CARBON TRUST

Carbon footprinting

An introduction for organisations

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Introduction

Climate change is increasingly recognised as a major challenge. It is widely accepted that the greenhouse gas emissions caused by humans are having a negative impact on the environment.

The most important greenhouse gas, arising from human activity, is carbon dioxide (CO_2). Virtually all human activities cause the CO_2 emissions that lead to climate change. By using electricity generated from fossil fuel power stations, burning gas for heating or driving a petrol or diesel car, every person is responsible for CO_2 emissions. Furthermore every product or service that humans consume indirectly creates CO_2 emissions; energy is required for their production, transport and disposal. These products and services may also cause emissions of other greenhouse gases. Understanding and addressing the full range of our impact is crucial for the effects of climate change to be minimised.

The total set of greenhouse gas emissions caused directly and indirectly by an individual, organisation, event or product is commonly called their **carbon footprint**. Establishing the carbon footprint of an organisation can be the first step in a programme to reduce the emissions it causes.

This publication is aimed at helping businesses and organisations establish their carbon impact and introduces some of the key issues faced in the calculation of a carbon footprint.

Virtually all human activities cause the CO_2 emissions that lead to climate change.

What is a carbon footprint?

The term carbon footprint is commonly used to describe the total amount of CO_2 and other greenhouse gas (GHG) emissions for which an individual or organisation is responsible. Footprints can also be calculated for events or products.

The full footprint of an organisation encompasses a wide range of emissions sources from direct use of fuels to indirect impacts such as employee travel or emissions from other organisations up and down the supply chain. When calculating an organisation's footprint it is important to try and quantify as full a range of emissions sources as possible in order to provide a complete picture of the organisation's impact.

In order to produce a reliable footprint, it is important to follow a structured process and to classify all the possible sources of emissions thoroughly. A common classification is to group and report on emissions by the level of control which an organisation has over them. On this basis, greenhouse gas emissions can be classified[1] into three main types:

1. Direct emissions that result from activities the organisation controls

Most commonly, direct emissions will result from combustion of fuels which produce CO_2 emissions, for example the gas used to provide hot water for the workspace. In addition, some organisations will directly emit other greenhouse gases. For example, the manufacture of some chemicals produces methane (CH_4) and the use of fertiliser leads to nitrous oxide (N_2O) emissions.

2. Emissions from the use of electricity

Workplaces generally use electricity for lighting and equipment. Electricity generation comes from a range of sources, including nuclear and renewables. However, in the UK around 75% is produced through the combustion of fossil fuels. Although the organisation is not directly in control of the emissions, by purchasing the electricity it is indirectly responsible for the release of CO_2.

3. Indirect emissions from products and services

Each product or service that is purchased by an organisation is responsible for emissions. So the way the organisation uses products and services affects its carbon footprint. For example, a company that manufactures a product is indirectly responsible for the carbon that is emitted in the preparation and transport of the raw materials. Downstream emissions from the use and disposal of products can also be indirectly attributed to the organisation.

It is clear, therefore, that producing a full footprint covering all three types of emissions can be quite a complex task. A further complexity in understanding published footprints is that they are rarely comparable for the following reasons:

- Despite emerging international standards not all organisations follow the same approach to calculating their footprint or classify their emissions in the same way

- Some footprints are expressed on a time period basis, such as the footprints of an individual or company which are typically measured annually. Others are expressed on a unit basis, such as per event or product purchased

- Carbon footprints are typically calculated to include all greenhouse gases and are expressed in tonnes of CO_2 equivalent (tCO_2e). However, others calculate the footprint to include CO_2 only and express the footprint in tCO_2 (tonnes of CO_2).

The reasons for needing a carbon footprint will determine which approach is the most appropriate. In some cases it may be possible to do a basic footprint – in others a much more rigorous process will be required. Both approaches are discussed later in this publication.

[1] This classification follows the definition provided in the Greenhouse Gas Protocol, a widely utilised standard for corporate emissions reporting. The Greenhouse Gas Protocol was produced by the World Business Council for Sustainable Development and the World Resources Institute.

Why calculate a carbon footprint?

There are typically two main reasons for wanting to calculate a carbon footprint:

- To manage the footprint and reduce emissions over time
- To report the footprint accurately to a third party.

