

Pollinators in LCA: relevance and challenges

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Different drivers, primarily deriving from industrial development and intensive agricultural practice, are leading to declines in insect pollinator populations, potentially affecting also the provision of critical ecosystem services, including pollination [1]. Insect pollinators play an essential functional role in terrestrial ecosystems, supporting ecological stability and food security worldwide [2]. Therefore, assessing impacts on pollinators is fundamental in any effort aiming at enhancing the environmental sustainability of human production and consumption patterns, especially in the agro-food supply chains.



Existing life cycle impact assessment (LCIA) models miss to assess impacts on pollinators. Some LCIA models have mentioned pollination [3], but none has presented a proposal for integrating pollinators as target group for biodiversity protection within an LCIA framework. The present work, building from a thorough review of drivers of impacts on pollinators (Crenna et al. 2016, [4]) aims at providing recommendations on how future research should be oriented to improve the current models and how novel indicators should be developed in order to devise a pathway towards the inclusion of impacts on pollinators in LCIA.

LCIA framework and insect pollinators

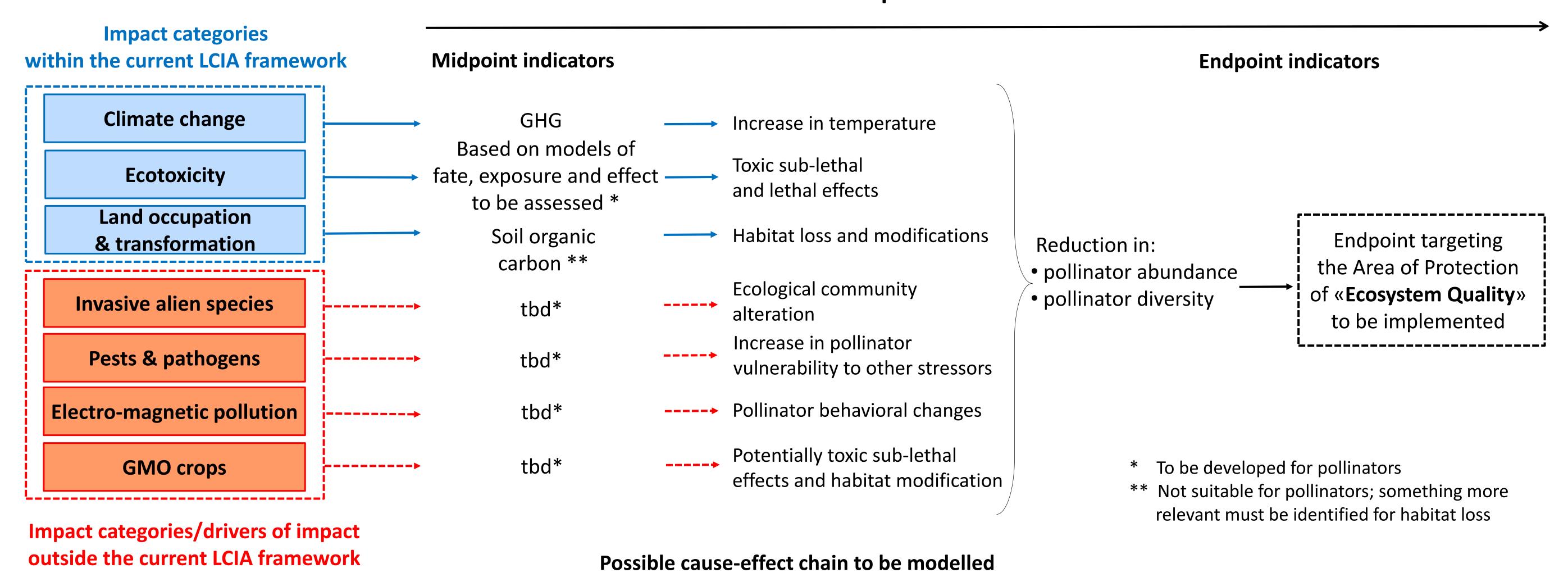


Figure 1 – Identified drivers of impacts on pollinators within a potential cause-effect chain. LCIA framework adapted from ILCD [5]

The current LCIA framework incorporates some threats to pollinators as impact categories (blue boxes) while lacking an impact pathway leading to assess damage on pollinators. Besides, some threats are completely missing (red boxes), namely an impact category does not exist, although there is evidence of potential environmental concern related to the topic. Furthermore, the functional role of pollinators in providing pollination services is not taken into account at the endpoint level, since the existing indicators for biodiversity are mainly based on data of species richness.

Outlook



It is of high priority covering the existing conceptual and methodological gaps by:

- integrating the fate, exposure and effects of those chemicals affecting pollinators in the current models of ecotoxicity;
- integrating within the inventories those features which highlight the loss of relevant habitats for insect pollinators in the current land use models (i.e. land management, presence and typology of field margins);
- developing novel models and indicators both at midpoint and endpoint levels for those categories of impacts which have not been included in the LCIA framework yet;
- accounting for the functional role of pollinators in providing pollination services at the endpoint level, overcoming the classical biodiversity measurements

References

- [1] Millennium Ecosystem Assessment (MEA), 2005. Ecosystems and Human Well-being: Synthesis., 155 pp., Island Press, Washington, DC.
- [2] Klein et al., 2007. Importance of pollinators in changing landscapes for world crops. Proceedings of the Royal Society B-Biological Sciences 274, 303-313.
- [3] Zhang, Y., Singh, S., Bakshi, B.R., 2010b Accounting for ecosystem services in life cycle assessment, Part I: a critical review. Environmental Science & Technology 44: 2232-2242.
- [4] Crenna E, Polce C, Sala S, Collina E ., 2016 Pollinators in Life Cycle Assessment: towards a framework for impact assessment. Journal of Cleaner Production, doi:10.1016/j.jclepro.2016.02.058

[5] European Commission - Joint Research Centre (EC-JRC) 2010. ILCD Handbook: Framework and requirements for LCIA models and indicators. 116 pp.

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