

# Transforming research to better support societal transition to a sustainable trajectory

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## Commentary

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## Abstract

**Non-technical summary.** This commentary argues that the current academic and societal pursuit of ‘solutions’ to sustainability challenges fails to acknowledge how change normally occurs in complex adaptive systems, that is, socio-economic systems and the Earth system, relevant for societal development. Such systems seldom evolve through isolated changes or ‘solutions’ but, rather, through numerous small adjustments of component parts. It is the interactions between these small adjustments that lead to system change. Thus, we argue the need for altered expectations in relation to, and a new narrative describing, the anticipated role of research in the pursuit of a more sustainable societal development trajectory.

**Technical summary.** The commentary argues for seeking multiple adjustments rather than seeking ‘solutions’ to our current planetary crises. Based on the belief that many of these adjustments may already lie dormant across academic departments, the University of Copenhagen conducted a series of ‘Transformation Labs’ in 2023 with the purpose of identifying the potential socio-economic and technical adjustments that, in combination, may catalyze societal transformation toward sustainability as well as potential barriers for their societal implementation. Here, we reflect on the learnings from the exercise and argue that both current funding practices and university training should be modified to support this altered narrative. In addition, interactions between research institutions and the beyond-academic world should be strengthened.

**Social media summary.** For reaching a sustainable trajectory, research needs to focus on multiple adjustments rather than fixed solutions.

## 1. What kind of knowledge is needed for a transformation to a sustainable development trajectory and how is it best mobilized?

The call for concrete research-based ‘solutions’ to deal with the crises-state in the Anthropocene has been made repeatedly in recent years (Andersen, 2022; IPCC, 2023; Messerli et al., 2019). Despite many years over which these calls have now been made, the most recent Global Sustainable Development Report 2023 (Independent Group of Scientists appointed by the Secretary-General, 2023) again shows little progress in achieving the sustainable development goals (SDGs) (Malekpour et al., 2023). Indeed, for most of the indicators for the global environmental goals of Climate (SDG 13) and Biodiversity (SDGs 14 and 15) either ‘little or no progress’ or continued ‘degradation’ has been achieved. The most recent planetary boundaries update also concludes that six of the nine identified boundaries are now transgressed, with transgression having increased since 2015 for the boundaries found to be transgressed at that time (Richardson et al., 2023). This failure of the search for large-scale solutions to bring societies onto a more environmentally sustainable development path gives cause to reconsider how academia can best deliver and mobilize its knowledge to catalyze sustainable progression.

It seems unlikely that the overall visions of the SDGs will be achieved unless policymakers, scientists, and stakeholders take a systemic approach in addressing them (e.g. Messerli et al., 2019). Changes in the overall state of complex adaptive systems such as the Earth system occur as the result of interactions between many small changes occurring simultaneously or in response to each other (Steffen et al., 2020). Searching for singular ‘solutions’ to address an unwanted change in individual components of the Earth system will not guarantee a desired change in the overall condition of the system itself. Several of the ‘solutions’ being proposed to human-caused climate change illustrate this well: injection of particles into the atmosphere to reduce radiative forcing and cool the Earth would allow CO<sub>2</sub> concentrations in the atmosphere to continue to increase with potentially disastrous Earth system consequences, including acidification of the oceans (Tang & Kemp, 2021). Reducing global forest areas to create biomass for generating energy reduces the potential for biological carbon sinks to counter climate change (Mather-Gratton et al., 2021; Richardson et al., 2023), and the list goes on.

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In 2023, the University of Copenhagen carried out an experiment with the aim of fast-tracking research relevant for sustainable societal transformation into practice. These ‘Transformation Labs’ were based on online discussions carried out over a 3-month period. The purpose of these discussions was to identify realistic and implementable adjustments to current practices across scales and geographies that, if widely adopted, could be expected to catalyze societal development toward increased environmental and socio-economic sustainability. More than 200 participants from all inhabited continents, representing a broad disciplinary spectrum spanning science, technology, engineering and mathematics (STEM) as well as the social sciences and humanities (SSH) research participated. A global team of (mostly) postdoctoral researchers was recruited to facilitate the process.

