27

No Neutrality Here

Mobilising Reflexivity in Sustainability Transitions Research

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At a time of unprecedented climate pressures, rising inequality and increasingly militant demands for societal transformation, academic researchers grapple with the question of engagement. Should they, as detached observers, strictly adhere to the adage of presenting the scientific facts and leave acting upon them to others? Or does their deeper understanding of the issues bestow upon them a greater obligation to actively bring about change? Such one-sided views on scientific engagement are rooted in an outdated conception of knowledge as a neutral mirror of reality. In this chapter, we argue that, whether you are a theoretical physicist, archaeologist or transition researcher, you are always inherently engaged. As a producer of knowledge about how the world works, you inevitably – and often implicitly – address the question of what the world should look like (Jasanoff, 2004). The issue, therefore, is not whether you engage as a researcher, but how you shape that engagement. Addressing this issue asks for reflexivity – an introspective process in which the researcher turns their own engagement into a subject of research, reflection and discussion.

In this chapter, we explore the concept of reflexivity specifically in sustainability transitions research (STR) and aim to make it tangible for individual researchers. While reflexivity is relevant across all scientific disciplines, it is particularly critical in STR because the field explicitly aligns itself with a normative vision of how the world should be – namely 'sustainable'. Given that sustainability is a widely embraced guiding principle, at least in our Western colonial context, there is a risk that unexamined engagement may too easily reinforce established power relations. In other words, the escape route of so-called neutrality is simply not an option for transition researchers.

The chapter unfolds as follows: In Section 27.1, we introduce the concept of reflexivity through the lens of Science and Technology Studies (STS), emphasising the social embeddedness and inherent non-neutrality of science and technology. Section 27.2 elucidates the importance of reflexivity for STR, particularly in

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relation to both its normative and descriptive categories. In Section 27.3, we focus on concrete instances of STR where mobilising reflexivity makes a difference in opening creative pathways of transformative research towards sustainability. This exploration culminates in the conclusion that reflexivity presents transition researchers with an inextricable and inescapable responsibility.

27.1 Reflexivity and the Non-neutrality of Technology and Knowledge

Technological innovation and knowledge production are socially embedded practices. It is always specific individuals who, within particular social, cultural and material contexts, develop new technology and knowledge, which in turn further shape these contexts. In STS, it has been convincingly demonstrated how this contextual embeddedness co-shapes research interests, methods and concepts. In other words, knowledge and technology are not neutral.

In this context, reflexivity is commonly cited as a means of addressing this non-neutrality. Reflexivity involves becoming aware of the embeddedness of the technology and knowledge that we, as human beings, develop. However, questions remain as to the extent to which one can become fully aware of their own embeddedness, what form this 'knowledge about one's own knowledge' can take, and whether it can actually remedy the non-neutrality of technology and knowledge.

But what do we mean when we assert that technology and knowledge are (or are not) neutral? While STS offers many nuanced perspectives on these questions, this contribution focuses on three ideal-typical responses. In addition to and beyond the illusory claim that technology and knowledge are neutral, we distinguish two fundamentally different ways of understanding non-neutrality: a first-order and a second-order claim (Goeminne, 2012). The first-order claim views non-neutrality as the result of – though in principle avoidable – influences from social, cultural and material contexts on technology and knowledge. This claim characterises non-neutrality negatively, as it represents a deviation from an ideal of neutrality. In contrast, the second-order claim acknowledges embeddedness affirmatively, seeing it as a necessary condition for, and even constitutive of, the production of meaningful knowledge and usable technology.

In what follows, we link these three ideal-typical responses to corresponding approaches for addressing (non-)neutrality in the application of technology and knowledge. We draw inspiration from Stirling's (2006) incremental distinction between 'unreflectiveness' (neutrality), 'reflectiveness' (first-order non-neutrality) and 'reflexivity' (second-order non-neutrality). This ideal-typical framework will guide our exploration of how transition researchers, both individually and collectively, can address this non-neutrality as conscious producers of transformative knowledge for shaping sustainability transitions.

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27.1.1 Unreflectiveness: Neutrality

The neutrality thesis, still prevalent in various forms within societal debates, assumes that knowledge represents a universally valid and faithful reflection of the world. According to this view, regardless of who conducts the research or the context in which it occurs, one inevitably arrives at the objective truth about reality. Similarly, technologies are viewed merely as instruments, with their societal impact being determined by how they are used by individuals or societies. In other words, technology is seen as a neutral means to an end, with ethical or social implications arising from the intentions and actions of its users, rather than being inherent to the technology itself.

From this perspective, there is no need for a remedial movement. Technological innovation and knowledge production should instead embrace the position of the disinterested researcher and be guided solely by scientific objectivity and technical efficiency. Drawing from our own experience, this attitude is exemplified by technology-oriented actors who claim to be developing 'merely a technology', implying that their social responsibility ends at that point. For instance, it is objectively established that hydrogen can store energy at high density and produces no carbon dioxide upon combustion. From an unreflective viewpoint, the focus of hydrogen technology researchers should be on deploying and optimising this lab-proven technical efficiency. In this view, it is the responsibility of legislators, policymakers and social scientists to address the legal, political, market, psychological and other barriers to ensure that the technology reaches its full potential. Unreflectiveness thereby subscribes to a linear model of progress in which the best possible technology and knowledge are developed upstream in the seclusion of the lab, with the expectation that they will lead to the best possible solutions to societal problems downstream.

27.1.2 Reflectiveness: First-Order Non-neutrality

The first-order claim about the non-neutrality of technology and knowledge rests on the idea that, as human practices, they are inherently imperfect. Non-neutrality is considered negative because it stems from unintended and potentially avoidable influences and limitations in the concrete research design and its all-too-human execution. These influences lead to incompleteness and bias in the knowledge produced. With respect to technology, this claim points to the unintended consequences, societal implications, cross-cutting aspects and socio-technical issues associated with introducing technology into society.