Footprinting for management of emissions

Calculating an organisation's carbon footprint can be an effective tool for ongoing energy and environmental management.

If this is the main reason that an organisation requires a carbon footprint, it is generally enough to understand and quantify the key emissions sources through a basic process, typically including gas, electricity and transport. This approach is relatively quick and straightforward.

Having quantified the emissions, opportunities for reduction can be identified and prioritised, focusing on the areas of greatest savings potential.

Explanation of the basic approach to carbon footprinting can be found on page 4.

Footprinting for accurate reporting

Organisations increasingly want to calculate their carbon footprint in detail for public disclosure in a variety of contexts:

- For CSR or marketing purposes
- To fulfil requests from business or retail customers, or from investors
- To ascertain what level of emissions they need to offset in order to become 'carbon neutral'.

For these purposes, a more robust approach is needed, covering the full range of emissions for which the organisation is responsible. It may also be appropriate for the calculation to be independently verified to ensure that the methodology has been correctly used and that the results are accurate.

For more on the process of calculating a detailed carbon footprint see page 4.

For more information on carbon offsetting see the Carbon Trust publication *'The Carbon Trust three stage approach to developing a robust offsetting strategy'* (CTC621).

Calculating a carbon footprint

A basic approach to carbon footprinting

For most organisations, calculation of a basic carbon footprint is a fairly quick exercise. A basic footprint is likely to cover direct emissions and emissions from electricity as these are the simplest to manage, but exclude some of the indirect emissions.

There are usually a handful of major emissions sources that must be quantified, including:

• Onsite fuel usage

• Onsite electricity usage

• Use of transport which you own.

To get the key information to calculate a basic carbon footprint, collect data from all utility meters and record the distances travelled by the organisation's vehicles. Convert the fuel, electricity and transport consumption figures to CO_2 by using the standard emissions factors, which are published by Defra and reproduced on the Carbon Trust website, together with advice on how to undertake the calculation.

When calculating a basic carbon footprint it is common to exclude sources of indirect emissions which your organisation does not control, for example emissions from waste, from the supply chain or from employee travel on public transport or airlines.

Once the basic carbon footprint has been established, it is then possible to take steps to manage the emissions:

• Set and agree efficiency or emissions reduction targets

• Identify likely opportunities for efficiency or emissions reduction

• Prioritise the opportunities, based on environmental or financial criteria

• Take action to implement the opportunities

• Monitor the performance of the actions taken and improve as necessary.

Throughout the process of calculating a carbon footprint, always be clear, consistent and transparent.

Producing a full carbon footprint

Accurate calculation of your carbon footprint requires a more detailed approach and may require specialist advice. The five steps below show a systematic approach, suitable for producing an accurate carbon footprint:

1. Define the methodology
2. Specify the boundary and scope of coverage
3. Collect emissions data and calculate the footprint
4. Verify results (optional)
5. Disclose the footprint (optional).

1. Define the methodology

For a footprint to be accurate there must be a consistent approach, which is why it is important to define the organisation's methodology from the outset. This also ensures that when issues arise they can be dealt with systematically. A consistent methodology is particularly important in a large organisation which depends on many individuals to help collect and interpret data.

Some organisations choose to define their own approach for carbon footprinting. However, it is usually quicker and better to use a methodology that is already widely accepted and understood. The results may be seen to be more credible, and can be compared with other organisations using the same methodology.

One commonly used methodology is the GHG Protocol produced by the World Resources Institute (WRI) and the World Business Council for Sustainable Development (WBCSD). This methodology provides detailed guidance on corporate emissions reporting and is available free of charge online. A more recent standard from the International Organization for Standardization, ISO 14064, also provides guidance on corporate footprint calculation and emissions reporting. It builds on many of the concepts introduced by the GHG Protocol; both provide explanations of the steps covered here.

To download a copy of the GHG Protocol, visit **www.ghgprotocol.org**. Visit **www.iso.org** for more information on ISO standards.

2. Specify the boundary and scope of coverage

Be clear about which set of emissions will be quantified. This is commonly referred to as defining your 'boundary'. Common issues include:

- Treatment of emissions from wholly or partially owned subsidiaries

- Treatment of emissions from leased assets, such as from a van which is leased from a hire company.

