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NOTE AND COMMENT

Science under pressure: how research is being challenged by the 2030 Agenda

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Abstract

In this comment, we scrutinize how research is being challenged by the 2030 Agenda and what may be required for research to contribute to transformative change toward sustainability. Building on the current debate and state of knowledge, we argue that we need a stronger engagement with norms and values within science. Conflicting goals, values and visions need to be made explicit and taken into account in the (co-)production of knowledge in a transparent way. This requires the ability for normative reflection on the part of scientists, both about the norms at play and their own role. To produce transformative-oriented knowledge needed for the implementation of the sustainable development goals, we argue, fundamental changes are required within the science system, from the production to the assessment of knowledge.

Keywords Sustainable development goals · 2030 Agenda · Sustainability research · Knowledge integration · Normativity in science

Introduction

With the adoption of the UN 2030 Agenda, the scientific community has been called upon to help put society on a sustainable development path. However, we doubt that current priorities in sustainability research can adequately address the challenges arising from the orientation toward the normative model of a sustainable society. So far, at any rate, the mandate of science is too often misunderstood or even misinterpreted by scientists to legitimize a research agenda or to gain more attention for one's own research. While only a few research projects take a systemic view and consider the interactions between the various 17 sustainable development goals (SDGs) incorporated in the UN 2030 Agenda (see e.g., Le Blanc 2015; Nilsson et al. 2019), the starting point of most studies are individual sustainability goals (or even more fine-grained, specific targets and/or indicators). Thus, sufficient knowledge exists today in many scientific fields and for specific problems and challenges to take immediate action to achieve individual SDGs. In contrast, knowledge about transformative change, i.e., "fundamental, system-wide reorganizations across technological, economic and social factors, including paradigms, goals and values" (IPBES 2019, p. 14) and how to promote it on a larger scale is still largely incomplete and fragmented (Wittmer et al. 2021). The impact of scientific work, measured in terms of stimulating societal change, has thus been limited (Messerli et al. 2019). In particular, scientific assessments of environmental goals, such as climate change mitigation or biodiversity loss, paint a sobering picture (Moses and Tauringana 2022). This brings us to the overarching question: How is research challenged by the Agenda 2030, and what changes within the science system are needed to better support societal changes with knowledge?

Despite the persistent call to rethink and reorganize knowledge production from the sustainability science community (see, e.g., Lang et al. 2012; Jahn 2013; Kläy et al. 2014; Kläy and Schneider 2015; Ott and Kiteme 2016; Gratzer et al. 2019; Schneider et al. 2019; Fazey et al. 2020; Lawrence et al. 2022), most of the scientific practice of research within

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or for a normative agenda such as the Agenda 2030 today is still far from the collaborative, integrative and reflexive research approaches that are needed to support transformative change. With the SDGs, however, the question of how research must change when put in the service of normative goals has extended to many scientific fields other than sustainability science. Thus, we take the half-life of the 2030 Agenda as an occasion to take up this debate. We argue that a systematic engagement with the normative dimension of the 2030 Agenda and the concept of sustainability is a prerequisite for the production of knowledge to operationalize the 2030 Agenda and advocate for fundamental changes in the science system that not only recognize but also systematically promote normative scholarship.[1] The considerations here are primarily based on the challenges and limitations of our own (transdisciplinary) research in the field of sustainability research. In addition, some of the thoughts and reflections in the paper come from discussions at a workshop organized by the Helmholtz Centre for Environmental Research (UFZ) in October 2019 and from a horizon scanning exercise (Sutherland et al. 2011) from November 2019 to February 2020 addressing the potential role of research for the SDGs.

In the following section, we first emphasize the demands and tasks that the 2030 Agenda places on science. We then discuss the key challenge posed to science by the inherently normative nature of the 2030 Agenda and address four steps researchers need to take to produce transformative-oriented knowledge. We conclude our paper by suggesting structural changes in the science system that we believe are long overdue to foster scientific engagement within or for a normative agenda such as the SDGs.

Treating the 2030 Agenda for what it is: a political and normative framework

The 2030 Agenda with its 17 SDGs places new demands and tasks on science. As a politically negotiated framework, the SDG framework can be useful to reflect on complexities, trade-offs, and synergies, to evaluate progress toward sustainable development, or to support the assessment of different policy options and scenarios and their expected impacts (Colglazier 2015). This requires understanding the interactions between the goals, analyzing synergies and trade-offs, and capturing the complexity of the efforts needed (Saito et al. 2017).

