Guidance on measuring and reporting Greenhouse Gas (GHG) emissions from freight transport operations

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freight by water

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IGD

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RFG Rail Freight Group

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Food Storage and
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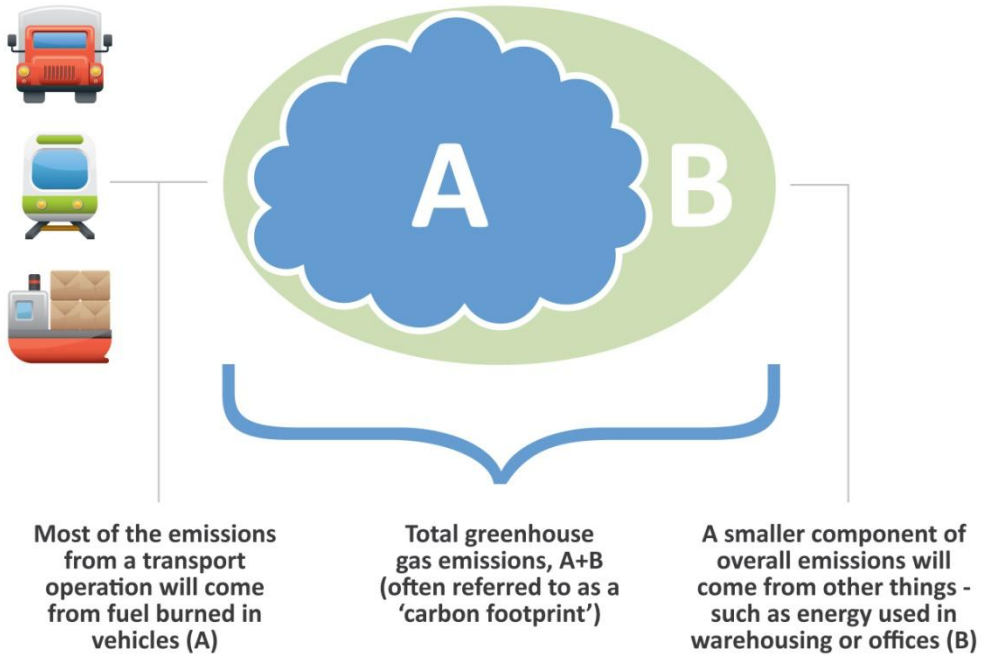
USING THIS GUIDANCE

This guidance provides clear instructions on calculating the greenhouse gas (GHG) emissions from freight transport operations. It is designed to supplement the DEFRA/DECC document 'Guidance on how to measure and report your greenhouse gas emissions', by providing more specific information and examples relating directly to freight transport operations.

It is important to understand that this document does not provide a complete guide to calculating a 'carbon footprint' for a freight transport operation. As illustrated below, the majority of GHG emissions from freight transport come from fuel burned in the vehicles themselves (A), with additional emissions coming from other elements, such as warehousing and offices (B). (Of course if the transport operation was only part of a company's business, then B would probably be a much larger proportion of the total emissions.)

This guidance is concerned solely with calculating and reporting the direct emissions from burning fuel to drive vehicles (component A). Other GHG emissions are important, and should be reported – it is therefore recommended that if you are seeking to report emissions from your whole business you should use this document alongside the Defra/DECC guide mentioned above.



One of the main reasons for transport operators to calculate their emissions is to provide information to their customers. For most transport operators, this will mean calculating their total emissions, and then using an appropriate method, such as the one provided in this document, to fairly 'allocate' an appropriate share of those emissions to each of their customers. The recommendation of this guidance is that the initial 'total' to share out should be just the direct vehicle emissions (A), not the total emissions of the operation/company (A+B).

This document is aimed primarily at freight transport operators. However, it will be of interest to any business that wishes to understand where transport fits into wider greenhouse gas reporting, and as such is written in a way that is accessible to a wider audience.

This document has been produced with the input of the freight and logistics industry, primarily via the Low Carbon Transport Supply Chain Steering Group, led by the Department for Transport (DfT). The group has the primary aim of establishing a consistent carbon measurement and reporting method for the logistics transport supply chain.

Throughout the document you will see orange boxes like this:

You will also see green boxes like this:

These contain more in-depth information

The contents of these boxes provide more explanation of points that are not essential to the main purpose of the section.

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1. INTRODUCTION

Calculating and reporting the GHG emissions from your freight transport operations need not be difficult, and can have multiple business benefits. Fundamentally, measuring the GHG emissions from transport is based on measuring or estimating fuel use, and as such is aligned with good logistics and fuel management – and all the cost savings this can bring.

This document has been produced for the following reasons:

- To provide clear guidance to transport operators of all sizes and types
- To address in more detail the specific challenges of calculating and reporting emissions across potentially complex supply chains
- To encourage a more standardised approach, leading to a more level playing field in the reporting and comparison of emissions in different parts of the freight sector
- To assist the customers of freight transport operators who may wish to understand the emissions of their supply chain and how they have been calculated.

The advice contained in the following pages is applicable to all modes of freight transport, though it does not explicitly cover aviation in this version. Although many of the diagrams and examples refer to road transport, calculations and methods are also provided for rail and sea, and the reference tables in the annexes include rail and sea data alongside information for road transport.

This document does not provide guidance on producing a complete 'carbon footprint' for your organisation. Such a footprint would include emissions from your offices, warehouses and any other operations of your company (and possibly subsidiaries) – this guidance is focused on emissions from transport operations, and within those, only emissions arising from the burning of fuel to drive vehicles (other transport emissions such as those associated with refrigeration are not considered).

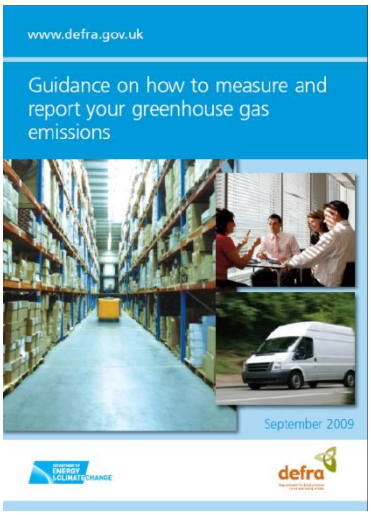
There are several mandatory government emissions reporting schemes, but apart from aviation, transport emissions are currently not included directly in any of them (Aviation will be

CO_2, 'GHG' or CO_2eq

In discussions of emissions, you'll hear lots of terms used – carbon emissions, carbon dioxide, greenhouse gases (GHG). In fact, climate change is caused by a range of gases, known collectively as 'greenhouse gases'. Of these, the most common is carbon dioxide (CO_2), which is why it's the most talked about. However, other greenhouse gases are emitted from vehicle exhausts (i.e. nitrogen dioxide and methane), and this guidance is concerned with calculating and reporting these also.

The terms used throughout this guidance are therefore 'GHG' and '$kgCO_2eq$', where the 'eq' stands for 'equivalent'. This is simply a unit for all GHGs expressed as if they had the same climate change effects as CO_2.

included in the EU Emissions Trading Scheme from 2012). Readers concerned with understanding the Carbon Reduction Commitment Energy Efficiency Scheme, the EU Emissions Trading Scheme, Climate Change Agreements and other schemes are referred to specific guidance which can be found on the website of the Department of Energy and Climate Change (DECC).



ALIGNMENT WITH ESTABLISHED APPROACHES TO EMISSIONS REPORTING

The standard approach to calculating and reporting GHG emissions in the UK is set out by Defra's Company Reporting Guidelines. These in turn are based on the established international approach created by the Greenhouse Gas Protocol.

The Greenhouse Gas Protocol is a common approach to emissions reporting set out by independent bodies, the World Resources Institute (WRI) and the World Business Council for Sustainable Development (WBCSD). All of the guidance in this document aligns with this approach, and with the WRI Principles of Reporting, listed below.

WRI PRINCIPLES OF REPORTING

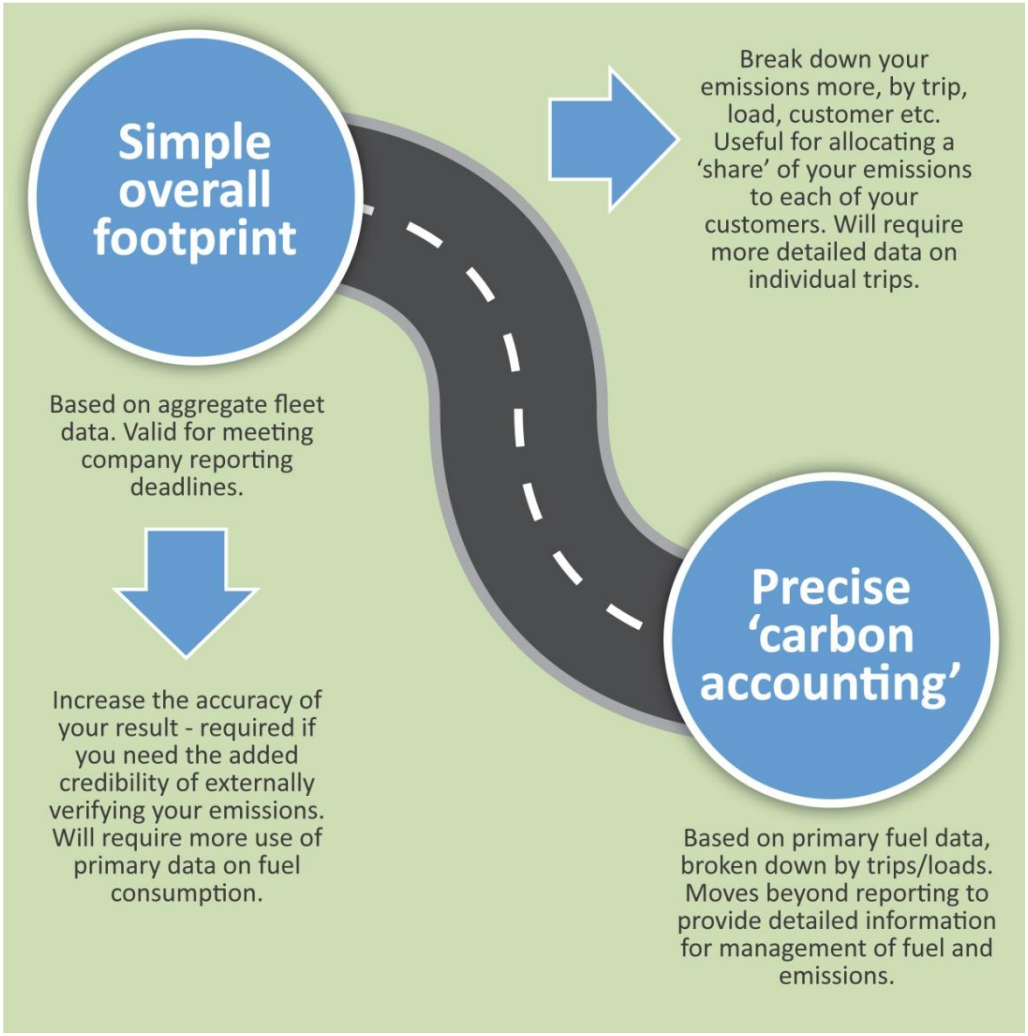
RELEVANCE	Ensure the GHG inventory appropriately reflects the GHG emissions of the company and serves the decision-making needs of users – both internal and external to the company.
COMPLETENESS	Account for and report on all GHG emission sources and activities within the chosen inventory boundary. Disclose and justify any specific exclusions.
CONSISTENCY	Use consistent methodologies to allow for meaningful comparisons of emissions over time. Transparently document any changes to the data, inventory boundary, methods, or any other relevant factors in the time series.
TRANSPARENCY	Address all relevant issues in a factual and coherent manner, based on a clear audit trail. Disclose any relevant assumptions and make appropriate references to the accounting and calculation methodologies and data sources used.
ACCURACY	Ensure that the quantification of GHG emissions is systematically neither over nor under actual emissions, as far as can be judged, and that uncertainties are reduced as far as practicable. Achieve sufficient accuracy to enable users to make decisions with reasonable assurance as to the integrity of the reported information.

2. REASONS FOR CALCULATING YOUR GHG EMISSIONS

Before you calculate the GHG emissions emitted by your freight transport operation, you should be clear about the reasons for undertaking the task. Common reasons for calculating your transport GHG emissions are:

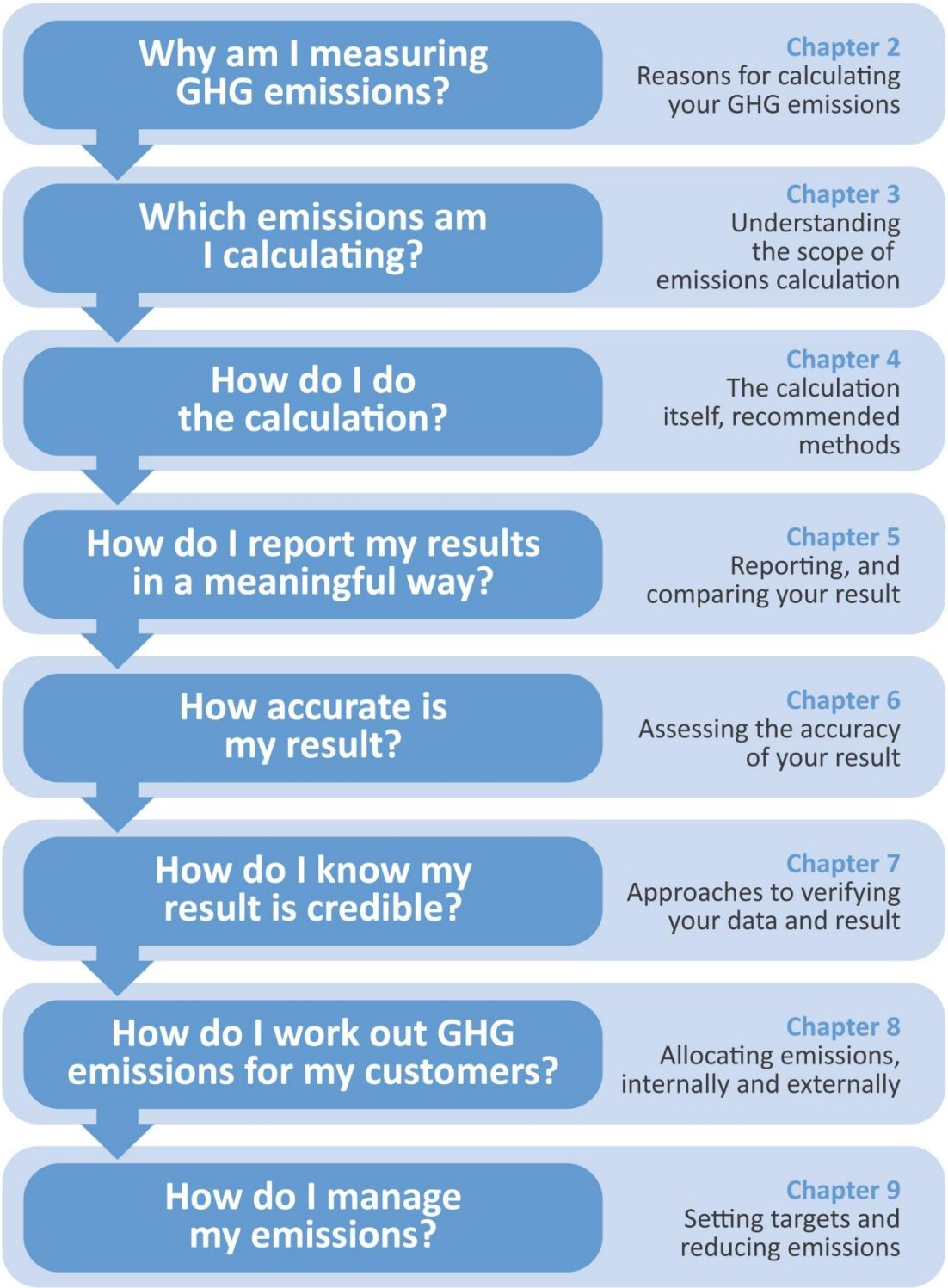
- To provide a basis for managing, and reducing, emissions (and fuel used)
- To adhere to government and industry best practice guidelines
- To provide a figure for your company reports
- To provide information that may be requested by your customers.

Calculating your emissions need not be a complex process, but it can vary in both its accuracy and detail. As illustrated below, depending on your purpose you may need to focus more on the accuracy of your result (see chapters 6 & 7), or on breaking your result down by trip or customer (see chapter 8).



Ultimately your emissions reporting journey will lead you towards information that will allow you to effectively manage both fuel and emissions, realising business and environmental benefits.

The flowchart below illustrates the steps this guide will take you through. Each chapter will provide a concise overview of a key consideration, and signpost you to additional information that you may wish to consider.



3. UNDERSTANDING THE SCOPE OF EMISSIONS CALCULATION

This guide is concerned solely with helping you calculate and report the direct emissions from your freight transport operations – i.e. the emissions from freight vehicles which you lease or own, and operate. Both UK and international guidance on GHG emissions reporting would refer to these as part of your 'Scope 1' emissions. Emissions are referred to as Scope 1, Scope 2 and Scope 3, and these terms are briefly explored and defined in the first section of this chapter.

The second section of this chapter explains how you should deal with the structure of your operation, including the use of subcontractors. This is a crucial issue for the transport sector, where the use of subcontractors is widespread and often involves very close working relationships.

THE REASON FOR CLASSIFYING EMISSIONS INTO 'SCOPES'

If *your* truck transports *my* goods, should I report the emissions, or should you? You might report the emissions, because you have control of what truck is used and how it's driven. Alternatively, I might report them as being part of the 'cradle to grave' carbon footprint of my goods. This is one of the central issues of emissions reporting, and one of the main factors which has led to an internationally recognised common approach.

A similar problem arises from buying electricity – do you count the emissions from the power station, or are they the responsibility of the power supplier who generated the power? Both approaches may be useful for some purposes, as with transport, but if all the emissions reported by all organisations in the UK were added together, how could it be ensured that some emissions weren't being counted more than once?

In order to address the confusion emissions are classified into three 'Scopes'. These three Scopes are carefully defined to allow definitive reporting of emissions from individual companies, products, supply chains or whole countries.

DEFINITION OF 'SCOPES'

Scope 1 emissions are those under your direct control – for a transport operator the largest of these is probably the fuel used by the vehicle fleet. It would also include emissions arising from any other fuels used, most likely gas for the heating of offices or warehouses.