In this approach, the imperfection of technology and knowledge can be addressed with an attitude of reflectiveness. Here, multi-, inter- and transdisciplinary approaches are used to anticipate the implications of technological innovation. Stirling (2006) uses the metaphor of a mirror to describe reflectiveness

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as striving for a 'faithful reflection of all that lies in the field of view' (p. 227), whereby all possible implications have to be considered before using a particular technology. To stay with our hydrogen example, reflectiveness starts from the recognition that deploying hydrogen as an energy carrier will have economic, environmental, geopolitical and other societal implications. These include the need for massive and hitherto unavailable amounts of renewable energy to produce green hydrogen, the potentially disruptive effect on geopolitical power relations and the need for new infrastructure, markets and regulations (Hanusch & Schad, 2021; Van De Graaf et al., 2020). Reflectiveness thus expands the societal responsibility of hydrogen technology researchers from merely developing the most efficient technology possible (as per the unreflective attitude) to anticipating and addressing these socio-technical implications.

While reflectiveness and the integration of ethical and societal considerations into technology and knowledge are essential, this approach maintains the ideal of completeness and neutrality, albeit as an aspirational goal. In this sense, reflectiveness should be seen as a form of knowledge acquisition on the same epistemological level as the original technological innovation practice. The aim is to obtain the most complete representation possible of the system under study, now claimed to be understood not merely in narrow technical terms but as an encompassing socio-technical entity. Here, inter- and transdisciplinarity are viewed as methods that allow for stitching together fragmented knowledge from different scientific domains and societal spheres into a comprehensive picture (Smith & Stirling, 2007). As such, reflectiveness operates in a linear model of progress, in which more technology and knowledge lead to better solutions.

27.1.3 Reflexivity: Second-Order Non-neutrality

As discussed in Section 27.1.2 on reflectiveness, the first-order claim only brings the social, cultural and material embeddedness of the research practice into focus to the extent that it negatively influences technological innovation and knowledge production by diverting it from an ideal of neutrality. By contrast, the second-order claim focuses on the researcher and their – now affirmatively understood – embeddedness from which they delineate and construct their research object. With this second-order claim, the image of the disinterested scientist is set aside and the researcher now appears as an always already engaged individual (Goeminne et al., 2011). According to Bourdieu (1990), this engagement involves an 'objectifying relationship' with the object of knowledge, whereby it is 'the value-orientation of the scholar [that] directs them toward what is culturally significant, narrowing the field and enabling them to 'make sense' of the empirical context' (Collyer, 2011, p. 322). As a culturally embedded individual, a researcher's engagement is

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thus imbued by the ways in which they interrelate with others, reality, and themselves, and by what they consider to be true, real and good in these interrelationships. In other words, knowledge is always already engaged, or 'situated' as Haraway (1988) puts it,[1] encompassing inextricable epistemological, ontological and ethical dimensions. In what follows, we will use 'engaged' and 'situated' interchangeably. Although they cover the same conceptual ground, 'situatedness' may be more suited when discussing the contextuality of non-neutrality, whereas 'engagedness' is more easily associated with directionality. That said, it is crucial to understand that we do not use 'engaged' in a voluntaristic sense. Rather, we employ it, somewhat provocatively, to underscore that knowledge, being situated, inherently carries a specific value orientation.

From this perspective on the non-neutrality of technology and knowledge, more – and something different – is required than mere reflectiveness. First, it reveals how researchers, as intrinsically engaged actors, can hold incommensurable framings, rendering problematic any straightforward inter- or transdisciplinary aggregation (Smith & Stirling, 2007). Second, despite their aspiration for inclusiveness, reflective approaches, being contextually embedded practices, will remain partial by their very nature. This constitutes the typical inclusion-exclusion mechanism of knowledge production: a scientific perspective allows for certain considerations but necessarily excludes others, rendering them irrevocably unknowable. To remain within the terms of Stirling's (2006) mirror metaphor: you have to hold the mirror up and look into it, otherwise you will see nothing. This means not only that you have an active part in creating the reflection but also that no matter how you turn the mirror, you will never be able to fully see that active part (i.e. oneself). Whereas reflectiveness aims to broaden the view and account for unintended consequences and implications, reflexivity turns the gaze inward, to how those implications are intertwined with the socio-cultural context of the concrete research practice. Reflexivity entails questioning one's own engagement. It includes introspection on the part of the researcher, both individual and collective, and ideally provides the means to assess the extent and nature of social and cultural elements in the research process. It is from this introspective movement, and the learning process that accompanies it, that the opportunity arises for transition researchers to actively shape their engagement in a reflexive manner.

In the case of hydrogen technology research, reflexivity thus directs attention to the 'objectifying relations' from which this field of research derives its purpose and meaning. We suffice here by raising a few questions as potential starting points for an in-depth introspection that traverses the economic, spiritual, emotional, existential and political ties that the research domain and each of its members maintain

[1] We are grateful to the reviewers for pointing this out.

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with its social fabric. For instance: What vision of sustainability aligns with a technological quest for hydrogen-based 'sustainable fuels'? Who benefits from this research and who finances it? As a researcher with a specific positionality – informed by race, gender and cultural and social background – whose voices do I respond to in formulating my research questions? What socio-ecological relationships give 'hydrogen' the sense that it takes in my research? What human-nature relations are presupposed in a project involving resource-intensive technologies such as electrolysers and industrial-scale solar farms? Does this not risk reinforcing a technological solutionist approach that perpetuates neo-colonial power relations through unequal ecological and value exchange (Andreucci et al., 2023)?

In sum, while reflexivity is possible to a certain extent, it does not offer a meta-perspective from which to approach things neutrally. Engaging with different frameworks and stakeholder perspectives, as well as conducting reflexive exercises, can enhance reflexive awareness, but the incompleteness is irreducible: you can encounter it, you can encircle it, but you cannot erase it with more knowledge. Reflexivity cannot be instrumentalised as a conscious, organised and planned activity as proposed by the reflective approach (Beers & Van Mierlo, 2017). As such, reflexivity demands modesty and openness, which will be discussed in Section 27.3.

27.2 Why Reflexivity is Key for Transition Researchers

Building on the preceding discussion regarding the non-neutrality of technology and knowledge, this section argues why STR should turn its gaze inward to the non-neutrality of its own research practices. As the STR community approaches technology and knowledge from an STS perspective – emphasising their co-evolution with society – numerous scholars have engaged with the concept of reflexivity (Beers & Van Mierlo, 2017; Chilvers & Longhurst, 2016; Smith & Stirling, 2007). However, the primary focus has been on reflexivity in the governance of transitions, particularly regarding the unintended consequences of transition interventions and strategies to anticipate and address them.

