

# Introduction

*Application guideline*



## Carbon Added Accounting

*Demonstrated reliability of CO<sub>2</sub>e footprints of products and services.*



# Management summary

## Introduction Carbon Added Accounting

Carbon Added Accounting is a CO<sub>2</sub>e accounting method that will solve many shortcomings of the Greenhouse Gas Protocol. This pragmatic method can serve as a CO<sub>2</sub>e chain administration in production chains. The use of primary business data and passing on of data quality will provide demonstrated reliable and accurate insights into CO<sub>2</sub>e emissions.

Carbon Added Accounting is based on *cost accounting* principles and can be roughly compared to VAT accounting. Several innovations have made Carbon Added Accounting a universally applicable, scalable and auditable method. The method allows starting at a small scale in existing software systems. Adding more and more details will produce more and more valuable insights into the energy and resource consumption of the production process in the chain.

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## 1 How to use this guideline?

This guideline gives the basics of Carbon Added Accounting and is aimed at anyone who is new to the concept of Carbon Added Accounting. It explains the need for Carbon Added Accounting, the basis of the CO<sub>2</sub>e calculation methodology, and how the reliability of the CO<sub>2</sub>e footprint becomes transparent passing on the data quality in the production chain.

The basic principles of these innovations are explained in this guideline.



Carbon Added Accounting focuses on value chains, including chains of physical commodity flows starting from agricultural or extractive processes whose products are delivered via storage and transportation to subsequent semi-manufacturing producers, end-manufacturing producers, wholesale and retail to finally reach the consumer.

The division of the production chain into different links will be looked at later in this guideline.

In doing so, this guideline describes the basis of the specific implementation of CO<sub>2</sub>e chain administration. It shows that Carbon Added Accounting is universally applicable in global flows of physical goods, both upstream and downstream.

## 2 Why Carbon Added Accounting?

### The Importance of Carbon Accounting

It is critical to have reliable data of the parts of the value chain that emit greenhouse gases and the amount of gases emitted. This makes it possible to define targeted actions to actually reduce CO<sub>2</sub>e emissions. Carbon footprinting involves calculating and allocating the total amount of greenhouse gases emitted by a person, event, organization, service, place or product, expressed as carbon dioxide equivalent (CO<sub>2</sub>e).

Companies see the increased importance of values other than profits and shareholder value. They will consider their contribution to society.

CO<sub>2</sub>e reduction is no longer non-committal from a government and customer perspective either. It requires demonstrable and reliable insights into the CO<sub>2</sub>e footprint of products, which we call product carbon accounting. This will help governments, businesses and consumers to make well-considered choices when buying products and services. The complexity of supply chains has been an impediment to a uniform method for product carbon accounting. However, Life Cycle Analyses can be used to estimate the footprint of a product in advance. The reliability of these estimates has not yet been established. This means that when we purchase products it is not clear and demonstrable what the CO<sub>2</sub>e footprint is. The lack of this demonstrability is problematic when CO<sub>2</sub>e, including its financial value, becomes increasingly important in purchasing decisions of production companies or services.

### From voluntary to mandatory

Various international developments add to the importance of product carbon accounting. More and more products claim to be sustainable. But the basis of these claims is not sufficiently substantiated. This creates ambiguity and probably wrong choices. The focus on circular production chains also requires more demonstrable facts of CO<sub>2</sub>e impact and origin of products. Claims about circularity must be suitable to be tested.

The most compelling developments are laws and government regulations. For example, starting in 2024 or 2025 the European Commission's Corporate Sustainability Reporting Directive (CSRD) requires that a larger group of companies are to report on their sustainability policies and performance including CO<sub>2</sub>e footprints. Also, the U.S. Inflation Reduction Act of 2022 sets aside hundreds of millions of dollars to help producers measure the amount of embedded carbon. In addition, materials used in federal government construction projects will be given a "carbon label". This increases the need for CO<sub>2</sub>e chain accounting such as Carbon Added Accounting. These laws and regulations meet the growing need of consumers and businesses for reliable and demonstrated CO<sub>2</sub> footprints of products and services.



