

## **Advancing science and application of planetary boundaries and related ecological limits concepts to enable absolute sustainability assessments**

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The planetary boundaries concept, first proposed in 2009, has gained widespread attention by offering a new approach to understanding and analyzing the biophysical dimension of sustainability at a global scale. The premise of the concept is that humanity as a whole only can be sustainable when staying within the "safe operating space" by avoiding exceeding planetary boundaries. Planetary boundaries are built on earlier science based boundary concepts, such as carrying capacity, maximum sustainable yield and critical loads, which are central to the field of ecology and have inspired the ecological footprint and other environmental indicators. An emerging research theme is now beginning to explore the integration of planetary and other science-based boundaries in various application areas and assessment techniques to allow absolute assessments of sustainability. That is, to answer the question "are the impacts of this object low enough to be considered (environmentally) sustainable, and if not, how much lower should they be?". In this session, we invite contributions that fall within this research theme by presenting methodological developments beyond the session on planetary boundaries for chemical pollution at SETAC EU AM in Berlin in 2012. We also invite contributions that illustrate planetary boundaries application in various assessment techniques and contexts within as well as across impact categories, e.g. risk assessment, technology assessment, life cycle assessment, environmental impact assessment, national emission inventories and impact assessments. From the method developer perspective, these contributions may cover (but are not limited to): (i) the modification of existing assessment models to accommodate integration of (planetary) boundaries and the development of entirely new models, (ii) discussions on where in the pollution impact pathway sequence the integration of (planetary) boundaries should take place, (iii) spatial and temporal differentiation of impacts and (planetary) boundaries and how to meaningfully aggregate indicator scores across space and time, (iv) ethical principles for deciding how much "safe operating space" a studied object is entitled to and how to concretely integrate the entitlement concept in the assessment, (v) science-based boundaries beyond ecosystems, e.g. for human health, non-renewable resource use and social impacts, (vi) considerations of uncertainties in absolute sustainability assessments. From the practitioner perspective, contributions should include the use and testing of existing and preliminary methods for absolute sustainability assessments in case studies. We encourage an emphasis on the interpretation of case study results to support communication with decision-makers.