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Conference session report: SETAC Europe 25th Annual Meeting

Session "Midpoint, endpoint or single score for decision-making?" - SETAC Europe 25th Annual Meeting, May 5th, 2015.

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Abstract

There is a strong demand for simple, understandable and clear LCA outcomes to support decision-making especially in the context of policy-making or company management. The debate is ongoing as to whether clarity and simplicity may be obtained by adopting either LCA endpoint or even single score methods. As a contribution to this debate, a session was organised to discuss the use of midpoint, endpoint or single score indicators in support of the decision making process. The session, comprising 10 presentations about different aspects of this topic, concluded with a 40 minute panel discussion. Most authors who contributed to this SETAC Europe LCA session concluded there was a need for endpoint or single score assessment (and transparent communication of the same) for sound and effective decision-making support. This may be the better option than letting the decision makers choose the relevant impacts subjectively. But endpoint or single score results do not mean that midpoint indicators have no value. Even though endpoint or single score indicators can be very helpful in decision support, midpoint indicators help identify issues of specific environmental concern (e.g. climate change, acidification or water scarcity).

1 Introduction

There is a strong demand for simple, understandable and clear LCA outcomes to support decision-making especially in the context of policy-making or company management. The debate is ongoing as to whether more focused and informed decisions may be reached adopting LCA endpoint or even single score methods. In life cycle impact assessment methods that use midpoint indicators, the impact potentials are presented and based on scientifically sound methods. Endpoint methods however contain additional uncertainty due to a more complete modelling of impact pathways and this should be taken into consideration when comparing impact categories.. When it comes to single score aggregation, a subjective weighting is used. This is one of the main reasons why the ISO 14040/44 standard only recommends the use of a sufficiently comprehensive set of midpoint impact indicators when disclosing comparative assertions to the public. Weighting of the midpoint impact categories to one single score should not be done. ISO-conforming LCAs only contain midpoint indicator level assessments and no endpoint indicators or aggregated single score (overall environmental impact).

Many LCAs carried out for decision makers (public or private) try to answer questions such as, "is product/system A better than product/system B", or "how to improve a certain product/system"? In many cases, midpoint level results cannot answer these questions because some midpoint categories show different tendencies than others. Decision-makers are forced to do their own weighting or to choose midpoint categories based on their own subjective interests resulting effectively in a weighting of zero for all other midpoint categories.

Given these difficulties, the question arises, can such weighting procedures still be more scientific (or at least contain less uncertainties) than endpoint or single score aggregation methods in LCA?

The goal of the session "Midpoint, endpoint or single score for decision-making?" at the SETAC Europe 25th Annual Meeting was to present studies leading to a discussion of the pros and cons of midpoint and/or endpoint or single score results for decision-making support. The decision-maker's point of view of midpoint and endpoint or single score results was also considered, together with the problem of misleading conclusions due to interpretation (or misinterpretation) of midpoint results or using endpoint or single score results.

The session contained 10 presentations and concluded with a 40 minute panel discussion. An overview of the plenary presentations is given in the Addendum.

2 Summary of the plenary session discussion

Different methodological concepts of single score methods, such as the damage oriented approach of ReCiPe or IMPACT 2002+, the distance-to-target concept of emission and resource level on ecological scarcity, or monetisation were discussed in the presentations. As part of the development of the Product Environmental Footprint (PEF), the European Commission provided normalisation factors and a preliminary equal weighting scheme for the International Reference Life Cycle Data System (ILCD) midpoint indicators. Work is ongoing at the Joint Research Center of the European Commission (JRC) to test different methods for weighting (policy-based, science-based, panel-based etc.), to support the identification of the most relevant impact categories out of the 15 midpoint impact categories that are mandatory for assessment. A newly developed set of policy-based weighting criteria was presented, based on the application of distance-to-target concept (considering EU2020 policy targets) to the midpoint level of ILCD.

One argument against single score methods is that the value choices that are deployed are not necessarily transparent to the decision-makers. Whilst the value choices can be made by the practitioner or the commissioner themselves, e.g. by making a careful selection of midpoints or endpoints, the question arises if these value choices are more adequate than value choices required by different methodologies based on political consensus or a scientific approach. Different presenters underlined the necessity of transparency in the weighting scheme when using endpoint or single score results, instead of only giving a single number. The weighting schemes that are the closest to a scientific approach have to be preferred.

