
Carbon footprinting:

An overview for Chinese SME Companies

Introduction

This report has been prepared for the China Prosperity SPF Fund 'Catalysing corporate supply chain carbon footprint reporting in China's export industries'. This report provides supplementary information on carbon footprinting and is a more detailed companion to the report, 'Carbon Footprinting for Chinese Companies', which has also been produced as part of this SPF China project.

The aim of this report is to provide the reader with summary information on how Chinese companies can measure, manage and report the greenhouse gases associated with their businesses. The report provides technical guidance that is considered to be of use to Chinese companies in terms of approaches to carbon footprinting, international standards and understanding the requirements of international business customers.

The content provided here is based on two international standards for corporate footprinting of greenhouse gas emissions, the GHG Protocol 'Corporate Standard', and ISO 14064-1 'Greenhouse gases - Part 1: Specification with guidance at the organization level for quantification and reporting of greenhouse gas emissions and removals'.

Introduction to Carbon Footprinting

Companies are increasingly requested to report their carbon footprint. But what exactly is a carbon footprint and how can they measure it? The following section provides an introduction to the concept of carbon footprinting and provides guidance on how to measure and report this.

The term 'carbon footprint' is usually used to describe the sum of all greenhouse gases (GHG) that are generated. Greenhouse gases are important to measure and reduce because of their effect on the climate.

Climate Change

Some gases that are released from the Earth have the effect of trapping heat into the atmosphere. The term 'greenhouse gas' is therefore often used to describe their effect on raising the temperature of the Earth's atmosphere.

The consequence of heating the atmosphere is predicted to be wide ranging and could include:

- Increased occurrence and severity of extreme weather events
- Rising sea levels and coastal flooding
- Associated increase in infectious diseases
- Scarcity of food and water, compounded by population growth
- Extinction of many species

Reducing the amounts of greenhouse gases that are released into the atmosphere will reduce the severity of climate change. There is general agreement that greenhouse gas emissions need to be reduced to limit global warming to less than 2°C, as scientist believe that dangerous climate change will occur past this limit.

Greenhouse Gas Emissions

There are a variety of greenhouse gases that contribute to climate change. It is estimated that increases in the three main man-made greenhouse gases, atmospheric carbon dioxide, nitrous oxide and methane, have increased by approximately 35%, 15% and 150% respectively since 1750.

There are a variety of sources of man-made greenhouse gases, such as:

- Combustion of fossil fuel that releases carbon dioxide

- Burning of coal and natural gas to generate electricity
 - Fuel for heating
 - Fuel for transportation
- Chemical reactions
- Agriculture
 - Release of methane from livestock
 - Rice production
- Decomposition of organic waste
- Land use change
 - Release of stored carbon in soils and trees, particular deforestation

The majority of an organisation's carbon footprint is likely to be made up of carbon emissions from fossil sources, such as oil or gas. However, emissions from sources of biogenic carbon, such as crops or wood, shall also be considered. The main reason why emissions from these different sources are reported separately is that there is a finite quantity of fossil carbon in the world, whereas biogenic carbon is a renewable source, and if grown in a sustainable manner, is preferable.

Global Warming Potential

The different types of greenhouse gas warm the atmosphere to varying extents. For example, methane has a global warming effect that is 25 times greater compared to carbon dioxide (CO₂), over a 100 year time period. The greenhouse gas Sulphur Hexafluoride, used in the electrical industry, is 22,800 more powerful than CO₂. It has a high 'global warming potential'.

Therefore, all greenhouse gases that are released must be accounted for and reduced. To make accounting easier, the amounts of all greenhouse gases are reported in a single metric, carbon dioxide equivalent (CO₂e).

1.1 Business Benefits of Reducing Emissions

Businesses contribute to climate change because of the different sources of greenhouse gases that they require to make the products and services they sell. For example, businesses require energy for heating, lighting and operating machinery, which is usually sourced from fossil fuels.

Reducing the amounts of greenhouse gases is important if we are to avoid dangerous levels of climate change. Industry contributes approximately 20% to global man-made greenhouse gas emissions.

There are also a variety of direct benefits to businesses that reduce their greenhouse gas emissions, such as:

- Meeting customer expectations
 - Business customers, especially in Europe and the United States of America, require suppliers to provide information on their greenhouse gas emissions
 - Consumers are increasingly buying products and services from companies that have demonstrated their commitment to reducing their environmental impact
- Reducing costs
 - Reducing the amount of fuel and energy that a company uses will save money
- Being prepared for government legislation
 - China's 12th Five Year Plan (2011-15) has identified the objective of reducing emissions growth in line with limiting global warming to within 2 degrees of pre-industrial levels
 - The European Union has set greenhouse gas reduction targets of 20% by 2020 and 80% by 2050, compared to 1990 levels

2 Calculating a Carbon Footprint

Businesses need to first measure their greenhouse gas emissions, or 'carbon footprint' in order to communicate this to customers and to make reductions. The following section aims to provide an overview of carbon footprinting that is designed for non-experts.

