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### Advancing Sustainability in the Semiconductor Value Chain: A Data-Driven Approach

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#### Abstract

In recent years, the semiconductor industry has shifted significantly towards environmental sustainability, driven by regulatory pressures and consumer demand for eco-friendly products. As a key player in the semiconductor materials supply chain, we are adapting to this evolving landscape, aligning our practices with sustainability goals.

Suppliers now face the challenge of delivering sustainable materials and technologies while fostering cleaner production processes. Transparency in greenhouse gas emissions is increasingly expected, necessitating efforts to understand and mitigate emissions across the value chain.

A critical component of this effort is optimizing manufacturing processes to address Scope 1 and Scope 2 emissions. At Merck Electronics, we embrace a comprehensive approach to greener chip production, integrating data-driven methodologies with fundamental engineering principles.

Our approach at Merck Electronics combines data analytics with predictive modeling to reduce environmental impact throughout the production lifecycle. Utilizing machine learning (ML) algorithms, we aim to reduce scrap and optimize production efficiency, thus curbing greenhouse gas emissions. This proactive approach to process design and optimization supports our climate footprint goals and maintains data integrity in sensitive environments.

To illustrate our approach's effectiveness, we present a case study showing how data and technology provide insights into product climate impact. Leveraging data analytics and predictive modeling, we identify opportunities for improvement and implement targeted control mechanisms in production processes. This case study exemplifies Merck Electronics' commitment to sustainable innovation in the semiconductor industry.

#### Biography

Anja Muesch has been Head of Use Case Management at Merck Electronics since 2022 focusing on data & digital portfolio management for the Semiconductor Materials Business with preceding experience in managing a sector-wide digital transformation project focusing on advanced data analytics, data access and data automation.

Prior to her role, Anja Muesch was Associate Consultant at Merck Inhouse Consulting managing strategy projects for Merck's Electronics, Life Science and Pharma business.

Anja Muesch received a Master of Science degree in Business Chemistry from Heinrich-Heine-University in Düsseldorf, Germany and the Universiteit van Amsterdam, The Netherlands, focusing on environmental chemistry and financial investments.

