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Values as leverage points for sustainability transformation: two pathways for transformation research

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The burgeoning literature on sustainability transformation agrees that values play a key, albeit unelucidated, role on the transformation research agenda. Recent literature linking values and transformation increasingly points toward the hypothesis that values may act as leverage points for sustainability transformation. However, how transformation research can engage with values as leverage points remains a critical knowledge gap. Here, I argue that transformation research needs to distinguish between two modes of knowledge production and mobilization: a linear, knowledge-first, mode-1 science, and a context-sensitive, linearity-contesting, mode-2 science. Based on this distinction, I identify two complementary pathways for transformation research to contribute to unleashing the transformative potential of values. I clarify that interventions targeting values rely on the stance taken on the relationship between science and society, and between production and governance of research. Knowledge about values as leverage points needs to be produced from both a mode-1 and mode-2 science perspective.

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Values, transformation, and leverage points

There is an influential discourse around how science can contribute knowledge in order to address complex problems of our time, such as climate change, resource depletion, or social inequity [80]. The rapidly growing literature on sustainability transformation shares the idea to move values high on the research agenda [25,92,95]. As a premise, there is a broad agreement that values play a key, albeit unelucidated, role for sustainability transformation. Not only is sustainability a normative concept, but values also underpin scientific institutions (e.g. methods) and understandings of the world. The idea to deliberately engage with values in order to capitalize on their transformative potential is put forward by different research communities such as social–ecological system research, resilience thinking, and transition management (e.g. [59,84,93]). For example, values represent one of the three spheres of transformation, which explain the dynamics of social change that would contribute to limiting global warming to 1.5C [75]. Another entry point toward a better understanding of values in sustainability transformation(s) is the growing concern for the ethics of the science of change. Values and normative implications are all the more evoked in the scientific discourse and practice tackling landscape change [6,65], climate change [18], or the biodiversity crisis [15]. Yet, it is difficult to pinpoint the role of values in scientific approaches to transformation and associated theories of change.

Drawing on seminal work by Donella Meadows [60], values, together with worldviews and paradigms, have been theoretically associated with deep leverage points (LP) [1], that is, system properties where interventions can lead to transformation in the systems as a whole, as opposed to interventions at shallow LP (e.g. parameters), leading to incremental change. In keeping with the principles of systems thinking, and using leverage points largely as a metaphor, recent literature linking values and transformation increasingly points toward the hypothesis that values may act as LP for sustainability transformation [13,36,54]. As part of the deepest realm of leverage, values also underpin the transformative visions toward which systems orient themselves [1,30]. One of the most developed theories around values as LP is proposed by the Intergovernmental Science-Policy Platform on Biodiversity and Ecosystem Services Global Assessment [40]. The IPBES Summary for policymakers (SPM) outlines eight LP (among which 'unleash values and action') and five levers (in the form of multiactor governance interventions) that could enable transformative change. Interestingly, the SPM considers values as both underlying the root causes, that is, the indirect

drivers of biodiversity change, but also as a LP that can be actioned through multiactor levers.

A key message in the IPBES SPM states that "Actions that help to voluntarily unleash existing social values of responsibility in the form of individual, collective and organizational actions towards sustainability can have a powerful and lasting effect in shifting behavior and cultivating stewardship as a normal social practice". The level of confidence of the knowledge behind this assertion is established but incomplete. There is no theory of change and associated practice that oversees how to mobilize values for transformation, especially in the context of collaborative multiactor governance interventions. For practitioners and scientists alike, data on concrete place-based governance interventions informed by the leverage potential of values are missing. How to deliberately and ethically engage with values as LP remains a critical knowledge gap for transformation research. In this paper, I focus on the specific case of science as a societal actor, and ask how academic work can investigate and contribute to unleashing the transformative potential of values for reaching visions of social–ecological well-being.

To answer this question, within the context of sustainability and transformation research, I aim to

1. Clarify that engaging with values as leverage points heavily relies on the stance taken on the relationship between science and society, and on how knowledge is produced;
2. Present two complementary pathways for transformation research to engage with the transformative potential of values in order to contribute to sustainability transformation.