Rather than advocating for a governance approach aimed at optimising transitions by addressing as many societal implications as possible, this chapter concentrates on reflexivity in STR as an inherently engaged practice.[2] As mentioned

[2] This being said, there is some overlap between the way reflexivity is conceived in this contribution and the way it is addressed in the literature on reflexive governance. As mentioned, we take inspiration from Stirling (2006) in distinguishing reflectiveness and reflexivity. Here, it is instructive to parallel Smith and Stirling's (2007) characterisation of governance as involving two complementary and intertwined processes of respectively 'social appraisal' and 'social commitment' with our view of research as an always-already engaged practice: you cannot research transitions without committing to them in a particular way and vice versa. Indeed, our elaboration of reflectiveness and reflexivity in STR is analogous to Smith and Stirling's (2007) distinction between 'governing on the outside' and 'governing on the inside'. In this respect, 'researching from the inside' may be an apt term to characterise our elaboration of reflexivity in STR.

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in the introduction, reflexivity is of particular significance to STR. Although the non-neutrality of sustainability as a normative guiding principle may seem self-evident, how this principle is given shape and direction within the situated practice of STR is far from straightforward.

Following Beck et al. (2021), who recently argued that STR needs to step 'back from the assumption that descriptive and normative categories in which people make sense of transitions and sustainability are somehow equally self-evident to everybody involved' (p. 144), this section examines STR's normative (e.g. sustainable, transformative, deep, radical) and descriptive (e.g. transition, system, regime, practice) categories. Although discussed separately later, these categories are intertwined and overlap. As situated concepts, both categories encompass inextricable epistemological, ontological and ethical dimensions. In combination with the third section of this chapter, the objective is to elucidate what reflexivity might entail for a transition researcher as an engaged individual.

27.2.1 The Non-neutrality of Sustainability

Transition researchers often focus on 'deep transitions' (Kanger & Schot, 2019), 'big picture questions' (Köhler et al., 2019) or 'deep transformative change' (Loorbach, 2022). Efforts are made to distinguish, for example, socio-technical transitions and sustainability transitions (Loorbach et al., 2017) or transitions and transformations (Hölscher et al., 2018) to make room for explicitly relating the desired changes to sustainability. Yet within STR, the emphasis often is on historical reconstructions of transition processes, the underlying dynamics and the emerging patterns of change (Grin et al., 2010; Köhler et al., 2019), typically leaving substantive and normative aspects underexposed. In what follows, normative categories of STR are elucidated by drawing inspiration from the literature on the politics of sustainability.

Sustainability problems such as climate change, biodiversity loss and social inequality underscore the need for transitions (Richardson et al., 2023). However, ongoing discussions about sustainability, particularly regarding the what, when and how of transitions to sustainability, highlight the politics of sustainability. In this context, scholars show how stakeholders such as researchers, policymakers, industry and NGOs all have their specific concerns related to sustainability. They present different problem definitions and solutions, harbour competing interests and hold conflicting values, necessitating analyses of who defines sustainability for whom and to what ends and effects (Blythe et al., 2018; Scoones et al., 2015). Correspondingly, other scholars highlight that these discussions reveal the characteristics of sustainability problems, namely incomplete and fragmented expert knowledge and high levels of uncertainty (Block et al., 2018; Rittel & Webber, 1973). Hence, sustainability emerges as a highly political and contested concept.

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To explore the politics of sustainability, scholars have proposed several classifications with system-affirming approaches on the one hand and system-breaking approaches on the other (e.g. Block & Paredis, 2019; Dryzek, 2005). Based on Hopwood (2005), Block & Paredis (2019) distinguish three views on the nature and scope of change: status quo, reformist and transformative views. According to status quo approaches, sustainability can be achieved within existing networks of political, cultural and economic power. Currently, this perspective is linked to eco-efficiency, international competitiveness, economic growth and free markets as well as concepts such as 'ecological modernisation' and 'green growth'. Reformist approaches seek to preserve but thoroughly reform existing power relations, assigning a crucial role to regulative and redistributive governance. According to transformative approaches, finally, fundamental change is needed as sustainability problems are 'located within the very economic and power structures of society' (p. 45) and in 'how humans interrelate and relate with the environment' (Hopwood et al., 2005, p. 45). Consequently, solutions and transition pathways must be sought outside dominant networks of power and beyond eco-efficiency. Here one can think of sufficiency, redistribution and decommodification, as well as transformative approaches like environmental justice, degrowth and an economic system that defines serving the common good as its principal goal (e.g. D'Alisa et al., 2015; Feola et al., 2021; Schlosberg, 2007).

It is clear that STR's key normative categories are non-neutral, particularly sustainability, which is a highly political and contested concept. Reflexivity, in this respect, requires transition researchers to acknowledge this political dimension in an open and critical manner while remaining aware of the assumptions, concerns, problem definitions, interests and values they include or exclude. Researchers may then not only ask what kind of socio-technical systems and transition pathways their research embeds and incites but also which systems and pathways they intend to shape, and where and when? Before further exploring such a reflexive stance in Section 27.3, the chapter delves into the non-neutrality of STR's descriptive categories.

27.2.2 The Non-neutrality of Transition Frameworks

While it may be evident that normative categories and sustainability in particular are not neutral, the descriptive categories in STR are also far from neutral. Each transition framework contains rationales, logics, assumptions and concerns that, often implicitly, touch upon the question of what the world should look like.

Frameworks like the multi-level perspective, strategic niche management, technological innovation systems (TIS) and transition management, for example, each offer a specific 'systemic' lens that highlights certain issues and concerns while overlooking others. The multi-level perspective has a theoretical basis in social

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constructivism, evolutionary economics and neo-institutional theory (Geels, 2020), which manifests itself, for example, in a focus on the interaction between hierarchical levels as different degrees of structuration (e.g. the landscape, regime and niche levels), at the expense of considering actor (inter)actions (De Haan & Rotmans, 2018) or the dynamics of social practices in everyday life (De Roeck & Van Poeck, 2023; Laakso et al., 2021). Interestingly, Keller and colleagues (2022) note that, when combined, both approaches are useful for uncovering the reasons why change derails or fails. Similarly, inclusion-exclusion mechanisms play a role in TIS. While TIS analyses have provided valuable theoretical and empirical insights into the dynamics of technological innovation (Bergek et al., 2008; Hekkert et al., 2007), they are also criticised for their 'inward-looking' nature with insufficient consideration of contextual factors that can influence the success or failure of a technology (Edsand, 2019; Markard & Truffer, 2008). As Edsand (2019) illustrates, a lack of reflexivity makes it so that what becomes external context receives little attention. Hence, TIS researchers have to decide for themselves where the boundaries of the focal innovation system lie, illustrating the non-neutrality of the TIS approach.

