Carbon Handprint

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Chapter Title Carbon handprint

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Definition/description (250 words)

A carbon handprint is a new approach developed to quantify the positive climate impact of products and services. In contrast to carbon footprint, which refers to negative global warming potential as a consequence of greenhouse gas (GHG) emissions over the life cycle of a product, a carbon handprint indicates the reduced amount of greenhouse gas emissions due to the use of a specific product or a service. A carbon handprint can be thus defined as *the beneficial climate impact that organizations can achieve and communicate by providing products or services that reduce the carbon footprints of customers* (Grönman et al., 2019).

Carbon handprint builds upon the assumption that reducing the product's carbon footprint alone is not a handprint. Carbon handprint can be achieved in a provider–customer relationship, when the provided goods, intermediate product, raw material, service, technology, etc. (hereafter: a product), that a customer uses, serves to reduce the customer's carbon footprint when compared to a baseline practice. A carbon handprint, therefore, is always a carbon footprint calculation of the modified situation against the baseline situation: see Figure 1. Carbon handprint can be used in the communicating and marketing of global warming reduction potential as well as in identifying the development needs of a product.

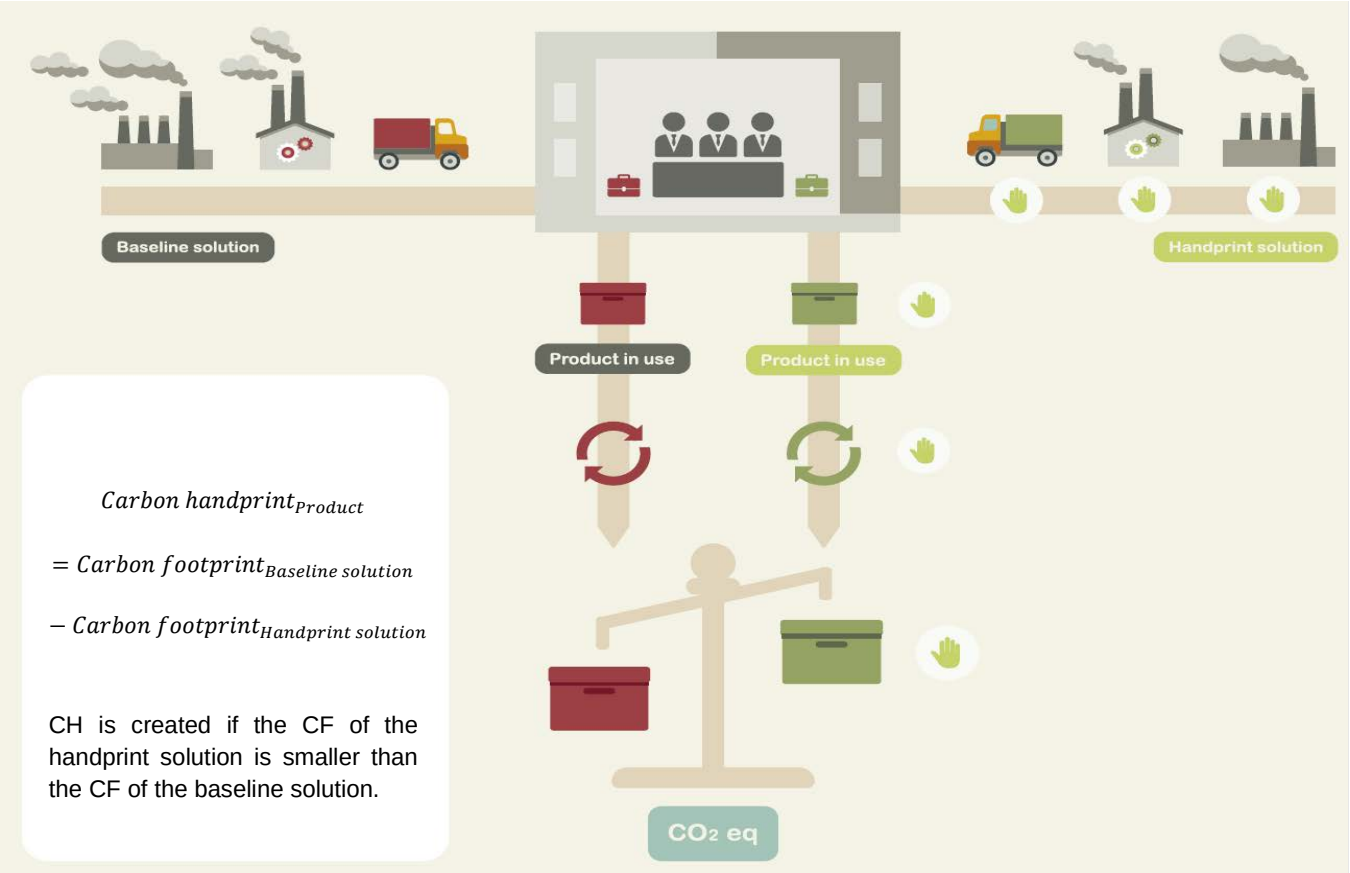

Figure 1. Carbon handprint (CH) is the difference of carbon footprints (CF) of the baseline solution and the handprint solution when a customer is using either the baseline product or the handprint product.

Development of the handprint concept

The term 'handprint' was first introduced in 2007 by UNESCO and determined as a measure of Education for Sustainable Development action, aiming to decrease the human footprint (Hand Print Action Toward Sustainability, n.d.). Shifting handprints to serve as environmental indicators is based on the work done by Biemer et al. (2013) and Norris (2015). Grönman et al. (2019) introduced the definition (see above) and calculation guidelines specifically for carbon handprint assessments. Norris (2019) backs up the Grönman et al. definition by determining handprints as *reductions in footprint related impacts outside the scope of the actor's footprint with respect to business as usual.* Most recently, Kühnen et al. (2019) introduced a handprint methodology that focuses on positive contributions to sustainable development.