To this end, I first outline examples of theoretical traditions that could potentially inform the understanding of values as LP, and explain why these are not sufficient. Second, I briefly summarize the distinction between mode-1 and mode-2 science, and its relevance for transformation research, and for the topic of values as LP. Third, based on the distinction between a mode-1 and a mode-2 science, I propose two complementary perspectives for thinking and designing value-based pathways within transformation research toward sustainability. Fourth, I review potential interventions (levers).

Theoretical traditions that could inform values as leverage points: are they enough?

For the purpose of this paper, I make a first distinction between core human values, as held, first-order preferences that transcend contexts, and guide evaluation of events; and contextual values, as ascribed, second-order preferences that relate to the worth or importance of a particular object, or state of the world [37]. Within sustainability research, there are other conceptualizations of values such as the Life Framework of Values [76] or the Intergovernmental Science-Policy Platform on Biodiversity and Ecosystem Services IPBES approach [69], and ensuing categories such as relational values [14] and more-than-human interests [76]. However, while acknowledging the benefits of these new categories to include the nonhuman world, the numerous discussions on the diverse and sometimes conflicting conceptualizations of values, especially nature's values, are outside the scope of this paper (but see [46,69]). Recognizing the interdependencies between the more normative and the more descriptive conceptualizations of values [14,86], hereafter, I focus on core human values (e.g. equity), defined as beliefs that pertain to desirable goals and transcend specific situations [83].

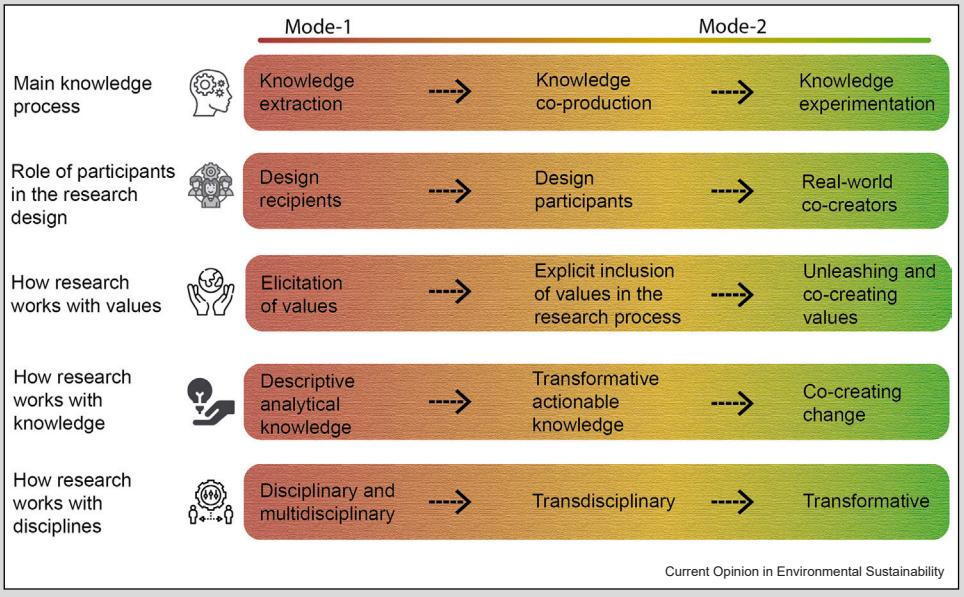
There are a number of theoretical traditions that could potentially inform the role of values as LP, non-exhaustively associated with bodies of knowledge such as ecological and behavioral economics, environmental psychology, organizational studies, anthropology, or philosophy. In fields of study that emphasize the collective such as anthropology, shared social and cultural values are explaining and underlying collective dimensions such as culture. In environmental psychology, theorists support the assertion that values are cognitive elements that shape individual human action, with less reference to affect and emotions. Values take a prominent place in behavioral theories such as the theory of planned behavior [2], which considers values as predictors of behavioral intentions. Another prevalent example, the value–belief–norm theory of environmentalism [88], provides a conceptual roadmap for understanding pro-environmental behavior starting from individuals' biospheric, altruistic, and egoistic value orientations [87]. These models are generally represented through causal and/or hierarchical chains of cognitive elements, including constructs such as attitudes, beliefs, and norms [78]. Similarly, the well-established cognitive hierarchy model of human behavior [22] is illustrated through an inverted pyramid with values situated at the bottom and influencing all the other forms of thinking, hence deemed the most fundamental aspect of cognition [45]. Many of these theoretical traditions also extensively reported on the issue of the value–action gap, the disparity between expressed concerns and actual behavior. Being widely employed, all these frameworks have the merit of generating advancements in many fields of application, such as land management [64], protected areas and conservation [96], climate change and energy [8].