More fundamentally, transition frameworks are imbued with ontological, epistemological and ethical assumptions. Rather than a faithful mirror of the world (cf. Section 27.1.2), STR concepts and frameworks (e.g. niche, regime, landscape, transition pathways, incumbents) are models and metaphors that represent a particular understanding of the world – they are situated concepts. For example, a few studies indicate that STR has been structured by a rather modernist worldview based on dualistic separations between subject vs. object, human vs. non-human, nature vs. culture and emotion vs. rationality (cf. Chapter 25 by Pel & Stirling; Stirling, 2015). Along these lines, STR is increasingly challenged because it separates science and action (Shove & Walker, 2007), it neglects culture in the co-evolution of technology and culture (Genus & Coles, 2008), and it may fail to understand colonially accumulated power relations (Ghosh et al., 2021; McGowan & Antadze, 2023). Additionally, concerns have been raised about the dominance of capitalist nature-society relations (Feola, 2020) and the failure to engage with the pluriverse, which acknowledges the potential of diverse ways of being and knowing (Arora & Stirling, 2023; Escobar, 2015). In this context, it becomes pertinent for transition researchers to explore these and other, hitherto excluded, paradigms and worldviews as well as to allow for a different imaginary of politics.

Let us attempt to illustrate the potential implications through the lens of human-nature relationships. The 'modern' view typically separates humans from nature, implying that non-human actors (e.g. ecosystems, animals, plants) lack agency, leaving the capacity for action, control or management solely to humans, which is an assumption that is engrained in transition frameworks. However, what if transition researchers also took inspiration from scholars like Haraway (2016), Stengers (2015), Latour

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(2018) or Pohl (2020) as well as from indigenous perspectives (Arora & Stirling, 2023; Escobar, 2018) to experiment with alternative paradigms that acknowledge the interconnectedness of beings and the agency of non-human actors?

While it is impossible to theorise what this implies for STR at this stage, it does create an opportunity for transition researchers to question their own practices in a reflexive manner. Using a pluralistic perspective and acknowledging the legitimacy and value of other ways of knowing, the following ideas can be explored: What socio-technical futures could STR envision if it no longer perceives '(m)Other Nature' (Pohl, 2020) as 'out there' or as the harmonious and stable background, but rather as an actor on stage disrupting current relations (Latour, 2018)? How might STR give voice to non-human actors to delve deeper into the interconnectedness of humans and non-humans? And how can STR integrate their agency into theorising possible transition pathways? Moreover, should STR continue to focus on multi-level perspective analyses from different levels (niches, regime, landscape) within one system if everything is fluid and interconnected through relational networks (Contesse et al., 2021)? If anthropocentrism and techno-optimism fade into the background and people are seen as more humble terrestrials among other terrestrials (Latour, 2018), how then could STR reconsider and redefine some of its key concepts and assumptions about 'commons' and property rights over natural resources and land? And how might STR reconceptualise the boundaries of a TIS by including the role of non-human actors and their agency?

27.3 Mobilising Reflexivity in Sustainability Transitions Research

The preceding section illuminated the non-neutrality of STR in terms of its normative and descriptive categories. As a result, transition researchers bear the responsibility to shape their engagement in a reflexive way, thereby probing the myriad ways in which their research, explicitly as well as implicitly, touches upon the question of what the world should look like. This section explores what this call for reflexivity[3] may imply by posing three questions: Where am I going (i.e. research orientation)? How can I act (i.e. research roles)? And where do I come from (i.e. positionality)? These questions are addressed through a few fictionalised experiences.

27.3.1 Research Orientation: Where Am I Going?

Consider the following example of an early-career transition researcher: A transition researcher embarks on a study focusing on oil majors with the intent of

[3] For the sake of brevity, we do not distinguish between reflexivity-in-action and reflexivity on action, see Yanow and Tsoukas (2009) for an extensive discussion.

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showcasing these actors as regime members impeding change. After scrutinising the annual reports of oil majors against the Paris Agreement's reduction targets, the researcher's first publication illustrates that these companies are, indeed, villains when it comes to sustainability. Presenting these findings to the industry, the researcher hopes to influence their behaviour by portraying them as, at best, incrementalists. Continuing this effort in a second study, the researcher conducts interviews within the industry. The belief in their own sustainable technology is strong and their rhetoric sounds powerful. Still, the researcher observes that a lot of these oil folks at least say that they support radical sustainability agendas. However perplexing and inconsistent these observations are, they prompt the researcher to reassess the initial results, revealing that actors who were previously categorised as regime actors are, in hindsight, more diverse and complex. Infused with doubt and vulnerability stemming from the first two studies, the researcher starts a third study focused on engaging with the industry through several workshops. Here, the researcher balances between the findings of the first and subsequent studies. Specifically, the researcher feels compelled to highlight the concerns of other actors with divergent assumptions. Yet it is a struggle to use an equally powerful rhetoric and introduce clear alternatives. Throughout this balancing process, the researcher continuously reflects on existing research that highlights the significant role of oil majors in impeding much-needed shifts to sustainability, assumptions about regime actors in STR, his own partial discoveries and personal views.

In each new study, our researcher encounters an irreducible incompleteness as well as a multitude of perspectives, interests and concerns. The first study challenges very powerful actors' views, while an open-ended and perhaps vulnerable approach in the second study not only calls these findings into question but also challenges STR's core concept of the regime. In the third study, the researcher balances between these findings, existing literature, stakeholder views and their own values and position. Overall, this leads the researcher to adopt a modest stance. Over time, he acknowledges and navigates the situatedness of other actors' perspectives and assumptions, his own findings as well as STR concepts. Yet such navigating does not come easily, the circumstances of the researcher's study, particularly the overwhelming messiness and uncertainty, often evoke feelings of anxiety and vulnerability. Indeed, every reflexive effort will be met with new uncertainties and full reflexivity is an elusive goal. Still, the researcher overcomes anxiety and carefully and continuously interrogates, and balances between, theory, the empirical settings and one's own findings and feelings.

