CARBON TRUST

Product carbon footprinting: the new business opportunity

Experience from leading companies

Contents

Preface

The Carbon Trust is an independent company set up in 2001 with the support of the UK Government. Its mission is to accelerate the transition to a low carbon economy. The Carbon Trust carries out a wide range of activities, including working directly with business to reduce carbon emissions, explaining the strategic implications of climate change and investing in new technologies and businesses that will help to tackle climate change.

Since 2006 the Carbon Trust has worked with companies to measure, reduce and communicate carbon emissions across the supply chain, as part of our broader efforts to accelerate the move to a low carbon economy. When we began, there was no consistent, practical method for measuring the carbon footprint of products – meaning either goods or services – yet it is essential information to help companies:

- Identify the true drivers of emissions and reduction opportunities across their products' life cycles.
- Inform customers and other stakeholders of the carbon content of their products.

In response to this market need, the Carbon Trust launched an initiative to measure, reduce and communicate the life cycle greenhouse gas (GHG) emissions of goods and services, or 'product carbon footprints'. The initiative includes three parts:

PAS 2050 – development of a new Publicly Available Specification (PAS) through BSI British Standards, jointly sponsored by the Carbon Trust and Defra, defining a robust, consistent measurement method of product life cycle GHG emissions.

Code of Good Practice on Product GHG Emissions and Reduction Claims – framework requirements for communicating product carbon footprint and reduction information, sponsored by the Carbon Trust in response to calls for guidance from industry and other stakeholders.

Carbon Reduction Label – working with companies to measure product carbon footprints in practice and to inform customers of the GHG impact of their products through a range of different channels; managed through the Carbon Label Company, a subsidiary of the Carbon Trust.

Over 20 leading companies have tested the standard calculation method and informed the development of the communications and reduction framework. Some of these companies are already using the Carbon Reduction Label as well. Through this process we have learned important lessons about the impact product carbon footprinting and labelling can have on businesses' commercial and environmental goals, and how relevant, applicable and pragmatic the approach can be. We hope other businesses will build on this experience and leverage the PAS 2050, Code of Good Practice and Carbon Reduction Label to capture the business opportunities associated with this approach.

This report summarises lessons learned during our experience, focusing on three main areas:

- Standards development and implementation.
- Business benefits from measuring and communicating product carbon footprints.
- Future business opportunities in product carbon footprinting, reductions and communications.

Also linked to this publication are a range of case studies illustrating companies' experiences in more detail – why they wanted to measure product carbon emissions, how they went about it, what they achieved and their plans for the future (accessible at www.carbontrust.co.uk and www.carbon-label.com).

Tom Delay, Chief Executive

Executive summary

Overview

- Product carbon footprinting addresses businesses' need to better understand how their products and supply chains impact carbon emissions, and to respond to growing consumer demand for carbon information and low-carbon products.
- PAS 2050, the first standard method for calculating life cycle greenhouse gas (GHG) emissions of products, was published in October 2008 by BSI British Standards, co-sponsored by the Carbon Trust and UK Department for Environment, Food and Rural Affairs (Defra).
  - PAS 2050 integrates product life cycle assessment with GHG emission accounting – a complicated union, but necessary in order to reliably and consistently calculate product-level emissions.
  - To support consistent communications of product carbon footprints, the Carbon Trust simultaneously sponsored the Code of Good Practice on Product GHG Emissions and Reduction Claims and developed the Carbon Reduction Label to provide companies with a certified, consistent and comparable way to display their products' footprints, along with a commitment to reduce those footprints over time.
- Over 20 leading companies applied the method across a wide range of products during the development process, leading to a standard that is both robust and practical for businesses to implement.
- The experience of these companies has already revealed the value of measuring product-level GHG emissions. These companies have:
  - Uncovered the true drivers of carbon emissions across a product's life cycle.
  - Identified high-impact emission reduction – and cost savings – opportunities.
  - Strengthened supplier relationships.
  - Developed better business and management practices in general.
- Product labelling provides further benefits, as seen by the companies who have communicated their products' carbon footprints using the Carbon Trust Carbon Reduction Label. They have already:
  - Realised additional emission and cost savings, driven by the Carbon Reduction Label's required commitment to ongoing reductions.
  - Differentiated their products to customers.
  - Improved their corporate brand and reputation.
- Product carbon footprinting and labelling is still in its nascent stages but is growing rapidly. Companies who act now can seize an advantage by:
  - Participating in the growing internationalisation of the standard and Carbon Reduction Label.
  - Building a reputation for excellence in the growing product carbon footprinting 'industry' of consultants, certifiers, software providers and database developers.
  - Responding to accelerating consumer demand for product carbon information and lower carbon products, and gaining from the cost savings that result from reducing emissions.

Importance of product carbon footprinting

Product carbon footprinting offers a unique view of GHG emissions, taking a single product from raw materials through manufacturing, distribution, use and disposal/recycling, and calculating the emissions created as a result of all related activities and materials. It can also be applied to the delivery of a service.

This view is critical for two reasons. First, in many developed countries such as the UK, GHG emissions arising from consumption of goods and services is greater than the emissions actually produced in the country – the UK is a 'net importer' of GHG emissions, and this trend is increasing. To ensure global reduction targets are met, it is critical to understand the full picture of carbon emissions driven by consumption, regardless of where the emissions occur.

Second, consumers recognise their role in contributing to climate change and are beginning to demand more information on the impact their purchasing decisions and behaviours have on emissions. A consumption-based view of emissions helps us understand not just what the emissions are across the economy, but why they exist. Product carbon footprinting provides the information these consumers need to make more informed choices. It also acts as the starting point for businesses looking to reduce the emissions associated with their products and unlock resulting cost savings, as well as providing a basis for developing future low-carbon products.

However, no single, consistent method for calculating product carbon footprints has existed until now.

Measurement and communication standards

PAS 2050, the first standard method for calculating life cycle GHG emissions of products, was launched in October 2008. The Carbon Trust also created a Code of Good Practice to standardise communications and reduction claims and the Carbon Reduction Label to provide a trustworthy way for companies to share their product footprint information publicly.

Developed by BSI British Standards and co-sponsored by the Carbon Trust and UK Department for Environment, Food and Rural Affairs (Defra), PAS 2050 is a Publicly Available Specification that establishes a standard approach to calculating life cycle GHG emissions. Building from the Carbon Trust's method created in 2006, its development was led by an independent Steering Group and incorporated two rounds of stakeholder consultations (~1,000 experts from business, academia, government and NGOs). Input was also provided by several Technical Working Groups, plus the experience gained through testing the method with companies on real products. The result is a standard method that is both robust and practical for businesses to implement.

PAS 2050 addresses many of the complex issues driven by the integration of product life cycle assessment (LCA) and GHG emissions accounting. Although some of the decisions were difficult, particularly around issues such as recycling and allocation, PAS 2050 addresses each one and provides a consistent approach to calculating life cycle GHG emissions.

The Carbon Trust also sponsored a Code of Good Practice for Product GHG Emissions and Reduction Claims with the Energy Saving Trust to set a standard for companies who want to communicate their product carbon footprints and make claims about emission reductions. Like PAS 2050, the Code's development was led by an independent Steering Group and involved several rounds of stakeholder consultations, plus input from companies who were applying it in practice.

To provide companies who comply with these standards a means of credibly communicating their product carbon footprints, the Carbon Trust also developed the Carbon Reduction Label. Managed through a wholly owned subsidiary – Carbon Label Company – the Carbon Reduction Label offers companies an independently certified, consistent and comparable public display of their products' carbon footprint information. The Carbon Reduction Label can be used across a range of different channels including website, CSR report, brochures, point-of-sale and on the product itself.

It also states the company's commitment to reduce product emissions over time, and it can include an explanation of the footprint, a comparison to footprints of alternative products in the category and tips for consumers on how they can reduce the product's emissions by changing the way they use it.

Approach used by over 20 companies during development

Over 20 leading companies trialled the method during the development process, contributing to a standard that is both scientifically robust and practical for businesses to implement.

Working with the Carbon Trust, these companies across diverse sectors and sizes tested the draft PAS 2050 on over 75 product types covering goods and services; B2B customers as well as consumers; local and international supply chains; and both simple and complex product life cycles.

This practical experience with companies was fed back into the PAS 2050 development process and helped ensure a standard method that is robust yet practical for any company to implement, regardless of size or sector.

Measuring product carbon footprints creates value for businesses

Companies have already begun to see real benefits from assessing product carbon footprints.

First and foremost, product carbon footprinting identifies the true drivers of GHG emissions, often revealing some surprises. It therefore enables better targeted, more effective emissions reduction and cost savings initiatives, which may or may not fall under the company's direct control. Some companies who have used the draft PAS 2050 method have already reduced product-level GHG emissions by 15-20%. Considerable cost savings have also been achieved due to energy and waste efficiency measures across the supply chain.

Product carbon footprinting also helps companies strengthen relationships with suppliers, particularly if it reveals cost savings opportunities up the supply chain.

In addition, measuring product carbon footprints can improve a company's general business or management practices in unanticipated ways, such as developing interactive tools to improve sourcing decisions.

Further benefits achieved through communicating product carbon footprints

Companies who choose to communicate their product carbon footprints have realised added benefits, including greater carbon – and cost – savings, product differentiation and general brand enhancement.

Labelling can boost emissions reduction efforts in two ways. First, the public commitment to reduce emissions over time helps create a sense of urgency across the supply chain, creating momentum to follow through with emissions reduction measures. As a result of the urgency created through this public commitment, some companies have initiated 'supplier summits' and other programmes to bring various parts of the supply chain together, discuss the product carbon footprint and identify joint ways to reduce emissions.

Second, by putting credible information in the hands of consumers, companies who label help consumers reduce their own impact on climate change. Armed with information on alternative product footprints and how their behaviours during the use phase affect product emissions, consumers are empowered to reduce emissions themselves.

Using the Carbon Trust Carbon Reduction Label also helps companies differentiate their products based on their commitment to reduce emissions and general willingness to pioneer credible carbon labelling. Consumers are beginning to demand 'low carbon' products and the information they need to make informed choices: 67% of UK consumers surveyed are more likely to buy a product with a low carbon footprint[1], and 44% would switch to a lower-carbon product even if the brand was not their first choice[2].

Other research has shown that, regardless of the product's actual carbon footprint, consumers prefer products that are carbon labelled: 49% are more likely to buy a product if the label is displayed on pack[3], and 65% declared a label indicating suppliers have committed to reducing a product's emissions would make them more likely to buy it[4].

For B2B companies, the Carbon Reduction Label offers additional ways to differentiate products. Companies who label for business customers provide certified product carbon footprint data up to their customer's gate, thereby reducing the time and cost required for the customer to footprint its products. One B2B company has created a sales tool based on its product carbon footprint analysis that it uses with business customers to discuss emissions implications of various product configurations.

In addition to differentiating products, labelling boosts a company's overall brand image. 44% of customers surveyed by Walkers (a UK-based subsidiary of PepsiCo) stated the Carbon Trust Carbon Reduction Label used on the company's crisps makes them feel more positive about Walkers, rising to 63% of 'social influencers' (people who like talking to others about brands)[5].

[1] GfK NOP Oct 2006.

[2] LEK Consulting Carbon Footprint Report 2007; research conducted by YouGov, representative sample of 2,039 UK consumers.

[3] Populus Concerned Consumers Survey July 2007; 1,063 adults aged 18+.

[4] Boots internal market research; 1,029 Advantage Card users September 2007.

[5] Millward Brown research commissioned by Walkers.

Opportunities for companies to lead – or be left behind

The future will offer big opportunities for companies to lead – or be left behind – in product carbon footprinting, reductions and communications. Product carbon footprinting is a fast-growing industry of its own, with opportunities for companies who act now to seize an advantage.

Three trends are expected to accelerate over the next few years: internationalisation of the standards and communications/labelling of products, growth of support services to speed and ease implementation and increasing consumer demand for product carbon information and lower carbon products.

