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Guidance for the Application of GHG Scope 1 & 2 in Local Highways Authorities

February 2022

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Forward

Atkins: Guidance Development Partner

Atkins and Ringway are proud to be sponsoring this important guidance. Increasingly, climate change is affecting us all and the impacts are becoming more severe and frequent. The requirement to minimise carbon emissions is now widely accepted with most local highway authorities having already declared a climate emergency. Whilst there is a shared clarity about this ambition, the journey towards achieving it is less clear. The associated challenges cannot be resolved in isolation and a collaborative effort is required, from government to council, and across the supply chain. Many of these influencing stakeholders are clients of Atkins and Ringway and we have capability, and the moral duty, to drive change across the sector.

Our approach to highways asset management goes beyond just ‘maintenance’ and we embrace the International Standard (ISO 55000), which describes asset management as an organisation wide decision-making framework. We help our clients deploy these principles to align front line activity with higher level corporate objectives and to embed a culture of systemic continuous improvement. For these reasons, adopting an asset management approach becomes a key enabler for steering the organisation towards its sustainability targets. It drives decisions on design, inspection regime, maintenance interventions, and materials selection, all of which drive their respective carbon footprint.

This guidance provides the first steps in enabling local highways authorities to measure and report their carbon footprint consistently. This will not only help to drive improvements now but will also provide an overall picture of what local authorities have achieved to date and establish their future role in realising the overall national net zero target. This guidance will help local authorities engage with government departments, providing a common understanding and clarity on capacity and responsibilities for prioritising decarbonisation initiatives. We recognise that funding continues to be a critical issue and this guidance facilitates the necessary two-way conversations that will help to attract the necessary funding for whole-life carbon reduction.

We are passionate about bringing simplicity and structure to this complex global issue and supporting local highways on their decarbonisation journey.

John Turpin, Practice Director, Digital Asset Management, Atkins

Ringway: Guidance Development Partner

We are all very aware of the urgency of the climate crisis we now face, and the potential impact on local services. Climate Emergencies have been declared across a majority of Local Authorities in England, with incredibly challenging targets to deliver positive change. Progress in delivering real change needs to be ramped up if these targets are to be achieved.

The UK Government has made it clear that transport is the biggest emitter of carbon in this country. Whilst much of this is inherent in the use of our highway networks, there is much that can be done to address the embodied carbon within the way we work to deliver and maintain highway services. Carbon calculations – and claims about net zero, carbon savings

and 'greener' ways of working, need to be substantiated with real, comparable data about our highway services. What is the contribution highway assets and services make to carbon outputs? And what tools, materials and changes might support significant carbon reduction?

To start to answer these important questions, and to meet this challenge head on, the Future Highways Research Group (FHRG), Ringway and Atkins have led this important work, supported by ADEPT. They have reviewed the carbon recording, conversion and reporting approaches currently being used and provided some practical guidance to help Highway Authorities to understand the Scope 1 and 2 carbon impacts associated with their whole service; including where services are currently outsourced.

This report, and the guidance contained within it, will enable transparent reporting of carbon associated with highway services and the potential impact, both positive and negative, this has in meeting Climate Emergency ambitions. It will provide a blueprint to share best practice and drive real long-lasting improvements – signposting best value investment now, for long-term sustainable gain for local communities.

The time has long gone for talking about making changes – we all need to take action now. I am proud to share this important guidance with you, and very much look forward to seeing and sharing that real change for the benefit of us all and the communities we represent.

Mitesh Solanki, Managing Director, Ringway

Introduction

The Future Highways Research Group (FHRG) has developed this step-by-step guidance to assist Local Highways Authorities (LHAs) in implementing the GHG (greenhouse gas) protocols for measuring and reporting carbon emissions. This guidance follows what the GHG protocol refers to as the *operational control approach* and is intended to identify the emissions from LHAs over which they have control or influence.

The primary objective of this document is to provide standardised, highways-specific guidance for applying the GHG standards for scope 1 and 2 within LHAs. This guidance will assist LHAs in determining what their carbon footprint includes and how to monitor and measure the applicable data. This will enable LHAs to calculate their carbon emissions and carbon footprint on a comparable basis.

This document is intended to provide guidance for the implementation of the established GHG standards and does not seek to replace or supersede them. To ensure best practice, this guidance has incorporated the relevant elements of the GHG standards, BS EN ISO 14001, PAS 2050 and PAS 2080; these being the most common standards and protocols adopted by local authorities.



'Carbon footprint' is a term used to describe the amount of greenhouse gas (GHG) emissions caused by a particular activity or entity, and thus provides a way for organisations and individuals to assess their contribution to climate change. Understanding these emissions, and where they come from, is a necessary step towards reducing them.

What are scope 1, 2 and 3 emissions?

Greenhouse gas emissions are categorised into three *scopes* by the most widely used international accounting tool, the Greenhouse Gas (GHG) Protocol. Scope 1 covers direct carbon emissions from owned or controlled sources. Scope 2 covers indirect emissions from the generation of purchased electricity, steam, heating, and cooling consumed by the authority. Scope 3 addresses supply chain emissions, including emissions from purchased goods and services. The emissions categories of the three scopes are illustrated in Figure 1:

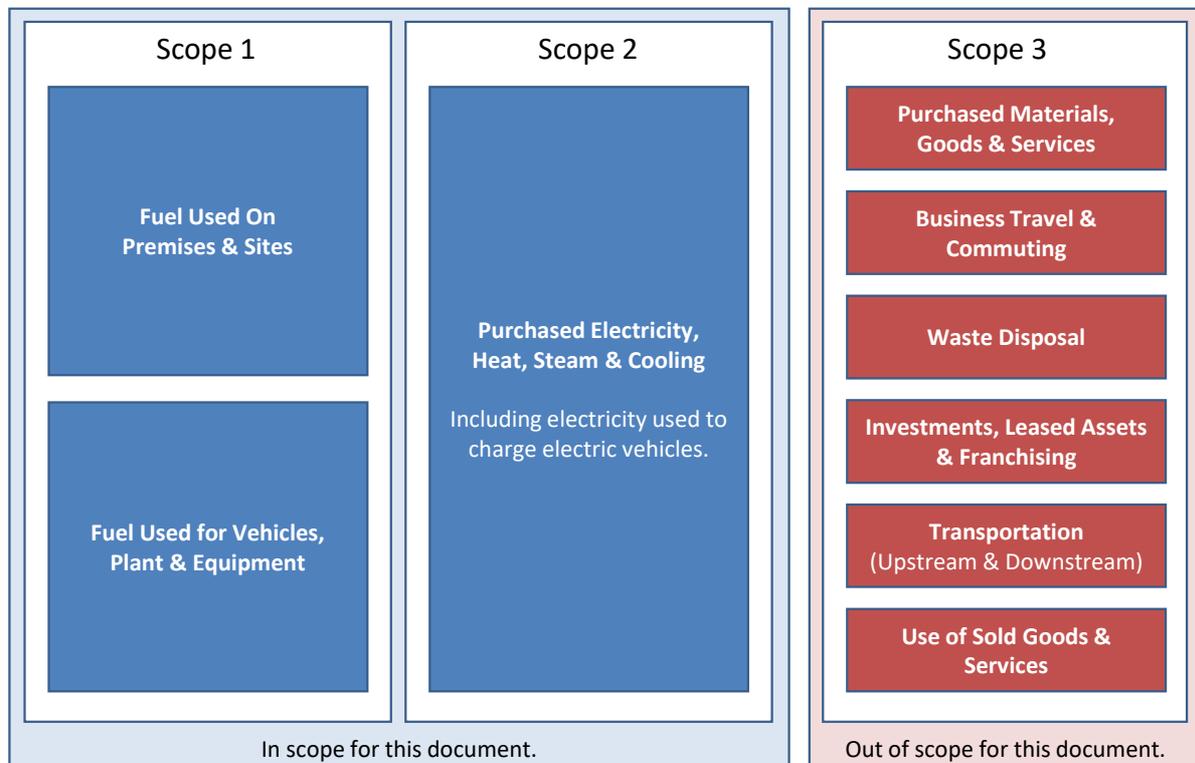


Figure 1: Scope of this guidance

Scope 1 is commonly split into fuel combustion, processes emissions, fugitive emissions and emissions from vehicles, plant and equipment. This guidance follows conventional approaches, but sub-divides emissions from LHA premises / sites and emissions from LHA-directed activities using vehicles, plant and equipment on

the network. This approach is consistent with the GHG protocol for the construction sector and seeks to separate static fuels consumption from the fuels used in network-based operations.

The scope 1 and 2 categories can be found detailed in Table 1.

Table 1: Scope 1 & 2 Categories (Adapted from the Carbon Trust, 2021)

Emission Type	Description
Scope 1	
Fuel Combustion	Includes boilers for heating buildings, gas furnaces and gas-fired combined heat and power (CHP) equipment and plant. The most common fuels are natural gas, liquified petroleum gas (LPG), gas oil (aka red diesel) and burning oil (aka kerosene).
Process Emissions	Includes emissions released into the atmosphere during industrial processes, for example the production of carbon dioxide (CO ₂) as part of cement manufacturing.
Fugitive Emissions	Emissions are leaks of greenhouse gases, for example from refrigeration and air-conditioning units. Refrigerant gases are generally extremely potent greenhouse gases, some of which are thousands of times more damaging than carbon dioxide (CO ₂).
Company Vehicles	All vehicles owned or leased by an organisation, and which burn fuels producing greenhouse gases, fall into scope 1. Typically, these will be cars, vans, trucks, and motorcycles powered by petrol or diesel engines. Transport, however, is changing. Alternative fuels, such as Liquid Petroleum Gas (LPG) and Liquefied Natural Gas (LNG) are being adopted, as are biofuels, biodiesel, and bioethanol. Full electric vehicles (EVs) and plug-in hybrids (PHEVs) are also becoming more popular ¹ .
Scope 2	
Purchased electricity, heat, and steam	Indirect emissions from the generation of purchased energy from a utility provider.

Use and scope of this guidance

This document provides step-by-step guidance for completing the following tasks:

1. **Selecting a baseline year for scope 1 and 2 reporting.**
 - a. Aligning the carbon footprint and financial reporting cycles.
2. **Creating a boundary to establish the scope of the carbon footprint assessment.**
3. **Identifying and assigning highways activities to the relevant scopes (1, 2 or 3).**
4. **Creating an inventory of premises / sites where fuel is combusted, and emissions produced.**
5. **Creating an inventory of premises / sites where utilities are supplied from carbon producing sources.**
6. **Creating an inventory of Vehicles, Plant and Equipment (VPE).**
 - a. This includes VPE that use fuel and electric vehicles that require charging.
7. **Measuring fuel consumed and emissions produced.**
8. **Measuring energy purchased and the indirect emissions produced.**
9. **Calculating the scope 1 carbon footprint.**
10. **Calculating the scope 2 carbon footprint.**
11. **Creating in-house processes for the on-going measurement of scope 1 and 2 emissions.**

This document will remain under review by the FHRG, ADEPT, Atkins and Eurovia and will be updated periodically to reflect changes in standards and policies, improvements in technologies, fuels, data capture methods and data analysis techniques. The scope of this guidance is illustrated in Figure 1, and covers scope 1 and 2 emissions measurement and reporting for LHAs.

¹ The increasing use of electric vehicles could mean that some of an organisation's fleet will fall into scope 2.

Complimentary tools supporting this guidance are available to all FHRG and ADEPT members from February 2022, these include:

1. **Microsoft Excel workbooks for:**
 - a. Scope 1, 2 and 3 activities analysis.
 - b. Creating a premises / sites inventory.
 - c. Creating a vehicles, plant and equipment inventory (those using electricity and / or fuel).
2. **A scope 1 and 2 guidance compliance assessment (as a Value Analyser™ add-in assessment).**

As illustrated in Figure 1, Scope 3 emissions are out-of-scope of this document and are covered separately in *GHG Scope 3 Standards & Guidance for Local Highways Authorities*. This additional guidance is currently being prepared by the FHRG and is scheduled for release in the summer / autumn of 2022. The FHRG is exploring carbon footprint benchmarking and the development of a curated online database of carbon reduction options. Combined, these tools will facilitate knowledge sharing and underpin future, informed, carbon reduction strategies.

Who is this guidance is for?

This guidance has been prepared for LHAs. As well as general guidance, specific advice is provided for key highways services stakeholders engaging in carbon measurement and reporting. Each step in the guidance will require the oversight and participation of the following stakeholders:

- **Carbon Management & Reporting Team².**
- **Highways Services Director (and Highways Services Commissioner).**
- **Asset Manager(s).**

It should be noted that all members of the LHA team should be briefed on this guidance, the GHG standards, and the wider implications of carbon measurement and management on services provision.



In most authorities, a corporate *Carbon Management & Reporting Team* will be responsible for monitoring and recording the sources of emissions. In these cases, reporting should be undertaken by the corporate team, ensuring that effort is not wasted, and data is not double counted.

The *Carbon Management & Reporting Team* should be able to provide the highways services team with adjusted figures for emissions for highways related services based on the data collated and calculated centrally.

Terminology: *shall, should, may*

This guidance uses precise language to indicate accounting and reporting requirements, recommendations, and allowable options that companies may choose to follow.

- **The term “shall” is used throughout this document to indicate what is required for a GHG inventory to be in conformance with this guidance and, by extension, the GHG protocols and associated standards.**
- **The term “should” is used to indicate a recommendation, but not a requirement.**
- **The term “may” is used to indicate an option that is permissible or allowable.**

The term “required” is used in the guidance to refer to requirements and reporting obligations. Where specified, “needs”, “can”, and “cannot”, may be used to provide recommendations on implementing a requirement or to indicate when an action is or is not possible.

² These may be part of a corporate function within a local authority but have reporting responsibility for highways services.

