# "FAST LCA" TO APPLY LIFE CYCLE METHODOLOGIES AND SUPPLY CHAIN MANAGEMENT AT SCALE

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Tools in Industrial Ecology such as Life Cycle Assessment (LCA) of goods and services lend themselves to better understand, measure, and potentially reduce the material consumption and cradle-to-grave environmental impact of goods and services. Owing to modern enterprise resource planning (ERP), many companies making such products have much of the required primary inventory data required for product-level LCA already available. To deal with inevitable data imperfections or missing data, LCA offers, via the concepts of secondary data, proxies, and immaterial contributions, a framework to arrive at approximated LCA results that, while informative in their own right, also form a basis for gradual, future improvement. Such iterative processes (e.g., "data screening" as per [1]) are best carried out while carefully monitoring compound uncertainty of the resulting LCA and using this as a guide for further research into some rather than all inventory materials and processes (e.g., [2, 3]).

In practice, however, above approach faces significant obstacles when to be carried out in real world situation because practitioners (here: companies that produce such goods or services) become overwhelmed by the deluge of data and the strategy of screening is impossible to implement when dealing with tens of thousands of underlying inventory data items, each potentially contributing materially to the LCA result and its error margin [4]. Recognizing that recent standards on carbon footprinting, a sub-discipline of LCA, propel LCA to the mainstream [1, 5-15], we recently developed a novel methodology that enable companies to calculate thousands of "mass-produced" product carbon footprints and use these for their inner operations and business decision making [4]. Working with a global consumer goods company, we have since applied this methodology to quantify the carbon footprints of ~3000 different products across 5 countries.

Here, we focus on three sets of results from this work: (i) Using real-life feeds from ERP data warehouses, we demonstrate how common data limitations and inaccuracies in LCA inventory data can be overcome by employing intelligent data filtering, cleaning, and flagging algorithms. (ii) Despite tens of thousands of underlying inventory inputs, in real life data sets, only a few of these determine most of the error margin in a particular, monitored environmental impact (such as GHG) or life cycle stage. We give benchmarks for such data. (iii) Carbon footprinting is a prime example for a common dilemma at the intersection of Industrial Ecology-based methodologies and their actual use by practitioners. Complexity of analytics and data structure can deter wide-spread use of LCA, thus preventing many of its benefits. By the same token, overly simplified approaches risk not capturing important aspects of the LCA and thus yielding misleading sustainability information. Focusing on the educational aspect of the novel methodology and presenting results from pilot tests, we discuss how explicit inclusion of uncertainty and a uniform yet flexible data structure (e.g., primary/secondary; LCA assemblies) can facilitate immediate access to the methodology on the one hand while still allowing expert users to evaluate sophisticated GHG-affecting product scenarios on the other.

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