While these circumstances may induce modesty in the researcher, recognising the situatedness of the research practices, including the normative and descriptive categories of STR (cf. Section 27.2), is precisely what enables transition

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researchers to enrich this modesty with an immodest, engaged research orientation.[4] Such a modest immodesty (Goeminne & Block, 2014), characterised by a continuous learning-by-doing attitude, allows transition researchers to commit to justice without adhering to fixed sustainability principles and to move between such principles and concrete settings. They can then navigate power dynamics in ways that do not unfold destructively (Caniglia et al., 2021), especially by playing various roles (cf. Section 27.2.2). Furthermore, regarding the balancing between modesty and immodesty, STR allows to pursue a zone of nuanced positions and well-considered engagement. Here, transition concepts can serve as a starting point for overcoming lines of polarisation resulting from naive optimism and paralysing critiques of transitions. Against naive optimism, path dependence may highlight the heavy hand of the past; the institutional contradictions within a regime can be seized to create opportunities for change, leading away from both naive optimism and paralysing critiques; and niche–regime dialectics allow to illustrate how innovations diversify over time into brighter and darker variations (Pel et al., 2023).

Taken together, a reflexive research orientation involves transition researchers being continuously attentive to how their research trajectory unfolds with respect to sustainability (cf. Section 27.1.1), transition frameworks (cf. Section 27.1.2), empirical and institutional environments and their own views. To be sure, this process of introspection knows no end and is being shaped and co-shaped over time by, amongst other things, theory, empirics, research environments as well as personal views and experiences. Yet, while acknowledging their own situatedness calls for a degree of modesty, it also encourages transition researchers to shape their engagement in a reflexive manner. This engagement may encompass a range of more immodest research roles, to which we turn now.

27.3.2 Research Roles: How Can I Act?

Let us return to the example of our transition researcher: The third study engaged with the industry through workshops and revealed the conditions under which regime actors facilitate or impede transitions. Building upon this, a fourth study continues to explore this field by conducting additional interviews with NGOs and policymakers. This results in a paper that underscores the diverse views of the stakeholders regarding transitions rather than reproducing a single view of one actor. By discussing the results on several occasions with the different stakeholders, the researcher takes up the role of mediating between these diverse perspectives in an attempt to inform stakeholders about each other's views. This task is demanding as

[4] Conversely, without recognising the situatedness of transition knowledge or by using open-ended or goal-oriented incrementalism approaches, transition researchers may embed and incite impoverished notions of sustainability and transitions, which may reinforce rather than transform current regimes.

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the researcher does not only navigate stakeholder viewpoints but also his own and those found in the existing literature and those of colleagues. It may involve feigning neutrality, managing diverse expectations and facing accusations of bias. Yet, as the researcher gains confidence, stakeholders are brought together to facilitate a dialogue process geared towards learning. While the researcher identifies opportunities for long-term learning processes, the stakeholders express a desire for concrete solutions to real-world problems. In yet another workshop, the researcher gathers the confidence to actively intervene and challenge dominant views by not only elucidating the diversity of perspectives but also highlighting excluded views. The researcher balances between modest and immodest roles, risking criticisms of ambiguity once again.

This example illustrates how one researcher may intentionally adopt various roles within different academic, policy and empirical settings where STR is put to use. The researcher moves from the conventional role of a scholar to that of a knowledge broker, mediating between the different perspectives of stakeholders. Subsequently, the role of a process facilitator is played, establishing and facilitating collaborative learning processes with stakeholders. Eventually, a role akin to a change agent is adopted, particularly advocating for marginalised views. Over the past years, these and other roles of researchers have been identified and described in sustainability literature (Schrage et al., 2023; Turnhout et al., 2013; Wittmayer & Schäpke, 2014).

Importantly, in addition to acknowledging and playing such roles, the researcher seizes the opportunity to take up a variety of engaged and more immodest roles to open up these settings to wider scrutiny. Balancing and juggling between different researcher roles (Balmer et al., 2015; Chambers et al., 2022; Schuijer et al., 2021), the researcher attempts to induce change while carrying out research. In the example, there is a move from sensibly brokering between knowledges and perspectives towards a more explicit commitment to elevating marginalised views and perhaps a transformative sustainability perspective (cf. Section 27.1.1). In other words, as 'various positions and actions become differentially possible across space, types of engagement and over time' (p. 16), there is potential to enable change by moving back and forth between roles and 'play the chameleon' (Balmer et al., 2015, p. 16).

The example further shows that such role-playing faces serious challenges. Specifically for early-career scholars, it has been observed that the current academic system binds them to developing transformative knowledge rather than enabling change through stakeholder engagement or action research (Kump et al., 2023). Moreover, adopting multiple research roles requires social, organisational and, above all, navigational skills that go beyond the regular academic curriculum (Schuijer et al., 2021). Other challenges that were identified in the context of

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playing different roles include role conflicts between engaged academic and project worker roles, established political settings that favour traditional research roles, and results and outcomes (e.g. Bulten et al., 2021; Thapa et al., 2022; Wittmayer et al., 2024). Notwithstanding these challenges, transition researchers can, in different contexts, intentionally and reflexively juggle between multiple roles to open academic and empirical settings to wider scrutiny.

27.3.3 Positionality: Where Do I Come From?

Let us return to our example of a transition researcher once more: as mentioned, the researcher's first publication portrays oil majors as regime members. This led to attempts to change these actors by explaining to them how they are villains and block niche innovation. Yet, when wrapping up the four studies in a methodological chapter of the PhD, the researcher realises, in hindsight, that *his* gender, Western background, education, research group, progressive ideas and reading of early yet established STR may have shaped the research results. Specifically, being progressive and following STR, he may have uncritically assumed that all oil majors are regime members and thus villains. At the same time, as a Western man, he felt a degree of acceptance within an industry dominated by middle-aged men in suits, which may have facilitated roles such as knowledge brokering between the industry and civil society. Yet in doing so, this background may have made him a gullible researcher who neglected the industry's historical roles and current delaying tactics.

