emissions is inconsistent in terms of approach, including significant variability in the operational and organisational boundary and reporting methodology. The current system of reporting emissions would not meet the requirements of the Welsh Government to monitor and report progress against their ambition of having a carbon neutral Welsh public sector by 2030. Five next step actions are suggested below.

The results from this project have demonstrated that there is no single reporting standard that would meet all of the Welsh public sector emissions reporting requirements. However, by combining the suite of GHG Protocol standards and guidance, along with the IPCC standard to cover sequestered carbon and elements of additional standards, all of the requirements can be met. It is probable that the planned GHG Protocol on carbon removals and land use will be able to displace the IPCC standard in this group.

Suggested action 1

There is an online survey on the GHG Protocol website which allows organisations to help shape the proposed GHG protocol on carbon removals and land use. It is suggested that NRW/the Welsh Government respond to this survey and request periodic updates. There is the opportunity within the survey to mention any methodologies, guidance, datasets or initiatives related to the topic and it would be useful to highlight the extensive work done in the Carbon Positive project on sequestration in the NRW estate.

It has also been identified that organisations will require varying levels of support in order to help develop the final accounting approach and use it effectively. This should include support for organisations and individuals to build capacity, develop skills, exchange information and experience and actively benefit from the reporting process.

Suggested action 2

The Welsh Government should review existing networks through which carbon management teams and individuals, identified through the baseline survey, interact. This should be with a view to co-opting such networks as vehicle for providing support but also as a means to identify participants for a working group to help develop a Welsh public sector reporting system.

It is recommended that the group of standards mentioned above are used to develop a unified Welsh public sector reporting guide, taking the best parts from all the available documents. This is as opposed to simply referring users to a large number of documents, some of which are quite technical in places.

Suggested action 3

As a first step in developing a Welsh public sector reporting standard, an initial draft of a unified standard should be assembled from the relevant sections in the suite of existing standards. This will provide a starting point for developing a working definition of carbon neutrality, including answers to the questions highlighted in Step 1 of Table 18.

Similarly, no single reporting approach that meets all the criteria set for a Welsh public sector reporting approach was found. This is partly because of the unusual requirements of the approach which requires robust conclusions to be drawn regarding progress against the commitment to a carbon neutral Welsh Public Sector by 2030. The proposed option is to amend an existing approach. The most likely approaches for adapting are listed but all of these are likely to require significant input to make them fit for purpose and might still contain existing identified flaws.

Suggested action 4

The Sustainable Scotland Network which manages public sector reporting in Scotland on behalf of the Scottish Government is currently in the process of reviewing the reporting process and has set up a Reporting action group to facilitate this process. The PBCCD reporting process was one of the approaches that was highlighted as being a potential option for adapting to the Welsh requirements but due to the timing, it could be worth exploring the options for joint working. Therefore, it is recommended that the Welsh Government contact the Scottish Government and Sustainable Scotland Network to discuss options.

The second option explored was to design a system from scratch. The specification of a specific approach is outside the remit of this project but a number of lessons learnt from the review are presented for consideration. These all point to the need for careful consideration of the specification of the approach, including the system requirements and the reporting format. Regardless of whether the Welsh reporting system is adapted from an existing system or in conjunction with another network, or it developed from scratch for the particular Welsh requirements, a draft specification is a useful starting point.

Suggested action 5

Develop a draft specification (e.g. what does the system need to do) for a Welsh Public Sector reporting approach as a starting point for discussions with other devolved administrations and with reporting organisations. This draft specification can draw on the identified best practice for individual sub-criteria, therefore avoiding the requirement to reinvent a system completely from scratch.

