

Planetary Boundary Initiative Newsletter

SIXTH EDITION • Q1 2026 



Planetary Boundaries
Science



POTSDAM INSTITUTE FOR
CLIMATE IMPACT RESEARCH



While Planetary Boundary science has advanced tremendously over the past decades, we still lack a deep understanding of the intricate, yet pivotal connections between many biological and physical functions of the Earth system.

In late 2023, the **Potsdam Institute for Climate Impact Research** and its partners launched a major scientific effort to improve both our ability to model how the Earth system evolves under the pressure of human activity, as well as our ability to measure the state of the Earth system at a high temporal resolution: **Planetary Boundaries Science (PBScience)**.

A satellite view of Earth from space, showing the Indian subcontinent and surrounding oceans. The image is a high-resolution satellite photograph of the Earth, showing the Indian subcontinent in the center, surrounded by the Indian Ocean to the south and the Bay of Bengal to the east. The landmasses are shown in brown and green, while the oceans are a deep blue. White clouds are scattered across the scene, particularly over the Indian subcontinent and the surrounding oceans. The image is a high-resolution satellite photograph of the Earth, showing the Indian subcontinent in the center, surrounded by the Indian Ocean to the south and the Bay of Bengal to the east. The landmasses are shown in brown and green, while the oceans are a deep blue. White clouds are scattered across the scene, particularly over the Indian subcontinent and the surrounding oceans.

WELCOME TO THIS SIXTH NEWSLETTER OF THE **PLANETARY BOUNDARY INITIATIVE (PBI).**

Here, you find updates on **Planetary Boundaries Science** and related research efforts conducted at the Potsdam Institute for Climate Impact Research (PIK) and beyond. Read on for news on our steadily growing science initiative, cutting-edge Planetary Boundaries (PB) research results, and exclusive insights into the PBScience effort.

TIPMIP GENERAL ASSEMBLY

FIRST MULTI-MODEL RESULTS SHARED IN TOKYO

Text: Bruce Phillips | Visual: TIPMIP/Donovan Dennis

From 4–6 March, around 70 researchers from across the globe – including PhD students, postdocs, senior scientists, and several IPCC authors – met at the **Third General Assembly of the Tipping Points Modelling Intercomparison Project (TIPMIP)**. Hosted at the University of Tokyo and co-organized with our partners there, the meeting marked the Asian stop in TIPMIP’s rotating series of annual gatherings. Participants included PIK researchers and deputy co-leads of the Earth Resilience Science Unit (ERSU) Sina Loriani and Jonathan Donges as well as the PBScience Lab’s co-lead Boris Sakschewski.

A major milestone this year was the presentation of the first results produced by Earth System Models following the TIPMIP simulation protocol. Participants shared both detailed analyses from individual modelling groups and early comparisons across multiple models, highlighting growing momentum in the project.

What the community discussed

Key scientific discussions focused on:

- How likely tipping behaviour may be in different parts of the Earth system – the atmosphere, ocean, cryosphere, permafrost, and biosphere
- How potential tipping elements might interact with one another
- What tipping events could mean for policy-relevant time horizons and for long-term climate commitments

Breakout groups dug into practical topics, such as refining the protocol for standalone models (e.g., land or ice models) and how these should use outputs from the larger Earth System Models.

In plenary sessions, the community outlined shared research priorities and prepared for upcoming project milestones, especially with the next IPCC assessment cycle on the horizon.



TIPMIP SCIENTISTS CONTRIBUTE TO

GLOBAL CMIP WORKSHOP IN KYOTO

Text: Bruce Phillips | Visual: TIPMIP/Sina Loriani

Immediately after the TIPMIP meeting in Tokyo, many participants travelled to Kyoto for the **CMIP Community Workshop 2026**, the central gathering where the global climate-modelling community plans the next phase of the **Coupled Model Intercomparison Project (CMIP)**. CMIP plays a crucial role in the IPCC assessment reports by coordinating climate simulations across research groups, countries, and components of the Earth system.

