

The Future of Sustainability Science in a Deglobalising World

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Abstract:	As international cooperation on science and sustainability becomes increasingly fragile, sustainability science must evolve to remain effective in a deglobalising world. The traditional, centralised, top-down model of sustainability is proving too vulnerable to current global disruptions, from pandemics to geopolitical conflicts. These challenges threaten progress toward the Sustainable Development Goals and jeopardise decades of collaborative advancement. This commentary argues for a fundamental shift toward a decentralised, community-empowered model of sustainability science. By prioritising local solutions, embracing diverse knowledge systems, and fostering horizontal knowledge exchange, we can create a more resilient and adaptable framework for sustainable development. Key transitions include elevating successful local initiatives, adopting transdisciplinary approaches that include underrepresented knowledge holders, building decentralised knowledge-sharing networks, and recognising that sustainability has different meanings across cultural and geographical contexts. These changes will not only mitigate the fragility of globalised systems but also ensure sustainability efforts are more inclusive, context-sensitive, and grounded in real-world needs. Ultimately, this commentary reimagines sustainability science as a bottom-up endeavour, one that is robust, equitable, and capable of thriving even in an increasingly fragmented global landscape.

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The Future of Sustainability Science in a Deglobalising World

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16 Abstract

17 Non-technical summary

18 As global cooperation on science and sustainability weakens, we need a new approach to
19 tackle today's challenges. This Commentary argues that top-down, centralised models are
20 too fragile in a world shaped by diverse crises. Instead, we must shift towards locally driven
21 solutions that value diverse perspectives and knowledge systems. By supporting community-
22 led action, sharing ideas across regions, and recognising that sustainability means different
23 things in different places, we can build a more flexible, inclusive, and resilient path forward.
24 This bottom-up approach offers a better chance of meeting Sustainable Development Goals
25 in an uncertain and changing world.

26 Technical summary

27 As international cooperation on science and sustainability becomes increasingly fragile,
28 sustainability science must evolve to remain effective in a deglobalising world. The
29 traditional, centralised, top-down model of sustainability is proving too vulnerable to current
30 global disruptions, from pandemics to geopolitical conflicts. These challenges threaten
31 progress toward the Sustainable Development Goals and jeopardise decades of
32 collaborative advancement. This commentary argues for a fundamental shift toward a
33 decentralised, community-empowered model of sustainability science. By prioritising local
34 solutions, embracing diverse knowledge systems, and fostering horizontal knowledge
35 exchange, we can create a more resilient and adaptable framework for sustainable
36 development. Key transitions include elevating successful local initiatives, adopting
37 transdisciplinary approaches that include underrepresented knowledge holders, building
38 decentralised knowledge-sharing networks, and recognising that sustainability has different
39 meanings across cultural and geographical contexts. These changes will not only mitigate
40 the fragility of globalised systems but also ensure sustainability efforts are more inclusive,
41 context-sensitive, and grounded in real-world needs. Ultimately, this commentary reimagines
42 sustainability science as a bottom-up endeavour, one that is robust, equitable, and capable
43 of thriving even in an increasingly fragmented global landscape.

44 Social media summary

45 Rethinking sustainability science: local, diverse, and resilient in a deglobalising world.

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Sustainability in a Fragmenting World

Global cooperation on science and sustainability is being challenged by political movements (Jacobs & Booth, 2025). Many wonder what to do amidst a future full of uncertainties caused by climate change, biodiversity loss, future pandemic events, and compounding and cascading social challenges. An undeniable consequence of our *modus operandi* (a particular way or method of doing something) that has brought us into the Anthropocene (Slaughter, 2012; Steffen et al., 2011).

As scientists have pointed towards these global changes, over the last decade, the world has become more decentralised and deglobalised in response (Van Bergeijk, 2024). COVID and the war in Ukraine put a damper on international scientific collaboration (Abramo et al., 2022; Zhang et al., 2024) and knowledge exchange. Conflicts and tensions across the globe generally have made it difficult for some scientists to collaborate. Most recently, the Trump administration's actions to leave the Paris Climate Agreement are likely to further accelerate the undoing of global efforts to reduce greenhouse gases. It does not end there; the same administration is cutting staff and funding at environmental and science agencies, ordering the deletion of critical data gathered by scientists for decades, and ending international spending on sustainable development and biodiversity conservation projects. To better adapt to climate change, to protect ecosystems, to stave off the 6th great extinction, and to achieve the Sustainable Development Goals, the global sustainability community has to stand strong and organize themselves in different ways for the greater good (Sioen et al., 2024).

While disturbing and consequential, the erosion of knowledge sharing and support for science and sustainability serves as a wake-up call to reconsider how the world can best catalyse and harness science to address these multiple crises. It is a warning of the fragility of the system that has been created to achieve a sustainable planet. Furthermore, "*addressing the sustainability crisis requires a diverse and multifaceted approach that draws upon the best knowledge of humankind*" (Sioen et al., 2024), an effort that cannot be achieved in isolation.

Many of our current approaches to sustainability have focused on global agreements and processes to solve the biggest environmental challenges facing our planet (Izuchukwu et al., 2024). International COPs, global treaty agreements, and centralised systems of standards and certifications all represent approaches that are inherently difficult to enact or implement. The defection of one large party can lead to a cascade of other key defections that, in turn, can render the goals of a global agreement unattainable. One or a small number of holdouts can block consensus and thus delay much-needed action or water down agreed goals (Nasiritousi et al., 2024). Most global treaties, other than those involving trade and financial laws or those with specific enforcement clauses, have proven ineffective (Hoffman et al., 2022).

