Carbon Footprint of Products

– A Simple Guide

CUTS International

Carbon Footprint of Products
– *A Simple Guide*

CUTS International

Carbon Footprint of Products
– *A Simple Guide*

Published by:

CUTS International

CUTS Hanoi Resource Centre
No 112 Kham Thien Street
Dong Da District
Ha Noi City, Viet Nam
Phone number: +84.4.62 763 600, Fax: +84.4.62 763 606
Email: hanoi@cuts.org, Website: http://www.cuts-hrc.org

Supported by:

Sida

Contents

1. Introduction

Climate change is increasingly recognised as a global crisis which affects every country, people in different locations, social classes, genders and ages. "Climate change represents a serious challenge to sustainable, social justice, equity and respect for human rights; especially the rights of future generations."[1]

It is widely understood as any long-term significant change in the "average weather" that a given region experiences due to the direct and indirect impact of human activities resulting in global warming and extreme weather conditions.[2] The main cause of climate change is the increase of Green House Gases (GHGs) in the atmosphere as a negative result of human activities such as burning of fossil fuels (coal, oil, gas) for energy, leading to increased CO_2 emission.

Vietnam is one of the countries most affected by climate change because of its geographic and natural conditions, together with its fast but massive and unplanned urbanisation. Recognising the urgency of dealing with climate change, the Government of Vietnam has been proactively setting out policies to regulate adaptation and mitigation activities as well as establishing national mechanisms to get the global crisis reflected into the national context.[3]

One of those actions was the approval of the National Agenda 21, i.e. the Strategic Orientation for Sustainable Development in Vietnam. The Agenda 21 is specifically meant to react to climate change by analysing challenges for the country in adaptation planning and greenhouse gas mitigation.

Being an agricultural produce-exporting country, Vietnam will also face heightened climate change challenges, because of the negative impacts on its agricultural production. According to the Ministry of Agriculture and Rural Development (MARD) of Vietnam, as a result of climate change, main crop production of the whole country is likely to be reduced by 10 percent and the total agricultural output will be reduced from 1-5 percent a year. MARD

also said CO_2 emission from agriculture production in Vietnam accounts for about 43 percent of the nation's total emissions, of which 58 percent is generated from wet rice cultivation, 22 percent by agriculture land use activities and 12 percent by the livestock production. To cope with such a situation, in the recent period, Vietnam introduced many measures to cut down CO_2 emissions and to promote a green and sustainable agriculture industry.[4]

Although carbon footprint is quite a new concept in Vietnam, the same has been widely available and adopted in many developed countries and regions in the world such as the US, EU, Japan, New Zealand and Canada, etc. The reasoning is simple: To effectively reduce greenhouse gas emissions, one must first identify their sources. The carbon footprint concept highlights the contribution of individual products to the greenhouse effect.[5]

Various carbon footprint initiatives have been undertaken by private enterprises and corporations worldwide such as the carbon footprint measurement programme for more than 1,000 products by Tesco, UK; Carbon Index by Casino, France, or Supply Chain Innovation Programme and Sustainability Consortium by Walmart, etc. Many governments also take the drive or support GHG measurement programmes like in Japan, France, and Quebec, Canada, etc.

Ongoing programme on Carbon Footprint of Products (CFP) in Vietnam

At present, Vietnam is selected as one of 8 countries in the South and Southeast Asia regions to take part in a programme implemented by the Swedish Standards Institute (SIS) with support from Sida (Swedish International Development Agency) entitled "Trade Promotion through Standardisation in the Southeast and South Asia region" (hereinafter referred to as 'the SESA programme').

The overall objective of this programme is to contribute to economic development in the SESA region through increased access to markets by local and regional producers. The programme intends to attain this objective by strengthening standardisation capacity in the SESA region with focus on environment-friendly standardisation processes. More specifically, the programme aims to build national and regional knowledge both to participate in the standard setting processes at ISO ('the International Standards Organisation') and to implement ISO standards.

For this second component on standard implementation, the ISO Technical Specification on "Greenhouse gases - Carbon footprint of products – Requirements and guidelines for quantification and communication" (ISO/TS 14067:2013) will be used as a case study where this specific ISO/TS will be implemented in specific and selected products in the SESA regions. In Vietnam, this Technical Specification will be applied *vis-à-vis* the rubber industry, in particular the production of latex and rubber gloves. The Vietnam Rubber Institute (VRI) is leading this carbon quantification process in the industry in collaboration with

experts provided by SIS, to assess the impacts of production activity on the environment, hopefully being the starting point for CFP models in Vietnam in the future.

Objective

CFP is quite a complex topic. However, recognising the benefits that such measurement could bring about for addressing climate change issues, CUTS International, within the framework of the SESA programme, with support from SIS, is producing this simple guidebook with a view to helping relevant stakeholders in Vietnam to get an initial understanding about CFP and be able to appreciate the replication of the process in Vietnam. This booklet is not meant to be a technical guide and will only provide basic information, including some related standards on CFP, key terms and definitions, how to quantify and communicate CFP to the public, based on GHG emissions and removals over the life cycle of a product, as well as some illustrative examples of similar initiatives undertaken elsewhere.

2. Why should I undertake CFP?

While there are still many objections that CFP labelling may constitute one type of Technical Barrier to Trade, companies should consider the following environmental and economic reasons when they decide to engage in CFP activities, including:

- Responding to customer inquiries: It is increasingly common for companies to receive requests from major customers for detailed environmental impact information, therefore, more and more companies seek to understand and reduce their environmental impacts;

- Costs lowering: By thorough analysis of the full life cycle of their products, companies shall be able to identify GHG emissions hotspots in their supply chain. As a result, appropriate measures to innovate their production and improve transportation process shall be taken to reduce emissions and create cost savings in the long-term;

- Brand enhancement and corporate social responsibility strengthening: Conducting a life cycle assessment gives a manufacturer a sophisticated understanding of the impacts of its products. The social responsibility to the public is demonstrated by a commitment to understand these impacts, and a suggested commitment to reducing them;

- Quantitative basis for corporate sustainability and social responsibility: Engaging in a CFP exercise enables companies to make fact-based decisions about where to allocate resources, understand the consequences of their actions, avoid burden shifting, and obtain benchmarks for improvement;

- Competitive advantage: A CFP label shall be a basis for customers to compare with other products of the same type, which is a competitive advantage for manufacturers to differentiate its products;

- Market access and revenue increase: With a competitive advantage, companies have opportunities to access new market and increase their revenues as well.

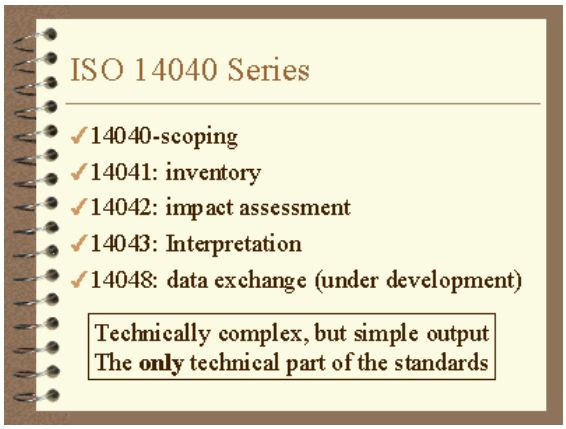
These shall be opportunities for companies to improve efficiencies while competing with other players in the market. The application of CFP may increase costs and create challenges for any organisation in the short term, but the long-term benefits shall compensate increasing costs and initial difficulties.

3. Who are doing CFP and where in the world?

Life Cycle Analysis or Assessment (LCA) is the basic method used in carbon foot-printing. LCA "studies the environmental aspects and potential impacts throughout a product's life cycle from raw material acquisition through production, use and disposal" (ISO 14040:2006). Since 1997, the ISO has published a number of standards that are relevant to carbon foot-printing, and this process is still ongoing.

ISO 14040 Series

The first ISO standards in this area to be developed were the ISO 14040 series dealing with LCA, which describe the procedures that should be followed in conducting LCAs[6]. They were consolidated into two revised standards in 2006, ISO 14040 and ISO 14044, without substantial change.