This example not only illustrates the non-neutrality of the regime concept (cf. Section 27.1.1), making researchers see certain things and not others (e.g. all oil majors are villains by definition), but also underscores the persisting nature of reflexivity in relation to one's own positionality. Reflexivity is not 'a badge of honor' (p. 17) that can be earned (Peshkin, 1988), but rather a continuous inquiry into how one holds oneself as a responsible subject within the intricate web of personal characteristics (e.g. personality, capacities and specific histories) and research assumptions. The beginnings of such introspective reflections have begun to emerge in recent transition research (e.g. McGowan & Antadze, 2023; Susur & Karakaya, 2021) and can be found in the PhD theses of a few transition scholars (e.g. Ampe, 2022; Avelino, 2011; Bosman, 2022; Wittmayer, 2016). For instance, as 'the only woman, wearing a pink scarf', Avelino (2011) notes a sharp contrast with 'the crowd that predominantly consisted of middle-aged men in grey suits' (p. 111) in her case studies, which is an observation that persisted throughout the research process. Likewise, one of us reflected on how personal, institutional and cultural contexts shaped the produced research (Ampe, 2022). These researchers attempt to bear witness to how their research findings are co-shaped

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by personal experiences with research roles, specific histories, institutional goals, resource-limited projects and normative ambitions, among many other factors. While such introspection is standard practice in fields like anthropology, ethnology and gender studies – where, for example, dedicating a full chapter to one's positionality is considered an essential component of a PhD – it remains subject to dismissal in some academic circles as 'unscientific'. Indeed, embracing vulnerability in this context requires both courage and determination.

27.4 Conclusion

In this chapter, we explored the question of engagement within STR through the lens of reflexivity. In the first section, we introduced reflexivity from an STS perspective on the situatedness of technology and knowledge. Distinguishing between unreflectiveness, reflectiveness and reflexivity, we advocated for an incrementally introspective attitude towards the non-neutrality of technology and knowledge. In the second section, we outlined why reflexivity is important to STR. We demonstrated that reflexivity extends beyond acknowledging the non-neutrality concerning sustainability and the direction of transitions. It also encompasses the more implicit non-neutrality inherent in the concepts and frameworks STR mobilises. In the third and final section, we addressed how transition researchers can mobilise reflexivity. Through some fictionalised experiences, we illustrated how a reflexive attitude continually prompts researchers to confront new and often challenging questions about their own research practice and how this, in turn, invites creative, critical and relevant interventions.

We close by stating that an ethos of reflexivity confronts transition researchers with an inescapable responsibility. This responsibility complicates the research process, making it far from straightforward, but it also makes it considerably more challenging and, at times, existential. There is an essential portion of reflexivity that is indispensably personal, in that it cannot be outsourced or delegated. Reflexivity is not a subroutine of a research procedure that can be addressed with a toolbox, principles, a separate reflexivity workshop or work package. Rather, reflexivity is the systematic and cultivated wonder about the social, societal and political status of one's own research practice, and, as such, it accompanies every move you make. This is something everyone has to do, by themselves, very personally. It is, after all, you, raising or not raising objections, seeing or not seeing the bigger picture, caring or not caring to understand what is at stake in what you are (or are not) doing. Much of reflexivity, therefore, lies in the question of how, and with what kind of awareness, you are personally doing what you are doing. If you are a transition researcher, you are in a comparatively powerful societal position so that your choices do make a difference in the world.

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References

Ampe, K. (2022). *Troubled wastewaters: The politics of transitions to a circular economy* [PhD dissertation]. Delft University of Technology & Ghent University.

Andreucci, D., García López, G., Radhuber, I., Conde, M., Voskoboynik, D., Farrugia, J., & Zografos, C. (2023). The coloniality of green extractivism: Unearthing decarbonisation by dispossession through the case of nickel. *Political Geography*, *107*, 102997.

Arora, S., & Stirling, A. (2023). Colonial modernity and sustainability transitions: A conceptualisation in six dimensions. *Environmental Innovation and Societal Transitions*, *48*, 100733.

Avelino, F. (2011). *Power in transition: Empowering discourses on sustainability transitions* [PhD dissertation]. Erasmus University Rotterdam.

Balmer, A. S., Calvert, J., Marris, C., Molyneux-Hodgson, S., Frow, E., Kearnes, M., Bulpin, K., Schyfter, P., MacKenzie, A., & Martin, P. (2015). Taking roles in interdisciplinary collaborations: Reflections on working in post-ELSI spaces in the UK synthetic biology community. *Science & Technology Studies*, *28*, 3–25.

Beck, S., Jasanoff, S., Stirling, A., & Polzin, C. (2021). The governance of sociotechnical transformations to sustainability. *Current Opinion in Environmental Sustainability*, *49*, 143–152.

Beers, P., & Van Mierlo, B. (2017). Reflexivity and learning in system innovation processes. *Sociologia Ruralis*, *57*, 415–436.

Bergek, A., Jacobsson, S., Carlsson, B., Lindmark, S., & Rickne, A. (2008). Analyzing the functional dynamics of technological innovation systems: A scheme of analysis. *Research Policy*, *37*, 407–429.

Block, T., & Paredis, E. (2019). Four misunderstandings about sustainability and transitions. In K. Van Poeck, L. Östman, & J. Öhman (Eds.), *Sustainable Development Teaching: Ethical and Political Challenges* (pp. 15–28). Routledge.

Block, T., Goeminne, G., & Van Poeck, K. (2018). Balancing the urgency and wickedness of sustainability challenges: Three maxims for post-normal education. *Environmental Education Research*, *24*, 1424–1439.

Blythe, J., Silver, J., Evans, L., Armitage, D., Bennett, N., Moore, M.-L., Morrison, T., & Brown, K. (2018). The dark side of transformation: Latent risks in contemporary sustainability discourse. *Antipode*, *50*, 1206–1223.

Bosman, R. (2022). *Into transition space: Destabilisation and incumbent agency in accelerating energy transition* [PhD dissertation]. EUR.

Bourdieu, P. (1990). *In Other Words: Essays Towards a Reflexive Sociology*. Stanford University Press.