The detailed specification of an approach is outside the remit of this project, but a number of points from the review are presented for consideration, including:

- Addressing the conflict between cost, content and usability, understanding that at some point there will need to be some trade-offs made, either in terms of the range of the dataset or in terms of how user-friendly the approach is.
- Drawing a boundary that works for public sector organisations, including de-scoping emission sources that are hard to collect and only represent an insignificant percentage of the footprint, avoiding gaps through estimating methodologies and recording the boundary effectively.
- Incorporating some realism into the application of complicated rules on allocating Scope but also understanding the importance of providing consistent and recognisable categories for emission sources.
- Providing a curated set of emission factors and ensuring these are applied consistently.
- Periodicity of reporting and the benefits and disadvantages of non-annual reporting.

- Considering the degree of narrative or supporting qualitative information about governance, procurement and emissions reduction activity that might be beneficial to request alongside quantitative emissions data.
- The importance of investment in skills and knowledge of public sector staff in the wider area of carbon management. This might be through the vehicle of existing networks or through professional development programmes developed in conjunction with Universities or other professional bodies.

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Appendix 1: Criteria, sub-criteria and level descriptors for reporting standards

Table 22 Criteria, sub-criteria and level descriptors for reporting standards

Criteria	Code	Sub-criteria	Strong	Reasonable	Weak	Non-existent
What breadth of emissions are accounted for?	S1a	Does the standard provide specifications for accounting of organisational Scope 1 direct emissions?	The standard provides clear specification for accounting of all organisational Scope 1 emissions	The standard provides clear specification for accounting of some organisational Scope 1 emissions	The standard provides specification for accounting of a limited range of organisational Scope 1 emissions	The standard provides no specification for accounting of organisational Scope 1 emissions
	S1b	Does the standard provide specifications for accounting of organisational Scope 2 indirect emissions?	The standard provides clear specification for accounting of all organisational Scope 2 emissions	The standard provides clear specification for accounting of some organisational Scope 2 emissions	The standard provides specification for accounting of a limited range of organisational Scope 2 emissions	The standard provides no specification for accounting of organisational Scope 2 emissions
	S1c	Does the standard provide specifications for accounting of organisational Scope 3 indirect emissions?	The standard provides clear specification for accounting of all organisational Scope 3 emissions	The standard provides clear specification for accounting of some organisational Scope 3 emissions	The standard provides specification for accounting of a limited range of organisational Scope 3 emissions	The standard provides no specification for accounting of organisational Scope 3 emissions
	S1d	Does the standard provide specifications for accounting of organisational out of Scope emissions?	The standard provides clear specification for accounting of all organisational out of Scope emissions	The standard provides clear specification for accounting of some organisational out of Scope emissions	The standard provides specification for accounting of a limited range of organisational out of Scope emissions	The standard provides no specification for accounting of organisational out of Scope emissions
	S1e	Does the standard provide specifications for	The standard provides clear specification for	The standard provides clear specification for	The standard provides specification for accounting of a	The standard provides no specification for

		accounting of carbon sequestration on the organisational estate?	accounting of all carbon sequestration on the organisational estate	accounting of some carbon sequestration on the organisational estate	limited range of carbon sequestration on the organisational estate	accounting of carbon sequestration on the organisational estate
	S1f	Does the standard provide specifications for accounting of organisational carbon stocks?	The standard provides clear specification for accounting of all organisational carbon stocks	The standard provides clear specification for accounting of some organisational carbon stocks	The standard provides specification for accounting of a limited range of organisational carbon stocks	The standard provides no specification for accounting of organisational carbon stocks
Criteria	Code	Sub-criteria	Minimal	Reasonable	High	Not assessable
What are the resource implications of adopting the standard?	S2a	What level of GHG accounting expertise is required to use the standard?	The standard is accessible and easily understood with a basic level of understanding of GHG accounting expertise	The standard is fairly accessible and can be understood with a medium level of GHG accounting expertise	The standard is not very accessible and would require a high level of GHG accounting expertise to use	It is not possible to assess the level of GHG accounting expertise required to use the standard
	S2b	Is the standard ready to use in a public sector setting, with appropriate tools and guidance?	The standard is ready for use in a public sector setting with all the tools and guidance already in place	The standard could be adapted for use in a public sector setting with a minimal level of investment in tools and guidance	The standard would require a high level of investment in tools and guidance in order for it to be used in the public sector	It is not possible to assess if the standard is ready to use in a public sector setting
	S2c	How many resources would be required on an periodic basis to implement the requirements of the standard?	The requirements of the standard could be implemented on a periodic basis with minimal staff time and investment	The requirements of the standard could be implemented on a periodic basis with a reasonable amount of staff time and investment	The requirements of the standard could be implemented on a periodic basis with a high amount of staff time and investment	It is not possible to assess the resource requirements for implementing the standard