While ISO 14040:2006 describes the principles and framework for LCA including: definition of the goal and scope, the life-cycle inventory analysis (LCI), the life-cycle impact assessment (LCIA), the life-cycle interpretation, reporting and critical review, limitations, the relationship between the LCA phases, and conditions for use of value choices and optional elements; ISO 14044:2006 specifies requirements and provides guidelines for LCA. The ISO 14040/44 standard and further specifications provide a solid basis for calculating product carbon footprints; and on this basis, a comprehensive assessment of the climate-impact of products is possible, provided that all GHG emissions over the entire life cycle of the products are accounted for.

ISO 14025

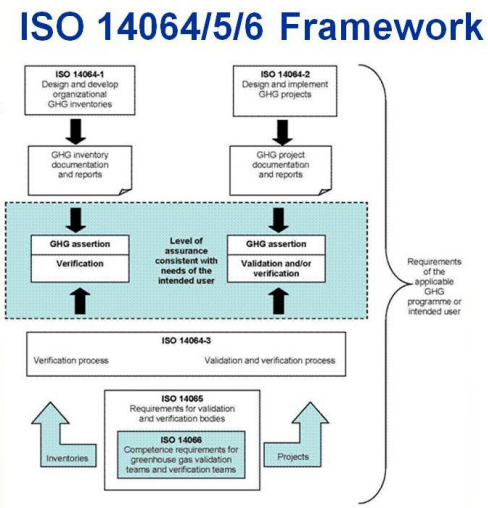
A second standard relevant in this regard is ISO 14025 (2006) on "Environmental labels and Declarations – Type III Environmental Declarations". This recommends the functional unit approach in communication of LCA results – as opposed to reporting mass or volume,

which are considered as insufficient to allow comparison. ISO 14025:2006 establishes principles for the use of environmental information, in addition to those given in ISO 14020:2000.

Type III environmental declarations are primarily intended for use in business-to-business communication, but their use in business-to-consumer communication under certain conditions is not precluded[7]. This group of standards was adopted against a background wherein several approaches to LCA had been developed over the previous two decades. There were a resulting danger that, as the method became more widely used, its results thus shall be incommensurate and lack credibility.

ISO 14064

ISO 14064 (2006-07) has a somewhat different focus. This group of standards is concerned not with the measurement of the overall environmental impact of the production, consumption and disposal of specific products or services over an unspecified time period, but with corporate and "project"-level GHG emissions within annual time frames.[8]



The initial motivation for this work was to create standards for comparing projects undertaken under the Clean Development Mechanism. ISO 14064-1 deals with corporate GHG accounting while ISO 14064-2 deals with project accounting.

ISO 14064-3 deals with validation and verification of GHG plans and accounts and ISO 14065 deals with the accreditation of bodies that carry out third party validation or verification. Perhaps the part of ISO 14064 that will prove most relevant to whatever ISO standards are eventually developed for carbon foot-printing are the provisions on verification in 14064-3. These state that a verification plan shall be formulated which sets out objectives, a data collection approach, a sampling plan, a schedule for performing tests, and a system for maintaining test records and other relevant documents.

ISO/TS 14067

ISO/TS 14067:2013 specifies principles, requirements and guidelines for the quantification and communication of the carbon footprint of products, including both goods and services, based on GHG emissions and removals

ISO / TS 14067

Greenhouse gases -- Carbon footprint of products -- Requirements and guidelines for quantification and communication

over the life cycle of a product. Requirements and guidelines for the quantification and communication of a partial carbon footprint of products ('partial CFP') are also provided. The communication of a CFP to the intended audience is based on a CFP study report that provides an accurate, relevant and fair representation of the CFP. This Technical Specification is based on existing International Standards ISO 14020, ISO 14024, ISO 14025, ISO 14040 and ISO 14044 and aims to set specific requirements for the quantification and communication of a CFP, including additional requirements where the CFP information is intended to be publicly available.[9]

ISO/TS 14067:2013 addresses only one impact category, which is climate change. Offsetting[10] is outside the scope of this Technical Specification.

Food miles of agricultural products

In the last few years, the focus on carbon emissions arising from transporting agricultural produce around the world from production areas to markets, and in particular by air, has created a lot of debate. Food miles are loosely defined as the distance fresh produce and flowers travel from source to market. This is a very simple concept and needs to be refined to include the complete supply chain from procurement of the seed and planting material through to the eventual consumption and disposal of the food.[11]

A further significant contributor to carbon emissions, in addition to that from the various modes of transport, is the refrigerator and cold chain necessary for and associated with agricultural trade.

Box 1: Facts and figures on carbon footprint of agricultural trade
Fresh fruit and vegetables exports from sub Saharan Africa (SSA) to the UK account for a maximum 0.1 percent of total UK emissions. It is estimated that the carbon footprint of roses produced in Holland was over 5.8 times that of roses produced in Kenya even after including the emissions from air freight (Williams, 2007). But a simple comparison of outdoor, field grown green beans in the UK and Kenya showed that the overall CO_2 footprint was higher for Kenyan beans because of the air freight emissions. Field-grown green beans, however, can only be produced in summer in the UK and any year-round production shall have be in heated and lit glasshouses and that shall bring about a similar scenario to the roses. And the drive to eat locally grown produce and to not eat out of season produce is neither realistic nor practical. The handling and storage aspect for perishable agricultural produce after post-harvest also utilises a lot of energy. Research conducted on UK and New Zealand onions shows that the CO_2 emissions associated with the UK storage of locally produced onions is greater than the emissions from sea freighting New Zealand onions to the UK (Saunders, Barber and Taylor, 2006).

Carbon Footprint System programme in France

France has adopted the most ambitious approach to product carbon foot-printing of any country. The French government proposed to progressively mandate the display of environmental indications for particular categories of goods, and, eventually, services sold in France by January 2011. The project has been advancing rapidly due to a firm political will coming out of the *Grenelle de l' Environment,*[12] a public consultative process held in the summer of 2007 to help shape the country's future environmental policy, and to the efforts of all the interested groups involved. In particular, work on environmental indication is being carried out in three areas: (1) supporting private-sector initiatives to test environmental labelling; (2) providing shared preferences for developing a database to support the calculation of the carbon footprints or the environmental impacts of goods and services; and (3) developing a regulation of mass-marketed products is provided to consumers.[13]

The *Grenelle de l'Environnement* led to the preparation of two pieces of legislation: *Grenelle 1*, a framework law establishing the general principles of the government's environmental programme, and *Grenelle 2*, which further specifies positive law measures stemming from the framework law.[14] Then, due to several amendments, the programme started with a trial phase of at least one year, scheduled for July 01, 2011. The outcomes shall allow for a final decision on how to implement the environmental display framework.

Carbon Footprint System programme in Japan

In 2009, the Japanese Government launched a programme to trial its new Carbon Footprint System (CFS), which aims at providing information on the emissions of GHG produced over the life cycle of goods and services in Japan.[15] The 'Carbon Footprint Pilot Programme' (CFPP) was launched by the Ministry of Economy, Trade and Industry (METI) in co-operation with the Ministry of Agriculture, Forestry and Fisheries, the Ministry of Environment and Ministry of Land, Infrastructure, Transport and Tourism of Japan. The Japanese government expects that the scheme will encourage companies to compete for customers by reducing their carbon emissions, as well as change consumer behaviour.

While the government is a main programme manager of the CFS, during 2009 METI commissioned the Environmental Management Association for Industry (JEMAI) to serve as the organising body of CFS during its trial period. JEMAI with expertise in LCA and environmental labelling shall provide expert support to companies who wish to participate in the CFS. Participation in the CFS is voluntary and decoupled from any climate-related regulation. CFS is open to all products; regarding durable goods. The methodology used by CFS is described in two sets of guidelines,[16] published by METI on 3 March 2009.[17]

4. Terms often used in CFP

The following key terms and definitions will be used throughout the booklet[18] and thus merit definition and explanation:

Terms related to carbon footprint and greenhouse gas

Carbon footprint of a product: sum of greenhouse gas emissions and removals in a product system, expressed as CO_2 equivalent and based on a life cycle assessment using the single impact category of climate change.

