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Tackling the Beast – How to Assess Scope 3 Emissions

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Abstract. The transparent and valid measurement of Scope 3 emissions (indirectly caused emissions upstream and downstream) represents one of the greatest challenges for companies during their sustainable transformation. In order to assess the current performance of a company and to derive the necessary action steps, it is essential to have the best possible knowledge of the current emissions. However, especially in the area of Scope 3, companies are dependent on external information and are not in a position to independently determine the ecological footprints of upstream purchased materials, products and services and the downstream emissions caused by products and services sold. This publication provides an overview of current main challenges and complexities deriving from the assessment of Scope 3 emissions and highlights the most suitable approaches to achieve best possible results.

Keywords: Footprint Assessment, Scope 3, Supply Chain

1. Introduction

In an effort to mitigate the challenges posed by climate change and environmental degradation, the European Union (EU) introduced the European Green Deal in December 2019 [1]. The overarching aim of the Green Deal is for the entire union to reach net zero emissions by 2050. With approximately 23 million non-financial enterprises operating within the EU, measurement, monitoring and comparison of emissions data becomes a very complex yet essential task [2]. The EU has therefore implemented the Corporate Sustainability Reporting Directive (CSRD) with the purpose of enhancing and standardizing corporate sustainability reporting. The directive aims to provide investors and stakeholders with improved information, increase transparency, and promote sustainable business practices. The specific guidelines for corporate reporting under the CSRD are outlined in the European Sustainability Reporting Standards (ESRS), covering various ESG issues, including climate change, biodiversity and human rights. Among its core elements is the transparent documentation of total corporate greenhouse gas (GHG) emissions. In accordance with the Greenhouse Gas Protocol [3], GHG emissions are categorized into Scope 1, 2, and 3 emissions (see Figure 1). Scope 1 emissions occur directly from sources that are owned or controlled by the reporting company and Scope 2 covers all indirect emissions via energy purchases in the form of electricity, heating, cooling and steam.

Scope 1 and Scope 2 emissions are relatively easy to grasp and report. This is because the activities responsible for these emissions are often billed with exact invoices and Scope 1 and Scope 2 emission factors are easily accessible in public databases, enabling accurate allocation and measurement. On the contrary, assessing indirect emissions within a company's

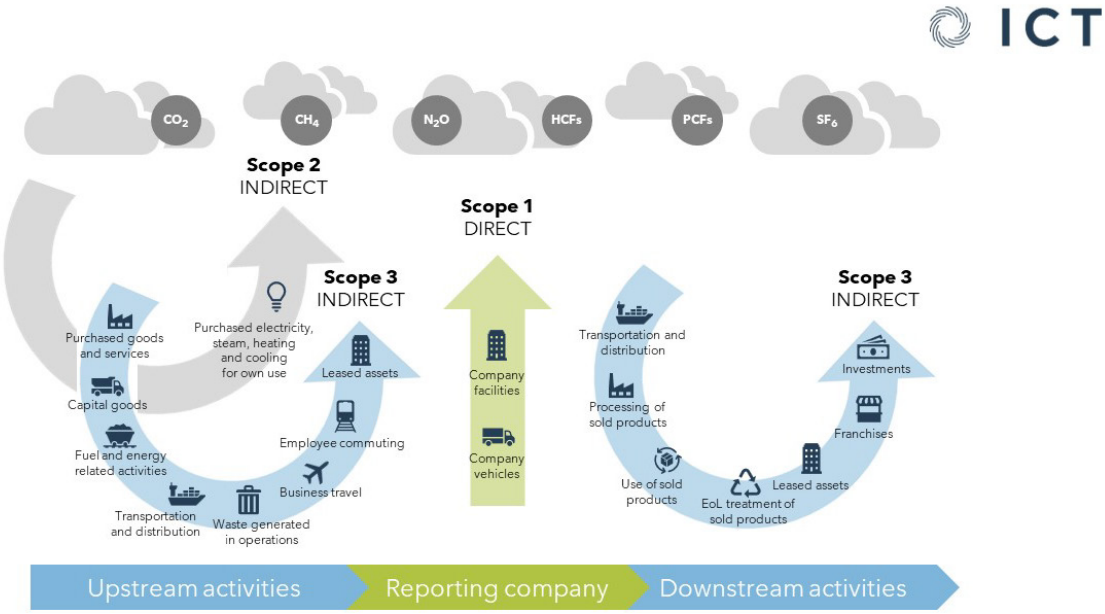

Figure 1: *Overview of GHG Protocol scopes and emissions across the value chain (Adapted from GHG Protocol* **[3]***)*