Scope 2 emissions are just those emissions resulting from the electricity (and heat or steam) a company buys – these are treated separately

Calculating a 'complete' emissions inventory

This guidance is written to help calculate only the GHG emissions from the use of fuel to drive vehicles. Other transport-related emissions, such as fugitive emissions from refrigeration, are not covered, and neither are non-transport sources such as offices.

For many transport operators, these other sources of emissions will be a significant proportion of their total Scope 1 and 2 emissions. For this reason, this document should be read as supplementary guidance to the Company Reporting Guidelines (signposted below).

from Scope 1 because the emissions actually take place 'off-site'.

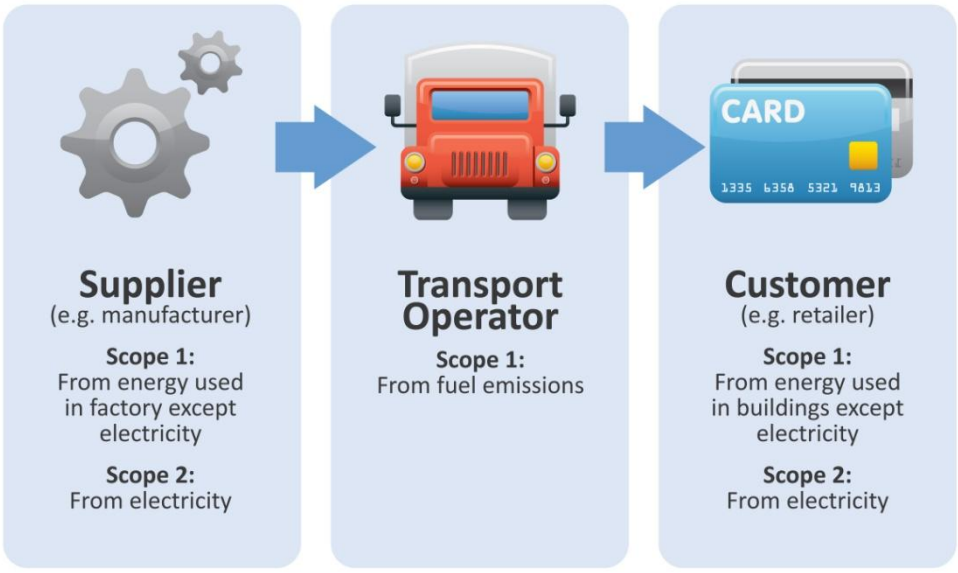
Scope 1 and 2 emissions are considered to be under the control of the reporting organisation, and are the minimum required for acceptable GHG reporting under the Defra/DECC company reporting guidelines.

Scope 3 emissions are 'other' emissions which are not under the direct control of a company, but which it might nevertheless want to count to understand its total climate impact, or the impact of a particular product. As consumers show greater interest in the climate impact of the products they buy, retailers in particular are increasingly looking to identify not just their own emissions, but those of their complete supply chain. They might therefore choose to include the manufacture and transport of the goods they sell in their reported footprint, as 'Scope 3' emissions.

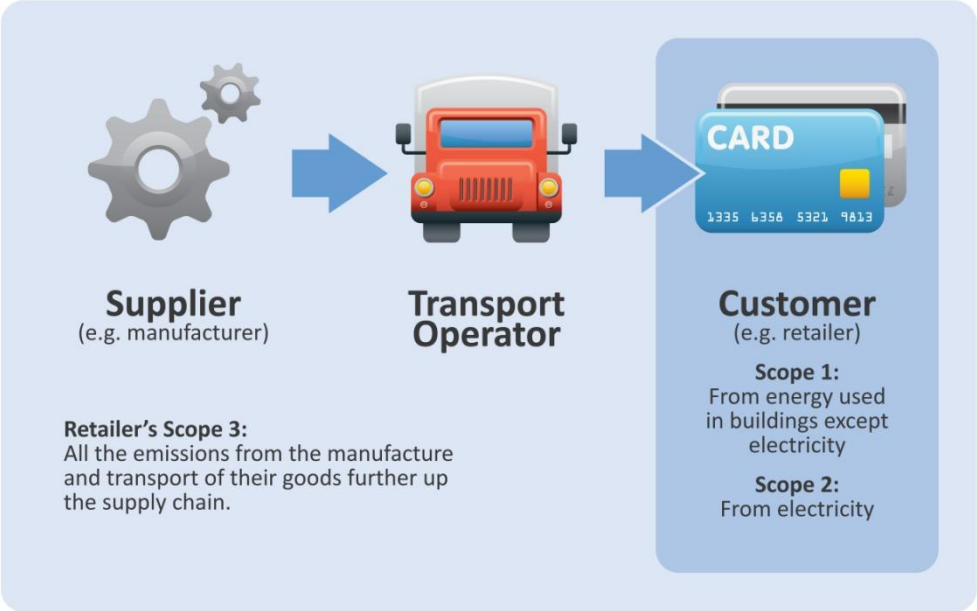
YOUR SCOPE 1 IS YOUR CUSTOMER'S SCOPE 3

For a transport operator, one of the most common reasons to calculate GHG emissions is to provide information to their customers. In a supply chain, part of the transport operator's Scope 1 emissions will be part of their customer's Scope 3 emissions. This is illustrated in part of a typical supply chain below.

Each of these elements of the supply chain has their Scope 1 and 2 emissions, under their direct control. (In the diagram below only the transport emissions are shown for the transport operator, for simplicity – the company would probably have an office, warehouse, etc. which would also have emissions, but the calculation of these is outside the remit of this guide).



The diagram below illustrates the Scope 1, 2 and 3 emissions for the retailer. Everything elsewhere in the supply chain that contributes to the customer's goods is included – note that this diagram is a simplification; in reality the supply chain could be extended back from the manufacturer all the way to the raw materials. Then the manufacturer's Scope 3 emissions would stretch back upstream, to the left.



For the purpose of reporting its own company emissions as per government guidance, in its annual report for example, a transport operator need only consider a total figure for its Scope 1 and 2 emissions. However, a very common reason for a transport operator to calculate its GHG emissions is to provide information to its customers, and this will often require a more detailed breakdown.

If a transport operator transports goods for more than one customer, it will need to consider how it allocates the correct proportion of its total GHG emissions to each. This may be relatively straightforward, for example if a vehicle is permanently assigned to a particular customer; or it may be extremely challenging, for example if drops are made to multiple customers in a single trip. This issue is considered in more detail in chapter 8.

CALCULATING YOUR OWN SCOPE 3 EMISSIONS

For everyone including transport operators, Scope 3 reporting is increasingly being regarded as less of an optional extra, and more part of best practice. However, it can be difficult to know how far to go in investigating Scope 3, and which elements are most important.

The diagrams on this and the previous page illustrate how Scope 3 emissions extend 'upstream' in the supply chain. In the case of the transport operator, this would **not** be the supply chain for the goods carried – the 'product' supplied by the transport operator is not the goods in the truck, train or ship, it is the transport service itself. The supply chain for that service is that for the vehicles used, and the fuel they burn. It would also include the use of subcontractors to deliver part of the transport service.

In practice, the simplest element of Scope 3 emissions to calculate is likely to be the emissions arising from the extraction and refining of fuel. 'Indirect emission factors' are currently being produced that include these 'well to wheel' emissions, as opposed to the 'direct emission factors' which only include the emissions produced when the fuel is burned. Since fuel use is such a large part of emissions from transport overall, calculating this aspect of Scope 3 will

allow a transport operator to assess a large proportion of Scope 3 with very little additional data gathering.

For further information on the three 'Scopes' see Part 4, page 10 of the Defra Company Reporting Guidelines:www.defra.gov.uk/environment/business/reporting/pdf/ghg-guidance.pdf.

It is important to note that it is not currently recommended that transport operators include *their* Scope 3 emissions in the emissions they *allocate* to customers.

See Annex A for further information on Scope 3 reporting.

For further information on the three 'Scopes' see Part 4, page 10 of the Defra Company Reporting Guidelines:

www.defra.gov.uk/environment/business/reporting/pdf/ghg-guidance.pdf

HOW COMPANY STRUCTURE AFFECTS WHICH EMISSIONS YOU INCLUDE

When you calculate and report your transport emissions, it will be important to understand which are considered your Scope 1 and 2, and which are in Scope 3. Scope 1 emissions are those identified as being under your direct control, and as such you are likely to be held more responsible for them. For most companies, Scope 2 emissions are just their purchased electricity. Your 'company boundary' delineates the emissions which you will count in Scope 1 and 2. Scope 3 emissions are those associated with your supply chain, the goods and services you buy in – you are not directly in control of them, but they can be seen as part of the overall emissions associated with your products. Scope 3 emissions lie outside your company boundary.

The extensive use of subcontractors in the transport sector makes the setting of your company boundary a particularly important question. It is common to find 3rd Party Logistics firms using a mixture of their own and subcontractors' vehicles and drivers, working very closely together – to what extent should the parent operation be considered responsible for its subcontractors' emissions?

The Defra/DECC company reporting guidelines explains the different methods for defining your company boundary for the purposes of defining your emissions. These are explained and illustrated below.

CONTROL VS. EQUITY SHARE

At the top level there are two agreed methods for deciding what's in your company boundary: 'control', and 'equity share'. The control approach means that you include all the operations over which you have direct control, whereas equity share would assign 'shares' of the emissions from an operation to different organisations based on their respective shares of equity.

In most cases the control approach is recommended. This is simply because it makes sense for the organisation that has the most power to make changes to emissions to also report those emissions.

FINANCIAL CONTROL VS. OPERATIONAL CONTROL

The control approach is itself divided into two methods – financial and operational. 'Financial control' actually refers to the normal situation wherein a company (i.e. its management) has control over both the company's financial decisions and operating practice, and stands to gain financially from the company's operation.

Financial control is the simplest and most commonly used approach and is recommended in the Defra/DECC guidance[1]. Under financial control, a parent company would include emissions from any subsidiary companies in its Scope 1 (because it profits from them), but all subcontractor operations would be deemed outside the parent's financial control, and counted as Scope 3. This method has the additional benefit of being aligned to most organisations' financial accounting methods.

In a minority of cases, a company may still be an independent entity, gaining financially from its activity, but effectively give up operational control to another entity. In this case, the 'operational control' approach may be used – i.e. the company that is in control of what's happening counts the GHG emissions as its Scope 1, even though it's not actually taking the profit.

There is no single 'right' approach to setting your company boundary. However, once you have chosen which of the three approaches outlined above you will use to report your emissions, you should apply that approach consistently.

DEFINING 'OPERATIONAL CONTROL' FOR A TRANSPORT OPERATION

Although rare in the economy as a whole, parent companies taking 'operational control' of subcontractors is more common in the transport sector. Subcontractors may simply provide vehicles and drivers – an example might be an express parcel carrier that operates a mixture of its own, and subcontractor vehicles from a single depot, loading and routing the subcontractors' vehicles alongside its own.

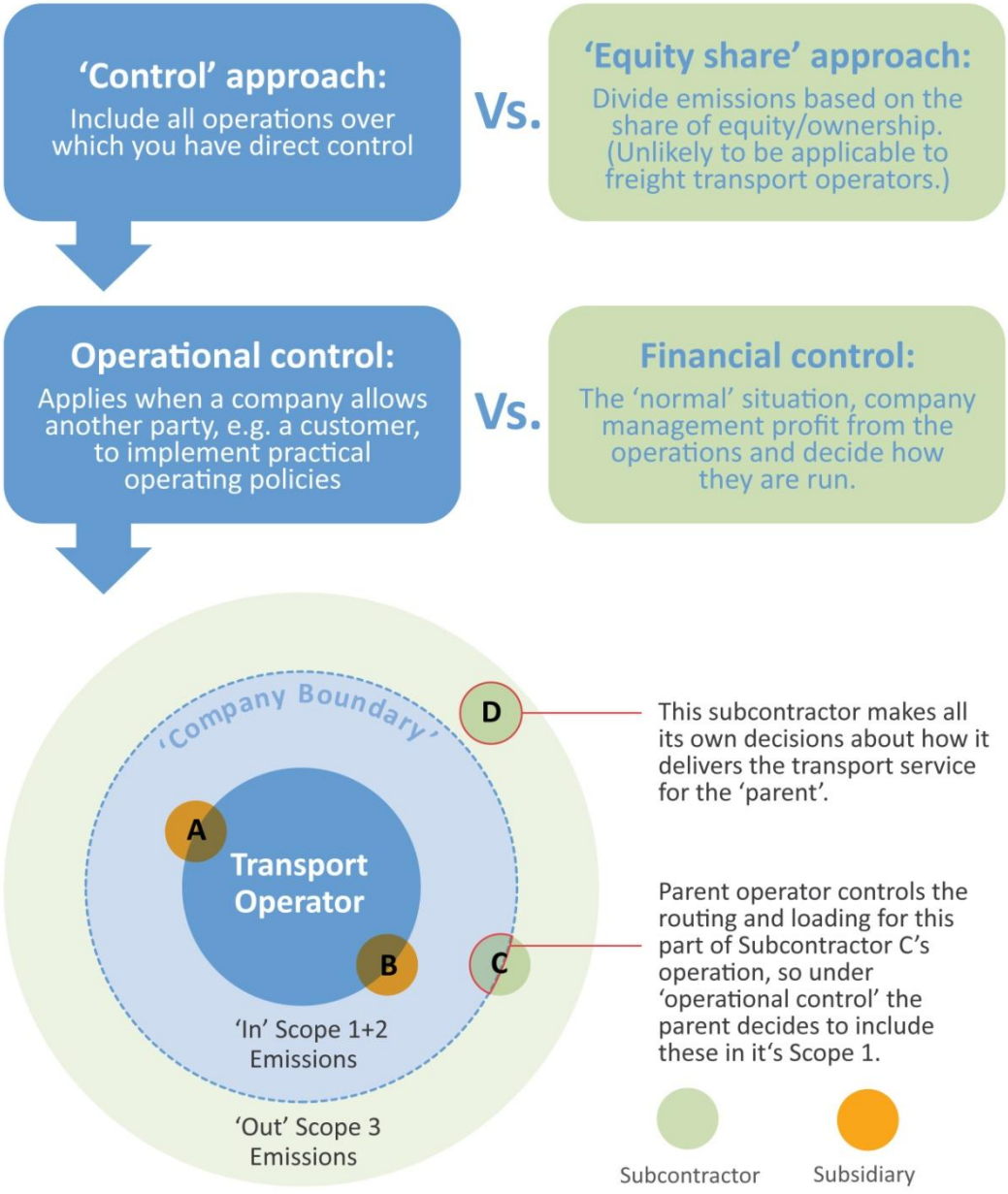
In such a case of a transport operator working closely with a subcontractor, exactly when would the parent operator be said to take 'operational control' of the subcontractor? Defra/DECC guidance states that, "Operational control may be used where the company has full authority to introduce and implement its operating policies on the operation."

In practice the dividing line is unlikely to be 100% clear cut, with both the parent and the subcontractor controlling some of the operating policies. In the example given, it may be that

[1] Guidance on how to measure and report your greenhouse gas emissions. Published by Defra/DECC 2009.

routing and loading is controlled by the parent operator, but the subcontractor is still responsible for training its drivers, and procuring and maintaining the vehicles.

Since routing and loading usually have the largest influence on GHG emissions, there is a strong argument in this example for saying the parent has operational control of the subcontractor vehicles. The suggestion would be that the parent has the most opportunity to make changes that will reduce emissions, and so should use operational control to include the subcontractor vehicles within its company boundary. However, each case would still have to be decided on its merits – it might be that there is little flexibility in the routes taken, and the greatest emissions reductions can be achieved by driver training, for example.



In the end, there is no 'right' answer to the question, but the judgement made should reflect the purpose of reporting emissions, which is management. If, as an operator, you manage subcontractor vehicles 'as your own', then you may consider that leaving them out of your GHG reporting simply gives an incomplete or misleading picture, and that it undermines your target-setting and emissions reduction efforts.

While the recommendation in the Defra/DECC reporting guidance is to use the financial control approach, a 'parent' company may choose to use the operational control approach where this would be more appropriate. In addition, it should be noted that whatever approach is taken to drawing the company boundary, it should be consistent and transparent across any group of companies/organisations. You must also clearly state the approach used in your reporting.

Example: XYZ Multi-Modal Hauliers

XYZ is a major haulier, and has three types of road operation of its terminals:

- Its own fleet that it has full control over
- Dedicated sub contractors that it has full control over for certain times of day
- Totally independent hauliers taken on by their customers independently.

Under either control method, financial or operational, its own fleet (1) come under scope 1, and independent subcontractors (3) would be scope 3. However, under financial control, dedicated subcontractors (2) would lie outside the company boundary if financial control is used, and so be scope 3. This is because they are separate financial entities providing a service to XYZ from which they profit.

Under operational control, the dedicated subcontractors' vehicles would be within XYZ's company boundary while they are working for XYZ. Emissions arising during these journeys would be XYZ's scope 1.

Either approach to setting company boundary would be valid. The choice of method might depend on how XYZ wished to set its targets and policies.

Example: Subcontract of single journey

A common case in which the operational control approach might be used is when a parent operator outsources a dedicated, one-way journey, and specifies the route and delivery times – say, from London to Land's End every Friday. The subcontracted haulier has effectively "lost" operational control of its vehicle for this time, and so the parent operator would count the subcontractor's emissions among its own Scope 1 emissions if using the operational control approach.

If, however, the subcontractor decides to on the return journey to divert to say, Bristol, to collect a load for its own operations (and thus incur additional mileage), the parent operator would be justified in only counting emissions from the outbound leg within its Scope 1.