We also have seen the consequences of an overly centralised system of environmental science in which one government can suddenly erase years of existing knowledge and expertise through mass firings, the removal of websites, and the elimination of access to centralised databases of environmental information. Such data and knowledge, controlled by

a single national government in a world of nearly two hundred countries, makes the case for more decentralized approaches to science and data management.

The Case for Local Solutions

Fortunately, recent global events have also served to remind us that many of the planet's greatest environmental challenges (e.g. observed with the Planetary Boundaries research (Rockström et al., 2024)) are experienced and solved locally; a vast multiplication of local solutions could go a long way towards achieving a globally sustainable planet (Masuda et al., 2021). To do so, however, will require that the global science community adapts quickly and learns the language of locality, to serve global sustainability.

There are numerous examples of effective sustainability transitions (Bandari et al., 2024). For instance, in India, a range of partners (from diverse backgrounds, including artisans, technical experts, and public sector workers, across both formal and informal sectors) came together to rethink the brick manufacturing process. A co-designed “action-research” intervention that lasted 10 years, successfully created a variety of solutions to develop and adopt a more environmentally friendly approach to brick-making that results in far fewer emissions and energy use (Heierli et al., 2008; Niazi, 2025).

Organisations operating locally, like Farm Africa, promote sustainable agriculture in Africa by empowering smallholder farmers to increase productivity while preserving natural resources and adapting to climate change. Through partnerships with local communities, governments, and private sectors, they play a critical role in driving agricultural transformation that is both inclusive and environmentally responsible across countries such as Ethiopia, Kenya, Tanzania, and Uganda. By promoting climate-smart practices such as agroforestry, integrated soil fertility management, and efficient water use, the organization helps rural communities improve food security and livelihoods without degrading the environment. Their programs support the adoption of sustainable farming techniques, enhance access to markets, and build resilience to economic and climate shocks (Farm Africa, 2024).

Now we have to find better ways of elevating these examples and sharing knowledge horizontally across local communities and scientists. We have to develop low-cost approaches to sustainability that do not require support from major economic powers. Doing so encourages us to rethink how we collaborate and do science in ways that are most effective. This new geopolitical landscape will also require new partnerships in the funding and co-creation of sustainability science that carefully navigates power dynamics. For instance, the CEO of Volvo recently came out in strong support of keeping EU regulations planned to eliminate combustion engine automobiles (Hägler & Zacharakis, 2025). We need to find opportunities to build coalitions with those in the various sectors, public and private, that are interested in sustainability and are willing to work with researchers to champion new ideas and approaches.

As a science community, we need to recognise and resolve the risks associated with overly centralised approaches to environmental science and sustainable action (Hickmann et al., 2024). We need to embrace the diversity of decentralization. Transferring knowledge and creating redundant repositories of information are important to ensure effective ways of

moving forward. New ways of computing and managing data (including the use of blockchain and AI) could allow us to have more and better integrated, decentralised nodes for environmental data without giving up data sovereignty (Mackey et al., 2022; Pendleton et al., 2019). Yet, there is no roadmap for this approach, and we have to find ways to work with people through trust and guidelines for change.

We are learning new ways of working at the local level that could transform how and by whom environmental information, data and science are created. Transdisciplinary approaches such as Real World Labs or Living Labs allow us to better involve stakeholders and rights holders in sustainability science (Guittard et al., 2024; Harris et al., 2024), while Indigenous knowledge holders and Indigenous researchers with local knowledge and academic training are creating new forms of environmental understanding that weave together old and new ways of knowing as real transdisciplinary.

Rethinking Scientific Collaboration

Sharing all of this new and possibly disparate knowledge will be key. We need to continue to push the boundaries of knowledge sharing to better facilitate shared experiences along more horizontal dimensions: within regions, bilaterally between countries, city-to-city, community-to-community, and Indigenous peer-to-peer knowledge sharing. New, decentralised digital platforms can help create more agile ways of coordinating and bottom-up approaches to the creation and distribution of environmental data and information.

A more decentralised approach to sustainability science will also force us to recognize and celebrate the huge diversity of visions about what sustainability means, how knowledge is created, and where society and humanity should be headed. This will require dealing with large global imbalances in the distribution of funds, power and capacity, as well as a recognition that institutions and bureaucracies have been built around the status quo and may require significant changes in institutional logics to support the changes that are needed. It also means turning away from paradigms of scaling up and replication that envision a small number of solutions that can be extrapolated globally (Hickmann et al., 2024).

We need to take great care to ensure that an embrace of diversity in ways of knowing does not become an invitation for misinformation and disinformation. Not managing this well would make it difficult for the public and decision-makers to discern what is real and what is not and can lead to a general rise in mistrust in science and institutions. How can peer review evolve to determine the validity and usefulness of new ways of knowing? Already, AI has been shown to be effective at countering disinformation at large scales by identifying, analysing, and mitigating disinformation (Saeidnia et al., 2025).

We envision a future in which the intellectual life of sustainability science also becomes more decentralised. As sustainability becomes part of the fabric of local governance, cities, states, and provinces will become hotspots for applied sustainability research and innovation. As the centre of gravity for sustainability science shifts, we will need to pay particular attention to the need to respect the rights of local data producers and knowledge holders and especially the sovereignty of Indigenous knowledge holders and their data rights. The CARE

and FAIR principles have created basic ground rules for Indigenous data (Carroll et al., 2021), but we may need new frameworks for sharing data that are created and owned by cities, states, and provinces that are not required to share their data more broadly.

A Globally Decentralized Science for a Sustainable Future

Now is the time to transform how we think about the science we need for a sustainable future – one that is resilient to changing political winds and shifts in the world order and well-adapted to the economic and cultural realities of the thousands of local communities that are striving for a more sustainable future.

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