The Carbon Trust, Defra and BSI are committed to internationalising PAS 2050. To this end, PAS 2050 has become a seed document for two international standards development processes: (1) World Resources Institute and World Business Council on Sustainable Development's planned Product GHG Protocol; and (2) International Organization for Standardization's (ISO) plans to develop a new international standard. The Carbon Trust sits on the GHG Protocol Steering Committee and is also participating with BSI in the ISO process.

Companies are also helping to accelerate the internationalisation of product carbon footprinting and PAS 2050. For example, companies who have tested the Carbon Reduction Label in the UK are rolling it out to other countries, including continental Europe, Asia and the USA. The Carbon Trust's Carbon Label Company subsidiary has now set up operations in these regions to support these international efforts.

Implementation will become easier and more cost effective as more trained consultancies, accredited certifiers, software and databases become available to meet growing demand from businesses. The Carbon Trust is working with the UK Accreditation Service (UKAS) to develop a pool of accredited product carbon footprint certifiers in the UK and internationally, which will increase the availability of skilled certification bodies while still maintaining the integrity and consistency of footprint results.

Finally, consumer demand for product carbon information and lower carbon products will increase as more companies use PAS 2050 and the Carbon Reduction Label, creating a virtuous cycle that is sure to accelerate product carbon footprinting and labelling.

Based on results from the 20 leading companies that have used the standards and the subset that has used the Carbon Reduction Label so far, a fast-growing product carbon footprinting 'industry' will translate into substantial reductions in GHG emissions, and associated cost savings, no matter where the emissions are generated. Better informed businesses and consumers will be able to make more informed choices about the products they buy – and how they use and dispose of them – further contributing to global emissions reductions and creating opportunities for companies to differentiate their products and brands. Understanding emissions at a product level is therefore key to addressing the global problem of climate change and for companies to capture the associated business opportunity this transition offers.

The future will offer big opportunities for companies to lead – or be left behind – in product carbon footprinting

Introduction and context

Moving to a low carbon economy will require fundamental changes to the ways that businesses deliver goods and services.

Mapping GHG emissions to consumption

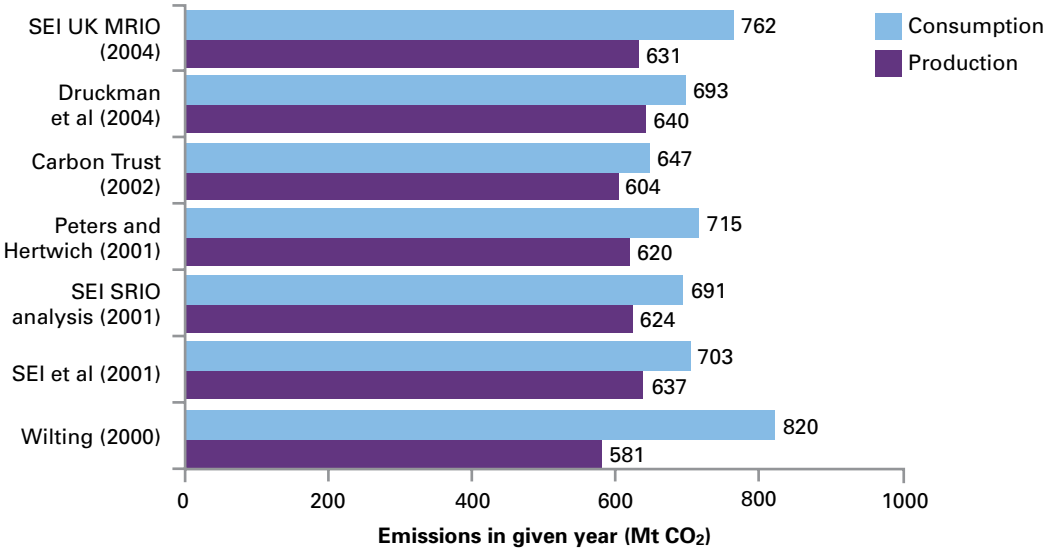
Typically a country's GHG emissions are calculated on a production basis, or the emissions produced within a country's borders. By this measure – used in the Kyoto Protocol process – some countries are well on their way to meeting national targets. The UK, for example, has reduced its GHG emissions by 15% vs. 1990 levels according to this method.

However, 'production' accounting ignores the impact of goods and services consumed within a country's borders but that were produced elsewhere, contributing to GHG emissions in other countries. Recent studies[6] have shown that when emissions associated with net imported goods and services are included in the UK's carbon footprint, emissions actually appear to be rising, potentially as much as 19% since 1990. This 'offshoring' of emissions means that they disappear from the UK's Kyoto-measured emissions but can be identified through measurements based on consumption.

Although this analysis is preliminary, it is supported by other studies[7] that reveal the UK's consumption emissions to be higher than production accounting suggests – anywhere from 7-40% higher (see Chart 1). Moreover, the GHG 'intensity' of imports (emissions per £) appears to be rising, suggesting that this trend will only get worse.

To begin reducing these consumption-driven emissions, it is necessary to understand the life cycle GHG emissions of these goods and services, from raw materials through production, distribution, use and disposal/recycling. Product-level carbon footprints offer transparency on the sources and drivers of emissions, which leads to higher impact reduction measures. Similarly, product-level information helps inform consumers of their role in contributing to, and fighting, climate change. It empowers them to choose products on the basis of GHG emissions, and also to change behaviours to further reduce their impact on climate change.

Chart 1 *Studies show UK emissions measured by consumption are 7-40% higher than production-based emissions*



Source: Stockholm Environment Institute (SEI), 2008 – article providing results of various studies given above. These are independent analyses using different base data, assumptions, methodologies and base years (shown in parentheses).

[6] Helm, Smale and Phillips, *Too good to be true?* The UK's climate change record, December 2007.

[7] Stockholm Environment Institute, *Development of an embedded carbon emissions indicator*, UK Defra, 2008.

Consumer interest on the rise

Consumers are beginning to rise to this challenge. Over the past three years, consumers have begun to recognise their role in contributing to climate change and the impact they can have in fighting it. They want to help, but do not have the information they need. Market research has shown that 73% of UK consumers claim they are aware of environmental problems but not solutions[8]. Moreover, 79% do not believe that business is doing enough to help consumers make informed choices about the carbon content of the products they buy[9].

At the same time, consumers remain sceptical of 'green' claims made by companies: ~60% say claims by manufacturers and retailers are not credible[10], and ~70% would value an independent assessment of a company's low carbon claims[11]. Growing consumer awareness has thus created new demand for more and better information on the carbon content of the goods and services they buy, based on robust underlying methods.

Challenge: no consistent method

As of 2006, no standard approach to measuring product carbon footprints existed, let alone a credible way to communicate them to consumers.

Available standards either measured emissions at a company level rather than a product level (e.g. the GHG Protocol and ISO 14064) or covered broader environmental product life cycle measurement but did not address issues unique to GHG emissions such as land use change or aircraft emissions (e.g. ISO 14040, 14044). No one in the environmental, academic, government or business community had yet combined these approaches into a standard method for calculating product life cycle GHG emissions.

Realising that product carbon footprints were key to unlocking emission reduction opportunities across the supply chain and engaging consumers in combating climate change, the Carbon Trust launched an initiative to standardise product carbon footprinting and communications and help businesses measure, reduce and communicate their product carbon footprints in practice. The resulting initiative, which set out to develop an approach that was comprehensive, credible and at the same time practical, has three parts:

- A standard method for calculating product carbon footprints which became BSI PAS 2050, jointly sponsored by the Carbon Trust and Defra.
- Rules for communicating product carbon footprints and reductions (the Code of Good Practice on Product GHG Emissions and Reduction Claims).
- Carbon Label Company, a subsidiary set up by the Carbon Trust to offer companies a way to display their products' carbon footprint information consistently, credibly and with a commitment to reduce the footprint over time.

The following sections describe the lessons learned from experience working with over 20 leading companies in these areas.

[8] The Climate Group 2006.

[9] GfK NOP October 2006.

[10] LEK Consulting Carbon Footprint Report 2007 (research conducted by YouGov).

[11] GfK NOP October 2006.

The method: PAS 2050 and the Code of Good Practice

PAS 2050 is helping to establish a common approach to assessing product carbon emissions, which is critical to maintaining consistency in the way companies assess and disclose their products' impact on climate change. It's also essential for ensuring that business and consumer decisions on how to reduce emissions are made based on complete and consistent information.

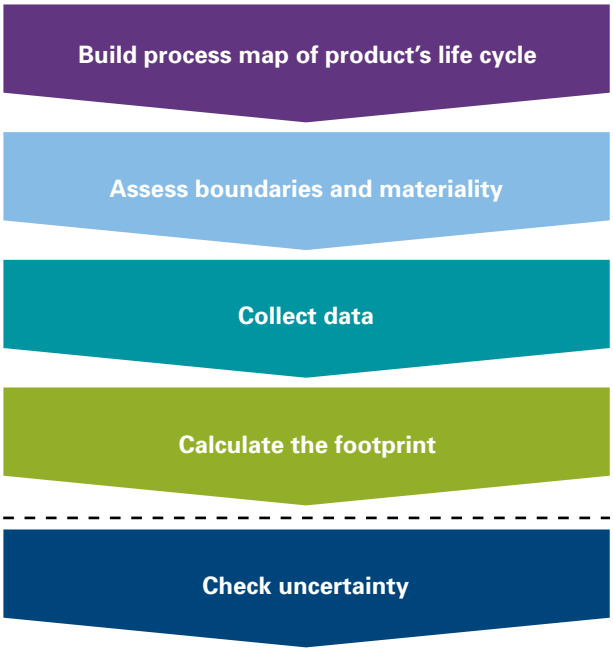
The assessment approach: PAS 2050

Publicly Available Specification (PAS) 2050 meets the demand for a supply-chain oriented approach to carbon accounting by providing a robust and consistent method for product GHG assessment. PAS 2050 is a specification for the assessment of the life cycle greenhouse gas emissions of goods and services, allowing organisations within the supply chain, and the users of goods and services, to better understand the carbon implications of their actions. PAS 2050 builds extensively on existing standards and approaches, particularly in relation to established life cycle assessment standards, but provides greater certainty around the requirements for product-specific GHG emissions assessment. The sidebox *Developing PAS 2050* (opposite) describes the process used to develop this new standard.

PAS 2050 is based on process Life Cycle Assessment (LCA), an approach which is commonly used in supply chain analysis to identify opportunities to reduce waste and increase efficiencies across an entire product system.

This is broader than simply focusing on improvements within a single company, and requires an understanding of the processes involved in the production, distribution, use and disposal of a given product. The product carbon footprinting method described in PAS 2050 is based on the five main steps shown in Chart 2.

Chart 2 *Five steps to calculating product carbon footprint*



By following a structured approach to implementing product carbon footprinting, businesses will gain maximum value from footprinting activities. Structuring the approach as suggested here, and in the Guide to PAS 2050[12], ensures that businesses gain a full insight into the structure and nature of their supply chains; that the full GHG impact of products, and hence the business's exposure to carbon issues, is understood; and that the assessment of carbon footprints forms a reliable and fact-based platform from which businesses can act to reduce their products' emissions, introduce low carbon alternatives and engage with suppliers and customers. Not all aspects of carbon footprinting are straightforward, and the next section considers some of the key issues that will arise for different businesses.

[12] For detailed information and support in carrying out a product carbon footprinting assessment, the Carbon Trust and Defra have co-authored the Guide to PAS 2050, also published by BSI, that can be found at www.bsigroup.com/PAS2050.

Developing PAS 2050

Standard setting occurs at a number of levels, from private standards for individual companies through to internationally agreed standards through organisations such as the International Organization for Standardization (ISO) and the European Committee for Standardization (CEN). In the UK, a Publicly Available Specification (PAS) is offered by BSI as a step in the process of standardisation, and allows for useful and practical information to be made available quickly to suit the market need of the developers and users of the standard.