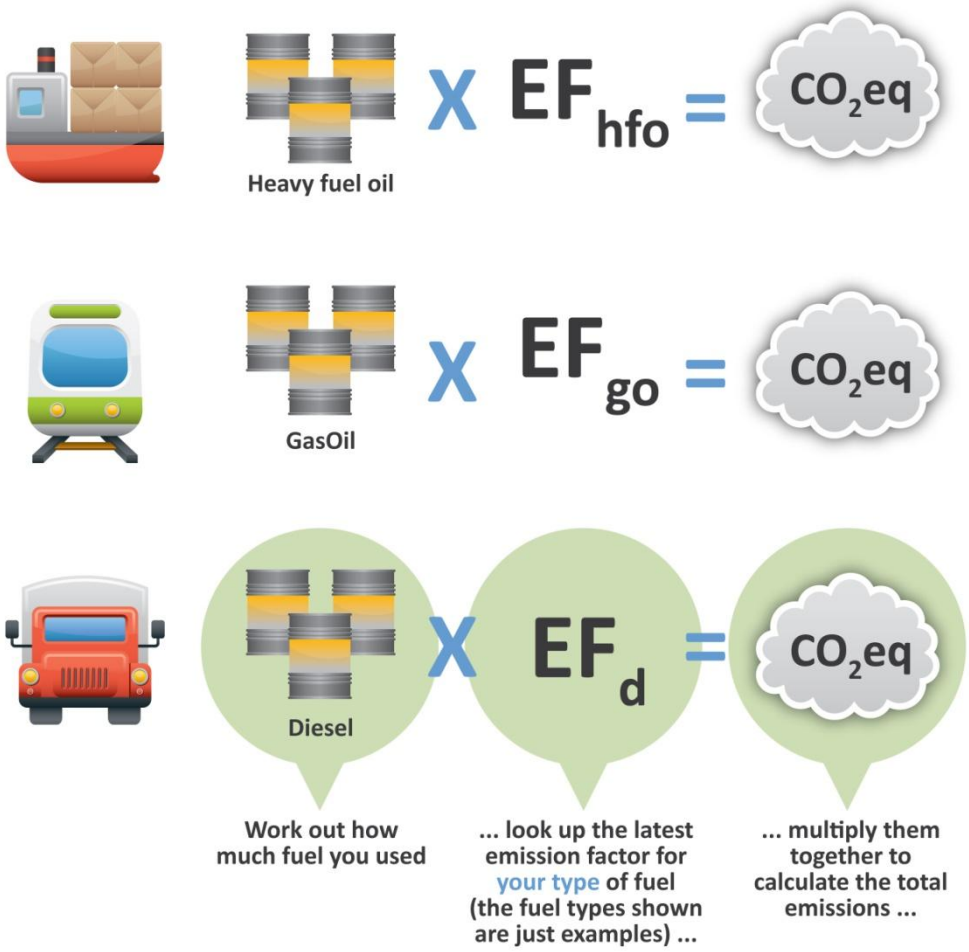
For further information on setting the 'organisational boundary' for your reporting, see Part 3, page 8 of the Defra Company Reporting Guidelines:

www.defra.gov.uk/environment/business/reporting/pdf/ghg-guidance.pdf

4. THE CALCULATION ITSELF – RECOMMENDED METHODS

At a basic level, there doesn't have to be anything complicated about calculating the emissions from your transport operations. Fuels contain carbon which is released as carbon dioxide when burnt in an engine. It follows that if you know the quantity of fuel you've used, you are well on the way to knowing your GHG emissions.

Knowing how much fuel you have used is the most accurate way of calculating your emissions. Each type of fuel has a corresponding 'emissions factor' (EF in the diagram below) - just look it up for the fuel used (see Annex B) and apply a formula like the one below:



Note – heavy fuel oil is shown for shipping – this will vary for different operations – confirm the fuel in use and apply the appropriate emissions factor.

Of course you may not know how much fuel you used. If you have a comprehensive fuel management system, then it's a case of pulling out the figures you need. Or you may have details of the litres of fuel you have purchased via your accounts.

If you have no direct records of actual litres of fuel purchased/used, the next best thing is to estimate fuel use from other information. The type of information you are likely to have will depend on your sector – road, rail and sea all have their own common protocols, and are explained separately in the sections below.

However you calculate your emissions, you will need to use data gathered over a consistent time period, e.g. annual, or quarterly, and you will probably wish to repeat your calculation as you continue to monitor.

Additional information on emission factors

An emission factor is a number that shows you the quantity of emissions that will be released for every unit of a specific fuel used. The 'direct emission factor' is the main one used in the calculations in this guidance. It indicates the 'tailpipe emissions', i.e. those from burning the fuel.

The 'eq' next to CO_2 in the diagram above is just short for 'equivalent'. Although we often talk about CO_2 in the context of emissions, we actually need to consider other gases like methane and nitrous oxide too. This is in line with the latest government guidance, and if you look up the emission factor you use on the Defra website, it will have been calculated to include these other gases. (For example, the emission factor for diesel was revised from 2.63 kgCO_2/ltr to 2.67 kgCO_2eq/ltr, to take account of these other gases.)

'Indirect' fuel emission factors – 'well to wheel' emissions

An 'indirect' emission factor is one that includes an estimate of the emissions that result from the extraction and refining of fuel, as well as the emissions at the point of use. Updates to the Defra emission factor spreadsheet will include both direct, indirect and Scope 3 only emission factors. This means that you can see the emissions from just your use of the fuel – tailpipe emissions, the emissions from every element of producing the fuel and using it – its life-cycle, or life-cycle minus tailpipe emissions – your Scope 3.

It is recommended that Scope 3 emission factors are used only in addition to direct emission factors. They should not be used to calculate emissions that are then allocated to customers as part of their Scope 3.

Other variations in emission factors

Emission factors are different for each different fuel. They may even vary from country to country for the same fuel (as different standard blends may be applied in different countries.) They are also regularly updated, so you should check for the latest factors at least annually.

As well as fuels, it is possible to calculate emission factors to be applied to other parameters such as distance travelled. These all rely on some additional assumptions – to provide an emission factor for distance travelled, one must estimate the fuel efficiency of the vehicle (from an average for example). These assumptions reduce the accuracy of the result, so wherever possible, fuel use itself should be calculated or estimated, and a fuel emission factor used.

CALCULATING EMISSIONS FOR ROAD FREIGHT

The information available to road freight operators varies enormously. Some have comprehensive monitoring systems that can provide data on vehicle routing, loading and fuel consumption at the click of a mouse. Others may have only tachograph records of distance travelled.

In order to allow all operators to calculate an estimate of their GHG emissions, Defra, DECC and the Department for Transport have produced a range of emission factors. By researching UK average fuel consumption data for various sizes and weights of vehicle, and combining these figures with the carbon contained in each type of fuel, they have calculated emission factors which can be directly multiplied by distance data to give emissions. Samples of these emission factors are provided in Annex B.

The fuel used by a freight vehicle will obviously depend on the type of vehicle and on how heavily loaded it is. Tables in Annex B illustrate the range of emission factors provided – some for specific vehicle types and specific loading (as a percentage), others for more general categories of vehicle and assuming the average UK loading.

The Defra emission factors are recommended for use by UK operators. Other emission factors are available which may be used, but your organisation should have a clear reason for doing so, and be sure of their origin. You must clearly state which emission factors have been used.

The decision tree below illustrates how you should choose the method of emissions calculation to use, based on the information you have available. The worked example on the following page then illustrates how each method might work, and the different levels of accuracy that might be expected.

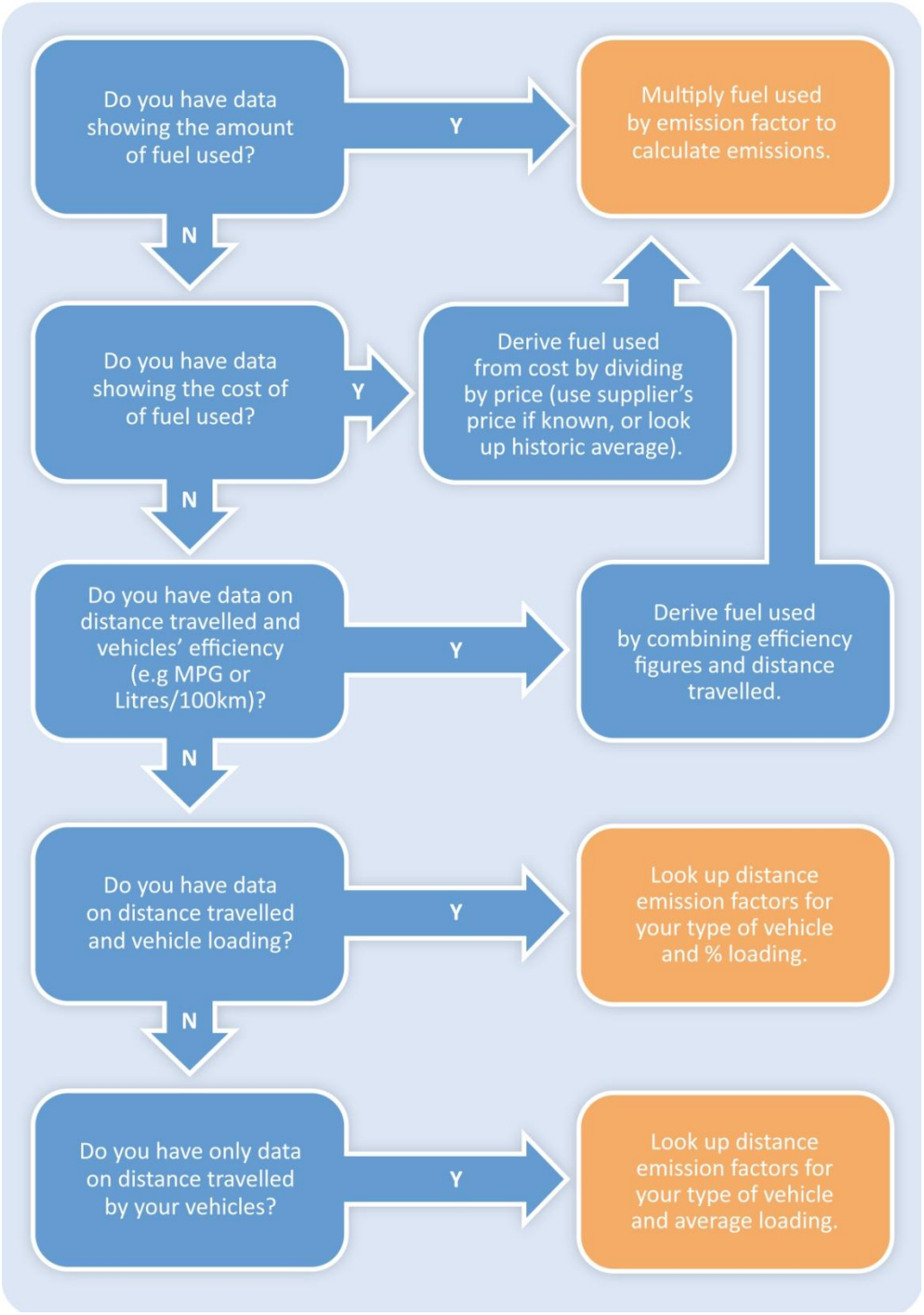
What about biodiesel?

You may have heard that the UK has 5% biodiesel mixed into all the diesel sold – this is not actually the case.

Under the 'Renewable Transport Fuels Obligation' (RTFO) the UK has targets for biofuels as a percentage of fuel sales. In the case of biodiesel this is mainly met by the sale of specific labelled 'blends' – such as B5 or B30.

Unless you are specifically aware that your fuel contains a percentage of biodiesel, you should assume it does not contain any and use the diesel emission factor as outlined in this chapter.

For further information on biofuels see Annex D



Past and present fuel price data is available at:

www.decc.gov.uk/en/content/cms/statistics/source/prices/prices.aspx

www.fta.co.uk/information/fuel/

Example calculation – XYZ Hauliers

The following example illustrates various ways of approaching the emissions calculation, reasons for choosing them and the resulting level of accuracy. In practice of course, you would only make use of one of these methods.

XYZ is a small haulage firm operating eight large articulated HGVs (>33t).

Scenario 1: XYZ have fuel use data

The total fuel used by all the vehicles is 150,000 litres. The UK emission factor for diesel is 2.67 kgCO_2eq/ltr, so:

Total emissions	**=**	**150,000 x 2.67**
	=	**<u>400,500</u> kgCO_2eq**

Scenario 2: XYZ uses fuel spend to calculate fuel use

Unfortunately, XYZ does not collect fuel usage data. Its total fuel spend is £150,300 for the year. Although this actually cost an average of £1.002/ltr it does not have actual price data. The average price for the year on the DECC website (see signpost on fuel prices in this section) is £1.026. Using this data gives an emissions figure of:

Fuel use	**=**	**Fuel spend ÷ fuel price**
	=	**150,300 ÷ 1.026**
	=	**146,491 litres**

Therefore:

Total emissions	**=**	**146,491 x 2.67**
	=	**<u>391,131</u> kgCO_2eq**

Scenario 3: XYZ calculates fuel use from mileage and efficiency

As the year's accounts have not yet been completed, XYZ is unable to access this fuel spend data. It knows that its total mileage is 234,267, and it estimates that its trucks get 7.8 mpg (or 1.75 litres per 100km). It therefore calculates its emissions as:

Fuel use	**=**	**distance ÷ fuel efficiency**
	=	**234,267 ÷ 1.716**
	=	**136,519 litres**

Therefore:

Total emissions	**=**	**136,519 x 2.67**
	=	**<u>364,506</u> kgCO_2eq**

Scenario 4: XYZ only have distance data

Unfortunately, the estimate of fuel efficiency is called into question by the new fleet manager due to discrepancies in some of the figures. He decides to calculate emissions on the basis of the distance travelled (he converts this from miles to 377,015 km). He does not have reliable data on the average % loading of the XYZ fleet, so he uses the emission factor based on average loading and fuel efficiency for all UK articulated HGVs (0.94353 at the time he checks).

Total emissions	**=**	**distance x emission factor**
	=	**377,015 x 0.94353***
	=	**<u>355,725</u> kgCO_2eq**

Note how each of the methods above introduces additional estimates and assumptions. With each of these additional assumptions, the accuracy of the result decreases. In this case the final estimate of emissions is around 11% less than the estimate based on direct fuel figures, but in reality the discrepancy could potentially be much greater.

*Do not use this factor – check the Defra spreadsheet for the most up to date figures.

CALCULATING EMISSIONS FOR RAIL FREIGHT

As for other modes, the most accurate way to calculate emissions from rail freight is to use direct measurements of fuel used. Defra/DECC provide emission factors for both gas oil and diesel. Gas oil will be predominantly used until 2012 when diesel will start to be introduced because it emits less carbon per unit.

Given that the most commonly used metric in rail freight is tonne km, Defra, DECC and the Department for Transport have calculated an emission factor which can be directly multiplied by tonne km data to give emissions. This emission factor is based on UK average fuel consumption data for various rail freight operations. However, fuel usage in rail freight will vary significantly across different locomotives and other factors such as the gradient of the route. Therefore it is recommended that where possible operators try to measure or estimate fuel use more directly, and use this as the basis of their emissions calculation.

Emission factors for electrified trains are under development, but at the time of writing electric trains are primarily used for transporting passengers in the UK.

See Annex B for further information.

CALCULATING EMISSIONS FROM SHIPPING

As for other modes, the most accurate way to calculate emissions from shipping is to use direct measurements of fuel used. Defra/DECC provide emission factors for fuel oil and other fuels in use in shipping.

Given that the most commonly used metric in shipping is tonne km, Defra, DECC and the Department for Transport have calculated a range of emission factors which can be directly multiplied by tonne km data to give emissions.

Updates to the emission factor spreadsheet will include a wider range of vessel types. We recommend that current tables are used to get an estimate of emissions for the interim, but that you refer back to Defra's web page regularly to check for updates which will allow you to improve the accuracy of your result.

See Annex B for further information.

You can find a spreadsheet with the full table of emissions factors, automated calculations and a complete explanation of the methodology used, at:

www.defra.gov.uk/environment/business/reporting/conversion-factors.htm

If you have vehicles which use alternative fuels, such as biofuels or electricity, see Annex D.

5. REPORTING AND COMPARING YOUR RESULT

This chapter is divided into two sections. The first section gives an overview of how you are recommended to report your emissions – including the idea of using a relative measurement, such as the amount of GHG emissions per pallet you deliver. In the Defra/DECC reporting guidelines this type of figure is referred to as an 'intensity measurement', and it is calculated from an 'intensity ratio' (i.e. [emissions]/[chosen metric]).

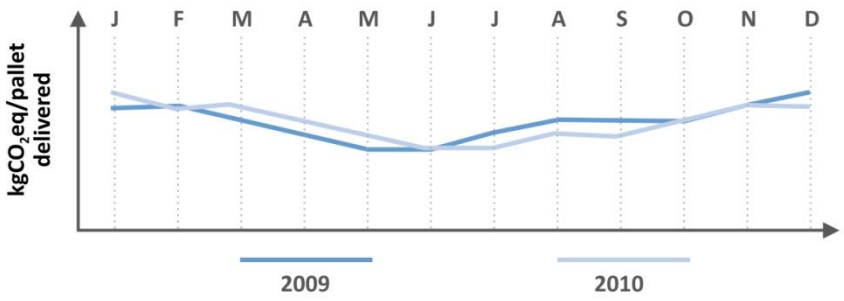
The second section provides more detail on intensity ratios. It explores the pros and cons of different factors you might choose to use, such as pallets delivered, tonne km or even business measures such as total revenue.

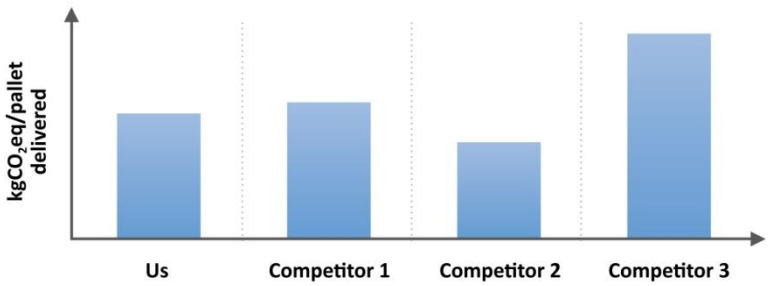
REPORTING YOUR EMISSIONS

The recommended way to report your GHG emissions is as *both* an absolute figure *and* an intensity measurement.

Your total absolute emissions are important – in the end it is total emissions that must be reduced to mitigate against climate change. Total figures are vital to inform government policy, and are also important for sector-based initiatives – for example the Freight Transport Association's (FTA) voluntary commitment to reducing emissions from freight transport is in line with government targets.

