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Towards net 0:

Digital CO_2 proofs for the sustainable transformation of the European economy

Study | January 2022

Fraunhofer FIT

Executive Summary

With the increasing priority of decarbonization and the associated emission reduction instruments, the need for emission data and the obligation to report emissions across sectors has increased. In this context, the administrative burden of collecting, processing, and providing CO_2 information is increasing as national and European regulatory frameworks evolve. Increasing reporting obligations (for example, in relation to due diligence requirements in the value chain and the introduction of the Taxonomy Regulation), new CO_2 pricing mechanisms (e.g., through the EU-ETS II and the CBAM), and further initiatives for the collection of CO_2 information (e.g., a digital product passport) are some of the reasons for this increased administrative burden. However, the current lack of granularity in the collected CO_2 emissions data prevents CO_2 emissions from being passed on according to their actual origin and use in the value chain, and from being uniquely allocated to specific emission reduction measures and CO_2 budgets. Without a unique allocation, however, double counting of emissions cannot be prevented, and an effective monitoring of economic processes according to CO_2 specifications is not possible. Transparent, reliable, and verifiable emissions data in the form of digital CO_2 proofs provide a solution.

In this context, this study identifies challenges for the provision of CO_2 information from a business perspective. Based on interviews conducted with experts from various industries, including the automobile industry, the construction industry, and the energy industry, this study analyzes the potential of digital CO_2 proofs of origin and use and derives recommendations for action in the area of climate policy.

Identified Challenges and Requirements

Interviews conducted for this study revealed the following challenges and requirements for companies:

Available Know-How

As collecting and processing emissions data as well as their publication and communication is a relatively new field of activity for companies, the corresponding know-how for the new processes is often lacking. Therefore, in the initial years in which a company calculates and publishes emissions data, a considerable number of personnel is often required to implement and establish the necessary processes for data collection and processing. The difficulties in finding new personnel with the necessary know-how increase the required effort for companies to develop efficient, digital, and suitable processes for emissions data within the company.

Company Management and Controlling

Although emissions data are of increasing importance, there is currently a lack of economic incentives to incorporate CO_2 data as a decisive factor for economic decisions. For example, companies do not know whether investments in better measurement infrastructure will generate a positive return on investment (RoI). This is mostly because it is difficult to assign a clear economic value to emissions and the associated climate damage, which can be integrated into business models and investment calculations. Similarly, companies should enable the evaluation and management of investments and emission reduction measures at shorter time intervals

with respect to the associated emissions.

Challenges with Data Collection

There are several challenges related to the collection of emissions data. The lack of fine granular data is mostly due to the lack of measurement infrastructure at the company and the difficulty in obtaining valid emissions information from process steps outside the company. Hence, data collection in the area of Scope 3 emissions is particularly challenging, which is why these emissions are only partially collected and aggregated using average calculations and estimates. In the process of data collection, potential errors in data transmission or the susceptibility of the collected data to manipulation are important concerns for companies.