*Laws and government regulations reflect the needs and desires of consumers and businesses for reliable and demonstrated CO<sub>2</sub>e footprints.*

## The future

Despite growing needs, there is as yet no uniform product carbon accounting method. In any case, such an accounting method will have to meet a number of requirements. These include:

- **Chain accounting:**  
the method must be able to show the development of the CO<sub>2</sub>e footprint throughout the value chain including its reliability and demonstrability.
- **Standardization of calculation methods:**  
chain accounting requires standardized calculation methods to make CO<sub>2</sub>e footprint calculations unambiguous and to allow chain partners to share this information and compare products. It is also important for the verification of outcomes by auditors.
- **Fully scalable:**  
In Europe alone, the CSRD requires around 50,000 European companies plus their suppliers to start preparing CO<sub>2</sub>e reporting, according to European Commission estimates. Rapid adoption will therefore be necessary to comply with this EC directive.
- **Positive influence on consumer behaviour:**  
ultimately, it is also about enabling and supporting sustainable purchasing behaviour to facilitate consumers and organizations to carry out these intentions.

## Carbon Added Accounting

To meet the above needs, the Logistics Top Sector started working on Carbon Added Accounting in 2019. This is a pragmatic methodology focused on creating CO<sub>2</sub>e chain administrations. It is not unlike the principle of VAT accounting whereby each party in the (circular) value chain adds CO<sub>2</sub>e emissions to CO<sub>2</sub>e inputs.

The remainder of this guideline will look at the working principle of Carbon Added Accounting.

### 3 Overview of the production chain

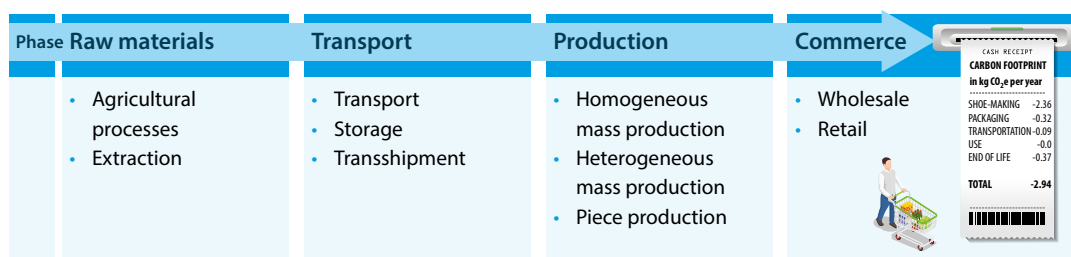
Most products are produced in a value chain involving several companies. These organizations tend to have different primary processes so their CO<sub>2</sub>e calculations may also differ. In accounting, Starreveld's typology model is widely used for setting up administrative organization and internal control and as a basis for auditing controls.

Carbon Added Accounting is in keeping with these typologies. Companies with physical flows of goods can be divided into four main types:

1. Agricultural and extraction
2. Transport
3. Production
4. Commerce

In principle, the basic principle for Carbon Added Accounting is the same for any type of business.

Specific details by main type and any subtypes are explained in separate guidelines. If we look at production, this can be split into homogeneous or heterogeneous mass production or piece production.

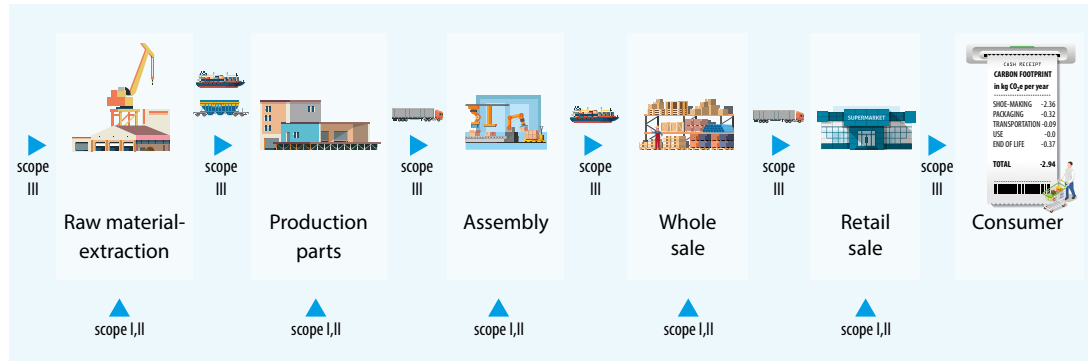


Carbon Added Accounting allows each chain partner to calculate their own CO<sub>2</sub>e footprint based on (mostly accurate) measured data and share this with subsequent chain partners so that a reliable footprint can be shown to end users.