It is usual to define the boundary to include the full range of emissions that the organisation controls directly and this is likely to include subsidiaries and leased assets. Established methodologies such as the GHG Protocol provide rules for allocation of the emissions to the organisation.

Having defined the boundary, consider what types of emissions will be included. Ask the following questions:

- CO_2 only or all greenhouse gases?

- Direct emissions from fuel use onsite and from transport?

- Direct emissions from manufacturing processes onsite?

- Emissions from the electricity the organisation purchased?

- Emissions from the organisation's supply chain and other activities for which the operation is indirectly responsible, such as outsourced activities or manufacture and transport of raw materials, by another company, which your organisation then uses?

The GHG Protocol and ISO 14064 discussed above provide helpful guidance and accepted standards on these questions. It is common to report all directly controlled emissions and emissions from electricity in full. Emissions from indirect sources, such as the supply chain, are more complex to define and are usually treated as optional reporting items. However, where indirect sources contribute very large amounts of emissions it may be important to include them – a lot will depend on the purpose of reporting the carbon footprint.

Whatever the approach taken to the organisational boundary and inclusion of emissions sources, it is important to document the decision transparently.

3. Collect emissions data and calculate the footprint

The accuracy of the footprint relies on correct data and may include collecting information on:

- Onsite fuel consumption

- Owned transport utilisation

- Emissions from chemical reactions in manufacturing processes or from land use or agricultural activities

- Electricity consumption

- Employee travel by air, rail and in vehicles not owned by the organisation

- Suppliers' emissions.

For gas and electricity, collect consumption data in MWh or kWh. Data for other fuels can be collected in a variety of units, for example, kWh, MJ, Litres and so on. For transport emissions it may be necessary to estimate the total fuel consumption based on the mileage of the vehicles and fuel economy assumptions.

Data on energy consumption can be translated into equivalent CO_2 emissions data using standard emissions factors, which are available from DEFRA and reproduced on the Carbon Trust website. For other emissions sources, more complex calculations may be required.

Emissions of other greenhouse gases must be translated into equivalent emissions data in tCO_2e, using the global warming potential factors published by DEFRA and available from the Carbon Trust.

Before collecting the data, decide what level of accuracy is required, and how much margin for error is acceptable.

4. Verify results

Having a carbon footprint verified by a third party, such as a consultancy or accountancy firm can lend credibility to an organisation's claims. Verification typically involves analysis of the methodology, data collection techniques and the calculation process that was used.

Different levels of assurance or verification of your results are available. Greater levels of assurance or verification are more onerous and expensive to achieve, but provide greater confidence in the results.

5. Disclose the footprint

Whether the footprint is disclosed in advertising material, a CSR report or other collateral, ensure that the data is presented transparently, providing full information about the process followed and what the information means.

Make the following information available:

• The methodology

• What boundary conditions were set and which types of emissions are included and excluded

• The data collection techniques, including what level of accuracy was achieved and any assumptions or estimates that were required

• The level of verification of the results provided by independent third parties.

This robust approach to calculating a carbon footprint should give enough information to be able to report it with confidence.

Using a footprint for carbon management

Calculating a carbon footprint is only the beginning of carbon management. There is little point in establishing a carbon footprint unless the organisation then acts to reduce emissions and improve efficiency. Carbon footprinting can be a useful exercise as part of a complete environmental management system.

Help from the Carbon Trust

Your organisation may be eligible for help from the Carbon Trust to enable you to take these steps.

Our site survey and carbon management services can quantify energy usage, likely to be the main component of your basic carbon footprint. In addition, the site survey will identify opportunities to reduce an organisation's consumption, which form the basis for a plan of action. Accredited consultants spend a few days onsite and provide you with a report containing:

• Details of your energy consumption

• A plan of action listing opportunities to reduce your footprint and save energy and money

• Access to further information.

The Carbon Trust customer centre provides free advice on saving carbon for businesses and public sector organisations of all sizes. Our publications and website resources are also free.