	S2d	What financial commitment would be required to implement the requirements of the standard?	The standard is freely available and does not require initial or recurrent payments for use. All additional guidance/tools are also free	The standard has an initial upfront cost or a very minimal recurrent outlay	The standard has an upfront cost and a recurrent outlay	It is not possible to assess the financial commitments required to implement the requirements of the standard
Criteria	Code	Sub-criteria	Strong	Reasonable	Weak	Non-existent
Does the standard define boundaries applicable to the public sector?	S3a	Does the standard explicitly mention public sector organisations?	The standard explicitly mentions public sector organisations and mentions some of the important features	The standard explicitly mentions public sector organisations but does not mention how they differ from corporate bodies	The standard does not explicitly mention public sector organisations but implies that the standard covers all types	The standard does not explicitly mention public sector organisations and is vague about the types of organisations covered
	S3b	Does the standard provide rules to deal with shared services/estate?	The standard provides clear rules and guidance about how to deal with shared estate and services	The standard provides rules and guidance about how to deal with shared estate but provides limited guidance on services	The standard provides minimal guidance about either shared estate or shared services	The standard does not mention shared services or estate
	S3c	Does the standard provide rules about how to deal with shared responsibility e.g. council housing, municipal waste	The standard provides clear rules and guidance about how to deal with shared responsibility	The standard provides rules and guidance about how to deal with shared responsibility but these are not clear	The standard provides minimal guidance about shared responsibility	The standard does not mention shared responsibility

Criteria	Code	Sub-criteria	Strong	Reasonable	Weak	Non-existent
Does the standard stimulate and reward purchase and generation of renewable energy?	S4a	Does the standard reward the generation, use and export of renewable energy?	The standard provides clear rules and guidance about how to deal with shared responsibility	The standard provides rules and guidance about how to deal with shared responsibility but these are not clear	The standard provides minimal guidance about shared responsibility	The standard does not mention shared responsibility
	S4b	Does the standard enable a market-based approach for accounting for purchased 'green' energy	The standard specifies simple criteria to enable organisations to determine if generated energy is eligible. On-site use is zero and export is credited	The standard specifies criteria to enable organisation to determine if generated energy is eligible. Both on-site use and export is rated as zero carbon	The standard does not specify criteria for determining eligibility. Both on-site use and export are rated as zero carbon	The standard does not contain rules to specify how generated renewable energy should be accounted for and generation data is not requested.
	S4c	Does the standard enable accounting of private-wire arrangements	The standard enables organisations to use both a locational and a market-based approach for purchased green energy	The standard allows organisations to report that they have purchased green energy but does not enable a market-based approach	The standard allows organisations to use a market-based approach but with no consequences to the residual emission factor	The standard does not contain mention of different accounting approaches for renewables
Criteria	Code	Sub-criteria	Strong	Reasonable	Weak	Non-existent
Does the standard specify rules for auditing?	S5a	Does the standard require verification	Meeting the requirements of the standard requires independent third party verification on a periodic basis	Meeting the requirements of the standard requires organisations to decide how to verify it	Meeting the requirements of the standard does not require organisations to undertake verification	Verification requirements are not mentioned within the standard
	S5b	Does the standard provide guidance about how the	Clear guidance and rules are set out explaining how	Rules are set out explaining how verification should be	Minimal guidance is provided for organisations wishing	Verification guidance is not provided within the standard

		verification should be achieved	independent third party verification should be undertaken	achieved but are not strict about who should undertake it	to undertake voluntary verification	
	S5c	Does the standard provide guidance about what constitutes carbon neutrality?	The approach contains clear and unambiguous guidance about what carbon neutral means and how organisations can achieve it	The approach contains guidance about what carbon neutral can be interpreted as and how organisations can achieve it	The approach contains limited guidance about carbon neutrality	The approach does not mention carbon neutrality