Using the guide

Figure 2 illustrates the steps involved in determining a local authority highway carbon footprint for scope 1 and 2 emissions:

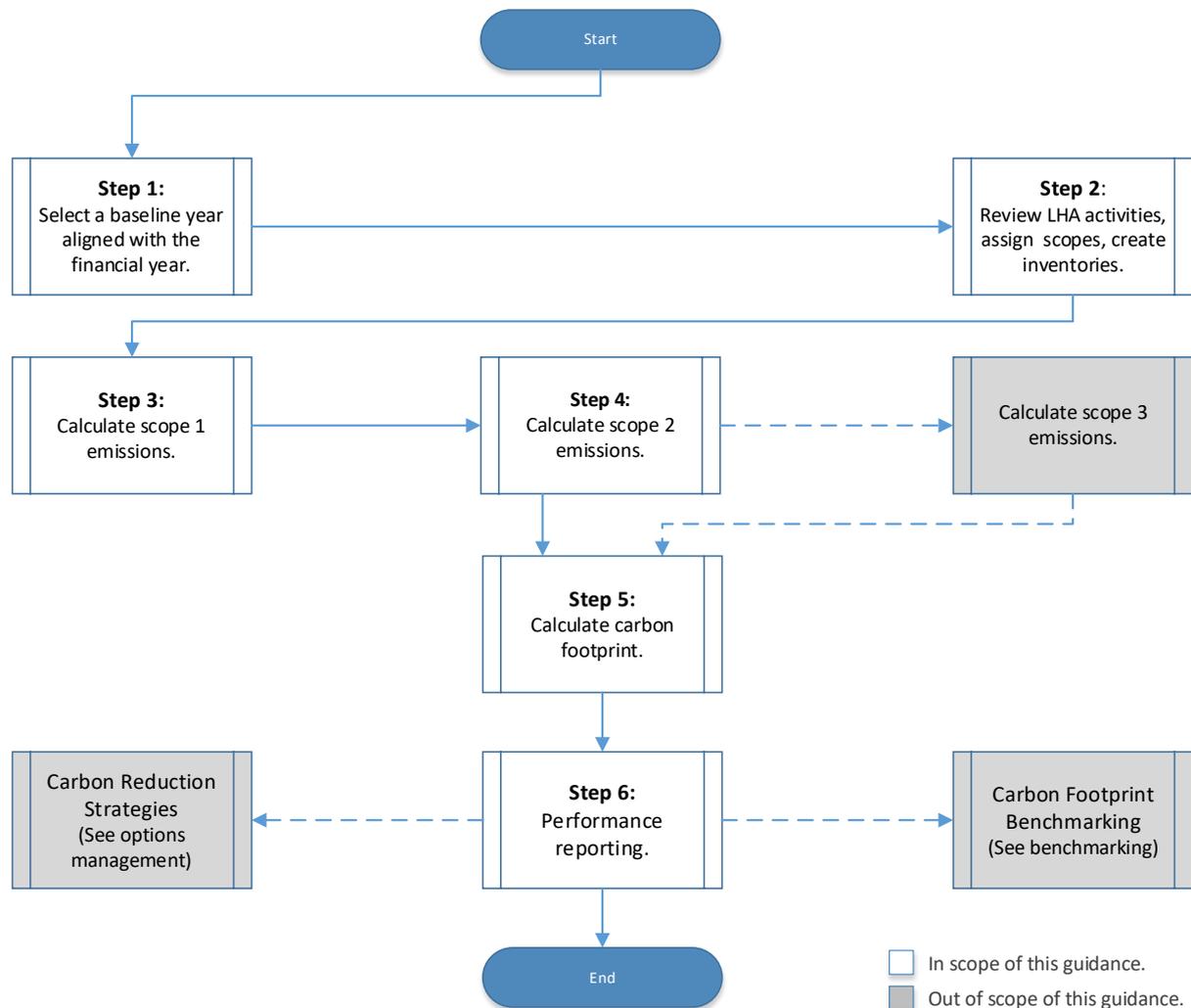


Figure 2: Flowchart illustrating the scope and steps in this guide

How to use this guide if you undertake activities on behalf of an LHA

Where activities are undertaken by external services providers, this guide can be followed to ensure that all reporting responsibilities are appropriately assigned, and emissions datasets are consistently collated and calculated. Working in collaboration with the LHA, data gaps should be identified and closed.

Transitory arrangements for supply chain partner(s) activities reporting

If you are a supply chain services provider, carrying out activities on behalf of an LHA, then this guide should be used to ensure that your datasets for scope 1 and 2 are collated and calculated as described for the LHA. Where current or historic emissions measurements deviate from this guidance, conversion protocols and interim reporting procedures will need to be agreed and documented with the LHA. A transition programme will be required to ensure that future processes, reporting boundaries, inventories, reporting cycles, and measurement protocols will comply with this guidance by an agreed date.

If you have an existing contract that includes a requirement for carbon footprint reporting, then this guide can be used to assess the consistency, accuracy and completeness of those reports. Where emissions measurement and reporting protocols differ from those stipulated in this guidance, these should be documented and reviewed by the LHA and the supply chain partner(s). In most cases, simple data conversions can be used to provide interim reports while a transition programme to align with this guidance is implemented by the services provider(s).

Resources and competence

Each LHA must ensure that resources are assigned, and that roles and responsibilities are clearly communicated. This will ensure that the necessary data used to calculate the carbon footprint is collected.

Competence requirements are to be determined by each local authority; however, it is recommended that the identified resources undertaking carbon monitoring and management activities are suitably trained and certified.

The main competencies for those involved in carbon management and monitoring are:

- **Familiarity with the GHG standards and the carbon reporting requirements.**
- **Carbon accounting systems training and skills³.**
- **Comprehensive understanding of the guidance outlined in this document.**
- **Familiarity with the items included in the inventories.**
- **Data and data sources management skills.**
- **Data collection and collation skills (especially the management of large data sets).**

There will be different levels of competency depending on the role, and frequent training is one of the many methods for achieving (and maintaining) competency. Those with responsibility for carbon management within LHAs should be encouraged to continually improve their knowledge, skills, and expertise.

The following competency requirements are recommended as a minimum for the associated roles:

1. **Data collator** - fully aware of where the data is sourced from; including access to data, meters, and other information as required. Data collators should be fully conversant in the use of data recording tools, the approach adopted for unit conversion and be able to identify data inaccuracies and data gaps, thereby enabling correction at source.
2. **Carbon footprint producer** - fully conversant in the use of the adopted carbon calculation and reporting tools and trained in the production of carbon footprint reports⁴.
3. **Carbon Manager** – trained and certified for carbon management, with comprehensive knowledge of the highways sector and LHA services.

It is recommended that the staff assigned the roles identified above receive formal training on carbon footprinting from a relevant local or national qualification (or equivalent) scheme. Training is offered by numerous providers including, but not limited to GHG Protocol and IEMA (Institute of Environmental Management and Assessment).

Effective communications and a zero-carbon culture

To ensure carbon measurement and reduction become priorities, effective communications and cultural change are essential at all levels of highways services.

The first step is to ensure that highways services policies and goals align with those of the parent authority. To achieve this, the highways team must establish communications with the authority-level team responsible for carbon management and reduction. To support this process, the Local Government Association (LGA) provides detailed guidance and resources for ‘building a narrative for your council’⁵. The LGA toolkit addresses why and how a more engaging approach to developing and communicating a narrative works and offers practical methods and examples.

Once established, consistent policies, goals and measures must be agreed and documented. This guidance can be used as a framework for those discussions. It is critical that service-level data and reporting standards are consistent and compatible with those set by the authority. It is equally important that the authority recognise the data dependencies of the highways service.

The LHA team should then prepare briefing materials, training and guidance for the workforce.

³ Authorities typically adopt either a proprietary software tool or will create an in-house Microsoft Excel-based reporting tool.

⁴ Including training and certification by an appropriate and relevant professional body.

⁵ <https://www.local.gov.uk/our-support/guidance-and-resources/comms-hub-communications-support/building-narrative-your-council>.

The objective is to inform and involve the entire workforce and create a culture where carbon measurement and reduction is a shared strategic goal and an operational priority. A low carbon culture is created and sustained through the daily decisions and behaviours of individuals. It is therefore important to emphasise the role of the individual.

To embed and sustain a low carbon culture, carbon measurement and performance reporting should be a topic discussed at management meetings. Frequent carbon performance briefings and Q&A sessions, involving the whole workforce, can be used to reinforce the importance of carbon management within the service.

Supply chain partners are increasingly reporting the carbon footprints of products and services. In many cases, reporting granularity extends to all client transactions (i.e., the carbon emissions resulting from printed documents, emails and electronic services).

In all cases, communications will require clear and consistent messaging, agreed with the parent authority. Messages should include tangible measures of performance and should be frequently refreshed to demonstrate progress.

Reduction strategy

Setting carbon reduction targets provides a clear direction and communicates the goals for carbon reduction. This should be underpinned by robust, frequent monitoring - highlighting progress towards set targets. Future FHRG Value for Money (VfM) assessments will include a new (Q4, 2021) sustainability dimension, assessing carbon reduction performance relative to the stated goals.

Once the processes are embedded (Steps 1 to 5) for scope 1 and 2, a meaningful and consistent comparison of each year’s emissions can be traced. A key component of carbon management is to set targets. Targets by date and emissions level need provide tangible goals for the LHA to pursue.

Using energy more efficiently reduces operating costs while cutting emissions. The energy efficiency measures that are considered as ‘low-regret’ measures are those that often save significant fuel costs (CCC, 2020a). This can be applied to various aspects of service delivery. To help focus planning and determine a starting point for carbon mitigation efforts, it is often useful to follow a carbon management hierarchy, an example of which can be found in Figure 3.

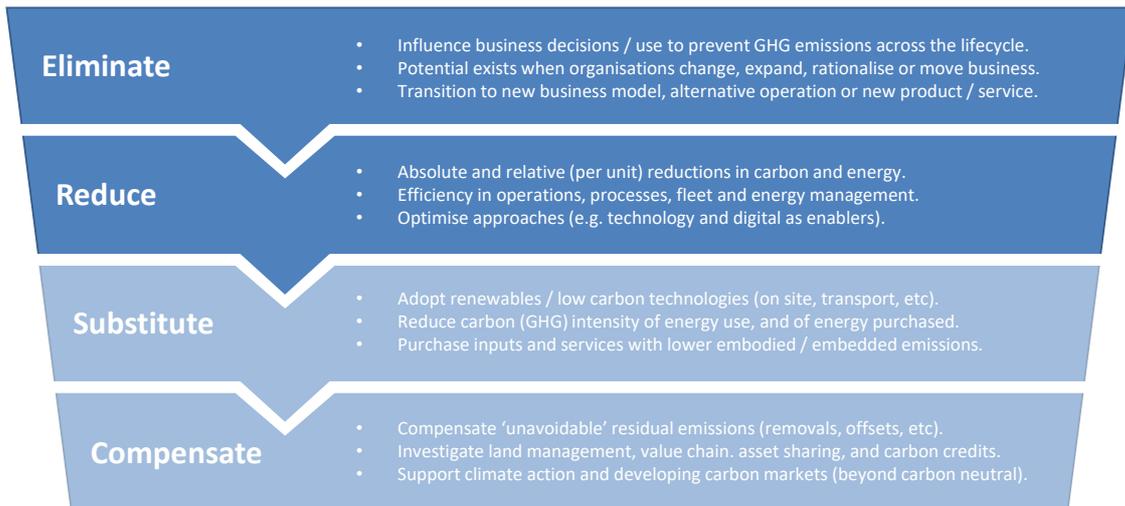


Figure 3. IEMA Greenhouse Gas Management Hierarchy (updated 2020), (IEMA, 2021)

The local authority should engage in early discussions with relevant supply chain partners to help identify high priority carbon reduction opportunities. This can be done through briefings and workshops, or by integrating carbon management into existing discussions.

It should be recognised by all that the compensation element of the hierarchy in Figure 3 occupies a changing landscape politically and is the last approach to be adopted. It is only applicable when all other opportunities for carbon reduction have been investigated and or deployed. Furthermore, it is expected that this will have greater relevance and impact when considering scope 3 emissions, which is outside of scope of this guidance document.

Leadership and Governance

The local authority executive has the overall responsibility for meeting and reporting environmental requirements, including that of carbon. In support of the authority, the highways services leadership team should:

- **Set a service strategy for carbon management.**
- **Support the development of a carbon footprint for scope 1 and 2.**
- **Communicate consistently and regularly to staff at all levels on the importance of the carbon footprint.**
- **Communicate consistently with supply chain members to develop collaborative relationships with the goal of reducing carbon emissions.**
- **Ensure that adequate resources are available for the analysis of the service carbon footprint.**
- **Demonstrate a commitment to continuous improvement through the sharing of current good practice.**
- **Implement governance structure where carbon reduction targets have been incorporated into a governance system to make the collection and reporting of KPI (Key Performance Indicator) data a pro-active process.**

When communicating to those in the organisation, top management should emphasise the importance of carbon management and reduction through employee engagement and consider methods of empowerment, motivation, recognition, training, rewards, and participation to support this activity.

It is recommended that local authorities adhere to the key principles identified for accounting and reporting environmental impacts noted by HM Government (2019) as follows when reporting figure for carbon. They must be:

- **Relevant** - the data collected and reported must appropriately reflect the environmental impacts and serve the decision-making needs of users — both internal and external to the organisation.
- **Quantitative** - KPIs need to be measurable (and where possible relate to primary data), and information should be accompanied by a narrative, explaining its purpose, impacts, and giving comparators where appropriate.
- **Accurate** - reduce uncertainties in reported figures where practical and achieve sufficient accuracy to enable users to make decisions with reasonable confidence as to the integrity of the reported emissions.
- **Complete** - quantify and report on all sources of environmental impact within the reporting boundary defined, disclosing, and justifying any exclusions.
- **Consistent** - use consistent methodologies to allow for meaningful comparisons of environmental impact data over time documenting any changes and relevant factors as they arise.
- **Comparable** - report data using accepted KPIs rather than organisations inventing their own versions of potentially standard indicators, furthermore, use of accepted KPIs assists in benchmarking against peers.
- **Transparent** – addressing all relevant issues in a factual and coherent manner, keeping a record of all assumptions, calculations, and methodologies used.

Where responsibility is delegated, the overall responsibility for leadership and governance remains with top management.

Step 1: Selecting a baseline year

The purpose of this step is to:

1. **Identify a potential (or authority set) baseline year.**
2. **Set the reporting starting date to align with the financial year.**

Step 1 preparation

To complete this step, you will need:

- **Your local authority's carbon management and reporting policy.**
 - Identifying the baseline reporting year, if specified.

Assigning a Step 1 leader and process delivery team

This step will require the engagement of the following local authority and highways service stakeholders:

- **Carbon Management & Reporting Team.**
- **Director of Highways Services or the Highways Services Commissioner.**
- **Highways Asset Manager(s).**

In many cases, this step will be managed by and / or coordinated with a corporate Carbon Management & Reporting Team. If completed within the service, the Director of Highways Services / Highways Services Commissioner should assign a process leader.

Step 1 process

A baseline year is essential for producing a carbon footprint. Without an assessment of baseline emissions, it is impossible to reliably judge the success of any carbon reduction initiatives through performance monitoring.

The process for determining the baseline year includes the following steps (as illustrated in Figure 4).

1. **Has a baseline year for carbon reporting been identified by the authority?**
 - a. If yes, move to step 4 in this list.
2. **Identify a proposed baseline year.**
 - a. The proposed year should be a year where activity and emissions data are envisaged as being available.
3. **Does the authority (corporate) Carbon Management Team agree?**
 - a. If the authority does not agree, identify a year with the Carbon Management & Reporting Team.
4. **Document the rationale and assumptions for the baseline year.**
 - a. It is important to document the rationale for selecting the chosen baseline year.
 - b. Any assumptions made regarding the selected baseline year should be documented⁶.
5. **Align the carbon reporting year with the financial year: 1st April to 31st March.**
 - a. Annual spend on services typically correlates with changes in the carbon footprint, so an alignment of the financial year and the carbon reporting year will aid in identifying carbon footprint changes related to spend on specific highways activities.
6. **Preliminary baseline year established.**
7. **Move to Step 2 (Establishing a boundary and the carbon sources inventories).**

Once a baseline year is identified, subsequent years must be calculated using methods and measures consistent with those used to calculate the baseline year. This will enable meaningful year-on-year comparisons and progress reporting.

⁶ Including the perceived availability of data, changes in the services delivery model, change of supply chain partners, etc.