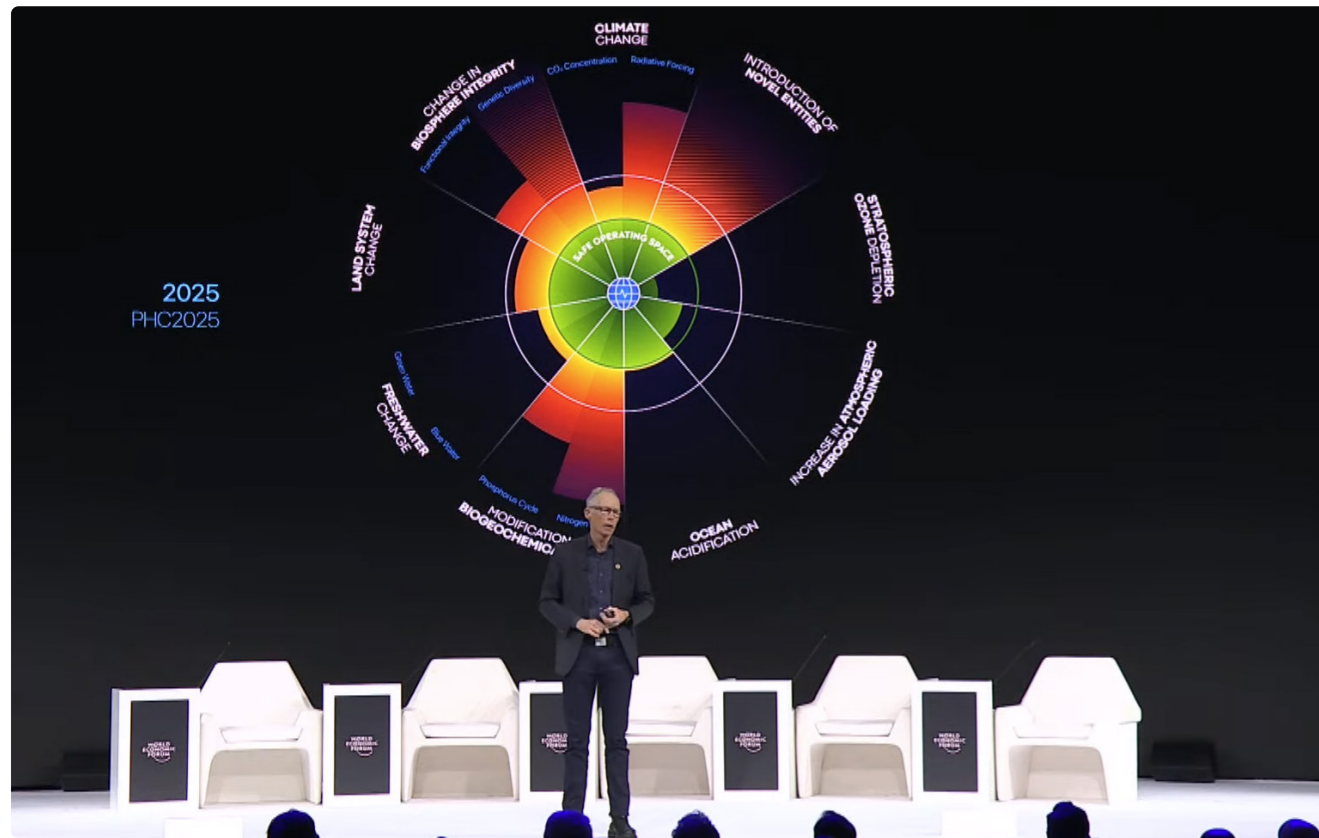
At the heart of CMIP is a simple but powerful idea: every climate model is different, with its own strengths, limitations, and levels of complexity. By running all models under the same scenario – a shared “recipe” designed around specific research questions – scientists can compare results and better understand both the models and the climate system itself. Many of the projections of 21st-century global warming used in IPCC reports come directly from CMIP simulations.

For the upcoming CMIP cycle, the research community has identified tipping points as a key scientific priority, and TIPMIP is the main modelling effort addressing this topic. PB-Tip scientists led a dedicated plenary session on tipping points, where early-career and senior researchers presented the latest findings, including several new results emerging from TIPMIP simulations.

Ricarda Winkelmann, Founding Director of the Max Planck-Institute of Geoanthropology and co-lead of PIK’s Earth Resilience Science Unit (ERSU), delivered a keynote talk, and Donovan Dennis, TIPMIP’s project coordinator, followed with a flashtalk highlighting the project’s progress and future directions.



The Kyoto International Conference Center where the **Kyoto Protocol** was signed in 1997.



