The Planetary Boundaries Crisis and the Urgency for Action

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Recently, we discussed the possibility that Planet Earth had crossed five of its nine recognized planetary boundaries.

Now, the scenario in which seven of these boundaries have been transgressed[2] is increasingly alarming: Planetary boundaries represent critical points of no return (PNRs), where damage to natural systems could be irreversible, leading to catastrophic consequences for the balance of the planet.

Figure 1: Visual representation of planetary boundaries. — Photo: Potsdam Institute for Climate Impact Research (PIK)

These limits include crucial issues such as biodiversity loss, ocean acidification, the nitrogen and phosphorus cycle, and climate change, all of which are interconnected to the survival of humanity and biodiversity. Transgressing these limits requires deep reflection and, more importantly, concrete action: If we still talk about planetary limits as something abstract, we need to make them part of the global governance and public policy agenda.

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[2] https://g1.globo.com/meio-ambiente/noticia/2024/10/19/terra-pode-ja-ter-ultrapassado-7-dos-seus-9-limites-planetarios-entenda-o-que-sao.ghtml

As academics, researchers, educators and citizens, we have a responsibility to share our knowledge, research and work with policymakers and decision-makers, as well as to raise awareness in our communities and networks.

This engagement is essential to achieving the Sustainable Development Goals (SDGs) of the 2030 Agenda[3], as well as to consolidate Brazil's role as a global leader in sustainability, especially considering important events such as the G20 presidency in 2024[4] and the COP 30 event in Brazil, in 2025[5].

Going Beyond Planetary Boundaries and the Implications for the 2030 SDGs

Planetary boundaries function as a set of boundaries within which humanity can operate safely and sustainably.

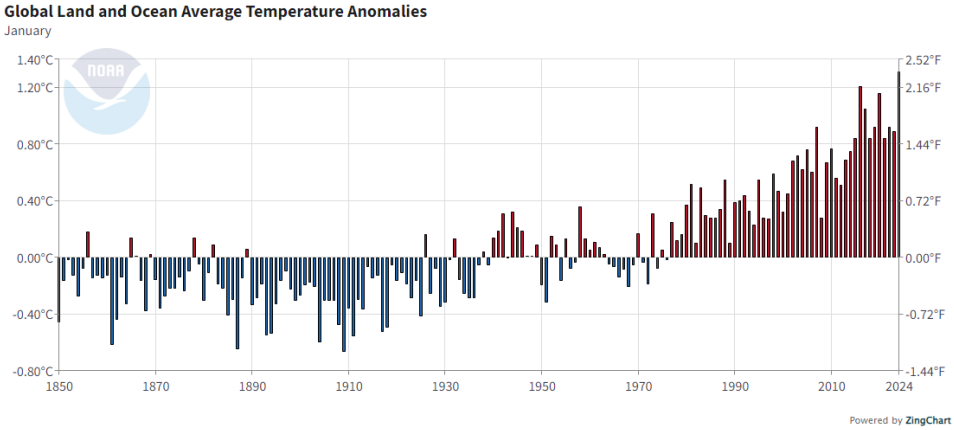

Figure 2: Global Land and Ocean average temperature. – Accessible at https://www.ncei.noaa.gov/access/monitoring/monthly-report/global/202401

By exceeding them, we enter dangerous territory, where systems crucial to life could collapse. Science indicates that we are exceeding seven of these nine limits, including:

- **Climate Change:** Rising greenhouse gas emissions have already put the planet on a path to warming by more than 1.1°C above pre-industrial levels. If this trend continues, we risk reaching increases of more than 2°C by 2050, with devastating impacts on ecosystems, agriculture, health and water security.

[3] https://brasil.un.org/pt-br/sdgs
[4] https://exame.com/mundo/o-que-e-o-g20-evento-presidido-pelo-brasil-em-2024/
[5] https://brasil.un.org/pt-br/254995-%F0%9F%87%A7%F0%9F%87%B7-bel%C3%A9m-do-par%C3%A1-ser%C3%A1-sede-da-cop30-confer%C3%AAncia-da-onu-sobre-o-clima-de-2025

- **Biodiversity Loss:** Species extinction rates are at alarming levels, undermining ecosystem resilience and the ability to maintain essential ecosystem services such as pollination, water purification and maintenance of the carbon cycle.

- **Nitrogen and Phosphorus Cycle:** Excessive use of agricultural fertilizers is disrupting the global nitrogen and phosphorus cycle, polluting rivers, lakes and oceans, leading to acidification and the proliferation of dead zones where marine life cannot survive.

These crises are intrinsically linked to the UN Sustainable Development Goals (SDGs). SDGs 13 (Climate Action), 14 (Life Below Water), and 15 (Life on Land) are directly affected by the transgression of these planetary boundaries. However, each of the seventeen SDGs is impacted, since environmental degradation is interconnected with poverty (SDG 1), food security (SDG 2), health (SDG 3), and social inequality (SDG 10).

Meeting the goals of the 2030 Agenda requires coordinated actions to mitigate climate change, restore degraded ecosystems and promote a transition to circular and sustainable economy models[6]. It is indisputable that Brazil's role is fundamental for these goals to be achieved.