value chain poses greater challenges. They range from upstream activities like mining of raw materials, manufacturing of purchased goods, transportation and distribution, employee commuting and business travels to downstream activities such as transportation, processing, use and disposal of sold products, as well as investments or franchise operations. It is no surprise that in many companies, particularly in the manufacturing sector, the biggest share of emissions is generated through Scope 3 activities. However, most companies struggle to adequately report their Scope 3 emissions because they operate within extensive supply chains which make it a challenge to track purchased and sold goods upstream and downstream in the value chain. In addition, suppliers often are not able to provide meaningful data or insights regarding the emissions generated by their goods and services. This increases a reporting company's reliance on the reporting capabilities and transparency of their suppliers. Lastly, not only data availability but also quality vary highly across geographies and data providers. As an example, it can be stated that out of 9 companies that are listed in the Top 20 of the Austria Traded Index (ATX), only three have reported values for their Scope 3 emissions in their latest sustainability reports (as of February 2024).

Thus, collaboration among stakeholders and across supply chains as well as standardization efforts are essential to effectively allocate, measure and reduce GHG emissions. The following section will outline a pragmatic and effective example on how to tackle the measurement of Scope 3 emissions.

2. Measuring Scope 3 Emissions in day-to-day Business Operations

Around 85% to 95% of a manufacturing company's emissions typically fall within Scope 3, although this percentage can vary, especially in heavy industries. In instances like steel or cement production, emissions within Scope 1 also contribute significantly to the manufacturer's overall emissions. However, quantifying Scope 3 emissions often requires significantly more effort.

To illustrate, consider the case of a hypothetical company, Delta GmbH, a fictitious entity specializing in the production of metal components for the automotive industry.

Table 1 serves as an example, detailing various sources of energy, materials, products, and services purchased by the company. The table provides information on the assigned scopes and the level of difficulty associated with data procurement and validation. It is important to note that every data point linked to Scope 1 or 2 also contributes to Scope 3, a consideration typically addressed by common tools for footprint assessment.

Table 1: *Overview of different emission categories and their associated main scopes including the general difficulty of data procurement* (quantitative and qualitative)*

Index	Category	Main Scope	Difficulty*
1	Combustion of gas for heating and process energy	1	low
2	Electricity purchase	2	low
3	Fuel consumption in the company fleet	1	low
4	Flights (business travel)	3	low
5	Waste generation and treatment	3	low
6	Employee mobility on the way to work	3	medium
7	Purchased raw materials	3	high
8	Purchased components and products	3	high
9	Shipment of goods	3	medium
10	Usage of products (downstream)	3	high

In general, it can be asserted that categories indexed 6-10 are responsible for more than 75 % of an enterprise's total emissions. However, accurately assessing these categories poses significant challenges, as indicated in Table 1. It can be stated that the three categories 7, 8 and 10 bear the highest difficulty for their valid assessment. This is because, as of now, valid data is not accessible for many materials, products and components, specifically in categories 7 and 8. Procurement departments have no information on the actual setup of components as well as the materials used in the components. If they do, valid data regarding the specific emissions is a scarcity as well. Furthermore, assessing the lifetime emissions of sold products is also highly challenging and remains largely unaddressed in most cases. In the outline of this contribution, the focus is placed on how to evaluate emissions in categories 7 and 8 as they contribute significantly to overall emissions and offer substantial reduction opportunities for individual companies. It can be generally stated that the most challenging aspect lies in efficiently narrowing down the amount of purchased goods and materials that contribute the highest shares to overall emissions. A complete assessment and consideration of all items is especially in the first phase almost impossible and therefore not expedient. However, what can be observed already is the steadily increasing demand for valid determinations of product carbon footprints. Companies ask their suppliers for certificates that guarantee the specific emissions of a product they buy. These suppliers therefore ask their sub-suppliers for footprint values of their products and so on.

