

Emissions measurement and reporting approaches for the public sector

Final report

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Executive summary

Introduction

The government's Net Zero Strategy, published in April 2022, sets out a long-term plan for the UK transition to net zero by 2050. Within the strategy, the government outlines the expectation that all public sector organisations should be monitoring their energy use and have targets to reduce greenhouse gas (GHG) emissions, particularly direct emissions from sources that are owned and controlled by the organisation. Furthermore, the strategy sets a target to reduce emissions from public sector buildings by 75%, against a 2017 baseline, by 2037.

To help public sector organisations achieve the ambitions, the government has committed to producing clear and coherent guidance on emissions monitoring and reporting for public sector organisations in England and sites managed by the central government across the UK. The guidance will provide the necessary information for public organisations to better understand and report their emissions, which in turn enables them to better manage their consumptions and identify opportunities for decarbonisation.

Energy Saving Trust has been commissioned by the Department for Energy Security and Net Zero (DESNZ) to conduct a review of the emissions measurement and reporting landscape for public sector organisations. The overarching aims of the research were to systematically review and map the full range of emissions reporting frameworks¹ and what decarbonisation outcomes they enable, and to assess the different emissions measurement approaches underlying the reporting frameworks. Findings from this research will help to inform the development of guidance for public sector emissions measurement and reporting.

This executive summary details the key findings for each of the research questions proposed. The research questions were answered by a comprehensive review of 16 reporting frameworks and consultation with 30 experts in this area.

Of the 16 frameworks that were reviewed, nine were public sector frameworks and seven were private sector frameworks (two national and five international). Whilst this research has a focus on the public sector and GHG emissions reporting, broader climate or sustainability reporting frameworks (where GHG emissions reporting forms part of the framework) and private sector frameworks were also reviewed. This provides a comprehensive view of the different emissions reporting approaches within the UK and surrounding economic region, generating insights into best practices, common challenges, emerging trends and potential areas for improvement that could be relevant to public sector emissions reporting.

The experts were engaged through 25 semi-structured interviews. They were experts from public sector organisations that set reporting requirements, standard-setting bodies, training/

¹ Including frameworks that have a specific focus on GHG emissions reporting, and broader climate or sustainability reporting frameworks where GHG emissions reporting forms an element of the framework.

certification/ professional bodies, technical and academic experts, and organisations that report their emissions.

Key findings

In this section, key findings of the research are presented based on the research questions posed.

Emission reporting frameworks and decarbonisation outcomes

The first objective of this research was to understand the full range of emissions reporting frameworks² and the decarbonisation outcomes that they enable for public sector organisations.

Key research questions

What is the range of approaches to emissions reporting?

What decarbonisation outcomes can emissions reporting support for public sector organisations?

The systematic review revealed that there are a number of different ways to approach emissions reporting. Of the frameworks reviewed, 12 utilise the Greenhouse Gas Protocol (GHGP) scope approach³ to define emission categories and boundaries – i.e. what should be measured and reported. Four frameworks employ alternative but similar approach to emissions accounting. For most frameworks, GHG emissions reporting is done at the organisation level and on an annual basis, with some exceptions such as the Greening Government Commitments (GGCs), which provide quarterly reporting of certain figures and annual reporting of strategies and actions. The Carbon Border Adjustment Mechanism (CBAM) is an example whereby GHG emissions reporting is a one-off reporting by unit of imported product.

For most frameworks, their requirements for emissions reporting mainly focus on defining the boundaries, but do not provide details on what methods should be used for measurement. It is worth noting that some of the frameworks are relatively nascent in implementation – such as the European Union (EU)'s Corporate Sustainability Reporting Directive (CSRD) that mandates emissions reporting for the private sector, CBAM that requires emissions reporting for imported goods, and the Standardised Carbon Emissions Framework (SCEF) for Further and Higher Education.

² Including sustainability reporting frameworks where GHG emissions reporting forms part of the framework.

³ Scope 1 are direct emissions released into the atmosphere from sources owned or controlled by the reporting organisation. Scope 2 and 3 are indirect emissions as a consequence of the activities of the reporting organisation, which occur at sources owned or controlled by another organisation.

Emissions measurement and reporting approaches for the public sector

Through a systematic review of these frameworks and expert interviews, the mechanisms through which emissions reporting enables public sector organisations to undertake decarbonisation actions were identified:

- **Enhanced transparency and creating accountability:** External disclosure of an organisation's emissions – whether to meet regulatory requirements (e.g. GGCs and Scotland's Public Bodies Reporting Framework) or on a voluntary basis – increases visibility into an organisation's climate impacts and creates accountability to reduce their impacts. This accountability, in turn, can lead to organisations taking actions to reduce emissions. All emissions reporting frameworks rely to some extent on this mechanism to drive decarbonisation actions.
- **Communication with internal stakeholders:** Emissions reporting provides the basis for engaging with internal stakeholders, including board members and decision-makers, facilitating informed actions towards decarbonisation.
- **Generation of information for operational management:** By mapping out the organisation's emission sources and levels, emissions reporting can serve as a useful tool for operational management from the perspective of identifying hotspots to focus efforts and reduce emissions. Having a comprehensive view of an organisation's emissions can help inform the development of a net zero transition plan, whilst ongoing emissions monitoring and reporting will support progress tracking against the plan.
- **Gaining access to market/investment:** Provision of information to potential funders or to a publicly available repository such as the CDP,⁴ whereby potential investors can use this information to assess the environmental sustainability of an entity.

Beyond enabling decarbonisation at the entity-level, emissions reporting by public sector organisations can support government's decarbonisation efforts through:

- **Progress tracking:** Emission data provided by the reporting entities can be used to track progress towards targets that are set by either the organisation or framework itself.⁵ It enables the government to hold individual organisations accountable for their efforts to reduce emissions.
- **Informing policymaking and funding decisions:** Emission data collected through government reporting frameworks can serve as a valuable resource for informing the government's decarbonisation strategy. It can help to identify priority areas for decarbonisation efforts, informing policy and funding allocation to accelerate the transition to a low-carbon economy.

Emissions reporting in the public sector also can have a spillover effect, driving decarbonisation in the private sector through the following:

⁴ Formally known as Carbon Disclosure Project

⁵ Progress towards UK's overall net zero strategy targets is tracked via [UK territorial greenhouse gas emissions national statistics](#)

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- **Engaging suppliers:** Through measuring and reporting of supply-chain related emissions, public sector organisation can identify emission hotspots in their value chain and engage their key suppliers to report and reduce their emissions.
- **Assessing suppliers based on climate performance:** Increasing expectation or procurement requirement for private sector companies to disclose their emissions if they want to tap into government contracts will foster competition and incentivise the private sector to cut emissions.

Assessing the effectiveness of public sector emissions reporting in promoting decarbonisation via the mechanisms outlined above has been challenging, primarily due to the complexity of attributing decarbonisation solely to reporting efforts. Other factors, such as regulations and funding, significantly influence the outcomes. Without a counterfactual scenario, it's difficult to ascertain what would have occurred in the absence of a reporting framework. Nonetheless, the pivotal role of emissions reporting as the first step to an organisation's decarbonisation journey is clear. The effectiveness of emissions reporting in driving decarbonisation could be influenced or enhanced by several factors as outlined below, some of which are drawn from private sector reporting frameworks.

- **Contextualisation of emission data, such as through benchmarking or in association with risks and opportunities**, makes it more meaningful for the reporting organisation, thereby incentivising actions. Contextualisation can be achieved in different forms:
 - Private sector reporting frameworks – such as Streamlined Energy and Carbon Reporting (SECR) and the Energy Saving Opportunities Scheme (ESOS) – incentivise decarbonisation actions by drawing focus to **efficiency gains and financial savings**.
 - EU CSRD and the International Financial Reporting Standards Foundation (IFRS) Sustainability Disclosure Standards (SDS) – place emphasis on **climate risks and opportunities**, enabling organisations and investors to better understand them and account for them in their decision-making.
 - Voluntary frameworks – such as the SCEF for Further and Higher Education and CDP cities, regions and states – utilise **benchmarking** to facilitate peer-to-peer comparison and promote continuous improvement.
- **Verification or peer review of emissions data** to improve credibility of the reported emissions, promotes cross-learnings and best practices. This also provides confidence to key stakeholders to make decisions based on the data and helps mitigate reputational risk associated with public disclosure of emissions reporting.
- **Requirement for emission reduction targets or transition plan, and progress reporting.** Many reporting frameworks additionally require reporting entities to establish emission reduction targets or transition plans, and report progress against the set targets or plans. This requirement holds organisations accountable for their emissions reduction commitments and compels them to take actions to achieve their targets.

- **Follow-on support or engagement by the body that sets the framework with the reporting bodies** to empower them to undertake decarbonisation actions. For example, SCEF and Setting City Area Targets and Trajectories for Emissions Reduction (SCATTER) provide further guidance or tools to enable reporting organisations to take actions and reduce their emissions. This can also be achieved through signposting to available resources or support.

Emissions measurement approaches

The second objective of this research was to assess the different emissions measurement approaches underlying the reporting frameworks.

Key research questions

What is the range of approaches to emissions measurement?

How can these emission measurement approaches enable different emission reporting frameworks?

The three main approaches to calculating emissions and their effectiveness in enabling decarbonisation actions are discussed:

- **Direct measurement** involves direct monitoring of flowrate or concentration using submeters. This approach of measurement provides the most accurate emissions measurement but also requires the most efforts. Therefore, consideration should be given to the level of efforts required for this approach against its potential benefits.
- **Estimation using average emission factors** is where conversion factors, such as emissions per unit expenditure, or per unit energy consumption, are used to allow simple estimation of emissions. This approach is easier to implement due to lower data requirements. However, the use of average emission factors results in rough estimations of emissions. By not taking into account organisation-specific consideration, this approach may hinder actions to undertake decarbonisation activities. For example, use of the market-based method to calculate emissions from electricity could prevent organisations from making more of an effort to improve efficiency, whilst use of the spend-based method will discourage organisations from purchasing the more expensive but more efficient products. Despite the disputed robustness of approximated emissions measurement, the common view was that there will always be a need for estimating some emission data, and the consensus was not to let improving accuracy get in the way of taking actions.
- **Modelling of emissions generation** whereby more than one entity- or site-specific factor is used to estimate emissions. This can be an effective means for understanding emissions. It requires less effort than direct measurement, but the use of a combination of entity- or site-specific factors in a model can result in an estimation that is more accurate than simply using national or sectoral average factors. The NHS England

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framework has effectively used a modelling approach to estimate emissions from a variety of sources, which would have been far too onerous to measure and determine directly, while identifying emissions and attributing them to a source which can be acted upon far more effectively than through utilisation of a basic average.

In addition to the approaches discussed above, there is also a hybrid approach where specific data is used when available, and when it isn't, less demanding methods are employed, or extrapolations are made from existing data.

For most frameworks, their requirements for emissions reporting mainly focus on what should be measured and reported, but do not provide details on which methods should be used for measurement. Some frameworks such as the IFRS SDS encourages reporting bodies to be transparent about the methods that they have used for emissions measurement. To accommodate the different measurement approaches, many frameworks use tiered systems to evaluate the precision of the reported emission data.

In the absence of a standardised approach to emissions measurement, there is limited comparability in the emission data generated, either across organisations or within an organisation across time. The lack of comparability has an implication on the effectiveness of emissions measurement in advancing decarbonisation efforts. Primarily, it reduces the ability to track progress and contextualise emission data through benchmarking, thereby making emission data less meaningful for organisations to commit to undertake decarbonisation efforts.

Comprehensive measurement across all scopes of GHGP can provide a holistic view of emissions from an organisation's operations as well as those from its value chain. Nevertheless, the efforts required for measurement of all scopes should not be underestimated. Scope 1 and 2 emissions are generally viewed as straightforward to measure, and with the right guidance and support, all public organisations should be able to measure and report their Scope 1 and 2 emissions. Scope 3 emissions remain an area that is the most challenging to measure, requiring further development in measurement methods and GHG conversion factors across the sector. This is essential if seeking to enable a wider range of organisations to better measure and report their Scope 3 emissions. When determining the level of Scope 3 emissions measurement and reporting for an organisation, considerations such as the scale of the emissions and the organisation's sphere of influence – whether the reporting entity can effectively manage or influence these emissions – should also be taken into account.

The Scope 3 emissions of one organisation are the Scope 1 and 2 emissions of another organisation. When considering emissions at the national or international level, this could lead to double counting. Therefore, where organisation emissions data is used for national inventories or policy-making, care should be taken to distinguish the different scopes of emissions and organisational boundaries to avoid double counting.

Challenges in emissions measurement and reporting

Through this research, a number of challenges associated with emissions measurement and reporting for the public sector organisations have been identified. They include:

- **Fragmented emissions reporting landscape** due to the relatively nascent discipline of emissions reporting (for example, as compared to financial reporting) and the lack of standardisation in emissions measurement and reporting approaches. This results in inconsistencies in emissions reporting across the landscape. Within the public sector, a more coordinated and standardised approach to emissions reporting is needed to increase the effectiveness of emissions reporting in driving decarbonisation.
- The public sector faces challenges in conducting emissions measurement and reporting due to **limited capacity and capability**, particularly among smaller organisations. This often results in the need for expensive external consultancy services to undertake emissions measurement and reporting.
- **Poor data accessibility and quality** reduces the precision of emissions measurement and reporting. This is especially challenging due to siloed working – data for emissions measurement needs to be sought across different departments or teams.
- **Resource constraints** also pose a challenge in conducting emissions measurement and reporting, particularly within smaller organisations where resources are already stretched with competing priorities.

Recommendations

Recommendations to help overcome the challenges of emissions measurement and reporting within the public sector, and increase the effectiveness of emissions reporting in driving decarbonisation.

- **Clear and consistent guidance** will help address some of the issues arising from the immature emissions reporting landscape, by creating a more standardised and coherent approach to emissions reporting for the public sector. The guidance should take into account strengths and learnings from the existing frameworks, such as contextualisation of emissions data to incentivise actions, verification or peer review processes for quality assurance and improvement, signposting to follow-on resource to support the development of emission reduction strategies and enable actions. Finally, where possible, the guidance should align with existing frameworks and best practices to streamline reporting processes and reduce reporting burden as some organisations may be subjected to multiple reporting requirements, as well as to avoid creating further fragmentation of the reporting landscape.
- **Clear purpose of emissions reporting** will help guide the design of GHG emissions measurement and reporting system. For example, if the purpose is for operational management, more granular data and frequent reporting can inform decisions and adjust actions, whilst annual emissions reporting at the organisation level will be

sufficient for the purpose of accountability and communicating climate performance. These are outlined within the **Emissions reporting and measurement pathways** section of the report. If the main purpose of emissions reporting is to facilitate actions, action-oriented matrices should also be considered alongside emissions data, such as tracking the percentage of fleet that has been electrified, or percentage of suppliers engaged to reduce emissions. Where the emissions data will be used for national GHG inventories, it is important to distinguish the different scopes of emissions and organisational boundaries to avoid double counting.

- **Emission database and tools** that can be easily accessible will help mitigate some of the resource issues and make emissions measurement and reporting easier, especially for the smaller organisations. Having a single tool that enables all public sector organisations to report their emissions in a consistent way is also useful, although it is also important to allow for the diversity of the public sector and maturity in their decarbonisation journeys.
- **Capacity building** of public sector staff in this area, such as through peer review of public-body emissions reporting and knowledge sharing. Upskilling of internal staff will reduce reliance on external consultants and save costs in the long-term.
- **Governance and leadership** from senior management to send a clear signal of their commitment to report and reduce emissions, promoting buy-in from staff to support emissions reporting and reduction efforts.

Emissions reporting and measurement pathways

Through the systematic review, whereby each component that makes up a reporting framework was assessed and evaluated, a reporting and measurement pathway categorisation schematic has been developed. The schematic illustrates the categories of measurement and reporting within a framework. It is designed so that pathways can be followed to outline the elements that make up a specific framework. Existing frameworks can be mapped into the schematic to enable quick comparisons between them (see Appendix B for examples). The schematic can also be utilised in the development of new frameworks, with flexibility for additional categories to be added, enabling adjustments for the future.

Table 1: Categories of emissions reporting and measurement pathways

Category	Description
Requirement	Why the reporting is being done, whether to comply with a regulation, gain access to a market, or voluntarily undertake environmental assessment.
Measurement breadth	Extent to which emissions are to be accounted or measured, including GHGP Scopes and non-GHGP method for accounting emissions.

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Measurement method	Ways which the emission data is being accounted for can be measured, including direct measurement, estimation using average emission factors and modelling.
Data granularity	There are different levels of emissions data, whether it is at the organisation level, site level, building level, or at a meter/ submeter level.
Reporting frequency	Frequency of when emissions data are reported, e.g. one-off, quarterly or annual reporting.
Verification	Level of verification, whether through independent third-party, peer review, internal governance or where no verification is required.
Data collection format	Tools which a framework or organisation use to gather data, such as Excel spreadsheets or an online portal.
Output format	Ways in which emission data can be presented, whether it is a report or dashboard.
Emissions reduction planning	How reduction targets and transition plans are reported, if required.
Target audience	Who the emissions reporting is intended for, whether it is the government, a client, internal stakeholders or the general public.
Mechanism of change	Mechanisms through which emissions measurement and reporting enable change and lead to decarbonisation as discussed above.