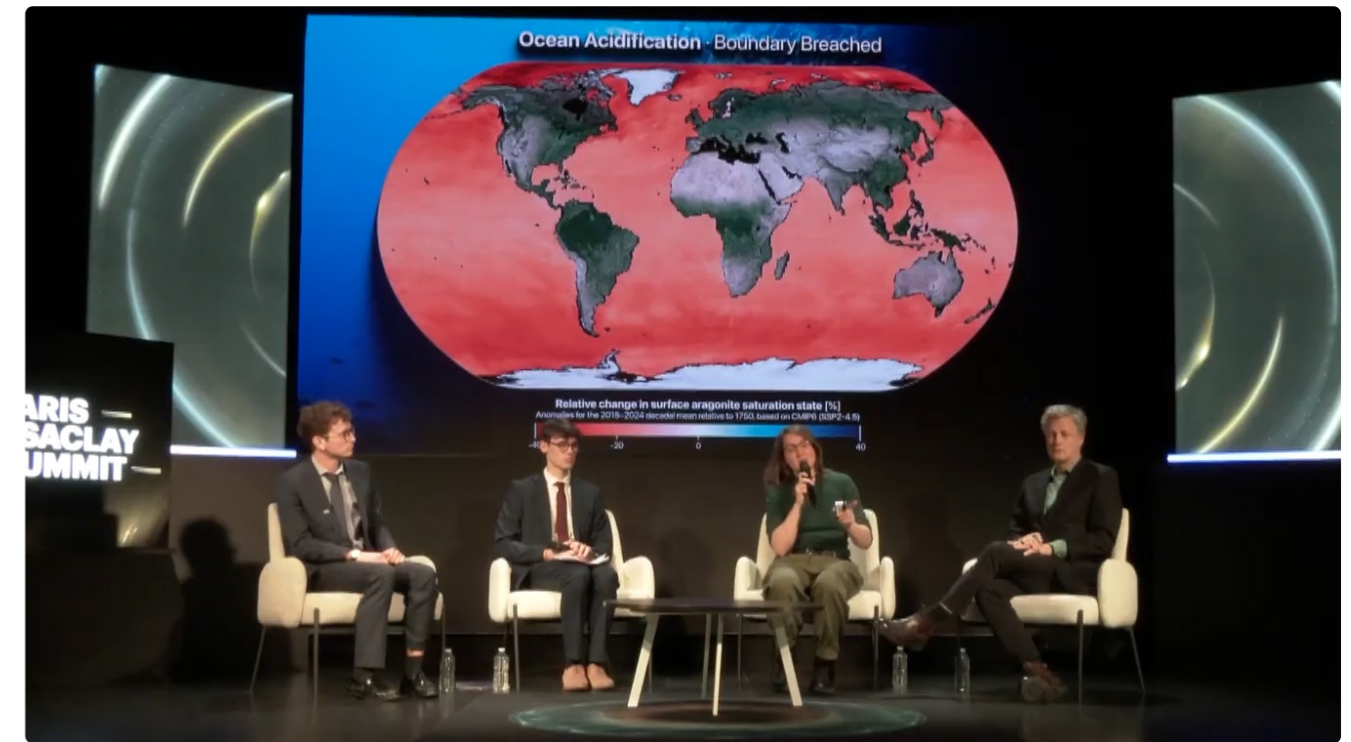
DAVOS 2026 PLANETARY GUARDIANS

Text & Visual: Planetary Guardians

Planetary Guardians Carlos Nobre, Hindou Oumarou Ibrahim, Paul Polman, Ralph Chami, Sylvia Earle, and Naoko Ishii, alongside Guardians co-founder Johan Rockström, participated in the **World Economic Forum 2026 in Davos**. They played a key role in shaping the debate on “how to build prosperity within the Planetary Boundaries”, one of the five core themes of the Annual Meeting. Johan delivered a plenary keynote to global leaders, translating planetary science into concrete implications for risk, stability, and long-term prosperity. Guardians engaged across high-level events and panels, advanced a widely amplified open letter with partners, and co-authored a TIME op-ed calling for the phase-out of fossil fuels.