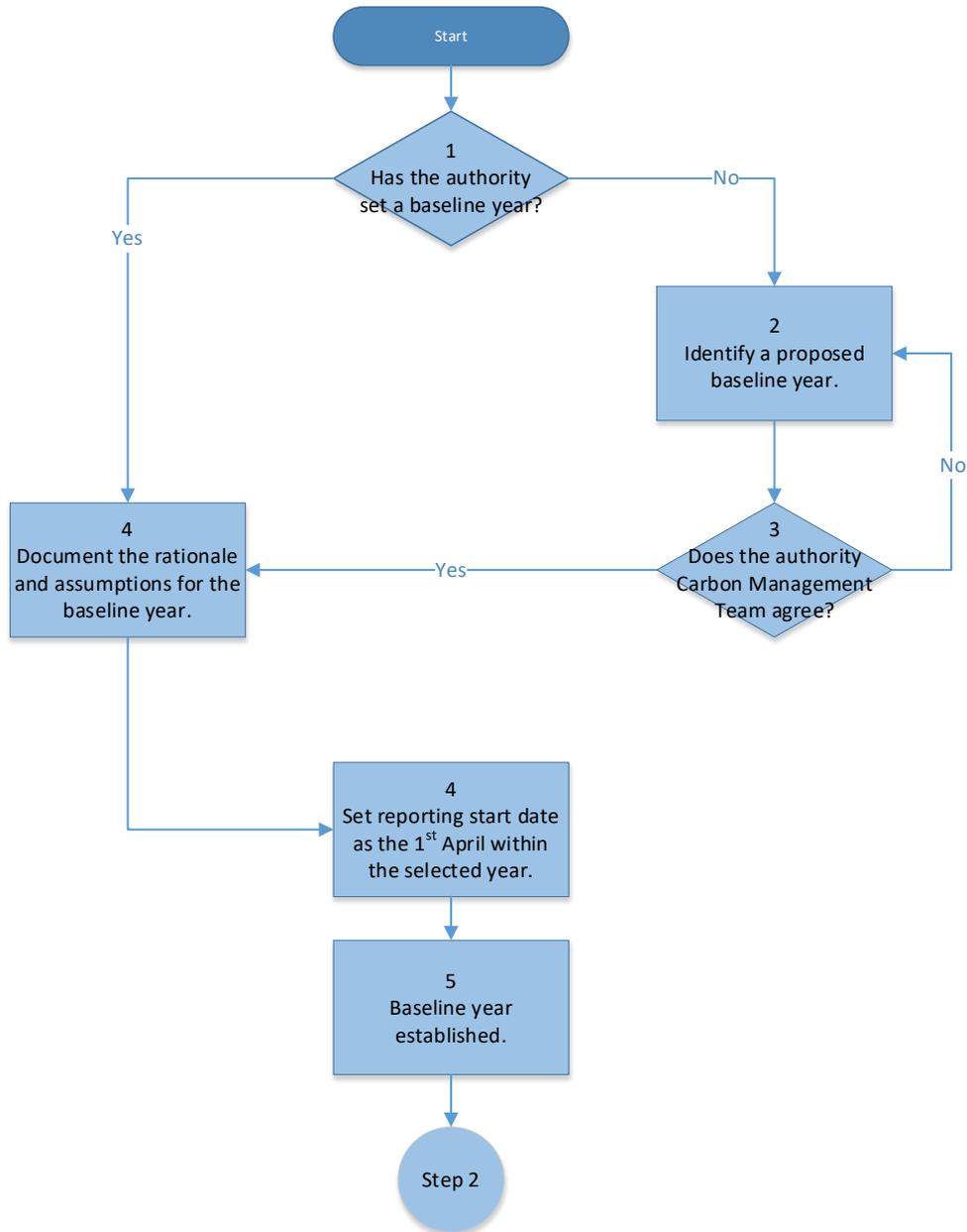


Figure 4: Establishing a baseline year

On completion of Step 2, if it is determined that an alternative year can provide more accurate data, the baseline year can be reviewed and amended, if agreed with by all key stakeholders. Further information on amending the baseline year can be found in Step 5, **Changes to the baseline year**.

Step 1 completion checklist

Check that Step 1 has been completed using this checklist:

- Identified a baseline year.
- Rationale for baseline year documented.
- Carbon reporting year is aligned with the financial year (1st April).

Step 2: Establishing a boundary and creating the carbon sources inventories

The purpose of this step is to:

1. **Identify all highways activities.**
 - a. See Table 2 for a standard list of highways activities.
2. **Assign each activity to a scope (1, 2 or 3).**
 - a. In-house activities are assigned as scope 1 and 2.
 - b. Outsourced and devolved⁷ activities are assigned as scope 3.
3. **Identify activities inside and outside of the carbon footprint boundary.**
 - a. Activities not conducted by, nor commissioned by the LHA, are outside of the boundary.
 - b. All other activities are within the boundary.
4. **Identify the premises / site(s) used by each activity and add them to an inventory of premises / site(s).**
 - a. This inventory is used to complete the assessment of scope 1 and 2 emissions.
5. **Identify the fuel-powered Vehicles, Plant & Equipment (VPE) used by each activity and add them to an inventory of VPE.**
 - a. This inventory is used to complete the assessment of scope 1 emissions.
 - b. Electrically powered plant, equipment and electric vehicles (using electricity sourced from a utility provider and / or public EV charging station) will be included in scope 2.

Step 2 preparation

To complete this step, you will need:

- **The locations and uses of the premises / site(s) owned, controlled or shared by the LHA.**
- **An inventory of electric and fuel-powered vehicles, plant and equipment.**
 - Owned, leased or rented by the LHA.
- **A schedule of in-house and outsourced functions and where they are located.**
 - Including operations co-located with supply chain partners or other authority services.



If the measurement and calculation of the scope 1 and 2 carbon footprint is the responsibility of a different function or team within your authority, then this guidance should be discussed with that team.

The highways leadership team needs to confirm that all scope 1, 2 and 3 activities are clearly defined and that the relevant inventories have been prepared, as described in this step. Emissions measurements and calculations can then be undertaken by the responsible team(s) within your authority and service.

Assigning a Step 2 leader and process delivery team

This step will require the engagement of the following local authority and highways stakeholders:

- **Director of Highways Services or the Highways Services Commissioner.**
- **Carbon Management & Reporting Team.**
- **Heads of highways functions.**
- **Highways Fleet & Transportation Manager.**
- **Finance team.**
- **Human Resources (HR) team.**
- **Supply chain partner(s) Client / Relationship Manager(s).**

This step should be led by the Highways Services Director or Highways Services Commissioner, supported by the (authority or service) Carbon Management & Reporting Team.

GHG protocol and the operational control approach

The GHG protocol states the following for the *operational control approach*:

⁷ Devolved to districts and parish councils.

Under this approach, a company would record emissions from facilities, sites, or operations over which it, or one of its subsidiaries, has operational control, i.e., the authority to introduce and implement its operating policies for the operation. A company accounts for 100% of emissions from operations over which it, or one of its subsidiaries, has operational control. (ENCORD, 2012)

The LHA should, therefore, include all directly managed and commissioned activities⁸. These directed activities form the *boundary*. Under the GHG protocol, emissions from outsourced activities, delivered by contracted supply chain partners, are classed as scope 3⁹. Any activities not undertaken by, or in financial control of, either the local authority directly or a commissioned third party should be documented as being outside of the GHG boundary.

Creating inventories of premises, sites, and powered vehicles, plant and equipment

The LHA will need to make inventories of all premises, sites, vehicles¹⁰, and powered plant and equipment. These inventories can be completed when reviewing the service checklist in Table 2. There are two inventories: **premises and sites**, and powered **Vehicles, Plant / Equipment (VPE)**.



The purpose of the inventories is not to account for emissions from individual premises or VPE items, but to ensure that all emissions sources are identified and included in the scope 1 and 2 calculations. Comprehensive inventories of emissions sources will also enable future carbon reduction initiatives to be prioritised, planned and implemented.

The premises and sites inventory

The inventory of premises (or sites) should include:

- **Offices.**
- **Depots.**
 - Including materials storage, processing and recycling sites.
- **Garages and vehicle storage sites.**
 - Including refuelling stations.
- **Staff rest areas, overnight accommodation facilities¹¹, welfare offices and marshalling sites.**
- **Plant and equipment maintenance and storage facilities.**

All premises / site(s) where fuel is combusted and / or stored, and where there is a mains electricity supply must be added to the inventory of premises / site(s). This includes any site with:

- **Boilers for heating buildings.**
- **Electric heating, electric lighting and / or electrically powered appliances.**
 - Utilising electricity purchased from a utility provider.
- **Gas fires.**
- **Gas furnaces.**
- **Combusted fuels used as a heat source for processes.**
- **Gas-fired Combined Heat and Power (CHP) plants.**
- **Air conditioning, humidity controllers and / or air filtration systems¹².**
 - These may produce fugitive emissions, see Step 3.

It is important for the footprint that all authority / highways service owned and / or controlled premises are included¹³. These are needed to calculate the carbon footprint and enable an assessment of the opportunities for carbon footprint reductions.

The inventory of premises / sites should include the following details for each location:

⁸ Or as many as practically possible.

⁹ This guidance recommends that outsourced activities producing scope 1 and 2 emissions (classed as scope 3) are calculated by supply chain partners as stipulated in this guidance.

¹⁰ Including fuel and electrically powered vehicles.

¹¹ Where this is owned / managed by the LHA.

¹² Humidity controllers and / or air filtration systems may include air cooling equipment.

¹³ Sites where no fuel is combusted and without a metered mains electricity supply can be excluded from the inventory unless this is likely to change within the reporting period.

- **Site reference name or number.**
- **Address of premises / site.**
 - Or the georeferenced position of the site.
- **Access details.**
 - Including times when access is available.
- **The responsible person(s) or agent(s) for that site.**
 - Including the names of key holders.
- **Owned, leased or rented.**
 - Directly by the authority.
- **Fuel type(s).**
 - Specify any applicable; gas, oil, coal and / or electricity.
- **On-site fuel storage.**
 - If the site includes fuel storage¹⁴, specify type, capacity and location.
- **Measurement method for each fuel type.**
 - Meter reading (preferred).
 - Invoices and statements (used for verification).
 - Invoicing / meter reading cycle details; i.e., monthly (recommended), quarterly or annually.
- **Location of meters.**
 - Including the floor, where applicable.
- **Measurement adjustments.**
 - Record in the inventory if a meter has been replaced, as readings may not tally if the replacement was zeroed¹⁵.
- **Air conditioner(s) and refrigeration unit(s) (where applicable).**
 - Number and location of air conditioning / air processing units.
 - Name(s) of the maintenance / service agent(s).
- **Shared site (where applicable).**
 - Specifying an agreed standard formula / ratio used to apportion emissions to the relevant parties.

A standard inventory template for premises / sites is available from the FHRG.

The Vehicles, Plant & Equipment (VPE) inventory

The scope of the inventory of fuel and electrically powered Vehicles, Plant and Equipment (VPE) should include:

1. **Fuel-powered vehicles (i.e. diesel, petrol, biofuels and / or LPG).**
2. **Hybrid vehicles (including plug-in and self-charging hybrid vehicles).**
3. **Fully Electric Vehicles (EVs).**
4. **Fuel-powered plant and equipment.**
 - a. Including portable plant and equipment.
5. **Shared / pool vehicles.**
 - a. These should only be included if not included within the inventory of another service within the authority.

Do not include:

1. **Electrically powered tools, plant and equipment.**
2. **Rechargeable hand-held tools.**
3. **Tools that used compressed air from an electrically powered compressor.**

Emissions from the excluded items will be assessed using meter readings under scope 2.

Details for each VPE inventory item should include:

¹⁴ E.g., oil tanks, gas cylinders and gas bottles.

¹⁵ In these cases, an adjustment will need to be applied prior to adding any usage data to the carbon footprint.

- **VPE type.**
 - Electric or fuel-powered vehicle, plant or equipment¹⁶.
- **VPE registration number, serial number, VIN¹⁷ number or asset number.**
- **VPE class.**
 - Used to align with government classifications for vehicle and plant classes¹⁸.
- **Fuel / energy type.**
 - Diesel and red diesel.
 - Petrol (gasoline).
 - Fuel oil.
 - Heating oil¹⁹.
 - Natural gas¹⁹.
 - Liquefied Petroleum Gas (LPG).
 - Compressed Natural Gas (CNG).
 - Propane.
 - Butane.
 - Hydrogen (grey, blue and green).
 - Solid fossil fuels (including coal and coke).
 - EVs using electricity purchased from a utility provider or a public EV charging station.
- **Fuel source.**
 - Garage or fuel retailer.
 - Fuels distributor (on-site delivery).
 - On-site fuel tank, gas cylinder and / or gas bottles owned and managed by the authority.
 - Jerrycan (for portable VPE items).
 - Electric charging station (on-site and / or public).
- **Fuel use recording method.**
 - Meter readings (preferred).
 - Invoices and receipts from a fuel provider / retailer, detailing the quantity purchased.
 - Fuel cards, detailing quantity of fuel purchased, the vehicle registration and mileage (preferred).
 - Filling dockets (from fuel storage tanks).
 - EV charging station receipts (reported as scope 2).
 - Jobs codes and works orders (optional).
- **Administrator, asset manager and user.**
- **Owned, leased or rented.**
- **Multi-purpose or single application VPE.**
 - Identifying VPE with multiple service applications²⁰.
- **Shared VPE with other authority services users (where applicable)²¹.**
 - Identify shared VPE with other (non-highways) authority users.
 - Agree a standard formula / ratio to be used to apportion emissions to the relevant users.
- **Typical monthly usage (optional).**
 - Mileage per month.
 - Hours in use per month (for plant and equipment).
- **Location (optional).**
 - Site reference for static plant.
 - Storage location for mobile plant and equipment.

Again, a standard inventory template for VPE with these headings is available from the FHRG. The FHRG template subdivides VPE into categories for ease of reference.

¹⁶ E.g., HGVs, vans, cars, gritters, gully emptiers and pavers.

¹⁷ VIN: Vehicle Identification Number

¹⁸ <https://www.gov.uk/government/publications/greenhouse-gas-reporting-conversion-factors-2021>.

¹⁹ Ensuring that heating appliances are not double counted in the inventory of premises / sites.

²⁰ E.g., pool cars, generators, mixers, multi-purpose off-road vehicles.

²¹ E.g., pool cars and buses (not public transport).

Step 2 process: Assigning activities to scopes and building the inventories.

Step 2 will set the carbon boundary and identify which scope applies for each activity performed by the LHA. Below are the descriptions of each process step for each item in the LHA activities checklist (see Table 2). This process is illustrated in Figure 5.