Challenges with Data Processing

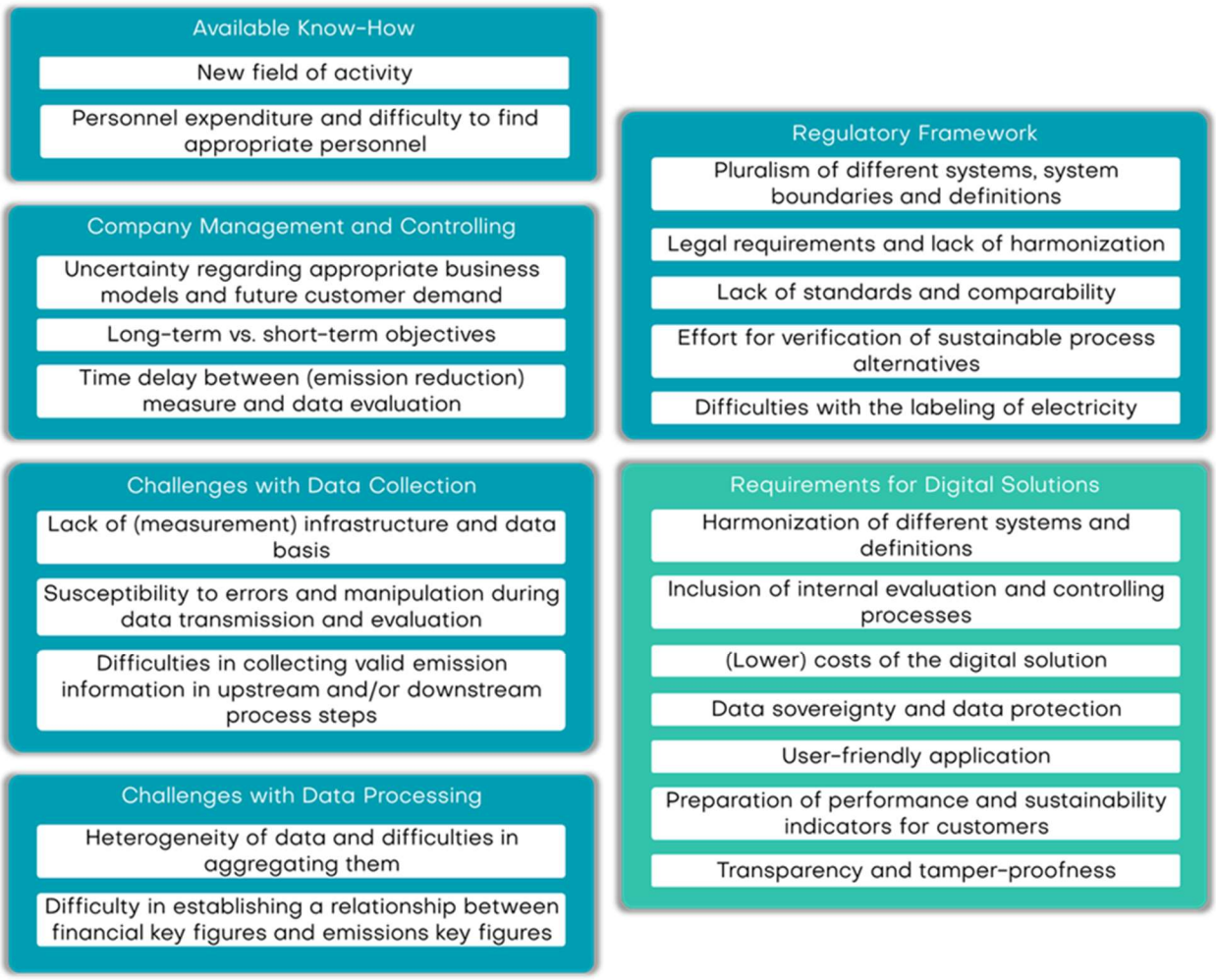
When processing the collected data, difficulties arise in aggregating it to specific key figures, as the data collected is available in different units and temporal resolutions and is, therefore, often very heterogeneous. This challenge is intensified when calculated key figures of emissions are to be integrated with financial key figures from other company departments.

Regulatory Framework

The regulatory framework itself poses challenges, such as the pluralism of different systems, system boundaries, and definitions that companies must observe and communicate due to regulations and/or voluntarily chosen standards. The pluralism of systems and definitions hinders the comparison of emissions information. In addition to the direct requirements for emissions information for the purpose of different reports, the effort required to verify sustainable process alternatives (e.g., new production methods and the use of alternative raw materials or primary products) and the regulatory uncertainty of labeling electricity (e.g., in the context of storage and hydrogen) is also challenging.

Requirements for Digital Solutions

From the challenges identified, the interviewed company representatives derived their requirements for digital solutions. The following key priorities emerged: the harmonization of the different systems and definitions for mandatory and voluntary standards and reports, and the inclusion of the company's internal evaluation and controlling processes should be enabled by digital solutions. Likewise, the necessary investments in digital solutions should be amortized. Furthermore, user-friendly application by employees is of great importance for the implementation of a digital solution. From a technical point of view, ensuring data sovereignty and sufficient data protection, as well as the transparency of the digital processes and the extent to which the data is tamper-proof play a significant role. In order to communicate emissions information to customers in a suitable manner, digital solutions should enable the preparation of performance and sustainability indicators.



Confirmation of Hypotheses

Based on the results of the interviews, the study confirms the following hypotheses:

Hypothese 1: Economic and regulatory uncertainty with regard to CO_2 pricing prevents companies from engaging in a long-term, targeted transformation toward climate-friendly processes.

Hypothese 2: The burden of bureaucratic documentation with regard to CO_2 emissions is increasing significantly for companies.