The **Emissions reporting and measurement pathways** section of this report provides detailed descriptions of the schematic, including each of the categories and elements held within it, and discusses the relevance of each element with respect to its effectiveness in enabling the desired outcomes.

Definitions

Acronyms are given in full when first used in the report but are also summarised here for clarity.

Accuracy: Degree of closeness between a measurement and its true value

BEIS: Department for Business, Energy and Industrial Strategy

CBAM: Carbon Border Adjustment Mechanism

CCAT: Climate Change Assessment Tool

CCC: Climate Change Committee

CCG: Clinical Commissioning Group

CDSB: Climate Disclosure Standards Board

CHP: Combined Heat and Power

CO₂e: A standardised unit used to express the total impact of various greenhouse gases, converting them into an equivalent amount of carbon dioxide based on their global warming potential.

CSRD: Corporate Sustainability Reporting Directive

DAERA: Department of Agriculture, Environment and Rural Affairs (Northern Ireland)

DECC: Department for Energy and Climate Change

DEFRA: Department for Environment, Food and Rural Affairs

DESNZ: Department for Energy Security and Net Zero

DfE: Department for Education

Direct emissions: Emissions of greenhouse gases released directly from the actions of the entity, such as burning fuel or venting fluorinated gases.

EAUC: Alliance for Sustainability Leadership in Education

EFRAG: European Financial Reporting Advisory Group

ERIC: Estates Returns Information Collection (NHS)

EMR: Estates Management Report

ESG: Environment, Social and Governance

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ESOS: Energy Saving Opportunities Scheme

ESRS: European Sustainability Reporting Standards

ETS: European Trading System

FE: Further Education

Framework: This refers to a system of rules that define methods and reporting requirements for measurement and or management of greenhouse gas emissions.

FReM: Government Financial Reporting Manual (UK Government)

GGCs: Greening Government Commitments

GHG: Greenhouse gas. These gases absorb infrared radiation emitted from the Earth and re-radiate it back. Within the Greenhouse Gas Protocol, the main emissions to account for are carbon dioxide, methane, nitrous oxide, and fluorinated gases.

GHGP: Greenhouse Gas Protocol. An established framework for measuring greenhouse gas emissions.

GRI: Global Reporting Initiative

HE: Higher Education

HESA: Higher Education Statistics Agency

HFS: Health Facilities Scotland

HOST: Health Outcomes of Stationary Sources Tool

HOTT: Health Outcomes of Travel Tool

IFRS: International Financial Reporting Standards

IFRS SDS: IFRS Sustainability Disclosure Standards

Indirect emissions: Emissions generated through operational requirements, such as electricity use or products that generate greenhouse gases during their lifecycle.

ISO: International Organisation for Standardisation

ISSB: International Sustainability Standards Board

JISC: Joint Information Systems Committee

kWh: Kilowatt-hours (energy unit)

GA: The Local Partnerships Greenhouse Gas Accounting

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NFRD: Non-Financial Reporting Directive

NHS: National Health Service

Mandatory: Legislation has been enacted to establish the framework, specifying that reporting to the framework is mandatory.

MBT: Mechanical Biological Treatment

Precision: Degree of closeness between repeated measurements or measurements under the same conditions, regardless of how close to the true value.

Required: The framework necessitates providing information as a minimum requirement to meet the standards outlined within it.

SASB: Sustainability Accounting Standards Board

SCATTER: Setting City Area Targets and Trajectories for Emissions Reduction

Scope 1: Direct emissions of greenhouse gases from sources within a defined boundary of control.

Scope 2: Indirect emissions resulting from purchased energy, typically electricity or purchased heat.

Scope 3: Covers 15 categories of indirect emissions listed within Appendix A of this document. These relate to all indirect emissions (not included in Scope 2) that occur in the value chain of the reporting company, including both upstream and downstream emissions.

SECR: Streamlined Energy and Carbon Reporting

SCEF: Standardised Carbon Emissions Framework for Further and Higher Education

SSN: Sustainable Scotland Network

SRG: Sustainability Reporting Guidance

TCFD: Task Force on Climate-related Financial Disclosures

UKRI: UK Research & Innovation

Voluntary: The framework requests or suggests information for reporting. However, even without this voluntary information, submission would still meet the defined standard if the minimum necessary information is provided.

VRF: Value Reporting Foundation

Introduction

The government's Net Zero Strategy, published in April 2022, sets out a long-term plan for the UK transition to net zero by 2050. Within the strategy, the government outlines the expectation that all public sector organisations should be monitoring their energy use and have targets to reduce emissions, particularly direct emissions from sources that are owned and controlled by the organisation. The strategy sets a target to reduce emissions from public sector buildings by 75%, against a 2017 baseline, by 2037.

The current emissions measurement and reporting landscape for the public sector is fragmented and can be complex to navigate for public organisations that lack the capability. Beyond Greening Government Commitments (GGCs) and HM Treasury Sustainability Reporting, there is limited clarity and guidance on what the public sector should do in terms of emissions measurement and reporting.^{6 7} The diversity of public sector organisations – ranging from central government departments, arms-length bodies and local authorities to schools, hospitals and emergency services (all diverse in size and governance structure) – has led to the development of sector-specific emissions measurement and reporting initiatives. These include the Standardised Carbon Emissions Framework (SCEF) for Further and Higher Education, the Greener NHS approach for the National Health Service (NHS) in England and Setting City Area Targets and Trajectories for Emissions Reduction (SCATTER). This has resulted in further fragmentation of the reporting landscape and made it difficult to benchmark or track progress made by particular public sector organisations in reducing emissions.

To support public sector organisations in measuring and reporting their emissions in an accurate and consistent way, the Department for Energy Security and Net Zero (DESNZ)⁸ has committed to publish guidance for public sector organisations in England by 2025.⁹ In December 2023, DESNZ commissioned Energy Saving Trust to conduct a critical review of the existing emissions measurement approaches and reporting frameworks while engaging a range of experts to understand the decarbonisation outcomes that emissions measurement and reporting support.

Key research questions were:

- What is the range of approaches to emissions reporting?
- What decarbonisation outcomes can emissions reporting support for the public sector organisations?
- What is the range of approaches to emissions measurement?

⁶ [National Audit Office \(2022\) Measuring and reporting public sector greenhouse gas emissions](#)

⁷ [Public Accounts Committee \(2022\) Measuring and reporting public sector greenhouse gas emissions: Twenty-third report of session 2022-23](#)

⁸ Previously Department for Business, Energy & Industrial Strategy (BEIS)

⁹ This will also cover sites managed by the central government across the UK.

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- How can these emission measurement approaches enable different emission reporting frameworks?

This report presents findings from this research, which will support DESNZ in their commitment to develop consistent guidance on emissions monitoring and reporting for the public sector.

This report is structured as below:

- **A methodology** section that describes the qualitative research methods, systematic review and expert engagement used to collect data and insights for answering the research questions.
- **Research findings** are presented in the following sub-sections:
 - **An emissions reporting and decarbonisation outcomes section** – looking at the different emissions reporting frameworks and the mechanisms with which they enable decarbonisation outcomes. The effectiveness of public sector emissions reporting in driving decarbonisation is also assessed and discussed.
 - **An emissions measurement approaches section** – providing an overview of the different approaches to measuring direct and indirect emissions, and mapping of the measurement approaches to reporting frameworks. Attributes of emissions measurement methods that have an impact on their effectiveness in driving decarbonisation are also discussed.
 - **A challenges in emissions measurement and reporting section** – providing a summary of key challenges when measuring and reporting emissions for the public sector, as well as recommendations to help overcome some of these challenges and increase the effectiveness of emissions reporting in driving decarbonisation.
 - **An emissions reporting and measurement pathways section** – providing a description of the schematic for reporting and measurement pathways, including the categories and elements held within it. The influence of each element in enabling the desired outcome is discussed.
- **A conclusion** summarises the main findings from this research and their implications, as well as factors that need to be considered when developing emissions measurement and reporting guidance for the public sector.

Methodology

The research questions were answered via a systematic review of existing emissions measurement and reporting approaches, and engagement with experts in this area through semi-structured interviews. Detail on the systematic review is presented in Annex A. This report focuses on the critical assessment of the different emissions measurement and reporting approaches, and the combined conclusions from both the systematic review and expert engagement.

Systematic review

The systematic review comprehensively analysed 16 GHG emissions and wider climate/sustainability reporting frameworks (where GHG emissions forms an element of the reporting framework) via a desk study. These included nine UK public sector frameworks (including three from devolved governments), two UK private sector frameworks, and five international private sector frameworks. Private sector frameworks were reviewed to provide a comprehensive view of the different emissions reporting approaches within the UK and surrounding economic region, to generate insights into best practices, common challenges, emerging trends and potential areas for improvement that could be relevant to public sector emissions reporting.

The UK public and private sector frameworks were selected based on their prominence, and the international private sector frameworks were chosen due to their potential influence in the UK. For example, the EU is a key trading partner with the UK, and therefore its frameworks have emissions reporting implications for certain exported goods.

Each framework was assessed by six key criteria:

- Context of the framework.
- Scope of the framework in terms of the GHG emission data that must be reported.
- Reporting guidelines.
- Emission reduction targets.
- Theoretical foundation.
- Effectiveness.

These criteria were the most relevant to identify the similarities and differences between the frameworks and to best define how each one works. The mechanisms by which the frameworks enable change and lead to decarbonisation were identified and outlined in the review.

Expert engagement

As part of the research, a range of experts were engaged through semi-structured interviews to deepen understanding of the various approaches to emissions measurement and reporting, and the decarbonisation outcomes that they can help to achieve. A copy of the interview topic guide is provided in Annex B.

The interviews took place in February 2024. The interviews were conducted online using Microsoft Teams and lasted between 40 to 75 minutes. A total of 30 experts were engaged through 25 interviews for this research. Interviewees were experts working in the industry, including standard-setting bodies, training/ certification/ professional bodies, technical and academic experts, public sector organisations that set reporting requirements, and organisations that report their emissions (Table 2Table 2).

Table 2: Types of organisations that interviewed experts work in [N = 30]

Organisation type	Organisation details	Number of experts interviewed
Government body	Central and devolved UK governments, and publicly funded bodies that deliver key services, who set reporting requirements but also report their own emissions	12
Standard body	Independent bodies that develop and provide a framework to enable organisations to measure and report their emissions	6
Professional/ independent research body	Independent bodies with technical knowledge or expertise in emissions measurement and reporting	5
Local government	Local authorities who voluntarily measure and report their emissions using a standard of their choice	3
Academia	Universities that voluntarily measure and report their emissions using a standard of their choice	2
International body	Funded bodies who support public and private sector organisations worldwide to measure and report their emissions	2

Research findings

Emissions reporting and decarbonisation outcomes

An overview of emissions reporting frameworks

This section provides an overview of the GHG emissions/ sustainability reporting frameworks reviewed in this research. The reporting frameworks are described and discussed in turn, with a focus on the mechanism through which the emissions reporting framework leads to change. A comprehensive review of the frameworks is presented in Annex A. The effectiveness of the reporting framework in driving decarbonisation has also been assessed, although for most frameworks, it's either too early (due to nascent stage of implementation) or there is insufficient data to fully evaluate their effectiveness.

Central government

Greening Government Commitments (GGCs)

Established in 2010/11, the GGCs set targets for UK government departments and their agencies to reduce their environmental impacts. They include targets on reducing GHG emissions, waste generation and water consumption, as well as commitment for sustainable procurement. UK central government departments and their agencies are required¹⁰ to report against GGCs. The reporting requirements ensure consistent reporting across government and generate emission data that is comparable across departments and over time.

GGCs sets out to increase transparency and hold government departments accountable against the set targets through reporting requirements. The last published annual report, 2020/21, states that the government met many of its commitments, including the emissions reduction target. In 2020/21, GHG emissions were reduced by 57% from the baseline year of 2009/10, although it was unclear whether the reduction was attributed to decarbonisation efforts or the impact of COVID-19 pandemic restrictions. Looking at the 2019/20 annual report (pre COVID-19 pandemic), the 50% GHG emissions reduction from the baseline year of 2009/10 achieved in that financial year was attributed to grid decarbonisation (19%) and improved estate management (31%), which indicated the effect of GGCs in driving decarbonisation. At the time of this research, the annual reports for GGCs 2021/22 and 2022/23 are not available but are expected to be published imminently, which will provide further insights into the effectiveness of GGCs in driving decarbonisation.

HM Treasury Sustainability Reporting Guidance (SRG)

HM Treasury introduced SRG for central government accounts in 2010/11. It aims to promote transparency on public sector performance in sustainability and on a year-on-year basis.¹¹ HM Treasury SRG and GGCs are now largely in line to reduce reporting burden, and work is underway to incorporate recommendations from the Task Force on Climate-related Financial Disclosures (TCFD) – for application from 2024/25 – to ensure that UK public sector reporting is better aligned with global private sector reporting and developments by standard setters. Implementation of TCFD aligned disclosure will be phased over three years, from 2023/24 to 2025/26.

Mandatory reporting promotes transparency on sustainability performance, which leads to public accountability and drives organisations to continuously improve their performance. Alignment of HM Treasury SRG with GGCs and sustainability-reporting frameworks of devolved nations makes it challenging to isolate the effect of HM Treasury SRG in enabling decarbonisation efforts. Further integration of TCFD principles could enhance reporting of climate-related data to facilitate informed decision-making, both within the organisation and the government.

¹⁰ See [Definitions section](#) for the definitions of “mandatory”, “required” and “voluntary”

¹¹ [HM Treasury Sustainability Reporting Guidance: 2023-24](#)

Health

National Health Service (NHS) in England

The NHS has been collecting and estimating, through modelled data, its Scope 1 to 3 emissions since 2008. The Health and Care Act 2022 committed the NHS to tackle its climate impact. The National Health Service (NHS) in England aims to achieve zero carbon emissions by 2040 for emissions that it can directly control (“Carbon footprint” that spans across GHGP Scopes 1 and 2, and parts of Scope 3) and by 2045 for emissions it can influence (“Carbon footprint plus” which includes all three GHGP Scopes, plus emissions from patient and visitor travel, and medicines used within homes).¹²

Integrated care boards (ICBs) and trusts are now mandated to develop and publish Green Plans and include updates on the delivery of these plans as part of the NHS Standard Contract and Group Accounting Manual. Additionally, the ERIC (Estates Returns Information Collection) is a mandatory annual collection of costs, operation and maintenance of the NHS estate. The data is used to extrapolate and model NHS emissions nationally, reducing reporting burden on local organisations, whilst ensuring comprehensive coverage of NHS emissions.

The accounting of GHG emissions enables costed and time-scaled strategies to be developed on a national scale. This can then be translated to local levels for them to develop their own plans and allocate specific and unique sources of high emissions, such as low carbon inhalers or primary care estates. This enables local regions to develop green plans in line with the national strategies.

The large purchasing power of the NHS is also utilised. In 2021 NHS England set out its NHS Net Zero Supplier Roadmap – the procurement requirements include that suppliers with contracts above £5 million per annum should publish a carbon reduction plan for UK Scope 1, 2 and a subset of Scope 3 emissions as a minimum. This generates environmental reporting and GHG reduction goals among key manufacturing suppliers, thus impacting sectors outside the NHS.

The results and strategies of this framework are publicly declared, enabling full transparency and accountability for the NHS. The 2022/23 annual report and accounts for NHS England show a 72% reduction in direct emissions from a 1990 baseline. The high- and low-level reporting and target-setting structure of the NHS framework means the reductions in CO₂e emissions are attributable to specific reduction measures, enabling evaluation and adjustment of specific plans for further GHG reduction.

The NHS is also incorporating TCFD aligned disclosure in their annual reports in a phased approach, from 2024/25, as per the recommendation from HM Treasury within the Department of Health and Social Care’s Group Accounting Manual 2023 to 24¹³ that was published in April 2024.

¹² See Figure 1 in [NHS England \(2022\) Delivering a ‘Net Zero’ National Health Service](#)

¹³ [Department of Health and Social Care \(2024\) Group Accounting Manual 2023 to 2024](#)

Education

Standardised Carbon Emissions Framework (SCEF) for Further and Higher Education

The SCEF aims to bring about comparability through standardisation so that Further and Higher Education (FE and HE) institutions can benchmark emissions baselines and reductions against other similar institutions. The reporting framework is aligned with the GHGP – as are the mandatory and voluntary reporting for FE and HE under the Scottish and Welsh GHG reporting frameworks. Under the framework, the “cost of net zero calculator” tool¹⁴ is made available, enabling users to set reduction targets, tailor investments and predict likely outcomes of GHG reduction, thus helping institutions set their own targets with costed scenario-based investment strategies.

