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MAINTAINING A MEASUREMENT APPARATUS: THE CALIBRATION OF A ROBUST INTERNAL MEASUREMENT OF PUBLIC SUSTAINABILITY TARGETS

BACKGROUND AND RESEARCH AIM



Existing research on sustainability accounting and reporting (SAR) has largely focused on the challenges organizations face during the implementation phase, particularly issues related to the absence or inadequacy of data and the initial setup of measurement systems. However, there is limited understanding of what happens after implementation, specifically, how organizations maintain SAR systems over time amid shifting internal and external circumstances. In contrast, research on long-term development has mainly focused on explaining why organizations eventually abandon these systems. This study addresses that gap by examining how a multinational manufacturing company, Sigma, maintained a robust system for measuring CO₂ emissions for more than two decades. Using the concept of calibration (i.e., practical steps to fix problems and keep the measurement system working smoothly), the paper shows how Sigma dealt with changes and challenges to keep its carbon accounting reliable over time.

RESEARCH METHOD

To understand how a company maintains its carbon measurement system over time, the researchers conducted a detailed case study of a multinational manufacturing company, referred to as Sigma. Sigma was selected for the study because it had a long-standing, well-established carbon accounting system and had consistently reported on CO₂ emissions for over 20 years, making it a rich site for examining the long-term maintenance of sustainability measurement practices.

The study was carried out in two parts: the first round of data collection took place in 2013, and the second in 2023. The researchers used semi-structured interviews and company documents to gather information. In total, they carried out 24 interviews with employees who were directly involved in producing and using carbon accounting information, including staff from areas like energy sourcing, product safety, strategy, and corporate sustainability. Many of the interviewees had long experience at Sigma and had been part of key decisions over the years. Alongside the interviews, the researchers collected internal documents such as spreadsheets, meeting minutes, sustainability reports, and technical guidelines. These documents helped confirm what the interviewees said and allowed the researchers to build a detailed timeline of events. All interviews were recorded, transcribed, and analyzed in depth. The analysis focused on identifying key moments called “critical episodes” – when the company had to adjust or fix parts of its carbon measurement system. These episodes were used to explore the idea of “maintenance” and understand how Sigma kept its system robust over time.

Note: For rest of this document, scope 2 emissions refer to indirect emissions from purchased electricity, heat, or steam, while scope 3 covers all other indirect emissions across the value chain, such as those from suppliers, product use, and waste.

FINDINGS



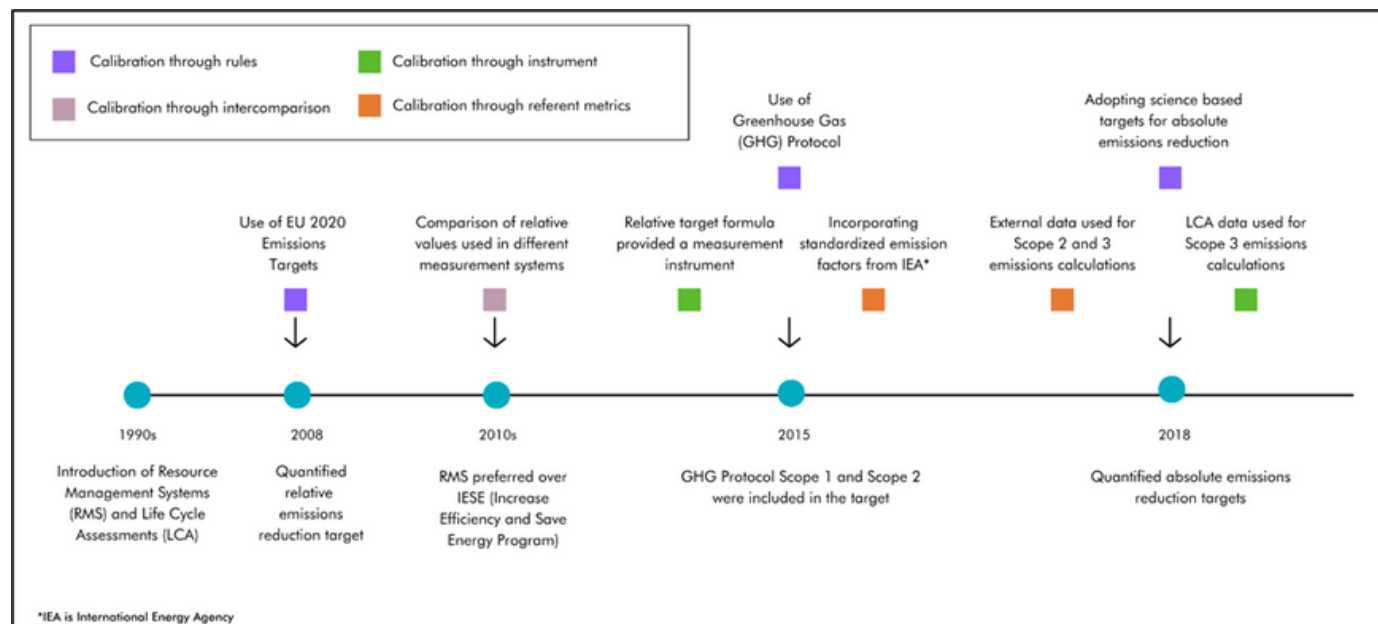
This study shows that maintaining a robust sustainability reporting system over time requires more than just good data input, it demands ongoing calibration to keep the system stable, credible, and aligned with changing goals and conditions. Drawing on a framework from science and technology studies, the researchers identify four distinct modes of calibration that Sigma used at different stages of its CO₂ measurement journey. These modes form a practical toolbox that other organizations can use to manage and maintain their own sustainability measurement systems.