Greenhouse gas: gaseous constituent of the atmosphere, both natural and anthropogenic, that absorbs and emits radiation at specific wavelengths within the spectrum of infrared radiation emitted by the earth's surface, the atmosphere, and clouds.

Carbon dioxide equivalent (CO_2e): unit for comparing the radiative forcing of a greenhouse gas (GHG) to that of carbon dioxide.

Carbon storage in a product: carbon removed from the atmosphere and stored as carbon in a product.

Global warming potential: characterisation factor describing the radiative forcing impact of one mass-based unit of a given greenhouse gas relative to that of carbon dioxide over a given period of time. CO_2 is assigned a GWP of 1, while the GWP of other gases is expressed relative to the GWP of CO_2.[19]

Greenhouse gas emission: mass of a GHG released to the atmosphere.

Greenhouse gas removal: mass of GHG removed from the atmosphere.

Greenhouse gas emission factor: mass of a greenhouse gas emitted relative to an input or an output of a unit process or a combination of unit processes.

Greenhouse gas sink: process that removes a greenhouse gas from the atmosphere.

Terms related to products and processes

Product: any goods or service.
The product can be categorised as follows:

- Service: (e.g. transport, implementation of events, electricity);
- Software (e.g. computer programme);
- Hardware (e.g. engine mechanical part);
- Processed material (e.g. lubricant, ore, fuel);
- Unprocessed material (e.g. agricultural produce).

Services have tangible and intangible elements. Provision of a service can involve, for example, the following:

- An activity performed on a customer-supplied tangible product (e.g. automobile to be repaired);
- An activity performed on a customer-supplied intangible product (e.g. the income statement needed to prepare a tax return);
- The delivery of an intangible product (e.g. the delivery of information in the context of knowledge transmission);
- The creation of ambience for the customer (e.g. in hotels and restaurants).

Product system: collection of unit processes with elementary flows and product flows, performing one or more defined functions and which models the life cycle of a product.

Process: set of interrelated or interacting activities that transform inputs into outputs.

Unit process: smallest element considered in the life cycle inventory analysis for which input and output data are quantified.

Product category: group of products that can fulfil equivalent functions.

Product category rules (PCR): set of specific rules, requirements and guidelines for developing Type III environment declarations[20] for one or more product categories.

Carbon footprint of a product - product category rules (CFP-PCR): set of specific rules, requirements and guidelines for quantification and communication on the CFP for one or more product categories.

Terms on system boundary and functional unit

System boundary: set of criteria specifying which unit processes are part of a product system.

Functional unit: quantified performance of a product system for use as a reference unit. This is the unit of analysis for the study, and provides a basis for comparison if more than one alternative is being studied.

Terms related to data collection

Primary data: quantified value of a unit process or an activity obtained from a direct measurement or a calculation based on direct measurements at its original source.

Site-specific data: data obtained from a direct measurement or a calculation based on direct measurement at its original source within the product system.

Secondary data: data obtained from sources other than a direct measurement or a calculation based on direct measurements at the original source within the product system. Such sources can include databases and published literature validated by competent authorities.

Terms related to life cycle analysis

Life cycle: consecutive and interlinked stages of a product system, from raw material acquisition or generation from natural resources to final disposal.

Life cycle assessment (LCA): compilation and evaluation of the inputs, outputs and the potential environmental impacts of a product system throughout its life cycle.

Life cycle impact assessment: phase of life cycle assessment aimed at understanding and evaluating the magnitude and significance of the potential environmental impacts for a product system throughout the life cycle of the product.

Life cycle interpretation: phase of life cycle assessment in which the findings of either the life cycle inventory analysis or the life cycle impact assessment, or both, are evaluated in relation to the defined goal and scope in order to reach conclusions and recommendations.

Life cycle inventory analysis (LCI): phase of life cycle assessment involving the compilation and quantification of inputs and outputs for a product throughout its life cycle.

Supply chain: those involved, through upstream and downstream linkages, in processes and activities delivering value in the form of products to the user.

Sensitivity analysis: systematic procedures for estimating the effects of the choices made regarding methods and data on the outcome of a CFP study.

Terms on land use change

Direct land use change: change in human use or management of land within the boundaries of the product system being assessed.

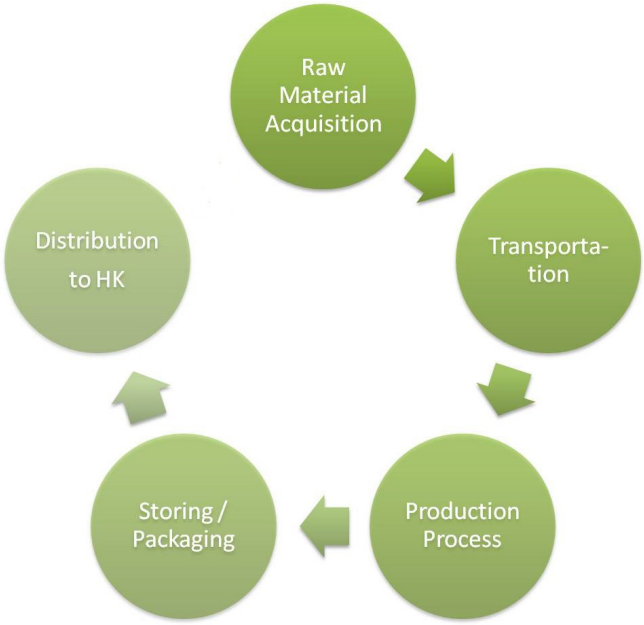
Indirect land use change: change in the use or management of land which is a consequence of direct land use change, but which occurs outside the product system being assessed.

5. Key principles in quantifying and reporting CFP

When conducting the quantification and reporting of the carbon footprint of a product, the following key principles should be taken into account[21]:

- **Life cycle perspective:** The development of CFP quantification and CFP communication has to consider all stages of the life cycle of a product, from raw material acquisition, to processing, production, distribution, use and the end-of-life stage.

- **Iterative approach:** Iteration is the act of repeating a process with the aim of approaching a desired goal, target or result. While undertaking an LCA for a CFP study, an iterative approach means a continuous re-assessment of all the four phases of LCA (goal and scope definition, life cycle inventory analysis, life cycle impact assessment and interpretation) to refine the CFP study. This approach is expected to contribute to the consistency of the CFP study and the reported results.



System Boundary for Carbon Assessment

- **Scientific approach:** During the CFP quantification process, natural science (e.g. physics, chemistry, biology, etc) should form the basis for any decision to be taken. Where no natural scientific basis exists, preference then should be given to other scientific approaches (such as social or economic sciences), or approaches contained

in relevant international conventions. Decisions should only be made based on value choices where none of the above base is available and in that case, the rationale for such value choices has to be explained. In short, a scientific approach in CFP means that a CFP study should be made based on sciences to the best extent possible.

- **Relevance:** For the assessment of GHG emission and removals arising from a product system, the undertaker of the CFP study should select only appropriate and relevant data and methods.

- **Completeness:** This principle means that all GHG emissions and removals that significantly contribute to the CFP of a product system should be included during the study process.

- **Consistency:** Assumptions, methods and data should be applied in the same way throughout the CFP study to arrive at conclusions which are consistent with its goal and scope definition.

- **Coherence:** Where there are recognised methodologies, standards and guidance documents for certain product categories; these methodologies, standards and guidance should be used to enhance comparability between CFPs within any specific product category.

- **Accuracy:** This principle requires CFP quantification and communication to be accurate, verifiable, relevant and not misleading; whereas bias and uncertainties have to be reduced as far as possible.

- **Transparency:** All relevant issues in a CFP study should be addressed and documented in an open, comprehensive and understandable manner. All the relevant assumptions should be disclosed and appropriate references should be made to the methodologies and data sources used during the study process. CFP communication, where available, should be made available to the intended audience and its intended meaning is presented in a way that is clear, meaningful and understandable. The CFP study should include information on functional unit, data assumptions, calculation methods and any other characteristics so as to be transparent and clear to the target group.

- **Avoidance of double-counting:** Double counting of GHG emissions and removals within the studied product system should be avoided at all costs, and similarly the allocation of GHG emissions and removals that have already been taken into account within other product systems.