Table 23 Criteria, sub-criteria and level descriptors for reporting approaches

Criteria	Code	Sub-criteria	Mandatory	Voluntary	Non-existent
How complete is the approach in terms of reporting all three emissions Scopes?	A1a-i	Major fuels	Reporting emissions from major fuels, such as natural gas and heating oils, is mandatory	Reporting emissions from major fuels, such as natural gas and heating oils, is voluntary	No mention is made of accounting for major fuels
	A1a-ii	Minor fuels	Reporting emissions from minor fuels, such as LPG etc. is mandatory	Reporting emissions from minor fuels, such as LPG etc. is voluntary	No mention is made of accounting for minor fuels
	A1a-iii	Biomass	Reporting emissions in Scope emissions from biomass is mandatory	Reporting emissions in Scope emissions from biomass is voluntary	No mention is made of accounting for in Scope emissions from biomass
	A1a-iv	Fleet fuels	Reporting in Scope emissions from fleet fuels is mandatory	Reporting in Scope emissions from fleet fuels is voluntary	No mention is made of accounting for in Scope emissions from fleet fuels
	A1a-v	Refrigerants	Reporting emissions from refrigerant fugitive losses is mandatory	Reporting emissions from refrigerant fugitive losses is voluntary	No mention is made of accounting for emissions from refrigerant fugitive losses
	A1a-vi	Process emissions	Reporting process emissions is mandatory	Reporting process emissions is voluntary	No mention is made of accounting for process emissions
	A1a-vii	Fugitive emissions	Reporting fugitive emissions is mandatory	Reporting fugitive emissions is voluntary	No mention is made of accounting for fugitive emissions
	A1a-viii	Grid electricity – generation	Reporting emissions from the generation of grid electricity is mandatory	Reporting emissions from the generation of grid electricity is voluntary	No mention is made of accounting for the generation of grid electricity
	A1a-ix	Steam and heat - generation	Reporting emissions from the generation of steam and heat is mandatory	Reporting emissions from the generation of steam and heat is voluntary	No mention is made of accounting for the generation of steam and heat
	A1a-x	Grid electricity – T&D losses	Reporting emissions from the T&D losses of grid electricity is mandatory	Reporting emissions from the T&D losses of grid electricity is voluntary	No mention is made of accounting for the T&D losses of grid electricity

	A1a-xi	Organisational waste disposal	Reporting emissions from the disposal of organisational waste is mandatory	Reporting emissions from the disposal of organisational waste is voluntary	No mention is made of accounting for the organisational waste disposal	
	A1a-xii	Municipal waste disposal	Reporting emissions from the disposal of municipal waste is mandatory	Reporting emissions from the disposal of organisational waste is voluntary	No mention is made of accounting for the municipal waste disposal	
	A1a-xiii	Water supply and treatment	Reporting emissions from water supply and treatment is mandatory	Reporting emissions from water supply and treatment is voluntary	No mention is made of accounting for the emissions from water treatment and supply	
	A1a-xiv	Business travel	Reporting emissions from business travel is mandatory	Reporting emissions from business travel is voluntary	No mention is made of accounting for the emissions from business travel	
	A1a-xv	Commuting	Reporting emissions from commuting is mandatory	Reporting emissions from commuting is voluntary	No mention is made of accounting for the emissions from commuting	
	A1a-xvi	Homeworking	Reporting emissions from homeworking is mandatory	Reporting emissions from homeworking is voluntary	No mention is made of accounting for the emissions from homeworking	
	A1a-xvii	Procurement of goods	Reporting emissions from procurement of goods is mandatory	Reporting emissions from procurement of goods is voluntary	No mention is made of accounting for the emissions from procurement of goods	
	A1a-xviii	Procurement of services	Reporting emissions from procurement of services is mandatory	Reporting emissions from procurement of services is voluntary	No mention is made of accounting for the emissions from procurement of services	
	A1a-xix	Upstream WTT emissions	Reporting emissions from upstream WTT is mandatory	Reporting emissions from upstream WTT is voluntary	No mention is made of accounting for the upstream WTT emissions	
Criteria	Code	Sub-criteria	Minimal	Reasonable	High	Not assessable
How complete is the approach in terms of	A1b	Does the approach enable reporting of activity data	The approach requires reporting of activity data with calculations for conversion to	The approach requires reporting of emissions data only but requires detail of the units of activity	The approach requires only input of emissions data by Scope or category, without detail of	The approach requires no reporting of emissions

