



Comparative Analysis of F-GHG Emission Estimates between IPCC Default Factors and Measurement-based Korea-specific Emission Factors in Semiconductor Manufacturing

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The semiconductor and display industries are significant sources of fluorinated greenhouse gas (F-GHG) emissions in the electronics, making accurate emission estimation essential for addressing climate change. The Republic of Korea, a leading country in the semiconductor and display industries, requires precise evaluation of the environmental impact of these industries due to its global competitiveness. Currently, The Republic of Korea relies on default emission factors provided by the 2006 IPCC guidelines for estimating F-GHG emissions. However, this approach does not account for the latest mitigation technologies implemented in Republic of Korea, resulting in a conservative overestimation of actual F-GHG emissions. To address this issue, this study conducted direct measurements of F-GHG emissions from semiconductor manufacturing processes in facilities equipped with advanced mitigation technologies. By employing state-of-the-art measurement methods, the study evaluated the use rate of gas (I) and generation rate of by-product gas ($\delta_{Vmf_cXi} W_i \delta_i$) and compared the results with the default emission factors provided by IPCC G/L (2006 and 2019). Moreover, based on derived country-specific emission factors (Tier 3b), GHG emissions were estimated and compared with tier-based methodologies using 2006 and 2019 IPCC G/L default factors (Tier 2a, 2b, 2c and 3a). The finding highlights the need for developing country-specific emission factors and contribute to the establishment of precise, data-driven policies for reducing GHG emissions in Republic of Korea's electronics industry. Furthermore, this research serves as valuable reference for other countries aiming to refine their emission estimates with country-specific data and technological advancements, ultimately contributing to global efforts towards carbon neutrality.