- **Participation:** The development and implementation of a CFP communication programme should be an open process, in which all interested parties could participate. And reasonable efforts should be undertaken for achieving consensus amongst all parties throughout this process.

- **Fairness:** Since ISO/TS 14067, the primary basis of this guide, addresses only one impact category, which is climate change, this should be made clear in any CFP communication based on a CFP study, undertaken using the guidelines provided in this Technical Specification. CFP studies do not examine broader environmental implications of products and a lower carbon foot-printing result does not mean that a product is environmentally superior to others. Quantified GHG emissions should not be confused with reductions in GG emissions.

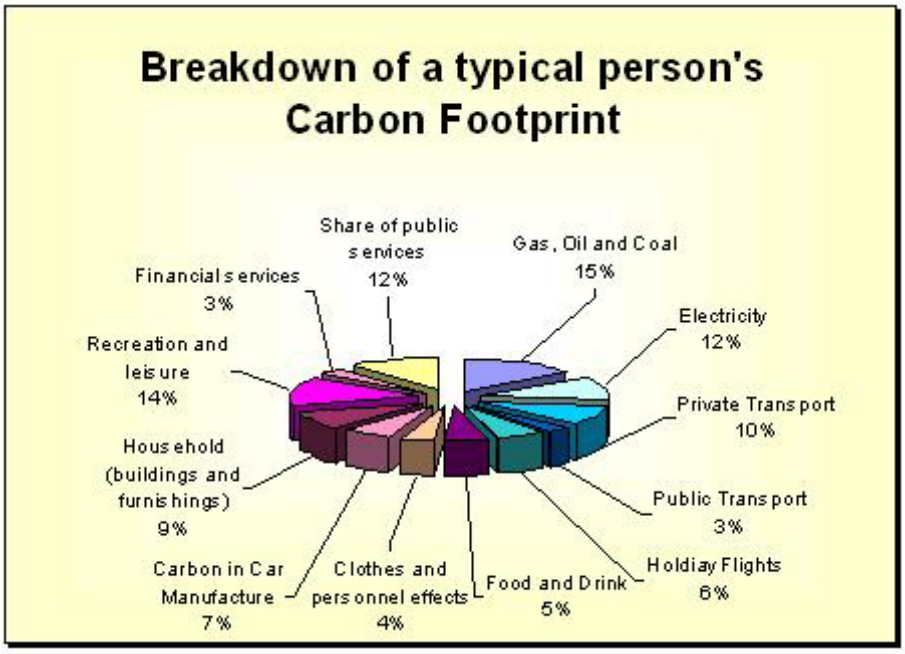
6. How to calculate the carbon footprint of my product?

The following practical steps should be followed to quantify the carbon footprint of a product:

Decision of specific product to be studied

Firstly, a specific product should be defined. A small or medium enterprise may choose to focus on one key product and differentiate it from others in the market. However, there are also enterprises that do businesses on different products or product lines. Therefore, the selection of the product to be studied should be clear.

After that, those enterprises undertaking CFP should keep in mind that where relevant Product Category Rules (PCR) or CFP-PCR exist, they shall be adopted. The CFP-PCR shall identify and document the goal and scope of the CFP study and the results for producing additional information for the product category together with the CFP. The CFP-PCR shall also determine the life cycle stages to be included, the parameters to be covered, and



the way in which the parameters shall be collated and documented. The CFP-PCR shall include, but is not limited to, the following information:

i. Instructions on the content of the CFP communication;
ii. Information on, and justification for, which life cycle stages are covered and which are not, if the communication is not based on a CFP covering all life cycle stages;
iii. Product category definition and description (e.g. function, technical performance and use);
iv. Goal and scope definition for the CFP including:
    - Functional unit,
    - System boundary,
    - Description of data,
    - Criteria for the inclusion of inputs and outputs,
    - Data quality requirements including coverage, site-specific data content, precision, completeness, representativeness, consistency, reproducibility, sources, uncertainty and units,
v. Life cycle inventory analysis, including:
    - Data collection,
    - Quantification procedures,
    - Allocation of flows and releases.
vi. Period of validity.

The CFP-PCR may also include additional guidance such as for-use and end-of-life stages.

Defining goal and scope of the CFP quantification

To quantify CFP, an enterprise may have the option of looking at the whole product life cycle to assess its impacts on the environment, or it may select some unit processes of their production process to record the carbon dioxide equivalent emission. Based on that decision, the goal and scope of CFP study shall be defined. The CFP then shall be either 'full' or 'partial'.

Goal of a CFP study

Generally, the goal of carrying out a CFP study is to calculate the potential contribution of a product to global warming, expressed as CO_{2e} by quantifying all significant GHG emissions and removals over that product's entire life cycle. This is also the goal identified by ISO/TS 14067:2013.

The actual specific goals that drive a carbon footprint study, in practice, vary greatly among different businesses. Among those, we can refer to some as follows:

- To understand the expectation of your customers in terms of sustainability and respond to it;
- To use the LCA results for sustainable product development ("Eco-design");
- To investigate the alternatives from an ecological point of view;

- To use the holistic view of the LCA for making the supply chain environmentally friendly;
- To develop LCA-based KPIs ('key performance indicators') for environmental management systems;
- To develop a roadmap for "Greening your company";
- To develop product stewardship programme.

In defining the goal of a CFP study, the following items shall be unambiguously stated:

- The intended application;
- The reasons for carrying out the CFP study;
- The intended CFP communication and the intended audience, i.e. to whom the results of the CFP study is intended to be communicated.

In another example of measuring Carbon Footprint of New Zealand Lamb, the objectives of the study are:

- To provide a unique, unprecedented benchmark from which all in the industry can understand the carbon footprint for New Zealand lamb consumed in the European market, specifically the United Kingdom.
- To enable every participant in the New Zealand lamb industry supply chain to better understand and improve their emissions performance.
- To provide simple tools for members of the supply chain to understand the impact that different operational decisions (effort and investment) shall have on the carbon footprint of lamb.

In the pilot CFP study which is being undertaken for the rubber industry in Vietnam within the framework of the SESA programme, the following overall goals are stated:

- To promote the concept of Carbon Footprint in the rubber industry in Vietnam in order to raise awareness about climate change, contribute with the international community in reducing greenhouse gases in industrial production and business activities;
- To create a model for calculating Carbon Footprint based on the application of ISO/TS 14067 in order to apply for the whole industry, to internationalise product standards, increase competitiveness towards sustainable development of Vietnamese rubber industry in the context of "Green economy" and international integration.

Whereas the specific objectives are:

- To calculate CO_2 emissions during the production process of the Vietnam Rubber Group, including manufacturing activities related to greenhouse gases emission in latex production process, concentrated latex (semi-products) at Phuoc Hoa Rubber Joint Stock Company and gloves production process (finished products) at VRG Khai Hoan Joint Stock Company.
- To communicate the results in order to introduce and share experiences with related enterprises in calculating carbon footprint of products.

Scope of the CFP study

Having defined the goal, the scope of a CFP study will be decided accordingly. It shall be consistent with the goal. In defining the scope, the following items shall be considered and clearly described:

i. The product system to be studied and its functions;
ii. The functional unit;
iii. The system boundary, including the geographical scope of the product system;
iv. Data and data quality requirements;
v. Time boundary of data;
vi. Assumptions especially for the use stage and the end-of-life stage;
vii. Allocation procedures;
viii. Specific GHG emissions and removals, e.g. due to land use change;
ix. Methods to address issues occurring with specific product categories, e.g. carbon storage;
x. CFP study report;
xi. Type of critical review, if any;
xii. Limitations of the CFP study.

In some cases, the scope of the CFP study may be revised due to unforeseen limitations, constraints or as a result of additional information. Such modifications, together with their explanation, shall be clearly documented.

Functional unit

In every CFP study, the functions of the product system being studied have to be clearly specified. The functional unit shall be consistent with the goal and scope of the CFP study. The primary purpose of a functional unit is to provide a reference to which the inputs and outputs are related. Therefore, the functional unit ought to be clearly defined and measurable. When CFP-PCR are adopted, the functional unit used will be that defined in the CFP-PCR and be consistent with the goal and scope of the CFP study.