The Carbon Trust and the Department for Environment, Food and Rural Affairs (Defra) were co-sponsors of Publicly Available Specification 2050 (PAS 2050), with BSI providing project management and independent oversight of the development process. BSI sets minimum requirements in terms of oversight, consultation and consensus, which are integral parts of the PAS development process, and which ensure that the final outcome considers the wider views of stakeholders.

PAS 2050 was developed between June 2007 and October 2008; this 16-month development phase was significantly longer than the 6-9 month period usually experienced by BSI for PAS development, and reflected both the complex technical nature of the standard, and the desire to go beyond the minimum consultation requirements of PAS development.

The development of the PAS was overseen by an independent Steering Group, including business, academic, government and expert members, and chaired by Professor Jim Skea, Research Director at the UK Energy Research Centre. The PAS Steering Group comprised 13 members whose skills and experience were relevant to the development of the assessment method. This group:

- Oversaw the development of the PAS, informed by best practice.
- Identified areas for further research, and topics to be considered by working groups, consultants or through in-house expertise.
- Identified key stakeholders for consultation purposes (supported by the project team).
- Made decisions on the PAS that incorporated feedback from the consultation process.

The decision-making activities of the Steering Group were achieved through consensus (overwhelming agreement).

Consultation activities extended far beyond those required for typical PAS development. Under the BSI model, the development of a PAS requires a single round of public consultation; however, for PAS 2050, consultation activities were far more extensive, including:

- Two rounds of consultation, approaching over 1,000 UK and international stakeholders.
- Workgroups established on key topics related to product carbon footprinting, establishing a second route through which expert input on the approach taken in PAS 2050 could be explored.
- Testing different draft versions of PAS 2050 via a pilot partner programme, allowing feedback from real-life application of the method to be considered by the Steering Group.
- Updates on progress and key issues arising in the PAS development process given at a wide range of industry and academic events in the UK and internationally.

Consultation activities were co-ordinated by BSI, which will continue to have oversight of the PAS now that it has been published, and will lead the update process over the next two years.

The result of this consultative and consensus-driven process is a standard that has specific requirements for the assessment of GHG emissions of products, and the key stages and important topics discussed in this chapter. The value of PAS 2050 is in providing certainty around the approach to be taken for assessing GHG emissions of products.

However, while PAS 2050 supports consistency and comparability in product carbon footprinting, it cannot fully achieve these goals in isolation. For this reason, the Carbon Trust, in association with the Energy Saving Trust, developed a Code of Good Practice for communicating product emissions and reductions; this is outlined at the end of this section.

Addressing key issues

PAS 2050 had to address some challenging topics in order to provide a rigorous yet practical approach to product carbon footprinting. Some of these debates are firmly rooted in existing life cycle assessment methods, including issues around the treatment of emissions from recycling, or the allocation of emissions from processes that create more than one product. The PAS development process identified many areas where there was little guidance around issues that were central to consistent product GHG emissions assessment. Therefore, PAS 2050 provides specific requirements for many aspects of life cycle assessment related to product carbon footprinting.

This has been an essential, and in some cases controversial, aspect of the work: while clearly setting out the requirements of the approach, some difficult decisions were necessary. Some of these topics and decisions are discussed below in relation to the process of implementation.

Step 1: Building a process map

Understanding the process flows behind the life cycle of a product is an essential first step in assessing product GHG emissions. For some products, the supply chain may be very straightforward; for others, the mapping exercise may reveal previously unrecognised complexity. Typical stages in a product's life cycle are shown in Chart 3 below; however, company- and product-specific supply chains can be very different, and three examples are presented in this section.

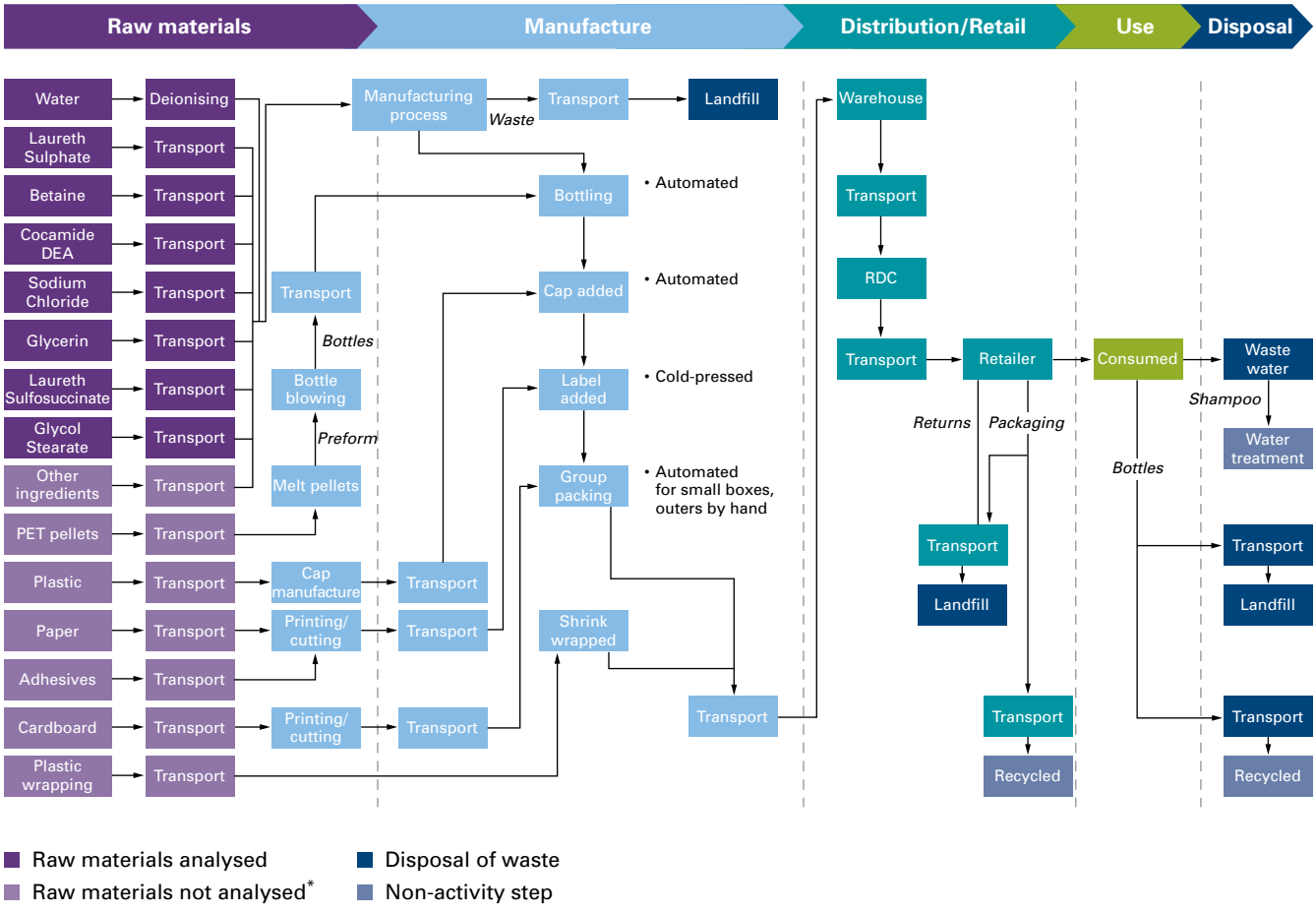
Boots Botanics shampoo is an example of a relatively complex product process map (Chart 4). To consumers, a bottle of shampoo may seem a simple product, but from a business and carbon perspective it is anything but. Constructing the process map of Boots' Botanics range of shampoo revealed a complex supply chain; it also revealed opportunities for carbon and energy reductions that were previously hidden from the company.

By contrast, the simplicity of the innocent smoothie recipe resulted in a relatively straight-forward process map (Chart 5). However, the innocent supply chain also includes a significant international component. For this reason, the carbon footprinting method needs to be widely applicable – and accepted – as agreement over a common approach can minimise costs for suppliers and customers.

Chart 3 *Typical stages in a product's life cycle*

Key questions
- What materials are used?
  - Where did they come from?
  - Where are they going?
- What requires energy (fuel, electricity)?
- What could cause direct emissions?

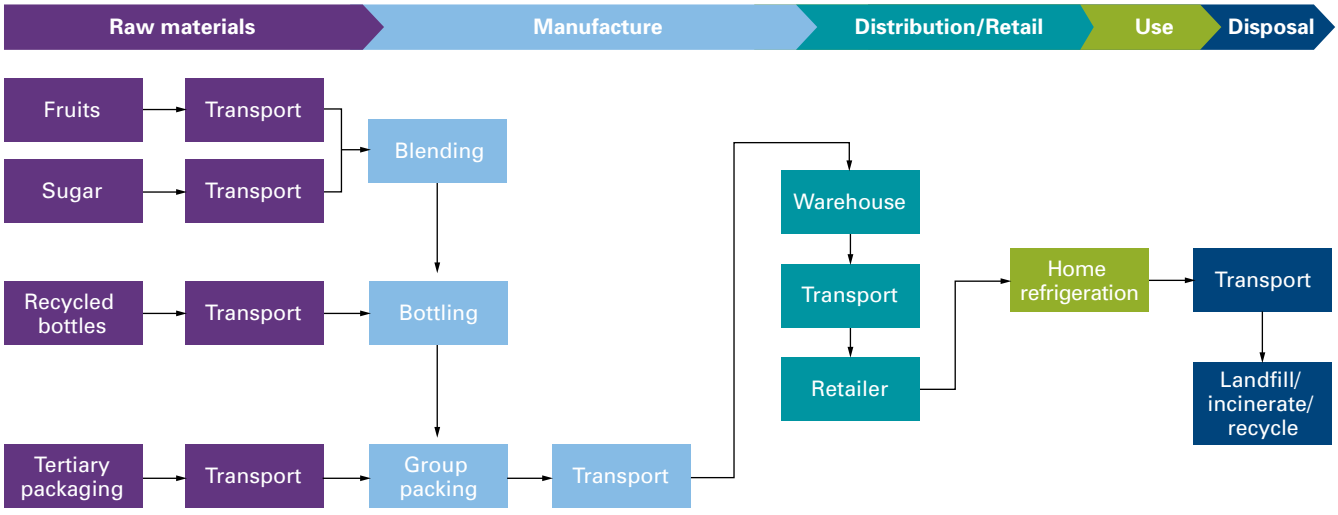
Chart 4 *Boots Botanics shampoo process map – example of a complex product supply chain*



Raw materials analysed
Raw materials not analysed*
Disposal of waste
Non-activity step

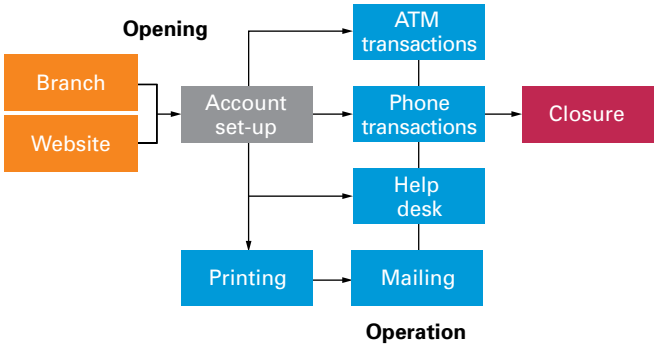
*Not analysed because immaterial impact on overall product footprint (see Step 2).

Chart 5 *innocent's smoothie process map – example of a simple product supply chain*



Services raise their own particular issues, starting with the definition of the service being provided. In the case of the Halifax Web Saver account (Chart 6), the service is the provision of one year of online banking. While the technology behind banking may be highly complex, the process map for the provision of this type of banking service is relatively straightforward.

