



6-7 May 2026 | Hotel The Standard, Brussels

PLANETARY BOUNDARY FOR NOVEL ENTITIES

DEFINING A SAFE OPERATING SPACE FOR CHEMICALS WITH ACTIONABLE TARGETS TO PROGRESS A TRANSITION TO A SUSTAINABLE FUTURE

This workshop is part of ECETOC's 2026 NEXUS WEEK 

Objectives

The primary goal of this workshop is to discuss the challenges and opportunities in defining the Planetary Boundary for novel entities and elaborate on the need to further develop this framework into well-defined, practical “Safe and Just” Earth System Boundaries (ESB) with appropriate control variables. The aim is to lay out a coherent framework based on the DPSIR framework that builds upon current chemical management practices and the wealth of chemical knowledge and data available. A workable ESB definition should be linked to targets and pathways, linking Planetary Boundary science with ‘Zero Pollution’ ambitions and include KPIs to operationalize sustainability and safety targets. The workshop sessions aim to address the following:

1. How to define Earth System Boundary(ies) for novel entities?
2. What are the tools, methods, metrics and data needed to determine performance in relation to the Safe and Just Earth System Boundaries?
3. How to enable and demonstrate progress toward a sustainable transition?
4. What are the next steps to operationalize the Planetary Boundary assessment for novel entities in the short-, mid- and long-term?

Background

In 2023, Richardson et al. concluded that the Planetary Boundary for novel entities, such as synthetic chemicals, has been breached. The control variable used was the proportion of chemicals with adequate safety assessments, with the safe threshold defined as zero untested synthetics being released. This approach was informed by Persson et al., who, to reflect the complexity of novel entities, proposed multiple complementary control variables along a pathway from production to impacts. Currently, work is undertaken by the Earth Commission to refine the definition and assessment of Safe and Just ESBs, particularly for novel entities, and to establish actionable sustainability targets.

Despite scientific uncertainties and ongoing work to define the safe operating space for novel chemical entities, policy initiatives are advancing rapidly, including UNEP's Global Framework on Chemicals and the European Environment Agency's Zero Pollution Action Plan. These frameworks set strategic goals for chemical safety and sustainability. A stronger link between Planetary Boundary science and these policy instruments is needed to monitor progress, align targets, and guide efforts toward a safe operating space for novel entities. This integration is essential for reversing boundary transgression and achieving a healthy, sustainable future.

Workshop Goals

1. Deepening understanding of the current safe operating space for chemicals and how to measure it. Provide an overview of the status of Planetary Boundaries science with special focus on novel entities. Review the current Planetary Boundary assessment for novel entities, discuss underlying assumptions and uncertainties.
2. Suggest and discuss practical ways to set Safe and Just ESBs e.g. based on DPSIR framework with a degree of certainty that allows to define targeted actions for managing the novel entities to reduce the level of impact.
3. Explore how current chemical management practices and the wealth of chemical data available can be applied to reduce uncertainties and focus efforts. Consider how the work that links chemical emissions to biodiversity can be embedded in setting practical Planetary Boundaries.
4. Discussing the need to further develop the Planetary Boundary assessment for novel entities, closing the gap with policy objectives.

Conclusion

This workshop aims to increase understanding of the Planetary Boundary concept for novel chemical entities, discuss the alignment between policy objectives, targets and indicators for 'Zero Pollution' and the Planetary Boundaries assessment, and initiates a roadmap that supports Planetary Health and business sustainability performance. By bringing together key stakeholders and experts from academia, industry, regulators and NGO's we aim to take first steps to develop an effective and harmonized approach to the regulatory assessment of Planetary Boundaries for novel entities.

References:

- Rockström J, Gupta J, Qin D, et al. (2023) Safe and just Earth system boundaries. *Nature*. 619(7968):102-111. doi: <https://doi.org/10.1038/s41586-023-06083-8>.
- Richardson K, Steffen W, Lucht W, et al. (2023) Earth beyond six of nine planetary boundaries. *Science Advances*. 9(37):eadh2458. doi: <https://www.science.org/doi/abs/10.1126/sciadv.adh2458>.
- Persson L, Carney Almroth BM, Collins CD, et al. (2022) Outside the Safe Operating Space of the Planetary Boundary for Novel Entities. *Environmental Science & Technology*. 56(3):1510-1521. doi: <https://doi.org/10.1021/acs.est.1c04158>.

Workshop programme

Day 1 – 6 May [Onsite]			
Start	End	Agenda item	Who
9:00 AM	9:30 AM	Registration – Welcome Coffee and Breakfast	
9:30 AM	9:45 AM	Welcome and WS objectives	Mathijs Smit
Session 1: Setting the Scene. Where do we stand with the PB for novel entities? Chair: Mathijs Smit			
9:45 AM	10:15 AM	Current status of novel entities within the planetary boundaries concept	Matthew MacLeod (Stockholm University)
10:15 AM	10:45 AM	Main conclusion from UFZ Planetary Boundary for Novel Entities workshop: It is time for a reboot	Annika Jahnke (UFZ)
10:45 AM	11:10 AM	Coffee Break	
11:10 AM	11:40 AM	Progress on the ESB assessment for novel entities. How to set boundaries given knowledge constraints	Zhanyun Wang (University of Southern Denmark)
11:40 AM	12:10 PM	Session 1 Discussion: - Challenges in defining a boundary for novel entities - How to set appropriate control variables and metrics needed to measure progress? - How can we cover multiple dimensions e.g. temporal, spatial, compartmental, - Do we need multiple boundaries depending on the NE characteristics?	Session 1 speakers Chairs: Claire Terry and Sam Deacon
12:10 PM	1:10 PM	Lunch	
Session 2: What do we measure? Metrics for Chemical policies vs Control Variables for Novel Entities Chair: Andrea Lopez			
1:10 PM	1:40 PM	Establishing Indicators under the Global Framework on Chemicals (GFC): Process, Progress Assessment, and Further Developments	Kay Williams (GFC)
1:40 PM	2:10 PM	EU pollution monitoring and study on planetary boundaries for chemicals	Julien Fabre (European Commission) / Kristina Flexman (WSP)
2:10 PM	2:40 PM	Towards Planet Positive Chemicals: A Chemical Transformation Roadmap	Jo Lloyd (ERM)
2:40 PM	3:10 PM	Industry data, dashboards and external reporting metrics for chemicals	Wibke Loelsberg (BASF)