Having chosen the functional unit, the reference flow shall be defined. Comparisons between systems should be made on the basis of the same function(s), quantified by the same functional unit(s) in the form of their reference flows.

For example, in the function of drying hands, both a paper towel and an air-dryer system are studied. The selected functional unit may be expressed in terms of the identical number of pairs of hands dried for both systems. For each system, it is possible to determine the reference flow, e.g. the average mass of paper or the average volume of hot air required to dry one pair of hands, respectively. For the systems, it is possible to compile an inventory of inputs and outputs on the basis of the reference flows. At its simplest level, in the case of paper towel, this shall be related to the paper consumed. In the case of air-dryer, this shall be related to volume and temperature of hot air needed to dry the hands.

In the case of Carbon Footprint of New Zealand Lamb, the functional unit is 100 gram portion of raw, purchased meat. This unit represents a recommended portion size in the United Kingdom. Other studies have calculated a footprint per kilo of animal live-weight or per kilo of carcass weight or even per unit of land area.

Results of the quantification of the CFP shall be documented in the CFP study report in mass of CO_{2e} per functional unit. For example, the CFP study of New Zealand Lamb concludes that, "the total carbon footprint was calculated at *1.9 kg CO^2-equivalents for a 100 g portion of lamb meat*."

A CFP may be reported on the basis of a product unit, which is selected by the parties calculating the carbon footprint themselves, i.e. carbon footprint per one item of product, for example, one pair of latex gloves. However, in that case, a functional unit still needs to be stated and the relationship of the functional unit to the product unit shall be documented and explained.

System boundary

The system boundary shall be the basis used to determine which unit processes are included within the CFP study. The selection of the system boundary shall be consistent with the goal of the CFP study. The criteria, for example cut-off criteria, used in establishing the system boundary shall be identified and explained. Enterprises or organisations undertaking CFP should decide which unit processes to be included in the CFP study and to which level of detail these unit processes will be studied. The deletion of life cycle stages, processes, inputs or outputs is only permitted if they do not significantly change the overall conclusions of the CFP study. Any decisions to omit life cycle stages, processes, inputs or outputs shall be clearly stated and the reasons and implications for their omission shall be explained.

In the case of Carbon Footprint of New Zealand Lamb, the system boundary includes four main phases: on-farm, meat-processing, transportation and consumption. On-farm emissions analysis undertaken for this study is consistent with New Zealand's GHG accounting methodology as submitted under the United Nations Framework Convention on Climate Change (UNFCCC). It should be noted this methodology does not include the accounting of carbon sequestration in agricultural soils and does not include any consideration of carbon sequestration in trees used in a normal farming context – such as shelter belts or planting for erosion control or conservation.

The setting of the system boundary can be different depending on the intended use of the CFP study. Where the CFP study results are meant to be communicated publicly, the quantification shall comprise of all life cycle stages, i.e. cradle-to-grave, including consumer use, disposal, etc. On the other hand, if the CFP assessment is not intended to be publicly available, a partial CFP study shall, at least, include the cradle-to-gate GHG emissions and removals arising from all stages and processes, from raw material planting, i.e. the 'cradle' for example, up to the point where the product leaves the production site, i.e. the 'gate'.

In the case of Carbon Footprint for Vietnamese Rubber Products, Phuoc Hoa Rubber Joint Stock Company (producing concentrated latex – semi products) and VRG Khai Hoan Joint Stock Company (producing gloves products – finished products) are the main investigation units, tentatively including the following unit processes:

- On-farm: nursery garden, basic design garden, exploitation garden;
- Production processes for concentrated latex, gloves products;
- Transportation stage;
- Usage stage;
- End-of-life stage.

Data collection

Defining the system boundary will enable the implementing agency to draw all practical unit processes to be involved. Based on that, data on elements that shall emit carbon into the environment for individual process should be determined. Data can include: energy use on site, mass of all materials used, packaging material, waste, transport on site, transport distances, other materials/energy required for use of products, end-of-life scenario.

In the case of Carbon Footprint of New Zealand Lamb for example, CO_2 equivalent needs to be calculated in four phases: on-farm, meat-processing, transportation and consumer stage. On farms, the largest specific contributors to emissions are natural processes associated with sheep utilising pasture as a feed source. These natural processes include methane from rumen digestion of pasture and nitrous oxide from animal excreta on soil. For meat processors, energy used for refrigeration, water-heating and operation of machinery, and wastewater management are sources for data collection.

Type of data

Besides, during this step, the examiner has to decide what type of data is needed and feasible. For example, in what case primary data is needed, or when site-specific data could be collected. Site-specific data shall be collected for all individual processes under the financial or operational control of the organisation undertaking the CFP study, and should be representative of the processes for which they are collected. Site-specific data should also be used for those unit processes that contribute significantly to the CFP, but are not under the financial or operational control of the organisation undertaking the CFP study. Site-specific data include GHG emissions from GHG sources as well as GHG removals by GHG sinks for one specific unit process within a site. Site-specific data refer to either direct GHG emissions, activity data or emission factors;

Secondary data and primary data that are not site-specific data shall only be used for inputs where the collection of site-specific data is not possible or practicable, or for processes of minor importance and may include literature data, calculated data, estimates or other representative data. Secondary data shall be justified and documented with references in the CFP study report.

Data quality

Data quality should be characterised by both quantitative and qualitative aspects. A CFP study should use data that reduce bias and uncertainty as far as practical by using the best quality data available. Requirements for primary and secondary data shall be specified to enable the goal and scope of the CFP study to be met. The data quality requirements should address the following:

- Time-related coverage;
- Geographical coverage;
- Technology coverage;
- Precision;
- Completeness;
- Representativeness;
- Consistency;
- Reproducibility;
- Sources of the data;
- Uncertainty of the information.

Consistent cut-off criteria that allow the omission of certain processes of minor importance shall be defined with the goal and scope definition phase. The effect of the selected cut-off criteria on the outcome of the study shall also be assessed and described in the CFP study report.

In the case of Carbon Footprint of New Zealand Lamb, on farm, the largest contributors to the carbon footprint are natural processes associated with sheep utilising pasture as a feed source. These processes produce methane from rumen digestion of pasture and nitrous oxide from animal excreta deposited on soil. Besides, GHG emission also comes from fuel & electricity and fertiliser & lime usage.

In those unit processes mentioned above in the case of Carbon Footprint for Vietnamese Rubber Products, data collection will be carried out by a field visit to the production site; direct interview in combination with indirect investigation by means of distributing questionnaires and using recorded data of business units on information related to the supply chain of inputs and outputs. Phuoc Hoa Rubber Joint Stock Company and VRG Khai Hoan Joint Stock Company are the main investigation units with the involvement of the following departments:

- On-farm;
- Technical departments: agricultural and industrial department;
- Quality testing departments: quality testing departments at concentrated latex factory and gloves manufacturing factory;
- Factories: concentrated latex factory and gloves manufacturing factory;
- Sales departments.

Time boundary for data

During the data collection stage, time boundary for data would also need to be taken into consideration. The time boundary for data is the time period for which the quantified figure for the CFP is representative. The time period for which the CFP is representative shall be specified and justified. Where the GHG emissions and removals associated with specific unit processes within the life cycle of a product vary over time, data shall be collected over a period of time appropriate to establish the average GHG emissions and removals associated with the life cycle of the product.

If a process within the system boundary is linked to a specific time period (e.g. seasonal products such as fruits or vegetables), the assessment of GHG emissions and removals shall cover that particular period in the life cycle of the product. Any activities outside that period shall also be included provided that it is within the product system. For example in the case of the rubber industry in Vietnam, GHG emissions related to rubber tree nursery shall be included.

These data on GHG emissions and removals shall be properly linked to the functional unit already identified.

Use stage to be included

In addition, when the use stage is included within the scope of CFP study, GHG emissions and removals arising from the use stage of the product during the product's service life shall be included. Information about the service life of products shall be verifiable and shall refer to the intended use conditions and to the related functions of the product. The use profile should seek to represent the actual usage pattern in the selected market for the product. Where not otherwise justified, the determination of the use profile (i.e. the related scenarios and assumed service life for the use stage of products) should be based on published technical information such as:

- CFP-PCR;
- Published international standards that specify guidance and requirements for development of scenarios and service life for the use stage for the product being assessed;
- Published industry guidelines that specify guidance for the development of scenarios and service life for the use stage for the product being assessed; and
- Use profiles based on documented usage patterns for the product in the selected market.