For some practitioners, another reason for using midpoint categories, instead of single score methods, is the problem of large uncertainties due to the value choices being made to produce the single score. But value choices also occur when decision-making is based on midpoint indicators. However, even if uncertainties are high, using single score methods gives the possibility to determine the relevance and significance of results and fewer uncertainties – some presenters said - than if applying one's own weighting at the midpoint level. The question must be which way is the best methodology to support the decision-making process?

One option to make the impact of the various value choices in the different methods visible is the use of more than one method. The different results can then be analysed and discussed and can also highlight the differences in value choices between methods. Whilst this may be good from a practitioner's point of view, it risks being even more confusing for decision-makers.

Using endpoint or single score results does not mean that midpoint indicators should not be shown. Some presenters even pointed out that showing the different indicators, whether at midpoint or at endpoint level, is much more transparent than only showing single score indicators because it can still easily be seen which design alternative performs better with regards to the different indicators. Normalisation may be used to highlight which environmental indicators the product under evaluation contributes the most to, and to which indicators the product's contribution is negligible.

For these reasons single score indicators alone are not always suitable. Combining endpoint or single score indicators with midpoint indicators can assist in better interpretation of the results. It can also assist transparency if the contribution of the different midpoint categories to the endpoint or single score results is shown; particularly given that existing endpoint and single score methods are designed in such a way as to allow this to be easily implemented.

In the final panel discussion of the session it was pointed out that most of the authors do not have an issue with the ISO norm restriction regarding single score methods: if clients ask for single score they do not ask for ISO conformity and vice versa. Furthermore, if an ISO-conformed study is requested, the reviewer would not allow single score or endpoint results. In this way, the ISO norm protects the LCA practitioner by not allowing companies to use an arbitrary single score for comparative studies disclosed to the public and so prevents it from being associated with the name of the LCA practitioner. However, an implicit weighting often takes place, based on endpoint or single score methods to finally decide whether "A or B is better". One problem of simplifying to a single indicator is that the whole picture is captured in one number making the reasons behind the number hard to understand due to a

definite lack of transparency. At the end of the day, it is about communicating science. Scientists should make their science understandable but all too often, an adequate interpretation of the single score is lacking. Another issue is how to choose the relevant impact categories. In practice, this choice should be based on endpoint or single score relevancies, as well as experience and knowledge, rather than on individual preferences - even if endpoint or singe score results are not disclosed in the final report.

3 Concluding remarks

Most authors that contributed to this SETAC Europe LCA session are convinced that endpoint or single score assessments can contribute to sound and effective decision support if supported by relevant and transparent information (eg. midpoint impacts, value choices). It may be better than letting decision-makers choose the relevant impacts subjectively. Additionally, LCA is evolving towards inclusion of more impact categories (e.g. economic and social or even noise and odour) and the necessity of an aggregation strategy will keep on increasing.

Even though endpoint or single score indicators can be very helpful for decision-making, midpoint indicators remain helpful in identifying reduction targets and measures for specific environmental concerns (e.g. climate change, acidification and water scarcity).

Some presenters suggested the need to discuss the optional grouping, weighting and normalisation steps in ISO 14044, clause 4.4.5, and their prohibited use in comparative assertions intended to be disclosed to the public. Carefully performed single score results (based on weighting) in comparative LCAs are preferred to single issue results (e.g. carbon footprints), which may neglect important environmental aspects related to the products or services analysed by theoretically assigning all other impact categories a de facto weighting of zero. In the meantime it was strongly suggested that LCA practitioners think beyond the ISO norm and include endpoint or single score indicators together with the midpoint indicators in their LCAs. This should avoid, or at least minimise, false conclusions being drawn and and increase the credibility of LCA results and their usefulness in a more transparent decision making process. If LCA is not able to deliver answers and only confuses decision-makers, it will lead to a decrease in interest in them over the long term.