reporting all three emissions Scopes?			emissions data being standardised	data and emission factor used to be provided	activity data units and emission factors used	
	A1c	Does the approach enable a range of units for activity data	The approach enables a range of units to be used for input and these are converted first to standard unit and then to emissions	The approach enables a range of units to be used for input and these are converted directly to emissions	The approach only enables use of standard units and therefore conversion happens outwith the approach	The approach does not require units of activity data to be identified
	A1d	Does the approach enable use of all UK Government reporting factors or a limited set	The approach enables use of a full range of UK Government Reporting factors and steers users to the correct one	The approach enables use of a reasonable sub-set of the UK Government Reporting factors	The approach enables use of a limited sub-set of UK Government Reporting factors	The approach does not specify the emission factors that should be used
Criteria	Code	Sub-criteria	Strong	Reasonable	Weak	Non-existent
Does the reporting approach account for sequestered carbon?	A2a	Is there a defined boundary for sequestered carbon from terrestrial sources	The rules for setting a boundary for sequestered carbon from owned, leased and managed/ unmanaged land are clear and easy to follow	The rules for setting a boundary for sequestered carbon from owned, leased and managed/ unmanaged land are available but not very easy to follow	The rules for setting a boundary for sequestered carbon are not explicit	There are no rules for setting a boundary for sequestered carbon
	A2b	Is there a defined methodology for calculating sequestration rates	There is a methodology for calculating sequestration rates which is clear and uses easily available data	There is a methodology for calculating sequestration rates	The methodology for calculating sequestration rates is not clear	There is no methodology for calculating sequestration rates

	A2c	Are there appropriate emission factors and conversion factors	All appropriate emission factors and conversion factors are available	Some appropriate emission factors and conversion factors are available	Very few appropriate emission factors and conversion factors are available	No appropriate emission factors and conversion factors are available
Criteria	Code	Sub-criteria	Strong	Reasonable	Weak	Non-existent
Does the approach stimulate and reward purchase and generation of renewable energy?	A3a	Does the approach reward the generation, use and export of renewable energy?	The approach specifies simple criteria to enable organisations to determine if generated energy is eligible. On-site use is zero and export is credited	The approach specifies criteria to enable organisation to determine if generated energy is eligible. Both on-site use and export is rated as zero carbon	The approach does not specify criteria for determining eligibility. Both on-site use and export are rated as zero carbon	The approach does not contain rules to specify how generated renewable energy should be accounted for and generation data is not requested.
	A3b	Does the approach enable a market-based approach for accounting for purchased 'green' energy	The approach enables organisations to use both a locational and a market-based approach for purchased green energy	The approach allows organisations to report that they have purchased green energy but does not enable a market-based approach	The approach allows organisations to use a market-based approach but with no consequences to the residual emission factor	The approach does not contain mention of different accounting approaches for renewables
	A3c	Does the approach enable accounting of private-wire arrangements	The approach enables organisations to report electricity/heat purchased through a private wire with no T&D losses	The approach enables organisations to report electricity/heat purchased through a private wire but with no change to losses	The approach does not distinguish between national grid and private wire purchases	The approach does not mention the possibility of a private wire connection
Criteria	Code	Sub-criteria	Strong	Reasonable	Weak	Non-existent
Does the approach	A4a	Does the reporting	The approach requires regular	The approach requires regular	The approach recommends regular	The approach does not specify frequency