End-of-life stage

The end-of-life stage begins when the used products are ready for disposal, recycling, reuse, etc. All the GHG emissions and removals arising from the end-of-life stage of a

product shall be included in a CFP study, if this stage is included in the scope. End-of-life processes may include:

- Collection, packaging and transport of end-of-life products;
- Preparation for recycling and reuse;
- Dismantling of components from end-of-life products;
- Shredding and sorting;
- Material recycling;
- Composting;
- Energy recovery, organic recovery or other recovery processes;
- Incineration and sorting of bottom ash;
- Land-filling, landfill maintenance, promoting emissions from decomposition, such as methane.

Life cycle inventory analysis

Life cycle inventory analysis (LCI) is the phase of LCA involving the compilation and quantification of inputs and outputs for a product throughout its life cycle. If CFP-PCR are adopted for the CFP study, the LCI shall be conducted according to the requirements in the CFP-PCR.

Firstly the qualitative and quantitative data for inclusion in the life cycle inventory shall be collected for all unit processes that are included in the system boundaries. The collected data, whether measured, calculated or estimated, are utilised to quantify the inputs and outputs of a unit process. When data have been collected from public sources, the sources shall be referenced in the CFP study report.

Then a check on data validity shall be conducted during the process of data collection to confirm and provide evidence that the data quality requirements have been met.

Subsequently, data shall be appropriately related to the unit processes and functional unit of the product being studied. An appropriate flow shall be determined for each unit process. The quantitative input and output data of the unit process shall be calculated in relation to this flow. Based on the flow chart and the flows between unit processes, the flows of all unit processes are related to the reference flow. The calculation shall relate the data about system inputs and outputs to the functional unit.

Reflecting the iterative nature of the CFP quantification, decisions regarding the data to be included shall be based on a sensitivity analysis to determine their significance. The sensitivity analysis may result in:

i. Exclusion of the life cycle stages or unit processes when lack of significance can be shown by the sensitivity analysis;
ii. Exclusion of inputs and outputs that lack significance to the results of the CFP study; or
iii. Inclusion of new unit processes inputs and outputs that are shown to be significant in the sensitivity analysis.

This sensitivity analysis serves to limit the subsequent data handling to the input and output data determined to be significant to the goal of the CFP.

Allocation

Furthermore, it should be noted that the inputs and outputs in any CFP study shall be allocated to different products according to a clearly stated and justified allocation procedure. The sum of the allocated inputs and outputs of a unit process should be equal to the inputs and outputs of the unit process before allocation.

Where possible, allocation should be avoided by:

(i) Dividing the unit process to be allocated into two or more sub-processes and collecting the input and output data related to these sub-processes, or

(ii) Expanding the product system to include the additional functions related to the co-products.

Where allocation is absolutely required, the inputs and outputs of the product system should be partitioned between its different products or functions in a way that reflect the underlying physical relationship between them. Where physical relationship along cannot be established or used as a basis for allocation, the inputs should be allocated between the products and functions in a way that reflects other relationships between them. For example, input and output data might be allocated between co-products in proportion to the economic value of the products. These allocation principles and procedures also apply to for reuse and recycling situations.

Time period for assessment of GHG emissions and removals

In terms of time period, for CFP quantification, the GHG emissions and removals arising from the life cycle of a product shall be calculated over the entire life cycle of the product, including the use stage and the end-of-life stage. For all life-cycle stages except the use stage and the end-of-life stage, GHG emissions and removals shall be included as if released and removed at the beginning of the assessment period.

Where all GHG emissions and removals arising from the use stage or from the end-of-life stage occur within ten years after the product has been brought into use, all those GHG emissions and removals shall be calculated as if released or removed at the beginning of the assessment period and included in the CFP. Where GHG emissions and removals arising from the use stage or from the end-of-life stage occur over more than ten years after the product has been brought into use, these GHG emissions and removals shall be included in the CFP without the effect of timing of the GHG emissions and removals.

Treatment of specific GHG emissions and removals

For the sake of consistency of quantification, specific requirements and guidelines are provided below for specific GHG emissions and removals where different approaches could lead to different results.

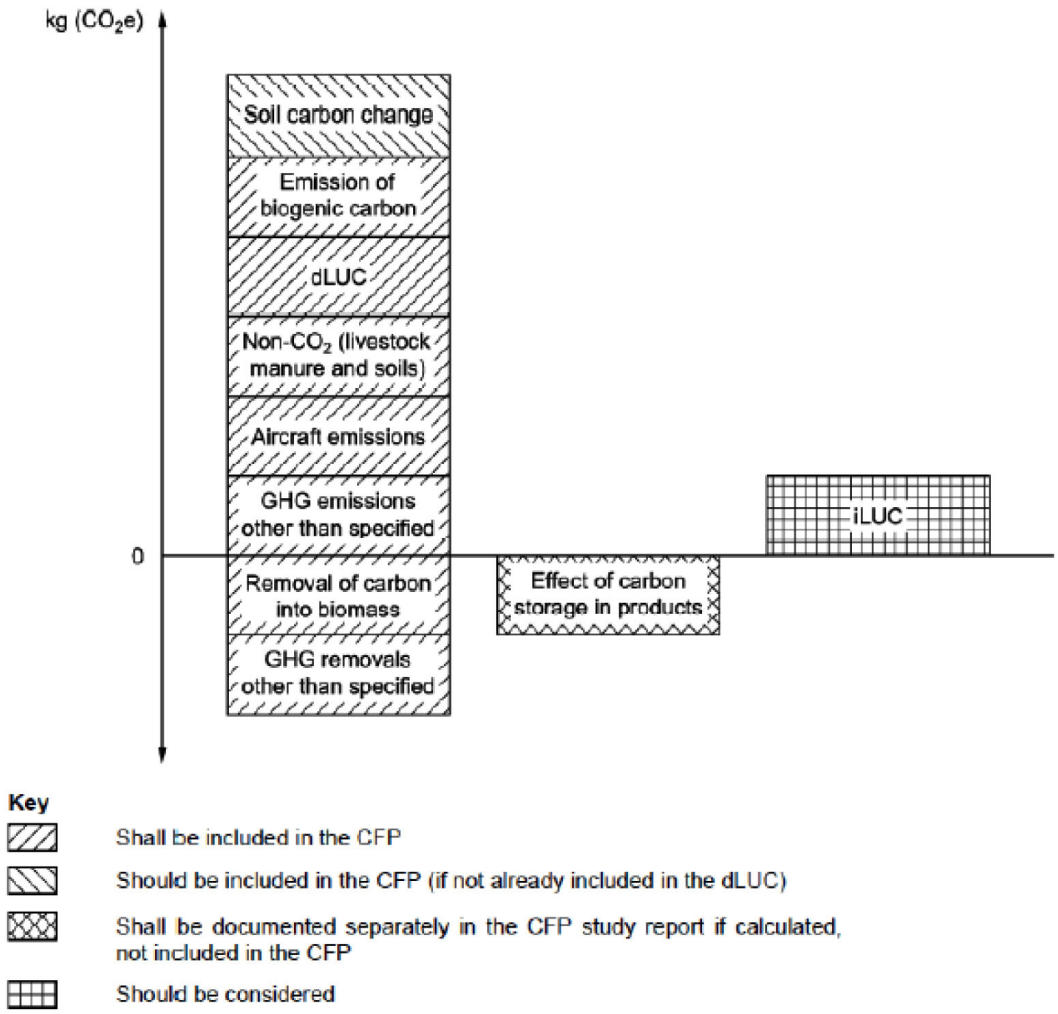
Table 1 – Specific GHG emissions and removals to be included in the CFP and to be documented separately in the CFP study report