The Brazilian Presidency of the G20 and Advances in Sustainability

As a “megadiverse” country, Brazil plays a central role in discussions on the environment and sustainability.

By assuming the presidency of the G20 through 2024, one of the most influential international forums in the global economy and politics, we are having an unprecedented opportunity to lead debates on energy transition, biodiversity protection and climate finance, topics that are already aligned with its own sustainable development needs.

[6] https://www.europarl.europa.eu/topics/pt/article/20151201STO05603/economia-circular-definicao-importancia-e-beneficios

Figure 3: Brazil at G20´s Presidency. – Accessible at https://omundodiplomatico.com.br/2024/01/15/presidencia-do-g20-e-oportunidade-para-o-brasil-projetar-seus-objetivos-de-politica-externa/

The G20 presidency has allowed Brazil - through the intense participation of Gov.br itself, but also of a myriad of national and international actors - to amplify the discussion on the role of emerging economies in mitigating climate change and adopting ESG (environmental, social and governance) practices.

The G20, responsible for more than 80% of global greenhouse gas emissions[7], is, in fact, an essential arena for the coordination of climate policies and international commitments, and Brazil can promote concrete actions, such as:

- **Promoting the Energy Transition[8]:** Encouraging investments in renewable energy sources, such as solar, wind and biomass, taking advantage of Brazil's potential in these areas. Electrifying the global energy matrix is a key strategy to reduce dependence on fossil fuels.

- **Protecting the Amazon and Brazilian Biomes:** Protecting and restoring the Amazon should be a priority, as the biome plays a crucial role in global climate regulation and carbon capture. Brazil can reinforce international commitments to forest preservation, while combating illegal deforestation.

- **Climate Finance[9]:** As president of the G20, Brazil can suggest and promote climate finance mechanisms for developing countries, ensuring that the transition to a low-carbon economy is fair and equitable.

[7] https://news.un.org/pt/story/2019/11/1695901
[8] https://www.gov.br/mme/pt-br/assuntos/noticias/transicao-energetica-a-mudanca-de-energia-que-o-planeta-precisa
[9] https://agro.fgv.br/sites/default/files/2023-07/eesp_relatorio_financiamento-climatico-ap1.pdf

COP 30 in 2025: A New Chapter for Brazil and the World

In 2025, Brazil will host COP 30 – the United Nations Climate Change Conference. This event will be a unique opportunity to consolidate Brazil's role as a leader in the global agenda for sustainability and climate change mitigation.

Figure 4: Belém do Pará will host COP 30 in Brazil. Image credit available at https://oconvergente.com.br/2023/12/11/conferencia-da-onu-oficializa-belem-como-sede-da-cop30/

COP 30 in Belém – PA, represents not only an opportunity to strengthen international commitments, but also to drive the implementation of practical climate mitigation and adaptation solutions. And it could be a milestone on several fronts:

- **Nature-Based Solutions (NbS)[10]:** Brazil can highlight the importance of NbS, such as reforestation and ecosystem conservation, as essential tools to combat climate change and preserve biodiversity.
  The country already has successful examples of forest restoration projects and sustainable management of biomes that can be replicated on a global scale.

  • **Technological Innovations for Climate Mitigation[11]:** As a country with a rich diversity of ecosystems and natural resources, Brazil has the potential to lead the development of green technologies, such as

[10] https://oics.cgee.org.br/pt/-/cat%C3%A1logo-brasileiro-de-solu%C3%A7%C3%B5es-baseadas-na-natureza
[11] https://news.un.org/pt/story/2024/09/1837711

advanced bioenergy, regenerative agriculture and climate-resilient infrastructure.
These advances could be fundamental in demonstrating to the world that it is possible to align economic growth with environmental sustainability.

- **Active Participation of Civil Society and Indigenous Peoples:** Brazil has an engaged civil society, and its indigenous peoples are essential guardians of biodiversity. COP 30 will be an opportunity to give voice to these groups, recognizing their vital role in environmental preservation and the implementation of sustainable solutions.

From Agenda to Action: A Call for Transformation

We have reached a point where mere discussion is no longer enough. We need to transform the sustainability agenda into concrete action, moving from commitments to implementing solutions that can mitigate the impacts of climate change and preserve our ecosystems.

As researchers and educators, our role is more crucial than ever. We must make our research and findings accessible to policymakers, making scientific knowledge accessible and applicable to practical decisions. Furthermore, it is our responsibility to empower the new generation of leaders and innovators so that, as students and citizens, they can actively engage in the transformation of their local and global environments.

As the host country of important events in the coming years, Brazil has a unique opportunity to position itself as a world leader in sustainability and climate mitigation. The success of this leadership depends on broad collaboration between government, civil society, the private sector and academia, all working in synergy to achieve the Sustainable Development Goals and ensure a sustainable future for future generations.

Science and responsibility must go hand in hand, because only then will we be able to make significant progress and reverse the damage we have already caused to the planet.

The time to move from agenda to action is now**!**