Your intensity measurement will provide vital context to the overall figure. It will allow you to compare emissions from different parts of your operation, and to track your performance over time. It will also allow you to make some comparison of your emissions against competitors:

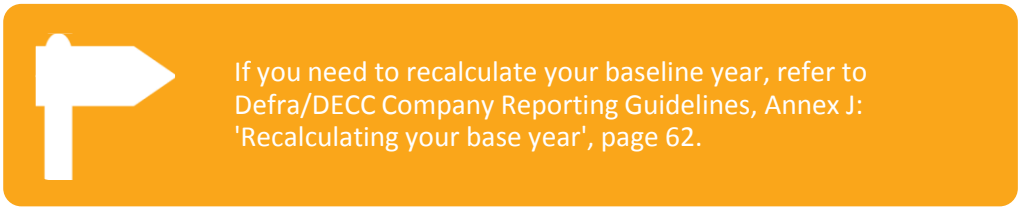




OTHER KEY INFORMATION TO INCLUDE IN YOUR REPORTING

As well as your absolute emissions and intensity ratio, you should provide a variety of supporting information in your report. The most important supporting information is a clear explanation of what operations are included in the calculation, and what method you used to decide on this scope (see Chapter 3).You should also include the following:

- Your reporting period
- Changes in emissions relative to a 'base year'. (This could be the first year you do the calculation, although in many cases companies develop their data collection processes significantly after this first attempt, and in such circumstances it may make sense to set the base year as the first year in which the final processes are put in place.)
- Any major changes to your company operations, such as acquisitions or divestments, since your baseline year

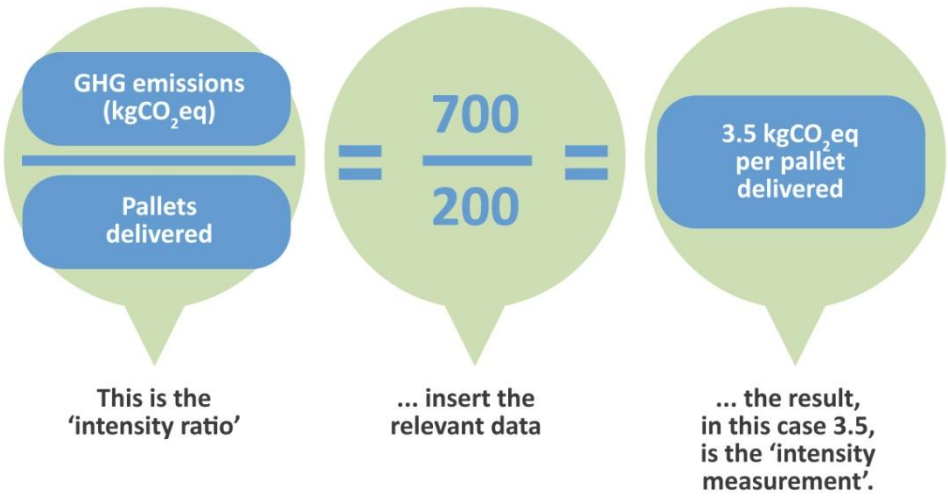


MEASURING THE EMISSIONS 'INTENSITY' OF YOUR OPERATION

When comparing the fuel efficiency of one vehicle with another, we would generally use a ratio such as 'miles per gallon', or 'litres per 100 km'. Simply reporting the total volume of fuel the vehicle used in a particular year would say very little, and be useless for comparing one vehicle (or driver) with another, because it clearly depends on how far each vehicle travels.

Similarly, when comparing GHG emissions, a ratio such as '$kgCO_2eq$ per pallet delivered' is a useful benchmark. In fact, 'litres per 100 km' is what is known as an 'intensity ratio' – a ratio is just one thing divided by another, so an intensity ratio allows us to compare the 'intensity' of one measure per unit of another.

The number you get from putting your data into your intensity ratio is referred to as your 'intensity measurement'. Your intensity measurement allows you to make meaningful comparisons with other companies in your sector, and your own business over time. It will to an extent 'correct' for the fact that different businesses are different sizes, and that the distances travelled and loads carried are highly variable.



CHOICE OF INTENSITY RATIO

The key to choosing the right ratio to use for a given purpose is to make sure it relates to your business. At the simplest level, for example, if you transport items by pallet, per pallet will probably be the best unit to use.

Your choice will depend on two considerations:

1. It shouldn't require any extra burden on your paperwork - for example, you should already have the total of units transported from your existing records.

2. It should allow you to make the comparison you want to make – if you want to compare yourself with the rest of the businesses in your sector, and they all publish data on emissions per tonne lifted, then you will need a 'per tonne lifted' figure, even if you choose to use 'per pallet lifted' for your own internal target setting.

There is no reason why you can't report more than one GHG intensity measurement to suit different purposes. However, different intensity ratios tend to be suited to different sectors, and comparing across different goods can be flawed because of varying sizes and weights of load.

The intensity ratios in the tables below are divided into those based on 'activity' and those based on 'finances'. Activity-based ratios help to explain the emissions generated by each thing you do (e.g. delivering one tonne of goods), whereas financial-based ratios relate emissions to financial indicators (primarily revenue and profit).

INTENSITY RATIOS BASED ON UNITS OF ACTIVITY

The ratios in the first part of this table are all per unit of product lifted (i.e. delivered), whatever unit that may be. If you reduce the distance travelled in delivering your product, **or** use more efficient vehicles, the ratio will be reduced.

These ratios all refer to either weight (tonnes, kg) or volume (pallets, cubic metres etc.). Assuming you can collect the data, you will need to decide whether weight or volume is the most appropriate measure.

You should base your decision on the limiting factor in the loading of your vehicles. If your vehicles are often loaded to their maximum weight before they are full, then an intensity ratio based on weight is likely to more accurately reflect your operating practices, whereas you should use a volume-based ratio if your vehicles are often full but rarely at their weight limit.

Lifted or moved?

In many parts of the freight sector, goods 'lifted' simply means the amount of goods you've delivered. This will typically be in tonnes or pallets.

Goods 'moved' means the amount of goods you've lifted, multiplied by how far you carried them. For example, 5 pallets carried 100km would be expressed as 500 pallets 'moved'.

Although this terminology can be a useful shorthand, it is recommended that to avoid ambiguity, full units (e.g. 500 pallet km) should be used in reporting.

Per unit weight (kilograms or tonnes lifted)	Since load weight is usually monitored for other purposes, this data is often readily available. It is also easily interpreted by customers.
Per pallet	Pallets are simple and usually monitored for other purposes, so often no extra effort is needed to gather the data.
Per pallet equivalent	This method aligns all containers for carrying goods, such as cages, with pallets by describing them in terms of the equivalent number of pallets that would occupy the same space in a truck. For example, a cage would be 1.5 pallet equivalents. This is good for standardising different carrying methods within an industry.
Per cubic metre	Cubic metres are an appropriate measure for bulk goods that are not packaged onto pallets/cages etc.
Per container	This is only applicable for situations where the percentage weight laden does not vary significantly. 'Container' refers to an ISO standard container – if non-standard containers are used it is recommended that loads be reported by weight or cubic metre to provide clarity.
Per litre	This is primarily applicable for companies transporting liquids, and should be kept within the sector.

In some cases it may be appropriate to look at the ratio of emissions to distance as well as units of product. Consider two parcel carriers, one genuinely global in its operations, and the second mainly focused on Europe. As a customer, simply comparing the average emissions per parcel delivered could be misleading, since the average distance parcels travel will be significantly different for the two businesses. Comparing per 'parcel kilometre' would be a fairer way to assess the emissions likely to result from one extra parcel being delivered.

The danger in 'per kilometre' factors is that they can remove the incentive to reduce journey distance. For many complex logistics operations, the biggest emissions savings may be made from reducing vehicle kilometres through more efficient routing, reducing empty running etc. If this type of factor were widely adopted in a particular sector, it could 'hide' poor practice in these areas.

We would recommend that where 'per kilometre' factors are reported, an effort is made to also report and explain changes in the total distances travelled. For example:

"This year we saw significant growth in deliveries to the Far East, so overall km per parcel grew 20%. However, in our European operations more efficient logistics brought our km per parcel down by 5% on a like-for-like basis. Across the company, more efficient vehicles led to a 3% fall in overall '$kgCO_2eq$ per parcel km'."

Per kilometre	As a measure of intensity, this conveys very little information about a business, and has limited use. It would only be valid in a situation where all loads weigh the same **and** distances travelled are outside the control of the operator.
Per tonne kilometre (or pallet km, litre km etc.)	This is a reasonable measure where distances travelled vary greatly and are outside the control of the operator. It will show improvement (or deterioration) in the efficiency of vehicles and drivers, but will hide potential inefficiency in loading and routing, and should therefore be used with caution.

INTENSITY RATIOS BASED ON FINANCIAL RATIOS

Financial ratios should be used with caution, because they are less directly related to the activity undertaken. For example, if you use the ratio 'GHG emissions per unit turnover', then if you were to increase turnover by increasing prices, with no other action taken, your emissions ratio would decrease - misleadingly implying an improvement. They can be useful for comparing the relative emissions intensity of activity across a wider range of businesses, sectors or indeed the whole economy – but wherever they are used, sufficient contextual information must accompany them to prevent a misinterpretation of the results.

Per financial unit	These are used across the whole economy to compare the emissions generated per unit of economic activity. They are of limited use in actually managing the emissions from your transport operations – an activity based factor will be more closely linked to operational changes. Financial ratios have the advantage of being applicable across sectors, some commonly used factors are: • Per full time equivalent employee • Per £ turnover • Per £ EBITDA (Earnings before interest, taxes, depreciation and amortisation).
Per revenue tonne kilometre (RTK)	In most cases, RTK is defined as the revenue gained from transporting one tonne over a distance of one kilometre. This type of 'hybrid' of activity and financial factors is useful in assessing what effect the overall expansion of your business is having on emissions, for example. (We would recommend that this factor is only used alongside one or more of the other, simpler, factors listed above, to provide some explanation of the results.)

More generic intensity factors such as pounds of sales revenue or square metres of floor space can be found in Annex H of Defra's company reporting guidelines.

Freight Best Practice has produced an online benchmarking tool. This is an easy-to-use website where you can enter your data and track your performance over time. You are also able to anonymously compare yourself to industry averages against thirteen different measures or Key Performance Indicators (KPIs). These include fuel, safety and customer satisfaction.

The online benchmarking tool can be found here: www.freightbestpractice.org.uk/benchmarking

6. ASSESSING THE ACCURACY OF YOUR RESULT

Given at least some basic records, everyone is able to calculate their GHG emissions. The accuracy of the final result will vary, depending on the accuracy of the data and the assumptions that have to be made. Use of data types of varying accuracy is acceptable, but you must state all the data sources and assumptions you use in your reporting.

Of course there are advantages to increasing the accuracy of your emissions calculation. The main ones are, firstly, to refine the way you manage your fleet, and secondly, to provide a more credible figure for your customers.

Ideally you should feel confident that the data you already have available is accurate enough. This section will help you assess the accuracy of that data, and decide whether you need better systems. The next chapter, on verification, will also help you understand what level of accuracy may be needed to meet the various independent standards that your customers may ask for.

THE ACCURACY OF DIFFERENT DATA TYPES

In terms of accuracy, data is divided into four categories, illustrated on page 33. Primary and secondary data are the preferred sources, as these are taken from direct measurement of the items under consideration – primary data being measurements you take of your own operation, secondary when published sources for your industry are used.

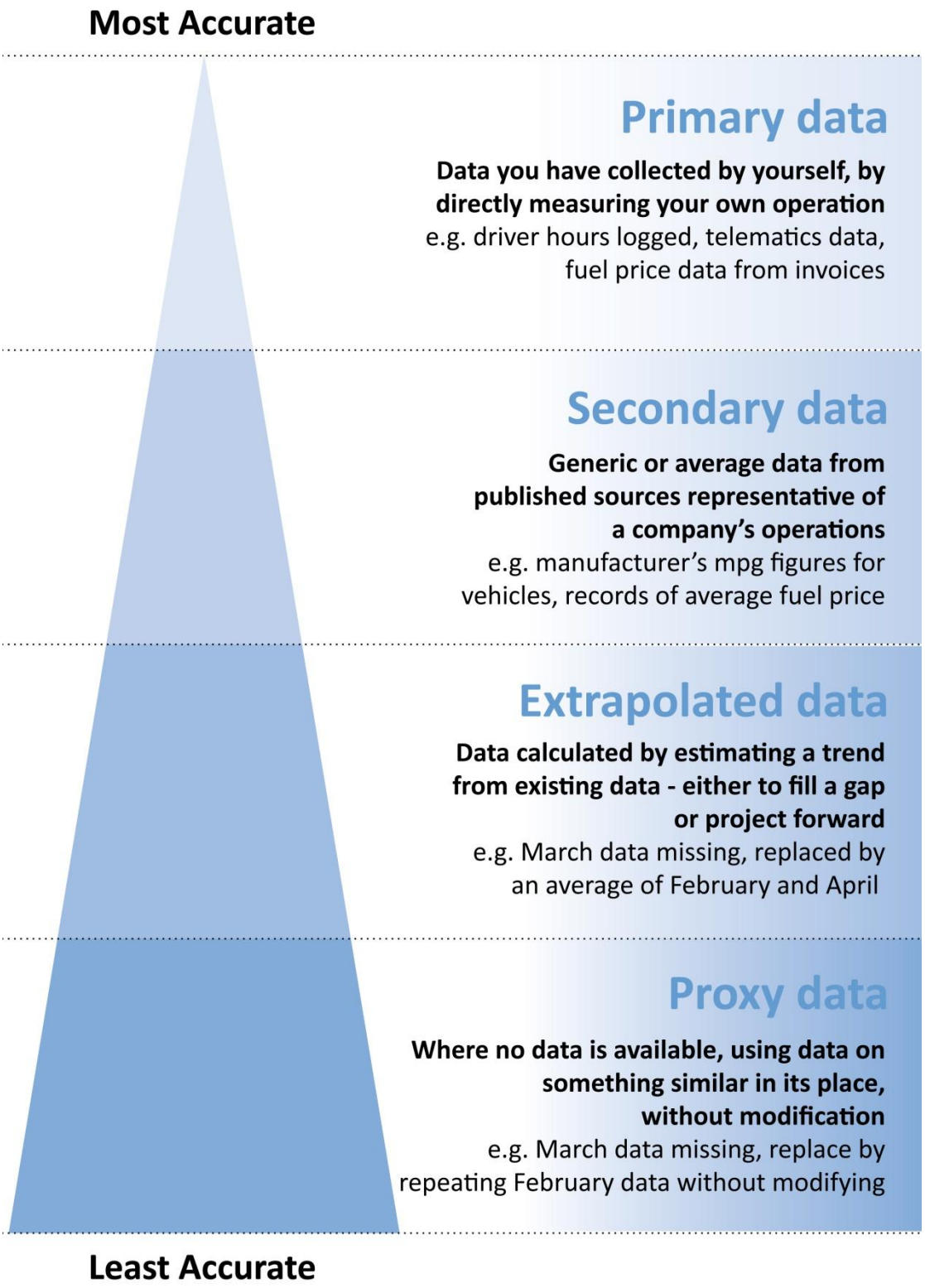
Assessing the accuracy of your result will be an ongoing process, and should be proportionate to what is necessary for the use to which you put the final results.

Is the 'data hierarchy' always right?

The hierarchy of data types is a useful guide, but it's not the only thing that might affect the accuracy of your data.

You may need to think particularly carefully about whether to use secondary vs. extrapolated data.

Published mpg figures may be available for your vehicles at different laden weights, for example. This might well be 'secondary' data, but in practice, if you have mpg figures for your own vehicles in operation, at say 0%, 50% and 100% loaded, then extrapolating between those points may well be more accurate – because your extrapolation is based on primary data.


Most Accurate
Primary data
Data you have collected by yourself, by directly measuring your own operation
e.g. driver hours logged, telematics data, fuel price data from invoices
Secondary data
Generic or average data from published sources representative of a company's operations
e.g. manufacturer's mpg figures for vehicles, records of average fuel price
Extrapolated data
Data calculated by estimating a trend from existing data - either to fill a gap or project forward
e.g. March data missing, replaced by an average of February and April
Proxy data
Where no data is available, using data on something similar in its place, without modification
e.g. March data missing, replace by repeating February data without modifying
Least Accurate

7. APPROACHES TO VERIFYING YOUR DATA AND RESULT

WHAT IS VERIFICATION?

Verification is an independent assessment of the accuracy and completeness of data. Verification of GHG emissions data merely provides an added layer of confidence in your emissions calculation.

Verification is an evolving process and the development of applicable standards is ongoing. There is currently no requirement for an organisation to have its emissions data verified. The process is entirely voluntary and may be undertaken at a number of different levels depending on its ultimate purpose.

This chapter explains the reasons why you may choose to undertake verification, and if so, how you could go about it.

WHY HAVE YOUR DATA VERIFIED?

The most common reason for verifying your data is to increase external stakeholder confidence. For example it may reassure a customer that they can include your data in what they report about their products, by demonstrating:

- Credibility and reliability of your data
- Consistency and accuracy of your approach
- Completeness of assessment.

There are a variety of other reasons for an organisation to have its GHG emissions data verified. Verification can provide you with confidence that your data is fit for the purpose for which you intend to use it, for example, target setting or participation in an external emissions reporting programme.

None of the above reasons necessarily implies that you need to get an external party to verify your data. If you establish reasonable and transparent processes, based in this guidance, then you should be able to have confidence in your calculation. The next step would be to use someone within your organisation who is independent of the individual/team carrying out the calculation to take a look at what you've done.

In certain circumstances you may feel you need an external verifier, particularly when reporting a reduction in emissions. Like many businesses, you may rightly want to publicise any reductions you achieve, but this will often bring your figures under increased public scrutiny. In such cases it is particularly important to be sure that the reductions are genuine and based on a consistent and accurate approach to measurement over time.

DIFFERENT LEVELS OF VERIFICATION

Self verification

- Internal verification process, often used for internal reporting processes, may also be satisfactory for customers requesting carbon data.

Verification by non-accredited third party

- Might be used in cases where a company requires an independent view, but is not working to a standard specifically requiring accreditation - particularly if they have an ongoing relationship with a particular consultant.

Verification by accredited third party

- Typically used by organisations that wish to report their data externally.
- Accreditation should be by an internationally recognised body e.g. United Kingdom Accreditation Service (UKAS). This will provide an extra degree of confidence in the service provided and may be a requirement of certain carbon reporting programmes.
- Could parallel financial auditing procedures, forming part of a 'triple bottom line' approach.

The level of data verification required is usually determined by the purpose for which the data is intended, and may be defined by your proposed end users, such as customers.