For each item on the checklist:

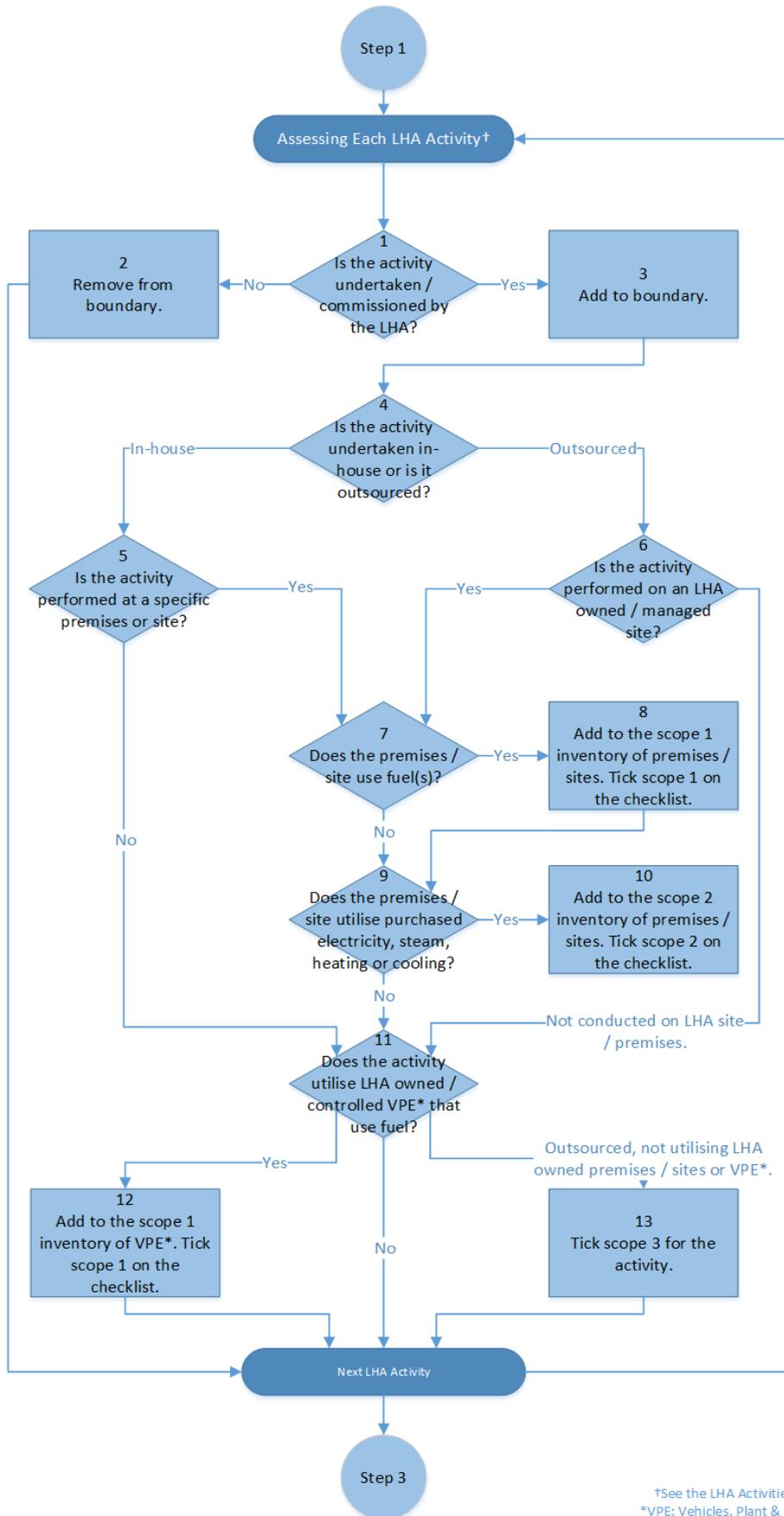
1. **Review and amend the checklist of standard LHA activities (see Table 2).**
 - a. Ensure that each activity title is amended to reflect the naming conventions for the functions / processes adopted by the LHA.
2. **If the activity is not undertaken / commissioned by the authority, the remove it from the checklist, thereby removing it from the boundary, move to the next activity (step 1 in this list).**
3. **If the activity is undertaken / commissioned by the authority, add it to the boundary by including it the checklist.**
 - a. The items remaining in the checklist are within the boundary.
4. **Is the activity undertaken in-house or is it outsourced?**
 - a. If the activity is outsourced, then move to step 6 on this list.
5. **Is the activity performed at a specific premises or site(s)?**
 - a. If the activity is performed at specific premises / site(s), then move to step 7 in this list.
 - b. If the activity is not performance at a specific premises / site and is conducted as mobile / field-based operations, then move to step 11 in this list.
6. **Is the activity performed on an LHA owned / managed premises or site(s)?**
 - a. If the LHA is the bill recipient for gas, heating oil, and / or piped steam, heating and / or cooling, then move to step 7 in this list.
 - b. If a supply chain partner is responsible for the costs of gas, heating oil, and / or piped steam, heating and / or cooling, then move to step 11 in this list.
 - c. If a supply chain partner leases a site from the authority, the partner is responsible for carbon reporting for that site.
7. **Does the premises / site use combusted fuel?**
 - a. This question excludes purchased electricity, piped steam, heating or cooling (see step 9 in this list).
 - b. If the premises / site does not use combusted fuel, then move to step 9 in this list.
8. **Add to the scope 1 inventory of premises / sites.**
 - a. Only record the premises / site once on the inventory.
 - b. Tick scope 1 on the checklist.
9. **Does the premises / site utilise purchased electricity, piped steam, heating or cooling?**
 - a. This question excludes combusted fuel (see step 7 in this list).
 - b. If no, then move to step 11 in this list.
10. **Add to the scope 2 inventory of premises / sites.**
 - a. Only record the premises / site once on the inventory.
 - b. Tick scope 2 on the checklist.
11. **Does the activity utilise LHA owned / controlled fuel-powered Vehicles, Plant or Equipment (VPE)?**
 - a. If the answer was no to step 7 (or step 7 was not applicable) and the answer to step 11 is also no, then move to step 13 in this list.
12. **Add to the scope 1 inventory of VPE.**
 - a. Tick scope 1 on the checklist.
 - b. Only record VPE items once on the inventory.
13. **Tick scope 3 for the activity.**
14. **Repeat for all LHA activities.**
15. **Move to Step 3 (Calculating scope 1 emissions).**

Inventories development and on-going maintenance

In most cases, additional investigations and information will be required to develop a comprehensive inventory of premises / sites and VPE. The inventories can be developed and refined by working groups reporting to the Carbon Management & Reporting and LHA leadership teams. A complete inventory is required before proceeding to Step 3.

As the inventories will change over time, the LHA should implement processes to ensure that all relevant changes²² are reflected in the applicable inventory. It is recommended that inventory items are date stamped to identify which inventory items have been used for a particular year's carbon footprint.

²² E.g., vehicle fleet changes, fuels used or measurement method changes.



†See the LHA Activities Checklist
*VPE: Vehicles, Plant & Equipment

Figure 5: Determining the boundary and scope 1, 2 and 3 activities

Table 2: LHA activities checklist

LHA Functions & Key Processes	In-House Emissions		Supply Chain Emissions
	Scope 1	Scope 2	Scope 3
Services Planning & Management			
Asset Policy & Asset Management	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Budget Setting, Allocation & Audit	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Procurements & Contracts Management	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Political & Executive Engagement	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Community Engagement & Communications	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Safety, Risk & Care Inspections			
Condition Assessments	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Safety & Risk Inspections	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Care Inspections (Cyclical)	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Programme Management Office			
Technical & Design Services	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Programme Management & Quality Assurance	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Planned Maintenance (Minor Schemes)			
Preventative Maintenance Delivery	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Minor Schemes Construction & Supervision	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Planned Schemes Quality Assurance	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Major Schemes & Capital Programmes			
Major Schemes Construction & Supervision	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Major Schemes Quality Assurance	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Reactive Maintenance			
Works Scheduling	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Reactive Maintenance Teams	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Network Management			
Permitting, Enforcement & Streetworks Coordination	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Reinstatements & Works Quality Assurance	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Highways Data Management	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Signals & Traffic Control			
Traffic Management	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Temporary Traffic Regulation Orders	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Civil Parking Enforcement	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Cyclical Maintenance (Excluding Drainage)			
Weed Treatments	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Grass Cutting, Verge & Hedge Maintenance	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Tree Cutting	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Streetscene Improvements	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Drainage & Flood Risk Management			
Flood Risk Authority (Planning & Management)	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Condition Inspections & Risk Assessments	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Gully Cleansing & Repairs	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Materials Handling & Storage			
Winter Treatments	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Construction Materials Management & Storage	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Waste & Recycled Materials Management	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Fleet, Plant & Equipment			
Fleet Management & Fleet Maintenance	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Plant & Equipment Management & Maintenance	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Network Resilience			
Winter Maintenance Services & Management	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Adverse Weather Services & Management	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Signs & Lines (Non-Electrical Assets)			

Signs Cleaning, Repair & Replacement	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Lines & Markings	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Electrical Assets & Intelligent Transport Systems			
Street Lighting	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Signals & Electrical Assets Maintenance	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Intelligent Transport Systems	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Structures Maintenance			
Vehicle & Pedestrian Restraints	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Bridges, Footbridges & Gantries	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Geotechnical Assets & Retaining Walls	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Footways & Public Rights of Way			
Condition Assessments	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Footways & Public Rights of Way Maintenance	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Traffic & Safety			
Road Safety Advisory Services	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Road Safety Partnerships Management	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
School Crossing Patrols	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Sustainable Development			
Road Adoptions	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Highways Development Control	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Materials Recycling / Reuse	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Waste Management	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Ecology & Biodiversity Management	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Laboratory Services			
Site Investigations & Surveys	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Reinstatement QA Assessments	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Materials & Methods Testing & Standards Setting	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Commercial Services			
Developer Services	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Consultancy Services	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Construction Services & Programme Management	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Shared Services	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

For this guide, all activities listed above that are carried out in-house by the LHA are designated as **scope 1 and 2**. All activities which are outsourced (i.e., completed by a third-party / supply chain partner) are designated as **scope 3**. Emissions reporting and management for authority corporate services²³ are outside of the scope of this guidance.



The highways activities checklist above is based on a standard list of highways functions as identified by members of the FHRG. Please ensure this list is suitable for your LHA. An editable Microsoft Excel version of this checklist is available from the FHRG.

Shared facilities and co-located staff

Some LHA facilities²⁴ may be shared with other local authority services teams. In these cases, fuel and electricity use (resulting in emissions) will need to be allocated based on a formula or ratio agreed both corporately and with each service sharing the facility. This formula can be recorded in the inventory of premises / sites for each shared location. In most cases, it will be the responsibility of the Carbon Management & Reporting team to ensure the data is collated and that emissions are properly apportioned.

Where LHA staff are co-located with external organisations, it is important to ensure that data gaps and double counting are avoided when calculating the carbon footprint. An approach consistent with one for shared facilities should be adopted, ensuring that the boundaries between scope 1, 2 and 3 are clearly defined and documented. Where premises are leased or rented, these agreements will require the cooperation and participation of the landlord(s).

²³ HR, IT/IS, Corporate Finance, Corporate Legal, Democratic Services, Customer Services, etc

²⁴ Including offices, depots, garages, storage areas and vehicle parking areas.

Step 2 completion checklist

Check that Step 2 has been completed using this checklist:

- A boundary has been established for all in-scope activities.**
 - Only activities undertaken in-house or commissioned by the LHA from a third party are within the boundary.
- All in-scope LHA activities have been identified as scope 1, 2 or 3.**
- A complete inventory of all LHA owned / controlled premises / site(s).**
 - Where fuel is combusted and / or purchased electricity is used.
- A complete inventory of LHA owned / controlled fuel or electrically powered vehicles, plant and equipment.**
 - Detailing fuel types, refuelling methods, and fuel use measurement / accounting methods.

Step 3: Calculating scope 1 emissions

The purpose of this step is to:

1. **Establish the measurement method for scope 1 emissions from combusted fuels.**
 - a. These are scope 1 emissions from authority-controlled sources.
 - b. Measurement methods include receipts, invoices and / or meter readings.
2. **Establish the measurement frequency.**
 - a. Monthly data collation is recommended.
3. **Apportion scope 1 emissions to responsible parties where activities / resources are shared.**
 - a. Ensuring the carbon footprint is accurate for the LHA.
4. **Identify sources of fugitive emissions.**
 - a. Arising from leaks from air conditioning / refrigeration units.
5. **Calculate scope 1 carbon footprint.**
 - a. Maintain a rolling, monthly carbon footprint calculation.
6. **Establish persistent processes for on-going measurement and reporting.**

Assigning a Step 3 leader and process delivery team

This step will require the engagement of the following local authority and highways stakeholders:

- **Carbon Management & Reporting team.**
- **Authority services representatives.**
 - Where facilities / resources are shared.
- **Supply chain partner(s) account / relationship manager(s).**
 - Where facilities / resources are shared.
 - Agent(s) or organisation(s) servicing air conditioning units.
- **Director of Highways Services or the Highways Services Commissioner.**
- **Highways Fleet & Transportation Manager.**
- **Highways Assets Manager(s).**

Step 3 should be led by the Carbon Management & Reporting team and provide a scope 1 carbon footprint report to the Highways Services Director or Highways Services Commissioner.

Step 3 preparation

To complete this step, you will need:

- **Inventory of premises / site(s).**
 - See Step 2.
- **Inventory of fuel-powered Vehicles, Plant and Equipment (VPE).**
 - Include hybrid vehicles, but exclude EVs, as these are covered by scope 2.
 - See Step 2.
- **Access to all fuel invoices and meter readings for all LHA controlled emissions sources for the current month²⁵.**
 - Invoices for gas from a utility provider.
 - Fuel receipts and garages and petrol retailers.
 - *Fuel receipts for vehicles, mobile plant and portable equipment.*
 - *Fuel receipts for filling jerrycans and demountable fuel tanks.*
 - Invoices and receipts from fuel providers.
 - Fuel card invoices.
 - Invoices for fuel delivered to fuel storage tanks.
 - *Typically, these include heating oil, red diesel and petrol.*
 - Invoices for gas fuel cylinders and bottles.
 - *Typically, these include CNG and LPG fuels.*
 - Invoices for delivered solid fossil fuels.
 - *Typically, these include coal and coke.*
- **Identification of the responsible person(s), team or agent within the authority for scope 1 reporting.**

²⁵ Or the reporting period and cycle set by the authority.



If the analysis and calculation of scope 1 emissions is the responsibility of a different function or team within the authority, you do not need to complete this step.

The Step 3 process assessing scope 1 fuel usage comprises two parts:

- 1. Fuels for vehicles, plant and equipment purchased from fuel retailers.**
 - a. With a receipt or invoice for each transaction.
 - b. Including receipts and mileage for reimbursed payments.
- 2. Fuels purchased on account and (typically) measured using meter readings.**
 - a. Gas purchased from a utility provider.
 - b. Combustible fuels stored in on-site storage tanks, gas cylinders and / or bottles.
 - c. Solid fossil fuels stored in coal barns or bunkers on-site.

Step 3A process: Fuel-powered Vehicles, Plant and Equipment (VPE)

As previously described in Step 2, scope 1 covers direct emissions from fuel-powered vehicles, plant and equipment from authority-controlled sources (see list of fuel types in Step 2, VPE).

The process steps are outlined below (and illustrated in Figure 6) for each item in the VPE inventory:

- 1. Refuelled using on-site fuel storage tank?**
 - a. If the item is refuelled from a controlled fuel tank or from a jerrycan, move to the next VPE item in the inventory. Fuel used from fuel storage tanks is covered in Step 3B.
- 2. Identify source(s) of fuel and purchasing records for VPE item.**
 - a. These may comprise one or more sources (see steps 3, 4 and / or 5 in this list).
- 3. Collate fuel card invoices for the current month.**
 - a. Using the monthly statement.
- 4. Collate fuel provider / retailer receipts, orders and invoices for the current month.**
 - a. As submitted by VPE users and / or the finance team.
- 5. Collate receipts and mileage claims for reimbursed payments to VPE users.**
 - a. As submitted by VPE users and / or the finance team.
 - b. Ensure only fuel payments for LHA related activities are included²⁶.
- 6. Are there data gaps / omissions?**
 - a. Check receipts and usage data to identify discrepancies and errors.
 - b. If no, move to step 9 in this list.
- 7. Investigate and resolve data gaps and / or missing receipts.**
 - a. Identify the issue and ensure any data gaps and / or omissions are resolved.
 - b. Report payment issues or exceptions to the finance team.
- 8. Add or amend VPE in the inventory where necessary.**
 - a. It is important that the VPE inventory is kept up to date for LHA activities.
- 9. Collate data for the current month²⁷.**
 - a. Total the fuel used for the VPE item.
 - b. Fuel can be measured using a range of different units of measurement, for example kWh, litres, kg, m³ etc. It is recommended that the same units are used each time and the units recorded with the figure.
- 10. Convert aggregated data.**
 - a. Convert the data using the current, government conversion tables²⁸.
 - b. See, Scope 1 data conversion and updating the carbon footprint.
- 11. If the VPE shared with other services, use the agreed formula / ratio to apportion the total emissions.**
 - a. The default formula / ratio should be recorded in the VPE inventory.
- 12. Add the converted total for the carbon footprint for the current month.**
 - a. Move to Step 3B; fuel from on-site fuel storage tanks and gas from utility providers.