Chart 6 *Halifax Web Saver account – example of a service supply chain*



Step 2: Assess boundaries and materiality

Boundaries (the limits around a life cycle that are defined in product carbon footprinting) and materiality (the significance of minor sources of emissions to the overall product carbon footprint) have a strong bearing on the ease and final outcome of a product's GHG assessment.

PAS 2050 provides requirements around boundary-setting for different phases of the life cycle of a product. Boundaries are important because they determine what activities, and therefore emissions sources, are included or excluded from the analysis.

A materiality rule has also been introduced in PAS 2050, setting a minimum threshold for any single emission source to be included. A materiality requirement minimises the effort required to collect data on minor contributors to the product's overall footprint. The rule allows any one source contributing less than 1% of the total footprint to be excluded, provided the total exclusions do not exceed 5% of the overall product carbon footprint.

PAS 2050 addresses two particularly tricky issues arising from this step in the product carbon footprinting process:

- Defining the boundaries of a business-to-business, or partial, supply chain.
- Assessing emissions during the consumer 'use phase'.

Partial GHG emissions assessment (B2B)

While PAS 2050 provides a method to assess the full life cycle GHG emissions of products, there may be many different companies contributing to different stages of the supply chain. In these circumstances, it may be appropriate for companies within the supply chain to provide their business customers with carbon footprint information up to their point in the supply chain (rather than for the whole life cycle). Prior to PAS 2050 there was no standard method for assessing these partial emissions that arise from, for example, a company that manufactures and supplies component parts to other business customers. PAS 2050 specifies the boundaries around this partial system, allowing B2B companies to offer consistent, robust and independently verified product carbon footprint data to their business customers. Having certified, PAS-compliant data from suppliers then simplifies product carbon footprinting for companies with multiple inputs to their processes – a potential competitive advantage for B2B companies.

'Use phase' emissions

Assessing the emissions arising from the use phase of a product is important, particularly for products requiring energy during use such as light bulbs, shampoo and refrigerated juice. However, it is also challenging, as there is no real certainty over how any one product will be used, and little chance that every product will be used in the same way.

On the other hand, excluding use phase emissions could lead to perverse outcomes. For example, if incandescent and compact fluorescent light bulbs (CFLs) were compared without including use phase emissions, CFLs would appear to have a higher carbon footprint. In fact, when use phase emissions are included, they have a much lower footprint (7kg CO_2e per 1,000 hours of light for CFLs vs. 36kg CO_2e for a regular 60-Watt bulb).

On this basis, PAS 2050 requires use phase emissions to be included in the product carbon footprint. The approach specified is to establish a 'use profile' which describes the assumptions used to quantify use phase emissions. This use profile must be made public if the company chooses to communicate its product carbon footprint. Thus, third parties who receive and use the footprint information can assess for themselves the validity of the underlying assumptions. Also, by making the assumptions transparent and public, this requirement provides the potential for consistency across different companies' product footprints.

Step 3: Collect data

Data collection is a critical step in product GHG assessment, and PAS 2050 specifies several requirements to ensure a robust, replicable and consistent footprint result. There are two basic types of data used in a product carbon footprint: activity data and emission factors. Activity data describes the specific, measurable quantities of materials and energy used across all life cycle stages. These measurements should be as specific as possible to the product being footprinted. Emission factors are the GHG emissions associated with a unit of activity data (processes, materials or energy) contributing to the product's life cycle.

While PAS 2050's rules for data collection apply equally to all products, different supply chains will have different data requirements. In general, data should seek to be as accurate, precise and relevant to the specific product as is practicable.

PAS 2050 addresses some of the particularly challenging issues around data collection, including:

- When to collect primary activity data, or rely on secondary sources.
- Specific requirements for collecting data on important inputs such as recycled materials or renewable electricity.

Primary activity and secondary data

From an accuracy perspective, it is generally preferable to use primary activity data in all life cycle stages; however, making direct measurements on every input, output or kilometre travelled for all activities across all life cycle stages may not be practical in every situation. PAS 2050 recognises this need for a balance between data quality and practicability, and therefore specifies a minimum requirement for primary activity data collection: companies collect primary data for processes they own, operate or control. Beyond these activities, secondary sources of data may be used, either existing PAS-compliant product data, or databases meeting PAS 2050's criteria for secondary sources. This compromise allows product carbon footprinting to be both robust and practical for any company to implement.

Recycled materials

Recycling is a complicated and hotly-debated topic in life cycle analysis. While recycling is promoted for a number of reasons (e.g. cost minimisation, landfill avoidance, etc.) use of recycled material may also result in lower GHG emissions than new (virgin) material. Therefore it can impact product carbon footprinting in two parts of the life cycle: raw materials and end-of-life (disposal/recycling after consumer use).

The complication arises when identifying the appropriate recycling rate to use, either:

- Specific to the product being assessed, i.e. the actual proportion of recycled material used as a raw material input and the average recycling rate of the product at end of life.
- The average recycling rate achieved across the whole industry for the recycled material (used for both raw material and end-of-life calculations).

The first approach is specific to the product being assessed. The second approach may fully acknowledge the recyclability of the material, but this is not specific to the product being footprinted.

PAS 2050 addresses this issue by specifying two alternative approaches depending on the recycled material's overall system:

- If the recycled material's system is confined to a single product (e.g. PET bottles can only be made from recycled PET bottles, not other forms of recycled PET), then the actual recycled content specific to the supply chain being assessed is used. For example, a manufacturer using 30% recycled PET bottles would use 30% as its recycled raw material input rate. It would then identify an average consumer PET bottle recycling rate to apply at the disposal/recycling stage (if it had not made any direct efforts to increase the recycle rate).
- However, if the recycled material is part of a larger system where it can come from any of a number of sources (e.g. aluminium), then the average recycling rate may be used as discussed in ISO 14044.

Any single solution to this issue would be controversial. The PAS 2050 Steering Group sought input from a wide range of stakeholders and will look to refine the approach as the PAS is updated in the coming years.

Renewable electricity

Although wind, solar and other forms of renewables are generally regarded as low- or zero-emission sources of energy, in practice it can be difficult to account for their impact on a specific process without double-counting the benefits. For example, the carbon benefit of renewable electricity that comes over an electricity grid can already be accounted for in the grid average emission factor, and can have specific government incentives designed to stimulate its construction.

Because of the international nature of supply chains, PAS 2050 needed to take a widely applicable approach to the treatment of renewable energy sources. It therefore requires organisations to assume a grid average emission factor unless they can demonstrate that no double counting has occurred, i.e. the low carbon electricity cannot be claimed in another product's life cycle and/or averaged into a national grid's emission factor[13].

Although this requirement may seem strict, it is still possible for companies to incorporate low emissions electricity into their product carbon footprints. For example, Continental Clothing was able to demonstrate that its on-site wind farm in India generated zero-emission electricity for its use only and that no one else claimed the carbon benefit associated with it. Continental therefore claimed the full benefit in its product carbon footprint.

PAS 2050's approach to renewable energy will be reviewed to take into account developing policy and standards in this area.

Step 4: Calculate the footprint

Once the process map is drawn, boundaries are set and data is collected, the actual footprint calculation is relatively straightforward. All activity data (quantities of materials and energy used) are multiplied by the relevant emission factor (or amount of CO_2e emitted per unit material/energy), and added together to create the final product carbon footprint.

There are some challenging issues to be addressed in the footprint calculation itself, particularly around (1) allocation between co-products (multiple outputs generated by a single process) and (2) carbon storage and delayed emissions. PAS 2050 offers detailed specifications for both situations, as described below.

Co-product allocation

Where a single process results in more than one product, emissions from the process must somehow be allocated among these 'co-products'. To take a simple example, when wheat is milled into flour, the process results in not only flour but also wheat germ and animal feed (i.e. flour's co-products); there needs to be a way to allocate the emissions to these co-products.

There is considerable debate over the correct way to allocate emissions to co-products. ISO 14044 provides some guidance through a hierarchy of approaches, but the exact interpretation of this standard is still open to debate. Wherever possible, it is best to avoid co-product issues altogether by dividing the process into sub-processes with unique outputs; however, this is not always possible, and in other situations PAS 2050 takes a pragmatic approach to co-product allocation by requiring, in order of preference:

1. Expanding the system to identify a displaced product to understand what impact the co-products have in other, related systems, and therefore the emissions that are avoided in these related systems.
2. Allocating the emissions in proportion to the relative economic value of the co-products.

The first approach is referred to as 'system expansion'. An example would be a combined heat and power (CHP) system that results in two products (heat and electricity). The emissions created during the CHP process must be allocated to the two co-products in some way.

[13] Otherwise, if one company's renewable electricity is connected to the national grid and therefore contributes to the grid's average emissions, other companies using the grid emission factor would be counting the renewables benefit already. This would result in double-counting if the company who exported the renewable electricity also claimed a benefit.

If the electricity is exported back to the grid, it avoids the need for the same amount of electricity to be generated from fossil fuels and therefore is credited with avoiding emissions; by netting these avoided emissions from the total emissions of the CHP, the emissions associated with the production of heat are found.

System expansion may not always be possible; in other circumstances, the PAS requires that economic value be used when allocating emissions to co-products. For example, passengers on commercial aircraft fly in different classes, and it may be necessary to determine the proportion of aircraft emissions passengers in different classes are responsible for; the emissions could be allocated in proportion to the cost of flying in the different classes.

Carbon storage and delayed emissions

Some products actually store carbon that would otherwise have been in the atmosphere. For instance, a wooden table made out of timber from a managed forest stores CO_2 previously taken out of the atmosphere during its life cycle, and the impact of this stored carbon on the product's GHG emissions is calculated over a 100-year assessment period from the point where the product is manufactured. Emissions that occur later in that period (e.g. from a table that has been in use for 20 years but is now starting to release GHGs in the disposal phase) therefore have less impact than those released at the start.

Thus PAS 2050 specifies a formula to calculate the weighted average impact of GHG emissions released during the 100-year assessment period. This calculation reflects the lower impact of stored carbon which is subsequently emitted during later years of the product's useful life.

This issue is also relevant for products that emit GHGs over a long use phase, or 'delayed emissions', such as long-life light bulbs.

Summary

Although product carbon footprinting may appear complex and technical, it can be done. PAS 2050 resolves the complicated issues and allows companies at any stage in the supply chain to calculate the carbon footprint of their products. The next step is to consider verification, reduction measures and whether and how to communicate the footprint results.

Code of Good Practice

PAS 2050 is specifically focused on the method to assess GHG emissions of products; and does not provide guidance on how to communicate or calculate reductions in a consistent way. The Code of Good Practice on Emissions and Reduction Claims (the Code), developed by the Carbon Trust and Energy Saving Trust, builds directly on the assessment provided by PAS 2050, and sets out these requirements, offering guidance to organisations wishing to declare their product carbon footprints and associated reductions.

The Code of Good Practice enables companies to provide business customers, end consumers and other stakeholders with useful and trustworthy information on product carbon footprints. The Code specifies how companies should:

- **Communicate** the verified life cycle GHG emissions of products clearly, credibly, on a consistent basis and with sufficient supporting information to facilitate comparisons.
- **Support claims of emission reductions** associated with a specific product.

The development of the Code followed a similar structure to that of PAS 2050, with an independent Steering Group leading the Code's development. The Code was developed in accordance with the ISEAL[14] *Code of Good Practice for Setting Social and Environmental Standards*, including a multi-stakeholder process similar to that adopted for PAS 2050. The Carbon Trust engaged consultants to manage the consultation process, ensuring that the process for stakeholder consultation was independent of the larger development work.

The purpose of the Code is to facilitate consistency in carbon footprint results assessed through PAS 2050, by supporting companies with further guidance around the communication of carbon footprint information, and the assessment of emissions reductions over time. This will support the communication of complete, credible and consistent product footprint data.

In addition to providing a consistent template for reporting product GHG emissions and reductions – the Product Emissions Report – the Code addresses three related issues that need to be carefully managed by companies:

- Reduction claims – rewarding improvements vs. absolute performance.
- Comparability.
- Simplicity vs. completeness.