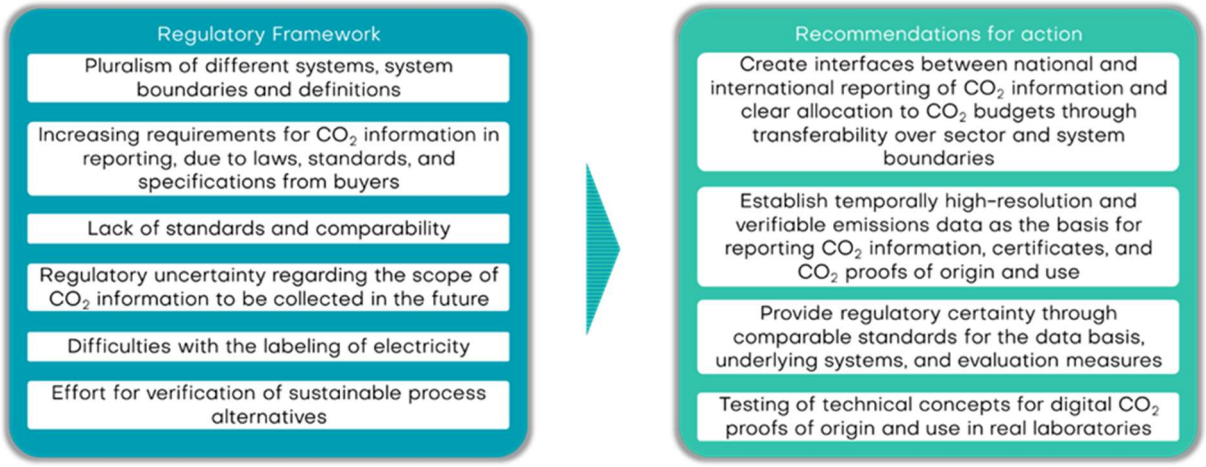
Hypothese 3: Digital collection and reporting of emissions at companies could provide direct incentives for emission reductions and create competitive advantages for companies. *(Partial confirmation)*

Hypothese 4: If companies want to use high-resolution CO_2 information for economic purposes, the information must be communicated in a verifiable manner. This requires new technological solutions.

Hypothese 5: Digital and product-specific CO_2 proofs of origin and use enable a high-resolution differentiation of products and, thus, a CO_2 assessment independent of accounting definitions.

Recommendations for Policy Action

Based on the identified challenges, the study derives the following recommendations for policy action:



Recommendation 1: Create interfaces between national and international reporting of CO_2 information and clear allocation to CO_2 budgets through transferability over sector and system boundaries

Due to different system boundaries in the assessment or calculation of emitted greenhouse gases, double counting of CO_2 emissions can occur. This currently complicates the specific allocation of CO_2 emissions and reductions to a specific CO_2 budget and, thus, also prevents the goal-oriented management of emission reduction measures. The transferability of CO_2 measurements between national and international boundaries, as well as system and sector boundaries, can be enabled by digital CO_2 proofs of origin and use. As a result, digital CO_2 evidence could help to utilize the amount of CO_2 emissions as a consistent metric for companies across the value chain to manage the transformation towards climate-friendly processes.

Recommendation 2: Establish temporally high-resolution and verifiable emissions data as the basis for reporting CO_2 information, certificates, and CO_2 proofs of origin and use

In order to establish CO2 emissions as a key decision-making factor for companies, emissions must be transmitted in a verifiable, transparent, forgery-proof manner as well as in a high temporal resolution. From a technical perspective, concepts for digital CO2 proofs of origin or use can be based on recent developments in relation to a European identity management system as well as promising initiatives such as the development of a secure and transparent European data infrastructure. These concepts rely on so-called Self-Sovereign Identities (SSI) and blockchain technologies (tokenization). By increasing the granularity of the data basis, CO_2 proofs of origin and use can be passed on according to their actual deployment in the value chain. Data at this level of detail is also necessary for initiatives such as a digital product passport, especially if products of the same type are to be differentiated according to their carbon footprint.

Recommendation 3: Provide regulatory certainty through comparable standards for the data basis, underlying systems, and evaluation measures

There is a need to develop digital solutions which implement existing and future standards and best practices. More standardized frameworks would enable automated emissions data collection and analysis, and threby leaner auditing processes. Existing technical concepts such as SSI can be used in combination with zero-knowledge proofs to speed up and make the existing certification and auditing processes more flexible, as well as to extend the functionality of current certification and product declarations. Additionally, life cycle assessment standards should be developed that allow for product-specific differentiation. These standards could then provide an incentive for a shift towards a more flexible and differentiated product assessment, for example in the context of a digital product passport, with regard to environmental factors.

Recommendation 4: Testing of technical concepts for digital CO_2 proofs of origin and use in real laboratories

It is difficult for companies to quantify, ex-ante, the direct added value from investing in systems for CO_2 data collection and monitoring. Therefore, possible technical solutions of digital CO_2 proofs of origin and use as well as their scaling should be tested in pilot projects or real laboratories. Implications for regulatory frameworks and legislative proposals as well as impacts on customer demand for products labeled with different carbon footprints can be derived from such pilot implementations.

In summary, the appropriate integration of digital technologies has the potential to enhance the visibility, verifiability, and reliability of CO_2 information and, thereby, greatly facilitating the transition to carbon neutral products. Therefore, CO_2 proofs of origin and use that are based on technical concepts such as blockchain and SSI, can form the interfaces between the different CO_2 instruments such as EU-ETS, CBAM, and EU taxonomy and reduce transaction costs. Policymakers should consequently encourage the development of technical concepts for digital CO_2 proofs as well as their use and, thus, support their implementation. Also, policymakers should evaluate the potential of digitalization when amending existing and developing new legislative frameworks with regard to emission reduction.