²⁶ Exclude bus, car, taxi and train commuting costs and any use of private vehicles where not directly engaged in LHA activities.

²⁷ Alternatively, data can be collated annually, however, this may make data errors and gaps difficult to identify and resolve.

²⁸ <https://www.gov.uk/government/publications/greenhouse-gas-reporting-conversion-factors-2021>

-  For vehicles, the VPE inventory should only include vehicles owned or leased by the authority. The carbon footprint should include all fuel paid for by the organisation (either directly, or indirectly through mileage allowances or expenses). This specifically applies to vehicles that travel on public highways.
-  Mileage for private cars (grey fleet) is out of scope for this guidance and **should not** be included in scope 1 and scope 2 emission calculations.

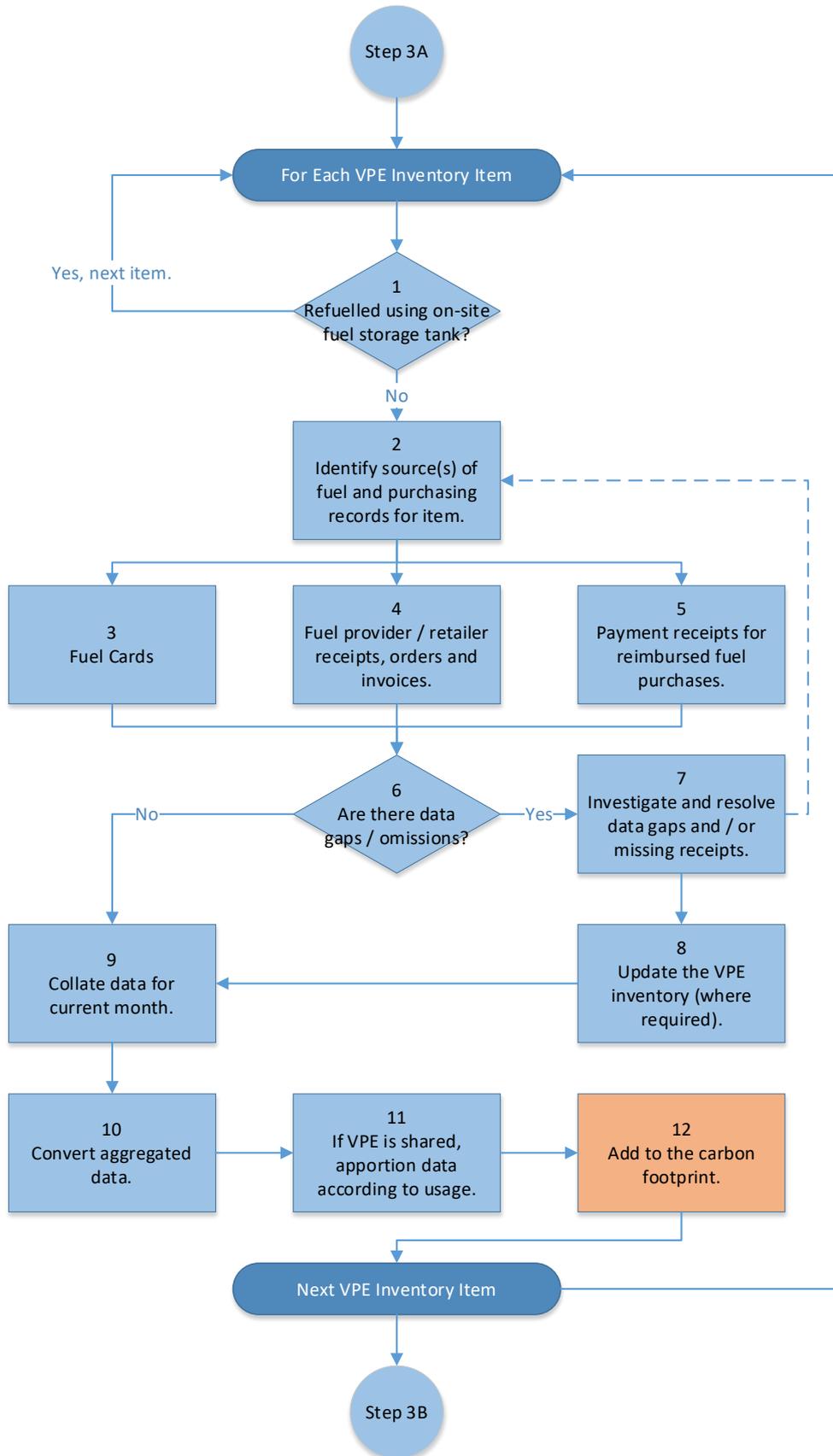


Figure 6: Recording fuel used by vehicles, plant and equipment.

Step 3B process: Fuel from on-site fuel storage tanks and gas from utility providers

Step 3B addresses on-site fuel storage (oil and coal for heating, VPE refuelling tanks) and gas from a utility provider.



In most authorities, a corporate *Carbon Management & Reporting Team* will be monitoring and recording the sources of emissions from gas appliances. In these cases, scope 1 reporting should be undertaken by the corporate team, ensuring that effort is not wasted, and data is not double counted.

The *Carbon Management & Reporting Team* should be able to provide the highways services team with an adjusted figure for gas emissions for highways services based on the data collated and calculated centrally.

The process steps are outlined below (and illustrated in Figure 7) for each fuel source at each premises / site inventory:

1. **Identify source(s) of fuel and purchasing records for premises / site item.**
 - a. These may comprise one or more sources (see steps 3, 4 and / or 5 in this list).
2. **Is the fuel metered?**
 - a. Yes, if metered gas supply (from a utility provider) or a metered fuel storage tank.
 - b. If no, move to step 4 in this list.
3. **Metered fuel (recommended method).**
 - a. Record fuel used from meter readings.
 - b. Move to step 5 in this list.
4. **Invoices for fuel purchases.**
 - a. Record fuel used from invoices and payment records.
5. **Are there data gaps / omissions?**
 - a. Check meter readings, statements and invoices to identify discrepancies and errors.
 - b. If no, move to step 9 in this list.
6. **Investigate and resolve data gaps and / or missing receipts.**
 - a. Identify the issue(s) and ensure any data gaps and / or omissions are resolved.
 - b. Report issues with invoicing or exceptions to the finance team.
7. **Add or amend premises / site in the inventory where necessary.**
 - a. It is important that the premises / sites inventory is kept up to date for LHA activities.
8. **Collate data for the current month²⁹.**
 - a. Total the fuel used for the current premises / site.
 - b. Fuel can be measured using a range of different units of measurement, for example kWh, litres, kg, m³ etc. It is recommended that the same units are used each time and the units recorded with the figure.
9. **Convert aggregated data.**
 - a. Convert the data using the current, government conversion tables³⁰.
 - b. See, **Scope 1 data conversion and updating the carbon footprint**.
10. **If the site is shared with other services, use the agreed formula / ratio to apportion the total emissions to the relevant parties.**
 - a. The default formula / ratio should be recorded in the premises / site inventory.
11. **Add the converted total for the carbon footprint for the current month.**
12. **Repeat for each premises / site in the inventory.**
 - a. Move to step 1 in this list.
13. **Move to Step 3C.**

²⁹ Alternatively, data can be collated annually, however, this may make data errors and gaps difficult to identify and resolve.

³⁰ <https://www.gov.uk/government/publications/greenhouse-gas-reporting-conversion-factors-2021>

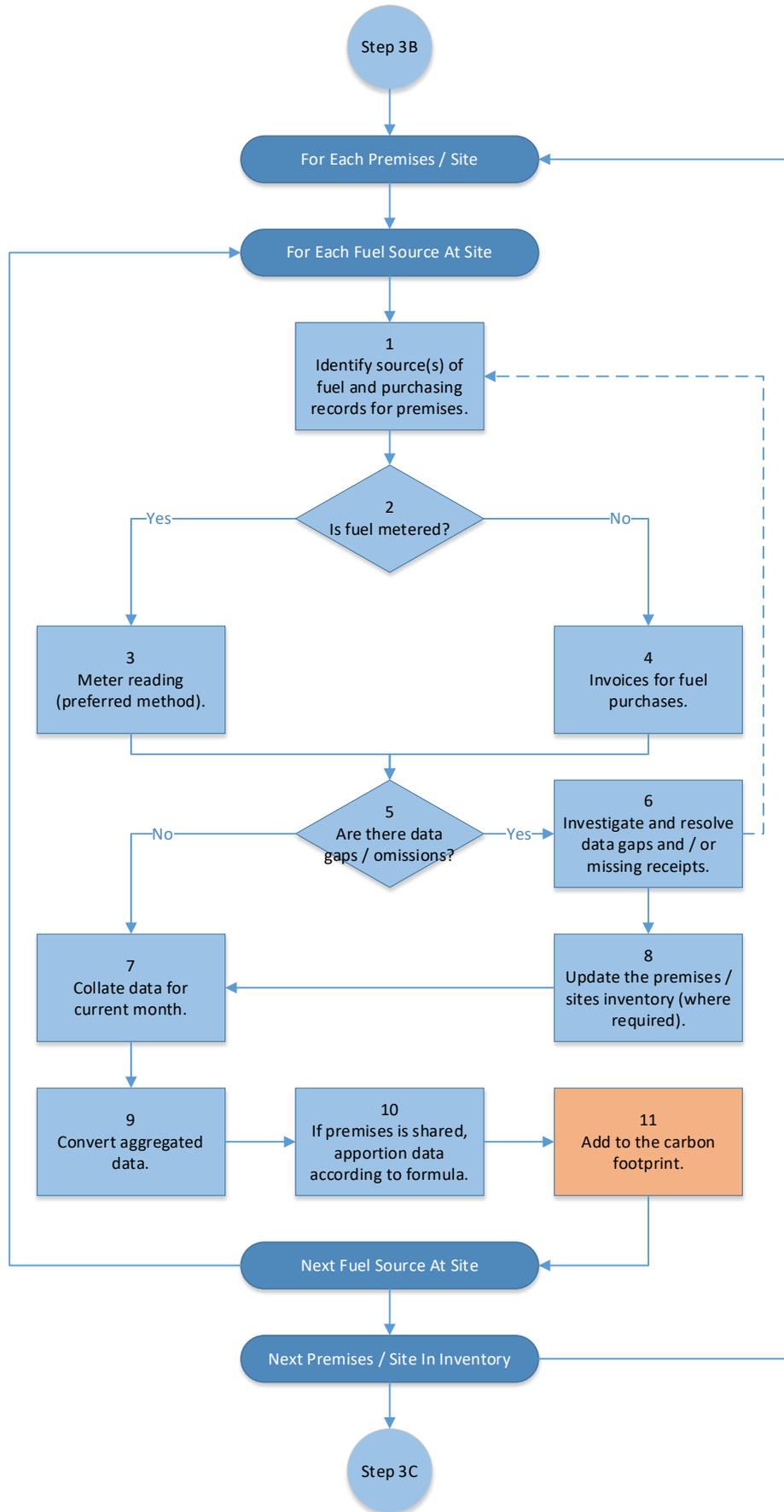


Figure 7: Recording fuel used from on-site fuel storage tanks and gas from a utility provider

Step 3C process: Calculating fugitive emissions

Step 3C calculates GHG emissions resulting from leaks in Air Conditioning (AC) and refrigeration units either owned or controlled by the local authority. These leaks are described as fugitive emissions.

The inventories of premises / sites should identify items with AC / refrigeration units (see Step 2). VPE items with AC / refrigeration units fall under scope 3 and should be excluded from scope 1 and 2 fugitive emission calculations.

The process steps outlined below (and illustrated in Figure 8) are repeated for each item with air conditioning / refrigeration units:

- 1. Collate AC / refrigeration unit servicing records for the inventory item.**
 - a. Premises / site only (VPE items fugitive emissions fall under scope 3).
 - b. Note, some sites may have multiple units.
- 2. Has the AC / refrigeration unit been serviced?**
 - a. If the unit has not been serviced, move to the next item in the inventory.
 - b. If the unit has been serviced, move to step 4 in this list.
- 3. Investigate missing records and close data gaps.**
 - a. If the service records are incomplete or missing, investigate and resolve for this item.
 - b. Move to step 1 in this list for this inventory item.
- 4. AC coolant topped-up?**
 - a. If the coolant level has not been topped-up, select the next item and move to step 1 in this list.
- 5. Record the amount and type of coolant replaced (i.e., 5kg of R410A).**
- 6. Collate data for the current month³¹.**
 - a. Total the refrigerant used for the current premises / site.
 - b. Refrigerant is measured in kilograms (kg).
- 7. Convert aggregated data.**
 - a. Convert the data using the current, government conversion tables³².
 - b. See, **Scope 1 data conversion and updating the carbon footprint**.
- 8. Add the converted total for the carbon footprint for the current month.**
 - a. Move to Step 4, fugitive emissions.
- 9. If the site is shared with other services, use the agreed formula / ratio to apportion the total emissions to the relevant parties.**
 - a. The default formula / ratio should be recorded in the VPE inventory.
- 10. Repeat for all inventory and VPE items with AC / refrigeration.**
- 11. Move to Step 4.**

³¹ Alternatively, data can be collated annually, however, this may make data errors and data gaps more difficult to identify and resolve.