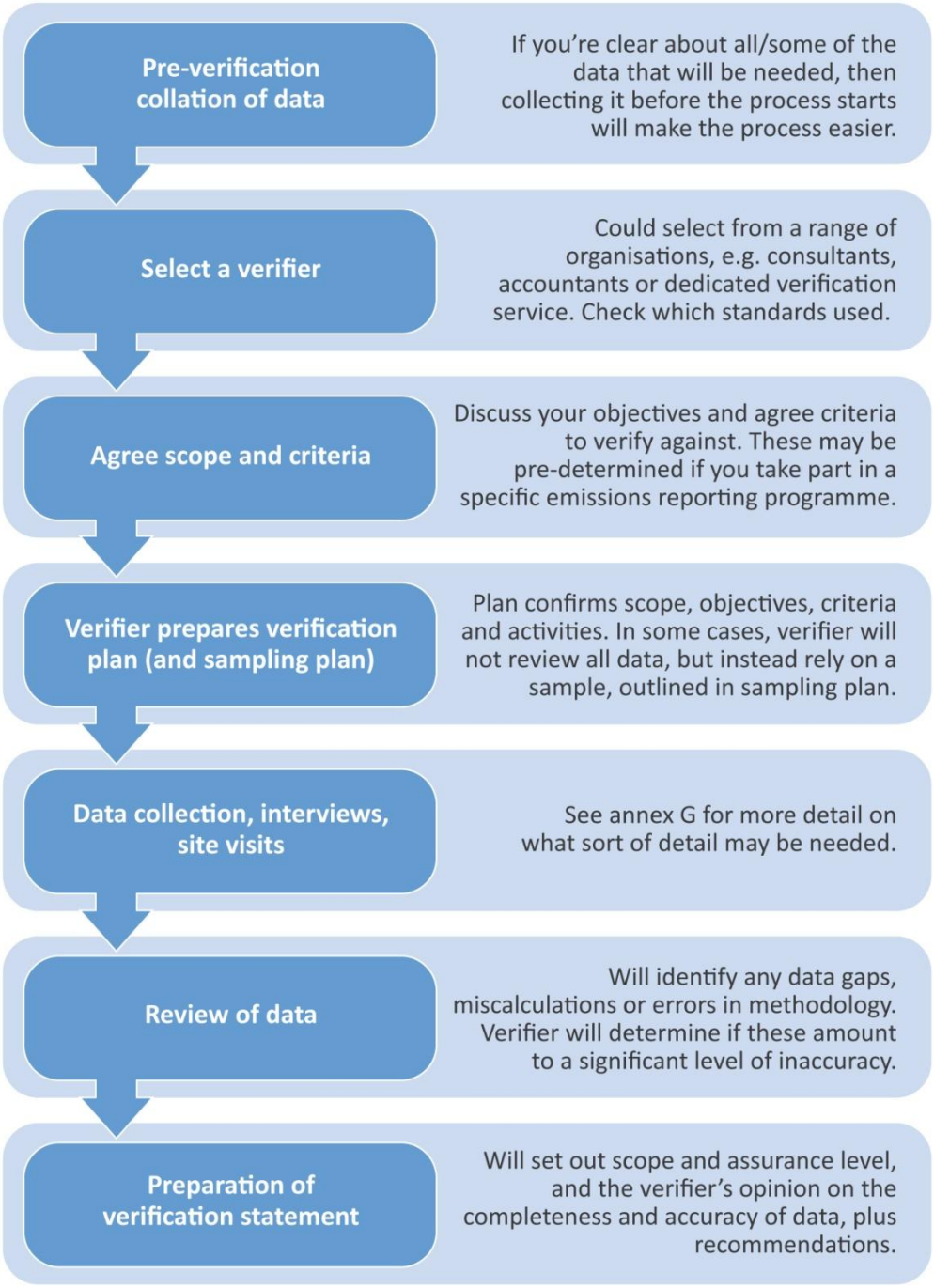
RECOGNISED VERIFICATION STANDARDS

All levels of verification should demonstrate compliance with recognised standards. There are a number of internationally recognised standards and protocols for GHG emissions reporting. These include:

- Defra/DECC's Guidance on how to measure and report your GHG emissions
- The WCBSD/WRI Greenhouse Gas Protocol: A Corporate Reporting and Accounting Standard
- ISO14064 – Greenhouse gas accounting
- ISO14065 – Requirements for greenhouse gas validation and verification bodies for use in accreditation or other forms of recognition
- PAS 2050 – Assessing the life cycle greenhouse gas emissions of goods and services.

Verification may be carried out in line with one or more of these standards and, whilst they are different, they are all internationally recognised and are complementary in their approach. As the process of verification evolves, more standards are being developed and will become available over time.

THE VERIFICATION PROCESS



For more information on the verification process see Annex H.

8. ALLOCATING EMISSIONS INTERNALLY AND EXTERNALLY

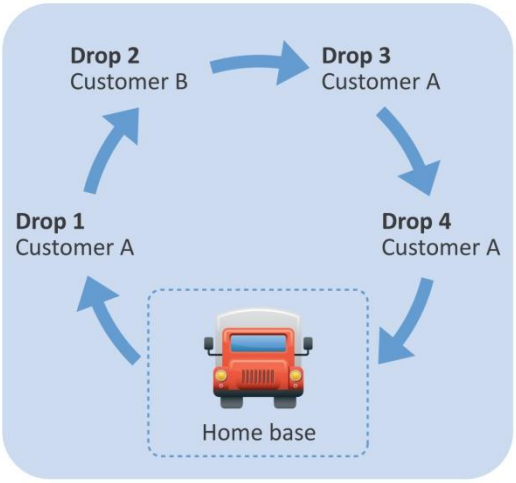
Transport operators very often distribute goods for other organisations. They may just provide transport (known as hire-and-reward), or provide transport as part of a wider logistics service (known as third party logistics (3PL)).

In any of these cases, the transport operator's Scope 1 emissions will also be part of their customers' Scope 3 emissions, as outlined in chapter 3. The transport operator's *customers* may wish to know what emissions were generated from transporting *their* goods.

If an operator's provision of transport is dedicated to a single customer this requires only a simple calculation. However, there are many cases in which transport operators deliver goods for multiple customers, often on the same vehicle.

When transport operators transport goods for more than one customer they will need some method for allocating their GHG emissions between customers. This problem is very complex when goods for more than one customer are transported on the same vehicle, occupy different percentages of the vehicle's total load capacity, and are carried for different distances on a single journey.

When more than one customer's goods are carried in a single trip, there are many factors that might need to be considered if emissions are to be divided fairly. They include:



- The physical characteristics of each customer's proportion of the total load, such as weight and volume
- The proportion of the total journey length that each customer's load is transported
- The proportion of emissions produced by movement of the vehicle itself, regardless of its load
- Any empty running required as part of a journey.

Which emissions to allocate?

In calculating a 'share' of GHG emissions for a customer, an operator could include a share of their emissions from ancillary operations, like warehousing. However, this presents an immediate problem of 'where to draw the line' – these ancillary operations will vary a great deal from company to company, and this could prevent a fair comparison.

It is therefore the recommendation of this guidance that the emissions allocated to customers should just be those arising directly from the use of vehicles (i.e. burning of fuel, or use of electricity).

‘EXACT’ ALLOCATION – AN IMPOSSIBLE PROBLEM?

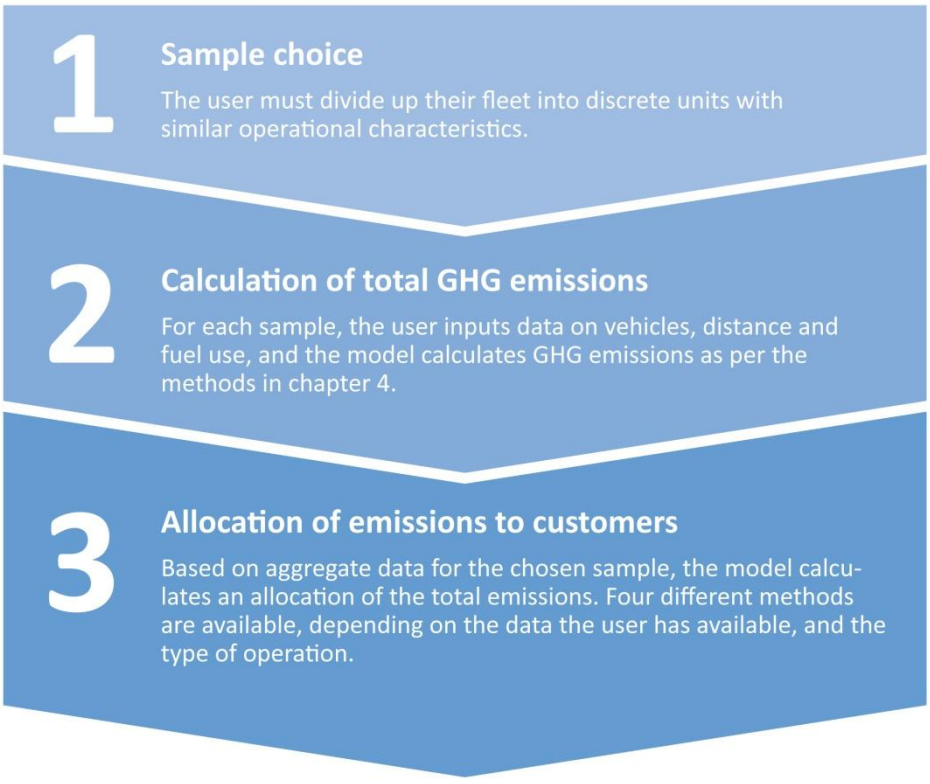
In practice, the mathematics required to definitively allocate carbon emissions from a specific multi-drop trip quickly become almost unworkably complex, requiring far more data than is likely to be available.

At a basic level, there are two components to fuel consumption to be considered for a multi-load, multi-drop trip. The vehicle will have a ‘base load’ fuel consumption – the fuel it would consume even if were empty. Then, there will be additional fuel consumed in fairly direct proportion to the additional weight of any load carried.

A calculation based on the above would require more data than most transport operators collect. To be truly exact, the calculation would have to take into account both the weight and volume of each part of the load, the distance of each leg of the trip, and even the change in load throughout the each trip. So yes, it’s theoretically possible to allocate exactly, but certainly not practical.

A WORKING COMPROMISE – DFT’S ‘SCOPE 3 THIRD PARTY GHG EMISSIONS MODEL’

The DfT has created its ‘Scope 3 Third Party GHG Emissions Model’ to provide a practical method of allocation that uses readily available data. Using the model is essentially a three stage process, as illustrated below.



SAMPLE CHOICE

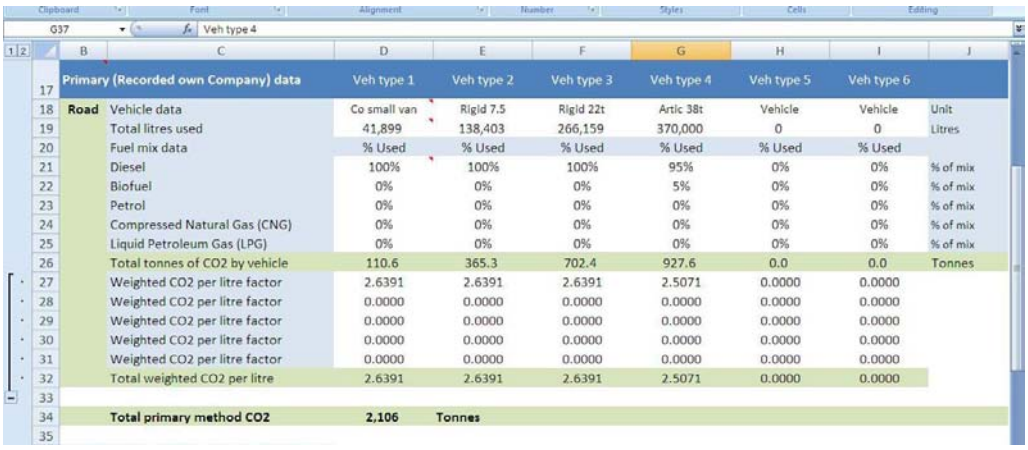
The methodology can be applied to any group of vehicles – from an entire fleet, down to one individual truck. (The methods in the model can also be applied to rail or shipping, but the user would need to select the correct emission factors).

In practice, the model will be best applied to groups of vehicles – all of the vehicles operating out of a particular depot for example. Any sample of vehicles can be selected, but as far as possible the sample selection should be based on the following three principles:

1. All the vehicles in the sample should be used for similar operations. The type of trips they undertake should be similar – e.g. multi-drop urban deliveries, or long distance trunking. And the type of loads they carry should be similar enough to be measured in similar units – whether that be by tonnes, pallets, litres or cubic metres.
2. Discrete data should be available for all the vehicles in the sample. In order to apply the model, the user will need data on fuel use and loads carried for the vehicles in the sample. If that data is only available in aggregate form for a larger pool of vehicles, or the whole fleet, then the user will either have to find a way to collect separate data, or choose a larger sample.

CALCULATION OF TOTAL GHG EMISSIONS FOR THE SAMPLE

The first step in using the model itself is to input information about the vehicle sample to calculate the total GHG emissions from the vehicles within it. The model can use a variety of calculation methods, exactly as described in chapter 4 of this guidance – a calculation based on fuel use data is the most accurate, but if this is unavailable then data on distances travelled, and loading if known, is possible. The screen-shot below illustrates the data entry table for use of the fuel use data method.



	B	C	D	E	F	G	H	I	J
17	**Primary (Recorded own Company) data**		Veh type 1	Veh type 2	Veh type 3	Veh type 4	Veh type 5	Veh type 6	
18	**Road**	Vehicle data	Co small van	Rigid 7.5	Rigid 22t	Artic 38t	Vehicle	Vehicle	Unit
19		Total litres used	41,899	138,403	266,159	370,000	0	0	Litres
20		Fuel mix data	% Used	% Used	% Used	% Used	% Used	% Used	
21		Diesel	100%	100%	100%	95%	0%	0%	% of mix
22		Biofuel	0%	0%	0%	5%	0%	0%	% of mix
23		Petrol	0%	0%	0%	0%	0%	0%	% of mix
24		Compressed Natural Gas (CNG)	0%	0%	0%	0%	0%	0%	% of mix
25		Liquid Petroleum Gas (LPG)	0%	0%	0%	0%	0%	0%	% of mix
26		Total tonnes of CO2 by vehicle	110.6	365.3	702.4	927.6	0.0	0.0	Tonnes
27		Weighted CO2 per litre factor	2.6391	2.6391	2.6391	2.5071	0.0000	0.0000	
28		Weighted CO2 per litre factor	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	
29		Weighted CO2 per litre factor	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	
30		Weighted CO2 per litre factor	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	
31		Weighted CO2 per litre factor	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	
32		Total weighted CO2 per litre	2.6391	2.6391	2.6391	2.5071	0.0000	0.0000	
33									
34		**Total primary method CO2**	**2,106**	**Tonnes**					
35									

The output from this section of the model is a figure for total GHG emissions for the sample, and per average trip. This is fed into the second section of the model, on allocation.

ALLOCATION OF SAMPLE GHG EMISSIONS TO CUSTOMERS

As mentioned above, there are four different allocation methods included in the model. The choice of method for each sample of a user's fleet should be based on the type of operation and the data available. In some cases users may wish to try out more than one method, benchmarking against a detailed calculation for one vehicle in order to assess the likely accuracy.

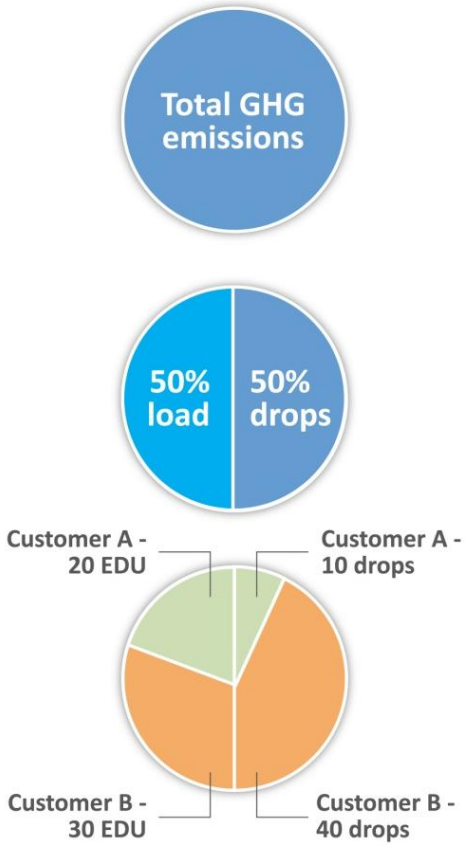
All four methods require the user to identify an 'equivalent delivery unit' (EDU) for all the loads carried by the vehicle sample. This could be any unit for which data is available – pallets, tonnes, litres or cubic metres are obvious choices, but the user may choose to create their own unit, e.g. 1 EDU = 100 litres. So long as the EDU is defined and quantified for all loads carried, it can be used.

METHOD 1: LOADS AND 'DROPS'

This method is appropriate to operations where vehicles make multiple drops per trip, carrying loads for different customers, and where typical trip distances do not vary greatly.

In such an operation, the number of drops made for a given customer is a useful proxy for the proportion of total distance that is 'driven' by that customer. The load carried for a given customer (based on number of EDUs) is used as an indication of the proportion of work done by the vehicles in transporting that customer's goods over a given distance.

The simple worked example below illustrates how the method works in principle.



For this example, total GHG emissions = 100 tonnes CO_2eq

The total GHG emissions are divided in half – one half to be allocated according to proportion of drops, one half to be allocated according to proportion of load.

For this example, each half therefore = 50 tonnes CO_2eq

Customer A has 2/5 (40%) of the total load, and therefore has 2/5 (40%) of the 50 tonne CO_2eq allocated by load = 20 tonne CO_2eq.

Customer A also has 1/5 (20%) of the total drops, and therefore has 1/5 of the 50 tonne CO_2eq allocated by drops = 10 tonne CO_2eq.

Customer A therefore has a total of 30 tonne CO_2eq allocated, with Customer B allocated the remaining 70 tonne CO_2eq

METHOD 2: LOAD AND DISTANCE

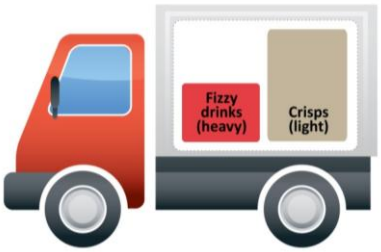
In operations with long trips, of varying distance, delivering to only one or a few customers, exact distance is an important driver of emissions. Using drops to approximate distance, as in method one, will not produce an accurate result. If the trips are fairly regular, and their distance known, then method 2 may be used.

For this method, the user first identifies the total number of trips, and the total number of EDUs delivered for each customer in the sample. These are then averaged, to give the number of EDUs for each customer on a theoretical 'average trip'.

The user then inputs data on the (average) distance of trips for each customer. These are then multiplied by the EDUs in the average trip to give a 'load x distance' measure for each customer. Emissions are then allocated by this as a proportion of the total 'load x distance' for all customers.

METHODS 3 & 4: LOAD AND WEIGHT OR VOLUME

In many cases neither of the first two methods will be appropriate. In particular, while method 2 is likely to be quite accurate, many operators will either not have data on trip length, or simply have too much variety in the trips made for different customers, for this method to be practical.



Methods 3 and 4 simply allocate emissions on the basis of the number of EDUs transported for each customer. However, this is done with an additional adjustment for the different weight or volume of the average EDU for each customer – for example, if using pallets, the average weight of a pallet may vary considerably between a company making bedding, versus another making soft drinks.

