

Combining Life Cycle Thinking and Carbon Footprinting: Conceptualizing GHG Accounting Within LCA

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With life cycle assessment (LCA) still perceived as costly and time-consuming, businesses might be inclined to overlook this tool when implementing their environmental management systems (EMS). However, life cycle thinking is already part of some EMS tools including greenhouse gas (GHG) accounting. This presentation shows a new conceptual approach where corporate GHG accounting could be represented by the annual discretisation of a 3-dimensionnal representation of LCA, focusing on the sole climate change impact category. To build this approach, the enterprise is first viewed as a part of a logistic chain including upstream suppliers and producers as well as downstream end-of-life managers. The enterprise's life cycle (meaning its logistic chain), is pictured as the first dimension of the 3-D LCA's representation, the X-axis. The second dimension of the conceptual approach, the Y-axis, represents the impact assessment. It is fed with the inventory data translated into impacts by means of characterization factors. The Z-axis, and third dimension, is the time dimension. Here, opposing LCA traditional point of view, the inventory is visualized dynamically but accounted for annually. On the other hand, GHG accounting divides the enterprise's annual emissions into three scopes, according to the GHG Corporate Protocol: direct GHG emissions (scope 1), indirect emissions related to energy production (scope 2) and other indirect emissions (scope 3). Then, GHG accounting is positionned towards each axis. On its X-axis, the scoping categorization of the enterprise's emissions refers to the emissions coming from the different actors of the logistic chain. On the Y-axis, GHG accounting's limited inventory is translated by means of emission factors in the sole climate change impact category. Finally, on the Z-axis, as GHG accounting is following an annual accounting procedure, the said inventory is referring to a one year time period.

In order to validate this approach, a case study was conducted, comparing the two kinds of analyses: GHG accounting and LCA. First, GHGs were accounted for the three scopes. Second, LCA was conducted over the same system boundaries and structured into a comparable framework: each LCA process was de-aggregated into the same three scopes. Focusing on the climate change impact category, the results showed a very good consistency between LCA and GHG accounting for the direct emissions (scope 1) as well as the indirect emissions related to electricity production (scope 2). The importance of the scope 3 emissions was also highlighted. The widening of the impact analysis from climate change to all 14 impact categories considered by the impact 2002+ method, showed that only climate change analysis was not always enough to get a good picture of overall environmental impacts. In fact, the nature of the activity undertaken by the enterprise, could shift the impact toward other impact categories. The results showed that GHG accounting can be considered as embedded within LCA. Moreover, the environmental information gained with the re-deployment of GHG accounting within life cycle thinking framework would lead businesses towards more comprehensive EMS.