³² <https://www.gov.uk/government/publications/greenhouse-gas-reporting-conversion-factors-2021>

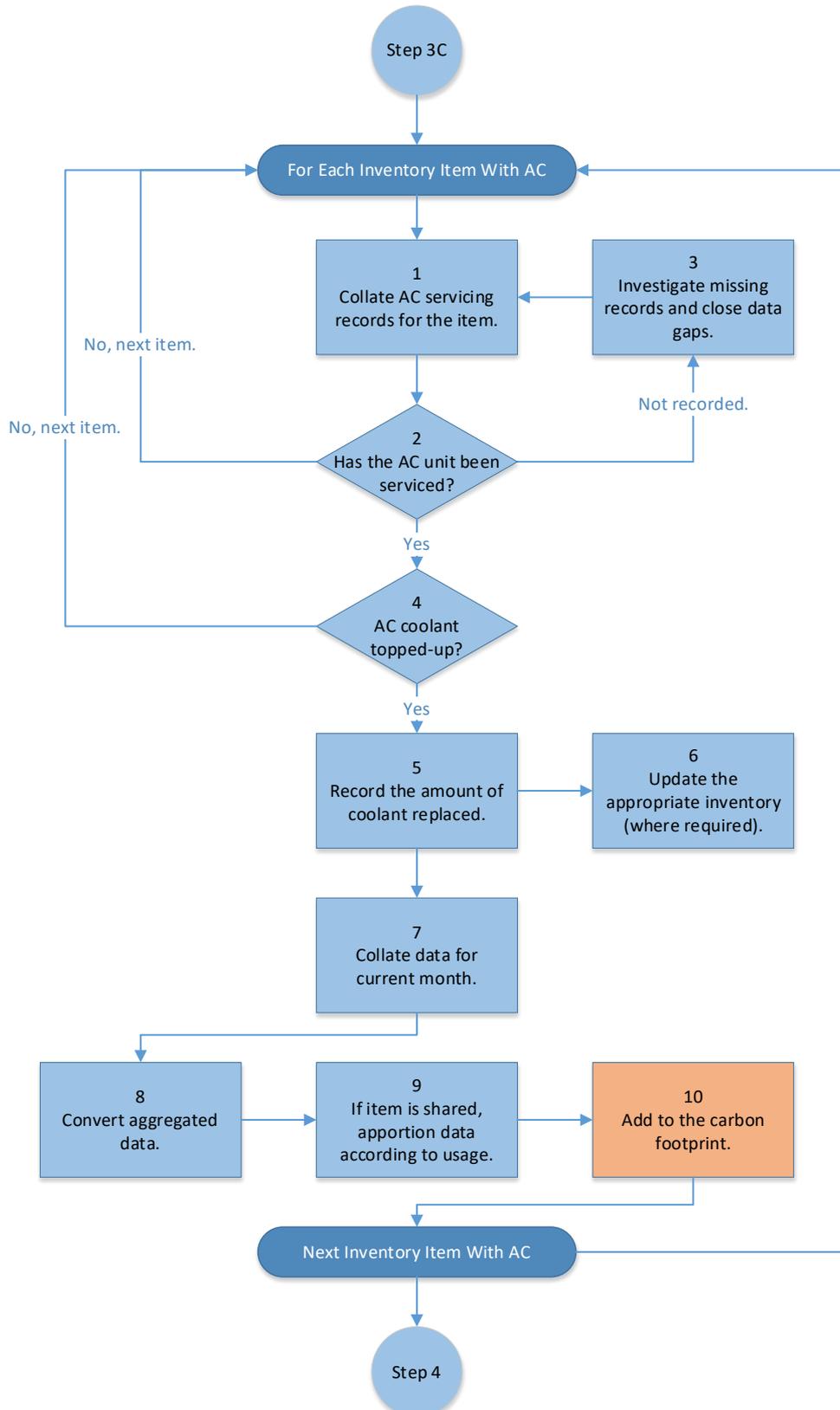


Figure 8: Calculating fugitive emissions

Scope 1 data conversion and updating the carbon footprint

Once the data for scope 1 has been collated, it needs to be converted to a **GHG Emission** before it can be added to the carbon footprint. The Department for Business, Energy & Industrial Strategy (BEIS) produces a new set of Emission Factors (EFs) to be used for conversion each year, together with a methodology paper explaining how the conversion factors are derived and applied. This includes a description of any changes to

the previous year’s Emission Factors. These are widely used by many carbon accounting tools, including those directly related to the highway sector³³.

It is recommended that the BEIS figures are used for the carbon emission data collated for a given year. These can be found on the UK Government website:

<https://www.gov.uk/government/collections/government-conversion-factors-for-company-reporting>

Expressed simply, the formula to calculate GHG emissions is:

$$[\text{Fuel Used}] \times [\text{Emission Factor}] = [\text{GHG Emission}]$$

Converting litres of fuel purchased for VPE to GHG emissions (recommended)

All receipts should be retained for fuel purchased from a fuel retailer (e.g., a garage forecourt) for fuel-powered Vehicles, Plant and Equipment (VPE). This includes fuel used to refill jerrycans (used to refuel portable plant and equipment³⁴). These receipts and / or fuel card statements will detail the quantity of fuel purchased and the fuel type (e.g., diesel, petrol, LPG).

Where only the mileage for vehicles is known, see *Converting the milage for vehicles to GHG emissions*, below.

The following steps should be followed for converting fuel purchased for VPE to GHG emissions:

1. **Total each fuel type used for the current month for each item in the inventory:**
 - a. Total litres of fuel used.
 - b. Total m³ of gas used³⁵.
 - c. Total kg of coal used.
2. **Using the BEIS workbook, select the [Fuels] tab, and find the fuel type in the [Activities] and [Fuels] columns of the appropriate tables.**
3. **Multiply the total fuel used by the corresponding Emissions Factor in the [kg CO₂e] column of the table to get the GHG Emissions for the inventory item.**
4. **Add the GHG Total for the inventory item to the Carbon Footprint total for scope 1.**

These steps are illustrated in Figure 9:

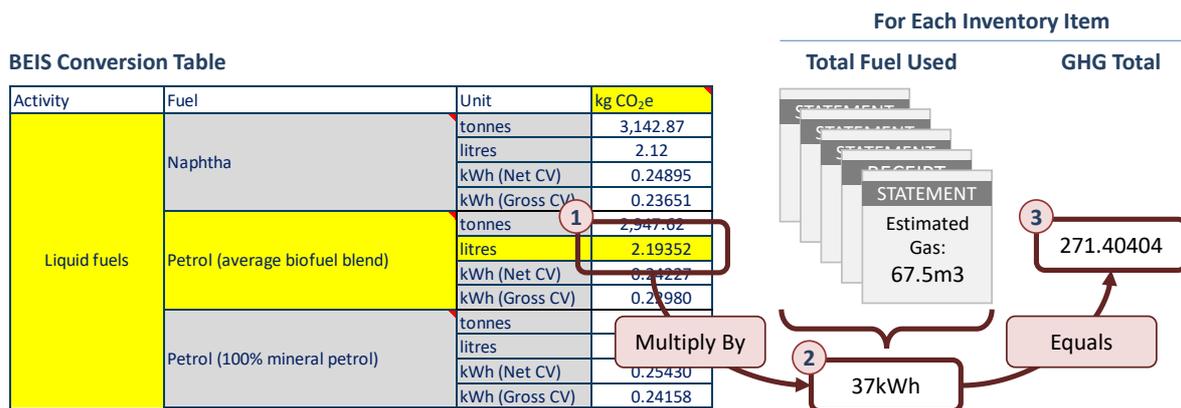


Figure 9: Calculating the GHG Emissions for an inventory item

This is the most accurate method for calculating emissions from VPE. This is, therefore, the recommended approach.

Converting vehicle milage to GHG emissions

For vehicles where the amount of fuel used is not known or where vehicles are shared with other users, it is possible to calculate the GHG Emissions using mileage and a different BEIS table within the BEIS workbook:

³³ Including asPECT (Asphalt Pavement Embodied Carbon Tool) and, by incorporation, Highways England and Local Partnerships.

³⁴ Fuel-powered trimmers, blowers, generators, etc.

³⁵ If the fuel is metered, subtract last month’s meter reading from the current month’s reading to get the total fuel used.

1. Using the inventory of VPE, identify all fuel-powered vehicles (exclude EVs).
2. Calculate the miles completed for the current month:
 - a. Subtract the previous month's mileage from the current month's reading.
 - b. For shared / pool vehicles, be sure to only include miles attributable to highways activities.
3. Using the BEIS workbook, select either the [Passenger & other] tab or the [SECR kWh pass & delivery vehs] tab depending on the vehicle type.
4. Find the vehicle type and fuel type in the [Activities] and [Type] columns of the appropriate tables.
5. Using the appropriate fuel column, multiply the total miles completed by the corresponding Emissions Factor in the [kg CO₂e] column of the table to get the GHG Emissions for the vehicle.
6. Add the GHG Total for the inventory item to the Carbon Footprint total for scope 1.

This process is illustrated in Figure 10:

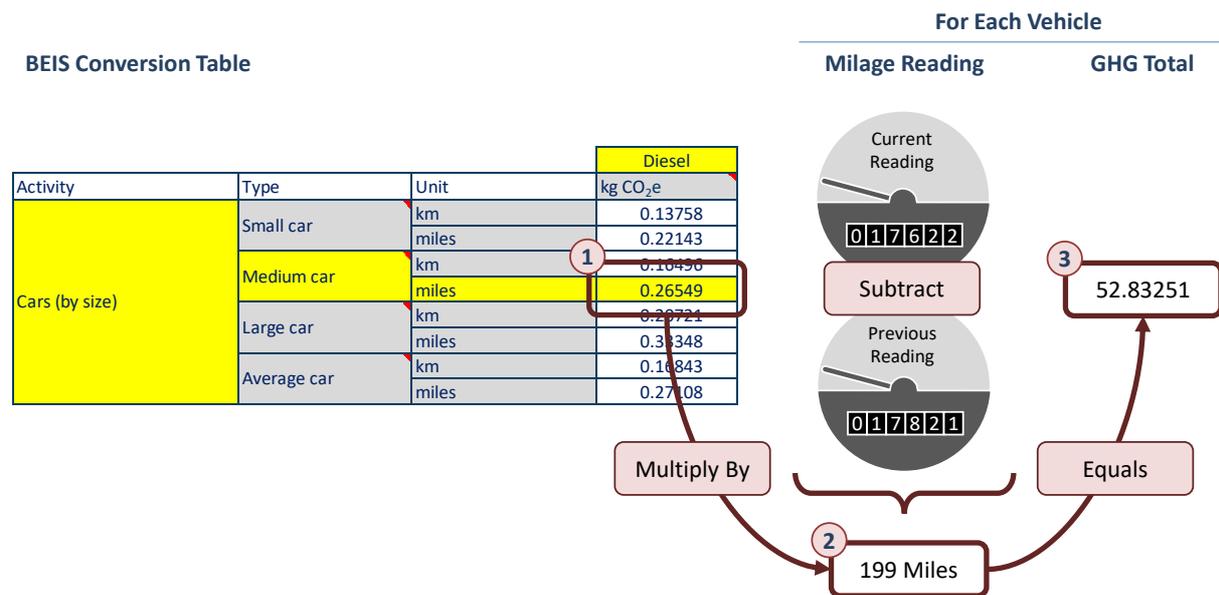


Figure 10: Calculating the GHG Emissions for a vehicle using mileage

Converting metered fuels to GHG emissions (recommended)

Converting metered fuel (i.e. gas from a utility provider or heating oil stored in an on-site tank) uses a similar process and is repeated for each premises / site where these fuel types are used:

1. Calculate the fuel used:
 - a. Subtract the previous month's meter readings from the current month's reading.
 - b. Note the unit of measure (cubic metres (m³), tonnes, litres (L), kWh (Net CV), kWh (Gross CV)).
2. Using the BEIS workbook, select the [Fuels] tab.
3. Find the fuel type in the [Activities] and [Type] columns of the appropriate tables.
4. Using the appropriate [Fuel] and [Unit], multiply the total fuel used by the corresponding Emissions Factor in the [kg CO₂e] column to get the GHG Emissions for the inventory item.
5. Add the GHG Total for the inventory item to the Carbon Footprint total for scope 1.

This process is illustrated in Figure 11:

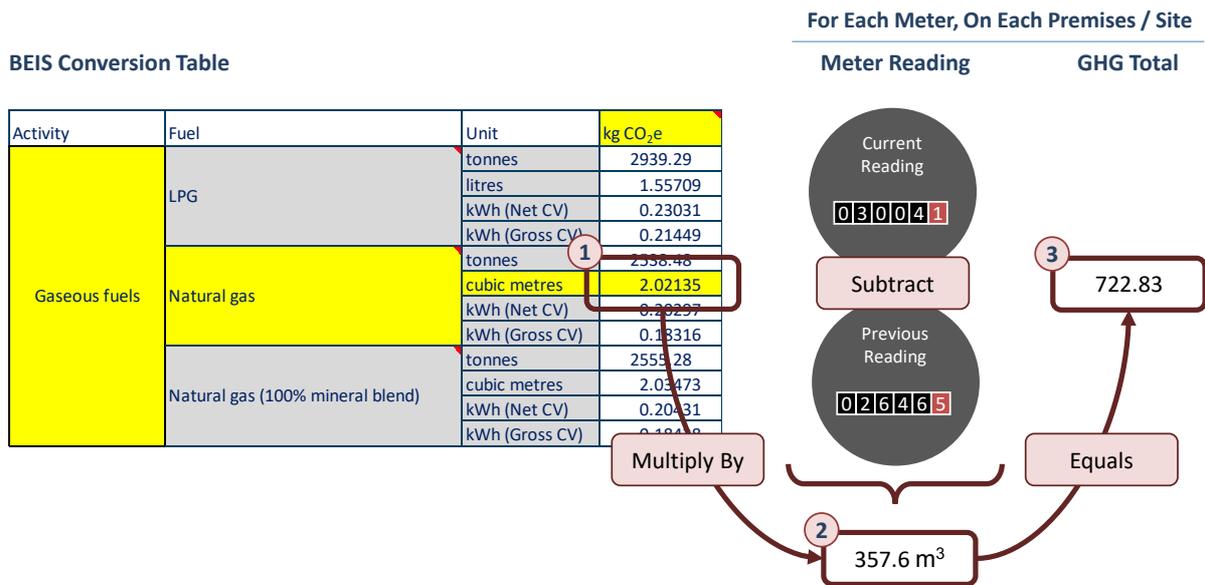


Figure 11: Calculating GHG emissions for metered fuel

This is the most accurate method for calculating emissions from fuels stored on-site and / or from gas utility providers. This is, therefore, the recommended approach.

Plug-in hybrid / hybrid vehicles

The process follows the same steps as **Converting litres of fuel purchased for VPE to GHG emissions** and **Converting vehicle mileage to GHG emissions** but uses different conversion factors. Hybrid vehicle conversion factors are also available in the BEIS workbook:

1. Select the **[Fuels]** tab.
2. Find the vehicle type in the **[Activities]** and **[Type]** columns of the appropriate table.
 - a. Use Table 1 on the worksheet for *plug-in hybrid vehicles*.
 - b. Use Table 2 on the worksheet for *standard hybrid vehicles*.
3. Find the columns for with the conversion factors for the vehicle type.
4. Multiply the total fuel used by corresponding Emissions Factor in the **[kg CO₂e]** column to get the GHG Emissions for the vehicle.
5. Add the GHG Total for the inventory item to the Carbon Footprint total for scope 1.

Converting invoices and statements from utility providers to GHG emissions

Converting fuel usage from statements and invoices (e.g., gas statements, heating oil invoices) uses the same method as meter readings; as these will include the quantity of fuel used / delivered. It should be noted, however, that some statements may be estimated, and this may distort emissions data when adjusted after a meter reading.

For delivered fuels (e.g., heating oil, LPG, coal), where the total GHG emissions are calculated for the total delivery rather than “as used”, this will cause a spike in the monthly data. Over time this, usage data will smooth to provide a clear usage pattern and rate of GHG emissions.

Cross-checking fuel use against statements and invoices.

Using the inventories (of premises / sites and VPE) will ensure that all emissions sources are considered and accounted for. It is important that all emissions sources are included in the reported carbon footprint.

By cross-checking fuel use for inventory items against statements, receipts and invoices, it will be easier to identify discrepancies and billing errors. Where errors are found, the higher value(s) for fuel use must be recorded on the carbon footprint while any investigations are undertaken. A correction can be recorded against subsequent carbon footprint reports, detailing the issue and the adjusted GHG emissions values.

Exceptions and omissions

Where emission factors are not available, ADEPT should be contacted for further advice.

Step 3 completion checklist

Check that Step 3 has been completed using this checklist:

- All scope 1 emissions measured for the current month.**
 - For premises / sites.
 - For fuel-powered VPE.
- Scope 1 emissions apportioned to responsible parties.**
 - Where activities / resources are shared.
- Established persistent processes for on-going measurement and reporting.**
- Scope 1 carbon footprint calculated.**

Step 4: Calculating scope 2 emissions

The purpose of this step is to:

1. **Establish the measurement method for scope 2 emissions for purchased electricity.**
 - a. These are scope 2 emissions for specific premises / sites and / or,
 - b. Electricity purchased from public EV recharging stations.
2. **Establish the measurement frequency.**
 - a. Monthly data collation is recommended.
 - b. This should be the same reporting frequency as scope 1 emissions.
3. **Apportion scope 2 emissions to responsible parties where premises / resources are shared³⁶.**
 - a. Ensuring the carbon footprint is accurate for the LHA.
4. **Calculate scope 2 carbon footprint.**
 - a. Maintain a rolling, monthly, scope 2 carbon footprint calculation.
5. **Establish persistent processes for on-going measurement and reporting.**

This step addresses indirect emissions resulting from electricity, steam, heating and / or cooling purchased by the local authority from a utility company.