ADDITIONAL NOTE ON CHOOSING AN APPROPRIATE EDU

Generally speaking, whatever method is chosen, the choice of EDU should reflect the limiting factor on the loading of the vehicle. If the load is typically limited by volume, then a volume-based EDU such as pallets or cube should be used. If the load is more often limited by weight, as in the aggregates industry for example, then a weight-based EDU such as tonnes will be more appropriate and provide more accurate results.

www.defra.gov.uk/environment/business/reporting/pdf/lct-steering-group-carbon-em.xls

9. SETTING TARGETS AND REDUCING EMISSIONS

Setting targets and reducing your emissions are the next logical steps after calculating your emissions. In the long term this is essential to prevent the negative impacts of climate change on the economy overall, but in the short term there are also sound business reasons for doing this:

- **Improve cost efficiency**: When fuel is a large part of your total outgoings, it makes a lot of sense to measure it closely. Any fuel savings translate directly into profits.

- **Brand recognition:** In an more environmentally-aware marketplace, demonstrating commitment to emissions targets could distinguish you from your competitors.

- **Demonstrate leadership:** By setting ambitious targets for reporting and reducing emissions, you can establish a strong reputation in your sector.

- **Support of customer strategies:** If your key customer(s) are pursuing ambitious emissions reduction strategies for themselves and their supply chain, you may need to align with those strategies in order to maintain your client relationship.

Detailed guidance on how to reduce your emissions is outside the scope of this document, but the broad areas that should be considered are as follows:

- Reduce vehicle km – seek to improve routing and networks
- Improve loading efficiency
- Use the most appropriate vehicle possible for each job, including switching mode
- Improve the efficiency of your drivers – through training, telematics etc.
- Improve the efficiency of your existing vehicles – through modifications (low rolling resistance tyres, aerodynamics) and improved maintenance regimes
- Switch to more efficient vehicles, and less carbon intensive fuels

CHOOSING WHAT TYPE OF TARGET TO SET

After following the steps outlined in this document, you should have a figure for both your total emissions, and an intensity measurement indicating emissions per unit of activity – e.g. per pallet delivered.

You could set a target to reduce either of these, and you are recommended to set targets for both. Reducing total emissions is the ultimate goal of emissions management and should be pursued, but it can be hard to achieve if growth in your business is offsetting the gains you make in efficiency.

A target to reduce your intensity ratio will drive efficiency, and is also a useful way to measure your ambition against that of your competitors. The table below summarises the benefits of absolute and intensity targets in more detail:

	Advantages	Disadvantages
Absolute target	• Transparent and easy to understand • Designed to achieve a reduction in emissions released in to the atmosphere	• Measured against a base year, which will have to be recalculated if your company structure changes • Not easily comparable with competitors • Strongly influenced by growth or contraction of business
Intensity measurement	• Reflects efficiency changes regardless of changes to your organisation • Base year recalculations only required for methodological changes (not for company changes) • More comparable with other organisations	• May be achieved even if overall emissions are increasing, encouraging complacency • In a diverse business there may not be an appropriate metric to use for the intensity ratio

DECIDING HOW CHALLENGING YOUR TARGET SHOULD BE

Having decided to set a target for absolute emissions, or your intensity ratio, or both, you will need some method by which to decide how challenging to make that target. Setting the target too high may look good when reported, but if it is unrealistic then subsequent failure to achieve will demoralise key staff, tarnish your reputation and undermine the process.

Setting your target too low can be equally problematic. A perceived lack of ambition will not look good externally, and is likely to be regarded as a low priority by staff.

It is not easy to set targets that are both challenging and achievable, but it helps to have a clear method rather than plucking a figure from the air. The following approaches are all worth consideration.

BENCHMARKING

You could set yourself a target based on achieving a certain benchmark as measured against your sector. For example, you might choose to aim for the sector average emissions per pallet lifted, or to be in the top 10% in your sector per tonne moved. Of course the average for your sector is probably a 'moving target' itself – you will need to pin it down to a particular figure to be achieved in a particular time period, and specify how often you will revise that figure.

We would recommend you use the free online benchmarking system at Freight Best Practice. This allows you to anonymously compare yourself against other companies in your sector across a number of Key Performance Indicators. Although emissions is not one of the KPIs specifically included, fuel use is, which you can easily translate to an emissions figure.

BASE A TARGET ON MEASURES YOU PLAN TO IMPLEMENT

By setting yourself a target based on the things you plan to do, you know the target is achievable, and you provide yourself an incentive to follow your plans through.

Check Freight Best Practice for advice on emissions saving measures. From here you can see what is realistic for your company, and measure the potential savings as a percentage of your total, or as an improvement to your intensity ratio. A good example is SAFED (Safe and Fuel Efficient Driving) training, which could save around 10% of your fuel bill. If you intend to get all drivers eco-driving trained, you could then set a target for a 10% reduction in your emissions once the training has been undertaken.

SET TARGETS IN LINE WITH OTHER POLICIES

If you have other targets in your company, to reduce vehicle accident payments by 10% for example, you could simply align your fuel/emissions saving with those. This has the benefit of simplicity, but, because it is unrelated to fuel performance, it could be inappropriate if you don't consider how you will actually reach that target.

Alternatively, you could align yourself with the government's latest targets which equates to a saving of around 1.5% per year, every year to 2050. The UK government has not yet set a target for the freight sector specifically, however there is a lot of information on the most effective ways to reduce emissions in the signposted documents below.

Given the opportunities set out in Freight Best Practice, competition within the sector will probably set a faster rate than the government targets in the short term, so we'd advise you to be more ambitious.

UK emissions reduction targets:

In 2010 the UK government set targets to reduce emissions by 34% by 2020 and 80% by 2050, compared to 1990 levels. This is a target for the economy as a whole, and different sectors will have different individual targets.

Although this may seem challenging at first glance, in 2010 we had already cut emissions by 21% since 1990, and have set out a "Transport Carbon Reduction Delivery Plan", which demonstrates how we could meet our targets. This is signposted below.

ANNEXES

A. SCOPE 3 OF THE TRANSPORT OPERATOR

For everyone including transport operators, reporting your Scope 3 emissions (i.e. the emissions of your whole supply chain rather than just those emissions under your direct control) is becoming increasingly important. It may be prudent to start reporting on some of these emissions now.

There are many components to your Scope 3 emissions, which can be overwhelming. So, we recommend that to start with you just report the indirect emissions of your fuel use. The reason for this is that indirect Scope 3 emission factors are being developed for the Defra spreadsheet. This means that you simply need to multiply your fuel use by the indirect Scope 3 emission factor. Not only is this the simplest Scope 3 to calculate, but for a number of operators it is also likely to be one of the largest contributors to your Scope 3, which will be a criterion of future guidance.

There may also be contributors which are of more interest to you as an operator, such as your employees' commuting. You can identify all significant areas based on:

- Scale - size/concentrations of emissions (the largest are likely to be oil extraction and processing and embedded emissions in the manufacture of the trucks)
- Importance to your business – e.g. to core function, contribute to company's climate change risk
- Importance to customers, suppliers, investors
- Activities which are typically done in-house in the sector, but which you outsource
- Potential for reductions – ability to control or influence
- Any additional criteria developed by the sector.

The table below shows some typical Scope 3 emissions for transport operators, which may arise across their operation and may then be included in an overall carbon footprinting exercise.

Emission source	Activity data collected (2009)	Tonnes of CO_2eq
Fuel production	Fuel used	720
Waste generated in operations	Tonnes waste disposed by waste fraction and method of disposal	35
Employee commuting	Distance and mode of travel by employees and/or fuel consumed	10
Business travel	Distance travelled (train) and/or fuel consumed (employee owned car)	1
Total Scope 3 emissions		**766**

This information, combined with Scope 1 & 2 emissions could be presented in a summary table, simply stating a total for each scope and a grand total for all emissions.

Carbon offsets and green tariffs could be included as negative figures in this disclosure. Further information on these can be found in Defra's company reporting guidance.

B. DETAILED EMISSION FACTORS

The full list of Defra/DECC emission factors, separated into categories such as transport of goods and fuel combustion can be found here:

For Defra's spreadsheet for calculating emissions, and the method behind calculating these emission factors, visit:

www.defra.gov.uk/environment/business/reporting/conversion-factors.htm

The spreadsheets illustrated below show the format and options of the Defra emission factors related to freight transport as of September 2009. It is important to note that these emission factors are based on yearly data taken from national statistics, and therefore may vary from year to year. **To ensure you are using the most up to date emission factors, you should use the most recent version of the spreadsheet available on Defra's website - signposted above.** The spreadsheet signposted also automates the calculations, reducing the burden for users and ensuring consistent results.

Direct and indirect fuel emission factors

Updates to the Defra emission factor spreadsheet will include both direct and indirect fuel emission factors, so that you can see the emissions from just your use of the fuel, or the emissions from every element of producing the fuel and using it – its life-cycle. This is particularly useful for reporting Scope 3 emissions.

The emission factors you should use are those for total GHG emissions, which is the same as CO_2 equivalent (CO_2eq). Please be sure that you report in CO_2eq not just CO_2, as this is the latest recommendation from government. A more complete explanation of why to report all GHGs is given in the introduction of this document.

Table numbers and formats are consistent with those in the Defra spreadsheet for ease of reference.

ROAD

FUEL EMISSION FACTORS

Using the fuel emission factors is the most accurate way to calculate CO_2eq, however the other methods are equally valid for reporting.

Table 7a from the Defra website, illustrated below, shows the factors you should use if you know what fuel you're using, and how much.

Standard Road Transport Fuel Conversion Factors				**Total GHG**	
Fuel used	Total units used	Units	x	kg CO_2eq per unit	Total kg CO_2eq
Petrol		litres	x	See signpost at start of Annex for link to up to date emission factors	
Diesel		litres	x		
Compressed Natural Gas (CNG)		kg	x		
Liquid Petroleum Gas (LPG)		litres	x		
Total					

VEHICLE KM EMISSION FACTORS

Kilometre emission factors should be used if you do not know your fuel consumption or fuel spend. These assume average load factors, and therefore are less accurate than using fuel emission factors shown in the previous section.

For a full explanation of what's most accurate, and other options, see Chapter 4. If you would like to convert data from miles to kilometres, see Annex H – Unit Conversions.

Table 7b illustrated below shows the categories of emission factors you could use if you know how far your van has travelled, but not the fuel used. These factors assume an average load factor based on national statistics for the different vehicle weights.

Van/Light Commercial Vehicle Road Freight Conversion Factors: Vehicle km Basis				**Total GHG**	
Type of van	Gross Vehicle Weight (tonnes)	Total vehicle km travelled	x	kg CO_2eq per vehicle km	Total kg CO_2eq
Petrol	up to 1.25t		x	See signpost at start of Annex for link to up to date emission factors	
Diesel (Class I)	up to 1.305t		x		
Diesel (Class II)	1.305t to 1.74t		x		
Diesel (Class III)	1.74t to 3.5t		x		
Diesel (average)	up *to 3.5t*		*x*		
LPG or CNG	up to 3.5t		x		
Average	up *to 3.5t*		*x*		
Total					

This information is currently provided for diesel vans only, however petrol vans are planned for inclusion so please see the latest Defra spreadsheet for the most appropriate emission factors.

Table 7d illustrated below shows categories of emission factors for HGVs on a kilometre basis. Due to the larger variability of HGV load weights, more options are provided in the weight laden column – further explained beneath the table.

Diesel HGV Road Freight Conversion Factors: Vehicle km Basis						**Total GHG**	
	Gross Vehicle Weight (tonnes)	% weight laden		Total vehicle km travelled	x	kg CO_2eq per vehicle km	Total kg CO_2eq
Rigid	>3.5-7.5t	0%			x	See signpost at start of Annex for link to up to date emission factors	
		50%			x		
		100%			x		
		40%	*(UK average load)*		*x*		
Rigid	>7.5-17t	0%			x		
		50%			x		
		100%			x		
		37%	*(UK average load)*		*x*		
Rigid	>17t	0%			x		
		50%			x		
		100%			x		
		55%	*(UK average load)*		*x*		
All rigids	***UK average***	***53%***			***x***		
Articulated	>3.5-33t	0%			x		
		50%			x		
		100%			x		
		43%	*(UK average load)*		*x*		
Articulated	>33t	0%			x		
		50%			x		
		100%			x		
		60%	*(UK average load)*		x		
All artics	***UK average***	***59%***			***x***		
ALL HGVs	***UK average***	***56%***			***x***		
Total							

The % weight laden refers to the extent to which the vehicle is loaded to its maximum carrying capacity. A 0% weight laden HGV means the vehicle is travelling carrying no loads. 100% weight laden means the vehicle is travelling with loads bringing the vehicle to its

maximum carrying capacity. However, these factors account for some empty running as they are UK averages, so there is no need to incorporate this yourself.

TONNE KILOMETRE EMISSION FACTORS

It would be reasonable to assume that this method offers the opportunity for improved accuracy by entering tonnes of goods lifted, and kilometres driven to get an emissions result. However, to allow this kind of flexibility is currently beyond the bounds of providing standard emission factors. Therefore, this method employs the same weight laden assumptions as the kilometre method. So, although your tonne kilometre figure would represent a weight of goods specific to your journey, the weight of goods is assumed to be the UK average for the given vehicle class, as in the kilometre method. It follows that the result is the same as the above kilometre method.

So, why provide these figures if they don't improve accuracy, and will give the same results as above?

This method is not an alternative to the kilometre or fuel methods provided above. This method is simply provided if you would like to compare the emissions from using different modes to transport goods. Tonne kilometres are common amongst all modes of freight transport, and therefore comparable. However, great care should be taken when doing so – comparisons should include all transporting of goods between the common start and finish destinations.

For example, a freight train may have a lower tonne kilometre figure than an HGV, but require transport from station to depot at either end which would need to also be included in any comparison.

Table 7c illustrated below shows the categories of emission factor for vans, derived from the kilometre method. As with the kilometre method, because van goods weights are not as variable as HGV goods weights, no range of weight laden is provided, simply the UK average of 40% is used (estimated on the basis of DfT statistics for vans for 2005).

Van/Light Commercial Vehicle Road Freight Conversion Factors (UK Average Vehicle Loads): Tonne.km Basis				**Total GHG**	
	Gross Vehicle Weight (tonnes)	Total tonne km travelled	x	kg CO_2eq per tonne.km	Total kg CO_2eq
Petrol	up to 1.25t		x	See signpost at start of Annex for link to up to date emission factors	
Diesel (Class I)	up to 1.305t		x		
Diesel (Class II)	1.305t to 1.74t		x		
Diesel (Class III)	1.74t to 3.5t		x		
Diesel (average)	up *to 3.5t*		*x*		
LPG or CNG	up to 3.5t		x		
Average	up *to 3.5t*		*x*		
Total					

Table 7e illustrated below shows the categories of HGV emission factors for various percentage weight laden vehicles which can be used with tonne kilometre data.

Diesel HGV Road Freight Conversion Factors (UK Average Vehicle Loads): Tonne.km Basis						**Total GHG**	
	Gross Vehicle Weight (tonnes)	% weight laden	UK average tonnes goods carried per vehicle	Total tonne km travelled	x	kg CO_2eq per tonne.km	Total kg CO_2eq
Rigid	>3.5-7.5t	40%	0.81		x	See signpost at start of Annex for link to up to date emission factors	
Rigid	>7.5-17t	37%	2.31		x		
Rigid	>17t	55%	5.25		x		
All rigids	***UK average***	***53%***	***3.42***		***x***		
Articulated	>3.5-33t	43%	6.00		x		
Articulated	>33t	60%	11.46		x		
All articulated	***UK average***	***59%***	***10.97***		***x***		
ALL HGVs	***UK average***	***56%***	***7.23***		***x***		
Total							

As with the kilometre method, the gCO_2eq/tonne.km factors in Table 7e have been calculated on the basis that a lorry will run empty for part of the time in the overall transporting of the freight.

RAIL

As with all modes, the most accurate way to calculate emissions from rail freight is to multiply the amount of fuel used by the emission factor for that fuel. In the case of rail, gas oil is used and therefore the appropriate emission factor from Defra's spreadsheet (signposted at the start of this section) should be used. However, by 2012 this will be changed to conventional road diesel, and from then on the standard diesel emission factor is more appropriate. If unsure as to which emission factor to use, check the notes relating to the relevant emission factors in the Defra spreadsheet; these explain where the factors are appropriate and not appropriate.

> ***Modal Comparison***
>
> *It is possible to calculate emissions from the distribution of goods by other modes, however a direct comparison should be based on a 'door-to-door' approach. In other words, you will need to consider the road transfer legs between stations/ports and the final destination of goods.*

If you don't know your fuel consumption, tonne kilometres will be needed. Emission factors for tonne kilometres of goods transported by rail are calculated based on UK average weight laden statistics and the fuel consumptions of UK freight trains. See the notes accompanying the Defra spreadsheet for up to date information on the data sources used for the emission factors.

SEA

Large container ships often use heavy fuel oil, whilst smaller vessels tend to use gas oil or marine diesel oil. If you know your fuel quantity and type, it is most accurate to use these emission factors provided in the Defra spreadsheet signposted at the start of this Annex. If you are unsure which category your fuel is, read the notes related to the emission factors which explain their appropriateness.

As with rail fuel, shipping fuel is intended to become less carbon intensive in the near future. See that the notes related to the emission factors are appropriate to you, and apply them to make sure the emission factor you are using reflects current practice.

In the case that you do not know your fuel consumption, tonne kilometre data will be needed. More data has been collected on sea tonne kilometre emission factors, and therefore more options for the category of vessel will be provided in updates to Defra's spreadsheet.

For the latest information on what data and assumptions are used in the tonne kilometre emission factors, see the notes related to the Sea emission factors. This will cover issues such as how Roll-on Roll-off ferries which carry road vehicles and their passengers as well as having additional passenger-only capacity are dealt with.

C. CALCULATING EMISSIONS FROM INTERNATIONAL OPERATIONS

If you transport goods across international borders, then you will need to consider how this affects your calculation. There are no fundamental differences between calculating emissions for domestic and international transport operations. Across the EU, and most of the world, guidance on calculating and reporting emissions is harmonised with the Greenhouse Gas Protocol, as here in the UK.

The key issue that arises when considering international operations is the need to use different emission factors in different countries. This is considered in more detail below.

The other issue that is often raised is the question of 'where to draw the line' between emissions in one country and another. In practice, this is usually only a problem for governments, when calculating their inventories of national emissions (see green box).

'Drawing the line' between countries

By international agreement, all countries prepare inventories of their GHG emissions.