A standout moment – described by some as “the most important message in Davos” – was the delivery of the WEF Alternative Keynote in the streets of Davos and livestreamed globally, reaching tens of thousands directly. Collectively, these efforts reached well over a million people and reinforced a clear message: aligning prosperity with planetary stability is no longer optional, but foundational to future-proof economies

You can see the full presentation by Johan Rockström on Youtube: [How Can We Build Prosperity within Planetary Boundaries?](#)



PARIS-SACLAY SUMMIT

Text: Levke Caesar | Visual: Paris-Saclay Summit

At the **Paris-Saclay Summit**, the PBSscience Lab’s co-lead Levke Caesar (*second from the right above*) contributed to a panel discussion on “Infinite Growth on a Finite Planet”, a topic at the heart of current debates on sustainability, innovation, and economic transformation.

The discussion brought together perspectives from economics and Earth system science, including a dialogue with Mark Jaccard (Professor, *School of Resource and Environmental Management, Simon Fraser University*), and highlighted both shared goals and important differences in how these challenges are understood. While economic approaches often emphasise that growth can be decoupled from resource use through innovation and efficiency, Levke stressed that all economic activity ultimately depends on the stability of the Earth system.

From this perspective, a key challenge lies in how we measure progress. Indicators such as GDP capture economic value, but do not adequately reflect the condition of the natural systems that underpin societies – such as climate stability, clean water, and functioning ecosystems. This can create a mismatch, where economic progress appears positive, even as the physical foundations of that progress are being eroded.

“GDP can grow while we destroy forests, overfish oceans, and pollute our air and water.”
— António Guterres

At the same time, the discussion made clear that these perspectives are not in opposition, but complementary. Both aim to improve human wellbeing. Levke emphasised that this opens up a more fundamental question: what do we define as prosperity? Increasingly, research suggests that in many high-income contexts, quality of life is closely linked to healthy environments, stability, and resilience factors that depend directly on maintaining a stable Earth system, but not necessarily on GDP. As Robert F. Kennedy famously argued in 1968, GDP “*measures everything... except that which makes life worthwhile.*”

The exchange illustrated the growing importance of bridging economic thinking with Earth system science. As Levke concluded, the central question is not only whether growth is possible, but under which conditions it remains compatible with the biophysical limits of our planet. You can see the talk here: [Planète finie, croissance infinie ? L'ultime équation économique](#) (in French)



CHANGENOW SUMMIT IN PARIS

Text: Bruce Phillips | Visual: ChangeNOW, François Durand

At this year's **ChangeNOW Summit** in Paris – one of the world's largest gatherings dedicated to climate solutions – Planetary Boundaries emerged as a central guiding framework across the entire event. From opening sessions featuring Johan Rockström to workshops, high-level discussions, and even artistic installations, the idea of operating within safe limits of the Earth system shaped the summit's narrative.

In this context, PBS Science Lab co-lead Levke Caesar represented our team, bringing cutting-edge tipping-point science into a space increasingly ready to engage with Earth system thinking. She highlighted that climate risks are not only gradual, but can involve abrupt and potentially irreversible shifts.

A recurring theme throughout the summit was the tension between the urgency of climate action, the slower pace of political and economic systems, and the long-term dynamics of the Earth system. In the "Stand up for Science" session, Levke emphasized that rigorous scientific work is essential to distinguish between what we assume, what we interpret, and what can be robustly demonstrated. She also stressed that science does not solve societal problems on its own – it clarifies risks and strengthens understanding, while decisions remain shaped by societal values. Making science more inclusive by broadening who asks questions and which knowledge is considered is therefore key to addressing global challenges.

Levke also contributed to discussions on the role of the oceans, particularly the polar regions. As critical regulators of global stability, changes in the Arctic and Antarctic are increasingly recognised as central to global risk, underscoring that protecting the poles is inseparable from maintaining a stable Earth system.

Throughout the event, Levke connected with partners from research institutions, NGOs, and the private sector, reinforcing the link between scientific research and real-world climate action. The strong presence of Planetary Boundaries across sectors highlighted how this framework is moving beyond academia and shaping how solutions are designed and implemented.