The SCEF framework facilitates transparent, consistent, credible, and largely comparable disclosure, which will enable peer-to-peer benchmarking and learning. Follow-on support, in the form of a tool that enables FE and HE institutions to develop evidence-based, measurable targets and emission reduction strategies, facilitates decision-making and actions to decarbonise. As reporting is currently not mandatory in England and without a reporting mechanism based on the SCEF, it is difficult to determine reporting levels and its effectiveness in driving decarbonisation.

Local government

There is no mandatory requirement for local governments to report on their GHG emissions. However, several tools have been developed and made available to local authorities to calculate GHG emissions. These tools can largely be differentiated as entity-based and area-based. Entity-based tools – such as the Local Partnerships Greenhouse Gas Accounting (LGA) tool – provide a consistent approach for local authorities to calculate emissions associated with their operations and finances. The tool **helps local authorities identify their main sources of emissions and how certain interventions would impact on their emissions over time**. In a survey conducted by the Local Government Association¹⁵, it was found that most local authorities measure their carbon emissions and have official targets for net zero or carbon neutrality. They valued the climate change support provided but still faced a range of challenges in implementing climate change interventions, including the lack of resources and staff capacity, the lack of funding or short-term funding cycles, and the lack of clarity on goals and instructions to implement climate change related projects.

Setting City Area Targets and Trajectories for Emissions Reduction (SCATTER) is an area-based tool that aligns with the GHGP for Cities and the Global Covenant of Mayors Common Reporting Framework. The tool uses territorial boundaries for emissions reporting. **The aim is to help local authorities identify main sources of emissions in their area, which in turn help inform areas and stakeholders to focus their interventions and reduce emissions.**

Through the use of a standardised tool, SCATTER also enables local authorities to assess their GHG sources in a consistent and comparable way. Additional focus is placed

¹⁴ [The Cost of Net Zero](#)

¹⁵ [Local Government Association \(2022\) Climate Change Survey 2021](#)

on waste management, which is the key concern of emissions for local authorities. The measurements are in line with the GHGP for Cities enabling reporting to the Carbon Disclosure Project (CDP), which facilitates global benchmarking and comparison. SCATTER also enables other analysis systems – such as the Impact Community Carbon Calculator – to assist in describing and visualising emissions for a local area. A further tool of SCATTER pathways can be used in conjunction with this reporting to enable development of strategies and targets that are bespoke to the emission sources from the local authority. **These emissions strategies and targets can be provided to the public or other bodies requesting this information, increasing local authority accountability.**

Devolved nations

In Scotland, public sector reporting of Scope 1 and 2 emissions were made mandatory in 2015. For Scope 3 emissions, “relevant and significant”¹⁶ emissions should be reported and over time, public sector bodies are expected to report Scope 3 emissions as fully as possible. Sustainable Scotland Network (SSN) has created a tool and supporting guidance documents for measuring and reporting public sector emissions. Scottish Government has committed to be net zero by 2045 but requires individual public bodies to develop their own emissions reduction targets and report against them.

The SSN provides a tool to enable consistent and comparable reporting of GHG emissions. The tool also has sections on targets, strategies, verification procedures, and wider impacts. **The reporting framework enables centralised assessment of public sector emissions and identification of sources of emissions at the national level to help with policy making.** Peer review of reporting is also suggested, which enables similar organisations to learn from each other. **The overall result of the framework is one enabling accountability, transparency, bespoke self-generated targets and strategy based on risk and opportunity assessments.** GHG emissions reduction strategies can be reported against their previous iterations and adjusted appropriately. The latest Public Bodies Climate Change Reporting 2021/22 reported 38,500tCO₂e of savings as a result of carbon-reduction projects, but an overall increase in Scope 1 and 2 emissions as compared to the previous year – due to both rebound from COVID-19 pandemic and expanded reporting to include medical gases and refrigerants.

Public sector reporting is not mandatory in Wales or Northern Ireland. Wales has set a target to reach net zero emissions in its public sector by 2030 but does not mandate public bodies to develop or report their own targets. They have developed the Welsh Public Sector Net Zero Reporting Guide for use by Welsh public bodies **to estimate annual emissions, identify priority sources and to track progress towards the collective net zero public sector by 2030.** In addition to the guidance document, an Excel tool is also provided for emissions reporting by their public sector bodies to facilitate **standardised and comparable emissions reporting.** Public sector recommendations for carbon reduction are generated from the

¹⁶ “Any categories 1% of overall emissions can be treated as de minimis” as stated in [Scottish Government \(2021\) Public sector leadership on the global climate emergency: guidance](#)

Emissions measurement and reporting approaches for the public sector

reported data by Welsh Government. They use the data they collect as part of their evidence-based approach to making policy decisions, as well as to track their decarbonisation progress.

The information request for the Welsh carbon-reporting spreadsheet incorporates Scope 1, 2 and four key categories within Scope 3 (supply chain, waste, business travel and employee commuting, and homeworking). In addition, the Welsh framework also incorporates land use, enabling potential for carbon sequestration to be reported. Unlike the Scottish system, Welsh carbon reporting does not require targets or strategies to be generated or provided. Welsh Government has dedicated resource to help public organisations in measuring and reporting their emissions accurately. Despite being non-mandatory, Welsh Government reports that 100% of public sector organisations report to this framework.

In Northern Ireland, there is a target of 82% reduction in national emissions between 2021 and 2050 and work is still ongoing for establishing a system for reporting against targets and carbon budgets.

Private sector

Private sector frameworks were also reviewed to provide a comprehensive view of the different emissions reporting approaches within the UK and surrounding economic region, generating insights into best practices, common challenges, and potential areas for improvement that could be relevant to the public sector emissions reporting.

Streamlined Energy and Carbon Reporting (SECR)

SECR mandates energy and emissions reporting from quoted UK companies¹⁷ or categorised as "large" under the Companies Act 2006. It aims to **raise awareness of energy costs and carbon emissions, especially for key decision-makers**. SECR reporting forms part of the Annual Report that must be provided to Companies House registrar. There is no requirement for developing emissions reduction targets or strategies, but **public reporting within companies' annual reports enhances transparency for investors, which in turn could drive continual performance improvement**.

The last review of SECR in 2021 found some challenges in making SECR disclosures understandable and relevant to users. A post-implementation review of the current SECR framework is scheduled for 2024.

The Energy Saving Opportunity Scheme (ESOS)

ESOS was introduced in 2014 to address a finding of the 2012 UK Energy Efficiency Strategy, which surmised that the lack of information was a key barrier to the uptake of energy efficiency measures by businesses. ESOS requires reporting of energy related usage by UK industries which meet one or both of the following criteria:

¹⁷ Companies that have their equity listed in a public exchange in the UK, EU regulated markets or US (NASDAQ or NYSE).

Emissions measurement and reporting approaches for the public sector

- have an annual turnover exceeding £44 million and an annual balance sheet total exceeding £38 million,
- employ 250 or more people, regardless of working hours and domicile.

ESOS has currently entered phase 3 with additional changes and requirements at each phase.

ESOS aims to **provide large energy users information on tailored and cost-effective actions they can take to save energy**. Information collected on how much energy an organisation uses is to ensure that all energy use is covered in the energy audit. The scheme collects and publishes data from reporting organisations on energy-saving actions that have been identified, how much energy these actions could save, and whether they have been implemented, with the aim of encouraging organisations to take the actions identified. The new action plan function encourages organisations to make a public commitment to save energy and report against their progress. This aims to move participants from information to action, whilst not actually making taking action a legal requirement.

Previous evaluations of ESOS found organisations under the scheme making energy or fuel efficiency related improvements, but only a minority of organisations reported improvements or savings directly attributable to ESOS.^{18 19} It is also important to recognise that ESOS operates within a broader context of other regulatory frameworks – including Climate Change Agreements (CCA) and SECR – which collectively aim to promote energy efficiency and reduce GHG emissions. The focus on energy also means ESOS offers less potential for broader GHG reduction strategies, such as reducing fugitive or Scope 3 emissions.

EU's Corporate Sustainability Reporting Directive (CSRD)

CSRD is a new EU directive that mandates companies of specific types or exceeding a certain size²⁰ to report on their carbon emissions, wider environmental impacts, and their plans to address risks and opportunities arising, using European Sustainability Reporting Standards (ESRS). Some companies in the UK with securities admitted to trading on EU regulated markets or significant operations in the EU will also be required to report under CSRD.

CSRD reporting requirements aim to enable investors and other stakeholders to understand financial materiality and impact materiality (i.e. the material impacts of an entity on people and environment). The CSRD has the most far-reaching requirements of any mandatory reporting framework. Under CSRD, organisations are required to undertake scenario analysis to derive strategies and targets that are aligned to limiting global warming to

¹⁸ [Evaluation of the Energy Savings Opportunity Scheme: Interim process and early impact evaluation report](#)

¹⁹ [Research on energy audits and reporting, including the Energy Savings Opportunity Scheme \(ESOS\): Phase 2 final report](#)

²⁰ Companies already reporting under the NFRD to start reporting for 2024 fiscal year for publication in 2025. Large EU registered companies not previously subject to NFRD to start reporting for 2025 fiscal year for publication in 2026. SMEs listed on EU markets meeting two of the criteria: >250 employees, >EUR40 million turnover, or >EUR20 million assets, to start reporting for 2026 fiscal year, for publication between 2027 and 2029. Non-EU entities with significant EU operations to start reporting for 2028 fiscal year for publication in 2029.

1.5°C. This should eventually be complemented by the Corporate Sustainability Due Diligence Directive (CSDDD).²¹

The CSRD thus holds the highest regulatory burden for reporting. The mandated implementation is phased to enable a market of third-party verification to develop and mature before smaller organisations must comply. It will also expand its reach to organisations outside the EU over time – with mandates for international organisations that engage in business within the EU – thus making reporting a precondition for accessing its market. The first set of companies – large EU companies that are already under the existing Non-Financial Reporting Directive (NFRD) – must begin data collection in the 2024 financial year, for reports to be published in 2025.

Carbon Border Adjustment Mechanism (CBAM)

CBAM will be introduced in the UK by 2027. Reporting to CBAM has been implemented in the EU since 2023. Tariffs dependent upon the reported emissions will be implemented by the EU from 2026. It requires importers of cement, aluminium, fertilisers, iron, steel, hydrogen and electricity to register with their national authority and purchase CBAM certificates for these goods. These certificates will be priced weekly and attribute a carbon price to the goods imported into the EU. Organisations are required to report three categories of emissions (embedded, direct and precursor) and must report the quantity, quality and emissions for these imported goods.

To enable comparable coverage with the UK Emissions Trading Scheme, UK CBAM will apply to Scope 1 and 2, as well as selected embedded emissions from precursor goods.

Both UK and EU CBAMs are designed to enable transparency of carbon emissions associated with imported emission intensive products and tackle the issue around carbon leakage, whereby industrial carbon emissions are not reported when generated outside the region. **Under these schemes, companies will be required to report the emissions and eventually pay a carbon tariff associated with their goods to gain access to a regional market.** Given the nascent stage of its implementation, it's too early to ascertain the effectiveness of CBAMs in reducing carbon leakage.

The International Financial Reporting Standards Foundation (IFRS Foundation) Sustainability Disclosure Standards (SDS)

The IFRS Foundation hosts two standard setting boards:

- International Accounting Standards Board (IASB), which issues IFRS Accounting Standards,
- International Sustainability Standards Board (ISSB), which issues IFRS Sustainability Disclosure Standards (SDS).

²¹ [EU \(2022\) Corporate sustainability due diligence: Fostering sustainability in corporate governance and management system](#)

IFRS SDS, are international standards created to meet investors' demand for sustainability reporting. The standards build on the work of investor-focused reporting initiatives such as the Climate Disclosure Standards Board (CDSB), the Sustainability Accounting Standards Board (SASB), and the TCFD, which are all now consolidated into the IFRS Foundation. In the UK, work is also underway to create UK Sustainability Disclosure Standards (UK SDS), which will set out corporate disclosures on the sustainability-related risks and opportunities, based on IFRS SDS.²²

IFRS S2 Climate-related Disclosures outlines comprehensive reporting of Scope 1, 2 and 3 emissions, where methods used in identifying these emissions must be disclosed. Within Scope 3, organisations are required to consider all 15 categories of Scope 3 emissions and report emissions which are deemed material to their operation. Where carbon credits are used, they must be third-party verified. IFRS S2 also requires scenario analysis, and (where applicable) transition plans and targets.

IFRS SDS aims to build transparency, integrity and accountability – use of the standards should positively **enable access to capital, improve the business reputation and stakeholder engagement**. The standards should also help organisations to better understand their potential climate-related risks and opportunities. It is difficult to assess the effectiveness of the IFRS SDS as they require individual jurisdictions to mandate their use, and no reporting has been produced to date.

International Organisation for Standardisation (ISO)

The ISO prepares and distributes standards which any organisation can adopt and report against. Organisations voluntarily report under ISO standards to follow best practice and demonstrate credibility. The ISO standards most relevant to emissions reporting include the ISO 14060 family, which is designed to help organisations measure their GHGs, and ISO 50001, which has a focus on energy performance to help organisations increase energy efficiency and reduce GHG emissions. **Voluntary compliance within these standards is largely driven by an organisation's desire to demonstrate compliance with best practice, improve reputation, and/or to gain access to a procurement market.**

Aside from research conducted by Antaris Consulting in 2013 to explore the adoption rate of UK reporting standards – which showed increased organisational engagement with ISO 50001 – information related to the effectiveness of ISO standards is not readily available.

Mechanisms by which public sector emissions reporting lead to decarbonisation

A key focus of this research has been understanding the mechanisms through which emissions reporting leads to change, which in turn drives decarbonisation actions and contributes to GHG emissions reduction. Based on findings from both the systematic review and expert interviews, the main mechanisms underlying how emissions reporting leads to

²² [Department for Business and Trade \(2023\) UK Sustainability Disclosure Standards Guidance](#)

decarbonisation actions within the public sector and beyond are identified and discussed in this section.

Mechanisms that facilitate decarbonisation within the reporting public organisation

Emissions measurement is often viewed as the first step towards decarbonisation by **enabling awareness of emissions levels**. “*You can’t reduce [or manage] what you don’t measure*” is a common phrase quoted by interviewees. However, enabling awareness may not always lead to actions to reduce emissions. All emissions reporting frameworks, to a certain extent, rely on **enhancing transparency and creating accountability** – whether to the government, their investors or funders, or the general public – as the route to drive change and decarbonisation actions: “*the view has always been and continues to be, public disclosure of emissions leads to a faster reduction in emissions, because of that transparency, in terms of an organisation’s performance.*”

Within the public sector, external disclosure of an organisation’s emissions – whether to meet regulatory requirements (e.g. GGCs and Scotland’s public bodies reporting framework) or on a voluntary basis to demonstrate climate leadership – creates accountability which in turn drives organisations to decarbonise. Some public sector organisations, such as local authorities and HE or FE institutions, voluntarily disclose their emissions as a way to communicate their climate performance to potential funders and other stakeholders. One interviewee stated that their local authority voluntarily reports to CDP cities, regions and states to attract private investments to fund projects in their region. Another example is SCEF that is sector-led, which enables HE and FE to demonstrate their green credentials to potential funders and students (**gaining access to funding**).

According to the interviewees, emissions reporting is a useful tool for **operational management to increase efficiency and reduce emissions**. Through mapping emissions sources and identifying emissions hotspots, emissions reporting enables decarbonisation actions through informing decisions on where to focus decarbonisation efforts. “*It is not so much about the reporting as a goal in itself*” but as a mechanism to shed light on the areas which they could improve on and promote actions in the right direction.

Another way of enabling actions is the use of emissions reporting for **communication internally with decision-makers and stakeholders to drive actions**. Emissions reporting provides a basis for engagement with internal stakeholders, including the board members and decision-makers to take decarbonisation actions. The use of recognised reporting frameworks or standards helps to assure the emission data.

Mechanisms at the government level that facilitate decarbonisation

At the government level, emission data provided by public sector organisations through GGCs and Scotland and Wales public sector emissions reporting is used to track progress towards targets. In addition, emissions information gathered by government frameworks, if utilised effectively to **inform policy or funding decisions**, can accelerate decarbonisation. For example, if reporting reveals road transport as a main source of emissions, improving public

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transport systems would reduce the number of car journeys and the associated emissions. Demonstrating effective use of emission data by the regulating body to inform decisions will promote buy-in and efforts to improve emissions reporting among reporting bodies.

Area-based emissions reporting for local authorities – such as SCATTER and CDP cities, regions and states – can inform local-level decarbonisation interventions. One interviewee noted that area-based reporting frameworks recognise that local authorities do not have direct control over emissions in their area, but they can play a role in influencing emissions in their local area through policy making, engaging key emitters in their area and facilitating collaboration to reduce emissions: *“It is about pushing local authorities to have the maximum impact they can, and that means understanding the areas that they don't have direct control over, but understanding what levers they can use to address those areas”*.