Ultimately, an ‘idea catalog’ was developed (Transformation Labs, 2024). This catalog presents the outcome of the prolonged discussions in a format that identified the feasibility, social consequences, and applicability of the proposed ideas. This forced researchers to consider their own research activities in the light of how they could potentially contribute to societal transformation and consider all the barriers along the way. As such, the ideas were not solutions, but suggestions and ways to move forward – multiple steps and adjustments at a time. Therefore, equally important was the process through which novel alliances across cultural and disciplinary boundaries were developed.

As the participants were trained in different disciplines the exercise was, by nature, transdisciplinary. Successful transdisciplinary interactions entail the development of an understanding of how to make these actors, with their complementary and sometimes incompatible views, engage and strengthen one another through critical and dynamic dialogue (Harris *et al.*, 2024). In attempting to do so, we observed some general challenges to our project. One of these was stimulating scientists to translate their research into concrete small-step initiatives that collectively may lead to transformation.

The most striking observation of the interactions in the Transformation Labs was that while the participants never struggled to describe their ideal vision and version of the future (and to identify how actors other than themselves needed to change their approaches to achieve the vision), they found it much harder to imagine how their own activities and research could contribute to change. This signals a need to alter how scientific research and activities are conducted, and researchers trained. Specifically, there is a need for a focus on how the many forms of knowledge represented by modern universities and research institutions can synergistically be combined into concrete, critically founded, transformative adjustments. Initiating this process, we argue, requires acknowledging from the outset that the sustainability challenges faced by humanity are too broad and interconnected to be solved by quick fixes or one-step ‘solutions’, and the urgency of the planetary crisis requires us to do things differently. Instead, multiple adjustments to the system must be proposed simultaneously.

The potential for combinations of small adjustments in system components to bring about a change in system state should always be a consideration when carrying out research. It is important to understand how small adjustments may potentially synergize, or conflict, with other components in the system in achieving a desired end-goal. The Transformation Labs we conducted were developed on the premise that knowledge concerning potential small systemic adjustments already exists within the archives of university and

research institutions and that it needs to be harvested, systematized, and applied to achieve a more sustainable societal development path.

## 2. The challenge of formulating implementable ideas

Through the Transformation Labs experiment, we observed researchers from some disciplines (including the technical and engineering sciences, economics, and law) readily able to focus on – and comfortable with – suggesting implementable ideas. In contrast, participants trained in other disciplines seemed more hesitant with respect to this approach. The latter tended to be more comfortable with critical analysis of the proposed ideas. While these two approaches complemented each other, it became apparent that some important knowledge, critique, and ideas got lost on both sides, as the cultures inherited from training in the different disciplines seemed hard to alter.

Harris *et al.* (2024) emphasize tensions arising from transdisciplinary work may impede or slow down research processes. We stress, however, that by steering research thinking toward small-step adjustments rather than final solutions, some of these disciplinary tensions might be overcome. Other authors (e.g. Bruce *et al.*, 2004; Horwitz, 2003; Klein, 2008; Spangenberg, 2011) have called for new trans- and interdisciplinary vocabularies to facilitate transdisciplinary research collaboration. Our experiences suggest instead that, rather than developing new vocabularies, that there should be a focus on developing tools and strategies to facilitate researchers in the understanding of the language differences of various disciplines as they present themselves through interaction.

This calls for a focus on how to harness both ‘soft’ and ‘hard’ sciences (and whatever may lie in-between) holistically when thinking of potential initiatives aimed at catalyzing transformation. The first step here is to accept that all knowledge forms may hold parts of the key the system adjustments needed to address sustainability challenges – again, recognizing that components of the Earth system are intricately interconnected. We must also acknowledge that bringing the hard and soft sciences together with a single purpose entails the meeting of different knowledge traditions. That these different traditions exist must be an accepted precondition for broad-based collaboration and a premise for their success (Price *et al.*, 2023). Finally, there is a need to foster a scientific culture that cherishes the proposal and generation of ideas that can be implemented. To cultivate such a scientific culture, it must be ensured that scientists – from across the disciplinary spectrum – feel valued, included, and heard in decision-making processes. This requires the nurturing of a critical dialogue between academia and beyond.