Table 1: Calibration Modes

Calibration Mode	What It Means	When Sigma Used It	Use This When...
1. Rules	Following recognized standards, regulations, or expert guidelines	- Set targets to match the European Union's goals - Applied Green House Gas (GHG) Protocol for carbon calculations - Used Science-Based Targets initiative (SBTi) validation for its emissions target	One needs credibility, regulatory compliance, or to align with external expectations
2. Instruments	Using the same tools and systems across the organization to collect and track data	- Used the existing Resource Management System (RMS) and standardized Excel spreadsheets to collect site-level data - Used and adjusted existing Life Cycle Assessment (LCA) tools to estimate emissions for purchased goods and product life cycles	One needs consistent data collection across teams, sites, or over time
3. Referent Metrics	Using trusted, fixed data sources (like national averages or third-party values) for accuracy	- Relied on International Energy Agency (IEA) country-level emission factors to calculate Scope 2 emissions - Used external data for Scope 3 where internal data wasn't available or consistent	One doesn't have complete data and wants to use reliable, recognized sources to fill gaps
4. Inter-comparison	Comparing different systems or results to find and fix mismatches	Identified inconsistencies between the IESE (Increase Efficiency and Save Energy) program data and the RMS, then decided to prioritize RMS for public CO₂ reporting when the two systems diverged	Different tools give different results, and one needs to explain the differences or decide which to trust and use for a particular purpose

The study shows that using different modes of calibration is an ongoing process which organizations must attend to in order to maintain a robust measurement system for sustainability accounting and reporting.

Figure 1: Sustainability target measurement timeline with calibration modes used



In addition to the four modes of calibration, the study highlights that targets themselves play an important role in maintaining sustainability measurement systems. At Sigma, targets were not only used to set performance goals but also helped shape how data was defined, collected, and reported. For example, the choice between a relative or absolute CO₂ target influenced the type of data needed and how it was compiled. The adoption of a science-based target required the company to align its systems with stricter external standards, prompting further adjustments. In this way, targets acted as reference points that guided technical decisions and ensured consistency over time.

IMPLICATIONS FOR PRACTICE



This study offers valuable lessons for organizations seeking to maintain robust sustainability reporting systems. It shows that maintaining such systems is not a one-time task but an ongoing process that requires active management, technical adjustments, and strategic decisions. For practice, the findings offer a useful framework: organizations can draw on different calibration modes (rules, instruments, referent metrics, and intercomparison) as tools to manage evolving challenges. Additionally, the study highlights a new understanding of targets, not just as performance goals but as tools that help stabilize and shape the measurement system itself. Future research should focus more on the maintenance phase of sustainability accounting, the evolving function of targets, and how organizations adapt their systems amid rising regulatory demands.

ACADEMIC REFERENCE

Cederberg, E., & Sjögren, E. (2025). Maintaining a measurement apparatus: The calibration of a robust internal measurement of public sustainability targets. *Accounting Forum*.
<https://doi.org/10.1080/01559982.2024.2446867>