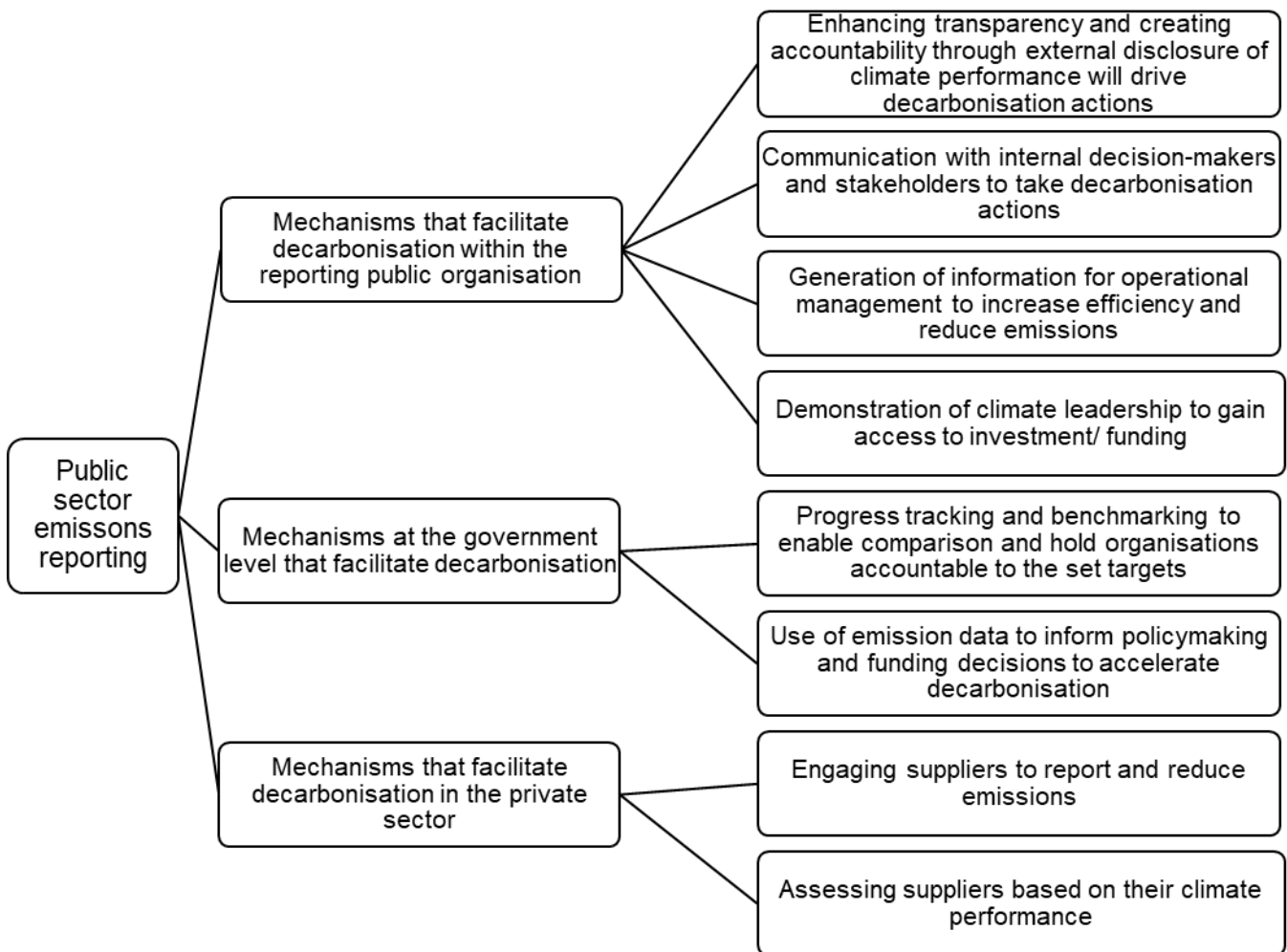
Mechanisms that facilitate decarbonisation in the private sector

It is also well recognised that the public sector is in a unique position to influence emissions beyond its own operational emissions, both given the regulatory powers held by some organisations, and because of the extent of public spending and supply chains: Through reporting of their Scope 3 emissions, public sector organisations can **identify and engage key suppliers to reduce emissions**. This approach can be most effective at-scale, employed either by the largest organisations with the most purchasing power and supply-chain influence, or through joint action and co-ordination.

There's an increasing expectation for private sector companies to disclose their emissions if they want to **tap into government contracts, fostering competition and incentivising the private sector to cut emissions**. Use of official emissions reporting frameworks or internationally recognised standards – such as TCFD or ISO – will enable private sector companies to demonstrate their climate performance in a robust and credible way.

An overview of how emissions reporting within the public sector can drive decarbonisation is depicted in Figure 0-1.

Figure 0-1: Mechanisms by which public sector emissions reporting facilitate decarbonisation actions



Effectiveness of public sector emissions reporting in driving decarbonisation

In this section, the effectiveness of emissions reporting in driving decarbonisation efforts was assessed through evidence generated from the systematic review and insights from the expert interviews.

Emissions reporting frameworks and decarbonisation outcomes

A key focus of this research has been to explore whether different reporting frameworks lead to different decarbonisation outcomes. The general feedback from expert interviews was that there is no direct link between specific reporting frameworks and decarbonisation outcomes. With the exception of ESOS, which aims to drive energy efficiency, most frameworks are not explicitly designed to drive specific decarbonisation outcomes.

For many organisations, the onset of measuring and reporting emissions stems from regulatory requirements or their voluntary commitment to address emissions. In most cases, they do not “shop around” for reporting frameworks to comply with. Rather, they have been requested to report towards a specific framework (such as GGCs, SECR or CSRD if they want to operate in

EU). Or if voluntary, they will choose the framework that aligns with their specific context, such as a framework tailored for local authorities (LGA or SCATTER) or educational institutions (SCEF). It therefore falls upon the design of the emissions reporting framework or guidance to steer toward particular results.

The pivotal role of emissions reporting as the first step to an organisation's decarbonisation journey is evident. Whilst the emissions data that is reported to a framework is generally at an aggregated organisation level, in order to do this most organisations collect information at a more granular level (bottom-up) to arrive at the aggregated organisation-level emissions. Through this process, organisations gain an understanding of their emissions, enabling them to identify hotspots to focus decarbonisation efforts.

One interviewee commented that through emissions reporting, they have identified supply chain and travel as the main sources of their emissions, prompting targeted decarbonisation efforts in those areas. In comparison, emissions from water and waste were minimal in comparison, though measures to reduce them remain for conservation purposes. Overall, decarbonisation outcomes depend on a number of factors, including the nature of the organisation's operation and their capability to decarbonise, rather than the emissions reporting framework that they use.

Attributing decarbonisation outcomes to emissions reporting

The effectiveness of emissions reporting in driving decarbonisation efforts through the mechanisms theorised above were also assessed. As previously discussed, enhanced transparency and creating accountability regarding an organisation's climate impacts is the primary pathway through which emissions reporting drives actions to decarbonise. While GGCs annual reports indicated emissions reduction as a result of public organisations' efforts to decarbonise, it's difficult to assess the extent to which GHG emissions reduction was attributable to the reporting framework. This is similar for ESOS, where only a minority of organisations reported energy efficiency improvements or savings directly attributable to the framework. It is also important to recognise that these reporting frameworks operate within a broader context of other regulatory frameworks, and therefore it is challenging to isolate the effect of emissions reporting in driving decarbonisation.

Expert interviews also highlighted the challenge of attributing specific climate mitigation actions to emissions reporting; they reported other factors also come into play – such as regulations, technological development and funding. However, some interviewees were able to provide examples of emissions reporting enabling them to map their emissions and identify hotspots, which led to them taking actions, such as installation of low-carbon heating to reduce estate emissions, procurement of electric vehicles to reduce fleet emissions, and improved waste management to reduce waste related emissions. This validates the theory that emissions reporting supports organisations in managing their emissions and informing their decisions on where to focus decarbonisation efforts.

While some interviewees reported using emissions reporting as a tool for progress tracking, others expressed reservations due to the limitations associated with the current approaches to emissions measurement (which is discussed further in the next section). For example, some

interviewees commented that most emission savings in the recent years are the result of grid decarbonisation rather than organisation-level actions. Use of energy intensity or consumption information for progress tracking will be more reflective of the organisation's efforts in improving energy efficiency. Comparing against a baseline where data collection and data quality are improving also makes it difficult to track progress. Some interviewees reported that as they got better at data collection, they discovered quite a few gaps in their baselines, and some have gone back to re-baseline. Scotland's Public Bodies Climate Change Reporting 2021/22 showed an increase in Scope 1 and 2 emissions, partly attributed to expanded reporting scope to include medical gases and refrigerants. Relying solely on emission data to gauge progress is therefore inadequate – emissions reporting should include narratives to effectively communicate the figures.

At government level, there is limited evidence from this research, which focussed on frameworks aimed at organisations, of how the governments use emission data beyond reporting purposes, such as to hold public bodies accountable for their performance or to inform policy that drives decarbonisation.²³ One interviewee noted that the primary aims of GGCs reporting have been being accountable to Parliament and transparent to the public, although more can be done to use the information for informing policy. To enable this, further efforts, such as redesigning the data collection tool or data presentation, are needed to enable disaggregation of data for deeper insights to inform targeted intervention.

Factors that can influence effectiveness of emissions reporting

Overall, the effectiveness of emissions reporting in driving decarbonisation actions is inconclusive. Nevertheless, it is clear that emissions measurement and reporting form the first step to an organisation's decarbonisation journey, bringing to light their emissions levels and sources, and informing internal decision-making to decarbonise.

This research found there are a number of ways in which the effectiveness of emissions reporting in driving decarbonisation actions can be influenced or enhanced. **Contextualisation of emission data through association with saving opportunities and climate risks** can incentivise actions. Some private sector reporting frameworks, such as SECR and ESOS, incentivise decarbonisation actions by drawing focus to efficiency gains and financial savings. For example, under ESOS, emissions are not reported directly; instead the potential is presented as financial and efficiency savings offered by energy-use reduction to incentivise actions. In the financial sector, reporting also places emphasis on climate risks and opportunities – such as TCFD and IFRS SDS – to enable organisations to better understand them and account for them in their decision-making. Highlighting cost-saving opportunities, or conversely the risks of inactions, could both be effective ways to incentivise decarbonisation actions.

Another way of contextualisation is **benchmarking**, which requires consistent and comparable emissions reporting. Currently, there is disparity in emissions measurement and reporting across organisations and frameworks, resulting in limited comparability. Enhanced peer-to-peer comparison enables cross-learning and promotes continuous improvement. One

²³ [National Audit Office \(2022\) Measuring and reporting public sector greenhouse gas emissions](#)

interviewee reported that improving their council’s Climate Plan Scorecard²⁴ motivated them to increase efforts in measuring and reporting their emissions as the first step to their decarbonisation journey. Both SCEF and CDP cities, regions and states, also use benchmarking to facilitate peer-to-peer comparison and promote continuous improvement.

Interviewees highlighted the importance of providing their senior leadership teams with emissions reporting underlined by robust data and methodology, to give them confidence in the emission data and get their buy-in to take actions. **Increased credibility** can arise from verification processes, whether they be disclosed internal governance methods for generating the reports, or peer review by similar organisations which can also spread best practice techniques. A final option, as required by the CSRD, is assurance provided by a third party. Disclosure of emission data and reports to the public or government that are credible and can stand up to scrutiny is important to manage reputational risk.

There is also the **requirement to set emission reduction targets or transition plans** and progress reporting against the set targets or plans, which creates accountability and drives organisations to undertake decarbonisation actions. Many reporting frameworks require reporting entities to set emissions reduction targets and strategies, as outlined in the following Table 3. However, setting targets that are ambitious and realistic could be a complex and expensive exercise, and for many public organisations, they may not have the capability or resource to do this. A common view among interviewees was that many organisations are setting targets without understanding how they are going to achieve them, or setting targets without having a detailed plan in place to deliver decarbonisation projects or explain how these projects will be funded. Nevertheless, interviewees felt it is important to set targets as it gives organisations a “*flag to work to*” and drives people to take actions.

Table 3: Target-setting requirements of reporting frameworks

Target-setting requirement	Frameworks
Provide high-level, long-term targets such as net zero by 2050 or maintaining a global warming temperature of 1.5°C or less	GGCs, NHS, Scottish Government, Welsh Government, CSRD
Define lower-level targets for reporting bodies	GGCs, NHS (non-emissions based targets such as reducing desflurane to <10% or targets for transitioning to low and ultra-low emissions vehicles)
Require the reporting bodies to set their own targets	ESOS, NHS, Scottish Government, CSRD, IFRS SDS

²⁴ [Climate Emergency UK assesses councils across the UK and scores them based on the actions they have taken towards net zero](#)

Provide detailed guides or tools to enable reporting bodies to develop their own strategies and targets	LGA, SCATTER, SCEF, Scottish Government
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Follow-on support or engagement by the body that sets the framework with the reporting bodies to empower them to undertake decarbonisation actions. Engagement with the reporting organisations can increase effectiveness. *“Reporting is always problematic because you’re asking them to do lots of things and they don’t necessarily get very much out of it.”* Instead of reporting for the sake of reporting, emissions reporting should support and facilitate actions by providing something tangible back to reporting organisations, so that they can take action. Some emissions reporting frameworks, such as SCEF and SCATTER, provide further guidance or tools to enable reporting organisations to take actions and reduce their emissions.

Follow-on guidance or tools will be particularly beneficial for small public sector organisations that lack the capability to decarbonise. One interviewee noted that small organisations are often able to make decisions and implement measures faster, especially given that they have higher proportion of Scope 1 and 2 emissions, in comparison to their Scope 3 emissions. The interviewee also remarked that despite the differences between sectors, many initial steps towards decarbonisation, or the *“low hanging fruits”* are often similar across organisations, such as implementing energy efficiency measures, switching to renewable energy sources and reducing business travel through transport hierarchy. Therefore, provision of follow-on guidance on implementing these measures will support small organisations in their decarbonisation journey.

It is also worth noting that there are numerous resources available to support organisations decarbonise. However, organisations may not be aware of them (for example, the local authorities interviewed for this research were not aware of the resources provided by Energy Systems Catapult that is tailored for local authorities²⁵), necessitating more effective signposting rather than creating new resources.

Emissions measurement approaches

This section outlines the range of emissions measurement approaches and views of experts on the different approaches, including their effectiveness or limitations in driving decarbonisation actions. Based on findings from both the systematic review and expert interviews, key challenges associated with the current emissions measurement approaches have been identified.

²⁵ [Energy Systems Catapult: Accelerating local authorities to Net Zero](#)

Overview of measurement approaches

Generalised measurement methods for greenhouse gas emissions

The main approaches to measuring GHG emissions are:

Direct measurement involves monitoring of flowrate or concentration of the emissions (e.g. direct monitoring of flue gas) or the source of emissions (e.g. the quantity of fuel burned) using submeters. This methodology utilises aspects of direct detection and combines them with other sources of information to provide a more accurate measurement of emissions. An example of direct measurement is direct fuel usage on site, which can be directly measured and converted to emissions using the fuel emission factor. This method is more accurate as the direct amount of fuel burned is known and this should directly correlate with the amount of GHGs emitted.

This method is similar to measuring the release of fugitive gases. For example, the measurement of refrigerant released into the atmosphere is assumed to be the same amount as the air coolant dropped, which needs to be topped up. Another example, which involves a greater level of assumptions, relates to release of methane gas from pipelines, whereby the volume escaping the whole pipeline is estimated from the pressure changes from one end of the pipeline to the other.

Estimation using average emission factors is where conversion factors – such as emissions per unit expenditure, or per unit energy consumption – are used to allow simple estimation of emissions. This approach utilises activity data and national or sectoral emission averages to estimate emissions. The use of average emission factors thus has resulted in rough estimations of emissions. An example of this could be market-based analysis of the grid for generating emissions based upon electricity usage, or spend-based value chain assessment whereby average emissions for turnover are attributed to average businesses within a specific sector. This is most similar to indirect/average means of measurement.

This method is easier to implement due to lower data requirements. However, its dependence on averages can lead to discrepancies with the specific characteristics of the organisation being analysed. For indirect energy usage, such as electricity, an organisation could combine the kWh used with an average of the emissions from a national or local grid to calculate emissions. However, using the average emissions of the grid introduces errors. For example, if the energy is used at peak times, it is more GHG intensive than if the same amount of energy is used during off-peak time. This difference in GHG emissions from the grid based on the time of usage cannot be easily accounted for by the reporting organisation.

Research found that using average emission factors produce notably consistent estimations for Scope 1 emissions, but the consistency reduces when estimating Scope 2 emissions, and even more significantly for estimating Scope 3 emissions.²⁶ This is likely to stem from the use of different estimation methods, which are not transparently disclosed by the data providers.