In the case of shipping and aviation, this presents a problem. If a ship sails from China to the UK, the emissions occur in international waters – should they belong to China, the UK, the country where the ship is registered, or the country where the ship owner is based?

In practice, this question has not been resolved. If a ship sails from one UK port to another, it is considered 'domestic' shipping and the emissions will be included in the UK inventory. Emissions from international shipping, and aviation, are recorded and reported for information purposes, but do not currently form part of any country's official inventory.

INTERNATIONAL VARIATION IN EMISSION FACTORS

For a variety of reasons the emission factors for different fuels may vary from country to country. For most fuels these differences are slight, though for some they are more significant. Diesel is produced to a similar level of quality around the world with only minor variation, but it may be locally blended with different amounts of biofuel. Electricity (if considering it as a 'fuel') varies a great deal in how it is produced from country to country leading to very different levels of emissions per kWh used[2].

Whenever possible, in calculating emissions the transport operator should check the emission factor for that specific fuel in that specific country. In many cases this will not be possible/practical, in which case an emission factor for another similar country will serve as a suitable proxy – this will then need to be made explicit in the final calculation.

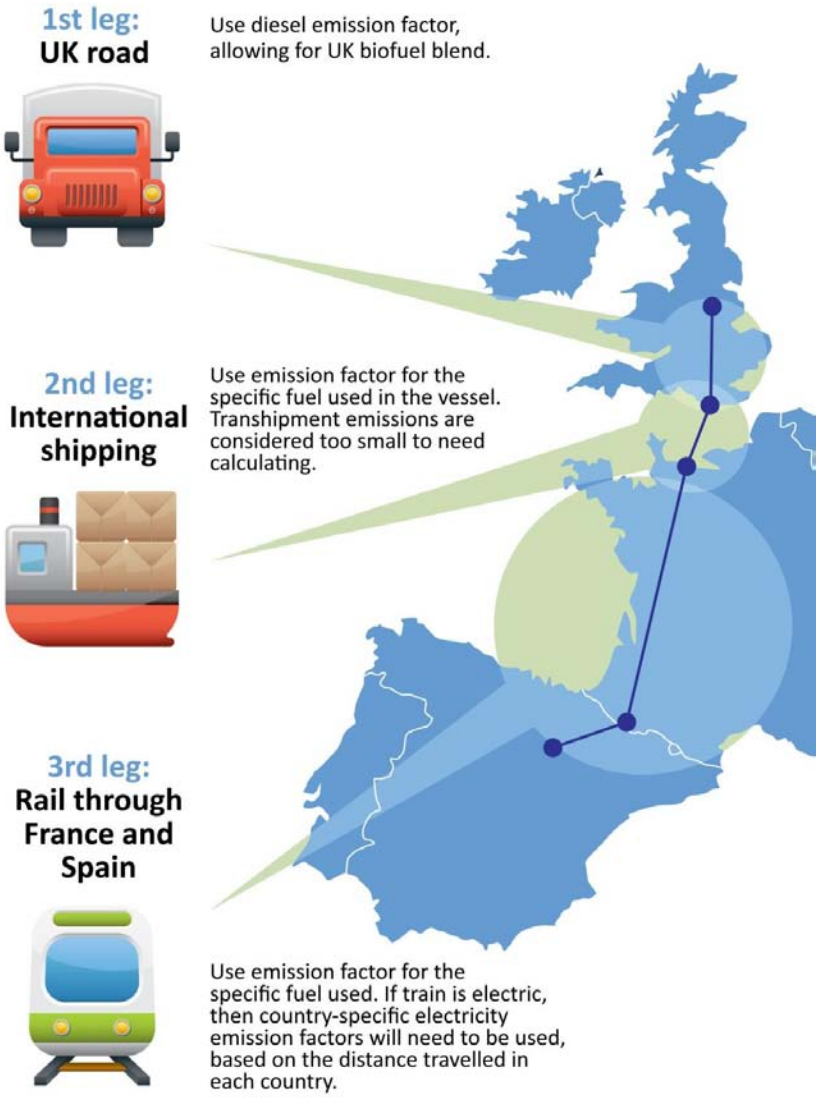
[2] The Defra emission factors include electricity emission factors for a broad range of countries, so this information is easier to access than it would seem at first glance.

APPROACHES TO APPLYING COUNTRY-SPECIFIC EMISSION FACTORS

As outlined elsewhere in this guidance, the best approach to calculating emissions is to base the calculation on fuel consumption data. For international journeys, this holds true, but ideally the choice of emission factor should be related to where fuel is purchased rather than where it is used.

If an HGV fills up in Germany, and then drives through France, the most accurate calculation will be based on using the diesel emission factor for Germany. When looking at an overall transport operation, if fuel use data is based on fuel purchase data from the accounts, then it will be practical to look at the amount of fuel purchased in each country, apply the relevant emission factors and generate an overall result.

If fuel use data is derived by another method, then each country-specific emission factor should be applied to a proportion of the total fuel used, based on the proportion of total distance travelled that was in that country.



IF YOU HAVE NO DATA ON FUEL USE

The calculation chapter of this guidance outlines a method to use for road transport if you only have data on vehicle km (and possibly loading). This is based on emissions factors that have been worked out by Defra, DECC and the DfT, taking into account a wide variety of average data from the UK. These factors would not be the same if worked out for other countries.

In some cases, similar factors have been provided in other countries by the equivalent government departments. You are therefore recommended to first look for these if this is the method you would have used in the UK.

If such factors are unavailable, then the first approach recommended for international emissions is to find some way to derive fuel use – the most likely being to estimate the efficiency of your vehicles and then to use this and the distance travelled to calculate an estimate.

If this is completely impossible, as a method of last resort, you may choose to use the UK distance emission factors as a proxy, or possibly the factors from another country close to the country in question which does provide factors. It should be noted that this method may entail considerable inaccuracy, and should be stop-gap only.

For Defra's spreadsheet for calculating emissions, and the method behind calculating these emission factors, visit:

www.defra.gov.uk/environment/business/reporting/conversion-factors.htm

D. ALTERNATIVE FUEL VEHICLES

BIOFUELS

If you use a percentage of biofuel blended with diesel, it is important you follow the guidance below. This will reduce your emissions total from transport, and make sure you are reporting in line with the latest advice from government.

SEPARATE REPORTING

Diesel is mined from wells in the earth, and therefore its associated emissions would not be released if we had not mined it and then burnt the fuel. The carbon in biofuels however would be released naturally when plants decay even without our burning it in our engines. It follows that the carbon from combustion of biofuels is not additional to what would have happened through its natural life cycle. The CO_2 should therefore be reported separately to scopes 1, 2 and 3.

At the moment, emission factors for biofuels signposted by Defra include the lifecycle emissions from burning biofuel. This means they include the cultivation, treatment, transport and burning emissions, and is another reason why they should be reported separately.

In future revisions to emission factors, direct or tailpipe only emission factors will also be provided. Refer to the notes on biofuels in the Defra emission factors table to see what is appropriate for making comparisons and what is appropriate for the separate reporting of emissions from biofuel use.

Further explanation of the Renewable Transport Fuels Obligation (RTFO):

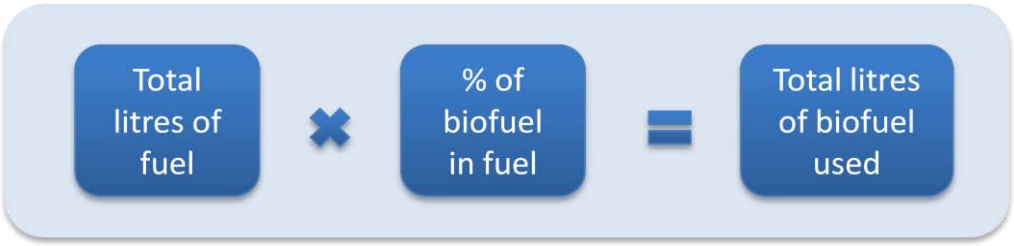
www.renewablefuelsagency.gov.uk/aboutthertfoo

REPORTING IF YOU USE A KNOWN BLEND OF BIOFUEL

This only applies to companies who purchase a known blend of biofuel, for example B5 or B30. If you use conventional diesel from forecourts or suppliers who don't state a percentage of biofuel, then you should use the emission factor for straight diesel. See the link signposted above for further explanation.

Defra's spreadsheet will contain a dropdown box from which you can choose your percentage biofuel, and get the direct emissions from diesel and indirect emissions from biofuel to be reported separately all in one calculation. If this is not a function of the spreadsheet yet, follow the steps below to make the separation of diesel and biofuel, so that your reporting can be correctly categorised.

The example below shows how to calculate your total litres of biofuel.



This is worked through below:

Total litres of fuel used:	1,000
Fuel type used:	B5
Percentage biofuel:	5%
Total Litres biofuel:	50
Total Litres of diesel:	950

In this instance, 950 litres of fuel should be reported as standard diesel, and 50 should be reported separately. Note that the 1,000 litre total requires breaking down into diesel and biofuel before using any emission factors.

Many vehicles are now running on stronger mixes of biofuel such as B30, meaning 30% biofuel. In these cases the biofuel should also be separated out as above.

Tip on calculating percentages

5% : Multiply by 0.05

20%: Multiply by 0.2

30%: Multiply by 0.3

For companies that buy higher blends, it may be possible to use a specific emission factor provided by the supplier. However this may not be very easy, especially if the fuel has passed through a number of middlemen. Further, no check will be carried out to verify the percentage being supplied. It follows that if you cannot obtain a credible emission factor from your supplier, it is best to resort to the standard biofuel emission factors provided in the Defra spreadsheet. In updates to Defra's spreadsheet, knowing at least the feedstock and place of origin will help you choose a more accurate factor.

If Defra's spreadsheet does not include your chosen biofuel, the Renewable Fuels Agency (RFA) is a reliable source of emission factors. The RFA requires your fuel use to be in terms of its energy content, in Megajoules (MJ). Examples of how to convert from litres to MJ are provided below, and further unit conversion factors are provided in the Defra spreadsheet of emission factors.

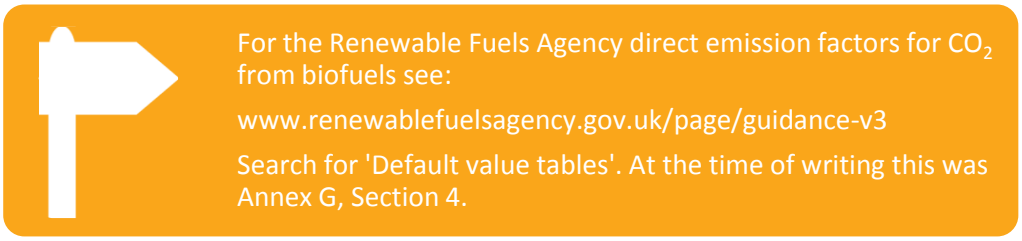
Biodiesel ME (Methyl Ester) - the conventionally produced biodiesel type (also known as 1st generation biodiesel).

Litres to tonnes:	divide by 1,124
Tonnes to GJ:	multiply by 37.2
GJ to MJ:	multiply by 1,000

Biodiesel, BtL (Biomass-to-Liquid) is an advanced biodiesel fuel not yet in significant commercial production (also known as 2nd generation biodiesel). **Biodiesel HVO** (Hydrotreated Vegetable Oil) is a new type of biodiesel, similar in properties to BtL biodiesel fuel, only recently becoming available. These require the following conversion:

Litres to tonnes:	divide by 1,282
Tonnes to GJ:	multiply by 44
GJ to MJ:	multiply by 1,000

The most comprehensive source of reputable emission factors for biofuels is the RFA:



ELECTRIC VEHICLES

Calculating emissions from electric vehicles is just as straightforward as for fossil fuels if you have appropriate data available to you. In an ideal situation, electric vehicles would be charged from submetered sockets on site. The electricity consumption for that submeter could then be totalled, multiplied by the electricity emission factor, and emissions from the vehicle calculated.

Alternatively, it may be that you do not have a submeter to show exactly how much electricity is being used for your vehicle. In this case, it is possible to work back to the information you need using the efficiency figures from your vehicle in the same way using as miles and MPG can get you to fuel use – see Chapter 0.

If some of your charging occurs off-site, you may want to use the efficiency figures you have for your vehicles to extrapolate data using the distance travelled – see Chapter 6 on data accuracy.

It is not essential that you are able to identify how much electricity is used by trucks and how much is used by your offices, however it will help you understand the benefits better – see Chapter 2 on the benefits of improved precision.

As with electricity consumed by your offices, it would fall under Scope 2 because you have no influence over the mix of fuels used in to generate the electricity, although you can influence the amount you consume through energy efficiency measures.

Do electric vehicle emissions count towards the Carbon Reduction Commitment Energy Efficiency Scheme (CRC-EES)?

No. The CRC-EES is not designed to monitor or reduce emissions from transport. Specifically, this means that any fuel used, regardless of source, which is used in a Vehicle Excise and Registration Act (VERA) or nil licensed vehicle is not included from the outset. Even if considering residual emissions to include, transport cannot be counted because it is omitted when defining the initial parameters for reporting under the CRC-EES.

For further guidance on CRC-EES, see the environment agency website:

www.environment-agency.gov.uk/business/topics/pollution/98236.aspx

There is a selection of emission factors for electricity, and it is important that you choose the right one. To make your choice, follow the steps below:

1. Go to the table for 'Electricity Consumed' – labelled as shown below in the top left hand box. The emission factors in this table include efficiency losses which occur in the distribution network, which is accurate.
2. Find the row of the most recent year displayed, or the historical year for which you wish to measure. The data may not go up to the year for which you wish to measure – in this case find the most recent year.
3. Look to the right at the separated tables coloured as shown below. These are 'Grid rolling average' tables. This means that the emission factors are averages of the most recent five years for which data is available, which improves reliability.
4. Use the emission factor in the coloured table to the right labelled 'Total GHG' because - in line with the rest of this document - we want to include CH4 and N2O emissions. Do not use the emission factor in the same box as the Year information, because this is not the Grid Rolling Average.

Electricity emission factor

This UK grid electricity emission factor changes from year to year, as the fuel mix consumed in UK power stations changes. Because these annual changes can be large (the factor depends very heavily on the relative prices of coal and natural gas), and to assist companies with year to year comparability, the factor presented is the grid rolling average of the grid conversion factor over the previous 5 years. This factor is updated annually, and as new factors are presented in the guidance, historical calculations should be updated too with any changes to previous year's factors.

An example of the format of the factor you need to identify is provided below:

Electricity emission factors from 1990 to 2007 per kWh (electricity CONSUMED):		**Grid Rolling Average:**	**Total GHG**	
UK Grid Electricity Year		Amount used per year, kWh	kg CO_2eq per kWh	Total kg CO_2eq
Latest year			See signpost below for link to up to date emission factors	

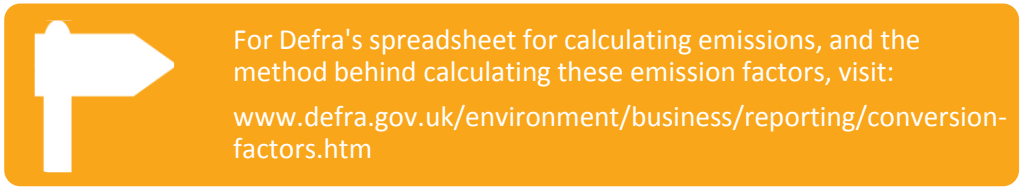
For Defra's spreadsheet for calculating emissions, and the method behind calculating these emission factors, visit:

www.defra.gov.uk/environment/business/reporting/conversion-factors.htm

E. IT SOLUTIONS AND ADD-ONS TO MONITOR GHG EMISSIONS

A number of IT solutions have been developed to automate elements of emissions calculations. Some are specific to emissions, and some will calculate your emissions as part of an overall financial report for your business.

Different packages will suit different types of operator. The simplest would be using the Defra emission factor spreadsheet which simply automates emissions calculations, signposted below.



The DfT's 'Scope 3 Third Party GHG Emissions Model' signposted in Chapter 8 will also remove the burden of the calculation, and allocate your emissions if you have the appropriate data. Some trade associations, Freight Best Practice and the Carbon Trust also provide emissions calculators.

The most advanced IT solutions tend to be software programmes which includes emissions as part of financial or fuel reporting. These are provided by a range of transport technology companies.

Using an IT package will also help if you're looking to get your emissions verified. At a basic level, stating that you checked your calculations in the Defra spreadsheet signposted above will help, but at a more advanced level, showing verifiers the software you've used will be invaluable.

F. HOW DO TRANSPORT EMISSIONS FIT WITH THE BROADER PICTURE?

As explained in the introduction, this document only covers the transport elements of your overall carbon footprint. This section shows how the transport element would fit into a broader carbon footprint.

In a complete carbon footprint disclosure all Scope 1 and 2 emissions should be reported, in many transport cases fuel use will be the largest component of these.

We also advise you report at least the indirect emissions from your fuel under Scope 3 – see Annex A.

EXAMPLE COMPANY PROFILE

Your company profile simply provides information about your business and a list of vehicles and sites to show the sources of emissions being considered.

Industry:	Food & drink
Company:	Third Party Logistics
Fleet:	30 articulated HGVS (5 refrigerated)
Warehouses:	2
Refrigerated Storage Unit:	1
Forklift trucks:	10
Employees:	100

XYZ'S EMISSIONS BY SCOPE

Following on from this, XYZ's emission sources will fall into the categories below:

Scope 1 Emissions Sources

Activities owned or controlled by XYZ which release emissions straight into the atmosphere

- Owned transport fuel use
- Fuels combustion for heating/cooling of premises – e.g. warehouses and offices
- Fugitive emissions from refrigeration in warehouses/transport
- Fugitive emissions from air-conditioning in offices (companies should aim to have zero fugitive emissions from air conditioning as they are particularly potent greenhouse gases)

Scope 2 Emissions Sources

Emissions released from purchased heat, steam and cooling - often just from purchased electricity

- Purchased electricity for warehouses/offices
- Any other purchased heat, steam or cooling

Scope 3 Emissions Sources

Emissions released by operations over which you do not have direct control

- Emissions from the extraction and processing of the fuel prior to combustion in the engine of owned vehicles

Fugitive emissions:

Emissions that are not physically controlled but result in the release of GHGs. They commonly arise from the production, processing, transmission, storage and use of fuels and other chemicals, often through joints, seals, packing, and gaskets. An example would be leaks from air conditioning and refrigeration units.

REPORTING SCOPE 1 AND 2 EMISSIONS FOR 2009

A summary table like the one shown below should be produced, showing the emissions from each activity.