## 4 Principle of Carbon Added Accounting

$$\text{CO}_2\text{e-input} + \text{CO}_2\text{e-added} = \text{CO}_2\text{e-output}$$

The premise of Carbon Added Accounting is the principle of VAT accounting whereby each party in the (circular) value chain adds CO<sub>2</sub>e emissions to the CO<sub>2</sub>e input to calculate and pass on the CO<sub>2</sub>e output to the next chain partner. This requires that the CO<sub>2</sub>e output is passed on by data reliability (data quality) class. To subsequent chain partners it will be clear how the reliability of the calculated footprint is established. As each party in the chain can start using Carbon Added Accounting, the method is fully scalable.

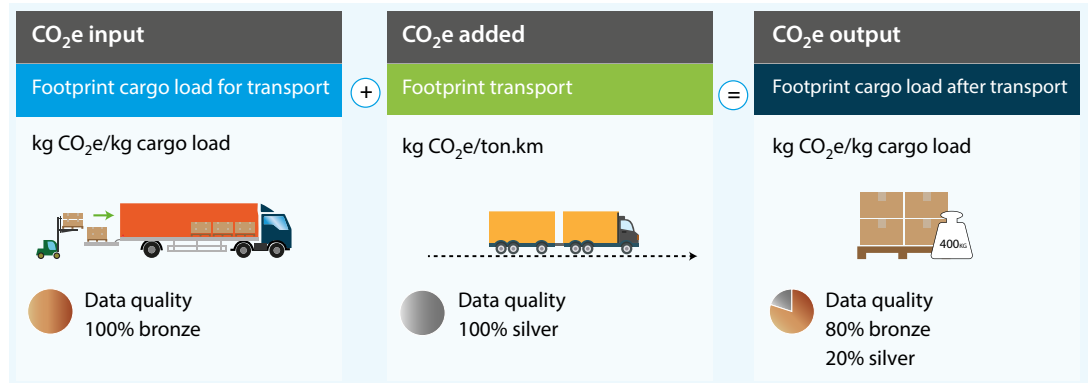


The attraction of the Carbon Added Accounting method is its universal applicability, basically the same for every step in the supply chain.

The CO<sub>2</sub>e input covers everything a company purchases for the primary business process. Examples this will include the CO<sub>2</sub>e footprint of purchased raw materials, semi-finished products, means of production, as well as the CO<sub>2</sub>e of associated transportation and storage and transshipment. This is quite similar to the upstream portion of scope III of the GHG Protocol.

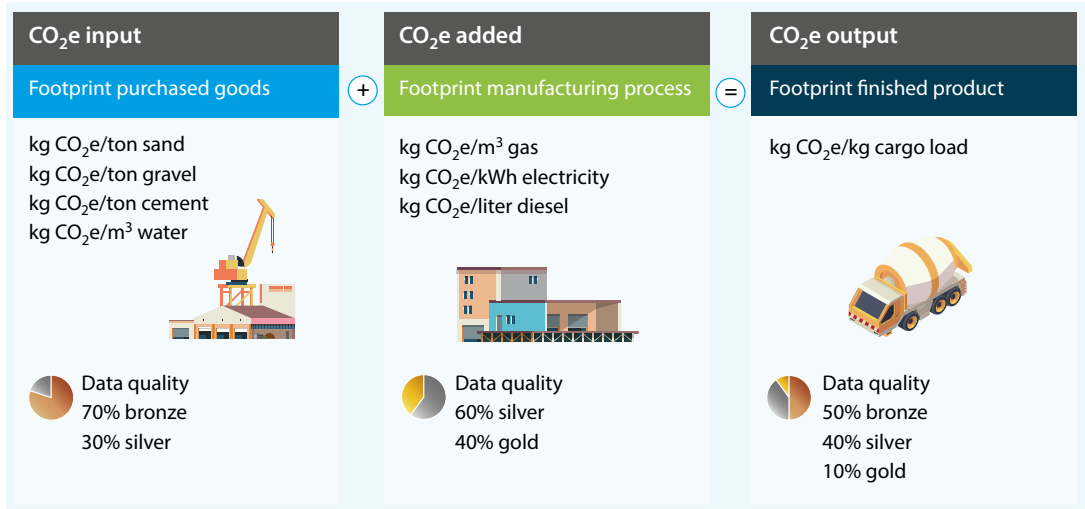
The CO<sub>2</sub>e added covers all emissions that the organization itself adds during the primary business process, described as scope I and scope II in the GHG Protocol. This includes the fuel consumption of vehicles, energy consumption of production lines and gas consumption for heating buildings.

The CO<sub>2</sub>e output of transported pallets (including data quality)





CO<sub>2</sub>e output  
of concrete production



Calculations at each step of a production chain, using the relevant allocation of CO<sub>2</sub>e (e.g., recipe) to the final products, will produce the final CO<sub>2</sub>e footprint for end-users indicating the relevant data reliability.

