Ecosystem quality in LCIA: status quo, harmonization, and suggestions for the way forward

Purpose: Life cycle impact assessment (LCIA) results are used to assess potential environmental impacts of different products and services. As part of the UNEP-SETAC life cycle initiative flagship project that aims to harmonize indicators of potential environmental impacts, we provide a consensus viewpoint and recommendations for future developments in LCIA related to the ecosystem quality area of protection (AoP). Through our recommendations, we aim to encourage LCIA developments that improve the usefulness and global acceptability of LCIA results.

Methods: We analyze current ecosystem quality metrics and provide recommendations to the LCIA research community for achieving further developments towards comparable and more ecologically relevant metrics addressing ecosystem quality. Impact indicators—which result from a range of modeling approaches that differ, for example, according to spatial and temporal scale, taxonomic coverage, and whether the indicator produces a relative or absolute measure of loss—should be framed to facilitate their final expression in a single, aggregated metric. This would also improve comparability with other LCIA damage-level indicators.

Results and discussion: We recommend that LCIA development for ecosystem quality should tend towards species-richness-related metrics, with efforts made towards improved inclusion of ecosystem complexity. Impact indicators—which result from a range of modeling approaches that differ, for example, according to spatial and temporal scale, taxonomic coverage, and whether the indicator produces a relative or absolute measure of loss—should be framed to facilitate their final expression in a single, aggregated metric. This would also improve comparability with other LCIA damage-level indicators.

Furthermore, to allow for a broader inclusion of ecosystem quality perspectives, the development of an additional indicator related to ecosystem function is recommended. Having two complementary metrics would give a broader coverage of ecosystem attributes while remaining simple enough to enable an intuitive interpretation of the results.

Conclusions: We call for the LCIA research community to make progress towards enabling harmonization of damage-level indicators within the ecosystem quality AoP and, further, to improve the ecological relevance of impact indicators.

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