enable the ability to demonstrate progress over time?		approach require regular reporting against a consistent boundary, methodology and emission factors?	reports and transparent documentation, including changes	reports, but the documentation requirements are weak	reporting and documentation	of reporting or transparency of documentation
	A4b	Does the reporting approach require organisations to quantify project reductions?	Organisations are required to report quantified data for GHG reduction activity and projects	Organisations are recommended to report quantified data for GHG reduction activity and projects	Organisations are recommended to report qualitative data for GHG reduction activity and projects	The approach does not require reporting of GHG reduction activity or projects
	A4c	Does the reporting approach require organisations to quantify external/other factors leading to emissions increases/reductions?	Organisations are required to quantify factors leading to emissions increases/reductions	Organisations are recommended to quantify factors leading to emissions increases/reductions	Organisations are recommended to quantify factors leading to emission increases/reductions	The approach does not mention external/other factors and does not require organisations to report these
Criteria	Code	Sub-criteria	Strong	Reasonable	Weak	Non-existent
Does the approach enable the ability to aggregate and report emissions for all Welsh	A5a	Does the reporting approach provide rules for boundary setting that would produce a comparable boundary for all organisations?	Clear and effective rules are provided for boundary setting that would be likely to produce comparable boundaries	Rules are provided for setting boundaries that would be likely to produce similar boundaries	Rules are provide for setting boundaries but these are likely to produce some inconsistencies across sectors	No rules provided to set comparable and consistent boundaries and it is left up to individual organisations to decide

public-sector organisations?	A5b	Does the reporting approach detail appropriate emission factors for reporting?	Appropriate emission factors are provided and effective guidance is provided about how to select the most appropriate	Appropriate emission factors are provided but limited guidance is given about choice	Organisations are directed towards appropriate emission factors	No guidance given about appropriate emission factors
	A5c	Does the reporting approach provide a mechanism for consistently categorising emission sources into Scopes and end-uses?	The approach requires categorisation of emissions sources into Scopes and end-uses and provides guidance	The approach recommends categorisation into Scopes and end-uses but with limited guidance	The approach for categorisation is left up to individual organisations	No mechanism for categorising sources into Scopes and end-uses
	A5d	Does the approach have an electronic tool to aid reporting?	An online portal is available that is user-friendly and enables analysis and reporting on data	An online portal is available but data has to be extracted and downloaded for analysis	The approach uses an excel tool format requiring submission, data extraction and individual updates	There are no electronic tools available to aid reporting
	A5e	Does the approach have the facility to report metrics such as floor area, FTE etc.	The approach enables organisation to enter appropriate and consistent metrics to enable comparability of the sector	The approach enables organisations to choose metrics appropriate to their sector	The approach has the facility to report metrics but these are limited	There is no facility for organisations to enter metrics
	A5f	Does the approach have the facility to report progress against targets	The approach enables organisations to enter targets and progress against them in a consistent manner	The approach enables organisation to enter targets but there is limited facility to assessing progress consistently	The approach enables organisations to enter targets but not progress against them	There is no facility for organisations to enter targets