Opening Keynote by Johan Rockström on the Planetary Boundaries (starting 26:30): [Opening Ceremony](#)
Keynote by Levke Caesar on our Climate Future and Tipping points: [The Adaptation Imperative](#)
Discussion on the Polar Oceans with Levke Caesar: [Sentinels of a Changing Climate](#)



YOUTUBE: NEW SEA LEVEL RISE VIDEO

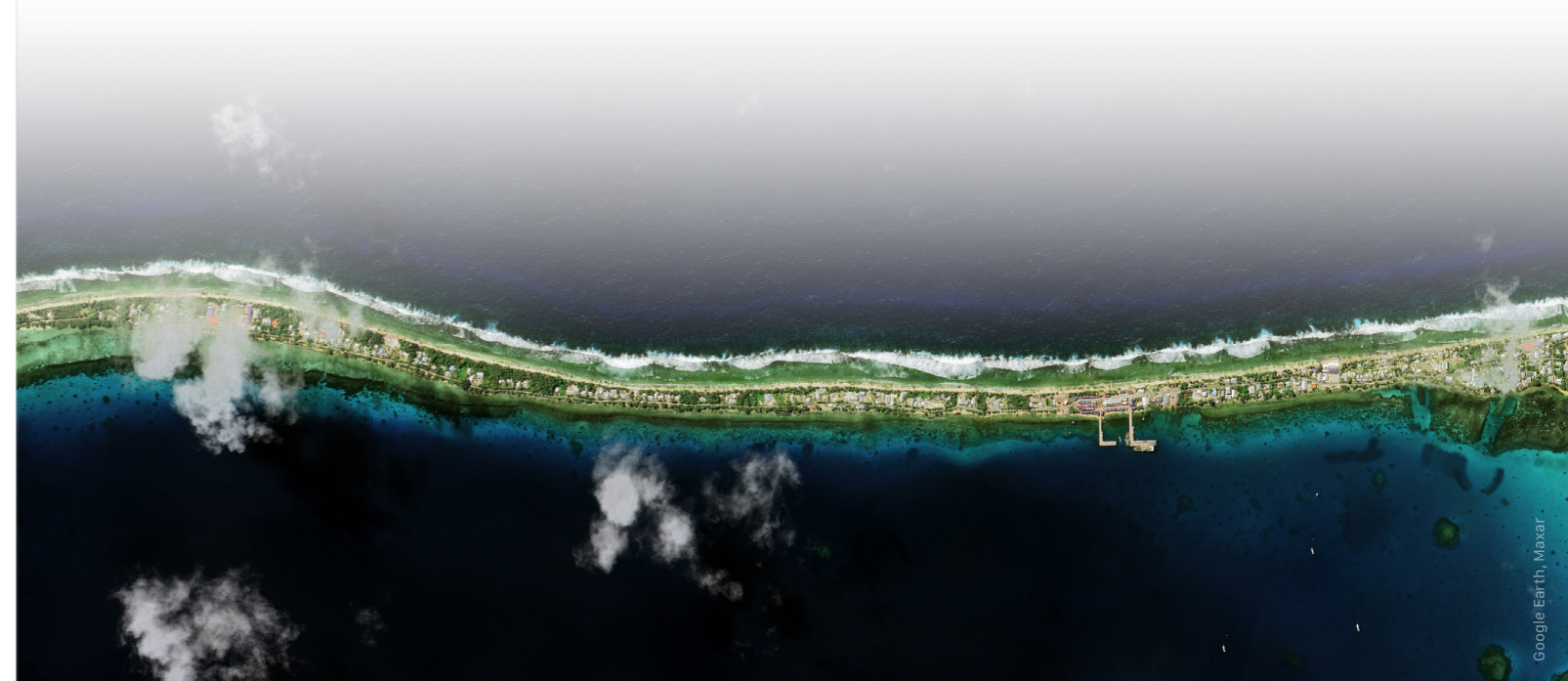
Text & Visual: Bruce Phillips

One of the consequences of burning fossil fuels and land use change, both of which are drivers of the climate change boundary, is accelerating sea level rise: Thermal expansion of the oceans combined with rapid land ice loss.

However, when people think of sea level rise they often think of the vertical rise but something that isn't always considered is how far inland the water goes for every centimetre of rise. So how do you highlight this? Sometimes real practical models are a great way to demonstrate the impacts of crossing planetary boundaries and in a **recent video made by the PBS Science Lab** we did exactly that. We built a beach in miniature to show the surprising impacts and causes of sea level rise for an explainer video.