How might a roadmap to ensure a precise assessment of Scope 3 emissions for purchased raw materials and components look like in practice? A pragmatic and highly effective approach to initiate the resolution of this issue is the application of the 80/20 principle. This principle, rooted in nature, dictates that 20 % of a specific category contributes to 80 % of the overall impact. For instance, in the natural world, 20 % of the Earth's species constitute 80 % of the total species mass [4], [5]. Despite some deviations, this principle is universally applicable to every segment in the assessment of emissions. Notably, the mass of goods serves as a robust indicator of associated emissions. As a rule of thumb it can be stated that within a company's list of purchased articles, the top 20 % of items, sorted by descending mass, typically contribute to more than 80 % of the total emissions from all purchased materials. Using the example of Delta GmbH, a manufacturer of metal components, it is highly likely that over 80 % of emissions within the raw materials segment can be identified within the initial items on the list. Embracing the 80/20 principle in emissions assessment offers a practical and efficient strategy, enabling enterprises like Delta GmbH to prioritize interventions for maximum impact. This approach optimizes resource allocation and enhances the efficiency of efforts to monitor and reduce emissions. The approach to focus on those items or suppliers that contribute to 80 %

of emissions is also stated by the framework of the Greenhouse Gas Protocol which serves as a guideline in many aspects of footprint assessment [6]. In case the 80/20 principle applied to the mass does not prove to be helpful due to a lack of data, an alternative approach is to initiate the assessment of Scope 3 emissions by focusing on monetary considerations, particularly the purchase volumes. The next chapter describes the assessment procedure using mass as a criterion and, in the case where mass data is unavailable, utilizing monetary values.

3 Assessment of Scope 3 Emissions – the Practical Approach

Let's assume, Delta GmbH has very precise records of its raw materials and products purchased. The list of raw materials used in the production includes all items with the purchased mass and an article description. In total, there are around 4300 items from over 100 different suppliers. The procedure for significantly narrowing down the list is as follows: The table is clustered using e.g. an Excel function or a short python script so that the masses of identical materials purchased from the same supplier are added up. In this way, the length of the list can be significantly reduced in many cases. The list is then sorted in descending order of mass. Now the list is narrowed down to those items which, starting from the top, add up to 80 % of the mass. As a rule, this drastically reduces the length of the list and thus also the information to be collected in the further emissions assessment process. This is usually 20 % of the number of all items in the list. In general, the collection of mass-specific emission factors for raw materials is complex, but much easier than for products and components. In the case of the then restricted list, one can begin to acquire the factors for the materials. It can be stated that the most desirable data points are those provided by the manufacturer/supplier itself. If these are not available, there are a number of databases that can be used to research emission factors. If no data can be obtained for certain materials, a related material can be used in an initial assessment. However, this should be strictly indicated.

For products and components, the entire approach is much more complex. They usually consist of dozens of materials and sub-components that the supplier has sourced externally. Valid emission factors are currently only available in rare cases. As already pointed out, this leads to an observable increasing demand of validated product carbon footprint and general LCA assessments. If the emissions were to be estimated by mass, the fact that the mass for components and products is very often not recorded in the central ERP systems makes things more difficult. To address this problem, it is possible to classify the products according to their monetary value. To do this, the list is sorted in descending order and those items that account for 80% of the value are taken into account. It may well happen that very expensive items with very low emissions are included in the list. An example of this is an electron microscope in a manufacturing company. In general, however, it can be stated that the price can be used to effectively identify items that contribute significantly to the footprint. Once the list is sorted in descending order of monetary values, the top items which contribute to 80 % of the price are more closely investigated to reveal information which can be used to calculate the CO_2 emissions. This information can be, in the best case, product carbon footprint provided by the supplier. Secondary details are the mass, main materials or components and respective emission factors. Once theses details are obtained, the calculation of the emissions can be carried out. Figure 2 gives an overview on the process of assessing Scope 3 emissions from purchased components and materials in dependence of the availability of data for the mass of the individual items.