Step 4 preparation

To complete this step, you will need:

- **Inventory of premises / site(s).**
 - Using the inventory created in Step 2.
- **Inventory of EVs.**
 - Using the inventory created in Step 2.
- **Access to all invoices for and meter readings for all LHA controlled sources for the current month³⁷.**
 - Invoices and statements for electricity from a utility provider.
 - Receipts for charging EVs at public charging stations.
 - Streetlighting electricity invoices from a utility company or a PFI partner.
- **Identification of the responsible person(s), team or agent within the authority for scope 2 reporting.**



In most cases, local authorities will have complex electricity sourcing arrangements and agreements, which may include:

- **Power Purchase Agreements (PPA),**
- **Renewable Energy Certificates (RECs),**
- **Utility-specific Emission Factors.**

In these cases, scope 2 reporting should be undertaken by the local authority *Carbon Management & Reporting Team*. This team can provide a carbon footprint for the highways service based on the data collated and calculated centrally.

Assigning a Step 4 leader and process delivery team

This step will require the engagement of the following local authority and highways stakeholders:

- **Carbon Management & Reporting Team.**
- **Authority services representatives.**
 - Where facilities / resources are shared.
- **Supply chain partner(s) client / relationship manager(s).**
 - Where facilities / resources are shared.
- **Director of Highways Services or the Highways Services Commissioner.**
- **Highways Fleet & Transportation Manager.**

³⁶ A simple approach is to divide the number of highways staff by the total number of staff at a location.

³⁷ Or the reporting period and cycle set by the authority.

- With responsibility for EVs.
- **Highways Assets Manager(s).**

Step 4 should be led by the Carbon Management & Reporting Team and provide a scope 2 carbon footprint report to the Highways Services Director or Highways Services Commissioner.

Determining the boundary for scope 2

The boundary for scope 2 should be the same as that determined for scope 1 (see **Step 2: Activities checklist**). All premises / sites in the inventory using purchased electricity, steam, heating and / or cooling should be included. Activities undertaken by supply chain partners that utilise purchased electricity, steam, heating, and / or cooling will fall under scope 3.

Step 4 process: Electricity purchased from a utility provider (simple conversion)

Where a simple highways service scope 2 emissions calculation is required, the BEIS conversion tables can be used for purchased electricity and EV recharging at public EV charging stations. The simple data collation and conversion steps are described below.

The Step 4 process assesses scope 2 emissions from:

1. **Electricity purchased from a utility provider and measured using meter readings.**
2. **Electricity purchased at public EV recharging stations.**
 - a. With a receipt or invoice for each transaction.
3. **Electricity purchased and reimbursed for authority owned / leased vehicles.**

Step 4A: Converting purchased electricity used at premises / sites to GHG emissions

The following process should be followed to calculate emissions from electricity purchased from a utility provider:

1. **Using the inventory of premises / sites, identify all sites with an electricity meter.**
2. **Total the electricity used for each site in the inventory of premises and sites:**
 - a. Subtract the previous month's meter readings from the current month's reading.
 - b. The unit of measurement used is kWh.
 - c. For shared sites / facilities, ensure that electricity usage is apportioned based on the formula / ratio recorded for the current premises / site in the inventory.
3. **Using the BEIS workbook, select the [UK electricity] tab.**
4. **Multiply the electricity used in kWh by the corresponding Emissions Factor in the [kg CO₂e] column to get the GHG Emissions for the premises / site.**
5. **Add the GHG Total for the inventory item to the Carbon Footprint total for scope 2.**

This process is illustrated in Figure 12:

BEIS Conversion Table

Activity	Country	Unit	Year	kg CO ₂ e
Electricity generated	Electricity: UK	kWh	2021	0.21233

1

For Each Meter, On Each Premises / Site

Meter Reading

GHG Total

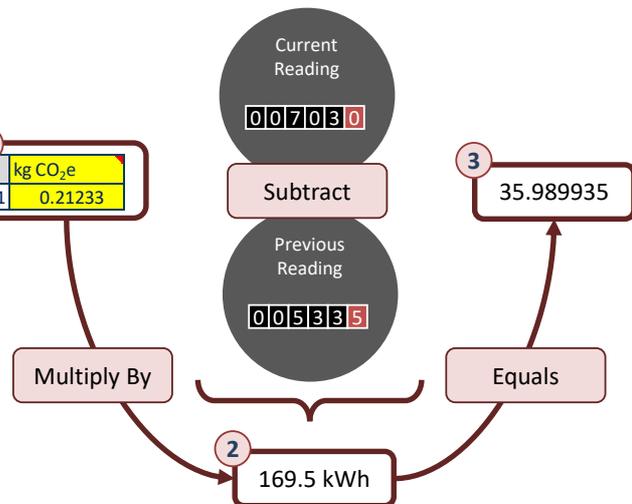


Figure 12: Calculating GHG emissions from electricity purchased from a utility provider

Step 4B: Converting electricity purchased at a public EV charging stations to GHG emissions

The following process should be followed to calculate emissions from electricity purchased from public EV charging stations:

1. Using the inventory of VPE, identify all EVs (exclude fuel-powered and hybrid vehicles).
2. Total the receipts for electricity purchases for each EV from public charging stations.
 - a. These should exclude all private use / mileage.
 - b. The unit of measurement used is kWh.
 - c. For shared / pool EVs, ensure that any usage is apportioned based on the formula / ratio recorded for the current EV. The recommended method in this case, is to record mileage and follow the steps in **Converting EV mileage to GHG emissions**, below.
3. Using the BEIS workbook, select the [UK electricity] tab.
4. Multiply the electricity used in kWh by the corresponding Emissions Factor in the [kg CO₂e] column to get the GHG Emissions for the EV.
5. Add the GHG Total for the inventory item to the Carbon Footprint total for scope 2.

Step 4B: Converting EV mileage to GHG emissions

The following process should be followed to calculate emissions from electricity purchased based on EV mileage:

1. Using the inventory of VPE, identify all EVs (exclude fuel-powered and hybrid vehicles).
2. Calculate the miles completed for the current month:
 - a. Subtract the previous month's mileage from the current month's reading.
 - b. For shared / pool vehicles, be sure to only include miles attributable to highways activities.
3. Using the BEIS workbook, select the [UK electricity for EVs] tab.
4. Find the vehicle type and fuel type and size in the [Activities] and [Type] columns of the appropriate tables.
5. Using the [Battery Electric Vehicle] column, multiply the total miles completed by the corresponding Emissions Factor in the [kg CO₂e] column of the table to get the GHG Emissions for the vehicle.
6. Add the GHG Total for the inventory item to the Carbon Footprint total for scope 2.

This process is illustrated in Figure 13:

BEIS Conversion Table

Activity	Type	Unit	Battery Electric Vehicle kg CO ₂ e
Cars (by size)	Small car	km	0.04195
		miles	0.06750
	Medium car	km	0.04826
		miles	0.07767
	Large car	km	0.05573
		miles	0.08969
Average car	km	0.05081	
	miles	0.08097	

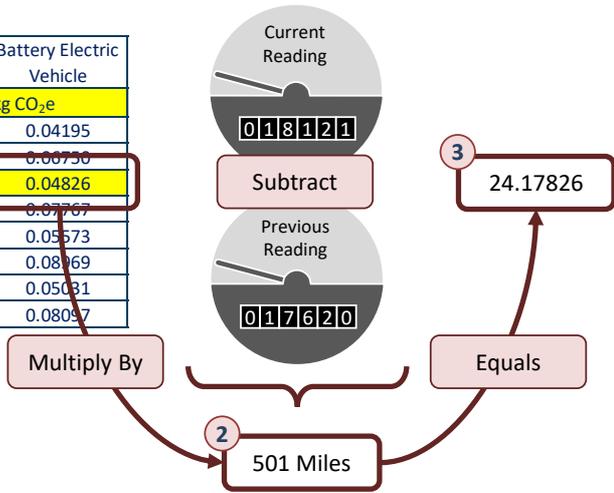


Figure 13: Calculating the GHG Emissions for a vehicle using mileage

Step 4 completion checklist

Check that Step 4 has been completed using this checklist:

- All scope 2 emissions measured for the current month.
 - o For premises / sites.
 - o For EVs using public charging points.
- Scope 2 emissions apportioned to responsible parties.
 - o Where activities / resources are shared.
- Established persistent processes for on-going measurement and reporting.
- Scope 2 carbon footprint calculated.

Step 5: Calculating the scope 1 and 2 carbon footprint

The purpose of this step is to:

1. **Assess the accuracy and completeness of the emissions data and calculations in Step 3 and Step 4.**
 - a. Checking usage and emissions data for inventory items³⁸.
 - b. Checking meter readings for purchased electricity.
 - c. Checking emissions are assigned correctly to the responsible parties³⁹.
2. **Ensure emissions are correctly assigned to scope 1 or 2.**
 - a. Checking for emissions double counting.
 - b. Checking for boundary leaks.
3. **Calculate the GHG scope 1 and 2 carbon footprint.**
 - a. For the current month.
 - b. Aggregated for the year to-date.

This step provides the carbon footprint for the LHA for GHG scope 1 and 2 emissions.

Step 5 preparation

To complete this step, you will need:

- **The calculated emissions and carbon footprint for scope 1.**
 - Using the inventories created in Step 2 and the source data and outputs of Step 3.
- **The calculated emissions and carbon footprint for scope 2.**
 - Using the inventories created in Step 2 and the source data and outputs of Step 4.



In most authorities, a corporate Carbon Management & Reporting team will be responsible for preparing carbon footprint reports.

The Carbon Management & Reporting team should be able to provide the highways service leadership team with service-specific carbon footprint reports based on the data collated and calculated centrally.

Assigning a Step 5 leader and process delivery team

This step will require the engagement of the following local authority and highways stakeholders:

- **Carbon Management & Reporting Team.**
- **Step 3 process leader.**
 - Where this differs from the Carbon Management & Reporting Team.
- **Step 4 process leader.**
 - Where this differs from the Carbon Management & Reporting Team.
- **Director of Highways Services or the Highways Services Commissioner.**

Step 5 should be led by the Carbon Management & Reporting Team and provide a scope 1 and 2 carbon footprint report to the Highways Services Director or Highways Services Commissioner.

Step 5 process: Calculating the scope 1 and 2 carbon footprint for highways services.

The Step 5 process should be followed to calculate the total carbon footprint for scope 1 and 2 (as illustrated in Figure 14):

1. **Review the scope 1 emissions report prepared in Step 3.**
2. **Do the scope 1 emissions vary significantly from those expected?**
 - a. If the reported emissions are as expected, move to step 5 in this list.
3. **Investigate variances and document findings.**
 - a. Start with inventory items known to have the high emissions.

³⁸ Using the premises / sites and VPE inventories.

³⁹ Where premises / sites and / or VPE are shared.

- b. Document all findings (updating the Step 3 processes and / or inventories, as applicable).
- 4. Update scope 1 emissions report.**
 - a. Move to step 1 in this list.
- 5. Select scope 1 data sample for checking.**
 - a. Select a data sample for scope 1 for error checking.
 - b. Where possible, test different data sources each month.
- 6. Does the data sample agree with the reported emissions?**
 - a. If the sample and the reported data do not agree, move to step 3 in this list.
- 7. Review the scope 2 emissions report prepared in Step 4.**
- 8. Do the scope 2 emissions vary significantly from those expected?**
 - a. If the reported emissions are as expected, move to step 11 in this list.
- 9. Investigate variances and document findings.**
 - a. Start with inventory items known to have the high emissions.
 - b. Document all findings (updating the Step 3 processes and / or inventories, as applicable).
- 10. Update scope 1 emissions report.**
 - a. Move to step 7 in this list.
- 11. Select scope 2 data sample for checking.**
 - a. Select a data sample for scope 2 for error checking.
 - b. Where possible, test different data sources each month.
- 12. Does the data sample agree with the reported emissions?**
 - a. If the sample and the reported data do not agree, move to step 9 in this list.
- 13. Add together the verified scope 1 and scope 2 emissions for the month.**
 - a. This provides a total carbon footprint for scope 1 and 2 for the current month.
- 14. Apply the ratio indicators for future benchmarking.**
 - a. See **Ratio indicators and benchmarking**, below.
- 15. Prepare the scope 1 and 2 monthly carbon footprint report.**
 - a. See **Monthly carbon footprint report**.

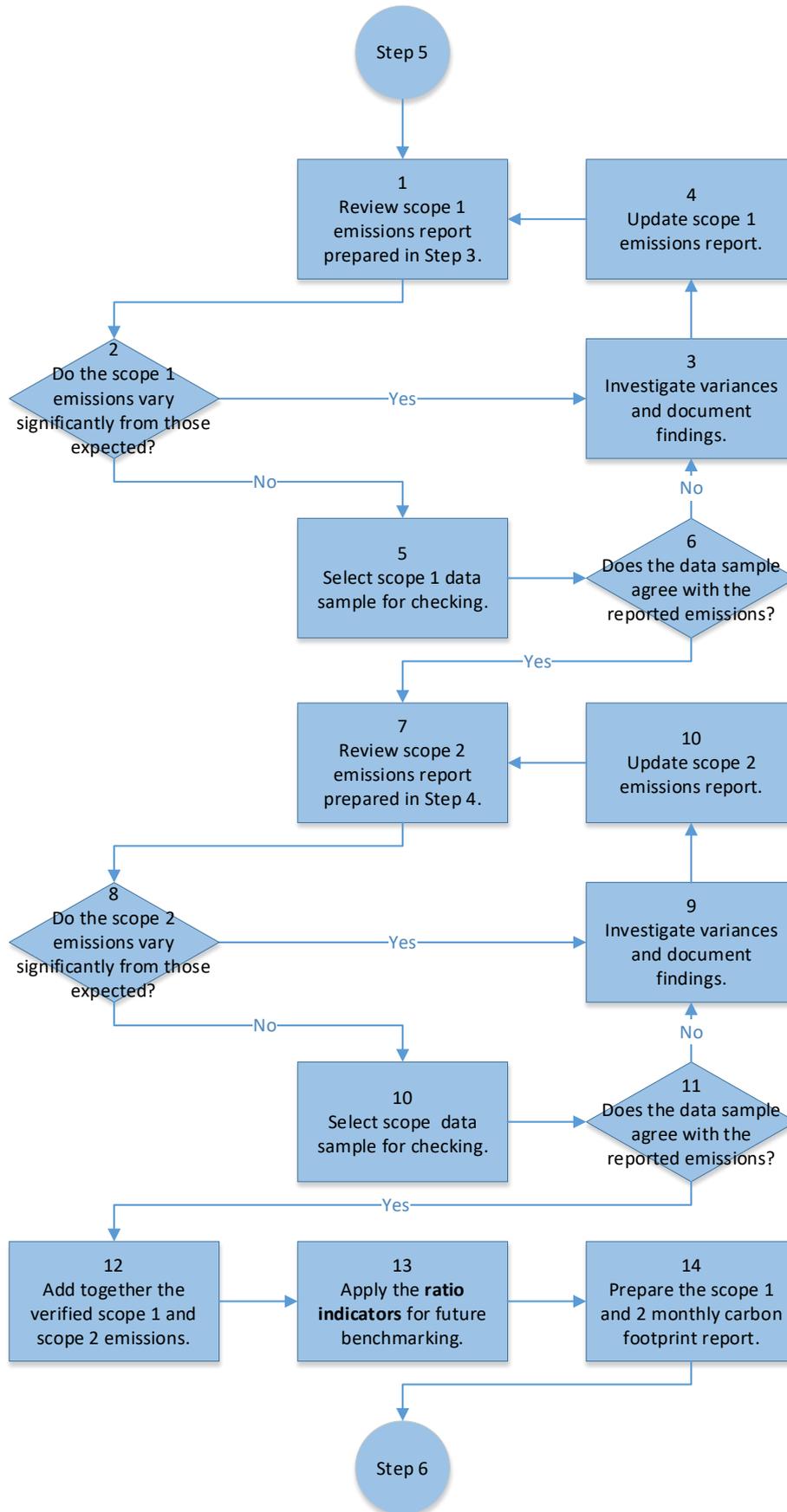


Figure 14: Calculating the scope 1 and 2 carbon footprint

Calculating the baseline year's carbon footprint



In most cases, the local authority Carbon Management & Reporting Team will have created a baseline carbon footprint for scope 1 and 2 emissions. If a baseline carbon footprint has previously been prepared by / for the authority, it is important to use that as the baseline for highways services reporting.