An important distinction: how and for which purpose is knowledge produced?

Despite there being well-established bodies of work that could inform how to unleash values as LP, the progress is slow, signaling above theoretical traditions may not be

Table 1

Main assumptions in a mode-1 and a mode-2 pathway for engaging with values as LP.

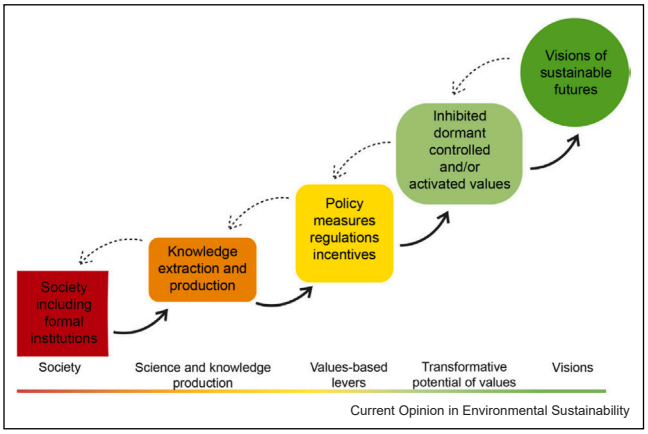


enough seeing the challenges that society (including science) needs to face today. The mainstream solution options such as techno-managerial fixes and behavioral changes of 'the other' are often grounded in disempowering theoretical models, which ignore and perpetuate ethical risks and systemic causes of inequity (e.g. Western ways of thinking), and are less able to inspire reflection on their assumptions within scientific knowledge production [4,49,85]. In addition, there are critiques of technical solutions and behavioral approaches pertaining to their shortcomings in dealing with the social complexity of transformation processes [75]. The linearity of the disciplinary and even interdisciplinary approaches considering values and change is brought into question by the nonlinearity of real-world problems. In order to understand the role of transformation research in engaging with the potential of values as LP, it is worth first paying attention to the question itself, transformative in its nature: it does not pursue knowledge production only to increase a knowledge base, but seeks instead to also trigger action [12]. Hence, it is worth looking into why and how knowledge is produced.

One of the most useful conceptualizations in terms of how and for which purpose knowledge is produced is the distinction between a mode-1 and a mode-2 science. Mode-1 science is dominated by established scientific methods designed for the purpose of cartesian knowledge generation within disciplinary confines subject to academic quality control. Coined in 1994, and intended to supplement mode-1, mode-2 science is characterized among others by producing societal actionable knowledge in and for 'the context of application', in a socially accountable and reflexive way ([24]:3–7). It describes a dynamic relationship between science and society, moving from the unidirectional flow of information characterizing mode-1 science toward the transdisciplinary coproduction of knowledge with a heterogeneity of academic and nonacademic relevant actors (Table 1). According to mode-2 science, basic versus applied divides, as well as disciplinary silos fade, and meaningful knowledge is increasingly created in a dialog. In addition to mode-2 science, comparable postcedents and antecedents (postnormal science, action research) argued for a paradigm shift that rethinks the role of science in and the relationship with society [23,102]. They were followed in the next decade by more authors making a distinction between a change-oriented and an analytical agenda [19], between first-order and second-order transformation research [18], or between a problem-oriented and a solution-oriented trajectory [51].

Here, I argue that one of the key factors hindering a large part of the sustainability research community in its normative endeavor to contribute to 'unleashing values and action' is the unacknowledged difference between framing scientific inquiries from a mode-1 compared with a mode-2 perspective. I develop this argument while acknowledging that part of transformation literature and research practice that does support an understanding of the difference of the two science modes (e.g.