Scope	Activity – Emission source	Activity data collected (2009)	Tonnes of CO_2eq
1	Fuel combustion - HGVs	Litres diesel	400
	Fuel combustion – Forklifts	Litres of diesel	20
	Fuel combustion – gas heating	kWh	10
	Fugitive emissions – refrigeration including from vehicles	Equipment charge capacity (kg) and refrigerant type	60
2	Purchased electricity for warehouses and refrigerated storage unit	kWh	40
1 + 2	**Total Scope 1 +2 emissions**		**530**

For a detailed explanation for deciding which Scope 3 emissions to include and how to calculate them, see Annex A.

G. ADDITIONAL INFORMATION ON THE VERIFICATION PROCESS

IF YOU DECIDE YOU NEED A THIRD PARTY VERIFIER

Data verification can be carried out by a range of organisations including environmental or management consultancies, accountants, and organisations dedicated to the provision of verification services. Your Trade Association may also be able to offer you a data verification service, or direct you to an appropriate organisation to assist you.

When selecting a verifier, you should look for the standards that their processes will comply with (see 'How is verification carried out?'). They should be able to demonstrate appropriate qualifications and experience.

Third party verifiers should be entirely independent of your organisation's activities in order to avoid conflicts of interest. For self-verification processes, it is beneficial to engage a member of staff who has not been involved with the main reporting activities.

LEVELS OF ASSURANCE

Verification may be carried out for all, or just part, of your GHG emissions data. For organisations seeking third party verification there are two different levels of assurance that it is possible to obtain. The level of assurance requested will depend upon the intended use of the GHG emissions data.

- **Reasonable assurance** – where the verifier provides a reasonable, but not absolute, level of assurance over the emissions data.
- **Limited assurance** – this is an assurance statement based on a more limited level of verification, i.e. a less detailed review process is carried out.

Any verification process will have limitations, which means that it is never possible for an absolute level of assurance to be provided.

STARTING THE PROCESS

Before starting the process, you should agree the scope and objectives with your verifier. You should also discuss and agree the criteria that they will be verify against. If you are a member of a specific emissions reporting programme, you may need to comply with pre-set verification criteria.

Following the agreement of these parameters, your verifier will produce a verification plan, which will confirm scope, objectives and criteria and set out the activities to be undertaken.

Depending on the complexity of the emissions reporting, it may be inefficient to review all data. The verifier will therefore develop a 'sampling plan', as part of the overall verification plan, which will set out which information will be reviewed. This plan should be developed using a risk based approach in order to understand the extent of the verification needed to satisfy the level of assurance required. It is usual to follow an iterative approach in the

development of the verification and sampling plans in order to take account of any issues identified during the process.

DATA COLLECTION

An external verifier will need to gather a range of information and may also need to conduct one or more site visits and/or staff interviews as part of the verification process. The extent of the information required will depend on the level of verification that you request.

The table below sets the likely information that an external verifier will request.

Information requirement	Details
Emissions reporting objective	The verifier will need to know the objective of your emissions report and the requirements of all end users.
Organisational activities	A description of the type and location of the activities carried out by your organisation, together with identification of the GHG emitting processes.
Organisational structure	Details of subsidiaries, the legal relationship between different organisational undertakings and any changes to the organisational structure that have occurred during the reporting period (the effects of these changes on the data and calculations should also be described).
Information on any other assurance processes to which the data has been subjected	Details of internal audit processes/QA procedures, and any other external reviews that have been undertaken.
Data used for calculating emissions	This may include: • Fuel consumption data • Customer orders and invoices • Vehicle telematics data
A description of the data collection processes used	An explanation of any systems and procedures used to collect the data. Names and contact details of the staff members responsible for collating the different types of data. The verifier may also request to see the maintenance and calibration programme for any equipment used to collect data.
Calculation methodology	A clear methodology should be provided to the verifier. This must include: • Emission factors used • Assumptions • Any exclusions made • Information on any uncertainties You should specify any standards or protocols that you have based your methodologies on.

Your verifier may also need to examine the organisational boundaries of your carbon reporting. This will apply if you are measuring transport emissions for a wider 'footprint' and there is any complication of your company structure - e.g. outsourcing, joint ventures.

Refer to Part 3, page 8 of Defra's Company Reporting Guidelines to understand whether to use the 'control' or 'equity' method to apportion emissions:

www.defra.gov.uk/environment/business/reporting/conversion-factors.htm

Ensuring that you have assembled as much of this information as possible prior to the start of the verification process will significantly reduce the work that the verifier is required to carry out. Throughout the verification process you will need to have a member of staff available who can answer questions and provide any additional information requested by the verifier.

The verifier will review your information to identify any errors that result in significant inaccuracies in your reporting. This may include data gaps, miscalculations, misrepresentations of data, or the application of an incorrect methodology. Such an error is known as a 'material discrepancy'. At the start of the verification process you will be need to work with the verifier to define the threshold for what will constitute a 'significant inaccuracy' for your organisation.

REPORTING CHANGES IN EMISSIONS

If you are reporting a change in emissions, you will also need to provide baseline data. Your baseline period will be specified, and the historical data associated with the baseline should be retained and provided to the verifier.

You will also need to justify any changes to your approach to calculating and reporting emissions. If significant changes have taken place, it is likely that it will be necessary to re-calculate your baseline in line with your revised approach. Any re-calculations should be thoroughly documented.

THE VERIFICATION STATEMENT

At the end of the process you will be issued with a verification statement, or report. This statement will set out the scope and level of assurance of the verification, and will provide the verifier's opinion on the accuracy and completeness of your reporting data. It may also contain recommendations for improvements to your data collection processes.

Prior to releasing the final version of your verification statement your verifier should issue you with a draft report for review. In cases where the verifier has issued a negative opinion, their report should clearly explain the reasons for this.

The verifier may not be able to provide you with a conclusive opinion. This is likely if you do not have established processes in place for monitoring and recording data, and calculating emissions. However, in such cases organisations can benefit greatly from any advice and recommendations provided by the verifier as part of their report.

The verifier is responsible for retaining all records of the verification process.

WHEN TO HAVE YOUR DATA VERIFIED

Organisations may choose to have their data verified either at the end of a reporting period, such as the end of their financial year, or part way through a reporting period. The advantage of undertaking verification during an ongoing reporting period is that it allows any data collection deficiencies to be identified and corrected early in the process.

HOW TO USE YOUR VERIFICATION STATEMENT

The outcome of your verification may influence the way in which you decide to use your data. Once your emissions reporting data is issued, details of the verification process that you have used and, if applicable, your final verification statement, should be made available to end users.

The verification process may also result in recommendations for improvements to your data collection processes and calculation methodologies. These can be extremely useful in the continuous improvement of your GHG emissions reporting.

H. UNIT CONVERSIONS

It may be the case that you have to convert miles to kilometres, gallons to litres, or you want to be sure whether you are using UK or American measurements. The information below should be useful in these cases, or see the signpost for more conversions.

Miles to kilometres

Multiply by 1.60934 (divide to go the other way from kilometres to miles)

Gallons to litres

Multiply by 4.5461 (divide to get from litres to gallons)

US gallons to mperial gallons

Multiply by 0.8327 (divide to get to US gallons from imperial gallons)

Nautical miles to kilometres

Multiply by 1.852 (divide to get from kilometres to nautical miles)

Litres to Megajoules (MJ)

The conversion factor from units of volume to units of energy, for example MJ to litres, depends on the fuel type. The Defra spreadsheet signposted below has information on how to convert various fuels such as biofuels into units of energy, which may be required by emission factors.

For Defra's spreadsheet for calculating emissions, which also includes unit conversion factors , visit:

www.defra.gov.uk/environment/business/reporting/conversion-factors.htm

I. GLOSSARY

Absolute target. A target defined by reduction in absolute emissions over time, e.g. reduce CO_2 emissions by 25% below 1994 levels by 2015.

Activity data. Information on material flow, volume and rates of fuel consumption, input materials, or production output that is used to calculate GHG emissions.

Base year emissions. GHG emissions in the base year.

Base year. A historical specific year against which a company's emissions are tracked over time.

Benchmarking. Measurement of performance at a base year or in comparison with competitors.

Biofuels. Liquid or gaseous fuel for transport produced from biomass; biomass is organic material of recent plant or animal origin.

Biomass. Non-fossilized and biodegradable organic material originating from plants, animals, and micro-organisms, including products, by-products, residues and waste from agriculture, forestry and related industries as well as the non-fossilised and biodegradable organic fractions of industrial and municipal wastes, including gases and liquids recovered from the decomposition of non-fossilised and biodegradable organic material.

Boundaries. GHG accounting and reporting boundaries can have several dimensions, e.g. organisational, operational, geographic, business unit, and target boundaries. The boundary determines which emissions are measured or calculated and reported by the organisation.

British Standards Institution (BSI). BSI is the National Standards Body of the UK which produces standards that promote best practice.

Calculation tools. Tools that automate the calculation of GHG emissions.

Carbon dioxide equivalent (CO_2eq). A universal unit of measurement used to indicate the global warming potential of a greenhouse gas, expressed in terms of the global warming potential of one unit of carbon dioxide. It is used to evaluate the releasing (or avoiding releasing) of different greenhouse gases against a common basis.

Carbon Disclosure Project (CDP). An independent not-for-profit organisation holding a database of primary corporate climate change information. Similar to the Global Reporting Initiative (GRI).

Carbon Reduction Commitment Energy Efficiency Scheme (CRC-EES). The CRC Energy Efficiency Scheme (formerly known as the Carbon Reduction Commitment) is the UK's mandatory climate change and energy saving scheme, which started in April 2010. It has been designed to raise awareness in large organisations, especially at senior level, and encourage changes in behaviour and infrastructure. Transport emissions are specifically excluded from this scheme unless the participant wishes to include electricity or gas used for transport vehicles – see www.decc.gov.uk/en/content/cms/what_we_do/lc_uk/crc/crc.aspx for more details.

Climate Change Act 2008. The world's first long term legally binding framework to tackle the dangers of climate change. The Climate Change Bill was introduced into Parliament on 14 November 2007 and became law on 26 November 2008.

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

Corporate carbon footprint. The total direct and indirect GHG emissions that an organisation is responsible for as a result of its business activities.

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

Direct monitoring. Direct monitoring of exhaust stream contents in the form of continuous emissions monitoring (CEM) or periodic sampling.

Double counting. Two or more reporting companies take ownership of the same emissions or reductions.

Downstream emissions. Indirect GHG emissions that occur in the life cycle of outputs (i.e., sold goods and services) subsequent to sale by the reporting company.

Eco-driving. A number of principles and practices aimed at optimising the performance of the engine.

Embedded emissions. Emissions which occur in the process of bringing a good to market, such as manufacture or distribution, that cannot be influenced by the good's use thereafter.

Emission factor. A factor allowing GHG emissions to be estimated from a unit of available activity data (e.g. litres of fuel consumed).

Emissions. The release of GHGs into the atmosphere.

Energy indirect. Emissions released into the atmosphere associated with the consumption of purchased electricity, heat, steam or cooling. These are indirect emissions that are a consequence of an organisation's activities but which occur at sources not owned or controlled by the organisation.

Equity share. The equity share reflects economic interest, which is the extent of rights a company has to the risks and rewards flowing from an operation. Typically, the share of economic risks and rewards in an operation is aligned with the company's percentage ownership of that operation, and equity share will normally be the same as the ownership percentage.

EU ETS. European Union Emissions Trading System. This is a Europe wide scheme which puts a price on carbon that businesses use and creates a market for carbon. It has been in place since 2005.

Extrapolated data. Primary or secondary data related to a similar (but not representative) input, processor activity to the one in the inventory that are adapted or customised to a new situation to make it more representative. For example, using data from the same or a similar activity type and customising the data to the relevant region, technology, process, temporal period and/or product.

Finance lease. A lease which transfers substantially all the risks and rewards of ownership to the lessee and is accounted for as an asset on the balance sheet of the lessee. Also known as a Capital or Financial Lease. Leases other than Capital/Financial/Finance leases are Operating leases.

Fugitive emissions. Emissions that are not physically controlled but result from the release of GHGs. They commonly arise from the production, processing, transmission, storage and use of fuels and other chemicals, often through joints, seals, packing, and gaskets.

GHG Protocol. The accounting and reporting standard for GHG emissions. Comprising the GHG Protocol Corporate Accounting and Reporting Standard and the GHG Protocol Project Quantification Standard. Developed by a multi-stakeholder collaboration convened by the World Resources Institute (WRI) and the World Business Council for Sustainable Development.

Global Reporting Initiative (GRI). A network-based organisation that has developed a sustainability reporting framework. Similar to the Carbon Disclosure Project (CDP).

Global warming potential. A factor describing the radiative force impact (degree of harm to the atmosphere) of one unit of a given GHG relative to one unit of CO_2.

Greenhouse gases (GHGs). In this guidance reference to GHGs are to the Kyoto gases (see glossary definition).

HDV. Heavy Duty Vehicle. A broader category of heavy vehicle including HGVs and buses and coaches.

HGV. Heavy Goods Vehicle. Goods vehicles with a gross vehicle weight greater than 3.5 tonnes.

Hire and Reward. A contract whereby a firm provides the transport service to its customer only.

Indirect GHG emissions. Emissions that are a consequence of the operations of the reporting company, but occur from sources owned or controlled by another company. These will be either Scope 2 emissions or Scope 3 emissions.

Intensity measure. A unit of physical activity or economic value which is used to divide your total carbon emissions.

Intensity ratios. Ratios that express GHG impact per unit of physical activity or unit of economic value (e.g. tonnes of CO_2 emissions per passenger kilometre).

Intensity target. A target defined by reduction in the ratio of emissions and a business metric over time, e.g. reduce CO_2 per tonne of cement by 12% between 2000 and 2015.

International Organization for Standardization (ISO). ISO is a non-governmental organisation which produces International Standards.

Kyoto gases. These are the gases covered by the Kyoto Protocol: Carbon dioxide (CO_2), methane (CH4), nitrous oxide (N2O), hydroflurocarbons (HFCs), perflurocarbons (PFCs), and sulphur hexafluoride (SF6).

LCV/LDV. Light Goods/Duty Vehicle. Any goods vehicle of up to and including 3.5 tonne gross vehicle weight.

Lifted goods. Lifted goods means the amount of goods delivered. This will typically be in tonnes or pallets.

Materiality. Information is material if its omission or misstatement could influence the economic decisions of users.

Mobile combustion. Burning of fuels by different types of transportation such as cars, trucks, trains, airplanes, ships.

Moved goods. Moved goods means the amount of goods lifted, multiplied by how far they have been carried. For example, 5 pallets carried 100 km would be expressed as 500 pallets 'moved'.

Open book accounts. A method for payment of fuel whereby a transport operator provides vehicles to a customer, but the customer pays the fuel bill for those vehicles directly, rather than paying the transport operator for the whole logistics service, including fuel.

Operating lease. A lease which does not transfer the risks and rewards of ownership to the lessee and is not recorded as an asset in the balance sheet of the lessee. Leases other than Operating leases are Capital/Finance/Financial leases.

Operation. A generic term used to denote any kind of business, irrespective of its organisational, governance, or legal structures. An operation can be a facility, subsidiary, affiliated company or other form of joint venture.

Operational boundaries. The boundaries that determine the core direct and indirect emissions associated with operations owned or controlled by the reporting company. This assessment allows a company to establish which operations and sources cause direct and

indirect emissions, and to decide which other indirect emissions to include that are a consequence of its operations.

Organisational boundaries. The boundaries that determine the operations owned or controlled by the reporting company, depending on the consolidation approach taken (equity or control approach).

Other equity investments. Equipment, land, stocks, property, incorporated and non-incorporated joint ventures, and partnerships over which the parent company has neither significant influence nor control.

Other indirect. All other activities that release emissions into the atmosphere as a consequence of your actions, which occur at sources that you do not own or control and which are not classed as Scope 2 emissions.

Outsourcing. The contracting out of activities to other businesses.

Primary data. Observed data (emissions data, activity data or emission factors) collected from specific facilities owned or operated by the reporting company or a company in its supply chain.

Proxy data. Primary or secondary data related to a similar (but not representative) input, process, or activity to the one in the inventory, which can be used in lieu of representative data if unavailable. These existing data are directly transferred or generalised to the input/process of interest without adaptation.

Publicly Available Specification (PAS). BSI Standards Solutions has led the development of a Publicly Available Specification (PAS) for a method for measuring the embedded greenhouse gas (GHG) emissions from goods and services

Renewable energy. Energy taken from sources that are replenished by natural processes, e.g. wind, water, solar, geothermal energy and biofuels.

Reporting. Presenting data to internal management and external users such as regulators, shareholders, the general public or specific interested groups.

Scope 1. Emissions from sources that are owned or controlled by the reporting company. Also known as direct emissions.

Scope 2. Emissions that are a consequence of the operations of the reporting company, but occur from sources owned or controlled by another company, e.g., as a consequence of the import of electricity, heat, cooling or steam. Also known as indirect emissions or energy indirect emissions.

Scope 3. Emissions that are a consequence of all other activities which release emissions into the atmosphere as a consequence of your actions, which occur at sources which you do not own or control and which are not classed as Scope 2 emissions. Also known as other indirect emissions.

Scope. GHG Protocol definition which defines the operational boundaries in relation to indirect and direct GHG emissions.

Secondary data. Generic or industry average data from published sources that are representative of a company's operations, activities, or products.

Stationary combustion. Burning of fuels to generate electricity, steam, heat, or power in stationary equipment such as boilers, furnaces.

Subsidiary. The parent company has the ability to direct the financial and operating policies of the subsidiary with a view to gaining economic benefits from its activities.

Target base year. The base year used for defining a GHG target, e.g., reduce CO_2 emissions 25% below the target base year levels specified by the target base year 2015.

Target boundary. The boundary that defines which GHGs, geographic operations, sources and activities are covered by the target.

Target completion date. The date that defines the end of the target period.

Third Party Logistics Operator (3PL or TPL). A firm that provides a service to its customers of outsourced (or 'third party') logistics for part, or all of their supply chain functions.

Tonne km. standard unit of goods moved, calculated by multiplying the load (in tonnes) by the distance it travels (in km).

Upstream emissions. Indirect GHG emissions that occur in the life cycle of inputs (i.e., purchased or acquired goods, services, materials, and fuels), up to the point of receipt by the reporting company.

Verification An independent assessment of the reliability (considering completeness and accuracy) of a GHG inventory.

World Business Council for Sustainable Development (WBCSD). A global association of companies dealing with business and sustainable development.

WRI. World Resources Institute. WRI is a centre for policy research and analysis addressed to global resource and environmental issues.

Glossary adapted from Defra's Company Reporting Guidelines