Watch the video to find out more:

[Is sea level rise worse than you think? Planetary Boundaries Science](#)





EARTH in the BALANCE

Lewes Climate Hub
32 High Street, Lewes, BN7 2LU, FREE

Talk: Planetary Boundaries – Are we crossing the line?
Thursday 12 February, 7pm-9pm

How far have we breached critical planetary boundaries – and how do we return to a 'safe operating space' for humanity? Join **Bruce Phillips** of the Planetary Boundaries Science Lab in conversation from Potsdam to find out. To book your place, email coordinator@lewesclimatehub.org

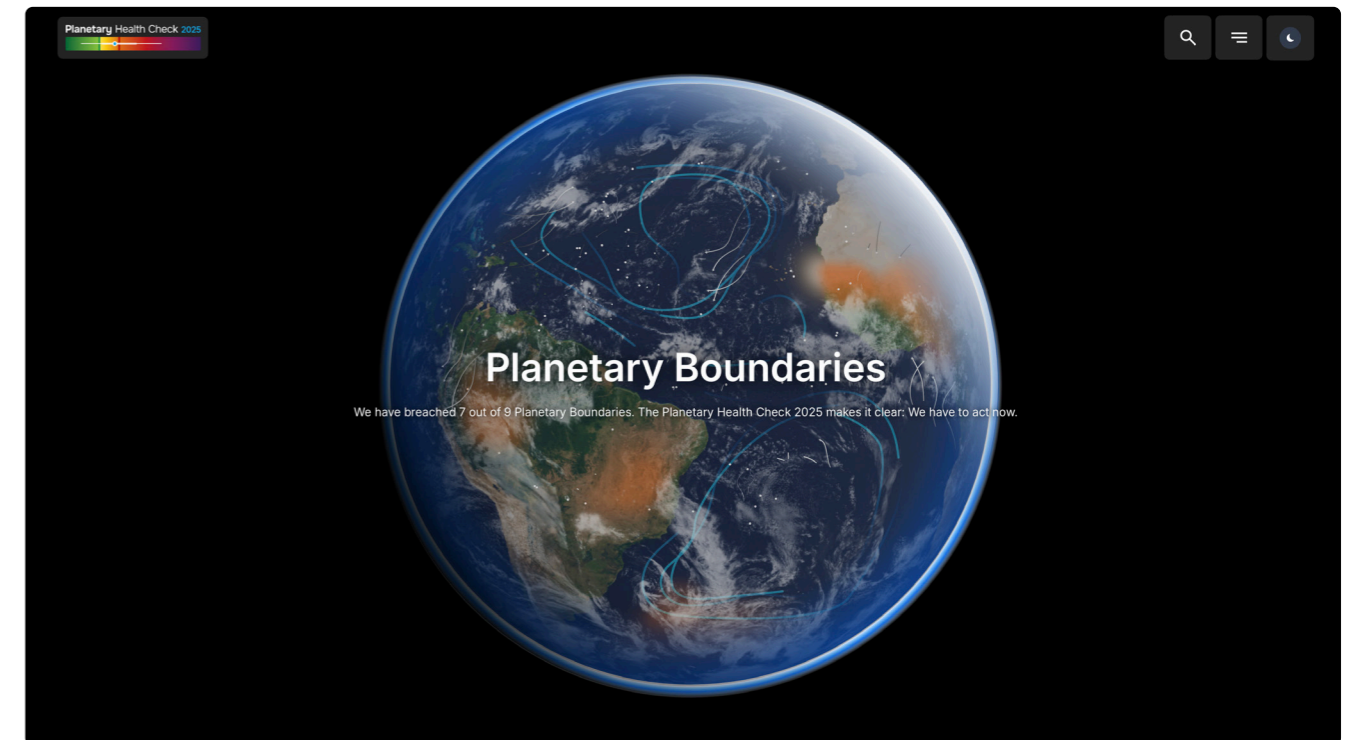
LEWES CLIMATE HUB

Text: Bruce Phillips | Visual: Lewes Climate Hub

Science Communication to the public and local community groups should be a two way process and a great way to see how the public responds to planetary boundaries while highlighting their local solutions.

In February, our science communicator, **Bruce Phillips**, gave a presentation on the **Planetary Boundaries** and the current **Planetary Health Check** to an enthusiastic public audience at the **Lewes Climate Hub**, an influential community group working on solutions to sustainability challenges in Southern England. Attendees included a wide range of professions and backgrounds and following on from the event were requests for the Planetary Health Check report and even an author asking for more details for their book on land use and food.