Figure 1



A mode-1 archetypical pathway for engaging with values as leverage points. Within this pathway, values are not considered part of objective scientific inquiry and analysis.
Source: own illustration.

real-world labs [79,81]). Ignoring the mode-1 and mode-2 distinction partly explains the paradox of there existing a multitude of literature strands that could inform values as LP, and at the same time a scarcity of real-world attempts. Most of the theoretical traditions dealing with values and change (section 2) tacitly regard the dynamics between science and society as linear. Their correspondent methods and practices operate and are silently applied from a mode-1 knowledge production. For example, mainstream studies on nature's values are elaborate scientific accounts of the worth and preferences assigned to specific places or ecosystem elements. However, the question of how to engage with these elicited values typically remains outside the scope of the analysis [55]. Similarly, interdisciplinary research communities, such as social–ecological systems or transitions research, have explored values in relation to natural resource management [41,45] or social movements [48], without fully elucidating how to purposefully engage with or enact nature's values and core human values (e.g. responsibility [13]) for improved outcomes.

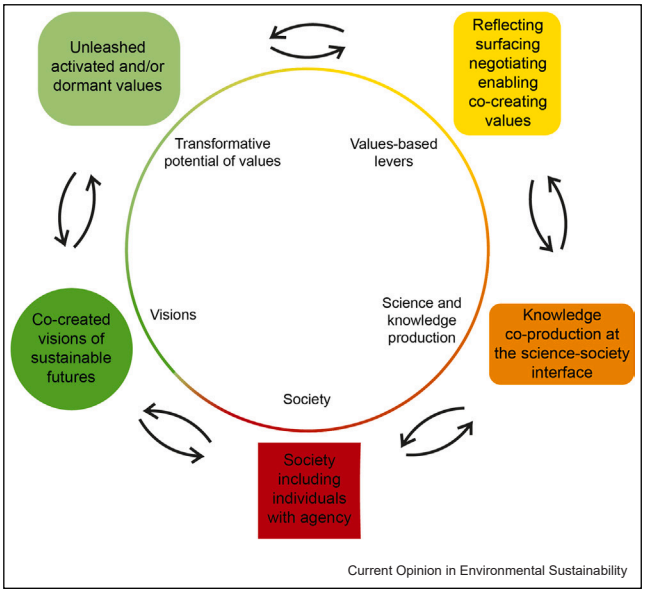
In order to understand, investigate, and engage with values as LP, the stance taken on the relationship between science and society, and between production and governance of research, needs to be a priori clarified. A mode-1 standpoint seems more appropriate for diagnosing the values that are part of a certain system, while a mode-2 perspective better serves the question of how to mobilize or activate the transformative potential of those values. Similarly, there are certain conceptualizations and categories of values, which may be more suited to be engaged with from a mode-1 perspective, while others may be more compatible with mode-2 science. Hence, mode-1 and mode-2 are complementary in terms of the knowledge they could effectively contribute toward unleashing the transformative potential of values. But by exclusively focusing on the quality of the scientific outcome (as per mode-1), there is a risk that the context of scientific production, the one with which research is trying to 'transform' in the first place, does not answer back and remains passive toward the produced knowledge [17,33,35,99,103]. Conversely, directing analytical attention to both outcome and process places researchers in a relationship more open to the affect and unpredictability of research participants [66].

Mode-1 and mode-2 value-based pathways

Based on a distinction between mode-1 and a mode-2 science, I reflect on two broad complementary ways for thinking about and designing value-based pathways toward sustainability within transformation research (see also [54]). The two archetypical pathways differ primarily in terms of their assumptions on knowledge, values, society, individuals, and related processes (Table 1).

As a starting point, a mode-1 pathway begins from the assumption of a strong and stable societal organization, including effective formal institutions that conceptualize science as being from *without* [18] (Figure 1). Rather than relying on a combination of scientific approaches, this pathway may employ a reductionist application of the theory and practice of singular disciplines (e.g. environmental economics or psychology) and to some extent of interdisciplinary cooperation. Here, individuals, as knowledge and values holders, are the recipients of already-designed research that often includes knowledge extraction aiming at the elicitation of values, attitudes, or preferences. An aggregation or integration of values is regularly sought. To intervene at values' level,