²⁶ [Corporate carbon performance data: Quo vadis?](#)

Emissions measurement and reporting approaches for the public sector

The study emphasises the importance of transparency in disclosing emissions estimation methods and encourages organisations to adopt a more standardised approach.

A key risk associated with this approach as identified from the systematic review is the reliance of the vast majority of reporting schemes on emission factors. This leads to a sector which is heavily reliant on the accuracy of these factors, as well as consistent application of these factors across different reporting frameworks. Some interviewees noted Defra emissions conversion factors as the go to, but the database is lacking coverage, especially for Scope 3. A range of private sector databases have been developed to meet demand, but use of these databases may entail a cost.

There is a potential for the government to better utilise emission data collected from reporting bodies to improve Scope 3 emissions measurement. An example is utilising the emission data gathered under a framework such as SECR to generate spend metrics for specific companies that report their Scope 1 and 2 emissions vs their turnover. This could enable derivation of a spend metric specific to each of the reporting companies under SECR. CDP is already undertaking this approach, but they charge a fee for verifying emission data. Utilisation of SECR data could also enable more accurate spend metrics for companies which are not reporting to SECR, by leveraging averages derived from the framework's emission data and adjusting them as needed.

A hybrid approach can also be used whereby specific data is used when available, and when not, less demanding methods are employed. For example, in the case of purchased goods and services, a hybrid approach to identifying the GHG emissions from purchasing products or services from an entity, would be to account for a spend-based ratio of their Scope 1 and 2 emissions.

Modelling of emissions generation can be an effective means for understanding emissions. In this instance, there is a distinction between modelling and estimation using average emission factor, whereby in a model, there is more than one factor that affects the data output. In the modelling approach, there should be continual improvement and re-assessment, but more importantly effective use of entity- or site-specific data, such as financial information, number of occupants, distance of travel. The use of entity- or site-specific data can improve the quality of the models, as compared to utilisation of generic or average data multiplied with the emission factors.

Modelling is a common approach used at a high level of calculating emissions. This approach can be used when large amounts of data are available on a variety of variable and factors. It enables more entity-specific estimation of GHG emissions based upon these variables. It can also be used as a prediction tool in identifying how assumed changes within these variables may affect GHG emissions in the future and create a more evidence-based emission reduction strategy. Furthermore, it can also be used on historical data prior to the existence of the model to estimate historical emissions. The modelling approach enables a broader array of emissions to be calculated from less direct or resource-intensive means of data gathering.

The NHS has utilised models effectively to estimate their own emissions over a very broad range of emission sources. The top-down modelling approach does not replace the bottom-up approach of counting specific emission-producing activities but fills in any gaps in emissions reporting that cannot be measured. The report “Delivering a ‘Net Zero’ National Health Service”²⁷, discusses the modelling methods used and illustrates how they have used models to calculate emissions more accurately back to the 1990s.

The “Impact community carbon calculator” demonstrates a clear example of how modelling can draw on many different sources to estimate emissions for specific regions beyond what is directly reported by organisations within the area. The accompanied method paper describes how the model generates emission estimates based upon aggregations and analysis of a wide variety of inputs.²⁸

Accuracy and precision

Measurement of GHG emissions is a complex task. To truly measure GHG emissions, a meter for each type of GHG needs to be placed upon each GHG source; even then the true value will still be within a set of uncertainties as defined by the precision of the meter itself. The accuracy of an estimate is how close the estimated value is to the true value, but additional calculations to identify precision can provide useful information which defines error margins to understand how close the estimated value is to the true value.

This true value is also an adjustable concept which is defined by boundaries set for encapsulating what is being measured. Within GHG emissions measurement, a standard for defining the boundaries is which emission scopes are of interest, whereby an organisation may define the boundaries as full measurement of Scope 1 and 2, alongside Scope 3 categories for waste, business travel and employee commuting. Under these defined boundaries, various measurement approaches as discussed above can be utilised to calculate the associated emissions, depending on data availability and quality.

As a means for evaluating the precision of specific methods utilised in measuring emissions, the GHGP offers a framework.²⁹ They suggest a “pedigree matrix” which considers factors like completeness, temporal and geographical representativeness, technological representativeness and data precision (specific to the data source, i.e. how to how many figures are you measuring). Each factor receives a qualitative score (Very Good, Good, Fair, or Poor), which then gets assigned a value within the pedigree matrix. Through various mathematical techniques (e.g. Monte Carlo simulations or Taylor series expansions), an overall data quality assessment can be provided for specific data points. The result is that an applied measurement can be given a quality score with a corresponding estimate of uncertainty for a final emissions value generated from the specific data. As there is mathematical knowledge necessary to undergo an assessment such as this, the burden this methodology puts on individual reporting entities might be excessive. However, this could be a means by which measurement methodologies suggested within a framework can be given a

²⁷ [NHS \(2020\) Delivering a ‘Net Zero’ National Health Service](#)

²⁸ [Centre for Sustainable Energy: Impact Tool Method Paper](#)

²⁹ [Quantitative Inventory Uncertainty](#)

defined value of precision – potentially leading to a tiered system of reporting, where a variety of methods are provided alongside an estimate of precision given to each method.

Tiered system for assessing data quality

Most frameworks reviewed in this research do not explicitly specify acceptable data sources for emissions measurement, except when a tool is provided that requires inputting data compatible with its calculation methods. However, many frameworks include a more granular data-point quality assessment.

To accommodate for the different approaches to calculating emissions, while assessing their precision, some more recently developed frameworks use tiered systems to evaluate the precision of the reported data. The SCEF reporting system provides a tiered listing of how to measure emissions ranging from “Advanced level: Best-in-class calculation methodology” to “Basic level: lower-accuracy [precision] calculation methodology”. This specific section of the guide covers Scope 1 to 3 and can be found within SCEF guidance.³⁰ Whilst this guidance provides a very user-friendly set of procedures for identifying emissions from a wide variety of sources, it does not provide clear values of precision associated with these methods.

The Welsh government’s system for reporting GHG emissions also utilises a tier-based approach, giving the reporting organisation multiple means of estimating their emissions, much like the SCEF system. However, the “Welsh public sector net zero reporting guide version 3” provides estimated values of precision. When reporting the emission data, the reporting organisation must also describe the methodology/tier used to estimate the data. Thus, a final estimate of uncertainty/precision can be established for each of the reported emissions and the total value of emissions as a whole. Due to the inclusion of precision estimates attached to each method, this method of reporting is a highly effective means by which the data provided can be assessed for accuracy.

The tiered approach in requesting information to be reported fosters an understanding of how to improve data quality while enabling organisations to quickly and easily assess their data quality, as long as the quality tiers are adequately defined within the reporting guideline. Furthermore, these tier systems help point towards where reporting organisations can gather data, allowing them to choose the appropriate dataset based on their available resources.

Some organisations might be able to develop more precise methods for emissions measurement or reduce resource burdens while maintaining similar accuracy. Therefore, overly restrictive regulations could stifle innovation in this evolving sector. While tiered systems are a highly valuable tool, some leeway should be given for alternative methodologies, provided that they are transparently described.

³⁰ [The Alliance for Sustainability Leadership in Education: Standardised Carbon Emissions Reporting Framework, version 3.0](#)

Mapping of emissions measurement approaches to reporting frameworks

This section outlines how the different measurement approaches enable different reporting frameworks. Table 4 and Table 5 summarise the different emissions measurement approaches and reporting frameworks for the public and private sectors, respectively.

Table 4: UK Public sector frameworks

Reporting framework	Reporting bodies and pathway	Data granularity and reporting frequency	Measurement approach and breadth	Reporting tool and conversion factors	Verification requirement
GGCs ³¹	Bottom-up reporting by government departments and agencies	Required organisation-level reporting, on a quarterly and annual basis	In line with GHGP Scope 1 and 2: Required Scope 3: Business travel is required; other emissions are encouraged	Data input tool provided Utilise Defra GHG reporting conversion factors	Internal verification and checks by the receiver of the information
HM Treasury SRG	Bottom-up reporting by government departments	Mandated annual, organisation-level reporting	In line with GHGP Scope 1 and 2: Mandated Scope 3: Business travel is mandated; other emissions are encouraged	Data input tool not provided Utilise Defra GHG reporting conversion factors	Internal verification and checks by the receiver of the information
LGA	Bottom-up reporting by	Voluntary organisation-level reporting	In line with GHGP for cities	Data input tool provided	Not required

³¹ Fourth phase of GGC will commence in 2026; reporting scope is therefore subject to change.

Emissions measurement and reporting approaches for the public sector

Reporting framework	Reporting bodies and pathway	Data granularity and reporting frequency	Measurement approach and breadth	Reporting tool and conversion factors	Verification requirement
	local authorities		Scope 1, 2, and 3: Voluntary	Utilise Defra GHG reporting conversion factors	
SCATTER	Bottom-up reporting by local authorities	Voluntary area-based reporting	In line with GHGP for cities Scope 1, 2, and 3: Voluntary	Data input tool provided Utilise Defra GHG reporting conversion factors	Not required
Greener NHS	NHS using a combination of bottom-up reporting of measured data and top-down modelling	Pre-existing mandatory data collection, plus additional voluntary data collection and data collected directly from suppliers utilised for national modelling of emissions.	In line with GHGP Scope 1, 2 and partial Scope 3	Emissions are calculated nationally, but data collection tools are used for ERIC to collect data such as waste volumes and energy consumption	Not required
SCEF	Bottom-up reporting by universities and colleges	Voluntary organisation-level reporting	In line with GHGP Scope 1, 2, and 3: Voluntary	Data input tool not provided Utilise Defra GHG reporting	Not required

Emissions measurement and reporting approaches for the public sector

Reporting framework	Reporting bodies and pathway	Data granularity and reporting frequency	Measurement approach and breadth	Reporting tool and conversion factors	Verification requirement
				conversion factors if within the UK; IEA is suggested for outside of the UK	
Scottish public sector emissions reporting framework	Bottom-up reporting by Scottish public bodies	Mandated annual organisation-level reporting	In line with GHGP Scope 1 and 2: Mandated Scope 3: Entity dependent. Relevant and significant emissions should be reported.	Data input tool provided Utilise Defra GHG reporting conversion factors	Internal verification and peer review is also recommended
Welsh public sector emissions reporting framework	Bottom-up reporting by Welsh public bodies	Voluntary annual organisation-level reporting	In line with GHGP Scope 1, 2, and 3: Voluntary	Data input tool provided Utilise Defra GHG reporting conversion factors	Internal verification and peer review is also recommended

Table 5: Private sector frameworks

Reporting framework	Reporting remit	Reporting requirement	Measurement approach and breadth	Reporting tool and conversion factors	Verification requirement
ESOS	UK	Mandated annual organisation-level reporting	Not in line with GHGP Organisations report an energy intensity ratio	Data input tool not provided Conversion factors in energy intensity ratios are provided	Verifiable data must be stored within an evidence pack; data can be provided from non-verifiable sources (such as modelling) but must be stated
SECR	UK	Mandated annual organisation-level reporting	In line with GHGP Scope 1 and 2: Mandated Scope 3: Voluntary	Data input tool not provided Utilise Defra GHG reporting conversion factors	There is no statutory requirement for data to be audited, but checks are required to ensure the data is consistent and credible
IFRS SDS	International	Voluntary	In line with GHGP Scope 1, 2 and 3: Required	Data input tool not provided Emission conversion factors not provided	Not required, but the methods of measurement must be reported
EU CSRD	International	Mandated annual organisation-	In line with GHGP	Data input tool not provided Emission conversion	Independent limited assurance is required

Emissions measurement and reporting approaches for the public sector

Reporting framework	Reporting remit	Reporting requirement	Measurement approach and breadth	Reporting tool and conversion factors	Verification requirement
		level reporting	Scope 1, 2 and 3: Mandated	factors not provided	
ISO 14060 family	International	Voluntary one-off reporting	GHGP scopes are not strictly followed. A facsimile of Scope 1, 2 and 3 is required	Not provided	There is a verification process under ISO 14061-3 and verifier must undergo ISO 14065 and 14066
ISO 50001	International	Voluntary one-off reporting	Not in line with GHGP Organisations report an energy intensity ratio	Not provided	Verified under ISO 50015
EU CBAM	EU	One-off reporting as required	Predefined process to calculate embedded carbon of imports	Data input tool provided An 'effective carbon price' will be assigned per tonne of CO2e following the transition period	Not required within the current transition period
UK CBAM	UK	One-off reporting as required	N/A	N/A – not yet in existence	N/A – not yet in existence

Overall, most frameworks follow GHGP to define emission categories, and four frameworks (CBAMs, ISO 14060 family and ISO 50001 standards, ESOS) employ alternative but similar approaches for emissions accounting. Among the frameworks that follow the GHGP, Scope 1 and 2 emissions are required to be reported for all frameworks, while IFRS SDS and CSRD also requires reporting of material Scope 3 emissions. For the remaining frameworks, there is a mixture of required partial Scope 3 reporting and recommended reporting of Scope 3. Northern Ireland has been excluded from the table because of its absence of reporting requirements.

Materiality

Under IFRS SDS, materiality is defined as follows:³²

“In the context of sustainability-related financial disclosures, information is material if omitting, misstating or obscuring that information could reasonably be expected to influence decisions that primary users of general-purpose financial reports make on the basis of those reports, which include financial statements and sustainability-related financial disclosures and which provide information about a specific reporting entity.”

Double materiality

Under EU’s CSRD, it goes further by requiring reporting based on double materiality, i.e. covers both impact and financial materiality, whereby organisations must disclose information that is material from a financial perspective, as well as its impacts on people and/or the environment.³³

For most emissions reporting frameworks, their requirements mainly focus on what should be measured and reported as outlined above, but do not provide details on what methods to be used for measurement. Interviewees who reported to multiple frameworks commented that they collect data and calculate their emissions using the same approaches, regardless of the frameworks they report to. However, they have to adapt the reporting of emission data according to the boundaries or requirements set by each of the frameworks. For example, one interviewee noted that they counted emissions from some of their sites which are run by private finance initiative (PFI) companies as their regulated footprint under Scottish Government public bodies reporting framework, but they do not count them for SECR reporting as these emissions are captured by the respective parent companies.

To accommodate for the different methods of measurement, many frameworks use tiered systems to evaluate reported information precision as described in the section above, and some frameworks also require verification (e.g. CSRD and ISO). In the absence of a standardised approach and set of emission factors to be used, there is limited comparability in the emission data generated from the different frameworks, or in some cases, within the same framework.

³² [IFRS SDS \(2023\) General Requirements for Disclosure of Sustainability-related Financial Information](#)

³³ [EFRAG \(2023\) Draft EFRAG IG1: Materiality assessment implementation guidance](#)

Effectiveness of emissions measurement in driving decarbonisation

In this section, the effectiveness of different emission measurement approaches in driving decarbonisation is discussed.

Direct measurement

Direct measurement of emissions provides the most accurate data; however it is also expected to be the most resource intensive. Hence, consideration should be given to the level of efforts required for this approach against its potential benefits. *“The effort versus materiality is quite important. How much effort do I put in for a tiny part of my estate to have better data?”*

One of the key challenges that interviewees mentioned was direct measurement of fugitive emissions. Fugitive emissions are unintentional releases of gases or vapours from pressurised pipes or apparatus. Interviewees noted measuring and reporting of fugitive emissions is inconsistent. *“There’s no centralised aggregation of what the emissions are... [no guidance for] Scopes or the boundaries that people are capturing. So I talked about buildings a lot, but refrigerants which sit in Scope 1 hasn’t really been reported on consistently at all.”*

Fugitive emissions constitute a significant portion of estate emissions. Despite the EU Energy Performance of Building Directive which requires an annual survey of air conditioning and the reporting requirements of Montreal Protocol,³⁴ emissions of refrigerants are still not being tracked properly in the public sector. Inadequate measurement and reporting of fugitive emissions can result in these emissions being overlooked, leading to a failure to mitigate their substantial climate impacts.

Estimation using average emission factors

The effectiveness of using average emission factors to estimate emissions and enable decarbonisation actions was also discussed by interviewees. Some interviewees criticised the market-based method to calculate emissions from electricity. Under this method, organisations can report they have lower or zero emissions using green tariff or Renewable Energy Certificates (which are found to be not additional³⁵). The view is that using the location-based method better reflects the true emissions and promotes actions to improve energy efficiency. Interviewees also noted that recent emissions reduction are mostly driven by grid decarbonisation, rather than organisations’ effort to improve efficiency.

“I noticed that in the private sector a lot of [companies] use market-based... they’re saying we’ve got an 80% reduction in our emissions [due to renewables], but they might still have very inefficient buildings and that’s the risk with going down the market-based [route]. I think it’s really important that we have location-based emissions to show that efficiency over time.”