Criteria	Code	Sub-criteria	Strong	Reasonable	Weak	Non-existent
Does the reporting approach enable robust conclusions to be drawn regarding progress against the commitment to a carbon neutral Welsh Public Sector by 2030?	A6a	Does the reporting approach provide guidance about what constitutes carbon neutrality?	The approach contains clear and unambiguous guidance about what carbon neutral means and how organisations can achieve it	The approach contains guidance about what carbon neutral can be interpreted as and how organisations can achieve it	The approach contains limited guidance about carbon neutrality	The approach does no mention carbon neutrality
	A6b	Does the reporting approach provide guidance for organisations to deal with uncertainty	Clear guidance is provided on how to identify and document uncertainty in measurement of activity data and emission factors	Guidance is provided on how to identify and document uncertainty in measurement of activity data and emission factors	Limited guidance is provided on how to identify and document uncertainty in measurement of activity data and emission factors	No guidance is provided on how to identify and document uncertainty in measurement of activity data and emission factors
	A6c	Does the reporting approach provide guidance for organisations to deal with variation	Clear guidance is provided on how to identify and document variation in activity data	Guidance is provided on how to identify and document variation in activity data	Limited guidance is provided on how to identify and document variation in activity data	No guidance is provided on how to identify and document variation in activity data
Criteria	Code	Sub-criteria	Strong	Reasonable	Weak	Non-existent
What are the resource implications of adopting the approach?	A7a	What level of GHG accounting expertise is required to use the approach?	The approach is accessible and easily understood with a basic level of understanding of GHG accounting expertise	The approach is fairly accessible and can be understood with a medium level of GHG accounting expertise	The approach is not very accessible and would require a high level of GHG accounting expertise to use	It is not possible to assess the level of GHG accounting expertise required to use the approach
	A7b	Is the approach ready to use in a	The approach is ready for use in a	The approach could be adapted for use in	The approach would require a high level of	It is not possible to assess if the

		public sector setting, with appropriate tools and guidance?	public sector setting with all the tools and guidance already in place	a public sector setting with a minimal level of investment in tools and guidance	investment in tools and guidance in order for it to be used in the public sector	approach is ready to use in a public sector setting
	A7c	How much resource would be required on a periodic basis to implement the approach?	The requirements of the approach could be implemented on a periodic basis with minimal staff time and investment	The requirements of the approach could be implemented on a periodic basis with a reasonable amount of staff time and investment	The requirements of the approach could be implemented on a periodic basis with a high amount of staff time and investment	It is not possible to assess the resource requirements for implementing the approach
	A7d	What financial commitment would be required to implement the requirements of the approach?	The approach is freely available and does not require initial or recurrent payments for use. All additional guidance/tools are also free	The approach has an initial upfront cost or a very minimal recurrent outlay	The approach has an upfront cost and a recurrent outlay	It is not possible to assess the financial commitments required to implement the requirements of the approach
	A7e	Is there duplication of other reporting obligations?	The approach supports the completion of other reporting obligations	The approach duplicates some obligations but also supports completion	The approach duplicates other reporting obligations or does not support completion	It is not possible to assess the duplication of other reporting obligations

Appendix 2: Changes to the list of standards and approaches reviewed

Table 24 Changes to list of documents reviewed

Reporting standard	Added or removed	Rationale
PAS 2070:2013 Specification for the assessment of GHG emissions of a city	Added	Identified in the CDP as a possible standard in use
The GHG protocol: Interpreting the corporate standard for U.S public sector organisations	Added	Identified in the CDP as a possible standard in use
CDP (formerly the Carbon Disclosure Project)	Moved	Moved to approaches as fulfils more criteria of an approach than a standards
Climate Disclosure Standards Board	Moved	
English BEIS GHG reporting	Split	This approach was split into three separate approaches:
EU ETS	Removed	After discussion with NRW, it was decided that EU ETS did not meet the criteria for either a reporting approach or standard as it is focused on high energy use installations, rather than organisations.
Hybrid approach (included in the original specification for the work)	Removed	After discussion with NRW, the suggested hybrid approach was removed from the approaches because there was insufficient detail at this stage to review the approach in the same detail as other documents and it was felt that the output of this project should instead inform this approach in the future.

Data Archive Appendix

Data outputs associated with this project are archived in the NRW Document Management System on server-based storage at Natural Resources Wales.

The data archive contains:

[A] The final report in Microsoft Word and Adobe PDF formats.

[B] A Microsoft Excel spreadsheet of the completed database of all evaluation, scores and results entitled “Database of GHG reporting standards and formats v2.4.xls.”



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