Figure 2



A mode-2 archetypical pathway for engaging with values as leverage points. Here, values are viewed as relational. They can be activated, negotiated, consolidated, and mobilized within and across intentional individual or collaborative processes.
Source: own illustration.

this pathway employs a technocratic strategy, based on policy measures, laws, incentives, and fund distribution. Under mode-1, the production of knowledge is regarded as largely value-free, and values are external to the inquier, as for broadly many of the theoretical traditions mentioned in previous sections. A linear transfer of knowledge takes place from science to policy- and decision-makers, that is, speaking truth to power. Here, one possible framing of the question how science can engage with the transformative potential of values is around closing up the value–action gap. Evidence-based knowledge informs technical and behavioral interventions which produce results that can be measured, monitored, evaluated, and sometimes monetized, assuming a natural emergence of action from knowledge. Under mode-1, the visions of sustainable futures are already decided, and the values underpinning these visions are not necessarily surfaced.

In contrast, a mode-2 pathway recognizes individuals as sense-makers, agency holders, and change agents (*sensu* [75]) (Figure 2). Although it could be also informed by vanguard disciplines such as quantum social science [98], a mode-2 pathway can integrate tools and methods across the more established disciplinary fields to create a new paradigm of socially relevant and transdisciplinary research complementing disciplinary specialism. It discriminates between values problematic for sustainability (e.g. anthropocentrism, individualism) and sustainability-oriented values [5,104]. Mode-2 embraces the bidirectional relationship between values and knowledge, espousing the normative side of knowledge especially reflected in the kind of prescriptive knowledge for sustainability that guides action for cocreating transformative change [12]. It aims to explicitly consider values both within the research process and regarding the object or outcome of research [36].

From a mode-2 science standpoint, the understanding of values as LP seems to point less to the idea of controlling the expression of certain values, but rather to capitalizing on already- existent sustainability values, such as solidarity or stewardship or on place-based values [27]. Hence, within mode-2 pathway, the spectrum of processes suitable to build the pathway becomes wider, spanning under given contexts a gradient from surfacing, recognizing diverse values, and reflecting on values, to deliberating, mobilizing, weaving, or even cocreating values in sustainability experiments [16]. When designing intentional processes, including mechanisms to correct for power asymmetries is essential [33,70]. The focus on consensus and integration is replaced with an albeit time-consuming concern for diversity and plurality of values, inclusiveness, and coherence building [11,53,91]. Methods such as appreciative inquiry, future thinking [71], and the more engaged forms of research [102] can facilitate to a certain extent a value's convergence.

Processes such as removing the institutional or systemic barriers that are hindering the expression of values supportive of sustainability [104], also fit under this part of the spectrum. In situations of weak governance or weak social capital, such enabling processes might enliven values at community level [84]. Dialog, experimentation, questioning, and challenging assumptions, or 'unruly hope-inspired agonistic contention' ([89]:iii) may encourage those attributes that empower individuals and communities to act toward their desired visions. For example, one of the best ways to ensure the continuity of a transitioning cultural landscape is to tap into the existing land-based connection and self-esteem of locals [37]. Similarly, systematically surfacing and reflecting on values underpinning sustainability options or scenarios might already be transformative in certain cases [30]. Indeed, under mode-2, visions of sustainable futures are cocreated and the values underpinning these visions are made transparent or deliberated.

Finally, the design of a mode-1 and mode-2 pathway is a continuum (Table 1) from a disciplinary, multi-, and sometimes interdisciplinary knowledge production (mode-1) to a transdisciplinary and more transformative one (mode-2). At its frontiers, a mode-1 pathway may also trial more inclusive and cocreational ways of dealing with knowledge, values, and individuals. As for a cutting-edge mode-2 pathway, it may move beyond

knowledge coproduction toward intentional knowledge experimentation [61,79], from design participants to real-world knowledge cocreators, from the transparent making of values in the research process to their unleashing, and from solution-oriented knowledge to co-creating conscious change. These ambitious goals for research are signaled in the recent literature [44] through yet disparate examples such as supporting the embedding of values created in experiments [16]. There are also pledges for a science that goes beyond the established discourse of mode-2 by integrating an institutional dimension, whereby the reward systems, incentive structures, and paradigms of academic cultures are revisited and reformed [81].

If values are the leverage points, which are the levers?