Supply chain and investments-related emissions are more challenging to measure and therefore, rely heavily on assumptions and estimations. Whilst interviewees felt this is useful for understanding their emissions, the approach reduces precision and applicability for year-

³⁴ [UNEP \(1999\). Handbook on Data Reporting under the Montreal Protocol](#)

³⁵ [Renewable energy certificates threaten the integrity of corporate science-based targets | Nature Climate Change](#)

on-year tracking. *“If you have a big supply chain, they tend to be spend-based estimates, so those methods of reporting emissions are pretty good for estimating a sense of scale and total emissions in a given year. But they do have some drawbacks in terms of the ability to show year-on-year change in a way that reflects what is happening in the real world and as a public sector organisation.”* There are also some reservations around using a spend-based method, as it relies on spending and thus could reduce the effectiveness of emissions measurement in driving decarbonisation (e.g. disincentivise actions such as spending more on energy efficient or green products).

Interviewees also highlighted that spend-based factors are not frequently updated, meaning that emissions calculations are based upon factors that are potentially years out of date. *“The spend-based multipliers I think are only currently published up to 2020, so there is an inherent uncertainty between the current period and when those figures were released, and we have to manage that lag because there is a requirement to report things in a way that is seen as being up to date, rather than two or potentially even three years behind times.”*

Despite the disputed robustness of approximated emissions measurement, the consensus was that due to the complex nature of various public sector activities, there will always be a need for estimating some emission data. *“As soon as it becomes indirect it becomes very complex and less accurate. But I do think it is crucial to take responsibility for these emissions, even if they are estimates.”* One key message from the interviewees was not to let improving accuracy get in the way of taking actions. *“You could spend 10 days easily getting lost in a balance sheet or you could spend 10 days speaking to your top five suppliers and actually make a whole lot of progress [in enabling actions].”*

Modelling

The Greener NHS framework has used a modelling approach to monitor emissions from a variety of sources, which would have been far too onerous to measure and determine directly, while identifying emissions and attributing them to a source which can be acted upon far more effectively than through utilisation of a basic average. For example, the NHS have determined that metered dose inhalers are a significant source of GHG emissions. Thus, they have developed a strategy to shift towards lower carbon inhalers such as dry powder inhalers where possible.

Overall, the NHS has demonstrated that modelling offers an effective approach to emissions measurement, minimising reporting burden on local facilities, whilst ensuring comprehensive coverage of NHS emissions and enabling targeted actions.

Comparability of emissions data

There are two levels of comparability of emission data; one is comparability across organisations, and another is comparability within an organisation over time.

Comparability of emission data across organisations enables organisations and governments to benchmark performance, inform decarbonisation actions and set emissions reduction targets. Currently, there is disparity in emissions measurement and reporting across organisations and frameworks. Emission data is inconsistently measured across organisations,

using different measurement approaches, calculation methods and assumptions for converting primary data to emissions, resulting in unequal reporting outputs with limited comparability.

Comparability of emission data of an organisation across time can help track progress towards their targets. Expanding measurement breadth or improving data collection will likely identify a higher number of emissions each year, seemingly making emissions increase and pushing organisations further from their targets – hence the call for more guidance around when a public organisation should re-baseline, so the base-year emissions are aligned and comparable to the reporting year.

Overall, the current lack of standardisation in emission measurement approaches reduces comparability of emission data across organisations and across time. This has an impact on the ability to track progress and contextualise emission data through benchmarking, thus reducing the effectiveness in driving decarbonisation actions.

Breadth of emissions measurement

This section looks at the breadth of emissions measurement through the lens of GHGP scopes and discusses how breadth of emissions measurement can affect its effectiveness in driving decarbonisation.

An organisation's GHG emissions as categorised and defined by GHGP³⁶

Scope 1 emissions are direct emissions from owned or controlled sources.

Scope 2 emissions are indirect emissions from the generation of purchased energy.

Scope 3 emissions are all indirect emissions (not included in Scope 2) that occur in the value chain of the reporting company, including both upstream and downstream emissions.

Scope 1 and 2 emissions were, on the whole, seen by interviewees as straightforward to measure and report. With the right guidance and support, all public sector organisations should be able to measure and report their Scope 1 and 2 emissions.

As for Scope 3 emissions, while recognising measuring Scope 3 emissions is challenging and likely to be imprecise, the common view among interviewees was Scope 3 measurement is important and needs to be done in some way: *“Just because you don't measure them, it doesn't mean they're not there”. “The more information you arm yourself with, the better... you start to piece together a clearer picture of what's actually going on.”*

Accounting for emissions from all three scopes provides the most comprehensive view of emissions for the organisation, ensuring that emissions from its own operations and value chain are accounted for, and can potentially identify resource inefficiencies within the organisation. However, it is important to acknowledge that gathering of some Scope 3 data can

³⁶ [Greenhouse Gas Protocol FAQ](#)

Emissions measurement and reporting approaches for the public sector

be complex and expanding the boundaries of measurement to include full Scope 3 emissions can stretch the resource available for emissions measurement and reporting.

Resource intensity for Scope 3 emissions measurement relies on the measurement approach utilised. The less precise the measurement approach, the less resource intensive it will be. In many cases, financial data can be utilised for estimating Scope 3 emissions, such as business travel, cost of transporting goods or waste disposal. As the methods for estimating emissions become more precise, the resource intensity will increase, as more data sources become necessary, and more entities need to be engaged with. For example, moving away from spend-based approach for estimating supply chain emissions towards engaging specific suppliers to obtain their Scope 1 and 2 emissions data will be a more complex and resource-intensive undertaking.

Some interviewees noted that Scope 3 emissions measurement can empower organisations to make better purchasing decisions. Public sector organisations, especially those with high spend or where organisations can act together, can use their purchasing power to influence their supply chain and drive decarbonisation. They can also engage their key suppliers and request more accurate emission data to improve their Scope 3 emissions reporting, and gradually move away from using estimation such as the spend-based method.

Different approaches for public sector reporting of Scope 3 emissions were suggested by interviewees, such as making all Scope 3 emissions reporting completely optional, or making some mandatory – such as the ones that are more within the organisation’s control, i.e. business travel and waste. The extent to which Scope 3 emissions should be measured and reported will depend on materiality and the organisation’s capability to act on those emissions.

Regardless, the consensus among interviewees around Scope 3 emissions measurement is to prioritise taking actions over fixating on the numbers or metrics. Scope 3 emissions measurement, even if using less precise methods such as the spend-based method, can provide an overview of emissions from an organisation’s value chain and identify areas for targeted interventions. Once these hotspots for decarbonisation have been identified, some interviewees suggested using non-emissions based or action-oriented metrics to track progress – such as tracking the percentage of suppliers engaged to reduce emissions, or the percentage of suppliers that have emissions target in place.

“We are very concerned because resources [in the public sector] are so tight at the moment, that that resource is spent on action rather than chasing numbers”.

It is also worth mentioning that Scope 3 emissions of one organisation are the Scope 1 and 2 emissions of another organisation. When considering emissions at the national or international level, this could lead to double counting. Therefore, where organisation emissions data is used for national inventories or policy-making, care should be taken to distinguish the different scopes of emissions.

Challenges in emissions measurement and reporting

This section outlines the key challenges when measuring and reporting emissions as identified from the systematic review and expert interviews. A set of recommendations are also proposed to assist organisations in overcoming the discussed challenge.

Key challenges

Key challenges faced by public sector organisations when measuring and reporting their emissions:

Fragmented emissions reporting landscape

The current emissions reporting landscape, in both private and public sector, is fragmented. The multitude of emission reporting frameworks and emission measurement approaches reflects the nascent discipline. The lack of standardisation creates uncertainty among reporting organisations and causes inconsistency in their emissions reporting.

Within the public sector, there's an absence of a singular authority steering all public organisations in the same direction in terms of emissions measurement and reporting. *“The sector needs senior leadership and to bring everyone together from the top”. “There are conflicting messages or decision being made. If there was something that allows the public sector to work towards one goal together, then we're likely to get a better outcome.”* This reflects the immaturity of the emissions reporting discipline within the public sector, suggesting the necessity for more fundamental changes to the structure of emissions reporting within the sector.

Interviewees indicated that while it is important to recognise the diversity of public organisations – and their varied types of emissions – it is also important to standardise emissions measurement and reporting where possible, to enable benchmarking and decision-making in terms of where to focus efforts for the sector as a whole.

Limited capacity and capability

Interviewees identified various skill gaps within the public sector in emissions measurement and reporting. According to the interviewees, in small public sector organisations, the task of emissions measurement and reporting is often given to someone with existing roles and responsibilities, who have limited knowledge and experience to do it properly. Without training and experience, it is very difficult for the staff of public sector organisations to understand the intricacies and collect relevant data. This becomes even more complex for Scope 3 emissions measurement: *“When you get into the reporting of procurement emissions, very few staff in-house will have the ability to do that”*. There is also a lack of knowledge around quantifying carbon savings associated with specific project or intervention for decarbonisation.

The public sector also faces steep competition from the private sector to recruit experts in this area. The lack of in-house capability could lead to emissions measurement and reporting becoming a substantial cost to public sector organisations. In the case where very few in-

house staff have the ability to measure and report emissions, that often leads quite expensive external consultancy fees that occur on an annual basis.

Data accessibility and quality

Many interviewees mentioned challenges related to accessing the data required to measure their organisation's emissions. Sourcing data across different departments or teams was cited as an issue. This is particularly difficult when different teams do not collaborate: *"Siloed working, especially in large organisations, I think that's a barrier."* Another internal barrier exists where the team measuring the emissions needs authorisation to access the data, which can take a long time to be processed: *"Sometimes we have to get permission from the commercial director in order to access data that they hold centrally for six of the arm's-length bodies and that can take a bit of time to get that stuff done."* One interviewee noted that when engaging other colleagues, such as the finance team, it is important to *"speak their language"* and get their buy-in in order to access the data that they need for emissions reporting.

Collecting consistent and good quality data that can be accurately converted into emissions reporting has also been identified as a challenge. *"We might get a readout of energy utility data, but the person that's given it to us might have done some weird adjustment without telling us. And then the next year, we get it from a different person."* The data could also come in different formats. For example, for Scope 3 emissions associated with business travel, the primary data could be the distance travelled and mode of transport (more precise) or just an amount claimed through expenses (less precise). Interviewees noted that having a documented process or guidance such as *"data quality hierarchy"* will help resolve some of these challenges.

Resource constraint

Most large public bodies have dedicated members of staff or teams to work on emissions measurement and reporting. However, as mentioned above, in the smaller public organisations, the task may fall on someone who has other roles. *"Any challenges we have seen is due to a real lack of resource, so either staff are not in post or there's a lack of funding to get someone in post."*

There is also the question of whether it is necessary for smaller public sector organisations to report emissions which are resource and time consuming to measure in these challenging financial times, where they have other priorities which they need to spend money on. Some interviewees felt that as the public sector is facing a multitude of challenges, including the lack of resource and funding, despite increasing interest in net zero, there should be a balance between spending their limited resources and the returns that they get. This is where materiality comes into play, whether it is worth spending time and effort on collecting very accurate data on all their emissions, or to start off with rough data to identify hotspots and then dive into areas that really need proper consideration or improvement of precision.

Recommendations

Key recommendations for overcoming the challenges discussed above, as well as increasing the effectiveness of emissions reporting in driving decarbonisation.

Clear and consistent guidance

Having clear and consistent guidance for emissions measurement and reporting can help overcome a number of the challenges discussed above. This can help to mitigate uncertainties associated with the current fragmented landscape, improve consistency and enhancing the quality of emissions reporting, and above all, increase the effectiveness of emissions reporting in driving decarbonisation through increased comparability of the reported emissions data.

Scope 3 is an area of particular uncertainty for public sector organisations. Clear guidance is required to ensure that a proportionate approach is taken, and emissions are reported on a correct and consistent basis. Many expressed an interest in a single, simple set of guidelines that can be used to report each type of Scope 3 emissions. *“When we're talking about Scope 3, public bodies would love it if we could provide the tools for them, but that is beyond our resources and budget at the moment... The other thing that's very difficult is creating one for our public bodies which are so different.”*

Some interviewees also noted guidance is needed to clarify the application and boundaries of Scope 4 emissions,³⁷ so public sector organisations can accurately report their avoided emissions. Interviewees who mentioned Scope 4 felt that further guidance is required in this area to offer greater transparency (i.e. not act as a smokescreen for increased emissions) and encourage further decarbonisation efforts, such as renewable technology installations and sustainable land management practices.

Clear and consistent guidance needs to be provided by those with the greatest influence over how public sector organisations report. Governments and standard-setting bodies were identified as those best placed to raise awareness and provide the necessary tools required for public organisations to report their emissions. *“How to report emissions, where to make assumptions, or make estimation – that really is in DESNZ's court. And I think that's an area where having more guidance or tools to [help public organisations] set policy would be a lot more useful.”*

Finally, guidance for public sector emissions reporting should be aligned with existing frameworks where possible to avoid creating further fragmentation of the reporting landscape, promote comparability and reduce reporting burden. One interviewee highlighted that the upcoming merger of reporting frameworks – such as TCFD and IFRS SRS – should be considered when developing the guidance to avoid duplication of efforts and future proofing.

³⁷ There is no official definition of Scope 4 emissions under the GHGP. It is generally known or discussed as “avoided emissions”. It is a relatively new and controversial concept.

Increasing effectiveness of emissions reporting in driving decarbonisation

When developing the guidance for public sector emissions measurement and reporting, consider incorporating the following factors which could increase the effectiveness of emissions reporting in driving decarbonisation:

Contextualisation of emission data to make it more meaningful for the reporting organisation to take action. Emissions data can be contextualised in the form of benchmarking, cost savings or cost of inactions.

Verification or peer review of emissions data to improve credibility of the reported emissions, provide confidence to key stakeholders to make decisions based on the data and help to mitigate reputational risk associated with public disclosure of emissions reporting.

Guidance on emission reduction targets or strategy setting ambitious yet realistic and actionable targets could be a complex and expensive exercise, especially for organisations that lack capability. Therefore, further guidance should be provided to support target setting and developing strategy to achieve the set target.

Follow-on support to empower public organisations take actions to decarbonise. There are numerous resources available to support organisations decarbonise. However, organisations may not be aware of them, necessitating more effective signposting rather than creating new resources.

Clear purpose of emissions reporting

Clear purpose of emissions reporting will help guide the design of emissions measurement and reporting systems. For example, if the purpose is for operational management, more granular data and frequent reporting will be required to inform decisions and adjust decarbonisation interventions, whilst annual emissions reporting at the organisation level will be sufficient for the purpose of accountability and communicating climate performance. These are outlined within the **Emissions reporting and measurement pathways schematic** section of the report.

Many interviewees noted reporting should not just be for the sake of reporting, but a mechanism to enable actions. More action-oriented metrics or targets and signposting to follow-on support or guidance on implementing decarbonisation projects could make more of a material impact on enabling decarbonisation outcomes.

Emission database and tools

Reporting of Scope 1 and 2 emissions is viewed as practical and achievable for most public sector organisations, although interviewees noted that the lack of resource in public sector organisations, in terms of staff time and costs, should be “*front and centre*” when comes to emissions measurement and reporting for the public sector. Having all the tools and

Emissions measurement and reporting approaches for the public sector

conversion databases in one place that reporting organisations can easily navigate is viewed as useful and will help mitigate some of the resource issues discussed above.

Many interviewees also called for the development of a single tool that enables all public sector organisations to report their emissions in a consistent way, although some recognised that this could be challenging given the diversity of the public sector and maturity in their decarbonisation journeys.

“Public sector is a really diverse, non-homogeneous set of organisations that are doing everything. Trying to come up with a single document that does all of that is probably too difficult, but coming up with something that covers a really decent chunk of it so that you get consistency across the sector I think would be really useful, even if that doesn't cover absolutely everything.”

In Scotland, Sustainable Scotland Network (SSN) has developed a guide and tool for measuring and reporting emissions within the public sector. 188 public bodies are mandated to report and the reports are compiled by SSN for summary analysis. Welsh Government have also developed a tool, in which any public sector organisation – irrespective of their activities or size – can report their emissions into the single, streamlined tool, which in turn allows comparison between organisations and sectors.

Capacity building/ upskilling

There is a clear need for investing in capacity building of public sector staff in this area, which will help overcome some of the challenges discussed above and result in cost savings in the longer-term. *“Public sector has to invest in the skills and capability of people and resources to actually deal with these issues”. “Upskill staff within public organisations to be able to do the data analysis and measurement, so they don't have to constantly pay external consultants to do it.”*

Upskilling is not only needed for specific staff or the team responsible for emissions measurement and reporting, but for the wider organisation as well. As mentioned above, data for emissions measurement needs to be sought from different departments of the organisation, such as finance and procurement. In addition to data collection, staff from different departments also need to be upskilled to implement projects or interventions to reduce emissions. *“Significant upskilling of procurement teams is needed to make purchasing decisions and contractual arrangements with companies in their supply chain based on carbon intensity as well as cost”.*

In addition to providing clear guidance and tools for public sector emissions reporting, additional support can also be provided by the government to help improve the quality of reporting, while building capacity. An interviewee commented that while the compliance rate for Scottish Government public bodies reporting is high, the reporting quality varies significantly across the reporting organisations. Welsh Government has dedicated resource to assist public organisations in their emissions measurement and reporting. Both Wales and Scotland also encourage peer review of public-body emissions reporting to facilitate quality reporting and knowledge sharing throughout the public sector.

