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

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May 9, 14:20 - 16:00, Hall 100

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.

Clean circular economy: recycling while eliminating legacy toxics

Niels Jonkers, Heather Leslie

May 10, 14:20 - 16:00, Silver Hall

Optimized reuse and recycling of materials are main requirements in order to reach a circular economy. The challenge is not only how to recycle as much material as possible, but also how to make sure these material streams are of sufficient quality to go through a new life cycle. The risk of contamination of material streams is seen by many as one of the key threats to a circular economy. Recycling substances we want to get rid of does not seem wise. Interest in this issue is "emerging" both in the media, the environmental science community, industry and policy. The substances involved are well known by the SETAC community: brominated flame retardants in recycled plastics, PAHs in recycled roofing material and mineral oil mixtures (MOSH/MOAH) in recycled paper. In the LCA community, modelling of recycling systems has been a research topic for decades as well. However, in the SETAC Europe meetings, no specific session has been devoted to the issue of toxic substances in recycling so far. Therefore, a session is organized to address toxic substances in recycling from a broad perspective, bringing together knowledge from analytical chemistry and toxicology, as well as life cycle assessment and policy. Specific topics to be addressed are: -what is the problem? Which toxic substances are involved and to which extent are they found in recycled materials? Some examples are flame retardants in insulation materials and plastics from electronics, and endocrine disrupting plasticizers and metals (e.g. cadmium) in packaging plastics. -challenges in analytical chemistry: the development of fast, selective and sensitive techniques for monitoring contaminants in waste streams, as well as smart sampling strategies. -how are policy makers dealing with the issue? Discussions on the Stockholm Convention are ongoing, and will have to lead to acceptable recycling protocols balancing material resource efficiency and consumer safety. -Life Cycle Assessment studies could play a prominent role in this discussion, by quantifying the environmental benefits of recycling, as well as the potential impact of toxic compounds being emitted. What developments are needed to allow LCA to also deal with the potential harm of toxics remaining in the materials, without direct release into the environment? -which solutions are available for removing contaminants from recycling streams?

Nanoparticles and Microplastics: Harvesting Recent Findings to Fertilize a New Pressing Topic

Ralf Kaegi, Frank Von der Kammer, Thorsten Hüffer

May 10, 8:30 - 18:30, Exhibition Hall (Poster Corner session)

Nanoparticles and micro-nanoplastics are both particulate materials which are being introduced into the environment by human activities. Both material types have already been detected in various environmental compartments and biological systems and both may have adverse effects on the ecosystem. Furthermore, the identification and quantification of both material types is very challenging and requires a chemical and a particle size information. Extensive research in the field of engineered nanoparticles have greatly increased our analytical capabilities to detect the respective materials in complex environmental matrices and thus contributed to an increased understanding of the environmental fate and effects. Although our understanding of nanoparticle behavior, fate and effects is still far from being complete, there is a great chance that experience and knowledge gained in nanoparticle research can help to better understand the behavior and effects of microplastics in the environment. A cross-fertilization might help to reduce the remaining uncertainties regarding to the risks associated with the increasing use and related release of both materials. In this session we critically address similarities and differences in the two research fields. We aim at identifying lessons that we already learned in one field and to what extend this knowledge can be transferred to the other field and where we need to develop new approaches and concepts. Contributions addressing the fundamental behavior of either of the two material types in the environment, promising analytical approaches to identify the materials in complex environmental matrices, persistence and transformation of the materials in the environment and in biological systems are equally welcome as modeling studies addressing the flow of the respective materials in and through different environmental compartment and biological systems. If the session format permits, we aim to have a concluding panel discussion with approx. 6 panelists recruited from the presentations given in the session and external invited experts. With this session proposal we are aiming at the new SETAC track that specifically calls for fundamentally new concepts and novel or even controversial ideas. We emphasize novel and controversial ideas.