

Comparing North American and European Methods to Characterize the Environmental Impacts of Common Processes

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This paper explores the similarities and differences of the assessed environmental impacts of four common processes using two impact characterization methods: EcoIndicator⁹⁹ and TRACI. EcoIndicator⁹⁹ is a familiar European impact characterisation method¹; the United States Environmental Protection Agency oversaw development of TRACI². This paper³ describes the following components and results of the assessed processes:

- ***What production processes are assessed?***
The assessment process employs chemical input/output data from common processes: production of polypropylene, production of carbon-steel, production of paper and production of electricity (with electrical energy source mixes specified per region). In each case separate chemical input/output data from a European source and a US source are used, with specific geographical parameters described. Eight data sets are analyzed.
- ***What impact categories are assessed by each method?***
I give an overview of the similarities and differences between the two characterization methods. Similarities and differences between the impact categories, equivalency units and characterization methods for each of the two methods are clearly described.
- ***What differences in characterized impacts result from differences in chemical input-output data?*** When comparing data sets for one type of process, differences in data set system boundaries and significant differences in emissions are noted. Particular emissions that result in the high impact values are identified.
- ***What differences in characterized impacts result from the characterization methods?*** Impact categories having widespread scientific agreement about their characterization values (such as Climate Change) have nearly identical results when characterizing the same data set. Impact categories characterized by different methods (such as human health) yield significantly different values resulting from characterization of the same chemical inventory set. Differences and similarities are noted, with significant differences explained.

The implications of these findings to practitioners of environmental impact assessment are examined. Users of these data sets can learn from these explicit examples of how different chemical input/output data sources from the same type of production process can create dramatically different results. Likewise, these explicit examples demonstrate how the two transatlantic characterization methods applied to identical chemical input/output data sets can result in different assessed impact values.

The results underscore the necessity for critical caution among LCA practitioners when selecting chemical input/output data and comparing the assessed results from different data sets, and the necessity for characterization scientists to develop more global environmental impact characterization methods.

1 Goedkoop, Mark, et al, Eco-indicator 99 Methodology Report, 3rd revised edition, Amersfoort, NL, 2004

2 Bare, Jane, et al, The Tool for Reduction and Assessment of Chemical and other Waste (TRACI), Journal of Industrial Ecology, Volume 6, number 3-4, MIT Press, Cambridge, MA 2002