We hope to run more public outreach events in the near future and welcome requests. For inquiries, you can contact us via the planetary health check website: PlanetaryHealthCheck.org



SCROLLYTELLING WEBSITE UPDATE

Text: Bruce Phillips | Visual: planetaryhealthcheck.org

We are excited to say our website has been updated with a new “scrollytelling” page.

“Scrollytelling” is a way to show a storyline explanation using handmade animations and text, you will probably have used websites with it before, but in our case it explains the planetary boundaries spider diagram in a concise, yet easy to understand way. Especially useful if you know someone who hasn't heard about Planetary Boundaries before.

You can see it here: planetaryhealthcheck.org/planetary-boundaries



PROF. STEFAN RAHMSTORF DEBUNKS THE TOP FIVE CLIMATE MYTHS

Text & Visual: Bruce Phillips

Climate myths, mis- and disinformation are a growing problem on social media but the science is clear. The Planetary Boundaries Science Lab teamed up with Prof. Stefan Rahmstorf, Co-Head of Research Department on Earth System Analysis of the Potsdam Institute for Climate Impact Research (PIK) to cut through the top five myths, noise, and misconceptions around climate change in a new set of videos. The videos cover everything from how we know fossil fuel emissions are causing current climate change to why small amounts of powerful substances, such as greenhouse gases, have big impacts.

You can find the videos on our YouTube channel: [@PlanetaryBoundariesScience](https://www.youtube.com/@PlanetaryBoundariesScience)



PLANETARY HEALTH CHECK 2026 IS IN PROGRESS

Text & Visual: Niklas Kitzmann & GLOBAÏA

The Planetary Boundaries Science Lab has begun coordinating the work on the next edition of the annual, multidisciplinary **Planetary Health Check report, or PHC**. The PHC's main purpose is to assess the state of each of the nine Planetary Boundaries, i.e. the nine biophysical systems that are essential for sustaining life on Earth.

International author teams located at research institutes and universities around the world have started their work on dedicated chapters about each of the nine boundaries. Simultaneously, the PBScience Lab is selecting additional topics we will be spotlighting this year. We are also working towards improving the accessibility and impact of this year's report – stay tuned!

OUTLOOK

UPCOMING EVENTS, ACTIVITIES AND PUBLICATIONS RELATED TO THE PLANETARY BOUNDARY INITIATIVE AND RELATED RESEARCH TEAMS.

24-29 APRIL 2026

CONFERENCE ON **FOSSIL FUEL PHASE-OUT**, COLOMBIA

From 24-29 April, the governments of Colombia and the Netherlands will jointly host the **Santa Marta Conference, the first Conference on Transitioning Away from Fossil Fuels**. As fossil fuel extraction and usage impact far more than just our climate, the Planetary Boundaries will feature in the program as a highly relevant framework addressing the most essential systems sustaining life on Earth. Learn more about the conference here:

<https://transitionawayconference.com/>

MAY 2026

CRITICAL TRANSITIONS WORKSHOP BY THE EARTH RESILIENCE AND SUSTAINABILITY INITIATIVE

From 26-28 May, the Earth Resilience Science Unit (ERSU) will host the 7th Critical Transitions Workshop of the Earth Resilience and Sustainability Initiative in Potsdam. The Initiative, which was formally launched in 2019, is a joint effort of Princeton University, the Stockholm Resilience Centre (SRC) at Stockholm University, and the Potsdam Institute for Climate Impact Research (PIK). Learn more about the Initiative and the workshop here: <https://earthresiliencesustainability.org/>

MAY 2026

MEET US AT THE POTSDAMER TAG DER WISSENSCHAFTEN!

Join us on May 9 from 12 noon to 6 p.m. at the Golm Campus of Potsdam University to meet some of the core members of the Planetary Boundaries Science Lab and experience science in action. More than 40 universities, schools, and research institutes in Brandenburg will join us to present their work. At our booth, science enthusiasts of all ages can try out experiments, observe the greenhouse effect, see the physics of sea level rise, and learn why not all air pollution aerosols are created equal. More information about the program is available here (in German only): <https://potsdamertagderwissenschaften.de/programm>.



THANK YOU...

for your interest in Planetary Boundaries science. By providing us with feedback on our activities, you can help us to continuously improve our outreach efforts:
pbscience@pik-potsdam.de