[14] ISEAL is an international non-profit organisation that codifies best practice for the design and implementation of social and environmental standards. Members of ISEAL include FairTrade, Forest Stewardship Council, Rainforest Alliance, International Federation of Organic Agricultural Movements, and other international voluntary certification schemes.

Reduction claims

For consistency and transparency, the Code provides detailed guidance on calculating emission reductions in products over time. The Code also specifies that companies should always declare the actual emissions associated with the product when making any reduction claims. This avoids potential confusion resulting from reduction claims alone, which do not tell a customer about the magnitude of the product's emissions. In addition, the Code does not support claims of 'low emissions', as there is not yet enough consistent information available to define 'low' or to make comparisons in a robust way.

Comparability

While the provisions of PAS 2050 clarify many aspects of product carbon footprinting, this single standard cannot by itself guarantee comparability of results; there will remain areas open to interpretation (e.g. emissions arising from the use phase of products), which may yield different carbon footprints. While PAS 2050 introduces an assessment method that encourages consistency, it is not possible to be completely prescriptive through a standard-setting process in all aspects of GHG emissions assessment.

The Code helps to facilitate comparability beyond PAS 2050 alone. For example, the Code specifies the level of rounding appropriate for communicating product carbon footprints. Given the inherent uncertainty in footprint calculations, rounding reduces the risk of false precision and provides for more meaningful comparisons between products.

The Code of Good Practice further supports comparability of product carbon footprints by required companies to disclose supporting information along with any emissions or reduction claims, including product life cycle boundaries used and data sources. However, complete comparability can only be achieved through use of consistent data sources, system boundary assumptions and interpretations of PAS 2050.

Simplicity vs. completeness

The Code of Good Practice also addresses the trade-off between simplicity and completeness in its requirements. The challenge lies in how to provide customers with sufficient information to make informed purchasing decisions, while at the same time not overwhelming them with complexity. Considerable confusion already exists in the marketplace around terms such as 'carbon neutral' and 'offsetting'; product carbon labelling should not add to the confusion but rather help to clarify.

The Code's approach is to allow for simple, clear information on product labels or point-of-sale materials; however, the Code requires companies to back these claims up with detailed information that is easily accessible to interested parties, e.g. on a company website.

Like PAS 2050, the Code of Good Practice addresses many of the complications arising from product carbon footprinting. Together, they simplify the process of measuring, communicating and understanding product GHG emission information.

Implementation: practical lessons

We have learned through our work with pilot partners that product carbon footprinting can be implemented successfully, efficiently and cost-effectively on many products.

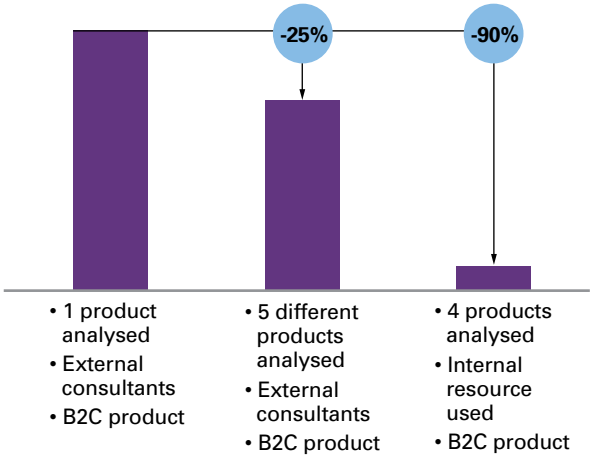
Cost of implementation

Our experience shows that the cost of footprinting varies considerably depending on the complexity of the product and its supply chain. Smaller companies can implement PAS 2050 themselves without hiring external consultants if they are concerned about costs, and then have their results verified, as Continental Clothing did. Costs can also be controlled and/or mitigated by the company's choice of product type and numbers (see Chart 7).

Companies can take other steps to simplify – and reduce the overall cost of – implementation by ensuring the right enablers are in place and following 'best practice' process steps.

Chart 7 *Companies can reduce footprinting costs by as much as 90% depending on approach and scope*

Illustrative cost per product
(Includes internal resource time and external consultancy cost)



Key enablers

At an organisational level, successful implementation of product GHG assessment requires:

- Strong internal support – senior management leadership and strong project management will keep the project on track.
- Supplier engagement – there are significant opportunities for suppliers to benefit from carbon footprinting activities, but it's important to make them aware of these opportunities and why you want their support.

'Best practice' process steps

With organisational and supplier support, attention turns to establishing a process that will deliver effective GHG assessments.

- Clarify scope and objectives of the product footprinting project early, such as:
  - Understanding of supply chain exposure to GHG emissions and reduction opportunities.
  - Providing B2B data on the life cycle GHG emissions of products to your customers.
  - Providing B2C information on the full life cycle GHG emissions of products to consumers.
- Start with simpler products to get comfortable with the method, such as those with:
  - Fewer ingredients.
  - Fewer supply chain stages, e.g. B2B goods.
  - Direct access to data, i.e. where much of the supply chain is owned by a single company or where strong supplier relationships exist.
  - Previous LCA or GHG data available.
- Build economies of scale and scope – cost and time required will decrease with additional footprinting, particularly within a product category.
  - e.g. Walkers took three months for its first product footprint (Cheese & Onion crisps in a 34.5g bag) but only two weeks to roll it out across all the other flavours, pack sizes and multi-packs.
  - e.g. Continental Clothing has constructed a verified model which will make the marginal cost of a product footprint virtually zero.
- Create data collection templates, as this will:
  - Simplify data collection by your suppliers, making it easy for them to understand and provide what is being asked for.
  - Reduce the data-collection burden, and help systematise future carbon footprint calculations (e.g. at reassessment periods).
- Focus on representative products, where the GHG models could be re-used for other products and the learnings spread across other ranges.
  - Leverage and train internal resources to build the in-house knowledge base for the future.
- Consider investing in software and established emissions databases.
  - This will simplify initial GHG assessments, and provide access to credible secondary data.
- Learn from others.
  - This publication, the Guide to PAS 2050 (www.bsigroup.com/PAS2050) and the supporting case studies provide advice that will support cost-effective and successful product footprinting projects.

Summary

PAS 2050 builds on existing international standards, providing clarity and certainty around a large number of issues that are central to the consistent assessment of product GHG emissions. In some cases, this means that specific approaches to issues have been adopted; in others, the PAS has addressed new issues relevant to the treatment of GHG- and product-specific footprinting.

As this is the first product-specific standard for assessing GHG emissions it is anticipated that its publication will encourage further interest in, and refinement of, product carbon footprinting – part of the BSI process for developing this PAS is a review of the standard within two years. In the meantime, PAS 2050 delivers a single, widely applicable standard that has been tested in a number of organisations, and in a range of countries around the world. It is already providing real value to companies who use it: the business benefits are considered in the next two chapters.

Measurement in practice: benefits for business

Measuring product-level carbon footprints reveals the true sources of emissions and therefore the greatest opportunities for reductions – and cost savings.

PAS 2050 has proven applicable across a wide variety of industry sectors and product categories, including services. Measuring product carbon footprints helps reveal unanticipated emission drivers and reduction opportunities – plus cost savings – across a product's life cycle and supply chain. Companies who measure product carbon footprints have discovered other benefits as well that translate into real financial returns, such as stronger relationships across their supply chains. Product carbon footprinting has proven its place as a core part of any organisation's efforts to reduce climate change risks – and seize related opportunities.

Lessons learned from 20 leading companies

The Carbon Trust, through the Carbon Label Company subsidiary, has worked with more than 20 companies to measure and reduce the carbon footprint of their products. Many have also gone on to communicate their product footprints as described in the next section. These efforts have informed the development of the PAS 2050 method and proven the method can work across a broad spectrum of situations:

- Companies representing diverse industry sectors, from food and drink to building materials to financial services.
- A wide range of products, including both goods and services, ranging from simple to complex.
- Products covering different stages of the supply chain, both business-to-business (B2B) and business-to-consumer (B2C).
- A mix of small to medium-sized enterprises (SMEs), large companies and multinational corporations.
- Supply chains varying from local to global.

Our work with these diverse companies across hundreds of product permutations has given us an interesting perspective on the potential benefits to business – and has proven that product footprinting is relevant for any company and any good or service.

The table on the opposite page illustrates the diversity of companies and products that have already used PAS 2050.

Benefits of measuring product carbon footprints

These companies that have measured the GHG emissions of their products have benefited in several ways:

- Revealed true sources and drivers of emissions, leading to more effective carbon reduction strategies.
- Identified high-impact cost-saving opportunities across the supply chain.
- Built stronger, more collaborative relationships with suppliers.
- Developed better management practices in general.

Pioneers in product carbon footprinting	
ab agri Sainsbury's	Milk produced from 325 farms
AGGREGATE INDUSTRIES	Hard landscaping products (paving stones, etc.)
Boots	Botanics brand shampoo
BRITISH SUGAR	White granular sugar
Cadbury	Dairy Milk bars
Coca-Cola Enterprises Ltd	Sparkling and still drinks
Colors	South African fruit supplied to UK retailers
CONTINENTAL®	EarthPositive® T-shirts
Coors	Carling lager
DANONE	Evian® and Volvic® natural mineral water
innocent	Smoothies in 250ml bottle, 1 ltr carton and kids' size carton
HALIFAX	Web Saver, web-based savings account
Kimberly-Clark	Andrex toilet tissue and Huggies nappies
Marshalls Transforming Britain's Landscapes	>500 hard landscaping products
- MEY SELECTIONS -	Mey Selections Luxury All Butter Shortbread, Mey Selections Heather Honey and Mey Selections Blossom Honey
morphy richards	12 Comfigrip, Turbo Steam and Precise Steam irons
müller	Yoghurt from its product range
PEPSICO INTERNATIONAL UK & Ireland	Walkers crisps
S&N Scottish & Newcastle UK	Fosters Lager and Bulmers Original Cider
TESCO	Potatoes; orange juice; light bulbs; washing detergent
The co-operative	200g and 400g punnet strawberries

Revealing true carbon footprint and reduction opportunities

A key benefit of product carbon footprinting over and above other climate change initiatives is its ability to uncover surprises and potentially disprove conventional wisdom regarding key emissions sources.

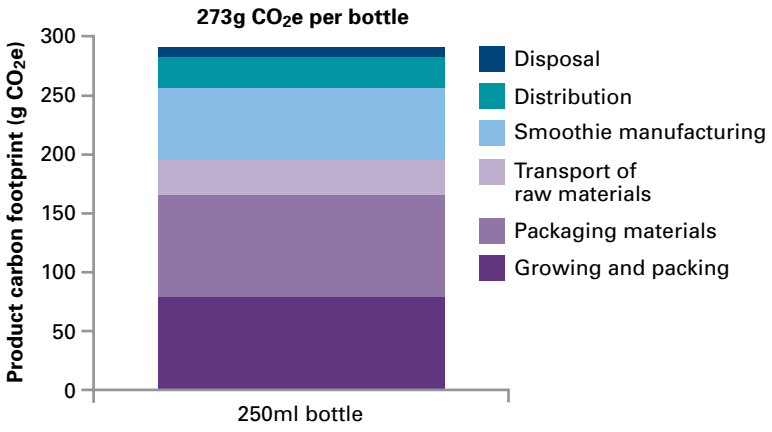
For example, raw materials, packaging and manufacturing account for almost 80% of innocent's 250ml smoothies' GHG emissions (see Chart 8). Fruit transport was a minor contributor, despite conventional wisdom linking 'food miles' to climate change. Based on this discovery, innocent focused its emissions reduction strategy on higher-priority areas, such as packaging, and achieved reductions quickly: after switching to 100% recycled plastic bottles, it realised a 20% reduction in materials – and therefore cost – and reduced carbon emissions from the bottle manufacturing process by 55%.

