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## **Planetary boundaries in sustainable production and consumption systems**

### **Context**

A 'net-zero' economy is expected to be developed in the next few years to help towards the Sustainable Development Goals (SDG) proposed by the United Nations Environment Programme (UNEP)'s Agenda 2030 and the 2050 Paris Agreement's Climate Goals. To do so, changes in production and consumption patterns are needed, as well as increasing the awareness of how local environmental effects could have significant effects globally. Bearing this in mind, it is important to develop global assessment methods and, in this regard, 'Planetary Boundaries' (PB) could be considered as one of possible approaches.

The concept of PB identifies nine Earth system processes critical for maintaining the stability and resilience of the Earth's system as a whole (Rockstrom et al., 2009). Accordingly, the PB framework defines nine 'boundaries' and spilling over these boundaries increases the risk of causing large-scale abrupt or irreversible environmental impacts. By 2023, six out of nine planetary boundaries have been crossed, so there is a need to take action on trying to slow down surpassing the thresholds (Richardson et al., 2023).

The PB framework formulates limits for anthropospheric impacts on the Earth's system (Grabs et al., 2023) by identifying a scientifically based 'Safe Operating Space' (SOS) (Steffen et al., 2015). It represents the region within which humanity can continue developing and thriving for generations (Rockström et al., 2009). The PB framework has been widely used in sustainability assessments for systems at different scales in which the system's environmental impacts are compared with its threshold (Arias et al., 2022).

However, many barriers make it difficult to implement PB effectively in practice. These include a lack of information and data sharing systems (Li et al., 2020, Erlandsson et al., 2023), lack of considering the life cycle of products, services, and activities (Bergmark and Zachrisson, 2022), lack of clarity on the management of recovery of materials, and lack of standards, tools, methodologies and guidelines to evaluate the PB implications for production and consumption systems (Guinée et al., 2022).

Therefore, this special issue is posing the following questions related to PB for both production and consumption:

1. What are the features or requirements that production systems must have to implement properly management of PB in practice?
2. Can PB be a driving force for achieving more sustainable production and consumption in emerging markets?
3. What approaches and tools could be used to determine the PB and their optimal management in different applications?

4. How can more sustainable consumption patterns contribute to PB management?
5. How could the PB approach be applied to assess both traditional and emerging technologies and production patterns?
6. How to deal with assessing the PB perspective with limited data availability?

Papers aiming to answer other related questions are also welcome as are theoretical and practical approaches to the application of PB to sustainable production and consumption systems.

### **Special issue guest editors**

Managing editor: Adjunct Professor Diogo A. Lopes Silva, Federal University of São Carlos (UFSCar), Brazil

Assistant Professor Rodrigo Salvador, Technical University of Denmark (DTU), Denmark

Associate Professor Daniela C. A. Pigosso, Technical University of Denmark (DTU), Denmark

Dr Ana Arias, Universidade de Santiago de Compostela, Spain

### **Submission deadline and contacts**

The deadline for submissions is 31 October 2024.

Authors should upload their contributions at <https://www.editorialmanager.com/spc/> and choose Article Type “VSI: Planetary Boundaries”

Authors are advised to read carefully the Aims and Scope of the journal before submitting the paper.

For enquiries about this special issue or the fit of the paper for the journal, please contact in the first instance Journal Manager Pippa Wright ([pwright@icheme.org](mailto:pwright@icheme.org)).

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