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ecoinvent's integrated approach for Life cycle inventory datasets' creation for metal manufacturing processes

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As industries transition towards more sustainable supply chain principles, leveraging reliable LCA databases becomes crucial. Among others, the metals industry also faces increasing demand for transparent environmental data to support sustainability decisions and climate targets. However, the metals industry presents unique challenges to datasets' creation (e.g., diverse extraction methods, complex multi-output processes, reticence to share data, and rapidly evolving recycling technologies requiring comprehensive modelling approaches that capture both primary and secondary production routes).

The ecoinvent association, by managing the ecoinvent LCA database, aims at addressing these challenges through systematic data development in collaboration with industry associations and technical experts. Our approach to improving the coverage of the metals sector involves three key phases: analysing the state of the art through stakeholder engagement and literature reviews, prioritizing data gaps by mapping value chains and identifying critical needs from the industry, and developing datasets following rigorous quality and transparency standards.

This presentation showcases examples of the types of initiatives that lead to data creation for the ecoinvent database, specifically for the metal sector. Recent database releases demonstrate ecoinvent's expanding coverage. For ferrous metals, we provide comprehensive modelling of steel production, including basic oxygen furnace (BOF) and electric arc furnace (EAF) routes, with particular attention to scrap-based production and steel alloy specifications. We have developed alloy-specific datasets through literature-based modelling approaches that reflect real-world material compositions and production requirements. For non-ferrous metals, our collaboration with the International Aluminium Institute (IAI) ensures aluminium supply chain data reflects current industry practices and regional variations, while our partnership with the International Zinc Association (IZA) has enabled the development of Zamak alloy datasets. This coverage spans the full complexity of metals supply chains, from primary extraction and secondary recycling routes to the production of engineered alloys that represent final market products. We explore the different types of data creation processes from both a database management and a user perspective.

As significant data gaps remain, particularly for specialty alloys, emerging recycling technologies, and regional variations in production, ecoinvent actively seeks collaboration with industry associations, research institutions, metal producers, and technology providers to continuously improve data quality and expand coverage. By working together with stakeholders across the metals value chain, we aim to provide the trusted LCI foundation needed for evidence-based environmental decision-making in an evolving sector where primary and secondary production routes increasingly coexist and interconnect.

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