The need for carbon handprint quantification and communication has risen from the industrial sector. Many companies and organizations already act responsibly toward the environment, so they might have already minimized their resource use as well as the emissions and waste created. They could even be providing products or services that help their customers reduce their environmental impact. However, these frontrunner companies have also been forced to settle for using traditional life cycle assessment (LCA) quantifying their negative environmental impacts. Besides handprints, other concepts or indicators for environmental benefits have emerged, e.g. Cradle to Cradle (McDonough and Braungart, 2002), unburdening of the environment (Kravanja and Čuček, 2013), positive footprints (Dyllick and Muff, 2016), and net positivity (Dyllick and Rost, 2017; Norris, 2015).

The goal for carbon footprints is to see a reduction close to zero whereas, with handprints, there is no upper limit on the positive impacts that can be achieved (Biemer et al., 2013). Some studies have used a negative footprint to illustrate the positive impact, which has led to confusion regarding the footprint concept. These starting points indicate a clear need for developing a scientifically sound calculation approach for carbon handprint that organizations can use effectively.

Carbon handprint calculation process

The carbon handprint approach of Grönman et al. (2019), which is further presented in Pajula et al. (2018) and Vatanen et al. (2018), is based on ISO standards for life cycle assessment (ISO 14040, 2006 & ISO 14044, 2006) and for carbon footprint (ISO 14067, 2018). The carbon handprint approach complements these standards by offering guidance in setting up a comparison between the handprint solution and baseline solution: especially by identifying customers of the product, identifying potential carbon handprint contributors, and defining the baseline. Figure 2 illustrates the four stages and ten steps in the carbon handprint approach, which are then described in more detail.