However, the question as to whether specific policy options contribute to greater sustainability in the sense of the 2030 Agenda is not always easy to answer (cf. Schneider et al. 2019). In fact, a normative framework such as the Agenda 2030 may be interpreted and lived differently due to different value systems, and the concept of sustainability itself, with its various underlying values and the means of implementation attributed to it, is also contested. This is because the 2030 Agenda and the normative concept of sustainability are based on values and norms of what a 'good' or 'desirable' future should look like, distinguishing it from a 'bad' transformation pathway (Schneider et al. 2019). As these visions of a sustainable future are deeply normative and political, they are thus negotiable (cf. Beck and Forsyth 2020). As scholars, therefore, we should also acknowledge the implicit task of the SDGs: as a globally legitimized normative frame of reference that despite representing "political" targets requires our engagement not just in terms of implementation but also in terms of critical reflection.

Therefore, an engagement with the overarching concept of sustainability and its underlying normative dimension, as well as a critical examination of the 2030 Agenda with reference to concepts such as environmental justice, is required. In this context, science must ask: Are the SDGs (as they exist) suitable to achieve the sustainability objectives? Which are the underlying sustainability views or definitions? Which transformations do these views or definitions trigger?

After all, we can observe that in concrete political practice, sustainability is compatible with positions of post-growth, climate justice, and ecological modernization as well as a moderate 'business as usual'. These basic attitudes and their power chances in politics may be decisive for implementing the SDGs and related conflicts. Even if we cannot find satisfying solutions for all conflicting principles derived from values and norms, a necessary step would be to acknowledge them and search for negotiation potential. This requires that scientists contextualize their work beyond their specific area of interest and expertise, e.g., that environmental scientists reflect on the entire SDG framework and consider aspects such as health (SDG 3), gender (SDG 5) and equity (SDG 10). This is necessary insofar as, after all, the targets and indicators themselves also limit the transformative potential of the 2030 Agenda by, e.g., favoring economic growth over sustainable resource use (Eisenmenger et al. 2019). However, to rethink targets and indicators, the values and norms they are meant to pursue must be clear. Accordingly, scholars should reconstruct the process of development of the

[1] With the term 'normative scholarship', we refer here to scientific engagement that is applied, goal directed, unavoidably political, and acknowledges this as such. Endorsing such engagement neither denigrates the role of fundamental research nor entails that scientific research as such should only be evaluated in terms of its contribution to sustainability challenges—this, indeed, would be an infraction of the principles of freedom of scientific inquiry. The assertion made here is limited to the argument that given the pressing sustainability challenges, more normative scholarship is needed. See also Schneider et al. (2019).

SDGs and reflect on power relations in the negotiation of the 2030 Agenda, i.e., who was included in the process, and thus whose interests, perspectives and values found their place in the negotiations or were excluded?

Thus, our role as a scientific community should build on two pillars:

1. critically examining and advancing the 2030 Agenda and the 17 SDGs,
2. fostering the production of more applied, targeted and inevitably policy-driven knowledge for achieving a sustainable society.

Yet, aligning our research within or for a normative agenda presents challenges for us researchers and the scientific community as such, which we will discuss below.

Normativity in science

Normative statements, as well as implicitly normative, "thick" (Williams 1985) concepts, such as sustainability (Wiesmann and Messerli 2007; Schneider et al. 2019), do not only describe something, but they also are prescriptive, guiding action, thus distinguishing between different interests and options. With the SDGs, the question of how to deal with research within or for a normative agenda has extended to many scientific fields other than sustainability science. With fundamental recognition of the normative agenda of the SDGs, research needs to move away much more than before from a presumed 'objectivity' (which never existed as such anyway, e.g., Longino 1990) and focus on normative and, above all, solution-oriented approaches to make a constructive contribution to the overarching sustainability goal.[2]

However, the challenges of the SDGs in dealing with their normativity go far beyond recognizing and reflecting on the normative dimension of our own work. Values and norms of sustainable development vary between actors and contexts. Another problem is that the norms within the SDGs are not always spelled out (especially underlying moral norms) and different norms or principles may conflict with each other. This is no wonder, given that the SDGs are a political compromise resulting from an intensive communication process between civil society organizations, policy makers, scientists and statistical agencies from all over the world. However, taking them seriously and striving for the 2030 Agenda's overarching goal to achieve a more sustainable and equitable management of our planet, the above-mentioned challenges have to be addressed and norms and values must be explicitly made the subject of research. There are two main directions here (O'Neill 2009). Social research on norms and values can still be descriptive, analyzing (often implicit) norms and pointing at inconsistencies between them or in their justifications, as well as at the implications for societies. But it can, as in "applied ethics", go further and become prescriptive (see also Ott and Kiteme 2016). O'Neill (2009) aims to elaborate ways to practical judgment on how to overcome conflicting principles that derive from values and norms and what to do with principles whose mutual satisfaction is not possible.[3]