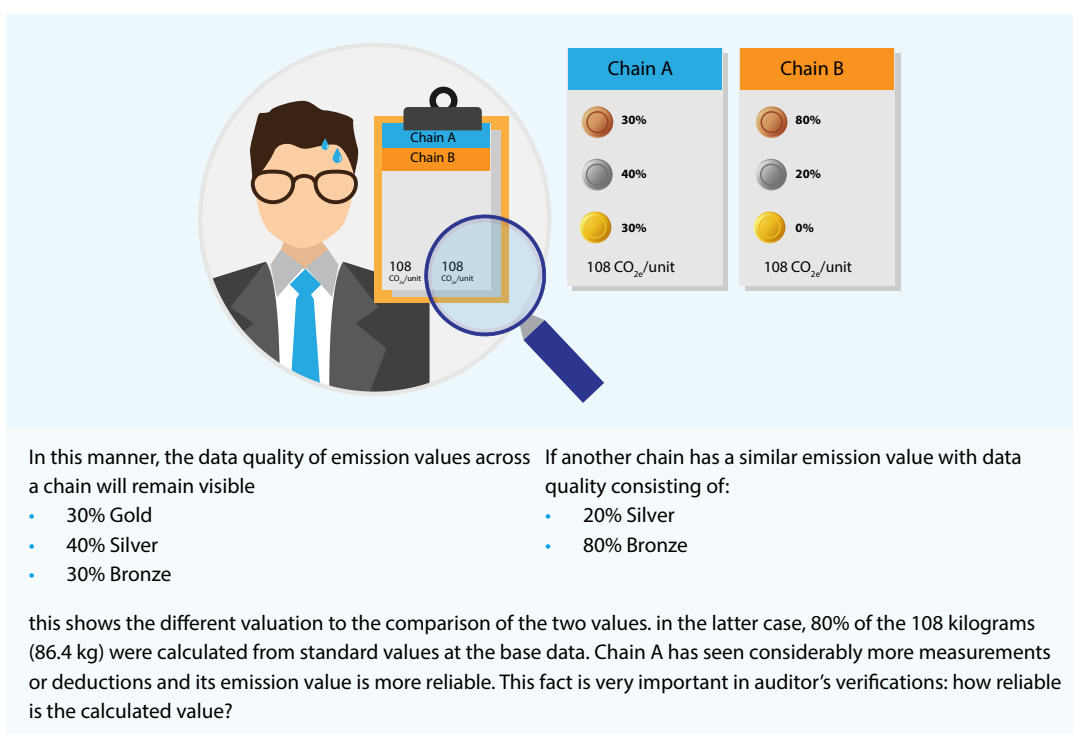
## 5 Passing on data quality

A key innovation of Carbon Added Accounting as a CO<sub>2</sub>e accounting method is passing on the data quality. Four levels of data quality have been defined within Carbon Added Accounting to indicate the reliability of CO<sub>2</sub>e values. They are Bronze, Silver, Gold and Gold+. Gold+ data quality means that the CO<sub>2</sub>e was calculated from highly accurate corporate data. Data quality Bronze was calculated through estimates and assumptions. By dividing CO<sub>2</sub>e output values by data quality levels and sharing this information with the next chain partner, there will be an insight into the reliability of the reported CO<sub>2</sub>e output throughout the chain.

The application of data quality levels makes it possible to deal with differences in the reliability of data. A key benefit is that this will lower the threshold for companies to start CO<sub>2</sub>e calculations. Where there is little or no knowledge of the CO<sub>2</sub>e values, estimates or characteristic parameters will be qualified as "bronze" which reliability can be further improved at a later stage.

Companies that develop their data quality levels can impress their customers. Auditors will be aware of the accuracy applicable to the CO<sub>2</sub>e data.

After the allocation calculation, the data quality of allocation is indicated for each (smallest) part of the allocation. Including that allocation quality in the data will keep these insights meaningful in analyses.



The level of data quality is defined differently by organizational type. For further details, including calculation examples, refer to the data quality guideline.

Carbon Added Accounting addresses the need to make the CO<sub>2</sub>e footprint transparent. This method meets the requirements of chain accounting, standardization of calculation methods, is fully scalable and has a positive effect on consumer behaviour. Practical examples have demonstrated these effects. Please, refer to the specific guidelines for types of companies for more information on the implementation of this method by link of the supply chain.

There are guidelines for manufacturing companies, for agricultural companies and other types.

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