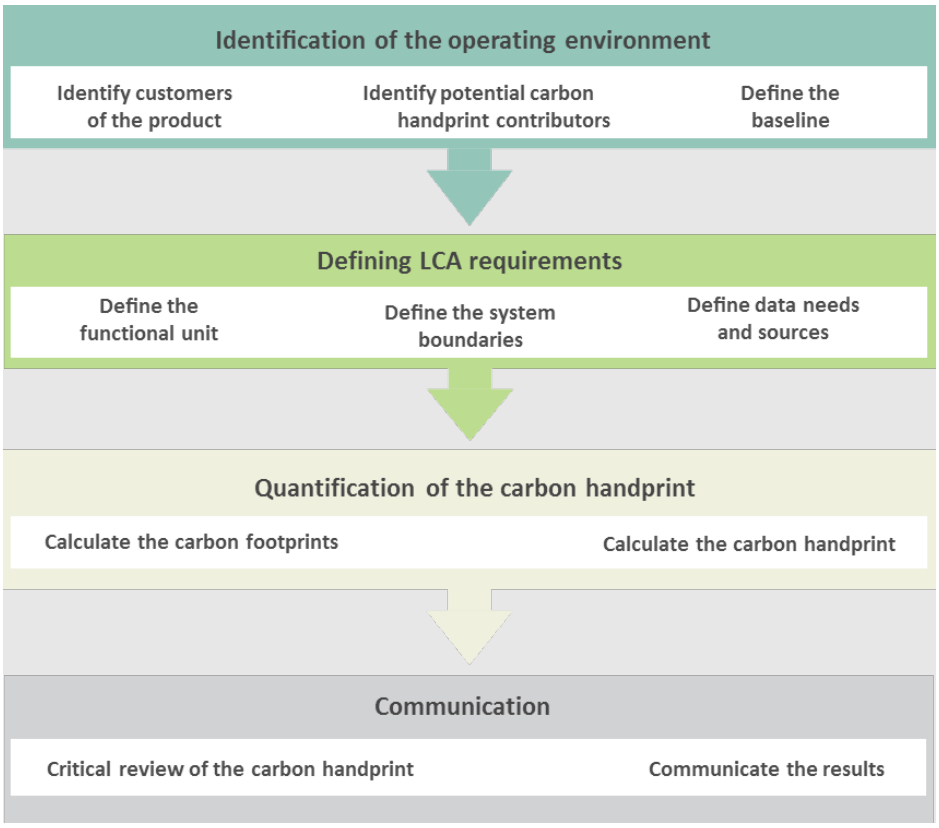

Figure 2. The carbon handprint calculation process (Pajula et al., 2018).

Stage 1: Identification of the operation environment

In the first stage, the conditions of the product's operational environment are identified. This stage forms the core of the carbon handprint assessment and is additional to traditional LCA. As the first step, the (potential) user of the product, or the customer, is recognized. Because carbon handprint is always calculated in the provider–customer interface, it is essential to define who the customers are and where and how they are using the product. Different kinds of customers using the product differently or in different operating environments can also be identified.

Next, a hypothesis is formed on the mechanism, in terms of how this product can reduce the carbon footprint of the customer using it. This hypothesis affects in following steps, defining the baseline and the system boundaries. Whether the carbon handprint outperforms the baseline product in this regard will be verified while conducting the carbon footprint calculations. Examples of possible contributing mechanisms for carbon handprint creation can be seen in Figure 3.