Using the activities checklist and inventories developed in Step 2, assess the accuracy and completeness of records for fuels used and electricity purchased for the baseline year. If sufficient data are available, then using the guidance detailed in Steps 3, 4 and 5, calculate the carbon footprint for the baseline year (and any intervening years) for the scope 1 and 2 carbon footprint for the LHA.

If the datasets are incomplete, return to Step 1 to agree a new start year with the authority's Carbon Management & Reporting team. Alternatively, the authority may create a baseline dataset using emissions averages over a number of years.

Where a baseline comprises averages or aggregated data, it is important to document:

- **All assumptions used / applied.**
- **References to all data sources and conversion tables / algorithms.**
 - Including the names, sources and version numbers / date of any externally sourced data.
- **All algorithms used in the compilation of the data set.**
- **An assessment of confidence in the data sources.**
 - Noting any possible inaccuracies and / or missing data.

Changes to the baseline year

Amendments to the baseline year may be necessary in the following circumstances:

1. **If a calculation error is discovered, or several cumulative errors, that are collectively significant.**
2. **There is a change in calculation methodology or in the accuracy of recording emission levels.**
3. **There are significant changes in the LHA services delivery / operating model.**
 - Impacting the assignment of scope 1, 2 and 3 activities.
 - Impacting the inventory of premises / sites and / or VPE.
 - Changes in the boundary (i.e., services devolution⁴⁰ or unitary services aggregation).

Changes to the baseline must be disclosed by the local authority. A change in baseline can have a significant impact on the targets set and carbon reduction strategies.

Significance threshold

A significance threshold sets the granularity of the data to be used when measuring emissions. A policy will need to be established to ensure like-for-like comparisons over time and to avoid cumulative errors manifesting in reports (i.e., rounding spikes).

The authority should therefore set a significance threshold policy to be applied:

- **Rounding vehicle mileage to the nearest mile.**
- **Accounting for unused fuel in gas cylinders and vehicle fuel tanks.**
- **Rounding electricity usage to the nearest kWh**
- **Rounding gas usage to the nearest m³.**

The GHG guidance makes no specific recommendations as to what constitutes "significant". It is, therefore, up to the local authority to set the significance threshold for monitoring and reporting.

⁴⁰ To district and / or parish councils.

Ratio indicators and benchmarking

When looking to compare performance and benchmark authority data, it is important to consider intensity ratios. Intensity ratios are used to obtain context in relation to the overall picture, enabling:

- **The comparison of data across LHAs.**
- **The evaluation of performance over time.**

In general, the ratios used should be selected to help improve understanding and clarify interpretation of performance for stakeholders. The FHRG proposes two baseline ratio indicators for LHAs:

$$1. \frac{\text{Scope 1 + Scope 2 Emissions}}{\text{Length of LHA Network}} = \text{Emissions per mile (or kilometre)}$$

And

$$2. \frac{\text{Scope 1 + Scope 2 Emissions}}{\text{Highways Budget (£)}} = \text{Emissions per £ spent on highways services}$$

When benchmarking, these ratios require like-for-like comparisons regarding boundaries (i.e., the activities within the boundary and which activities are assigned to scopes 1, 2 and 3). As this is likely to vary significantly between LHAs, these ratios are best used to monitor internal performance.



The addition of scope 3 emissions will provide a complete picture, and this can be used for benchmarking authority with authority. Further information will be available in the planned *GHG Scope 3 Standards & Guidance for Local Highways Authorities*, scheduled for release in Q2, 2022.

Reporting Cycle

This guidance recommends a monthly reporting cycle, ensuring the early identification of errors, omissions and trends. To reduce the monthly administrative workload, the authority may choose to adopt a longer cycle:

- Quarterly,
- Biannually,
- Annually.

Monthly reporting

Many authorities are already using carbon calculators and carbon accounting tools with comprehensive reporting capabilities. While this guidance does not prescribe a specific report format for LHAs, monthly reports should include:

- 1. Total scope 1 emissions for reported month.**
 - a. Top emission sources and explanatory notes.
 - b. Data quality notes (issues, causes and options).
- 2. Total scope 2 emissions for reported month.**
 - a. Top emission sources and explanatory notes.
 - b. Data quality notes (issues, causes and options).
- 3. Key ratio summaries.**
 - a. See **Ratio indicators and benchmarking**.
 - b. Notes for LHA stakeholders.
- 4. Month-on-month changes.**
 - a. Change trend year-to-date.
 - b. Projected trend to year end.
- 5. Anticipated footprint changes, based on planned works.**
 - a. Schemes (major and minor).
 - b. Cyclical maintenance.
 - c. Reactive maintenance.
- 6. Carbon monitoring and reporting processes.**
 - a. Overhead costs.

- b. Processes adherence and performance.
- c. Recommended process changes.

Data quality assurance

Data quality is recognised by the GHG Protocol as vital, and no methodology can compensate for poor quality data. It is therefore important that emissions data is accurate and complete.

The LHA is required to carry out an annual review, following the calculation of the carbon footprint to ensure that:

1. **The baseline year's data has been accurately calculated.**
 - a. As a foundation for all future years.
2. **The defined processes for emissions data collection, validation and conversion are followed.**
3. **The data is accurate and complete.**
 - a. All monitoring and measurement equipment is working, used as specified and properly maintained.

As described in the Step 5 process, it is recommended the local authority perform both cyclical and random (spot) checks on datasets, calculation methods, measurement instruments and processes adherence. These will typically include:

1. **Ensure all processes including carbon measurement are executed as specified.**
2. **Check meters and invoices for reporting errors.**
 - o Especially where reported usage levels change unexpectedly.
3. **Check for omissions / errors in the carbon sources inventories.**
4. **Check a sample of input data for transcription errors.**
5. **Check that assumptions for activity data and emission factors are documented.**
 - o Ensure any related files are referenced and archived.
6. **Check a representative sample of the calculations by hand or electronically for errors.**
7. **Check for equation / formula errors within spreadsheets or proprietary software tools.**
8. **Check for data aggregation / double counting errors.**
 - o Particularly if used in the wider local authority figures.
9. **Confirm version control is applied for electronic files with multiple users.**

Step 5 completion checklist

Check that Step 5 has been completed using this checklist:

- Check the scope 1 and 2 datasets are accurate and complete.**
 - o For all activities within the boundary.
- The total carbon footprint for scope 1 and 2 has been calculated.**
 - o Ensuring no double counting or data gaps.
- Monthly stakeholder reports have been prepared.**
 - o Stakeholders have been briefed on progress, trends and emergent issues.
- The ratio indicators have been applied.**
- Established persistent processes for on-going measurement and reporting.**

Step 6: Performance reporting

As previously stated (see **Step 5, Monthly reporting**), many authorities are already using carbon calculators and carbon accounting tools with comprehensive reporting capabilities. It is, therefore, not within the scope of the guidance to prescribe standard report formats.

It is, however, recommended that performance reporting includes the following elements:

- 1. Details of local authority contact (responsible officer).**
- 2. Date of the report and the reporting period included.**
- 3. A description of the activities and inventory items included within the reporting.**
 - The schedule of activities and scope assignments.
 - The schedule of premises / sites.
 - The schedule of VPE.
- 4. A schedule of exclusions and any relevant justifications.**
 - Activities outside of the carbon reporting boundary.
- 5. Relevant ratio performance indicators.**
- 6. Carbon footprints for the year of reporting.**
 - Explanation and comments relating to observable trends evident in the data for the reporting period.
- 7. An assessment of data quality.**
 - A narrative regarding the quality of the data, any uncertainties, their likely cause(s) and recommendations for improvements
 - Detail relating to changes which could impact reported data, or trigger a recalculation such as technology upgrades, etc as defined in Step 5 of this guidance.
 - Any external assurance and a copy of the verification statement⁴¹ and / or certificate, if applicable.
- 8. Carbon management and reduction reports.**
 - Comparative carbon emission information from previous years, including the baseline.
 - An outline of the carbon management and / or reduction strategy and related targets.
 - Report progress towards reduction targets and the implementation of strategic policies.
 - Areas of success and areas for improvement.
- 9. Communication strategy.**
 - Highway's workforce, members and citizens, engagement, communications and feedback.
 - Supply chain members engagement, reporting and compliance.

⁴¹ The verification process may also examine more general managerial issues, such as quality management procedures, managerial awareness, availability of resources, clearly defined responsibilities, segregation of duties, and internal review procedures.

Appendix A: References

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Appendix B: Terms and Definitions

This document contains the following terms and definitions:

Baseline year: a baseline year is a reference point in time against which emission reductions in the future are measured against.

Boundary: an individual or household; an organisation, event, or product; a city, region, or country.

Carbon dioxide equivalent (CO₂e): the universal unit of measurement used to indicate the global warming potential of greenhouse gases expressed in the terms of the 100-year global warming potential of one metric tonne of carbon dioxide. (Note: The carbon dioxide equivalent is calculated using the mass of a given greenhouse gas multiplied by its global warming potential) (PAS 2060).

Carbon footprint: absolute sum of all emissions and removals of greenhouse gases caused directly and indirectly by a subject either over a defined period or in relation to a specified unit of product or instance of service and calculated in accordance with a recognised methodology (PAS 2060).

Carbon reduction: process of minimising GHG emissions in the development of new infrastructure assets and programmes of work or the refurbishment of existing assets. The outcome of a carbon reduction process would be a quantified reduction in existing sources of GHG emissions, or the avoidance of GHG emissions associated with new or existing infrastructure (PAS 2080).

Control: The ability of a company to direct the policies of another organisation and / or operation. More specifically, it is defined as either operational control (the organization or one of its subsidiaries has the full authority to introduce and implement its operating policies at the operation) or financial control (the organization has the ability to direct the financial and operating policies of the operation with a view to gaining economic benefits from its activities).

Controlled sources: sources of emissions which are under the control of the reporting company.

Direct emissions: Emissions from sources that are owned or controlled by the reporting company.

Fugitive emissions: Emissions of gases due to leaks or other unintended irregular releases.

Greenhouse gases (GHGs): even gases listed in the Kyoto Protocol: carbon dioxide (CO₂), methane (CH₄), nitrous oxide (N₂O), hydrofluorocarbons (HFCs), perfluorocarbons (PFCs), sulphur hexafluoride (SF₆) and nitrogen trifluoride (NF₃). Note: The range of included gases will be updated should the list of GHGs identified by UNFCCC/Kyoto Protocol, be modified in the future (PAS 2060).

GHG emissions: release to air and discharges to water and land that result in GHGs entering the atmosphere (PAS 2050).

Indirect emissions: Emissions that are a consequence of the operations of the reporting company, but occur at sources owned or controlled by another company. This includes scope 2 and scope 3.

Mobile combustion: combustion of fuels in transportation devices such as automobiles, trucks, buses, trains, airplanes, boats, ships, barges, vessels, etc

Owned sources: sources of emissions which are owned by the reporting company

Power Purchase Agreement (PPA): A contract between a renewable energy generator (e.g., a wind farm) and an energy buyer or 'end-user'.

Projects: Mobile primary and secondary/outsourced activities i.e., drainage, pavements, service activity

Process emissions: Emissions from chemical transformation of raw material and fugitive emissions

Renewable tariffs: Renewable options are backed by REGOs (Renewable Energy Guarantees of Origins) and/or GoOs (Guarantee of Origin). The REGO scheme is administered by Ofgem and is used to provide transparency to consumers about the proportion of electricity that suppliers source from renewable generation in the UK.

Scope 1 emissions: greenhouse gas emissions from sources that are owned or controlled by the entity (described as direct emissions) (PAS 2060).

Scope 2 emissions: greenhouse gas emissions from the generation of energy utilized in direct connection to the activities of a particular entity/subject but occurring at sources owned or controlled by another entity i.e., indirect emissions (PAS, 2060).

Scope 3 emissions: greenhouse gas emissions that are a consequence of the activities of an entity/subject but occur at sources owned or controlled by another entity (i.e., indirect) and which are not classified as scope 2 emissions (PAS 2060).

Stationary combustion: combustion of fuels in stationary equipment such as boilers, furnaces, burners, turbines, heaters, incinerators, engines, flares, etc.

Top Management: person or group of people who directs and controls an organisation at the highest level

Value chain members: organisations and stakeholders involved in creating and managing infrastructure assets. These include asset owners/managers, designers, constructors, and product/material suppliers

Verification: The act or process of verifying, often undertaken by an independent person/organisation.

Whole service: includes in house (primary activities) scope 1 and 2 emissions plus scope 1 and 2 emissions associated with secondary/outsourced activities (third party provider).

Appendix C: Abbreviations

ADEPT	Association of Directors of Environment, Economy, Planning and Transport
asPECT	Asphalt Pavement Embodied Carbon Tool
CH₄	Methane
CO₂	Carbon Dioxide
CO₂e	Carbon Dioxide Equivalent
COP	Conference of Parties
DECC	Department of Energy & Climate Change
IEMA	Institute of Environmental Management and Assessment
EV	Electric Vehicles
FHRG	Future Highways Research Group
FTE	Full Time Employee
GoOs	Guarantee of Origin
GHG	Greenhouse Gas
GWP	Global Warming Potential
HGV	Heavy Goods Vehicles
HFCs	Hydrofluorocarbons
IEMA	Institute of Environmental Management and Assessment
IPCC	Intergovernmental Panel on Climate Change
ISO	International Organization for Standardization
km	Kilometre
KPI	Key Performance Indicator
kWh	Kilowatt-hour
LEC	Levy Exemption Certificate
LGA	Local Government Association
LHA	Local Highways Authority
LPG	Liquid petroleum gas
MWh	Megawatt-hour
N₂O	Nitrous Oxide
NF₃	Nitrogen trifluoride
PFCs	Perfluorocarbons
PPA	Power Purchase Agreement
RACI	Responsible, Accountable, Consulted, and Informed
REC	Renewable Energy Certificates
REGO	Renewable Energy Guarantees of Origin
ROC	Renewables Obligation Certificate
SF₆	Sulphur Hexafluoride
T	Metric tonne
VIN	Vehicle Identification Number
VPE	Vehicles, Plant & Equipment