Without fitting any of the below examples under a mode-1 or a mode-2 pathway, I present here four categories of levers for targeting values as LP. These may be more suited to an individual, collective, or social scale of intervention.

A case of value-based 'interventions' may be represented by value-articulating institutions (e.g. [3]), that is, set of rules that determines who can participate and in what role. When problematizing the valuation of nature, it is increasingly acknowledged that the way valuation is carried out shapes value formation [34]. The impact of choices researchers make when conducting ecosystem-service assessments does not stop at just identifying pre-existent values. In fact, these choices may be as important as the result of the assessment itself. At first view, value-articulating institutions seem more aligned with mode-1 pathways. However, the case of purposefully developing plural value-articulating institutions in order to include and empower marginalized voices leans toward the mode-2 end of the continuum (e.g. [43]). For example, it has been suggested that the inclusion of transcendental and relational values in value assessments may be key to building such new institutions [58,72]. Similarly, making visible the "sociocultural milieu that pervades and informs value articulating institutions" ([32]:28) is another step on the mode-2 pathway.

In order to illustrate another category of interventions for targeting values as LP, I draw upon the positive psychology notion of value activation, the intentional "processes which enable individuals to demonstrate behavior that is consistent with their self-related attitudes, traits or norms" ([73]:1388). Through self-reporting and third-party (e.g. counseling) reflection, individuals become aware of their values and thereafter align their behavior, including human-nature preferences with those values [73]. Value activation originates in the field of clinical psychology, but has relevance to the environmental values and sustainability transformation literatures [36]. Work on value activation builds upon and alongside priming, a concept with a broad evidence base [62]. Unlike priming where certain phrases are used by a facilitator to trigger a response in a participant, in value activation, character strengths and virtues are self-identified through a given intervention. A pathway employing value-activation interventions considers whether these self-identified values are congruently expressed [46]. Other procedural elements such as deliberation or reflexivity may bring forward or awaken diverse values and allow them to influence one's decision-making.

Another family of levers are inspired by the growing literature on the inner dimensions of sustainability; [9,42,97,101]. Considering inner dimensions of sustainability echoes concepts of 'self' from psychology that mediate the relationship between values and behaviors, and ties in the avenues moral psychology can [29] provide on how to experiment with values. Going beyond psychology, inner transformation would involve a wider, relational, collective notion of the 'Self' stressing interdependence and connectivity. Especially outside Western culture, inner dimensions are at the center of seeing the world. As such, ignorance of inner disconnections with the 'Self', nature, or 'the other(s)' counts among key causes for unsustainability [68]. Coping with the complexity and unpredictability of sustainability challenges requires not only new ways of producing and using knowledge, but also the capacity to handle opposing views and paradoxes without trying to rapidly 'solve' them. In this regard, personal sustainability scholars seem to converge toward the practice of awareness and mindfulness, and toward collective processes of intentional personal transformation as levers to target values [20,63,77].

Finally, the practice of reflexivity is a lever to unleash the transformative potential of values [38,90]. Here, I refer to practicing reflexivity at the level of the relationships between researched and researcher, and between researchers [10]. Particularly in the case of science aiming at studying transformative change, it is essential that researchers become aware of how their own set of values underpins their choice of scientific models and methods [36]. In line with repetitive calls for transparent positionality and dialogical formats in sustainability science [82,85], the interrogation of normative assumptions is essential to address philosophical disparities and commonalities. Appointing resources for formative accompanying research could to some extent support reflecting on the scientific process in inter- and transdisciplinary teams [21]. For policy, this means allocating space and time for critical self- and group reflection as common practices in academia [7]. These can

only be achieved by taming the dominance of productivity also when it comes to funding and other reward systems.

Are levers to shift values needed?