Specific GHG emissions and removals	Treatment in the CFP			Treatment in the CFP study report	
	Shall be included in the CFP	Should be included in the CFP	Should be considered for inclusion in the CFP	Shall be documented separately in the CFP study report	Shall be documented separately in the CFP study report, if calculated
GHG emissions and removals arising from fossil and biogenic carbon sources and sinks	✓			✓	
GHG emissions and removals occurring as a result of dLUC	✓			✓	
GHG emissions and removals occurring as a result of iLUC			✓		✓
GHG emissions and removals from soil carbon change, if not ready calculated as part of LUC		✓			✓
Effect of carbon storage					✓
Non- CO_2 GHG emissions and removals (e.g. N2O and CH4) arising from livestock, manure and soils	✓				
Aircraft GHG emissions	✓				

dLUC: direct land use change,
iLUC: indirect land use change,
LUC: Land use change.

a) The treatment of electricity shall be documented in the CFP study report but GHG emissions and removals from electricity do not have to be documented separately in the CFP study report.
b) Effect of carbon storage is not included in the CFP.
c) Non-CO_2 GHG emissions and removals arising from livestock, manure and soils shall be included in the CFP but do not have to be documented separately in the CFP study report

Figure 1: Illustration of the specific components of the CFP



Treatment of electricity

The GHG emissions associated with the use of electricity shall include, where relevant, GHG emissions arising from the life cycle of the electricity supply system, including but not restricted to:

- The GHG emissions arising from the generation of electricity, e.g. combustion of fuels;
- The GHG emissions arising from the transmissions as well as distribution losses in the grid;
- Upstream GHG emissions (e.g. the mining and transport of fuel to the electricity generator or the growing and processing of biomass for use as a fuel);
- Downstream GHG emissions (e.g. the treatment of waste arising from the operation of nuclear electricity generators or treatment of ashes from coal fired electricity plants);

- GHG emissions related to construction maintenance and decommission of the electricity supply system.

When electricity is internally (e.g. on-site generated electricity) produced and consumed for a product under study, life cycle data for that electricity shall be used for that product. If specific life cycle data on a process within the electricity supply system are difficult to access, data from recognised databases may be used. The treatment of electricity should be documented in the CFP study report.

Life cycle impact assessment

In the LCIA phase of a CFP study, the potential climate change impact of each GHG emitted and removed by the product system shall be calculated by multiplying the mass of GHG released or removed by the 100-year global warming potentials (GWP) given by the International Panel on Climate Change (IPCC) in units of "kg CO_2e per kg emission". The carbon footprint of the product will then be the sum of these calculated impacts.

CFP study report

When CFP has been quantified, the result shall be recorded in a CFP study report. The purpose of this report is to document the results of the quantification of the CFP study, to present the decisions within the goal and scope definition phase. The results and conclusions of the CFP study shall be documented in the CFP study report without bias. The results, data, methods, assumptions and the life cycle interpretation shall be transparent and presented in sufficient details to enable the readers to comprehend the complexities and trade-offs inherent in the CFP study.

The selected allocation methods shall be documented in the CFP study report in detail and the GHGs taken into account shall be clearly stated.

7. Communication

Communication of CFP results may take the form of a CFP external communication report, a CFP performance tracking report, a CFP label or a CFP declaration. According to ISO/TS 14067:2013, only the CFP performance tracking and the CFP external communication reports are the acceptable CFP claims. The purpose of CFP communication is for users of the product to be informed by the relevant CFP communication how and to what extent they can influence the GHG emissions by their behaviour during the use stage and by decisions on recycling or final disposal.

CFP communication intended to be available to the public

CFP communication intended to be available to the public may take the forms of (i) a CFP external communication report; (ii) a partial CFP external communication report; (iii) a CFP performance tracking report; or (iv) a CFP label.

The CFP external communication report shall be based on the CFP study report and shall include but is not limited to:

a. Contact information;
b. Studied product name and description;
c. Functional unit of the product system and the reference flow;
d. Type of CFP (partial or full);
e. CFP-PCR, if used;
f. Disclaimer stating the relevant limitations of various potential uses;
g. Description of the stages of the life cycle including a description of the selected use profiles and end-of-life scenarios, if relevant;
h. System boundaries, including cut-off criteria;
i. Exclusions and their justification;
j. Time boundary for data;
k. Description of primary and secondary data;
l. Life cycle inventory results in units of CO_2e per functional unit of the product system, which includes all GHG emissions;
m. GHG emissions and removals linked to the life cycle stages in which they occur, including the absolute and the relative contribution of each life cycle stage;
n. GHG emissions and removals arising from fossil carbon sources and sinks;

o. GHG emissions and removals arising from biogenic carbon sources and sinks;
p. GHG emissions resulting from LUC, if quantified;
q. GHG emissions resulting from aircraft transportation, if significant;
r. Results of the life cycle interpretation (e.g. sensitivity analysis and uncertainty), including conclusions and limitations.

The communication shall also be supported by a disclaimer on the proper use of the CFP external communication report. The CFP external communication report should include graphical representations of the processes of the life cycle of the product which describe the system boundary and the contribution to the CFP.

CFP tracking report

CFP communication may take the form of CFP performance tracking report, which allows for the comparison of CFP results of one specific product of the same organisation over time with respect to its original or previous CFP. When communicating a change of CFP to the public, the main contributions to the changes shall be specified. Communication of performance tracking may be made when they are due to:

- Improvements made by the reporting organisation;
- Selection of other suppliers;
- Deliberate and verifiable improvements made by suppliers;
- Improvements in the use stage and in the end-of-life stage made by improved product design or an improved end-of-life procedure; or
- Changes due to process improvements.

CFP label

CFP communication may take the form of a CFP label. The CFP label shall always be considered as a publicly available communication. The CFP label shall be awarded only to products that meet predetermined programme requirements. A CFP communication programme for a CFP label shall identify the CFP values that meet the specific criterion of the programme. This criterion is quantified by using the CFP-PCR of the product categories.

CFP declaration

CFP communication may also take the form of a CFP declaration which is intended to be either publicly available or not publicly available.

CFP communications intended to be publicly available shall be supported by:

a. Information at an appropriate place in the CFP communication that the CFP only addresses the single impact category of climate change and does not assess other potential social, economic and environmental impacts arising from the provision of a product;
b. A CFP with components as illustrated in Table 1 and Figure 1 above;
c. The functional unit to which the CFP communication refers;
d. The date of issue and a direct link to background information on a website, at the point of sale or any other publicly available communication. Publicly available background information includes but is not limited to:

- The methodology used;
- The involvement of interested parties in the CFP communication programme when required;
- Definition of rated scales and colour/letter codes, if used;
- Background information on GHG emissions and removal;
- Information on the fulfilment of data quality requirements;
- Information on uncertainties and how they were assessed.

e. The CFP verification statement of the CFP study report and the CFP communication when verified by a third-party;

f. A publicly available CFP disclosure report, when the CFP study report is not third-party verified;

g. The storage time period for biogenic carbon in the product if applicable.

Figure 2: General requirements and guidelines for the different CFP communication options

	CFP external communication report	CFP performance tracking report	CFP label	CFP declaration
CFP communication **not intended to be publicly available**	CFP communication programme optional	CFP communication programme optional		CFP communication programme mandatory
	CFP-PCR optional	CFP-PCR optional		CFP-PCR mandatory
	3rd party verification or CFP disclosure report optional	3rd party verification or CFP disclosure report optional		3rd party verification or CFP disclosure report mandatory
CFP communication **intended to be publicly available**	CFP communication programme optional	CFP communication programme optional	CFP communication programme mandatory	CFP communication programme mandatory
	CFP-PCR optional	CFP-PCR optional	CFP-PCR mandatory	CFP-PCR mandatory
	3rd party verification or CFP disclosure report mandatory	3rd party verification or CFP disclosure report mandatory	3rd party verification or CFP disclosure report mandatory	3rd party verification or CFP disclosure report mandatory

CFP communication not intended to be available to the public

When the CFP communication is not intended to be available to the public, requirements for a CFP communication programme, CFP-PCR and CFP verification are optional with the exception of the CFP declaration, where these elements are required.

CFP communication programme

A CFP communication programme is optional for the CFP external communication report and CFP performance tracking report. For CFP labels and CFP declarations, a CFP communication programme shall be used.