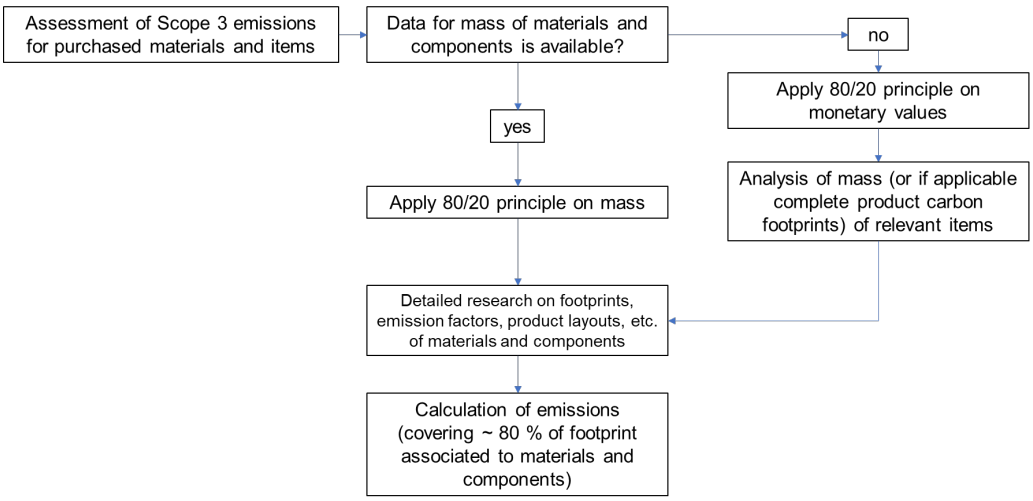

Figure 2: *Process for assessing Scope 3 emissions for purchased materials and items*

4. Conclusion

In conclusion, addressing Scope 3 emissions presents a great challenge for companies considering recent sustainability reporting requirements. The complexities arise from the indirect nature of emissions which occur outside a company's sphere of influence, notably in the supply chain. While Scope 1 and 2 emissions are relatively easy to measure, Scope 3 emissions are much more difficult to assess due to lack in data availability, quality issues as well as the large quantity of data points.

This paper advocates a possible approach to pragmatically tackling Scope 3 emissions by applying the 80/20 principle – focusing on the top 20 % of items that contribute to 80 % of emissions by mass. This approach facilitates the identification of products and services with significant contributions to the overall corporate carbon footprint, enabling companies to strategically prioritize their efforts in tracking down emissions and obtaining emission factors along the supply chain.

A practical and efficient approach is crucial for companies striving to meet reporting requirements and sustainability goals by effectively measuring and addressing Scope 3 emissions. Collaboration, standardization efforts, and a focus on high-impact items are essential elements in the ongoing effort to reduce greenhouse gas emissions in complex supply chains.

5. Summary

Recording Scope 3 emissions is one of the biggest challenges for many companies in the course of mandatory sustainability reporting. In particular, those emissions that are brought into the company through purchased materials and components are difficult to record due to the still very low availability of data for emission factors and also often due to ignorance of the exact structure of components. This article presents an approach to tackling this challenge in a first instance. Using the 80/20 principle, it is possible to determine the majority of these emissions with comparatively little effort. In the future, significantly better data availability and the existence of dedicated structures for data collection will be required for complete recording.

Data Availability Statement

Due to the novelty of the entire topic - the regulation is only applicable to companies subject to reporting requirements according to the CSRD - there is hardly any experience from the overall establishment of a recording system for Scope 3 emissions. Therefore, no statistical data was evaluated in the process of setting up this study, the results cited are purely qualitative and based on experience.

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