In scholarly treatments of values as LP, authors turn to the idea that shifting values is part of the ways to attain visions of human-nature-balanced relationships. Indeed, calls for a 'value shift' accompany many of the texts dedicated to the need for transformative change. For example, "Such transformations may require radical, systemic shifts in deeply held values and beliefs, patterns of social behavior, and multilevel governance" [67]. When investigating deeper, it is often about a shift away from a growth-centered society and "the view of humans as isolated agents in a competitive world" [59], toward an 'age of respect' [57]. Hence, interventions targeting values as LP can differ, depending on whether values are considered supportive of sustainability or problematic for sustainability [5]. Mobilizing values aligned with sustainability [104] could rely on enabling techniques [74], whereas engaging with values nonsupportive of sustainability may ultimately require shifting values. There is currently little practical guidance on how such a shift can be brought about. In keeping with the mode-1 and mode-2 distinction, the notion of shifting values also operates differently under the two standpoints, with mode-1 informing concrete governance interventions, and mode-2 adopting less reductionist conceptualizations of values (e.g. as material-discursive practices in [74]). However, acting toward changing values is the last resort when working with values as LP, not least because of the ethical questions raised by a potential 'social engineering' or coerced imposition of values. Beforehand, exploring alternative processes of challenging assumptions, questioning beliefs, and making values transparent can already be transformative (e.g. [52]). In addition, considering the role of social innovators and agents of change, be it individuals or movements that spearhead new ways of thinking, doing, and knowing may also be salutary [48,100].

Depending on the context and scale of intervention, asking whether a value shift is necessary should not be confounded with asking whether a value shift is possible. To the latter, the various scientific disciplines will have different answers, with some scholars regarding values as merely adaptive response to social-ecological conditions, claiming intentional value shift is not possible, and with the World Values Survey cited as the strongest evidence to date of predictable patterns of values shifts over time (e.g. [39]). Similarly, asking whether an intentional value shift is necessary is different than the question of detecting whether value changes are occurring in society (e.g. [56]). There is research theorizing how shifts in dominant social norms assist transformations over time by influencing societal trajectories. However, at the local level, an intentional value shift may not be necessary. It is well documented by social-ecological studies that place-based or indigenous complex values-knowledge systems are built in close interaction with nature [26,50]. Conversely, at global level, the normative concept of sustainability was translated into seventeen United Nations Sustainable Development Goals addressing social-ecological conditions. Although their purpose is to guide humanity in critical domains over the next years, they do not align with the more reflexive, for example indigenous, understandings of sustainability [47].

Limitations and future directions

A mode-1 and mode-2 science perspective on values as LP are different in how they produce knowledge and are complementary in their goal to support values as LP. What appears essential is becoming aware from which standpoint research is operating in a particular case. Recognizing when to switch between the two modes and how to interconnect them depending on the task at hand is a supplementary step, amenable to epistemological agility [28]. Importantly, research conducted from a mode-2 standpoint, cannot be evaluated from a mode-1 standpoint. Similarly, a mode-2 transformation pathway cannot be operationalized from a perspective that dismisses the existence of mode-1 research on values. Quality criteria appropriate for mode-2 science, determining the actual transformative potential of values, and elucidating which value conceptualizations are better suited for each of the two modes, are all part of important future directions for transformation research. Future studies may also focus on providing guidance to practitioners and policymakers on multiactor governance interventions informed by the leverage potential of values. Finally, the ethics of how to engage with values as LP go beyond what could be covered in a journal article. The multifaceted ethical implications of making value-judgments on values or of changing values remain to be disentangled.

Conclusion

How can transformation research contribute to unleashing values? In this paper, I argued that transformation research needs to distinguish between two modes of knowledge production and mobilization: a linear, knowledge-first, mode-1 science and a context-sensitive, linearity-contesting, mode-2 science. As the research question is transformative in its nature ('how to unleash?'), the answer should also be supported by a transformation in how we do science. Knowledge about values as LP needs to be produced from both a mode-1 and mode-2 science perspective to reach its aims, that is, contribute to advancing the world toward a more sustainable trajectory, where values such as empathy

potentially govern intra- and inter-generational human and more-than-human relationships. Recognizing epistemological challenges, an often untapped mode-2 may enable scientific disciplines traditionally operating from a mode-1 perspective to inform value-based solution options for sustainability. According to mode-2, values are a permanent constitutive part along the whole of sustainability-transformation models, as drivers, process elements, and outcomes. Furthermore, increasing evidence highlights that it is less about revisions in value systems, but about the imperative to reflect on and engage with diverse and plural values. I hope this paper contributes to this process.

Declaration of Competing Interest

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

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- • of special interest
- •• of outstanding interest

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