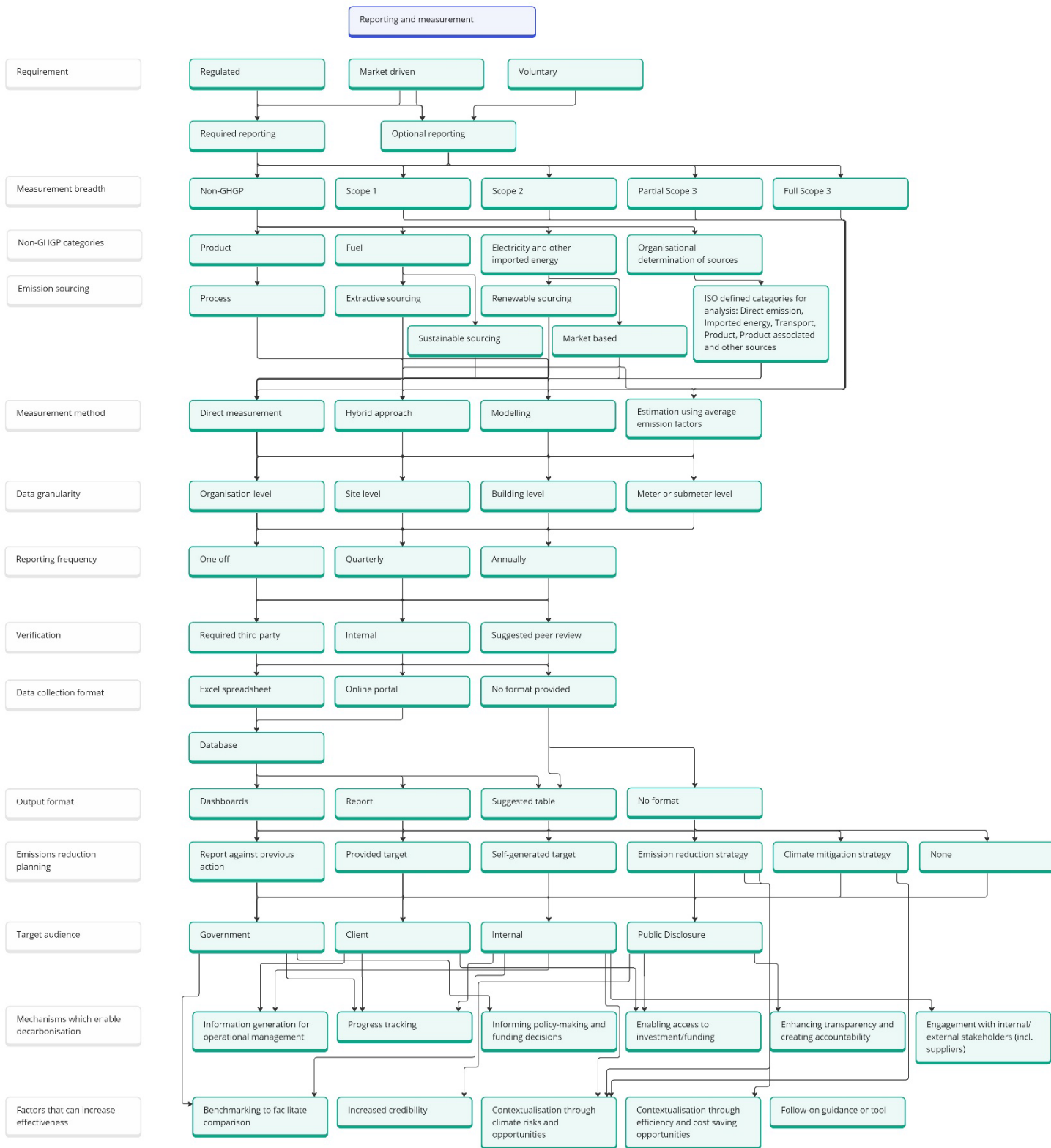
Governance and leadership

At the organisation level, governance and leadership can help overcome the issues of data accessibility and quality, enabling more effective emissions reporting. If senior management sends a clear signal of their commitment to report and reduce emissions, staff from different departments will better understand the purpose and be more willing to provide the data that's requested for emissions reporting, rather than seeing it as additional work for them. *“Making it part of people's jobs so that they actually do it well... it does actually need to be recognised as a part of the role that people have to undertake.”* Similarly, they will also be more willing to engage in taking actions to reduce emissions.

Emissions reporting and measurement pathways

Using findings from this research, a categorisation schematic has been developed. The schematic, Figure 0-2 provides visual depiction of the key aspects that make up a framework and the different pathways which a framework can select to reach the mechanism that facilitates change. Filled in versions of the schematic for the different frameworks reviewed in this research are presented in Appendix B.

Figure 0-2: Emissions measurement and reporting categorisation schematic, unfilled version



Emissions measurement and reporting approaches for the public sector

This schematic enables definition of pathways for frameworks of measurement and reporting. Frameworks are not required to only follow one pathway within each row. However, the arrows do hinder movement in some directions unless prior elements have already been selected. In the following sub-sections, each category and the elements within each category are discussed.

Requirement

Requirement defines why the reporting is being done, whether to comply with a regulation, gain access to a market, or voluntarily undertake environmental assessment.

- **Regulating reporting** by mandating its completion can be an effective method of ensuring adherence. However, if there are high hurdles to completion, a lack of support and guidance, and it's difficult to identify the benefit of completion, adherence may only be done with minimal effort, with a lack of resource or entity engagement/motivation. For example, one interviewee noted that their reporting towards GGCs is being looked after by a few staff within their organisation and is not shared widely enough to encourage actions.
- **Market driven** forces can drive implementation of reporting but become susceptible to greenwashing without verification or strict requirements of what should be reported. The drivers of this implementation can be the purchasers – who have implemented supplier requirements – or the public who wish to purchase from suppliers presumed to be more ethical or environmentally friendly.
- **Voluntary reporting** can yield the highest level of engagement, as organisations are self-motivated and more likely to be committed to the process, identifying emissions as a goal to help them appropriately adjust their operational methods.

Mandatory compliance as utilised within the frameworks by HM Treasury SRS, the Scottish Government public bodies reporting requirements, SECR, ESOS, CSRD and the Greener NHS is often seen as generating a fair playing field whereby all reporting organisations must adhere to the same requirements. However, in some of these frameworks, additional data is requested on a voluntary basis, thus enabling the preferential reporting of further data, mainly within Scope 3. A key point as part of creating this level field which should be considered is the potential high cost of reporting. Thus, allowances are often made in the quality of reporting with the hope that the reporting quality will improve as the process becomes smoother and more common place.

Measurement breadth

Measurement breadth defines what is to be measured. Most frameworks reviewed utilise the GHGP to define this, however some schemes also utilise non-GHGP methods to account for GHG emissions, such as ESOS, CSRD and ISO standards.

Under the GHGP categories Scope 1, Scope 2, partial Scope 3, and full Scope 3 elements have been listed:

- **Scope 1 emissions measurement** requires information on directly generated GHG emissions. This can be from boiler systems, or incinerators, however it also includes additional emissions, such as other GHG sources outside of CO₂ (e.g. from refrigeration and air conditioning). Reporting of Scope 1 is required by all of the GHGP-based frameworks.
- **Scope 2 emissions measurement** expands to indirect sources of energy-related GHG emissions, specifically electricity and purchased heat, etc. Inclusion of this metric expands the measured set of emissions, thus enabling further insight into areas where emissions reductions can be achieved. Reporting of Scope 2 emissions is required by all of the GHGP-based frameworks.
- **Partial Scope 3 emissions measurement** is suggested or required by many of the GHGP-based frameworks. Specifically, the HM Treasury SRS, GGCs, Welsh Government, Scottish Government, SECR, SCEF, LGA and SCATTER. There are 15 categories within Scope 3 (Appendix A) and the varying level of reporting across these categories makes comparison between organisations difficult.
- **Full Scope 3 emissions measurement** is a complex task as previously discussed. Scope 3 emissions are reported under the Greener NHS, IFRS SRS and CSRD. Within the IFRS SRS and CSRD, only material emissions are required to be reported.

Comprehensive assessment and reporting of Scope 3 emissions can provide insight into the areas of highest emissions and potential of improvement. Research shows that for many organisations, the bulk of emissions resulting from their operations or those of organisations within their value chain lie within Scope 3.³⁸ A key factor in determining the resource burden of measuring these emissions is within the precision desired, with more precise method being more resource intensive. To enable a wider range of organisations to better measure and report their Scope 3 emissions, further development in measurement methods and GHG conversion factors is needed across the sector. The extent to which Scope 3 emissions should be measured and reported needs to be considered in relation to the scale of emissions and the organisation's capacity to act on these emissions, as discussed in **Breadth of emissions measurement** section.

Non-GHGP reporting is part of the first level in **Measurement breadth** category and enables a pathway for non-GHGP reporting within frameworks such as ESOS, the EU CBAM, the ISO 14060 family and ISO 50001. It leads to a subsection of **Emissions sourcing** to enable distinctions within the non-GHGP methods. **Non-GHGP** and **Emissions sourcing** categories can be bypassed via reporting under the GHGP, however in certain circumstances reporting in this fashion can prove beneficial. This is the case under the CBAM or the ISO organisational guidelines which have enabled standardised methods of reporting and benchmarking in the absence of other requirements.

- **Product** is the first category, whereby for CBAM initiatives, information on the product is necessary to effectively model GHG emissions. This information can be as simple as the quantity of product being discussed and the quality/make-up of the product. This

³⁸ [CDP Technical Note: Relevance of Scope 3 Categories by Sector](#)

leads to a description of the production process, which then feeds into a model that estimates emissions associated with the product under review.

- **Fuel** is the next element in this category, and within this, extractive or sustainable sourcing enables identification of direct production of GHG emissions. This defines a large section of direct emissions, but it must be noted that it is a facsimile of Scope 1 under the GHGP, and not an exact replica of Scope 1 emissions. This is because it does not include fugitive gas emissions from sources such as refrigerants or otherwise, and these can generate an outsized influence on the GHG effect compared to CO₂.
- **Electricity and other imported energy** (such as heat) covers energy being used by an organisation whereby the emissions from that energy use have been generated by a separate organisation, thus creating some distance between the emissions and those who utilise the service/product.
- **Organisational determination of sources**, as requested via the ISO 14060 family, requires the reporting organisation to determine all sources of emissions, loosely defined under the categories of direct/indirect emissions, transport, product, product associated, and other sources of emissions. In a short and less defined form, this encompasses all of the GHGP scopes. However, it leaves some ambiguity around leased assets and investment related emissions. Once again, it's important to note, that those reporting under this framework must provide information on all these sources of emissions, and thus value-chain emissions also compose a key part of GHG emissions assessment within this framework.

Measurement method

The **Method** category defines elements in which the emission data is being accounted for can be measured. These methods – direct measurement, estimation using average emission factors and modelling – are discussed in the previous section: **Generalised measurement methods for greenhouse gas emissions**.

Of the frameworks reviewed in this research, none has specified one method over another, and any format for reporting the data can be utilised, unless the reporting tool, either a spreadsheet or web-based tool only enables specific units. Typically, it is only after an organisation has started gathering data that they gain an understanding of what data is available to them, that they can then decide which method to use and how data precision can be improved.

Data granularity

Emissions data can be measured and reported at different levels – organisation level, site level, building level, or at a meter/ submeter level. Reporting frameworks such as the GGCs only require organisation level data, as this is sufficient for the purpose of holding organisations accountable to their emissions and tracking their progress towards decarbonisation. At the operational level, more granular data, such as site or building level, will be required to inform areas where targeted efforts to improve efficiency and decarbonise is needed. More granular

data can also help inform the effectiveness of specific decarbonisation efforts or interventions in reducing emissions.

- **Organisation level** – The majority of frameworks require emissions data at the organisational level, as this level of information is deemed sufficient for the purpose of bringing transparency and tracking progress on organisations' climate performance.
- **Site level** – Within the Greener NHS framework, facilities and sites over a defined size are required to report under the ERIC system. This is how data from some emission sources such as energy usage are gained and fed into their overall emissions modelling.
- **Building level** – No frameworks specifically define building level reporting, however the Greener NHS provides a threshold for floorspace, which they must report under the ERIC system. Many larger organisations or institutions may require internal reporting on the building level, which they then aggregate and report emissions from energy usage at the organisation level.
- **Meter or submeter level** – For many organisations which occupy space within a building, submetering can be an effective means of measuring and calculating emissions directly attributable to them. Submeter level monitoring could also be used to assess the effectiveness of an energy efficiency measure.

Reporting frequency

The **Frequency** category provides illustration of how often data must be reported.

- **One-off reporting** is most often used in cases where a customer wishes to understand the emissions associated with a specific purchase, or through the timeframe of that contract. One-off reporting is useful in consideration of supplier engagement, whether that be through specific frameworks such as CBAM, or smaller subcategories of supplier engagement.
- **Quarterly reporting** is less frequently requested but it is utilised by frameworks which have set specific top-down targets and wish to ensure the reporting organisations are adhering to the targets, thus holding them accountable. As this increases the burden of reporting with more frequent deadlines, it's important for quarterly reporting process to be streamlined and effective. For operational management, quarterly or more frequent reporting of more granular data – such as at site, building or submeter level – can inform the performance of specific decarbonisation intervention and inform decision for adjustment if needed.
- **Annual reporting** is more common when reviewing strategies or assessing targets over a longer time period, whereby the feasibility of more frequent adjustments is less likely. It may also be more appropriate where the data is less granular or precise, or for assessing approaches that seek to deliver change over a longer period of time.

Verification

Verification of emission data is important for improving credibility of the reported emissions. The verification can be done by an independent third-party for quality assurance. Within CSRD, assurance is required and the third-party that provides the assurance needs to be accredited. Furthermore, within the ISO 14060 family, ISO 14065 and ISO 14066 outline requirements for validation and verification bodies, to ensure appropriate validation and verification of GHG statements under ISO 14064-3. For some frameworks, validation and verification are typically done internally, however both the Welsh and Scottish reporting frameworks also suggest peer review by other similar organisations, which helps promote best practice more organically and at a lower cost to the reporting organisations.

Data collection format

Data collection format outlines the tools which a framework or organisation use to gather data.

- **Excel spreadsheets** are very common for collecting or inputting relevant data which can lead to further analysis of the data.
- An **online portal** is similar in action to an Excel spreadsheet. However, these can enable more streamlined approaches for inputting the data.
- Frameworks such as ESOS or ISO do not provide or suggest a format for reporting – rather they provide information which must be provided as the content, while the format for gathering this is left to the user.

Providing a reporting tool, such as an Excel spreadsheet or web-based tool, can promote standardisation, but complete standardisation has drawbacks. For instance, it could impose an overly high resource burden on organisations new to reporting or lacking the resource to report at the highest level of precision. Conversely, a standard that's too lax may hinder organisations with well-established reporting methods from gathering more granular data to assess the impact of specific strategies on their reduction goals.

A database of organisation emissions data can be generated from the data collection process described above. These databases can be incredibly powerful and used to generate effective models – such as that used internally by the NHS, or externally by the Impact Community Calculator³⁹ – which creates a database and model that can provide vital graphical data as part of an output dashboard.

Highly important within this subsection is the realisation of the value of the data which is being gathered on two fronts. One is the money invested by the organisations to gather and analyse the data which is being input into the database. The second is the value of the data itself – to either be used as a scenario-based model generator, or for improving the data collection itself. This is the case with frameworks such as SECR whereby data is not gathered into a database – however if it was, this would contain all the Scope 1 and Scope 2 emissions for each specific

³⁹ [Impact's community carbon calculator](#)

Emissions measurement and reporting approaches for the public sector

company with turnovers larger than £40M. This data, if collected and made available, can be used to determine far more accurate spend-based data within Scope 3, which is most frequently one of the largest sources of emissions, and simultaneously one which is difficult to assess. This data can also be used to generate far more accurate and annually adjusted average data for organisations beyond SECR. Not having a database that collates all of this information is a missed opportunity for improving accuracy and precision across the board.

Output format

Output format outlines ways in which emission data can be presented:

- Some frameworks such as ISO or ESOS don't provide an output format, and thus restrict the ability for easy comparability of data across organisations.
- SECR, which provides a **suggested table** for reporting the output, suffers a similar issue and makes comparability across organisations difficult.
- **Dashboards** can present the gathered data in multiple graphical formats, dramatically increasing the use and versatility of the data. Improve Community Calculator is a good example of how this form of output can be effectively utilised to assist in improving policy making for local councils. Similarly, internal dashboards produced by Greener NHS achieve a similar goal within the NHS.
- **Reports** can provide richer information and insights to complement the emission data.