Bulten, E., Hessels, L., Hordijk, M., & Segrave, A. (2021). Conflicting roles of researchers in sustainability transitions: Balancing action and reflection. *Sustainability Science*, *16*, 1269–1283.

Caniglia, G., Luederitz, C., von Wirth, T., Fazey, I., Martín-López, B., Hondrila, K., König, A., von Wehrden, H., Schäpke, N., Laubichler, M., & Lang, D. (2021). A pluralistic and integrated approach to action-oriented knowledge for sustainability. *Nature Sustainability*, *4*, 93–100.

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Chambers, J. M., Wyborn, C., Klenk, N., Ryan, M., Serban, A., Bennett, N., Brennan, R., Charli-Joseph, L., Fernández-Giménez, M., Galvin, K., Goldstein, B., Haller, T., Hill, R., Munera, C., Nel, J., Österblom, H., Reid, R., Riechers, M., Spierenburg, M., … Rondeau, R. (2022). Co-productive agility and four collaborative pathways to sustainability transformations. *Global Environmental Change*, *72*, 102422.

Chilvers, J., & Longhurst, N. (2016). Participation in transition(s): Reconceiving public engagements in energy transitions as co-produced, emergent and diverse. *Journal of Environmental Policy & Planning*, *18*, 585–607.

Collyer, F. (2011). Reflexivity and the sociology of science and technology: The invention of 'Eryc' the antibiotic. *The Qualitative Report*, *16*, 316–340.

Contesse, M., Duncan, J., Legun, K., & Klerkx, L. (2021). Unravelling non-human agency in sustainability transitions. *Technological Forecasting and Social Change*, *166*, 120634.

De Haan, F., & Rotmans, J. (2018). A proposed theoretical framework for actors in transformative change. *Technological Forecasting and Social Change*, *128*, 275–286.

De Roeck, F., & Van Poeck, K. (2023). Agency in action: Towards a transactional approach for analyzing agency in sustainability transitions. *Environmental Innovation and Societal Transitions*, *48*, 100757.

Dryzek, J. (2005). *The Politics of the Earth: Environmental Discourses*. Oxford University Press.

Edsand, H.-E. (2019). Technological innovation system and the wider context: A framework for developing countries. *Technology in Society*, *58*, 101150.

Escobar, A. (2015). Degrowth, postdevelopment, and transitions: A preliminary conversation. *Sustainability Science*, *10*, 451–462.

Escobar, A. (2018). *Designs for the Pluriverse: Radical Interdependence, Autonomy, and the Making of Worlds*. Duke University Press.

Feola, G. (2020). Capitalism in sustainability transitions research: Time for a critical turn? *Environmental Innovation and Societal Transitions*, *35*, 241–250.

Feola, G., Vincent, O., & Moore, D. (2021). (Un)making in sustainability transformation beyond capitalism. *Global Environmental Change*, *69*, 102290.

Geels, F. (2020). Micro-foundations of the multi-level perspective on socio-technical transitions: Developing a multi-dimensional model of agency through crossovers between social constructivism, evolutionary economics and neo-institutional theory. *Technological Forecasting and Social Change*, *152*, 119894.

Genus, A., & Coles, A.-M. (2008). Rethinking the multi-level perspective of technological transitions. *Research Policy*, *37*, 1436–1445.

Ghosh, B., Ramos-Mejía, M., Machado, R. C., Yuana, S. L., & Schiller, K. (2021). Decolonising transitions in the global south: Towards more epistemic diversity in transitions research. *Environmental Innovation and Societal Transitions*, *41*, 106–109.

Goeminne, G. (2012). Lost in translation: Climate denial and the return of the political. *Global Environmental Politics*, *12*, 1–8.

Goeminne, G., & Block, T. (2014). De coproductie van feitelijkheden en bezorgdheden: Over de plaats van duurzaamheidsonderzoek en de vraag naar relevante kennis. In T. Block & G. Goeminne (Eds.), *Duurzaamheidsonderzoek in de spiegel: Refecties op het raakvlak tussen kennis en engagement* (pp. 203–220). Academia Press.

Goeminne, G., Kolen, F., & Paredis, E. (2011). Addressing the sustainability challenge beyond the fact-value dichotomy: A call for engaged knowledge. *Worldviews, Science and Us*, 200–220.

Goeminne, G., & Mühlhoff, R. (2024). *The SIMPORT Ethics Primer: What does it mean to do ethics in software development?*

Grin, J., Rotmans, J., & Schot, J. (2010). *Transitions to Sustainable Development*. Routledge.