2.1 Business Goals

It is important that a company decides the business goals for the carbon footprint, as this will determine the approach that is taken. It is envisaged that the majority of Chinese SME's will undertake a carbon footprint of their business to achieve the following objectives:

- To identify where cost savings can be achieved
 - For example, from more efficient use of energy and fuel
 - Or where new, more efficient technology might be installed
 - Or using materials that are more environmentally sustainable
- To demonstrate to business customers that your company is taking responsibility for reducing its environmental impact
 - This is particularly important of international business customers
- To participate in an international reporting scheme, such as the Carbon Disclosure Project (CDP)
 - The footprinting tool designed for this project will enable companies to report to the CDP
- To demonstrate that reductions in greenhouse gas emissions have been achieved on an annual basis
- To report the carbon footprint of your company and/ or of the products that are made

2.2 Basic Calculation of Greenhouse Gas Emissions

The calculation of a carbon footprint usually requires:

- The identification of all possible sources of greenhouse gas emissions
- The choice of reporting year
 - Companies usually report their carbon footprint each year
 - Each year usually represents a 12 month time period
 - The first carbon footprint is considered as the 'baseline' that subsequent reporting years are compared against
- Collection of data
 - The calculation of the carbon footprint requires data
 - This data is often information on how much of a particular substance is used, such as;
 - How much fuel (per year, per type)
 - How much electricity (per year)
 - This data is often collected from formal sources, such as bills from utility providers and purchasing receipts

- All data should correspond to the chosen year. For example, if the year is January to December 2012, then all data should be for that entire year.
- Use of appropriate emission factors
 - Emission factors are used to calculate the CO₂e value for each source of greenhouse gas emission using the equation:

$$\text{Emissions} = \text{activity data} \times \text{emissions factor}$$
 - For example, the amount of fuel oil used per year is multiplied by the relevant emission factor to calculate CO₂e
 - (most emission factors will be provided as part of the footprinting tool developed for this SPF project)
- Calculating the sum of all emission events, divided into the relevant 'scopes'
 - All CO₂e values are added to calculate the total greenhouse gas emissions for that footprint
 - The footprint is separated and reported in the relevant 'scopes', which is a common approach for international reporting standards
 - (this will be done automatically in the footprinting tool developed for this SPF project)

2.3 Principles of Carbon Footprinting

Calculating a credible carbon footprint requires the collection of accurate data and the use of appropriate emission factors. When calculating a carbon footprint there are key data quality principles that should be considered:

- **Relevance:**

Ensure the carbon footprint reflects the greenhouse gas emissions of the entity being assessed, such as the company or product, and serves the decision-making needs of users, both internal and external to the company.

- **Completeness:**

Report all sources of greenhouse gas emission within the chosen assessment boundary and time frame. Disclose and justify any specific exclusions.

- **Consistency:**

Use consistent approaches to allow for meaningful comparisons of emissions over time. Transparently document any changes to the data, assessment 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. For example, document where you have collected data from.

- Accuracy:

Aim to achieve accurate assessment of the carbon footprint to enable users to make decisions as to the integrity of the reported information.

For more information on data quality principles, see Chapter 1 (p8-9) of the Greenhouse Gas Protocol 'Corporate Standard' published by the World Resources Institute (WRI) and the World Business Council for Sustainable Development (WBCSD) <http://www.ghgprotocol.org/standards/corporate-standard>.

3 Carbon Footprint of a Company

Calculating the carbon footprint of a company uses the approach and principles described previously and also requires specific data to be collected within the 'boundaries' of the carbon footprint assessment.

First, the *organisational* boundary needs to be defined, which can be set in one of three ways:

- **'Operational control'** defines the boundary of an organisation as all operations over which it has the full authority to implement new operating policies
- **'Financial control'** defines the boundary of an organisation as all operations from which it gains the majority of financial benefits
- **'Equity share'** defines the boundary an organisation all operations that it wholly or partly owns. For example, using this approach, if an organisation owns a 30% equity share of a company, it would include 30% of this company's emissions in its boundary.

For more information, see Chapter 3 and 4 (p16-33) of the Greenhouse Gas Protocol 'Corporate Standard' published by the World Resources Institute (WRI) and the World Business Council for Sustainable Development (WBCSD) <http://www.ghgprotocol.org/standards/corporate-standard>.