Addendum: Overview of the plenary presentations

As an adequate assessment of the inherent uncertainties is relevant in LCA midpoint indicators and single scoring methodologies, the first presentation given by Jeroen Guinée (Leiden University) was about the important and correct use of uncertainty considerations in comparative studies.

Sebastien Humbert (Quantis) discussed how to use damage-oriented knowledge to increase analysis capacity. This allows an identification of which indicators dominate “absolute” impacts and should be of prime concern when making a choice between two products. Information based on endpoint and/or damage-oriented methods such as IMPACT 2002+, ReCiPe, or IMPACT World+ are used to generate conversion factors to assess the 15 impacts categories of PEF/OEF using endpoint in addition to midpoint indicators

Serenella Sala (Joint Research Centre) presented a set of weighting factors based on the application of a distance-to-target approach for Europe in 2020. Different approaches for normalising and weighting the PEF/OEF midpoint categories to single score were presented, in order to identify their difference in highlighting the most relevant impact categories in a given region or for a given product (e.g if they were applied in the context of defining Product Environmental Footprint Category Rules (PEFCRs)).

Rolf Frischknecht (Treeze Ltd.) presented a study about the environmental impacts of products and services consumed in Switzerland over time. Single score indicators were used in order to show the bigger picture and to identify hotspots in the consumption-based environmental impact of a nation, whereas midpoint indicators could help to identify specific reduction targets and develop measures to achieve them.

Jacob Lindberg’s presentation (Swedish Environmental Research Institute) was about monetisation as a valuable concept for single score information. A study was conducted by AkzoNobel´s Sustainability Department to explore the issue of economic assessment of environmental impacts. The three different monetisation methods - EPS, Stepwise and Ecovalue - were compared and analysed in a case study, comparing different decorative paints with regard to their environmental performance. One observation was the usefulness of including several methods to overcome data gaps and reduce uncertainties.

Liselotte Schebek (Technische Universität Darmstadt) presented results from a project carried out by SYRCON, Dr. Ahbe and TU Darmstadt on behalf of the Volkswagen Group Research Environment to adapt the Swiss Method of Ecological Scarcity to German framework conditions. The
Swiss method was adapted to allow for actual and critical flows from German legal targets (e.g. as to immission levels) or policy targets (e.g. as to GHG reduction). Ms Schebek highlighted that often natural science cannot yet provide clear limits for environmental impacts, and that political targets are formulated by democratic procedures, reflecting a consensus process of stakeholders. In this sense, the method of Ecological Scarcity is more suitable

specifically for use in environmental management and when needing to incorporate societal goals in decision-making of companies.

Urs Schenker (Nestlé Research Center) showed Nestlé's new approach to normalise selected midpoint indicators through their eco-design tool. He pointed out that while the different normalised indicator scores are not added together, the fact that they are displayed next to each other allow the identification of those indicators that matter most for any given product system. He stressed that transparency is highly relevant and that single scores often lack this transparency.

Steven De Mester (Ghent University) presented the PROSUITE (aggregation) methodology for sustainability assessment based on a biorefinery case study. The final PROSUITE framework consists of a selection of 40 midpoint indicators of relevant social, economic and environmental aspects and grouped this into 5 endpoints, namely, impact on social well being, prosperity, exhaustible resources, natural environment and human health. Conclusions were formulated on how such a complex assessment methodology should be interpreted and communicated.

Tommie Ponsioen (PRé Consultants) showed that stakeholder weighting at midpoint level is unreliable due to the large number of impact categories and because the concepts can be difficult to grasp. An alternative solution to directly using endpoints to determine the relevant impact categories or single scores is to use weighting factors on midpoint categories that are obtained by using an endpoint method including weighting at endpoint. Midpoint weighing factors based on endpoints will provide decision-makers with much more realistic information on which categories are important for the studied product than midpoint panel weighting factors.

Fredy Dinkel (Carbotech AG) discussed in his presentation the necessity of single score results for decision support. It is crucial to understand the relevance of the different midpoint indicators. For this, single score methods based on consensus and not merely personal opinions are not only helpful, but necessary. In order to reach a sound decision, different single score methods should be used to conduct sensitivity analysis, which allows assessing the consequences on the LCIA results due to different value-choices of the weighting methods.