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Opportunities and challenges for including Planetary Boundaries in Life-Cycle Assessment

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Life-Cycle Assessment (LCA) is a tool to quantify and assess the potential impacts of products to identify the environmentally better performing product as an aid for decision-makers. Environmental carrying capacities represent the environmental intervention a system can handle without shifting to a state which is impossible or difficult to revert back from. Carrying capacities, such as those quantified within the planetary boundary (PB) framework (Steffen *et al.* 2015), opens up the possibility for assessing products and services in absolute terms, relative to their occupation of carrying capacities. The planetary boundaries concept has already been taken up by international organizations and there is a growing interest from companies who wants to assess their products and relate these to the PBs.

This study present and discuss the opportunities and challenges related to including the PB-framework as part of the life-cycle impact assessment (LCIA) phase in LCA. The challenges lie in developing, using and interpreting the results of a new PB-based impact assessment methodology, where the impact scores are compatible with the indicators used in the PB-framework. This includes modifying current and developing new characterization models to comply with the indicators used in the PB-framework. The challenges on use and interpretation of the LCIA-methodology are primarily related to (I) the PB-framework and the selected indicators which are only concerned with keeping the Earth in the Holocene state, and for instance not taking into account human health and resource use; and (II) allocating the carrying capacity that the studied systems are entitled to in order to ensure that the accumulated impact of all studied systems are not exceeding planetary carrying capacities.

Although a number of difficult challenges can be identified, the new approach relating the environmental performance of products to environmental carrying capacities can provide greater insight on the sustainability of the assessed products and can further aid decision-makers by elaborating the question on whether choices are environmentally better by indicating whether the choices are environmentally good enough.

References

Steffen, W., Richardson, K., Rockstrom, J., Cornell, S.E., Fetzer, I., Bennett, E.M., Biggs, R., Carpenter, S.R., de Vries, W., de Wit, C.A., Folke, C., Gerten, D., Heinke, J., Mace, G.M., Persson, L.M., Ramanathan, V., Reyers, B., and Sorlin, S., 2015. Planetary boundaries: Guiding human development on a changing planet. *Science*, 347 (6223).