Carbon footprint

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Abstract: Climate change is increasingly recognised as a major challenge. It is widely accepted that the greenhouse gas emissions caused by humans, have 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 minimized. The total set of greenhouse gas emissions caused directly and indirectly by an individual, organization, event, or product is commonly called their carbon footprint. Establishing the carbon footprint of an organization can be the first step in a program to reduce the emissions it causes.

Key words: carbon footprint, carbon footprint for organization CO_2 emissions, GHG emissions, environmental management systems, green action plan, sustainable activities, low-carbon society, green business challenge, environmental communication

Ogljični odtis

Povzetek: Podnebne spremembe vedno bolj ogrožajo človeštvo. Splošno sprejeto je dejstvo, da imajo izpusti toplogrednih plinov, ki jih povzročajo dejavnosti ljudi, negativne vplive na okolje, predvsem na podnebni sistem. Najpomembnejši toplogredni plin, ki ga ustvarjajo človeške dejavnosti, je ogljikov dioksid (CO_2). Praktično vse človeške dejavnosti povzročajo izpuste CO_2, posledica teh pa so podnebne spremembe. Z uporabo električne energije, proizvedene v termoelektrarnah na fosilna goriva, s sežiganjem plina ali kurilnega olja za ogrevanje, z vožnjo v avtomobilih z bencinskimi ali dizelskimi motorji je vsakdo med nami odgovoren za emisije CO_2. Nadalje je vsak izdelek ali storitev posreden vzrok izpustov CO_2, saj je energija potrebna tako za njihovo proizvodnjo kot za transport, uporabo in odlaganje, oziroma uničenje. Vse to lahko povzroča tudi izpuste drugih toplogrednih plinov, zato je ključnega pomena, da se resno lotimo obravnave celotnega spektra naših vplivov, če želimo čim bolj zmanjšati učinke podnebnih sprememb. Seštevek vseh emisij toplogrednih plinov, ki jih neposredno ali posredno povzročajo človek, organizacija, dogodek ali proizvod, imenujemo ogljični odtis. Določitev ogljičnega odtisa posamezne organizacije je lahko prvi korak v načrtovanju zmanjševanja emisij, ki jih povzroča.

Ključne besede:, ogljični odtis, izračun ogljičnega odtisa, ogljični odtis za podjetja, CO2 emisije, emisije toplogrednih plinov, skrb za okolje, okolju prijazna pisarna, zeleni akcijski načrt, nizkoogljična družba, okoljsko komuniciranje

Introduction

Climate change is increasingly recognised as a major challenge. It is widely accepted that the greenhouse gas emissions caused by humans, have a negative impact on the environment. The most important greenhouse gas, arising from human activity, is carbon dioxide (CO_2). The total set of greenhouse gas emissions caused directly and indirectly by an individual, organization, event, or product is commonly called their carbon footprint. Establishing the carbon footprint of an organization can be the first step in a program to reduce the emissions it causes.

1. 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 organization is responsible. Footprints can also be calculated for events or products.

The full footprint of an organization encompasses a wide range of emissions sources from direct use of fuels to indirect impacts such as employee travel or emissions from other organizations up and down

the supply chain. When calculating an organization'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 organization'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. A common classification is to group and report on emissions by the level of control which an organization has over them. On this basis, greenhouse gas emissions can be classified[1] into three main types:

1.1. Direct emissions that result from activities under the organization's control

Most commonly, direct emissions will result from combustion of fuels which produce CO2 emissions, for example the gas used to provide hot water for the workspace. In addition, some organizations directly emit other greenhouse gases. For example, the manufacture of some chemicals produces methane (CH4) and the use of fertiliser leads to nitrous oxide (N_2O) emissions.

1.2. 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 renewable ones. However, in the UK around 75% is produced through the combustion of fossil fuels. Although the organization is not directly in control of the emissions, by purchasing the electricity it is indirectly responsible for the release of CO_2.

1.3. Indirect emissions from products and services

Each product or service that is purchased by an organization is responsible for emissions. So the way the organization 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 organization.

It is clear, therefore, that producing a full footprint – as information – 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 organizations 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 (t CO_2e). However, others calculate the footprint to include CO_2 only and express the footprint in t CO_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.

2. 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.

3. Foot-printing for management of emissions

Calculating an organization's carbon footprint can be an effective tool for ongoing energy and environmental management. If this is the main reason that an organization 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

[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

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

4. Foot-printing for accurate reporting

Organizations 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 organization 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.

5. Calculating a carbon footprint

For most organizations, 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 vehicles, 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 organization'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 organization 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;
• Prioritize 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.

6. 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).

6.1. Define the methodology

For a footprint to be accurate there must be a consistent approach, which is why it is important to define the organization'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 organization, which depends on many individuals to help collect and interpret data. Some organizations choose to define their own approach for carbon foot-printing. However, it is usually quicker and better to use a methodology that is already widely accepted and understood. The results may be found more credible, and can be compared with other organizations 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).

6.2. 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 organization 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 organization.

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 organizational boundary and inclusion of emissions sources, it is important to document the decision transparently.

6.3. 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 vehicles utilization;
• 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 organization;
• 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 t CO_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.

6.4. Verify results

Having a carbon footprint verified by a third party, such as a consultancy or accountancy firm can lend credibility to an organization'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.

6.5. 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.

7. 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 organization then acts to reduce emissions and improve efficiency. Carbon foot-printing can be a useful exercise as part of a complete environmental management system.

8. Conclusion

An individual's, enterprise's or another organization's social responsibility concerning humans' natural environment can receive support from information reflecting the carbon footprint. How holistic and hence reliable this information is, depends on the selected level of detailed insight, analysis, and complexity of the processes to be reported about. So far, this information is not as unified as necessary and desirable for the environment management to have a fully reliable basis. Still, foot-printing is a serious positive step forward.

References:

1. The Carbon Trust, 2007