In this context, transdisciplinary research has also demonstrated the importance of including non-scientific knowledge (i.e., a broader knowledge base) to better understand the challenges and shortcomings of sustainability as well as to ensure that sustainability goals can benefit and be accepted by broad segments of society (see, e.g., Lang et al. 2012). The recognition and integration of different forms of knowledge, values, and perspectives as well as knowledge stocks (*recognitional justice*) requires a reorganizing of knowledge elicitation and inclusive forms of deliberation about values and norms in the way we conduct research.

Four steps of rethinking and reorganizing knowledge production

While recognizing and integrating diverse forms of knowledge are largely consensual in scientific discourse, a key question is how this can succeed and what challenges are associated with it in practice. Four steps are particularly relevant in this regard, in our view:

[2] Scientific research always is based on several normative aspects (Schneider et al. 2019) and value judgments (Rudner 1953). Thus, the presumed dichotomy between 'normative' (value-based or prescriptive) and seemingly purely 'objective' (value-free or descriptive) aspects of scientific research has already been questioned in the past (e.g., Jenkins 1948; Longino 1990; Pielke 2007); it has, e.g., been a continuous subject of controversy among conservation biologists since the beginning of the discipline (e.g., Shrader-Frechette and McCoy 1993; Yanco et al. 2019). However, not all of these normative aspects are directly morally relevant, many only pertain to what has been called "constitutive" or "methodological values", relating to unavoidable choices, e.g., of methods, within science.

[3] Such insights go back to early interdisciplinary materialism, later critical theory, and social ecology and are applied in the concept of societal relations to nature (Zeug et al. 2023). They reveal that there is no non-normative science; if there is no explicit scientific value judgment there is an implicit one confirming the status quo (Kramm et al. 2017). Consequentially, ecological arguments can never be neutral any more than sociopolitical or economic arguments are ecologically neutral (Harvey and Braun 1996), e.g., Planetary Boundaries like the 1.5 °C goal in global warming is a societal norm set on interdisciplinary science.

The first step is to *reflect on existing approaches to knowledge integration and collaborative approaches.* Transdisciplinarity, which seeks to achieve epistemic justice,[4] means showing respect for the knowledge brought forward to solve sustainability problems and thus recognizing highly subjective and contextual evidence as legitimate knowledge. Further, marginalized groups or social movements, for example, which have tended to serve as subjects of research so far, need to be recognized as sources of knowledge. Transdisciplinarity in an honest sense, moreover, means shared authority and equal cooperation from the very beginning of the research process (*procedural justice*). Integrating "empowerment" into transdisciplinary projects is desirable (Ott and Kiteme 2016; Lawrence et al. 2022). However, this means addressing and changing real existing power relations in sustainability research (Fazey et al. 2020). Are we ready for such irritations and for rethinking power relations in transdisciplinary research? The reality of co-production has shown that it is anything but easy to cooperate on an equal footing.

Secondly, bringing in different bodies of knowledge often creates conflicts of interests and goals, but these can stimulate social change (Großmann et al. 2021). To find ways to overcome conflicting principles and promote transformative change, SDG transdisciplinary research will have to *focus more explicitly on conflicts of interests and goals and integrate their negotiation into the research process*. This means finding solutions that integrate different forms of knowledge in a fair way, including win–win and compromise "outcomes".

Thirdly, however, we must also *recognize that there are limits to the integration of knowledge* and that it will never be possible (nor necessary) to include and adequately represent all perspectives, visions and values. Views on inclusion and appropriate representation will always differ (Chilvers and Kearnes 2016). There are forms of knowledge, such as tacit knowledge, that are difficult to capture (Meisch et al. 2021). What we can do, however, is to ask within reflexive approaches to co-production (Beck and Forsyth 2020) whether diverse perspectives on a sustainable world are reflected by the selection of stakeholders (and consequently by us scientists who select them) (Beck and Forsyth 2020).