Similarly, HBOS' experience revealed that paper communications to account holders and the helpdesk contributed the bulk of its Web Saver account's emissions (Chart 9). This allowed it to focus efforts on reducing paper usage and increasing energy efficiency at the helpdesk while also investigating higher-efficiency servers.

Better understanding of the true carbon footprint enables more effective emission reduction strategies. Preliminary results show that companies who have used PAS 2050 subsequently reduced product level emissions by as much as 20%. These results were only achieved through a full and complete understanding of emission sources and collaboration across the supply chain.

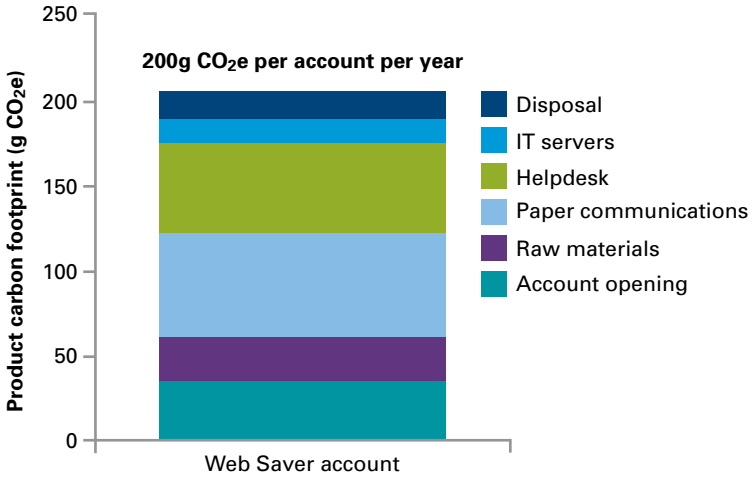
Other examples of the relative importance of different stages in the product carbon footprint are shown for shampoo (Chart 10), T-shirts (Chart 11) and crisps (Chart 12).

***Chart 8** innocent smoothies*



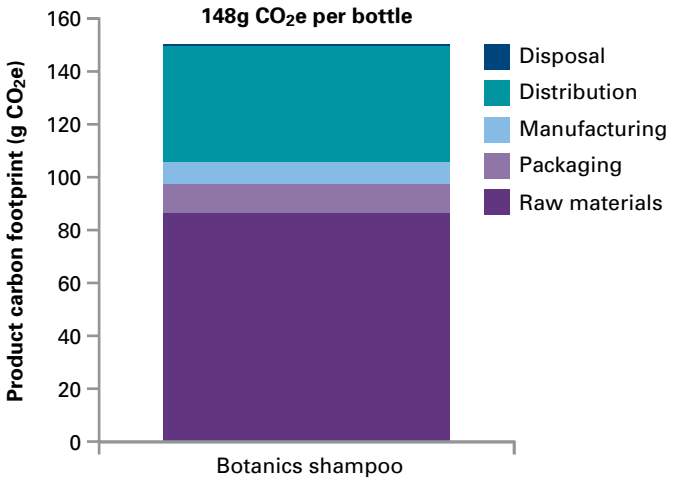
- The footprint results revealed **packaging and fruit growing** were the most significant contributors.
- The biggest surprise for innocent was the relative **insignificance of 'food miles'**, or raw material distribution, to the total footprint of its 250ml smoothies.
- Knowing where to focus helped innocent achieve **15% emissions reduction through**:
  - The first 100% recycled PET bottle, now in use across its smoothie range.
  - Working with suppliers to cut costs and carbon by improving energy efficiency and reducing waste.

***Chart 9** Halifax Web Saver account*



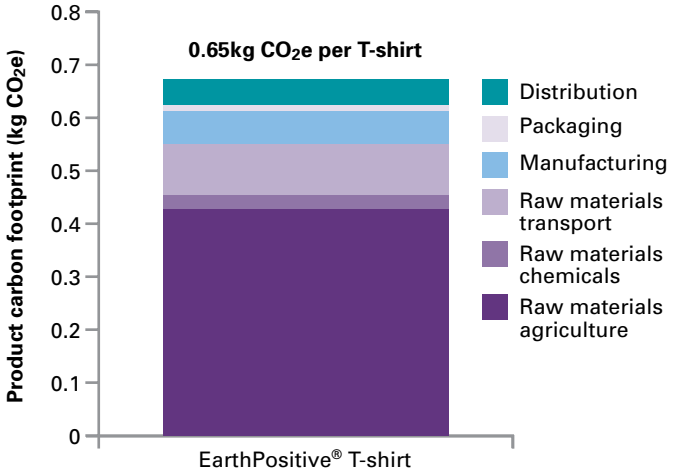
- Customer service, in the form of **paper communications and the helpdesk**, was the main driver of the Web Saver's carbon emissions.
- Given the Web Saver was designed as a web-based, primarily self-service account, these results were surprising.
- HBOS is investigating ways to **reduce paper** use and increase the **energy efficiency** of its helpdesk and ATM network.

***Chart 10** Boots Botanics shampoo*



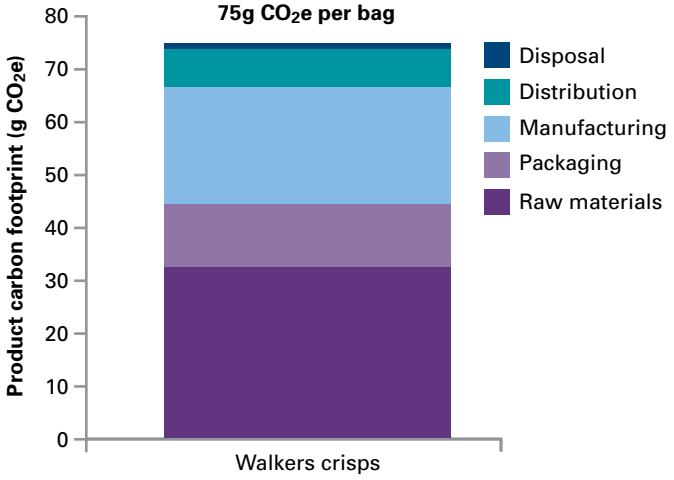
- **Raw materials and distribution** are the key drivers of emissions, apart from consumer use (which was excluded from the original assessment).
- Once it knew where to focus, Boots quickly identified and implemented emission reduction measures that resulted in a **20% decrease in emissions** across the product's life cycle:
  - Increased recycled content of plastic bottles to 30%.
  - Redesign of the distribution network to allow individual products to be shipped direct to stores.

***Chart 11** Continental Clothing T-shirt*



- Continental's use of on-site renewable electricity in India **reduces the carbon footprint** of its T-shirts **by 89%**.
- Interestingly, although Continental manufactures in India and distributes to business customers in the UK, US and Europe, **distribution** has a relatively **low impact** on the overall product footprint.
- Therefore, it can focus reduction efforts on more important sources, such as **farming and manufacturing** processes.

***Chart 12** Walkers crisps*



- **Raw materials and manufacturing** are the largest sources of emissions across the crisps' life cycle.
- Walkers scoured its own production facilities for opportunities to cut energy use and waste, resulting in **33% reduction in energy** use per kg crisps.
- It also engaged with its potato suppliers to reduce emissions through better agricultural and storage practices.

Experience with companies indicates some common sources of emissions and reduction opportunities, summarised below. These themes have emerged repeatedly, regardless of company size or industry:

Raw materials

- Reducing the need for carbon-intensive inputs is one way companies can support upstream emission reductions.
  - Manufacturers of agricultural products – food and drink, cotton apparel – have found ways to help suppliers reduce nitrogen-based fertiliser use.
- Reducing material inputs can also contribute to emission reductions for service products.
  - HBOS was able to reduce paper used for its Web Saver savings account, which had a material impact on emissions.
- Using packaging with greater recycled content can have a considerable impact on the packaging footprint.
  - innocent's smoothies now come in 100% recycled PET bottles.
  - Boots shampoo bottles now contain 30% recycled material.
- Reducing the amount of packaging used.
  - Boots introduced direct distribution and avoided secondary packaging altogether.

Manufacturing

- Efficiency measures are key to reducing carbon emissions and have the added benefit of saving costs.
  - Upgrading equipment is one way to achieve greater efficiency, as HBOS found with its ATM upgrade plans.
- Switching to lower-carbon energy supplies can have a significant impact on energy-related emissions, as long as the renewable energy benefit has not been claimed elsewhere.
  - Continental Clothing, one of our SME pilot projects, reduced the carbon footprint of its core T-shirt product 89% by switching to on-site wind-generated electricity for its factory in India.
- Process design – sometimes the efficiency of production processes themselves can be improved.
  - Boots, for example, is working in its shampoo production facility to reduce the carbon emissions associated with the cleaning process between shampoo production runs, with significant potential to reduce overall manufacturing emissions.

Distribution

- Improved planning and scheduling can reduce emissions from distribution.
  - Boots eliminated the need for some of its regional distribution centres (RDCs), which allowed it to remove a transport leg and extra storage facilities from its products' footprints, as well as its own corporate footprint.
  - Tesco is working with its produce suppliers to improve its planning processes, thereby reducing the need for RDCs and subsequent energy and fuel use.
- Transport methods used can also reduce emissions and costs considerably.
  - Continental realised this benefit with its decision not to ship anything by air.

Retail

- Energy efficiency measures in store can make a significant impact, particularly when in-store emissions due to lighting and refrigeration contribute a large amount to a product's footprint.

The value of product carbon footprinting is that it reveals not only these opportunities for emissions reductions, but also helps companies prioritise between them. Focused, targeted emissions reduction measures will be more successful and help drive greater support for further efforts.

Cost savings

Companies have also found considerable opportunities to cut costs for themselves and for their suppliers as a result of product carbon footprinting. These savings typically come from identifying efficiencies that help reduce energy use and/or waste across the supply chain.

For example, Walkers and HBOS both found ways to reduce their own energy costs as a result of the product carbon footprinting work. Working with the Carbon Trust over several years to reduce both direct and supply chain-based emissions, Walkers identified efficiency opportunities that allowed them to cut energy use in their factories per kg of crisps by 33%. HBOS identified ATM transactions as a key source of emissions for their web-based savings account – an unexpected result of the carbon footprint since most of the accounts did not come with ATM cards. It identified that some ATM types reduced energy consumption by up to 30% and is now reviewing the feasibility of rolling these out across the ATM network.

For some products, the greatest cost savings opportunities are further up the supply chain. For example, innocent helped one supplier increase efficiency, resulting in a 54% reduction in waste after only six months, and a 25% decrease in energy use. These initiatives generated annual savings of £150,000 for the supplier.

Often the efficiencies identified in one supply chain or production line can be extrapolated to reduce costs in other areas. Boots, for example, is increasing the recycled content of its plastic bottles across other product lines to build on its experience with shampoo.

Another example of a company achieving a more competitive cost position is Continental Clothing, which has been able to save costs relative to competitors due to its use of renewable energy in India, which protects them against fuel price volatility. Its 'no air freight' policy also reduces the transport cost per shirt from 30p to 3p.

Stronger supplier relationships

Companies who measure product carbon footprints have strengthened relationships with suppliers as a result of the initiative, particularly when actions to reduce emissions have also led to cost reductions up the supply chain. Proactive engagement, leading by example and the willingness to work together have all improved links across the supply chain.

For example, innocent discovered that almost 60% of its 250ml smoothies' carbon footprint comes from its raw materials – fruit and packaging. It therefore worked closely with suppliers in both areas to reduce waste and increase energy efficiency.

Companies have also built stronger supplier relationships by showing a willingness to cooperate, respond to supplier feedback and create coordinated solutions to reduce carbon emissions. Tesco, for example, has begun working with potato suppliers to reduce farming and transport emissions. It is helping suppliers to reduce fertiliser use and, in response to requests from potato farmers, is also working to improve its own planning to help farmers better manage their crops and reduce waste in the distribution network.