Second, the *operational* boundary needs to be defined, and the term that is used to describe these boundaries for a carbon footprint of a company is known as 'Scope 1 and Scope 2'.

3.1 Scope 1

Scope 1 emissions describe greenhouse gas emissions from sources that are directly owned or controlled by the company, sometimes also known as 'direct emissions'. They include:

- Emissions from the use of fuel in owned or controlled boilers, furnaces and vehicles
- Emissions from chemical reactions, such as waste processing, the manufacture and processing of materials such as cement or chemicals
- Fugitive emissions. This describes the intentional or unintentional release of greenhouse gases, such as leaks from seals, packaging and joints, the use of refrigeration and air conditioning equipment or methane leakages from gas transport

3.2 Scope 2

Scope 2 emissions are also generated by a company and are sometimes referred to as 'indirect' greenhouse gas emissions. Scope 2 emissions are generated by using purchased electricity that is consumed by the company, usually by machinery, lighting and heating. Emissions from purchased heat, steam and cooling are also included in Scope 2.

Scope 1 and Scope 2 emissions are usually accounted and reported separately by a company. The footprinting tool developed for this project will separately report Scope 1 and Scope 2 automatically in the results section.

3.3 Scope 3

Scope 3 emissions are an optional extra category that can also be reported by companies. It is unlikely that most Chinese SME's will choose to report their Scope 3 emissions because of the extra complexity and reduced business benefits of doing so. It is recommended that Scope 1 and Scope 2 emissions are the main focus of most company reporting, particularly for SME's.

Scope 3 emissions refer to the activities that are not owned or controlled by the company but take place as a consequence of their business. There are 15 different emissions categories across activities upstream and downstream of their company's activities, such as:

- Purchased goods and services
- Waste
- Business travel
- Distribution.

Larger corporates are likely to seek Scope 3 emissions data from their suppliers across the world, included those based in China. The tool is designed to provide the necessary information to them as part of this.

4 Carbon Footprint of a Product

Some companies also aim to understand the carbon footprint of their products. This requires a different approach from a company carbon footprint, such as Scope 1 and Scope 2, because it has to consider the greenhouse gas emissions that are associated with the entire lifecycle of a single product, such as all the energy, fuel and materials required from 'cradle to grave'.

For example, a lifecycle assessment of emissions includes each phase of a product's life, from the growing, mining or reprocessing of raw materials, through all the separate manufacturing stages of each component, the products use by the consumer and then its disposal.

The tool provided for this project is not designed for product footprinting, as this type of assessment is more complicated and outside the requirements of most Chinese SME's. The tool does, however, provide the user with an initial estimate of their product carbon footprint, as this information might be required by business customers who are themselves looking to footprint the products they sell to consumers.

5 Further Resources

There are international standards that provide more detailed guidance on how to conduct carbon footprint assessments, which include:

5.1 Company Footprinting

- The GHG Protocol 'Corporate Standard' published by the World Resources Institute (WRI) and the World Business Council for Sustainable Development (WBCSD) to provide standardised guidance to companies for them to manage their Scope 1 & 2 greenhouse gas emissions.
 - Available online:
<http://www.ghgprotocol.org/files/ghgp/public/ghg-protocol-revised.pdf>
- ISO 14064-1 Greenhouse gases - Part 1: Specification with guidance at the organization level for quantification and reporting of greenhouse gas emissions and removals.
 - Available online:
http://www.iso.org/iso/catalogue_detail?csnumber=38381
- Reporting guidance from the Carbon Disclosure Project.
 - Available online:
<https://www.cdproject.net/Documents/Guidance/CDP2012ReportingGuidance.pdf>
- Reporting questionnaires from the Carbon Disclosure Project.
 - Available online in English and Chinese:
<https://www.cdproject.net/CDP%20Questionnaire%20Documents/CDP-Supply-Chain-2012-Information-Request.pdf>
<https://www.cdproject.net/CDP%20Questionnaire%20Documents/CDP-Supply-Chain-2012-Information-Request-Chinese.pdf>

5.2 Product Footprinting

- The 'Publically Available Specification 2050' originally written by the Carbon Trust and co-published with the Department of Environment, Food and Rural Affairs (Defra), which is a government department in the UK.
 - Available online:
<http://www.bsigroup.com/Standards-and-Publications/How-we-can-help-you/Professional-Standards-Service/PAS-2050/>
- The 'Product Life Cycle Accounting and Reporting Standard' also published by the WRI and the WBCSD.
 - Available online:
<http://www.ghgprotocol.org/files/ghgp/Product%20Life%20Cycle%20Accounting%20and%20Reporting%20Standard.pdf>



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