## 3. Building and failing

We echo the call from the Independent Group of Scientists that developed the most recent UN Global Sustainable Development Report (2023) where they advocate for scientists bringing forth their ideas directly to policymakers, although how this best is achieved remains an open question.

One possibility for doing so would be to test the proposed ideas for system component adjustment through transdisciplinary discussion and engagement – an elaboration of the conventional peer-review process. In that manner, it might be possible to develop science–policy interfaces that work as sandboxes for testing implementable initiatives at an early stage of development. This would allow early analysis of the impact of multiple small



changes, which could lead to new observations that can reassess the state of the system. Rather than waiting for full scientific agreement on all topics, discussing proposals for adjustments with a wider range of actors early in the research process might help mitigate unforeseen consequences/barriers for implementation. In addition, this might make researchers more comfortable in developing small-step initiatives for system component change and more confident in bringing them into practice.

We make this suggestion based on two observations derived from the Transformation Labs experience: (1) an escape into idealistic visions of the future, without consideration of the small-step initiatives that could potentially bring about these visions, cannot solve the multiple sustainability crises humanity is facing and (2) disciplinary differences may be used as a tool to both criticize and strengthen the proposed initiatives developed across disciplinary spheres, thus providing more space for knowledge-based societal transformation.

#### 4. Recommendations

Based on the above observations, the following recommendations are proposed for making research and knowledge production more fit for purpose in relation to the promotion of transformation to more sustainable societal practices:

- (1) A change in narrative and academic culture. Instead of seeking step-change ‘solutions’ to sustainability challenges, we must acknowledge socio-economies as complex adaptive systems embedded within the Earth system. Changes in the overall state of these systems will best be enabled about through the interactions of multiple adjustments of system components. Knowledge concerning these small adjustments may already be lying dormant in existing research archives. Therefore, research institutions should systematically collect and analyze potential synergies between already existing scientific ideas and findings. Thus, beyond prioritizing the development of new research, we urge knowledge institutions to systematize and align their knowledge archives to make it easier to access for researchers but, more importantly, accessible for practitioners and policymakers.
- (2) A change in academic culture. Academics should be encouraged to address research questions holistically and in an integrated manner. We encourage, therefore, a transdisciplinary approach to sustainability research, where different knowledge forms are mobilized to critically scrutinize, but also to strengthen and propose adjustments to one another. Therefore, transdisciplinary thinking should feature prominently in both university policy and practice. This applies also to researchers who should be encouraged to seek out dialogue with researchers with training in different disciplines. Doing so can enable critical evaluation of new ideas within a broader epistemological spectrum. In addition, such dialogue allows practice in communication and the conveyance of specialized knowledge beyond the domain of a researcher’s own disciplinary training.
- (3) We echo other calls (e.g. Kaiser & Gluckman 2023) in arguing that current research funding mechanisms need to be restructured to prioritize taking research from findings to practice and through to implementation. This also entails an integration of various forms of applied sciences to be linked with practice at an early state, and financial support for this process.

- (4) Incentives should be created at universities for bringing research ideas into practice. For many researchers, the main universal qualifier in academia is the number of publications vis-a-vis impact rating. Accordingly, getting research into practice is not awarded the same career incentives as publishing in high-ranking academic journals. A pluralistic impact rating that considers the effort and time needed for the broad transdisciplinary collaboration it takes to bring research ideas into reality – that is, lifting the academic benchmark beyond publications – would make it more lucrative and appealing for researchers to invest time and resources in escorting their research from idea(s) into implementation, which would also elevate the societal utility of science.

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