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Towards a consilient Humanity Boundaries framework in the context of futurable agriculture, forestry, and fishery

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Agriculture, forestry, and fishery (hereafter primary industries) have played an integral role in maintaining the existence of human beings. The structure and functioning of primary industries have varied with scales of human activities for the past 10,000 years. A deeper understanding of uncertainties in the production efficiency and environmental capacities, and precautionary principles still needs to be developed. However, in addressing futurability of human-nature interactions (Handoh and Hidaka, 2010), it is a heuristic challenge to design the ways primary industries ought to be.

Rockstrom *et al.* (2009) proposed Planetary Boundaries (PBs) within which we expect that humanity can operate safely. Nine PBs have been identified. They could be considered to be *ad hoc* global and integrated environmental capacities or standards that may critically depend on local and regional primary industries. For example, fresh-water use for irrigation, pesticide-induced chemical pollution, excessive nutrients in aquaculture farms, and loss in biodiversity due to deforestation, are very likely to trigger various environmental risks through atmospheric and oceanic transports and global biogeochemical cycles. However, noting that primary industries themselves reflect regional climate and culture, and regional human-nature interactions, we must seek for region-specific environmental capacities or standards, which we will call Humanity Boundaries (HBs) within which the regional communities with a rich sense of humanity are expected to be futurable.

In the present study, we argue that a consilience, by which region-specific downscaling of PBs into HBs is developed, could provide new insights into designing primary industries in a futurable circulation-type society. It is proposed to develop a crossdisciplinary research group to evaluate environmental capacities in relation to primary industries. We will discuss how to integrate fieldwork-based inductive local-to-global and theory-based deductive global-to-local assessments into a consilient HBs framework in a transdisciplinary fashion.

References

1. Handoh, I.C., and Hidaka, T. (2010). On the timescales of sustainability and futurability, *Futures*, **42**: 743-748.
2. Rockstrom *et al.*, (2009): A safe operating space for humanity, *Nature*, **461**: 472-475.

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