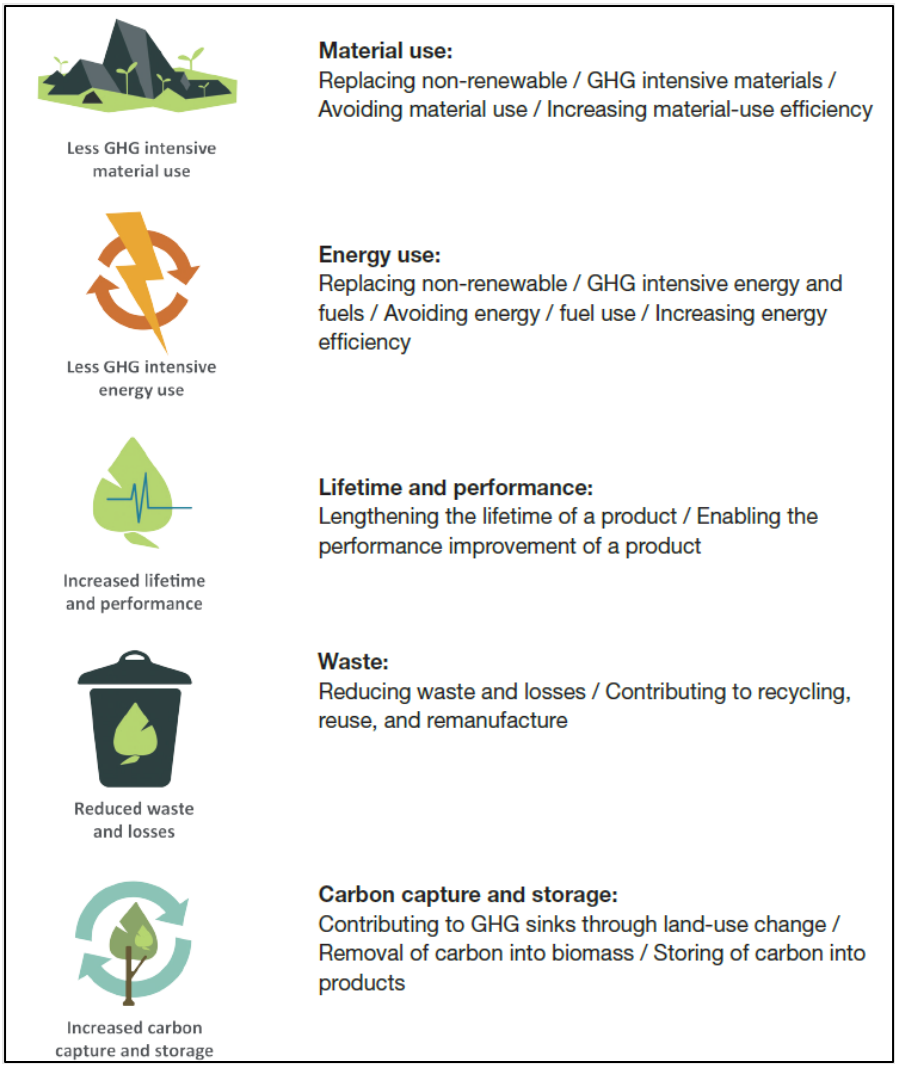

Figure 3. Possible contributing mechanisms to carbon handprint (Pajula et al., 2018).

As a third step, the baseline is defined. The baseline solution should deliver the same function as the handprint solution, be used for the same purpose, be available on the same market in a specified time period and geographical location, and be assessed consistently following the LCA guidance in terms of several key factors, e.g. data quality, representativeness, system boundaries, and assumptions.

If the product is entirely new on the market, the baseline has to be set to reflect the current situation without the product. However, if a (more sophisticated) product replaces a current market-available product, the conductors of the assessment have to define the baseline based on the specific customer's current product. If the customer cannot be precisely identified and, thus, the current baseline product cannot be determined directly, one must set the baseline complying with three key criteria. First, choose a market leader or a typical product in the identified reference area and time. Second, if identifying one typical product is not possible, one can use an average product in that specific region and time. As a third option, available product specifications, standards, or best available technique reference documents can be used as a baseline. This can be a justified choice, if there is an abundant amount of business-as-usual solutions or if data on the competitor's solution is difficult to attain.

Stage 2: Defining LCA requirements

The second stage in the process covers the essential steps regarding LCA requirements. First, the functional unit of the study describes the performance of the studied product system and provides a reference on which the resulting greenhouse gas emissions are related. Second, the system boundaries defining unit processes to be included or excluded from the study are set. The system

boundaries should be set consistently with the goal of the study and, therefore, always include the product's use phase by the customer. It is also important to have equal system boundaries for the baseline and the handprint solutions. Third, data needs and sources are identified. If the customer of the product can be identified in the previous stage, one should aim to use the most recent primary data from that customer. If this is not possible, statistical or average data needs to be used. However, the aim is to have data that is as representative as possible of the actual operating environment, both for the baseline and for the handprint solution.

Next, the carbon footprint calculation for the baseline solution, as well as for the handprint solution, is conducted following ISO 14067 guidance. After that, these two footprints are compared and the difference equals the carbon handprint of the product. The product that enabled this reduction gets the carbon handprint, and the carbon footprint reduction benefits the customer using that product. In some cases, the baseline solution has a lower carbon footprint than the handprint solution. Then, no carbon handprint is not created.

The final step in the carbon handprint approach focuses on communication. First, a critical review is recommended if the study is intended to be disclosed to a public audience. Second, the results of the study are to be communicated following the principles of appropriateness, clarity, credibility, and transparency – as presented in ISO 14026 (2017) and ISO 14063 (2010). Kilograms of carbon dioxide equivalents [kg CO_2eq.] per functional unit is the carbon handprint unit used for describing greenhouse gas emission reduction. However, using more informative reference unit instead the functional unit may be reasonable for better communicating the results to the audience. As carbon handprint is new as a concept, and the logic of creating a handprint differs from a footprint, the term and results can be difficult to convey. Additionally, also hindering the communication is a great deal of information and assumptions that should be acknowledged, as is the case in LCA or footprint studies too.

Summary

The lack of methods for calculating and communicating the beneficial environmental impacts of products and services has led to the development of a carbon handprint approach. The purpose of this approach is to assess and communicate the positive climate impact of products and services, thereby incentivizing responsible practices and allowing educated choices.

The core of the approach involves comparing the carbon footprint of an improved product with the carbon footprint of the baseline product and, subsequently, calculating the reduction in greenhouse gas emissions that can be achieved by using the improved product. The carbon handprint approach is founded on the standardized life cycle assessment methodology for footprints.

Organizations can use carbon handprints to quantify the greenhouse gas reductions that their customers can achieve by using provided products. The carbon handprint can, thus, serve as a tool in communications and marketing. A company can also find out how their product qualifies in comparison to baseline products and, therefore, carbon handprints can also support decision-making and lifelong product design. Through future research, the handprint methodology may be adjusted to also cover other environmental impact categories or indicators.

Cross-references

Carbon footprint

Life cycle assessment

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