For further information call the customer centre on 0800 085 2005 or visit **www.carbontrust.co.uk/energy**

Glossary

Assurance
The process of an independent third party checking the methodology, data and calculation processes to ensure that they are robust.

Carbon neutral
Commonly accepted terminology for something having net zero emissions (for example, an organisation or product). As the organisation or product will typically have caused some greenhouse gas emissions, it is usually necessary to use carbon **offsets** to achieve neutrality. Carbon offsets are emissions reductions that have been made elsewhere and which are then sold to the entity that seeks to reduce its impact. In order to become carbon neutral it is important to have a very accurate calculation of the amount of emissions which need to be offset – requiring calculation of a **carbon footprint**.

Carbon dioxide (CO_2)
The most important **greenhouse gas**. CO_2 emissions result from the combustion of fuel, from land use changes and from some industrial processes. CO_2 emissions are limited by the Kyoto protocol.

Carbon dioxide equivalent (CO_2e)
There are six main **greenhouse gases** which cause climate change and are limited by the Kyoto protocol. Each gas has a different global warming potential. For simplicity of reporting, the mass of each gas emitted is commonly translated into a carbon dioxide equivalent (CO_2e) amount so that the total impact from all sources can be summed to one figure.

Carbon footprint
The total set of greenhouse gas emissions caused by an individual or organisation, event or product. It should be expressed in **carbon dioxide equivalent (CO_2e)**.

Emissions conversion factor
When calculating emissions from energy use it is common to know what quantity of energy was used, either in kWh or by volume or mass of input material. Emissions factors enable a conversion to be made from the input measure of energy to the amount of **carbon dioxide** emissions that will result. UK conversion factors for energy to CO_2 are published by Defra and are also available from the Carbon Trust. See **www.carbontrust.co.uk/resource**

Greenhouse gases
Greenhouse gases are those which contribute to the greenhouse effect when present in the atmosphere. Six greenhouse gases are regulated by the Kyoto Protocol, as they are emitted in significant quantities by human activities and contribute to climate change. The six regulated gases are Carbon dioxide (CO_2), Methane (CH_4), Nitrous oxide (N_2O), Hydrofluorocarbons (HFCs), Perfluorocarbons (PFCs) and Sulphur hexafluoride (SF_6).

Emissions of greenhouse gases are commonly converted into **carbon dioxide equivalent (CO_2e)** based on their 100 year global warming potential. This allows a single figure for the total impact of all emissions sources to be produced in one standard unit. Conversion factors of greenhouse gas to **CO_2e** are calculated by the IPCC and Defra publish guidance on which set of conversion factors to use.

The Greenhouse Gas (GHG) Protocol
A widely used standard for emissions reporting. The protocol covers project emissions reporting and corporate emissions reporting. The corporate emissions reporting standard provides a methodology for calculation of a carbon footprint. The protocol was developed by the World Resources Institute and the World Business Council for Sustainable Development. It is available online from **www.ghgprotocol.org**

ISO 14064
ISO 14064 is an international standard for corporate emissions reporting. It builds on the approach outlined in the Greenhouse Gas Protocol. See **www.iso.org** for more information.

Offset
An emissions reduction, commonly resulting from a project undertaken in the developing world, which has been sold to compensate for emissions elsewhere. Offsets are commonly used to net off corporate emissions so that an organisation can claim to be **carbon neutral**. See the Carbon Trust publication *'The Carbon Trust three stage approach to developing a robust offsetting strategy'* (CTC621).

Verification
The process of independent third party checking of a carbon footprint calculation and statement by the third party that the results are accurate.

The Carbon Trust is a UK-wide company, with headquarters in London, and bases in Northern Ireland, Scotland, Wales and the English regions.

The Carbon Trust is a private company set up by Government in response to the threat of climate change, to accelerate the move to a low carbon economy.

The Carbon Trust works with UK business and the public sector to create practical business-focused solutions through its external work in five complementary areas: Insights, Solutions, Innovations, Enterprises and Investments. Together these help to explain, deliver, develop, create and finance low carbon enterprise.

The Carbon Trust is funded by the Department for Environment, Food and Rural Affairs (Defra), the Department for Business, Enterprise and Regulatory Reform, the Scottish Executive, the Welsh Assembly Government and Invest Northern Ireland.

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