Better management practices

Finally, pilot companies have used the learnings from their product carbon footprinting initiatives to improve decision making and drive further business benefits.

Putting its understanding of GHG emissions and their drivers back into the business, innocent is incorporating its carbon footprint calculation models into sourcing decisions. Now, when deciding where to source fruit from, it can test the cost and carbon impact of various options.

Summary

Product carbon footprinting is a valuable tool for companies to understand the real drivers of their products' emissions. This information enables higher impact emission reduction and cost saving measures, while the process supports collaboration across the supply chain and better management practices internally.

Product labelling: added benefits

Companies who choose to communicate their products' carbon footprints realise additional benefits over and above measurement alone.

Companies who not only measure but communicate the carbon footprint of their products and make a commitment to reduce have benefited through greater emission reductions plus the ability to differentiate products and strengthen the company's overall brand reputation.

There are many different ways to communicate product carbon footprints. The Carbon Trust Carbon Reduction Label is one option companies have for communicating compliance with PAS 2050 and the Code of Good Practice across a range of channels including Corporate Social Responsibility (CSR) or other company reports, on websites, in catalogues or sales brochures, at point-of-sale or on the product pack itself. In addition to the product's carbon footprint information it provides:

- Evidence of independent, third party certification.
- Company's commitment to reduce the footprint over time.
- Optional elements companies may wish to add, including:
  - Definition and explanation of the product carbon footprint and/or
  - Comparison to alternative products.

As of October 2008, six companies have chosen to communicate their product carbon footprints using the Carbon Reduction Label.

They have chosen a variety of different formats and media, and the Carbon Reduction Label itself has been redesigned, but the core information is consistent: the carbon footprint number, verified by the Carbon Trust (through its Carbon Label Company subsidiary) and the company's commitment to reduce. Chart 13 gives examples of products footprinted and communicated, along with the different media used to display the information. Further information on each of these examples is provided overleaf.

Not all companies have chosen to communicate their footprints, or at least not initially. PAS 2050 does not require any communication of the results, and some companies only want to use product carbon footprinting for a high-level assessment of emission 'hot spots'. That said, many companies have found the Carbon Reduction Label to be an effective way of not only communicating their products' carbon emissions to customers, but also signalling their commitment to reduce life cycle emissions.

Below we describe the key additional business benefits achieved through product labelling:

- Greater emission reductions driven by the public display of product carbon footprint information and the commitment to reduce.
- Product differentiation to both consumers and business customers.
- Enhanced company brand and reputation.

Chart 13 *Product carbon footprints have been communicated through a variety of media*

Sector	Company	Products	Label display
Goods			
Business (B2B)	Continental Clothing	T-shirts	Sales catalogue, website
Consumer (B2C)	Pepsi/Walkers	Crisps	On-pack
	innocent	Smoothies	Website
Retail	Boots	Botanics shampoo	Point-of-sale display
	Tesco	Detergent Potatoes Orange juice Light bulbs	On-pack
Services			
Consumer (B2C)	HBOS/Halifax	Web Saver bank account	Website

Greater emission reductions

Companies who label achieve greater reductions in their products' life cycle emissions due to the positive feedback loop they create internally and the information they provide to help consumers reduce their own emissions.

First, the public display of a company's commitment to reduce emissions helps ensure subsequent reduction activities are prioritised and successfully implemented. As Walkers says, "a public facing climate commitment forces business decisions to be focused through an environmental lens" as after all "nothing is more public than the front of your packet." This sense of urgency led Walkers to hold several 'supplier summits' bringing the supply chain together to introduce the concept of product carbon footprinting, share the footprint results and brainstorm ways to reduce emissions. These summits help maintain a spirit of cooperation and joint ownership of the crisps' carbon footprint and its reduction over time. They also encouraged Walkers' suppliers to take carbon emissions more seriously, and many are now embarking on broader climate change mitigation work across their operations.

Continental Clothing has developed an interactive model to communicate its B2B footprint to customers and work with them to minimise the carbon impact of their product design choices. This fully flexible model can determine the emissions impact of various product configurations in real-time during sales discussions. Customers appreciate being able to see the impact of different fabrics, styles, prints and colours on GHG emissions. Given its strategy to focus on environmentally-aware businesses in the music, media and entertainment industries, this 'carbon calculator' has become a valuable sales tool and will have a meaningful impact on GHG emissions as it empowers Continental's corporate customers to design lower-carbon products.

In addition, by putting credible information in the hands of consumers, companies help them reduce their impact on climate change. Although companies do not have direct control over how their products are used, many are taking advantage of the Carbon Reduction Label's optional module to include suggestions on how consumers can change their use patterns to reduce emissions.

Tesco, for instance, offers comparative data to consumers to encourage product replacement and change use behaviour. Using on-pack and in-store displays, it highlights emissions differences between products (see next page). Other examples include energy efficient vs. conventional light bulbs: an 11-Watt compact fluorescent emits 70g CO_2e per 1,000 hours of use, whereas a conventional 60-Watt bulb generates 300g CO_2e. Tesco also uses the Carbon Reduction Label to inform consumers of the impact their behaviours have on emissions, e.g. baking potatoes causes much higher carbon emissions during consumer use (1,025g CO_2e/kg) than boiling (240g CO_2e/kg) or microwaving (280g CO_2e/kg).

Continental works with its business customers to help them engage end consumers on the benefits of washing clothes in cold water. On its website it provides the following information:

"Save The Climate – Wash Cool EarthPositive® apparel can be washed at 30°C; however, we ask EarthPositive consumers to consider the effects of domestic machine washing and tumble drying time and time again, which may contribute up to 80% of the energy used by a conventional cotton garment in its lifetime. We label our garments SAVE THE CLIMATE – WASH COOL – LINE DRY in addition to standard wash care instructions."

Examples of different approaches to communicating product carbon footprints

On-pack labels: Tesco

- Tesco's Carbon Reduction Labels show the carbon footprint of a given product per unit, plus a comparison to alternative products and other consumer information. For example:
  - Fresh orange juice's footprint of 360g CO_2e is compared to long-life juice with a lower footprint of 240g CO_2e; the Carbon Reduction Label also explains why the footprints differ, i.e. due to energy required to chill the fresh juice.
  - Liquid detergent with a carbon footprint of 700g CO_2e per wash is compared to washing powder at 750g CO_2e per wash, and the Carbon Reduction Label includes tips on how consumers can reduce the footprint by washing at lower temperatures.

On-pack labels: Walkers

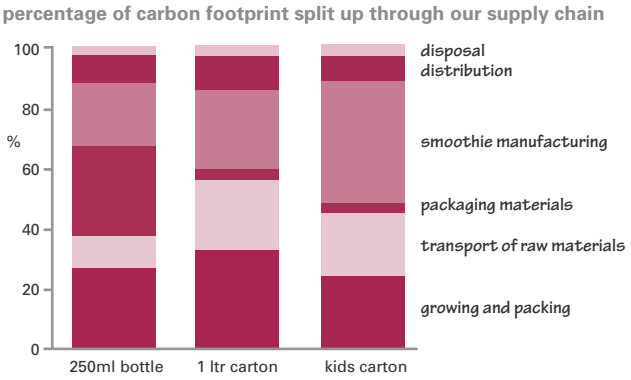
- Walkers was the first company to use a Carbon Reduction Label on-pack.
- This early version of the Carbon Reduction Label has since been updated to the footprint design shown above.

Point-of-sale information: Boots

- Boots used in-store posters to disclose the carbon footprint of its Botanics shampoo line.
- It used this larger display format to inform consumers of the 20% reduction in life cycle emissions already made and how consumers can reduce emissions themselves by washing with cooler water.

Website information: innocent

- innocent shares comparative data across its smoothie formats and flavours.
- It also offers information on product emission reductions achieved so far (~15% on average across six flavours).



Sales catalogue: Continental

- Continental Clothing uses the Carbon Reduction Label in sales material and on its website.
- It uses the optional components to describe what is included in its footprint calculation (i.e. all life cycle stages up to delivery to the UK) and to compare against T-shirts made from other manufacturing processes.

working with the Carbon Trust

650g CO2

per garment

We have committed to reduce this carbon footprint

The carbon footprint of this product is **650g.** This is the total carbon dioxide (CO2) and other greenhouse gases emitted from the raw materials, production and transport to the UK

This compares to the carbon footprint of an identical product manufactured without the use of renewable electricity which is **6.5kg** per garment

Services example: Halifax Web Saver account

- HBOS also chose to display its service footprint information on its website, which could be described as 'on-pack' labelling for this web-based savings account.
- It used the optional components to describe the 'life cycle' definition of its savings account in more detail since its process map stages differ from a standard manufactured good's.

working with the Carbon Trust

200g CO2

per account

The carbon footprint of this account is 200g per year and we have committed to reduce it

This is the total carbon dioxide (CO2) and other greenhouse gases emitted in providing the account, including setup, ongoing use and closure

Product differentiation

Although it is still too soon to understand the full impact carbon footprinting and labelling can have on product sales, early results suggest customers see value in labelled products.

Consumer reactions to the Carbon Reduction Label have been positive, with a strong preference for lower carbon products and even for any product with a carbon label.

Market research indicates consumers prefer lower carbon footprint products (Chart 14): 67% are more likely to buy a product with a low carbon footprint[15]. When given a choice, consumers want to do the right thing for the environment and a majority would choose a 'greener' product[16]:

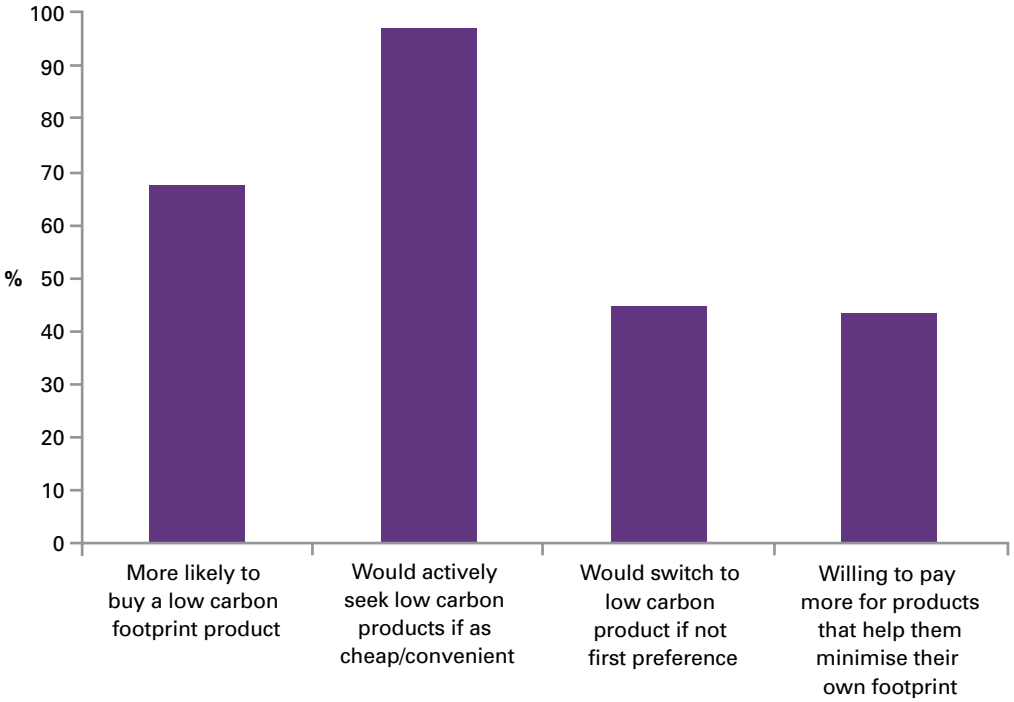
- 44% would switch to a product with a smaller carbon footprint even if it was not their first preference.
- 43% are willing to pay more for products that would help them minimise their own carbon footprint.
- 20% would even travel to a less convenient retailer in order to obtain such products.