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Hanusch, F., & Schad, M. (2021). Hydrogen research: Technology first, society second? *GAIA – Ecological Perspectives for Science and Society*, *30*, 82–86.
Haraway, D. (1988). Situated knowledges: The science question in feminism and the privilege of partial perspective. *Feminist Studies*, *14*, 575.
Haraway, D. (2016). *Staying with the Trouble: Making Kin in the Chthulucene*. Duke University Press.
Hekkert, M., Suurs, R., Negro, S., Kuhlmann, S., & Smits, R. (2007). Functions of innovation systems: A new approach for analysing technological change. *Technological Forecasting and Social Change*, *74*, 413–432.
Hölscher, K., Wittmayer, J., & Loorbach, D. (2018). Transition versus transformation: What's the difference? *Environmental Innovation and Societal Transitions*, *27*, 1–3.
Hopwood, B., Mellor, M., & O'Brien, G. (2005). Sustainable development: Mapping different approaches. *Sustainable Development*, *13*, 38–52.
Jasanoff, S. (Ed.). (2004). *States of Knowledge*. Abingdon, UK: Taylor & Francis.
Kanger, L., & Schot, J. (2019). Deep transitions: Theorizing the long-term patterns of socio-technical change. *Environmental Innovation and Societal Transitions*, *32*, 7–21.
Keller, M., Noorkõiv, M., & Vihalemm, T. (2022). Systems and practices: Reviewing intervention points for transformative socio-technical change. *Energy Research & Social Science*, *88*, 102608.
Köhler, J., Geels, F., Kern, F., Markard, J., Onsongo, E., Wieczorek, A., Alkemade, F., Avelino, F., Bergek, A., Boons, F., Fünfschilling, L., Hess, D., Holtz, G., Hyysalo, S., Jenkins, K., Kivimaa, P., Martiskainen, M., McMeekin, A., Mühlemeier, S., … Wells, P. (2019). An agenda for sustainability transitions research: State of the art and future directions. *Environmental Innovation and Societal Transitions*, *31*, 1–32.
Kump, B., Wittmayer, J., Bogner, K., & Beekman, M. (2023). Navigating force conflicts: A case study on strategies of transformative research in the current academic system. *Journal of Cleaner Production*, *412*, 137374.
Laakso, S., Aro, R., Heiskanen, E., & Kaljonen, M. (2021). Reconfigurations in sustainability transitions: A systematic and critical review. *Sustainability: Science, Practice and Policy*, *17*, 15–31.
Latour, B. (2018). *Down to Earth: Politics in the New Climatic Regime*. Polity Press.
Loorbach, D. (2022). Designing radical transitions: A plea for a new governance culture to empower deep transformative change. *City, Territory and Architecture*, *9*, 30.
Loorbach, D., Frantzeskaki, N., & Avelino, F. (2017). Sustainability transitions research: Transforming science and practice for societal change. *Annual Review of Environment and Resources*, *42*, 599–626.
Markard, J., & Truffer, B. (2008). Technological innovation systems and the multi-level perspective: Towards an integrated framework. *Research Policy*, *37*, 596–615.
McGowan, K., & Antadze, N. (2023). Recognizing the dark side of sustainability transitions. *Journal of Environmental Studies and Sciences*, *13*, 344–349.
Pel, B., Wittmayer, J., Avelino, F., Loorbach, D., & De Geus, T. (2023). How to account for the dark sides of social innovation? Transitions directionality in renewable energy prosumerism. *Environmental Innovation and Societal Transitions*, *49*, 100775.
Peshkin, A. (1988). In search of subjectivity. One's own. *Educational Researcher*, *17*, 17–21.
Pohl, L. (2020). Ruins of Gaia: Towards a feminine ontology of the anthropocene. *Theory, Culture & Society*, *37*, 67–86.
Richardson, K., Steffen, W., Lucht, W., Bendtsen, J., Cornell, S., Donges, J., Drüke, M., Fetzer, I., Bala, G., Von Bloh, W., Feulner, G., Fiedler, S., Gerten, D., Gleeson, T., Hofmann, M., Huiskamp, W., Kummu, M., Mohan, C., Nogués-Bravo, D., …

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Rockström, J. (2023). Earth beyond six of nine planetary boundaries. *Science Advances*, *9*, eadh2458.
Rittel, H., & Webber, M. (1973). Dilemmas in a general theory of planning. *Policy Sciences*, *4*, 155–169.
Schlosberg, D. (2007). *Defining Environmental Justice: Theories, Movements, and Nature*. Oxford University Press.
Schrage, J., Barraclough, A., Wilkerson, B., Cusens, J., & Fuller, J. (2023). Developing positional awareness in sustainability science: Four archetypes for early career scientists working in an SDG world. *Sustainability Science*, *18*, 1053–1058.
Schuijer, J. W., Broerse, J., & Kupper, F. (2021). Juggling roles, experiencing dilemmas: The challenges of SSH scholars in public engagement. *NanoEthics*, *15*, 169–189.
Scoones, I., Newell, P., & Leach, M. (2015). The politics of green transformations. In I. Scoones, M. Leach, & P. Newell (Eds.), *The Politics of Green Transformations* (pp. 1–25). Routledge.
Shove, E., & Walker, G. (2007). Caution! Transitions ahead: Politics, practice, and sustainable transition management. *Environment and Planning A*, *39*, 763–770.
Smith, A., & Stirling, A. (2007). Moving outside or inside? Objectification and reflexivity in the governance of socio-technical systems. *Journal of Environmental Policy & Planning*, *9*, 351–373.
Stengers, I. (2015). *In Catastrophic Times: Resisting the Coming Barbarism* (A. Goffey, Trans.). Open Humanities Press.
Stirling, A. (2006). Precaution, foresight and sustainability: Reflection and reflexivity in the governance of science and technology. In J.-P. Voss, D. Bauknecht, & R. Kemp (Eds.), *Reflexive Governance for Sustainable Development* (pp. 225–272). Edward Elgar.
Stirling, A. (2015). Emancipating transformations: From controlling the transition to culturing plural radical progress. In I. Scoones, M. Leach, & P. Newell (Eds.), *The Politics of Green Transformations* (pp. 55–68). Routledge.
Susur, E., & Karakaya, E. (2021). A reflexive perspective for sustainability assumptions in transition studies. *Environmental Innovation and Societal Transitions*, *39*, 34–54.
Thapa, K., Vermeulen, W., & Deutz, P. (2022). Science with society: Challenges of early-stage researchers engaging with transdisciplinary research in sustainability science. *Sustainable Development*, *30*, 1562–1572.
Turnhout, E., Stuiver, M., Klostermann, J., Harms, B., & Leeuwis, C. (2013). New roles of science in society: Different repertoires of knowledge brokering. *Science and Public Policy*, *40*, 354–365.
Van De Graaf, T., Overland, I., Scholten, D., & Westphal, K. (2020). The new oil? The geopolitics and international governance of hydrogen. *Energy Research & Social Science*, *70*, 101667.
Wittmayer, J. (2016). *Transition management, action research and actor roles: Understanding local sustainability transcations* [PhD dissertation]. Erasmus University Rotterdam.
Wittmayer, J., & Schäpke, N. (2014). Action, research and participation: Roles of researchers in sustainability transitions. *Sustainability Science*, *9*, 483–496.
Wittmayer, J., Huang, Y.-S., Bogner, K., Boyle, E., Hölscher, K., Von Wirth, T., Boumans, T., Garst, J., Hendlin, Y. H., Lavanga, M., Loorbach, D., Mungekar, N., Tshangela, M., Vandekerckhove, P., & Vasques, A. (2024). Neither right nor wrong? Ethics of collaboration in transformative research for sustainable futures. *Humanities and Social Sciences Communications*, *11*, 677.
Yanow, D., & Tsoukas, H. (2009). What is reflection-in-action? A phenomenological account. *Journal of Management Studies*, *46*, 1339–1364.

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