The purpose of a CFP communication programme is to establish specific requirements and procedures for ensuring communication of CFP to be accurate, clear and verified. The CFP communication programme shall manage and maintain CFP-PCR to ensure CFP are calculated consistently within product groups or sectors. The scope of the CFP communication programme shall be clear and shall contain an explanation whether the programme is limited to a certain geographical area or to certain industrial sectors, products or groups of products. The CFP programme operator shall prepare general programme instructions describing the operation of the programme including, but not limited to, the following information:

a. Objectives of the programme;
b. Identification of CFP programme operator;
c. Intended audience of the programme;
d. Involvement of interested parties;
e. Procedure for the definition of product categories;
f. Procedure for the management of the data and documentation used;
g. Data confidentiality management;
h. Procedure for development and maintenance of CFP-PCR, including
    - Content of CFP-PCR,
    - Rules for period of validity, which shall include consideration of changes in relevant information affecting the CFP-PCR, and
    - Selection procedure for predetermined parameters;
i. Any procedure for third-party CFP verification, including
    - Addition competence of CFP verifiers, and
    - Competence of the CFP-PCR review panel;
j. Any additional requirements for the CFP disclosure report;
k. Funding sources and other resources provided for programme development and operation;
l. Periodic review of the programme instructions;
m. Fees, if relevant.

The CFP communication programme instructions should be available to any person on request and should be accessible to all interested parties.

Additional aspects for CFP communication

For CFP communication intended to be available to the public, confidential information shall be accessible for CFP verification activities. For CFP communication not intended to be available to the public, organisations may decide to provide the data to a third-party and also may specify which confidentiality requirements to impose. Communication of a partial CFP may be made for:

- GHG emissions from selected stages of a product's life cycle, or
- Results based on different scenarios as defined by the CFP-PCR, e.g. use and disposal.

CFP communication intended to be available to the public shall be based on the life cycle of the product, unless:

- Information on specific stage (e.g. the use and end-of-life stages of the product) is not available and reasonable scenarios cannot be modelled, or
- There are stages that are insignificant for the GHG emissions and removals of the product.

Where it is possible to model reasonable scenarios for any specific stage(s), and the stage(s) is (are) significant for the CFP, the stage(s) shall not be excluded. Assumptions made to create the scenarios shall be clearly stated. A statement on omissions and justifications shall be included in the communication of partial CFP and shall justify the included and excluded life cycle stages.

8. References

British Standards Institute (BSI), PAS 2050, Specification for the assessment of the life cycle greenhouse gas emissions of goods and services, 2008.

BSI, PAS 2050, Assessing the life cycle greenhouse gas emissions of goods and services, 2009. Available at URL: http://shop.bsigroup.com/en/Browse-By-Subject/Environmental-Management-and-Sustainability/PAS-2050/

Carbon Trust, The Carbon emissions generated in all that we consume, London: The Carbon Trust, 2006.

Carbon Trust and BSI, Guide to PAS 2050, How to asses the carbon footprint of goods and services, 2008.

Carbon Trust, Code of Good Practice for Product Greenhouse Gas Emissions and Reduction Claims & Guidance to support the robust communication of product carbon footprints, 2008.

International Organization for Standardization (ISO), Responding to the global and related challenges of climate change, energy, water and nutrition, 2008 & APEC Conference on Standards and Conformance, August 2008/SOM3/SCSC/CONF/012.

ISO, ISO 14040:2006 - Environmental management – Life cycle assessment – Principles and framework, Geneva, 2006

ISO, ISO 14044:2006 - Environmental management – Life cycle assessment – Requirements and guidelines, Geneva, 2006

ISO, ISO/TS 14067:2013 – Greenhouse gases – Carbon footprint of products – Requirements and guidelines for quantification and communication, Geneva, 2013

Saunders, C., Barber A. & Taylor G., Food Miles – Comparative Energy/ Emissions Performance of New Zealand's Agriculture Industry, Research Report 285, AERU, Lincoln University, New Zealand, 2006.

Williams, A., Comparative Study of Cut Roses for the British market produced in Kenya and the Netherlands, Bedford Cranfield University, 2007.

9. Endnotes

1 Oxfam & UNVN, *Responding to climate change in Vietnam: opportunities for improving gender equality*, Policy discussion paper, United Nation Vietnam, 2009.

2 UN Vietnam, *Gender and climate change in Vietnam: a desk review*, UN Vietnam, Hanoi and VNRCS (2004). *Training module: hazards and disasters related to climate change*, Vietnam Red Cross Society and the Netherlands Red Cross, Hanoi, 2009.

3 Trung, P.T. (2013), "*Climate change and its gendered impacts on agriculture in Vietnam*", International Journal of Development and Sustainability, Vol.2 No.1

4 Vietnam News, *Climate change to hit crop hard*, see <http://vietnamnews.vn/environment/244904/climate-change-to-hit-crops-hard.html>

5 Herbert Hirner, *Greenhouse gas emissions - ISO 14067 to enable worldwide comparability of carbon footprint data*, ISO - 11 May 2012

6 Bolwig, S., & Gibbon, P., *Emerging product carbon footprint standards and schemes and their possible trade impacts*, National Laboratory for Sustainable Energy, Technical University of Denmark, 2009.

7 ISO 14025 – 2006*: Environmental labels and declarations – Type III environmental declarations – Principles and procedures*, ISO.

8 Bolwig, S., & Gibbon, P., *Emerging product carbon footprint standards and schemes and their possible trade impacts*, National Laboratory for Sustainable Energy, Technical University of Denmark, 2009.

9 ISO, *Greenhouse gases – Carbon footprint of products – Requirements and guidelines for quantification and communication*, ISO/TS 14067:2003, IDT

10 Offsetting could be understood as a mechanism for compensating for all or a part of the CFP through the prevention of the release of, reduction in, or removal of an amount of greenhouse gas emissions in a process outside the boundary of the production system being studied. For example, if a mobile phone manufacturing enterprise decides to plant trees around its factories, that shall be considered as an attempt to offset the greenhouse gas emission from its core manufacturing activities (which are to produce mobile phones). Even though such efforts are quite commendable, they are not within the scope of a CFP study as explained in this booklet.

11 Sha, H., *The Carbon Footprint in Agricultural Trade*, A Background paper prepared for the International Centre for Trade and Sustainable Development (ISTSD), 2008.

12 More information about this process can be viewed at URL: http://www.iea.org/policiesandmeasures/pams/france/name,24039,en.php

13 Bolwig, S., & Gibbon, P., *Emerging product carbon footprint standards and schemes and their possible trade impacts*, National Laboratory for Sustainable Energy, Technical University of Denmark, 2009.

14 French Sustainable Development Ministry and OECD, *France prepares for a general environmental labelling scheme for consumer products*, 2011.

15 This section draws on Ikezuki, Given that Japan's Carbon Footprint System is in a constant state of flux, the information contained herein should be regarded as provision, 2009.

16 The first is the "*Guidelines on the Carbon Footprint System*" including general rules for product carbon foot-printing and rules for the communication of carbon information on labels and elsewhere. The second set of guidelines is the "*Guide for Establishing Product Category Rules*" concerning the development of rules for conducting life-cycle assessments for different product categories, which is a condition for the subsequent PCF assessment and labelling.

17 Bolwig, S., & Gibbon, P., *Emerging product carbon footprint standards and schemes and their possible trade impacts*, National Laboratory for Sustainable Energy, Technical University of Denmark , 2009.

18 The terms and definitions provided are drawn from ISO/TS 14067:2013. See footnote 9

19 A table indicating global warming potentials relative to CO2 for the 100-year time horizon is included in Annex A of ISO/TS 14067:2013.

20 'Type III environmental declaration' is defined in ISO 14025:2006. It could generally be understood as a formalised set of environmental data describing the environmental aspects of a product. See more at <http://www.iso.org/iso/environmental-labelling.pdf> (ISO, *Environmental labels and declarations – How ISO standards help*, 2012, p.7)

21 The principles provided are also primarily based on ISO/TS 14067:2013. See footnote 9

30 1983 2012 CUTS International

www.cuts-international.org