Finally, when recognizing that visions of a sustainable world are political and normative, it is also our responsibility as scientists to *be aware of, question and be transparent about the implications of our own values, beliefs and assumptions for our research practice* (Ott and Kiteme 2016). After all, they determine which actors and which evidence we declare relevant (Beck and Forsyth 2020). This involves being capable of "normative reflection" (Bremer and Meisch 2017; Schneider et al. 2019) and "argumentative transparency" (Grunwald 2018).

All of this requires substantive and structural changes in the science system.

Changes within the science system for governing sustainability

For science to meet the demands and challenges of the 2030 Agenda and the 17 SDGs, fundamental and structural changes in the governance of sustainability research are long overdue. Although hardly anyone today would dispute the many potential benefits of transdisciplinary research, the science system holds many dangers and structural barriers for researchers who take cooperative, inclusive, and reflexive research approaches seriously. Scientific engagement within or for a normative agenda such as the 2030 Agenda therefore requires fundamental changes, i.e., a restructuring of research models and competencies as well as research assessment; otherwise, the contribution of us researchers to stimulating change will remain limited.

Restructure research models and competencies: Not only does the 2030 Agenda require more resources to be devoted to sustainability science overall (Messerli et al. 2019), but the recognition of different knowledge and value systems must also be reflected in the design of projects, research programs and agendas. In particular, this requires reflection on existing systems of science funding (Fazey et al. 2020). Transdisciplinary approaches that require trust and relationship building typically require more time and consequently more resources compared to traditional research models (Redman et al. 2021). They can also introduce unforeseen conflicts that usually increase the workload for scientists. Besides, honest transdisciplinary approaches require a process to define common goals, for which there is usually no funding. One way to address this is to support long-term partnerships rather than short-term project funding (Redman et al. 2021). Initial steps have been taken to support co-production approaches through research programs such as Future Earth under the International Science Council. However, further efforts are needed to ensure that the economic situation of actors and institutions does not determine whether they can afford to engage in elaborate co-production approaches. Furthermore, like the 2030 Agenda itself, funding programs and calls for research proposals to achieve sustainable development are linked to interests, agendas and power structures. These have to be reflected and disclosed. Besides, deliberative approaches require us scientists to communicate with and empower stakeholders, to rethink our own language and to build trust. These skills and competencies, as well as the ability to reflect on norms and values and to be transparent about them, must

[4] Epistemic injustice essentially refers to people experiencing injustice in their capacity as knowers. For research on epistemic justice and injustice see, e.g., Anderson (2020) and Mason (2011).

be learned already in the studies, and they should be included in training and education programs for scientists.

Restructure research assessment Ideally, the requirements and demands elaborated above should be reflected in the entire scientific process, i.e., also in the assessment processes. However, current research assessment processes foster disciplinary divisions, while hindering transdisciplinary approaches (Gratzer et al. 2019; Fazey et al. 2020). Until today, transdisciplinary approaches pose multiple risks to one's academic career, e.g., there is always the risk that practice partners may drop out during the joint co-production process or refuse to publish jointly developed results. Reflexive and inclusive research therefore requires a change in current publication practices; in particular we should question the existing paradigm of "publish or perish" (Otto and Haase 2021). Moreover, it must become easier to publish transdisciplinary research, where outcomes are inevitably different from traditional research. The focus in science, which has been on producing results or 'evidence' so far, needs to shift—when aiming to produce transformation-oriented knowledge—toward the process of knowledge generation (Ott and Kiteme 2016). When it comes to sustainable development, we are dealing with problems full of uncertainties and conflicting goals and values that cannot "really be *solved*, rather only *resolved* in multiple ways, with differing costs and benefits for those involved." (Lawrence et al. 2022, p. 44; see also Funtowicz et al. 1998). The complexity of knowledge production (and conflict) will inevitably increase in the process, and scholars may not be able to provide 'simple' answers to what is 'right' or 'wrong'. Instead of focusing on generating normative conclusions (e.g., right or wrong answers), we should produce high-quality knowledge inputs that may facilitate negotiating, shaping, and steering societal change (cf. Meisch et al. 2021). This would require not only a deliberate decision on what type of knowledge we want to produce, but also the readiness of the publication landscape (journals etc.) to invite and support research and evidence that focus on displaying different approaches, ways of thinking and "productive" controversy.

We are aware that these are all far-reaching changes and will reshape the relationship between science, society and politics. However, the SDGs are paradigmatic of larger societal challenges that we will continue to face in the future, and they should serve as a wake-up call for us scientists.

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