Day 1 – 6 May [Onsite]			
Start	End	Agenda item	Who
3:10 PM	3:40 PM	Session 2 Discussion: - Bridging the gap between measurements endpoints and assessment endpoint. - Are we measuring the right ones? Do existing metrics inform planetary boundary transgression? - What are the key data gaps?	Session 2 speakers <i>Chair: Claire Terry</i>
3:40 PM	3:55 PM	First day wrap up and expectations for day 2	<i>Mathijs Smit</i> <i>Andrea Lopez</i>
7:00 PM	9:00 PM	Networking Dinner	Onsite attendees registered for the networking dinner

Day 2 – 7 May [Onsite]			
Start	End	Agenda item	Who
8:30 AM	9:00 AM	Welcome Coffee and Breakfast	
9:00 AM	9:15 AM	Welcome and introduction to day two	Mathijs Smit
9:15 AM	9:40 AM	Theme presentation - Just earth system boundaries for novel entities	Sally Beckenham (University of York)
		1st Break-out Session: PB definition, control variables and metrics, and the role of exposure, hazard and risk. Can we define a single impact-based PB for NEs that covers multiple dimensions i.e. multiple stressors with different modes of action, multiple compartments, human health and environmental health? Groups A and B: Discuss definition of the planetary boundary for NEs, what are appropriate control variables linked to this definition? What metrics are required to measure the PB status? How does this relate to data we are currently collecting and reporting? What are the gaps? <i>Group A: Moderator: Peter Fantke; Rapporteurs: Alistair Boxall, Matthew MacLeod</i> <i>Group B: Moderator: Sam Deacon; Rapporteur: Mathijs Smit</i>	
9:40 AM	10:35 AM		
10:35 AM	11:05 AM	Coffee Break	
11:05 AM	11:30 AM	Plenary report out from breakout groups	
Session 3: How do we move forward? Transition pathways and tools for the chemical industry Chair: Mathijs Smit			
11:30 AM	12:00 PM	Chemical footprint methodologies	Peter Fantke (Substitute ApS/Goethe University Frankfurt)
12:00 PM	1:00 PM	Lunch	
1:00 PM	1:30 PM	Priority setting for chemicals, waste, and pollution prevention: a risk-based strategy for environmental and human health protection	Michelle Bloor (University of Glasgow)
1:30 PM	2:00 PM	Can Machine Learning Guide Us to a Safe Operating Space for Chemical Impacts?	Kerstin von Borries (Technical University of Denmark)
2:00 PM	2:30 PM	Red lines in the context of Planetary Boundary for novel entities	Eric De Deckere (Cefic)
2:30 PM	3:00 PM	Session 3 Discussion: What is needed to create a coherent system where the input for these tools is provided by reporting frameworks, and the output of these tools can be linked to the status of the planetary boundary? Are the current LCA based systems sufficiently mature to prioritize transition pathways?	Session 3 speakers Chair: Sam Deacon

3:00 PM	3:30 PM	Theme presentation - <u>Environmentally Safe and Just Pharmacy: A Framework and Action Plan for Operating Within the Earth System Boundary for Novel Entities</u>	Alistair Boxall (University of York)
3:30 PM	4:00 PM	Coffee Break	
4:00 PM	5:00 PM	2nd Break-out Session: Developing a roadmap to the safe operating space for novel entities Group A and B: - Setting a boundary for Novel entities (consider the multiple dimensions) - Control variables and metrics (Data gaps, Data blockers & the use of AI) - Transition pathways and tools (Inputs, Outputs, Endpoints) - Priority next steps in the roadmap development Group A: Moderator: Peter Fantke; Rapporteurs: Alistair Boxall, Matthew MacLeod Group B: Moderator: Sam Deacon; Rapporteur: Mathijs Smit	
5:00 PM	5:15 PM	Plenary report out from breakout groups	
5:15 PM	5:30 PM	Summarize, closing remarks and next steps	<i>Mathijs Smit, Sam Deacon, Andrea Lopez</i>

Organising Committee

Mathijs	Smit	Shell
Claire	Terry	Corteva
Maryam	Zare Jeddi	Shell
Alistair	Boxall	University of York
Brigitte	Dittrich-Kraemer	BASF
Steve	Maund	Syngenta
Irantzu	Garmendia Aguirre	JRC
Peter	Fantke	Substitute ApS Goethe University Frankfurt
Miriam	L. Diamond	University of Toronto
Sergio	Leon Perez	ECETOC
Andrea	Lopez Vignote	ECETOC

Venue

The Standard Brussels Hotel

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Organisers information

ECETOC is a not-for-profit scientific association that provides a collaborative space for leading scientists from academia, governments and industry to develop and promote trusted and practical scientific solutions which ensure a safe, sustainable and healthy world. For more information please visit <https://www.ecetoc.org/>

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