More recent research from Tesco[17] indicates 97% of consumers would actively seek to purchase products with a low carbon footprint if they were as cheap and convenient; 35% would buy lower-carbon products even with a cost/convenience trade-off.

Other research suggests consumer preference for labelled products – with the actual footprint information – regardless of what the footprint actually is (Chart 15):

- 49% of consumers believe 'it makes me more likely to buy their products when the label is displayed on pack'[18].
- 65% of respondents declared that a label indicating suppliers' efforts to reduce carbon would make them more likely to purchase a product[19].
- 72% of respondents believe 'it is important to show actual number of grams of carbon per product on a carbon footprint label'[20].

Chart 14 *Consumers reveal a strong preference for lower-carbon products*



Source: Gfk NOP Oct 2006; LEK Consulting Carbon Footprint Report 2007; Tesco Home Panel Survey August 2008.

[15] GfK NOP Oct 2006.

[16] LEK Consulting Carbon Footprint Report 2007; research conducted by YouGov, representative sample of 2,039 UK consumers.

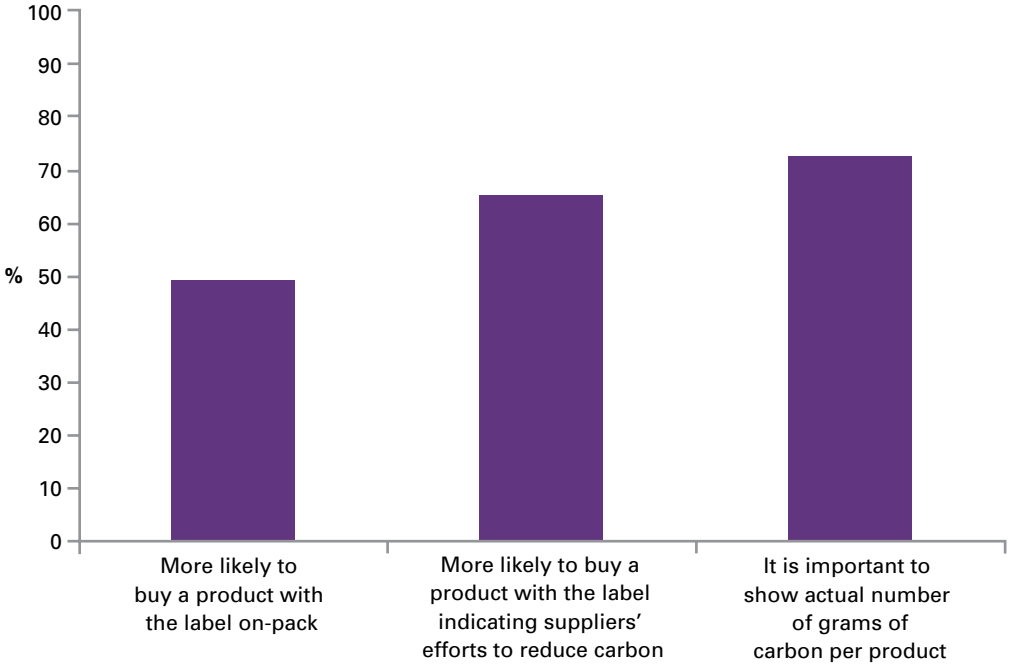
[17] Tesco Home Panel Survey, 874 respondents, August 2008.

[18] Populus Concerned Consumers Survey July 2007; 1,063 adults aged 18+.

[19] Boots internal market research; 1,029 Advantage Card users September 2007.

[20] Boots internal market research; 1,029 Advantage Card users September 2007.

Chart 15 *Labelling alone can differentiate a product, regardless of the footprint*



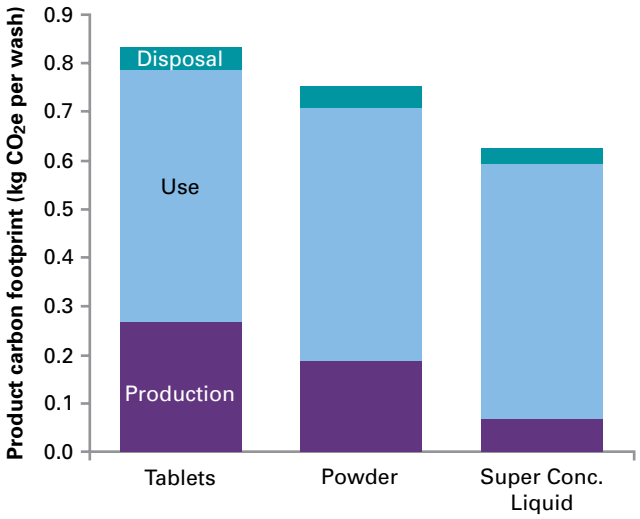
Source: Populus Concerned Consumers Survey July 2007;
Boots internal market research September 2007.

Carbon labelling responds to this demand for information and allows companies to differentiate their products on the basis of their carbon impact.

Tesco's carbon footprinting trial reveals the opportunity for suppliers to compete on the basis of product carbon emissions. When comparing different forms of detergent – concentrated liquid, powder and tablets – Tesco discovered that carbon emissions varied considerably (Chart 16, next page). All three products meet the exact same customer need, but their climate impacts vary by almost 25%.

67% of consumers are more likely to buy a product with a low carbon footprint

Chart 16 *Results from Tesco's footprinting of laundry detergents shows opportunity for products to differentiate on basis of carbon emissions*



This example shows the real opportunity for businesses with lower-carbon products to compete on that basis in a consumer market of increasing awareness of and engagement with climate change.

Business-to-business (B2B) companies can also use product carbon footprinting and labelling to differentiate to customers in target markets. Continental Clothing, for example, believes the Carbon Reduction Label has added credibility to its claims regarding its climate-friendly clothing: EarthPositive T-shirts have a carbon footprint of 650g CO_2e vs. competitor footprints of 6.5kg CO_2e. This information supports its differentiation as an ethical, sustainable fashion supplier, particularly among the target segments of fashion, entertainment and music.

As a B2B company, having the Carbon Reduction Label also provides Continental with a competitive advantage by offering business customers certified product carbon footprint data up to the point of delivery, thereby making it significantly easier for its business customers to footprint and label to end-consumers.

Enhanced brand/reputation

Companies that invest in product carbon footprinting and labelling are also beginning to see brand and reputation benefits.

For instance, Walkers found consumers' perceptions of the company improved after introducing the Carbon Reduction Label on its crisps. When asked how much this label changed their opinion of Walkers, 44% of consumers and 63% of 'social influencers' (people who are interested in companies/brands and who talk about them with others) said the Carbon Reduction Label makes them more positive about Walkers[21]. A majority of social influencers now believe Walkers 'is honest and open about its environmental impact' and 'cares for the environment'[22].

The positive reaction appears to be driven by the commitment Walkers has shown towards the environment – by making the effort to measure product-level GHG emissions as well as the commitment to reduce those emissions over time, plus providing information to help consumers make more informed choices. 68% of UK consumers agreed that carbon labelling 'shows that the company is committed to reducing its carbon emissions'[23]. This rose to 72%, among the segment of consumers who said they were 'concerned' about the environment.

[21] Millward Brown research commissioned by Walkers.

[22] Millward Brown research commissioned by Walkers.

[23] Populus research commissioned by Walkers.

Future opportunities

Over the next few years, we expect three key trends in product carbon footprinting and labelling to accelerate: internationalisation of the standard and labelling; growth of the product carbon footprinting 'sector', including support services; and ever-increasing consumer engagement.

Internationalisation

The Carbon Trust and Defra are committed to developing international standards based on the evolution of PAS 2050. Ongoing work with companies to test the method in diverse, real-world situations will help ensure the standard remains practical, industry-led and internationally applicable.

PAS 2050 has been taken up as a seed document in key international standards development processes, such as the Greenhouse Gas Protocol Supply Chain Initiative sponsored by World Resources Institute and World Business Council on Sustainable Development, plus similar initiatives within the International Standards Organisation.

Businesses have an opportunity to contribute and even to lead efforts to internationalise the product carbon footprinting method established in PAS 2050. Some companies are building on their experience with PAS 2050 and the Carbon Reduction Label and expanding these initiatives internationally: Continental Clothing has been the first company to introduce the Carbon Reduction Label to customers in the US, and PepsiCo and other existing partners are interested in trialling the footprinting method in their US businesses. In addition, the Carbon Trust is developing product carbon footprinting projects in continental Europe, China and other parts of Asia.

Additional support from businesses will be key to ensuring the development of a single, internationally recognised standard for calculating product-level carbon emissions.

Evolution of the product footprinting 'sector'

Assessing product carbon footprints will become easier and cheaper as the sector grows. Supporting industries are already beginning to develop around product footprinting, including trained consultants, software models and databases.

As the sector expands, a 'chain of custody' model should develop whereby every company in a supply chain is responsible for assessing its contribution to the carbon footprint of the overall product life cycle.

In this model, B2B companies footprint their products and provide verified carbon data to their business customers. This process continues down the supply chain until the full carbon footprint has been constructed, thus reducing the cost of footprinting for any single company in the chain, increasing understanding of climate change impacts and identifying further opportunities to reduce emissions.

Comprehensive and sector-specific databases, models, boundary rules and other guidance will help speed and ease the implementation of product carbon footprinting and support better comparisons between products.

Finally, as the industry evolves the number of trained consultancies and accredited certifiers will increase, further encouraging robust product footprinting to occur at scale. The Carbon Trust is working with the UK Accreditation Service (UKAS) to build a pool of accredited product carbon footprint certifiers. This work will help to increase skills in the area, but above all it will help to build trust by maintaining the integrity and consistency of results.

Consumer engagement

Consumer demand for carbon information is rising and will accelerate as more products are labelled and as consumers become more carbon-conscious in general, calling for more carbon information to guide their purchase decisions and behaviours.

Companies that engage in product carbon footprinting and labelling will be able to demonstrate to their customers that they are taking positive action to fight climate change. They will be able to show that they have followed a rigorous process, received independent verification of their product's footprint and are committed to reducing it. Businesses that are at the leading edge of this trend will be best placed to gain.

Further information

Case studies

The case studies published in parallel with this publication give more detail on the lessons learned from some of our pilot partners. These will be added to over time and can be accessed electronically at **www.carbon-label.com** and **www.carbontrust.co.uk**

PAS 2050 and Guide to PAS 2050

For more information on PAS 2050 and how to measure product carbon footprints, see **www.bsigroup.com**

Code of Good Practice

Additional information on the Code of Good Practice can be found on the Carbon Trust's website, **www.carbontrust.co.uk**

Carbon footprinting support and the Carbon Reduction Label

More information on working with the Carbon Label Company on a product carbon footprinting project or on the Carbon Reduction Label can be found at **www.carbon-label.com**

The Carbon Trust would like to acknowledge the contribution of the following partners.

www.carbontrust.co.uk

The Carbon Trust was set up by Government in 2001 as a private company.

Our mission is to accelerate the move to a low carbon economy by working with organisations to reduce carbon emissions and develop commercial low carbon technologies.

We do this through five complementary business areas:

Insights – explains the opportunities surrounding climate change
Solutions – delivers carbon reduction solutions
Innovations – develops low carbon technologies
Enterprises – creates low carbon businesses
Investments – finances clean energy businesses.

www.carbontrust.co.uk
0800 085 2005

ACT ON CO_2 is the Government's initiative to help individuals understand and reduce their carbon footprint. Visit http://actonco2.direct.gov.uk for more information.

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 Government, the Welsh Assembly Government and Invest Northern Ireland.

The Carbon Trust is a company limited by guarantee and registered in England and Wales under Company number 4190230 with its Registered Office at: 8th Floor, 3 Clement's Inn, London WC2A 2AZ.

Printed on 80% recycled paper containing a minimum of 60% de-inked waste fibre.

Published in the UK: October 2008.

CTC744