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IMPROVING PRECISION OF CARBON EMISSIONS ACCOUNTING FOR SUSTAINABILITY REPORTING: CASE STUDY FROM LATVIA

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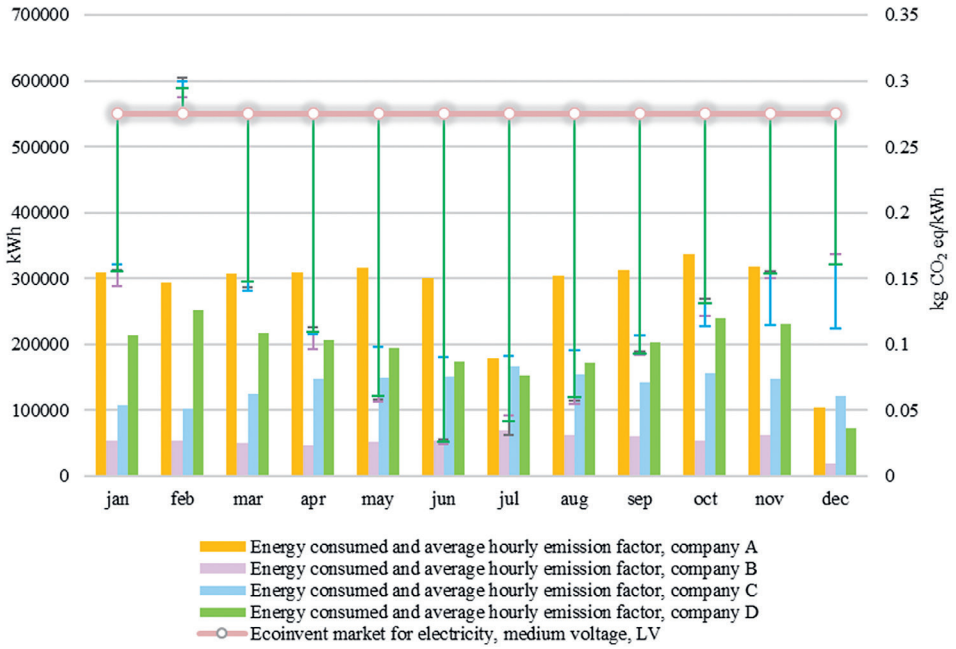
Abstract – Among growing regulatory and investor pressure for high-quality sustainability reporting, accurate carbon accounting has become essential for corporate Environmental, Social, and Governance disclosures. A key challenge exists in calculating consumed electricity-related emissions (Scope 2), where companies often rely on generalized national average emission factors, for which accounting approaches differ in how electricity generation, cross-border exchanges, and energy attributes are interpreted and allocated. Some methods primarily rely on nationally produced electricity as a proxy for consumption, while others incorporate electricity trade and contractual instruments to represent how energy is acquired and reported by companies. Even for two approaches defined by the GHG protocol, known as market-based mix accounting and location-based mix accounting, disparities appear in their interpretation. As concluded from studies on Norway's and Iceland's differences between nationally produced, exported and imported energy, the problem with accounting for location-based energy mixes (increasing double counting of renewable energy consumed by companies) has a higher impact on countries with a high share of renewable energy production, which export the produced energy and sell renewable energy certificates, such as Latvia. As a result, the choice of accounting method and data resolution plays a critical role in determining reported electricity-related emissions at the company level. This study aims to explore how an increase in the granularity of company-specific electricity consumption measured data can improve the precision and traceability of related Scope 2 emissions for more qualitative operational decisions in companies. A case study was conducted using hourly sensor-measured electricity consumption data from four manufacturing companies that operate in Latvia over one year. The delivered electricity mix to the company was recorded each hour, and the company-specific average hourly and yearly emission factor was calculated. The results demonstrate that company-specific data typically yield lower calculated emission factors than the commonly used Ecoinvent database country-specific CO_2eq emission factor, i.e., company-specific yearly average emission factors were approximately 56 % lower. However, these results must further be contextualized within the methodological tensions between physical location-based and contractual market-based energy mix accounting. This study supports the current need for harmonized, high-resolution energy data practices and integration with digital solutions to support trustworthy carbon emissions disclosures.

Keywords – Corporate sustainability reporting; energy mix; ESG; GHG protocol; guarantees of origin; IoT; LCA; renewable energy certificates; Scope 2



Energy consumed and average calculated hourly emission factors as deviations from Ecoinvent market for medium voltage electricity factor for Latvia in 2025

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