Emissions reduction planning

The **emissions reduction planning** category briefly defines the requirements for emissions reduction target setting and strategies under a specific framework.

- Some frameworks such as ESOS and Scottish Government public bodies reporting require organisations to **report against their previous actions, targets and/or strategies** to determine the effectiveness of these actions.
- Some frameworks, such as GGCs and Greener NHS, provide **targets** which must be met by the reporting organisations. In theory, these targets are based upon strategies determined by the data generated in reporting.
- Frameworks can also require reporting organisations to generate **emission reduction targets**, and present their transition plans. These frameworks are the Scottish Government public bodies reporting framework, CSRD, IFRS SDS, ESOS and Greener NHS (which has a combination of detailed top-down strategies and targets, while also requesting green plans from the local facilities).
- **Emission reduction strategies** are the grander method to accomplish the targets which have been set within the framework or self-generated. In frameworks such as CSRD, IFRS SDS, ESOS, Greener NHS, and the Scottish government public reporting, these strategies are presented.

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- **Climate mitigation strategies** are separate to emission reduction strategies, and specifically assess the sustainability of the organisation's operations, taking into account risks and opportunities which will come about as a result of a changing climate. These can be very important to potential investors wishing to determine the longevity of the organisation's proposed operations.
- The option of **none** is available for this category as certain frameworks may not require any of these, simply requesting the emission data with no necessity for an organisation to determine a means to reduce these emissions or mitigate against their affects.

Frameworks such as SCEF, SCATTER, and the Scottish Government public bodies reporting also provide additional tools which organisations can use to assist in generating organisation specific targets and strategies. The self-generated targets require more resources and internal governance by the organisation, but the increased autonomy can generate more actionable measures, which could be more effective in driving actions than the top-down strategies and targets.

Target audience

The **target audience** category defines where the reports or details are distributed. These include:

- **The government**, in cases where regulations require their data to be sent to a central repository, such as GGCs, SECR, ESOS and Scottish Government public bodies reporting.
- **A client**, whereby this information might be used as part of gaining access to a market, contract, or funding. This can be the case for client-specific purchasing requirements, as part of the client's data collection for Scope 3 emissions associated with purchased goods and services, or CBAM to gain access to European markets.
- **Internal disclosure** to decision makers and key stakeholders, as part of an organisation's initiatives and strategies to manage and reduce emissions, manage risks or to demonstrate accountability to board members.
- **Public disclosure** enables broader accountability to all stakeholders, and demonstrates climate leadership.

Mechanisms which enable decarbonisation

Mechanisms which enable decarbonisation is the final category. These mechanisms are as described in the previous section: **Mechanisms by which public sector emissions reporting lead to decarbonisation**. This holds information demonstrating how some of the prior categories feed into the mechanisms of enabling decarbonisation.

The second level of the mechanisms represents factors that can increase the effectiveness of emissions reporting in facilitating decarbonisation actions as discussed in **Factors that can influence effectiveness of emissions reporting** section.

Conclusions

The overarching aims of this research were to systematically review and map the full range of emission reporting frameworks⁴⁰ and the mechanisms through which they facilitate decarbonisation, and to critically assess the different emission measurement approaches underlying the reporting frameworks. To meet the research objectives, a comprehensive review of 16 frameworks and 25 semi-structured interviews with 30 experts in this area was undertaken. Findings from this research will help inform the development of guidance for public sector emissions measurement and reporting.

Emission reporting frameworks and decarbonisation outcomes

Emissions reporting in the public sector can catalyse decarbonisation through different mechanisms. At the entity-level, publicly disclosing emissions fosters transparency and creates accountability, compelling public organisations to address the climate impact of their operations, and driving decarbonisation efforts. Additionally, emissions reporting forms the basis for engaging with internal stakeholders to drive actions and serves as a valuable tool for operational management, to drive efficiency and reduce emissions. It can be used to inform areas to focus decarbonisation efforts and evaluate the effectiveness of such efforts in reducing emissions. These routes of enabling change remain relevant irrespective of the emission reporting framework applied.

This research also found most frameworks are not explicitly designed to drive specific decarbonisation outcomes, except for ESOS which has the aim of driving energy efficiency. Even though ESOS was found to result in efficiency savings and emissions reduction, it should be noted that it operates within a broader context of other regulatory frameworks which collectively aim to promote energy efficiency and reduce GHG emissions. Overall, the effectiveness of emissions reporting in driving specific decarbonisation outcomes has been challenging to assess, as other factors, especially regulation and funding, also come into play. In the absence of a counterfactual scenario, it is not possible to evidence what would have happened in the absence of a reporting framework.

Nevertheless, it is clear that emissions reporting forms the important first step to an organisation's journey to decarbonisation. "*You can't reduce [or manage] what you don't measure*" was a common phrase cited by interviewees. There are ways which emissions reporting frameworks or guidance can be designed to enhance the effectiveness of emissions reporting in catalysing change, such as contextualising emissions data through benchmarking or from the perspectives of saving opportunities or mitigating climate risks, to provide meaning to emission data and incentivise organisations to act.

⁴⁰ Including broader climate and sustainability reporting frameworks where GHG emissions reporting forms part of the framework

At the government level, emissions reporting can be used as a tool for the government to monitor progress and hold organisations accountable. Beyond that, emission data collected through government reporting frameworks generates a wealth of information, which if utilised effectively, can drive further decarbonisation efforts through policymaking and funding initiatives aimed at accelerating action. Frameworks tailored for local governments – such as SCATTER and CDP cities, states, and regions – are specifically designed to assist local authorities in reducing emissions within their jurisdictions, which are not directly under their control but within their sphere of influence.

Emissions measurement approaches

The different approaches to measuring emissions – direct measurement, estimation using average emission factors, and modelling – entail different levels of data collection efforts and accuracy.

Direct measurement provides the most accurate emissions measurement but may not always be possible with the available resource, and it also becomes more challenging when comes to Scope 2 and 3 emissions. In this instance, modelling offers an effective means for understanding emissions, as demonstrated by the Greener NHS, which allows a breadth of coverage to provide a comprehensive picture of emissions. The use of average emission factors is mostly debated, with some feeling its application could reduce the effectiveness of emissions measurement in driving actions, such as employing market-based methods for estimating emissions from electricity usage. Despite the disputed robustness of approximated emissions measurement, it remains evident that there will always be a necessity for estimating certain emission data. The perspective held is that this approach should be utilised for understanding and mapping emissions, rather than for tracking progress.

For most emissions reporting frameworks, their requirements mainly focus on what should be measured and reported, but do not provide details on what methods should be used for measurement. The lack of a standardised approach to emissions measurement leads to limited comparability in the emission data generated, thus limits the ability to contextualise emission data through peer-to-peer comparison and drive actions.

Whether Scope 3 emissions should be measured is also an area of debate. A thorough assessment encompassing all scopes of GHG emissions can offer a comprehensive understanding of an organisation's emissions profile including from its own operations and its wider value chain, facilitating targeted initiatives to enhance data accuracy or decarbonisation efforts. However, the efforts required for complete emissions measurement should not be underestimated. Further development of Scope 3 emissions measurement methods and GHG conversion factors across the sector is essential if seeking to enable a wider range of organisations to measure and report their Scope 3 emissions. The extent of Scope 3 emissions measurement should also be considered based on the scale of the emissions and the organisation's sphere of influence – i.e. whether the reporting entity can effectively manage or influence these emissions.

Recommendation

Through this research, a number of challenges associated with emissions measurement and reporting for the public sector organisations have been identified. The immaturity and lack of standardisation of the overall emissions reporting discipline leads to fragmentation and uncertainty. In the public sector specifically, inconsistencies in emissions reporting undermines its effectiveness in driving decarbonisation actions. The public sector also faces capability and resource constraints when it comes to measuring and reporting their emissions. Poor data accessibility and quality also add to the challenge.

Having clear and consistent guidance for the whole of the public sector can help address some of these challenges, enhancing the quality and comparability of reported emissions data as a way to promote decarbonisation efforts. When developing the guidance, consideration should be given to incorporate factors that can increase the effectiveness of emissions reporting in driving decarbonisation as discussed within this report. The purpose of emissions reporting for the public sector should be clear and this will guide the design of the reporting framework or system, as outlined in the emissions measurement and reporting categorisation schematic. More action-oriented metrics or targets should also be considered alongside emissions data to more effectively drive actions. The guidance should also align with existing frameworks and best practices to enhance comparability, reduce reporting burden and avoid creating further fragmentation in the reporting landscape.

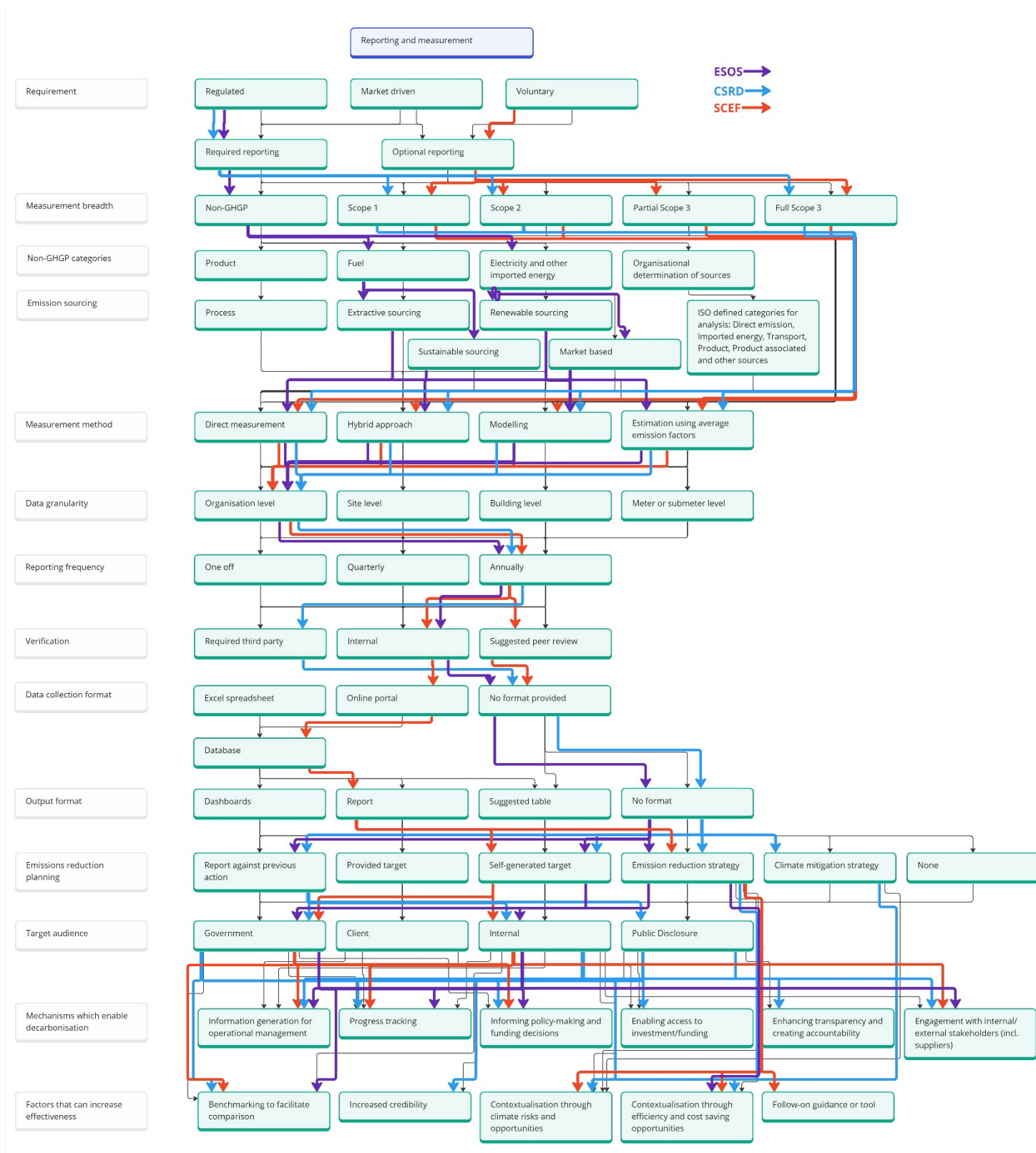
Appendix A: Scope 3 categories as defined by Greenhouse Gas Protocol Corporate Standard

Code	Description
3.1	Purchased goods and services
3.2	Capital goods
3.3	Fuel and energy-related activities
3.4	Upstream transportation and distribution
3.5	Waste generated in operations
3.6	Business travel
3.7	Employee commuting
3.8	Upstream leased assets
3.9	Downstream transportation and distribution
3.10	Processing of sold products
3.11	Use of sold products
3.12	End-of-life treatment of sold products
3.13	Downstream leased assets
3.14	Franchises
3.15	Investments

Appendix B: Filled in versions of emissions measurement and reporting categorisation schematic

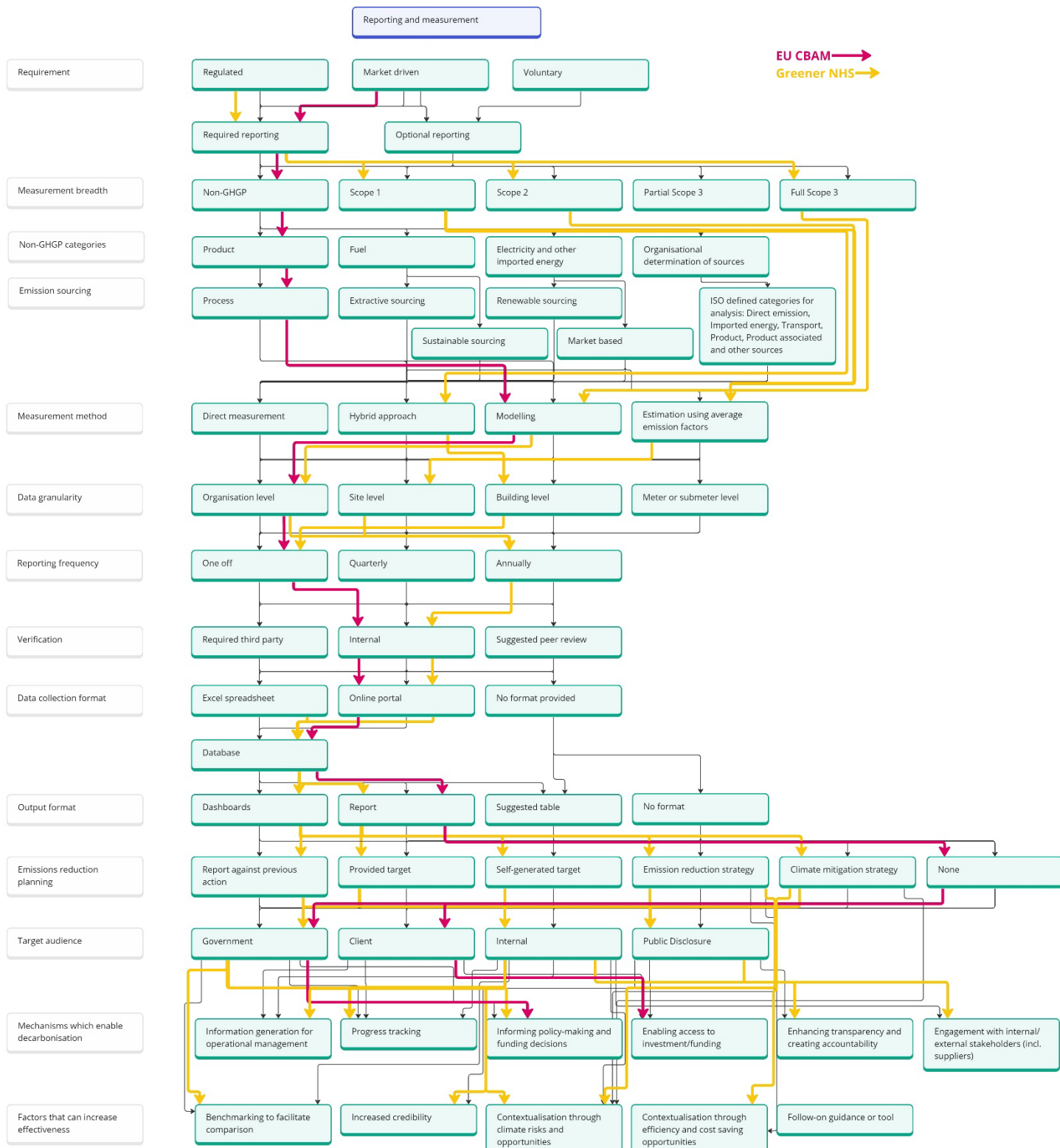
Emissions measurement and reporting approaches for the public sector

Examples of filled-in versions of emissions measurement and reporting categorisation schematic: ESOS, CSRD and SCEF



Emissions measurement and reporting approaches for the public sector

Examples of filled-in versions of emissions measurement and reporting categorisation schematic: CBAM and NHS



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